GANGA GUIDE

SCIENCE

10

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Price : ₹ 270/-

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PREFACE

SCIENCE text book has been prepared following the guidelines given in the **NATIONAL CURRICULAM FRAME WORK**. The new text book provides ample opportunities for the students to learn Science and use it effectively in their life. The marked changes in the new text book aims at equipping the students with a gradual building of scientific knowledge to face the competitive world.

In tune with the objectives as formulated in the new text book, **GANGA PUBLICATION** has come out with a new Science Guide to help the students to learn Science comfortably and score very good marks in Government Board Exam. Every effort has been taken to lend a hand to students to understand and assimilate the answers easily.

Accurate answers in simple language and enormous additional questions and answers will help the students to score good marks in School as well as in Government Board Examination. Moreover, we have added Unit Test for 50 marks for every chapter, which will be very useful for self evaluation.

It is earnestly hoped that **GANGA GUIDE** will be of immence help to equipe the students to face the examinations with confidence and competence.

Wish you the most successful, pleasant Academic Year with **GANGA GUIDE**.
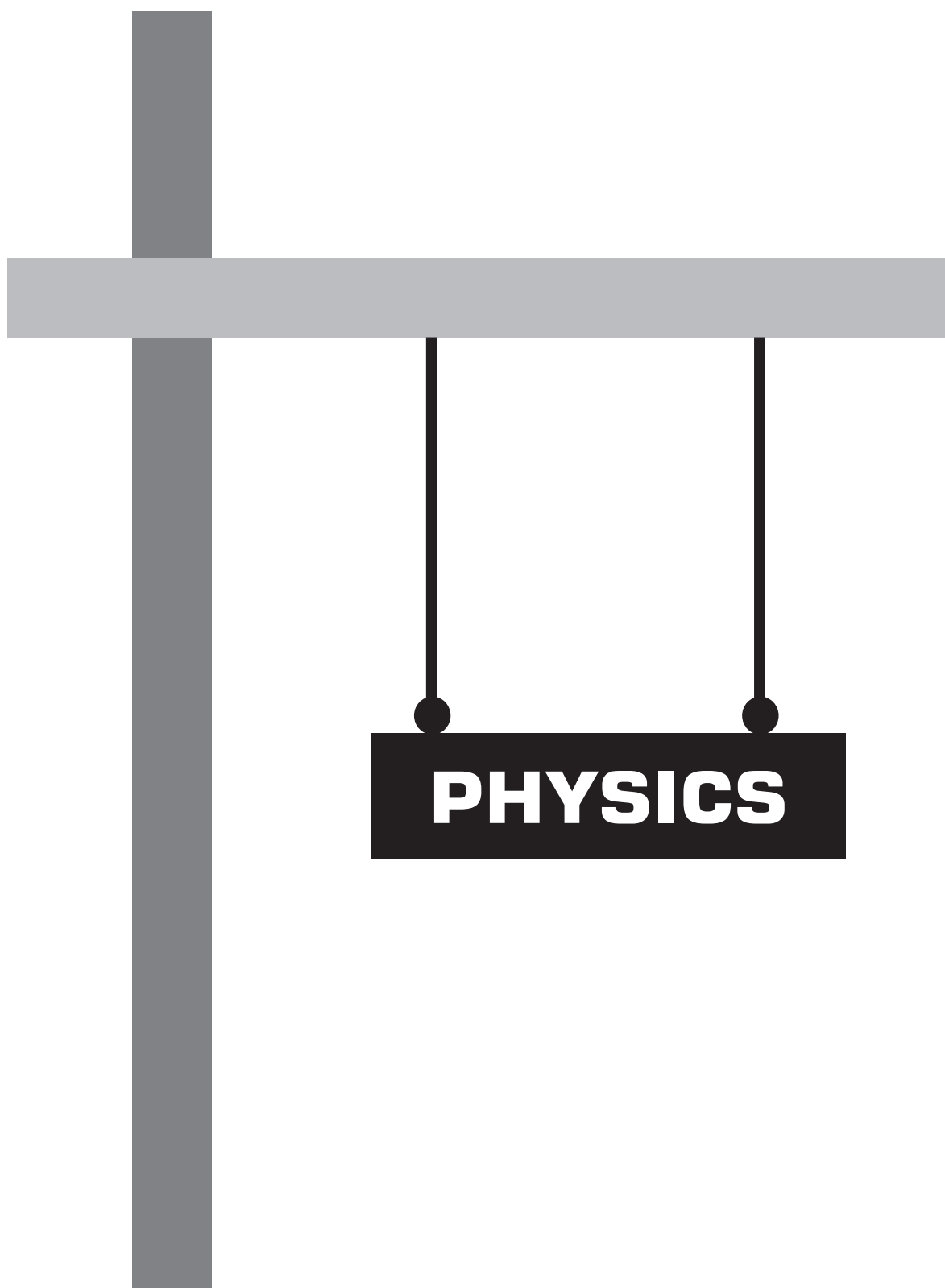
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PHYSICS

LAWS OF MOTION

UNIT 1

Important Points

➢ Mechanics is divided into statics and dynamics.

➢ Ability of a body to maintain its state of rest or motion is called Inertia.

➢ Moment of the couple is measured by the product of any one of the forces and the perpendicular distance between two forces.

➢ SI unit of force is newton (N). C.G.S unit is dyne.

➢ When a force Facts on a body for a period of time t, then the product of force and time is known as 'impulse'.

➢ The unit of weight is newton or kg f.

➢ The weight of a body is more at the poles than at the equatorial region.

➢ Mass of a body is defined as the quantity of matter contained in the object. Its SI unit is kilogram (kg).

➢ Apparent weight is the weight of the body acquired due to the action of gravity and other external forces on the body.

TEXT BOOK EVALUATION

I. Book Exercise – Choose the best answer

1. **Inertia of a body depends on**
   a. weight of the object
   b. acceleration due to gravity of the planet
   c. mass of the object
   d. Both a & b

   Ans : (c) mass of the object

2. **Impulse is equal to**
   a. rate of change of momentum
   b. rate of force and time
   c. change of momentum
   d. rate of change of mass

   Ans : (c) change of momentum

3. **Newton's III law is applicable**
   a. for a body is at rest
   b. for a body in motion
   c. both a and b
   d. only for bodies with equal masses

   Ans : (c) both (a) & (b)

4. **Plotting a graph for momentum on the X-axis and time on Y-axis. slope of momentum-time graph gives**
   a. Impulsive force   b. Acceleration   c. 1/Force   d. Rate of force

   Ans : (c) 1/F

5. **In which of the following sport the turning of effect of force used**
   a. swimming   b. tennis   c. cycling   d. hockey

   Ans : (c) cycling

6. **The unit of 'g' is m s^{-2}. It can be also expressed as**
   a. cm s^{-1} b. N kg^{-1} c. N m^2 kg^{-1} d. cm^2 s^{-2}

   Ans : (b) N Kg^{-1}

7. **One kilogram force equals to**
   a. 9.8 dyne   b. 9.8 × 10^4 N   c. 98 × 10^4 dyne   d. 980 dyne

   Ans : (c) 98 × 10^4 dyne

8. **The mass of a body is measured on planet Earth as M kg. When it is taken to a planet of radius half that of the Earth then its value will be _____ kg**

    a. 4 M   b. 2M   c. M/4   d. M

    Ans : (c) M/4

9. **If the Earth shrinks to 50% of its real radius its mass remaining the same, the weight of a body on the Earth will**

    a. decrease by 50%   b. increase by 50%   c. decrease by 25%   d. increase by 300%

    Ans : (c) decrease by 25%

10. **To project the rockets whice of the following principle(s) is /are required?**

    a. Newton's third law of motion   b. Newton's law of gravitation

    c. law of conservation of linear momentum d. both a and c

    Ans : (d) both (a) and (c)

II. Book Exercise – Fill in the blanks

1. To produce a displacement _____ is required.   **Ans :** Force

2. Passengers lean forward when sudden brake is applied in a moving vehicle. This can be explained by _____   **Ans :** Inertia of motion

3. By convention, the clockwise moments are taken as _____ and the anticlockwise moments are taken as _____.   **Ans :** Negative, Positive

4. _____ is used to change the speed of car.   **Ans :** Gears

5. A man of mass 100 kg has a weight of _____ at the surface of the Earth.   **Ans :** 980 N

III. Book Exercise – True or False (correct the statement if it is false)

1. **The linear momentum of a system of particles is always conserved.**

    Ans : False. The linear momentum of a system of particles is always conserved only if no external force is applied.

2. **Apparent weight of a person is always equal to his actual weight.**

    Ans : False. Apparent weight and actual weight is not equal during upward or downward motion.

3. **Weight of a body is greater at the equator and less at the polar region.**

    Ans : False. Weight of a body is lesser at the equator and more at the polar region as $g \propto \dfrac{1}{R^2}$.

4. **Turning a nut with a spanner having a short handle is so easy than one with a long handle.**

    Ans : False. Moment of force in longer handle is easy than one with a short handle.

5. **There is no gravity in the orbiting space station around the Earth. So the astronauts feel weightlessness.**

    Ans : False. Apparent weight is zero. They are in the state of weightlessness.

IV. Book Exercise – Match the following

	Column I		Column II
1.	**Newton's I law**	(a)	**propulsion of a rocket**
2.	**Newton's II law**	(b)	**stable equilibrium of a body**
3.	**Newton's III law**	(c)	**law of force**
4.	**Law of conservation of linear momentum**	(d)	**flying nature of bird**

Ans :

	Column I		Column II
1	Newton's I law	b	stable equilibrium of a body
2	Newton's II law	c	law of force
3	Newton's III law	d	flying nature of bird
4	Law of conservation of linear momentum	a	propulsion of a rocket

V. Book Exercise – Assertion and Reason

Mark the correct choice as

    a) **If both the assertion and the reason are true and the reason is the correct explanation of assertion.**

    b) **If both the assertion and the reason are true, but the reason is not the correct explanation of the assertion.**

    c) **Assertion is true, but the reason is false.**

    d) **Assertion is false, but the reason is true.**

1. **Assertion:** The sum of the clockwise moments is equal to the sum of the anticlockwise momen.

    Reason: The principle of conservation of momentum is valid if the external force on the system is zero.

        Ans : (b) both the assertion and the reason are true, but the reason is not the correct explanation of the assertion

2. **Assertion:** The value of 'g' decreases as height and depth increases from the surface of the Earth.

    Reason: 'g' depends on the mass of the object and the Earth.

        Ans : (c) Assertion is true, but the reason is false

VI. Book Exercise – Answer briefly

1. **Define inertia. Give its classification.**

The inherent property of a body to resist any change in its state of rest (or) the state of uniform motion, unless it is influenced upon by an external unbalanced force is known as Inertia.

Types of Inertia :

✦ Inertia of rest.

✦ Inertia of motion.

✦ Inertia of direction.

2. **Classify the types of force based on their application.**

The 2 types of forces are,

✦ Like parallel forces.

✦ Unlike parallel forces.

3. **If a 5 N and a 15 N forces are acting opposite to one another. Find the resultant force and the direction of action of the resultant force.**

$$\text{Resultant Force} \quad = F_2 - F_1$$
$$= 15N - 5N$$
$$= 10N.$$

4. **Differentiate mass and weight.**

S.No.	Mass	Weight
1	Fundamental quantity	Derived quantity
2	It is the amount of matter contained in a body	It is the gravitational pull acting on the body
3	It's unit is kilogram	It is measured in newton
4	Remains the same	Varies from place to place
5	It is measured using physical balance	It is measured using spring balance

5. **Define moment of a couple.**

The line of action of the two forces does not coincide. It does not produce any translatory motion since the resultant is zero. But a couple results in causes the rotation of the body. Rotating effect of a couple is known as moment of a couple.

$$\text{Moment of couple} \quad = F \times S$$
$$M \quad = F \times S. \text{ (S I Unit is Nm)}$$

6.   State the principle of moments.

When a number of like or unlike parallel forces act on a rigid body and the body is in equilibrium, then the algeberic sum of the moments in the clockwise direction is equal to the algebraic sum of the moments in the anticlockwise direction.

7.   State Newton's second law.

The force acting on a body is directly proportional to the rate of change of linear momentum of the body and the change in momentum takes place in the direction of the force.

8.   Why a spanner with a long handle is preferred to tighten screws in heavy vehicles?

The turning effect of a force is called moment of force.

$$\text{Moment of Force} = \text{Force} \times \text{Perpendicular distance}$$
$$= F \times d$$

For the spanner with a long handle, 'd' is large. Therefore the moment of force is also large and hence it is easier to rotate the object (nut).

9.   While catching a cricket ball the fielder lowers his hands backwards. Why?

In cricket, a fielder pulls back his hands while catching the ball. He experiences a smaller force for a longer interval of time to catch the ball, resulting in a lesser impulse on his hands.

10.   How does an astronaut float in a space shuttle?

On the astronaut there is no external force on him due to planet or space ship. By the first law of motion the acceleration on him is zero. So he floats.

VII. Book Exercise – Solve the given problems

1.   Two bodies have a mass ratio of 3:4 The force applied on the bigger mass produces an acceleration of 12 ms^{-2}.What could be the acceleration of the other body, if the same force acts on it.

$$\text{Let mass of the body A} = 3 \, m$$
$$\text{Mass of the body B} = 4 \, m$$
$$\text{Force applied} = F$$

For body A

$$F = \text{mass} \times \text{acceleration}$$
$$F = 3m \times 12 \, ms^{-1}$$
$$F = 36 \, N.$$

For body B

$$F = \text{mass} \times \text{acceleration}$$
$$\text{Acceleration} = \frac{\text{Force}}{\text{Mass}}$$
$$= \frac{36 \, N}{4m}$$
$$= 9 \, ms^{2}.$$

2.   A ball of mass 1 kg moving with a speed of 10 ms^{-1} rebounds after a perfect elastic collision with the floor. Calculate the change in linear momentum of the ball.

$$\text{Mass of the ball} = 1 \, kg$$
$$\text{Initial speed} = 10 \, ms^{-1}$$
$$\text{Final speed} = -10 ms^{-1} \, (\text{rebounds})$$

Change in momentum

$$\Delta P = mV - mu$$
$$\Delta P = 1 \times (-10) - 1 \times 10$$
$$= -10 - 10$$
$$\Delta P = -20 \, kg \, m/s.$$

3. **A mechanic unscrew a nut by applying a force of 140 N with a spanner of length 40 cm. What should be the length of the spanner if a force of 40 N is applied to unscrew the same nut?**

Equating the torque in both the cases.

$$F_1 \, l_1 = F_2 \, l_2$$
$$140N \times 40cm = l_2 \times 40N$$
$$l_2 = \frac{140\,N \times 40\,cm}{40\,N}$$
$$l_2 = 140 \text{ cm.}$$
$$l_2 = 1.4 \text{ m.}$$

4. **The ratio of masses of two planets is 2:3 and the ratio of their radii is 4:7 Find the ratio of their accelerations due to gravity.**

$$g_1 = \frac{GM_1}{R_1^2}$$
$$g_2 = \frac{GM_2}{R_2^2}$$
$$M_1 : M_2 = 2 : 3$$
$$R_1 : R_2 = 4 : 7$$
$$\frac{g_1}{g_2} = \frac{\cancel{G}M_1}{R_1^2} \times \frac{R_2^2}{\cancel{G}M_2}$$
$$= \frac{M_1}{R_1^2} \times \frac{R_2^2}{M_2}$$
$$= \frac{2}{(4)^2} \times \frac{(7)^2}{3}$$
$$= \frac{2}{16} \times \frac{49}{3}$$
$$= \frac{98}{48}$$
$$\frac{g_1}{g_2} = \frac{49}{24}.$$

VIII. Book Exercise – Answer in detail

1. **What are the types of inertia? Give an example for each type.**
    There are 3 types of Inertia. They are;
    ✦ **Inertia at rest :**   The resistance of a body to change its state of rest is called inertia of rest.
      Example :   When you vigorously shake the branches of a tree, some of the leaves and fruits are detached and they fall down (Inertia of rest).
    ✦ **Inertia of motion :**   The resistance of a body to change its state of motion is called inertia of motion.
      Example :   An athlete runs some distance before jumping because this will help him jump longer and higher.
    ✦ **Inertia of direction :** The resistance of a body to change its direction of motion is called inertia of direction.
      Example :   When a bus turn towards right, the passangers are thrown towards left.

2. **State Newton's laws of motion?**
    Newton's First Law :   This law states that everybody continues to be in its state of rest (or) the state of

uniform motion along a straight line unless it is acted upon by some external force.

Newton's Second Law : According to this law, the force acting on a body is directly proportional to the rate of change of linear momentum of the body and the change in momentum takes place in the direction of the force.

Newton's Third Law : Newton's third law states that for every action, there is an equal and opposite reaction. They always act on two different bodies.

3. Deduce the equation of a force using Newton's second law of motion.

This law helps us to measure the amount of force. So it is also called as "law of force". Let 'm' be the mass of a moving body, moving along a straight line with an initial speed 'u' after a time interval of 't', the velocity of the body changes to 'v' due to the impact of an unbalanced external force 'F'.

Initial momentum of the body P_i = mu

Final momentum of the body P_f = mv

Change in momentum P = $P_f - P_i$

$$= mv - mu$$

By Newton's second law of motion,

Force, F α rate of change of momentum.

F α change in momentum / time.

$$F \alpha \frac{mv - mu}{t}$$

$$F = K \frac{m(v-u)}{t}$$

Here K is the proportionality constant. K=1 in all systems of units. Hence,

$$F = \frac{m(v-u)}{t}$$

$$\text{since acceleration} = \frac{\text{change in velocity}}{\text{time}}$$

$$a = \frac{(v-u)}{t}$$

Hence we have

$$F = m \times a$$

$$\text{Force} = \text{mass} \times \text{acceleration}$$

No external force is required to maintain the motion of a body moving with uniform velocity. When the net force acting on a body is not equal to zero, then definitely the velocity of the body will change.

4. State and prove the law of conservation of linear momentum.

There is no change in the linear momentum of a system of bodies as long as no net external force acts on them.

Let us prove the law of conservation of linear momentum with the following illustration.
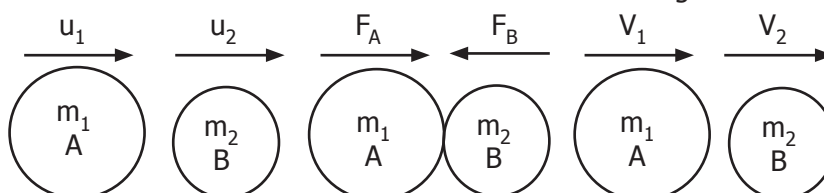
Proof : Let two bodies A and B having masses m_1 and m_2 move with initial velocity u_1 and u_2 in a straight line. Let the velocity of the first body be higher than that of the second body. i.e., $u_1 > u_2$. During an interval of time 't' second, they tend to have a colliusion. After the impact, both them move along the same straight line with a velocity V_1 and V_2 respectively.

Force on body B due to A

$$F_B = \frac{m_2(v_2 - u_2)}{t}$$

Force on body A due to B

$$F_A = \frac{m_1(v_1 - u_1)}{t}$$

By Newton's III law of motion,

Action Force = Reaction Force

$$F_A = - F_B$$

$$\frac{m_1(v_1 - u_1)}{t} = - \frac{m_2(v_2 - u_2)}{t}$$

$$m_1 V_1 + m_2 V_2 = m_1 u_1 + m_2 u_2$$

The above equation confirms in the absence of an external force, the algebraic sum of momentum after collision is numerically equal to the algebraic sum of the momentum before collision.

Hence the law of conservation of linear momentum is proved.

5. Describe rocket propulsion.

✦ Propulsion of rockets is based on the law of conservation of linear momentum as well as Newton's III law of motion.

✦ Rockets are filled with a fuel in the propellant tank.

✦ When the rocket is fired, this fuel is burnt and a hot gas is ejected with a high speed from the nozzle of the rocket, producing a huge momentum.

✦ To balance this momentum, an equal and opposite reaction force is produced in the combustion chamber, which makes the rocket project forward.

✦ While in motion, the mass of the rocket gradually decreases, until the fuel is completely burnt out.

✦ Since, there is no net external force acting on it, the linear momentum of the system is conserved.

✦ The mass of the rocket decreases with altitude, which results in the gradual increase in velocity of the rocket.

✦ At one stage, it reaches a velocity, which is sufficient to just escape from the gravitational pull of the Earth. This velocity is called escape velocity.

6. State the universal law of gravitation and derive its mathematical expression.

This law states that every particle of matter in this universe attracts every other particle with a force. This force is directly proportional to the product of their masses and inversely proportional to the square of the distance between the centers of these masses. The direction of the force acts along the line joining the masses.

Force between the masses is always attractive and it does not depend on the medium where they are placed.
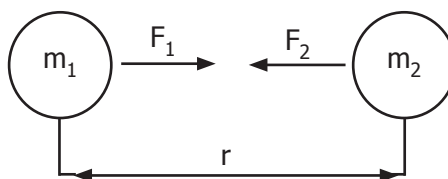
Let, m_1 and m_2 be the masses of two bodies A and B placed r metre apart in space

Force $F \propto m_1 \times m_2$

$$F \propto \frac{1}{r^2}$$

On combining the above two expressions

$$F \propto \frac{m_1 \times m_2}{r^2}$$

$$F = \frac{G m_1 m_2}{r^2}$$

Where G is the universal gravitational constant. Its value in SI unit is 6.674×10^{-11} N m^2 kg^{-2}.

7. **Give the applications of universal law gravitation.**
   ✦ Dimensions of the heavenly bodies can be measured using the gravitation law. Mass of the Earth, radius of the Earth, acceleration due to gravity, etc. can be calculated with a higher accuracy.
   ✦ It helps in discovering new stars and planets.
   ✦ One of the irregularities in the motion of stars is called 'Wobble' lead to the disturbance in the motion of a planet nearby. In this condition the mass of the star can be calculated using the law of gravitation.
   ✦ Helps to explain germination of roots is due to the property of geotropism which is the property of a root responding to the gravity.
   ✦ Helps to predict the path of the astronomical bodies.

IX. Book Exercise – HOT question

1. **Two blocks of masses 8 kg and 2 kg respectively lie on a smooth horizontal surface in contact with one other. They are pushed by a horizontally applied force of 15 N. Calculate the force exerted on the 2 kg mass.**

   Solution : If 2 blocks are of mass 8 kg and 2 kg

   $\xrightarrow{15\ N}$ | 8 kg | | 2 kg |
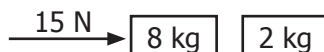
   Data

   $m_1 = 8$ kg
   $m_2 = 2$ kg
   m_T = Total mass
       = 8+2
       = 10kg

   $$F = m_T \times a$$
   $$15 = (8 + 2) \times a$$
   $$15 = 10 \times a$$
   $$a = \frac{15\,N}{10\,kg} = \frac{3}{2}\ ms^{-1}$$

   Force exerted by block 2 (2 kg)

   $$So\ F = m \times a$$
   $$= 2 \times \frac{3}{2}$$

   Exerted Force = 3 N.

2. **A heavy truck and bike are moving with the same kinetic energy. If the mass of the truck is four times that of the bike, then calculate the ratio of their momenta. (Ratio of momenta = 1:2)**

   Solution : According to kinetic energy,

   Since K.E are equal

   $$\frac{1}{2} m_1 v_1^2 = \frac{1}{2} m_2 v_2^2$$
   $$\frac{m_1}{m_2} = \frac{v_2^2}{v_1^2}$$
   $$\frac{4m_1}{m_2} = \frac{v_2^2}{v_1^2}$$
   $$\frac{v_2}{v_1} = 2$$

   Ratio of momentum $= \dfrac{m_1 v_1}{m_2 v_2}$

   $$= \frac{4m_2 v_1}{m_2 v_2}$$
   $$= 4 \times \frac{1}{2} = \frac{2}{1}$$

   Ratio of momentum = 2:1

   Data

   m_1 = Truck mass
   m_2 = Bike mass
   v_1 = Truck velocity
   v_2 = Bike velocity
   Given K.E are equal
   $m_1 = 4m_2$
   ratio of momentum = ?

3. **"Wearing helmet and fastening the seat belt is highly recommended for safe journey" Justify your answer using Newton's laws of motion.**

   Explanation :

   1. **Wearing a helmet** is strongly recommended for safe journy, because when a person fall from bike he exerts a force equal to product of mass of the persion and acceleration of the bike (Newton's II law). According to Newton's III law, inturn the ground offers and equal and opposite force on the persion, which will porduce large damage. In order to mimnse damages the persion must wear helmet.

   2. **Fastening of seat belt** will not allow a person to meve from seat why the vechicle comes to rest suddengly by applying brake or by having some accidents.

   This is deu to inertia of motion. (Newton's I law). When the speeding vechicle stops suddenly the lower part in contact with the seat stops while the upperr patr of the body tends to maintain its uniform motion. Hence the persion will trun forward and obtain injuries. Inorder to avoid this, fastening of seat belt is important.

Additional – Choose the best answer

1. **Rest and motion are _____.**
   a) Interrelated b) Independent c) either dependent or independent d) neither dependent nor independent
   Ans : (a) Interrelated

2. **Force is called as _____.**
   a) pull   b) push   c) pull or push   d) none of these
   Ans : (c) pull or push

3. **Who formulated the theory of laws of motion?**
   a) Newton   b) Galileo   c) Aristotle   d) Thales
   Ans : (a) Newton

4. **_____ is the branch of physics that deals with the effort of force on bodies.**
   a) Mechanics   b) Statics   c) Dynamics   d) kinematice
   Ans : (a) Mechanics

5. **_____ deals with the bodies, which are at rest under the action of forces.**
   a). Mechanics   b) Statics   c) Dynamics   d) Kinetics
   Ans : (b) Statics

6. **_____ is the study of moving bodies under the action of forces.**
   a) Mechanics   b) Statics   c) Dynamics   d) Kinetics
   Ans : (c) Dynamics

7. **_____ deals with the motion of bodies without considering the cause of motion.**
   a) Dynamics   b) Kinematics   c) Kinetics   d) statics
   Ans : (b) Kinematics

8. **_____ deals with the motion of bodies considering the cause of motion.**
   a) Dynamics   b) Kinematics   c) Kinetics   d) statics
   Ans : (c) Kinetics

9. **Force independent is called _____ motion.**
   a) Natural   b) Violent   c) radial   d) circular
   Ans : (a) Natural

10. **Force dependent is called _____ motion.**
    a) Natural   b) Violent   c) radial   d) circular
    Ans : (b) Viokent

11. **The product of mass and velocity is known as _____.**
    a) Impulse   b). Linear momentum   c) Resultant force   d) None
    Ans : (b) Linear momentum

12. _____ helps to measure the magnitutde of a force.
    a) Impulse   b) Linear momentum   c) Resultant force   d) None

    Ans : (b) Linear momentum

13. **Unit of momentum is SI system is _____.**
    a) Kg ms^{-2} b) Kg ms^{-1} c) Kg ms   d) Kg^{2}ms^{-2}

    Ans : (b) Kg ms^{-1}

14. **Unit of momentum in CGS system is _____.**
    a) g cms^{-2} b) g cms^{-1} c) g^2 cms^{-2} d) g cm^{2}s^{-1}

    Ans : (b) g cms^{-1}

15. **Force is _____ quantity.**
    a) Vector   b) Scalar   c) both   d) Tensor

    Ans : (a) Vector

16. **Force has _____.**
    a) magnitude   b. direction   c) both   d) none

    Ans : (c) both

17. **Based on the direction, Force can be classified into _____ types.**
    a) 3   b) 4   c) 2   d) none

    Ans : (c) 2

18. _____ is equal to the vector sum of all the forces.
    a) Resultant force   b) Imulse   c) Torque   d) moment of force

    Ans : (a) Resultant force

19. **Parallel forces acting in the same direction, the resultant force is _____.**
    a) $F_{net} = F_1 - F_2$ b) $F_{net} = F_1 + F_2$ c) $F_{net} = F_2 - F_1$ d) $F_{net} = F_2 + F_1$

    Ans : (b) $F_{net} = F_1 + F_2$

20. **An example of unlike parallel force is _____.**
    a) Tug of war   b) Action of lever   c) pulling a cart   d) both a and c

    Ans : (a) Tug of war

21. **An example of unbalanced force is _____.**
    a) Tug of war   b) Action of lever   c) pulling a cart   d) both a and c

    Ans : (b) Action of lever

22. **The axisof the fixed edge about which the door is rotated is called as the _____.**
    a) axis of rotation   b) point of rotation   c) moment of force   d) both a and c

    Ans : (d) both a and c

23. **The rod will be turned about the fixed point is called as _____.**
    a) axis of rotation   b) point of rotation   c) moment of force   d) both b and c

    Ans : (d) both b and c

24. _____ is measured by the product of the force and the perpendicular distance.
    a) Couple   b) Torque   c) force   d) none

    Ans : (b) Torque

25. **Torque is a _____ quantity.**
    a) vector   b) scalar   c) tensor   d) either scalar or vector

    Ans : (a) vector

26. **SI unit of Torque is _____.**
    a) Nm   b) Kgs^{-1} c) gs^{-1} d) Nm^{-1}

    Ans : (a) Nm

27. **Turning a tap is an example of _____.**
    a) Moment of couple   b) Couple   c) Torque   d) both a and c
                                                                    Ans : (d) both a and c

28. **_____ is the measured by the product of the force and perpendicular distance between the line of action of forces.**
    a) Couple   b) Moment of couple   c) torque   d) both a and b
                                                                    Ans : (d) both a and c

29. **The unit of moment of couple is _____.**
    a) Newton   b) Newton metre   c) Metre   d) Newton / metre
                                                                    Ans : (b) Newton metre

30. **The unit of moment couple in CGS system is _____.**
    a) dyne cm^2 b) dyne cm   c) dyne cm^3 d) dyne /cm^2
                                                                    Ans : (b) dyne cm

31. **In seasaw, when the heavier person comes closer to the pivot point the distance of the line of action of the force _____.**
    a) Increases   b) Decreases   c) None   d) both a and b
                                                                    Ans : (b) Decreases

32. **_____ the algebraic sum of moments in the clockwise direction is equal to the algebraic sum of the moments in the anticlockwise direction.**
    a) Moment   b) Principle of moment   c) action of points   d) center of mass
                                                                    Ans : (b) Principle of moment

33. **Force = mass x _____.**
    a) distance   b) accelertion   c) velocity   d) displacement
                                                                    Ans : (b) acceleration

34. **The acceleration is produced along the radius called as _____.**
    a) centripetal acceleration   b) acceleration   c) radial acceleration   d) both a and c
                                                                    Ans : (d) both a and c

35. **SI unit of Force is _____.**
    a) Newton   b) dyne   c) kg ms^{-2} d) kg ms
                                                                    Ans : (a) Newton

36. **CGS unit of Force is _____.**
    a) Newton   b) dyne   c) gms^{-2} d) gms
                                                                    Ans : (b) dyne

37. **One Newton is equal to _____.**
    a) 1 kg ms^{-1} b) 1 kg ms^{-2} c) 1 gms^{-2} d) 1 gms
                                                                    Ans : (b) 1 kg ms^{-2}

38. **One dyne is equal to _____.**
    a) 1 g cm^{-2} b) 1 g ms^{-1} c) 1 kg ms^{-1} d) 1 kg ms^{-2}
                                                                    Ans : (a) 1 g cm^{-2}

39. **1 Newton = _____ dyne.**
    a) 10^3 b) 10^5 c) 10^6 d) 10^4
                                                                    Ans : (b) 10^5

40. **A large force acting for a verys hort interval of time is called as _____.**
    a) Impulsive force   b) Resultant Force   c) force   d) none
                                                                    Ans : (a) Impulsive force

41. **Unit of Impulsive Force is _____.**
   a) Kg ms^{-2} b) NS   c) both (a and b)   d) none

   Ans : (c) both a and b

42. **G is the _____.**
   a) Gas constant   b) Universal gravitational constant   c) force constant   d) spring constant

   Ans : (b) Universal gravitational constant

43. **Value of G is _____.**
   a) 6.674×10^{-10} N m^2 kg^{-2} b) 6.674×10^{-9} N m^2 kg^{-2}
   c) 6.674×10^{-11} N m^2 kg^{-2} d) 6.674×10^{-11} N m^2 kg^2

   Ans : (c) 6.674×10^{-11} N m^2 kg^{-2}

44. **Radius of the Earth R value is _____.**
   a) 6388 km   b) 6478 km   c) 6378 km   d) 6578 km

   Ans : (c) 6378 km

45. **g = GM/R^2 is the _____.**
   a) Acceleration due to radius of the Earth   b) Acceleration due to Gravity
   c) Acceleration due to Moon   d) Acceleration due to any planet

   Ans : (b) Acceleration due to Gravity

46. **Mass of the Earth is**
   a) M = 5.729×10^{24} kg   b) M = 5.729×10^{22} kg
   c) M = 5.972×10^{24} kg   d) M = 5.972×10^{23} kg

   Ans : (c) 5.972×10^{24} kg

47. **Value of g depends on.**
   a) volume of earth   b) mass of earth   c) geometric centre of earth   d) none

   Ans : (c) geometric centre of earth

48. **Value of g is _____ at the centre of the Earth.**
   a) 1   b) zero   c) (a) and (b)   d) none

   Ans : (b) zero

49. **The value of acceleration due to gravity on the surface of the Moon is _____.**
   a) 1.256×10^2 ms^{-2} b) 1.625 ms^{-2} c) 1.276 ms^{-2} d) 1276

   Ans : (b) 1.625 ms^{-2}

50. **If a person whose mass is 60 kg stands on the surface of Earth, his weight would be _____.**
   a) 688 N   b) 588 N   c) 690 N   d) 780 N

   Ans : (b) 588 N

51. **If a same person whose mass is 60 kg stands on the surface of Moon, his weight would be _____ N.**
   a) 98.5 N   b) 97.5 N   c) 985 N   d) 975 N

   Ans : (b) 97.5 N

52. **Lift is moving upward with an acceleration, apparent weight is _____.**
   a) greater   b) lesser   c) zero   d) none

   Ans : (a) greater

53. **Lift is moving downward with an acceleration apparent weight is _____ than the actual weight.**
   a) greater   b) lesser   c) zero   d) none

   Ans : (b) lesser

54. **Lift is at rest, apparent weight is _____.**
   a) greater   b) lesser   c) equal   d) either a or b

   Ans : (c) equal

55. Lift is falling down freely, apparent weight is equal to _____.

a) greater   b) lesser   c) zero   d) either a or b

Ans : (c) zero

56. When a = g, this motion is called as _____.

a) free fall   b) resiessive fall   c) both a and b   d) neither a nor b

ns : (a) free fall

57. In free fall condition R = _____.

a) m (g + a)   b) R < W   c) R = W   d) R = O

Ans : (d) R = O

58. _____ helps to predict the path of the astronomical bodies.

a) Newton's law of gravitation   b) Acceleration   c) velocity   d) orbital speed

Ans : (a) Newton's law of gravitation

59. _____ helps to explain germination of roots is due to the property of geotropism.

a) Newton's law of gravitation   b) Acceleration   c) velocity   d) rotational speed

Ans : (a) Newton's law of gravitation

60. The mass of the star can be calculated using the law of _____.

a). Gravitation   b) Inertia   c) motion   d) non

Ans : (a) Gravitation

Additional – Fill in the blanks

1. Some bodies are at _____ and some are in _____.   **Ans:** Rest, Motion

2. _____ and _____ are interrelated terms.   **Ans:** Rest, Motion

3. _____ or _____ is called as Force.   **Ans:** pull, push

4. _____ proposed the laws of three motion.   **Ans:** Sir Isaac Newton

5. Direction of motion is due to _____.   **Ans:** Force

6. _____ is the branch of physics that deals with the effect of force on bodies.   **Ans:** Mechanics

7. Mechanics is divided into _____ branches.   **Ans:** 2

8. Mechanics is divided into _____ and _____.   **Ans:** Statics, dynamics

9. _____ deals with the bodies, which are at rest under the action of forces.   **Ans:** Statics

10. _____ is the study of moving bodies under the action of forces.   **Ans:** Dynamics

11. Dynamics is further classified into _____ and _____.   **Ans:** Kinematics, Kinetics

12. _____ deals with the motion of bodies without considering the cause of motion.

Ans: kinematics

13. _____ deals with the motion of bodies considering the cause of motion.   **Ans:** Kinetics

14. _____ is a Greek philosopher and scientist who stated that the natural state of earthly bodies is rest.

Ans: Aristotle

15. A moving body naturally comes to rest without any external influence of the force. Such motions are termed as _____.   **Ans:** Natural motion

16. Natural motion is a force _____.   **Ans:** Independent

17. A force is needed to make the bodies to move from their natural state and behave contrary to their own natural state called as _____.   **Ans:** Violent motion

18. Violent motion is a force _____.   **Ans:** Dependent

19. When two different bodies are dropped from height, in earth's atmosphere, the heavier body falls _____ than the lighter one.   **Ans:** Faster

20. _____ proposed the concepts of force , motion and inertia of bodies.   **Ans:** Galileo

21. A body in motion will continue to be in the _____ state of motion as long as no external force is applied.   **Ans:** Same

22. When a force is applied on bodies, they resist any change in their state. This property of bodies is called _____.   **Ans:** inertia

23. The coin falls into tumbler due to gravity. This happen due to _____.   **Ans:** Inertia

24. The resistance of a body to change its state of rest is called _____.   **Ans:** Inertia of rest

25. The resistance of a body change its state of motion is called _____.   **Ans:** Inertia of motion

26. The resistance of a body change its direction of motion is called _____.   **Ans:** Inertia of direction

27. An athlete runs some distance before jumping. Because this will help him jump longer and higher. This is an example of _____.   **Ans:** Inertia of motion.

28. When you make a sharp turn while driving a car, you tend to lean sideways. It is an example of _____.   **Ans:** Inertia of direction

29. When you vigorously shake the branches of a tree, some of the leaves and fruits are detached and they fall down. It is an example of _____.   **Ans:** Inertia of rest.

30. The impact of a force is more if the velocity and the mass of the body is _____.   **Ans:** More

31. The _____ measures the impact of a force on a body.   **Ans:** linear momentum.

32. The product of mass and velocity of a moving body gives the magnitude of _____.

         Ans: Linear momentum

33. _____ acts in the direction of the velocity of the object.   **Ans:** Linear momentum

34. _____ is a vector quantity.   **Ans:** linear momentum

35. Linear momentum = _____.   **Ans:** Mass × velocity

36. _____ helps to measure the magnitude of a force.   **Ans:** Linear momentum

37. Unit of momentum in SI system is _____.   **Ans:** $Kg\ m\ S^{-1}$

38. Unit of momentum in CGS system is _____.   **Ans:** $g\ cm\ s^{-1}$

39. _____ law states that everybody continues to be in its state of rest or the state of uniform motion along a straight line unless it is acted upon by some external force.   **Ans:** Newton's first

40. _____ gives the definition of force as well as inertia.   **Ans:** Newton's first law

41. _____ is an external effort in the form of push or pull.   **Ans:** Force

42. _____ produces or tries to produce the motion of a static body.   **Ans:** Force

43. _____ stops or tries to stop a moving body.   **Ans:** Force

44. _____ changes or tries to change the direction of motion of a moving body.   **Ans:** Force

45. Force has both _____ and _____.   **Ans:** Magnitude, direction

46. Force is a _____ quantity.   **Ans:** vector

47. Parallel forces can be classified into _____ and _____ forces.

         Ans: like parallel , unlike parallel

48. Two or more forces of equal or unequal magnitude acting along the same direction, parallel to each other are called_____.   **Ans:** like parallel forces.

49. If Two or more forces of equal or unequal magnitude acting along the opposite direction, parallel to each other, then they are called _____.   **Ans:** Unlike parallel forces.

50. _____ is adding the magnitude of the forces with their direction.   **Ans:** Resultant force.

51. _____ is equal to the vector sum of all the forces.   **Ans:** Resultant force

52. Line of action of forces which are acting in the same direction is _____ .   **Ans:** like parallel forces

53. In like parallel forces, resultant force F_{net} = _____.   **Ans:** $F_1 + F_2$

54. Line of action of forces which are acting in the opposite direction _____.   **Ans:** unlike parallel forces

55. _____ are acting in opposite directions in the same line of action.   **Ans:** parallel equal forces

56. _____ is an example of Unlike parallel forces.   **Ans:** Tug of war.

57. _____ is an example of Unbalanced forces.   **Ans:** Action of lever

58. The axis of the fixed edge about which the door is rotated is called as the _____.   **Ans:** Axis of rotation.

59. The rod will be turned about the fixed point is called as _____.   **Ans:** point of rotation.

60. The rotating or turning effect of a force about a fixed point or fixed axis is called _____.   **Ans:** Moment of the force or torque

61. _____ is measured by the product of the force (F) and the perpendicular distance (d) between the fixed point or the fixed axis and the line of action of the force.   **Ans:** Torque

62. Torque = _____.   **Ans:** Force × Distance

63. Torque is a _____ quantity.   **Ans:** Vector

64. SI unit of torque is _____.   **Ans:** Nm

65. Two equal and unlike parallel forces applied simultaneously at two distinct points constitute a _____.   **Ans:** Couple

66. Rotating effect of a couple is known as _____.   **Ans:** Moment of a couple or torque

67. Turning a tap is an example of _____.   **Ans:** Moment of a couple or torque

68. Spinning of top is an example of _____.   **Ans:** Moment of a couple

69. Moment of a couple = _____.   **Ans:** Force × perpendicular distance between the line of action of forces

70. M = _____.   **Ans:** F × S

71. The SI unit of moment of a couple is _____.   **Ans:** Newton metre.

72. The CGS unit of moment of a couple is _____.   **Ans:** dyne cm

73. A small steering wheel enables you to monoeuore a car easily by transferring a torque to the wheels with _____ effort.   **Ans:** less

74. A _____ is a circular wheel with teeth around its rim.   **Ans:** Gear

75. _____ helps to change the speed of rotation of a wheel by changing the torque and helps to transit power.   **Ans:** Gear

76. Principle of moments _____. **Ans :** Moment in clockwise direction = Moment in anticlockwise direction.

77. According to principle of moments _____.   **Ans:** $F_1 \times d_1 = F_2 \times d_2$

78. _____ law helps us to measure the amount of force.   **Ans:** Newton's second

79. Newton's law is also called as _____.   **Ans:** Law of force

80. Change in momentum ΔP = _____.   **Ans:** mv-mu

81. Force is _____ proportional to the rate of change of momentum.   **Ans:** directly

82. Change in momentum takes place in the _____.   **Ans:** direction of force

83. The change may takes place either in _____ or in _____ or in _____ .

Ans: Magnitude, direction, both

84. _____ is required to produce the acceleration of the body. **Ans:** Force

85. In a _____ circular motion the speed remains constant. **Ans:** Uniform

86. The acceleration is produced along the radius called as _____ acceleration. **Ans:** centripetal or radial

87. The force, which produces radial acceleration is called as _____ force. **Ans:** Centripetal

88. SI unit of force is _____ . **Ans:** Newton

89. In CGS system, the unit of force is _____ . **Ans:** Dyne

90. _____ is defined as the amount of force required for a body of mass 1Kg produces an acceleration of $1m\ s^{-2}$. **Ans:** 1 newton

91. 1 Newton is _____ . **Ans:** $1\ kg\ ms^{-2}$

92. _____ is defined as the amount of force required for a body of mass 1gram produces an acceleration of $1cm\ s^{-2}$. **Ans:** 1 dyne

93. 1 dyne is _____ . **Ans:** $1g\ cm\ s^{-2}$

94. 1 newton = _____ dyne. **Ans:** 10^5

95. The amount of force required to produce an acceleration of $1ms^{-2}$ in a body of mass 1kg is called _____ . **Ans:** Unit force

96. In the SI system of units, gravitational unit of force is _____ . **Ans:** Kg f

97. In the CGS system gravitational unit is _____ . **Ans:** g f

98. 1kg f = _____ . **Ans:** $1\ kg \times 9.8\ ms^{-2} = 9.8\ N$

99. 1 gf = _____ **Ans:** $1g \times 980cm^{-2} = 980\ dyne$

100. A large force acting for a very short interval of time is called as _____ . **Ans:** Impulsive force

101. Impulse is _____ . **Ans:** $J = F \times t$

102. Impulse is equal to the _____ . **Ans:** Magnitude of change in momentum

103. The unit of Impulse is _____ . **Ans:** $kgms^{-1}$ or Ns

104. A _____ acting for a _____ is impulse. **Ans:** large force, short time

105. A _____ acting for a _____ is impulse. **Ans:** smaller force, longer time

106. Automobiles are fitted with _____ and _____ to reduce jerks while moving on uneven roads. **Ans:** springs, Shock absorbers

107. In cricket, a fielder _____ his hands while catching the ball. **Ans:** pulls back or lowers

108. _____ law states that for every action, there is an equal and opposite reaction. They always act on two different bodies. **Ans:** Newton's third

109. While in motion, the mass of the rocket gradually _____ until the fuel is completely burn out. **Ans:** decreases

110. _____ is based on the law of conservation of linear momentum as well as Newton's III law of motion. **Ans:** Propulsion of rockets

111. The symbol for the Universal gravitational constant is _____ . **Ans:** G

112. SI unit of G is _____ . **Ans:** Nm^2kg^{-2}

113. The value of G is _____ . **Ans:** 6.674×10^{-11}

114. Acceleration due to gravity of the earth is denoted as _____ . **Ans:** g

115. The SI unit of g is _____ . **Ans:** ms^{-2}

116. Mean value of the acceleration due to gravity is taken as _____ ms^{-2}.   **Ans:** 9.8

117. The value of g is not the _____ at all points on the surface of the earth.   **Ans:** Same

118. The radius of the Earth R is _____.   **Ans:** 6378km

119. According to Newton universal law F = _____.   **Ans:** GMm/R^2

120. According to Newton universal law g = _____.   **Ans:** GM / R^2

121. Mass of the Earth M = _____.   **Ans:** g R^2/ G

122. Value of Mass of the Earth M = _____.   **Ans:** 5.972 × 10^{24} Kg

123. _____ of a body is defined as the quantity of matter contained in a body.   **Ans:** mass

124. SI unit of mass is _____.   **Ans:** Kilogram

125. _____ of a body is defined as the gravitational force exerted on it due to the Earth's gravity alone.   **Ans:** Weight

126. Weight is a _____ quantity.   **Ans:** Vector

127. Direction of weight is always towards the _____ of the earth.   **Ans:** Centre

128. SI unit of weight is _____.   **Ans:** Newton

129. The value of acceleration due to gravity on the surface of the moon is _____.   **Ans:** 1.625 ms^{-2}

130. Value of g is _____ at the centre of the Earth.   **Ans:** Zero

131. _____ is the weight of the body acquired due to the action of gravity and other external forces acting on the body.   **Ans:** Apparent weight

132. When the person is a lift moves down with an acceleration or equal to the acceleration due to gravity ie a = g. This motion is called _____.   **Ans:** free fall

133. The force which keeps the satellite in orbit is _____.   **Ans:** Centripetal force

134. Both the astronauts and the space station are in the state of _____.   **Ans:** weightlessness

135. _____ helps in discovering new stars and planets.   **Ans:** Newton's law of gravitation

136. One of the irregularities in the motion of stars is called _____.   **Ans:** Wobble

137. _____ lead to the disturbance in the motion of a planet nearby.   **Ans:** wobble

138. _____ helps to explain germination of roots is due to the property of geotropism which is the property of a root responding to the gravity.   **Ans:** Newton's law of gravitation

139. _____ helps to predict the path of the astronomical bodies.   **Ans:** Newton's law of Gravitation.

Additional – Say true or false

1. **Rest and motion are not related terms.**
   Ans: False.
   Correct Statement : Rest and motion are interrelated terms.

2. **Natural motion is a force dependent**
   Ans: False.
   Correct Statement : Natural motion is a force independent.

3. **Violent motion is a force dependent.**
   Ans: True.

4. **If the resultant force of all the forces acting on a body is equal to zero, then the body will be in equilibrium. Such forces are called Unbalanced forces.**
   Ans: False.   **Correct Statement :** If the resultant force of all the forces acting on a body is equal to zero, then the body will be in equilibrium. Such forces are called balanced forces.

5. **If a person whose mass is 60kg stands on the surface of the Earth, his weight would be 500 N.**
    Ans: False.
    Correct Statement : If a person whose mass is 60kg stands on the surface of the Earth, his weight would be 588 N (W = mg = 60 × 9.8 = 588 N).

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Additional – Correct the mistakes:

1. **Kinematics deals with the motion of bodies considering the cause of motion.**
    Ans: <u>Kinetics</u> deals with the motion of bodies considering the cause of motion.

2. **Inertia of rest is the resistance of a body to change its state of motion.**
    Ans: Inertia of <u>motion</u> is the resistance of a body to change its state of motion.

3. **Linear momentum is a scalar quantity.**
    Ans: Linear momentum is a <u>Vector</u> quantity.

4. **1 N = 10^3 dyne.**
    Ans: 1 N = <u>10^5</u> dyne.

5. **Geometric radius of the Earth is Minimum in the polar region, the value of g is maximum.**
    Ans: Geometric radius of the Earth is Maximum in the polar region, the value of g is <u>minimum</u>.

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Additional – Match the following

1.

	Terms	SI Unit	CGS Unit
i)	Linear Momentum	Kgms−1	dyne cm
ii)	Moment of couple	6.674 × 10^{-11} Nm^{2}kg^{-2}	g cms^{-1}
iii)	Force	Nm	———
iv)	G	Newton	dyne

Ans :

S.No.	Terms	SI Unit	CGS Unit
i)	Linear Momentum	Kg ms−1	g cms−1
ii)	Moment of couple	NM	dyne cm
iii)	Force	N	dyne
iv)	G	6.674 × 10^{-11} Nm^{2}kg^{-2}	———

2.

1.	An athlete runs some distance before jumping	(a)	Inertia
2.	Sharp turn while driving car	(b)	Inertia of motion
3.	Some of the leaves and fruits are detached	(c)	Inertia of direction
4.	Force is applied on bodies they resist any change in their state	(d)	Inertia of rest

Ans :

1	An athlete runs some distance before jumping	b	Inertia of motion
2	Sharp turn while driving car	c	Inertia of direction
3	Some of the leaves and fruits are detached	d	Inertia of rest
4	Force is applied on bodies they resist any change in their state	a	Inertia

3.

1.	Like parallel forces	(a)	$F_{net} = 0$
2.	Unlike parallel forces	(b)	$F_{net} = F_1 + F_2$
3.	Parallel equal forces	(c)	$F_{net} = F_2 − F_1$ (if $F_2 > F_1$)
4.	Unbalanced forces	(d)	Action of a lever

Ans :

1	Like parallel forces	b	$F_{net} = F_1 + F_2$
2	Unlike parallel forces	c	$F_{net} = F_2 - F_1$ (if $F_2 > F_1$)
3	Parallel equal forces	a	$F_{net} = 0$
4	Unbalanced forces	d	Action of a lever

4.

1.	**1 Newton**	**(a)**	**980 dyne**
2.	**1 dyne**	**(b)**	**9.8 N**
3.	**1 kg f**	**(c)**	**1 g cm s^{-2}**
4.	**1 g f**	**(d)**	**1 kg ms^{-2}**

Ans :

1	1 Newton	d	1 kg ms^{-2}
2	1 dyne	c	1 g cm s^{-2}
3	1 kg f	b	9.8 N
4	1 g f	a	980 dyne

Additional – Assertion and reason

1. Assertion: The resistance of a body to change its state of rest is called inertia of rest.
Reason: When you vigorously shake the branches of a tree, some of the leaves and fruits are detached and they fall down.
a) A is true R is wrong
b) A is wrong R is true
c) R explain A
d) R does not explain A

Ans : (c) R explain A

2. Assertion: Parallel equal forces are acting in opposite directions in the same line of action.
Reason: $F_{net} = F_1 - F_2$ (given: $F_1 = F_2$).
a) A is true R is wrong
b) A is wrong R is true
c) R explain A
d) R does not explain A

Ans : (c) R explain A

3. Assertion: Torque is measured by the product of the force and the perpendicular distance between the fixed point or the fixed axis and the line of action of the force.
Reason: Automobiles are fitted with springs and shock absorbers to reduce jerks while moving on uneven roads.
a) A and R are wrong
b) A and R are correct
c) R explain A
d) R does not explain A

Ans : (b) A and R are correct

4. Assertion: A rocket works on the principle of conservation of linear momentum.
Reason: Higher the velocity, smaller in the pressure and vice versa.
a) A is true R is wrong
b) A is wrong R is right
c) A and R are wrong
d) A and R are correct.

Ans : (a) A is true R is wrong

5. Assertion: lift is falling down freely.
Reason: R = m(g — g) = 0.
a) A is true R is wrong
b) A is wrong R is right
c) A and R are wrong
d) A and R are correct

Ans : (d) A and R are correct

Additional – Short answer questions

1. Write the different types of motion.

The different types of motion are:
✦   Linear motion.
✦   Circular motion.
✦   Ozcillatory motion.

2. What do you mean by Force?

A body needs a push or pull to move or bring at rest or change its velocity. Hence this 'push' or 'pull' is called as Force. It is an exteranal agency to change the states of rest or motion.

3. What do you mean by Mechanics write its types?

Mechanics is the branch of physics that deals with the effect of force on bodies. It is divided into 2 branches as Statics and Dynamics.

4. Define Statics.

The branch of Physics deals with the bodies which are at rest under the action of forces.

5. Define Dynamics.

The branch of Physics deals with the study of moving bodies under the action of forces.

6. Write the types of Dynamics.

Dynamics have 2 types. They are;
✦   Kinematics.
✦   Kinetics.

7. Define Kinematics.

It deals with the motion of bodies without considering the cause of motion.

8. Define Kinetics.

It deals with the motion of bodies considering the cause of motion.

9. Define natural motion.

Moving body naturally comes to rest without any external influence of the force. Such motions are formed as natural motion.

10. Define violent motion.

A Force is needed to make the bodies to move from their natural state and behave contrary to their own natural state called as violent motion.

11. Describe the activity about inertia of rest.

Take a glass tumbler and place a small card board on it. Now keep a coin at the centre of the card board. Then flick the card board quickly. The inertia of the coin keeps it in the state of the rest when the card board moves, and so the coin falls into the tumbler due to gravity. This happen due to inertia of rest.

12. Define linear momentum.

The product of mass and velocity of a moving body gives the magnitude of linear momentum. It acts in the direction of the velocity of the object.

Linear momentum = Mass × Velocity.

$P = M \times V$. SI unit is $kgms^{-1}$

13. Force is an external effort is the form of push (or) pull explain.

Since force can
✦   Produce or try to produce the motion of a static body.
✦   Stops (or) tries to stop a moving body and also
✦   Changes (or) tries to change the direction of motion of a moving body. So it is an external effort in form of push or a pull

14. **Explain the types of forces.**

    Force can be classified into 2 types.

    ✦ **Like Paralle Forces :** Two or more forces of equal or unequal magnitutde action along the same direction, parallel to each other are called Like Parallel Forces.

    ✦ **Unlike Parallel Forces :** If two or more equal forces or unequal forces act along opposite directions parallel to each other, then they are called Unlike Parallel Forces.

15. **Define Resultant Force.**

    When several forces act simultaneously on the same body, then the combined effect of the multiple forces can be represented by a single force which is termed as Resultant Force.

16. **Define Balanced Force.**

    If the resultant of all the forces acting on a body is equal to zero, then the body will be in equilibrium. Such forces are called Balanced Forces.

17. **Define Unbalanced Forces.**

    If the resultant force is not equal to zero, then it causes the motion of the body due to unbalanced forces.

    Eg.: Drawing water from a well, force applied with a crowbar, forces on a weighing balance.

18. **Define Equilibrant.**

    A system can be brought to equilibrium by applying another force which is equal to the resultant force in magnitude but in opposite direction. Such force is called as Equilibrant.

19. **Have you observed the position of the handle in door?**

    The door can be easily opened or closed when you apply the force at a point far away from the fixed edges deu to large moment of force.

20. **It is easier to open a door by applying a force near the handle rather than near hinges. Why?**

    While applying force near handle, the moment of force is larger than applying a force near the hinges. So it is easier to open the door.

21. **What do you mean by axis of rotation?**

    The axis of the fixed edge about which the door is rotated is called as the axis of rotation.

22. **What do you mean by point of rotation?**

    Fix one end of a rod and apply a force at the other end tangentially. The rod will be turned about the fixed point and it is called as "Point of rotation".

23. **Define Moment of force.**

    The rotating or turning effect of a force about fixed point or fixed axis is called moment of the force.

24. **Define Torque.**

    Torque is the product of the Force (F) and the perpendicular distance (d) between the fixed point or the fixed axis and the line of the action of the force.

    $T = F \times d$ (T – Torque, F – Force and d – distance) SI unit Nm.

25. **Define couple.**

    Two equal and unlike parallel forces applied simultaneously at the two distinct points constitute a couple.

26. **Define 1 Newton.**

    The amount of force required for a body of mass 1 kg produces an acceleration of $1ms^{-2}$, $1N = 1kgms^{-2}$.

27. **Define 1 dyne.**

    The amount of force required for a body of mass 1 gram produces an acceleration of $1cms^{-2}$, 1 dyne = 1 $gcms^{-2}$, also $1N = 10^5$ dyne.

28. **Define Unit force.**

    The amount of force requried to produce an acceleration of $1ms^{-2}$ in a body of mass 1 kg is called unit force or 1N of force.

29. Define Gravitational unit of force.

In the SI system of units, gravitational unit of force is kilogram force, represented by Kg F. In the CGS system its unit is gram force, represented by gf.

$$1 \text{ kg f } = 1 \text{ kg} \times 9.8 \text{ ms}^{-2} = 98 \text{ N.}$$
$$1 \text{ gf } = 1 \text{ g} \times 980 \text{ cms}^{-2} = 980 \text{ dyne.}$$

30. Explain acceleration due to gravity of the earth.

The velocity of the object keeps changing as it falls down. This change in velocity must be due to the force acting on the object. The acceleration of the body is due to the Earth's gravitational force. So it is called as acceleration due to the gravitational force of the earth (or) acceleration due to gravity of the earth. It is represented by as 'g'.The average value of g = 9.8 ms^{-2}.

31. How could you calculate the mass of the earth (M)?

Mass of the Earth (M) = gR^2/G. Substituting the known value of g, R and G. We calculate the mass of the earth as M = 5.972 × 10^{24} kg.

32. Define Mass.

Mass is the basic property of a body. Mass of a body is defined as the quantity of matter contained in the body. SI unit is Kilogram (kg).

33. Define Weight.

Weight of a body is defined as the gravitational force exested on it due to the Earth's gravity alone.

Weight   = Gravitational Force.
           = mass (m) × acceleration due to gravity (g).
           = m × g.

34. Define Apparent weight.

Apparent weight is the weight of the body acquired due to the action of gravity and other external forces acting on the body.

35. State Weightlessness.

Whenever a body or a person falls freely under the action of Earth's gravitational force alone, it appears to have zero weight. This state is referrred to as Weightlessness.

Additional – Solved problems

1. Calculate the velocity of a moving body of mass 5 kg whose linear momentum is 2.5 kg m s^{-1}.

Solution :

Linear momentum = mass × velocity.
Velocity = linear momentum / mass.

$$V = \frac{2.5}{5}.$$
$$= 0.5 \text{ m s}^{-1}.$$

2. A door is pushed, at a point whose distance from the hinges is 90 cm, with a force of 40 N. Calculate the moment of the force about the hinges.

Solution :

Formula :   The moment of a force M = F × d

Given : F = 40 N and d = 90 cm = 0.9 m.

Hence, moment of the force = 40 × 0.9 = 36 N m.

3. At what height from the centre of the Earth the acceleration due to gravity will be ¼th of its value as at the Earth.

Solution :

Data : Height from the centre of the Earth,

R$^{'}$ = R + h

The acceleration due to gravity at that height, $g' = g/4$.

Formula: $g = GM /R^2$

$$\frac{g}{g^1} = \left(\frac{R^1}{R}\right)^2 = \left(\frac{R+h}{R}\right)^2 = \left(1+\frac{h}{R}\right)^2$$

R'

$$g'_{\;} = \left(1+\frac{h}{R}\right)^2$$

$$2 = 1+\frac{h}{R}$$
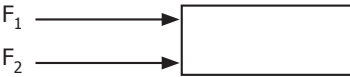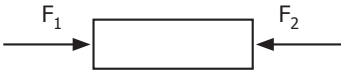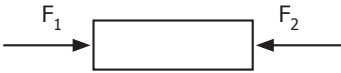
$$2 = 1+\frac{h}{R} = \frac{R+h}{R}$$

$$2R = R + h = R'$$

$$\text{So } R' = 2R$$

From the centre of the Earth, the object is placed at twice the radius of the earth.

Additional – Long answer questions

1. **Tabulate the Action of forces.**

Action of forces	Diagram	Resultant force (F_{net})
Parallel forces are acting in the same direction	$F_1 \longrightarrow$ $F_2 \longrightarrow$	$F_{net} = F_1 + F_2$
Parallel unequal forces are acting in opposite directions	$F_1 \rightarrow$ ⬅ F_2	$F_{net} = F_1 - F_2$ (if $F_1 > F_2$) $F_{net} = F_2 - F_1$ (if $F_2 > F_1$) F_{net} is directed along the greater force
Parallel equal forces are acting in opposite directions in the same line of action (F1 = F2)	$F_1 \rightarrow$ ⬅ F_2	$F_{net} = F_1 - F_2$ ($F_1 = F_2$) $F_{net} = 0$

2. **Write the application of Torque.**

   i) **Gears :**

   A gear is a circular wheel with teeth around its rim. It helps to change the speed of rotation of a wheelby changing the torqueand helps to transmit power.

   ii) **Seasaw :**

   In Seasaw, there is a difference in the weight of the persons sitting on it, the heavier person lifts the lighter person. When the heavier person comes closer to the pivot point the distance of the line of action of the force decreases. It causes less amount of torque to act on it. This enables the lighter person to lift the heavier person.

   iii) **Steering Wheel :**

   A small steering wheel enables you to manoeuore a car easilyby tsransferring a torque to the wheels with less effort.

3. **Explain the principle of moments :**

   At equilibrium, the algebraic sum of the moments of all individual forces about any point is equal to zero.
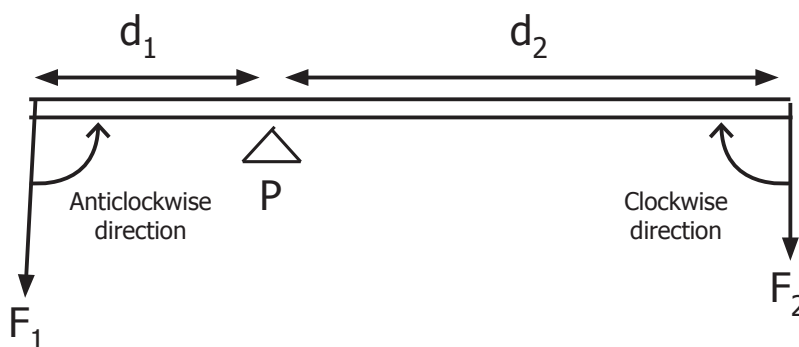
In the illustration, the force F_1, produces an anticlockwise rotation at a distance d, from the point of pivot (P) called fulcnum and force F_2 produces a clockwise rotation at a distance d2 from the point of pivot P. The principle of moments can be written as follows;

<div align="center">

Moment in   Moment in

Clockwise direction = Anticlockwise direction

$F_1 \times d_1 = F_2 \times d_2$

</div>

4. Explain Impulse.

A large force acting for a very short interval of time is called as Impulsive force.

When a force 'F' acts on a body for a period of time 't' then the product of force and time is known as 'impulse' represented by 'J'.

<div align="center">

Impulse J = F × t   ....(1)

</div>

By Newton's second law

<div align="center">

F = ΔP/t (Δ refers to change)

ΔP = F × t   ....(2)

</div>

From 1 & 2,   J = ΔP

Impulse is also equal to the magnitude of change in momentum. It's unit is $Kgms^{-1}$ (or) Ns.

Change in momentum can be achieved in 2 ways. They are;

✠ A large force acting for a short period time and

✠ A smaller force acting for a longer period of time.

Examples :

✠ Automobiles are fitted with springs and shock absorbes to reduce jerks while moving on uneven roads.

✠ In cricket, a fielder pull back his hands while catching the ball. He experiences a smaller force for a longer interval of time to catch the ball, resulting in a lesser impulse on his hands.

5. Explain Newton's Third Law with an example.

Newton's third law states that "for every action, there is an equal and opposite reaction". They always act on two different bodies.

If a body 'A' applies a force F_A on a body 'B', then the body 'B' reacts with force F_B on the body 'A', which is equal to F_A inmagnitude but opposite in direction. $F_B = -F_A$.

Examples :

✠ When **birds** fly, they push the air downwards with their wings (Action) and the air pushes the bird upward (Reaction).

✠ When a **person swims**, he pushes the water using the hands backwards (Action) and the water pushes the swimmer in the forward direction (Reaction).

✠ When you **fire a bullet**, the gun recoils backward. The bullet is moving forward (Action) and the gun equalises this forward action by moving backward (Reaction).

6. Write the relationship between 'g' and 'G'.

Explanation : When a body is at rests on the surface of the Earth, it is acted upon by the gravitational force of the Earth. Let us compute the magnitude of this force in two ways. Let 'M' be the mass of the Earth and

'm' be the mass of the body. The entire mass of the Earth is assumed to be concentrated at its centre. The radius of the Earth is 6378 km (=6400 km approximately). By Newton's law of gravitation, the force acting on the body is given by
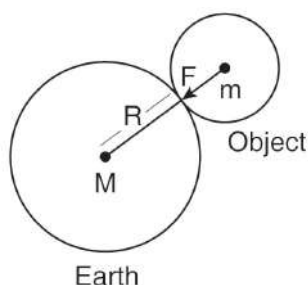
Earth

$$F \ = \ \frac{GMm}{R^2} \qquad\qquad\qquad ....(1)$$

Here, the radius of the body considered is negligible when compared with the Earth's radius. Now, the same force can be obtained from Newton's second law of motion. According to this law, the force action on the body is given by the product of its mass and acceleration (called as weight). Here acceleration of the body is under the action of gravity, hence a = g.

$$F \ = \ Ma = mg.$$
$$F \ = \ weight = mg \qquad\qquad\qquad ....(2)$$

comparing (1) and (2) we get,

$$mg \ = \ \frac{GMm}{R^2}$$

Acceleration due to gravity,

$$g \ = \ \frac{GM}{R^2}$$

7.   **Tabulate the apparent weight of a person in a moving lift.**

    Ans :

Case 1 : Lift is moving upward with an acceleration 'a'	Case 2 : Lift is moving downward with an acceleration 'a'	Case 3 : Lift is at rest	Case 4 : Lift is falling down freely
R–W = F_{net} = ma R = W + ma R = mg + ma R = m (g + a)	W – R = F_{net} = ma R = W – ma R = mg – ma R = m (g – a)	Here the acceleration is zero a = 0 R = W R = mg	Here the acceleration is equal to g a = g R = m (g – g)
R > W	R < W	R = W	R = 0
Apparent weight is greater than the actual weight	Apparent weight is lesser than the actual weight	Apparent weight is equal to the actual weight	Apparent weight is equal to zero

$$\boxed{\text{UNIT TEST-1}}$$

Time : 1.15 Hrs.　　　　　　　　　　　　　　　　　　　　　　　　**Marks : 50**

I. Choose the best answer
(5 × 1 = 5)

1. **The momentum of a heavy object at rest will be _____.**
    a) large　　　　b) small　　　　c) infinity　　　　d) zero

2. **The SI unit of force is _____.**
    a) energy　　　　b) joule　　　　c) newton　　　　d) dyne

3. **Rocket works on the principle of _____.**
    a) conservation of mass　　　　　b) conservation of energy
    c) conservation of momentum　　　d) conservation of velocity

4. **Momentum is a _____ quantity.**
    a. vector　　　　b) scalar　　　　c) tensor　　　　d) none

5. **Torque is a _____ quantity.**
    a) vector　　　　b) scalar　　　　c) tensor　　　　d) either a ro b

II. Fill in the blanks
(5 × 1 = 5)

6. Direction of motion is due to _____.

7. _____ proposed the concepts of force , motion and inertia of bodies.

8. Unit of momentum in CGS system is _____.

9. Torque = _____ × _____.

10. SI unit of G is _____.

III. State whether the statements are true or false. Correct the false statement
(4 × 1 = 4)

11. Rest and motion are not related terms.

12. Violent motion is a force dependent.

13. The unit of impulse and force is same.

14. If the resultant force of all the forces acting on a body is equal to zero, then the body will be in equilibrium. Such forces are called Unbalanced forces.

IV. Match the following
(4 × 1 = 4)

15. Force　　　　　　　(a)　cause of motion
16. Moment of force　　(b)　momentum
17. Newton　　　　　　(c)　push or pull
18. m × v　　　　　　　(d)　Torque

V. Assertion and Reasoning
(3 × 1 = 3)

Direction: In each of the following questions, a statement of Assertion is given and a corresponding statement of Reason is given just below it. Of the statements given below, mark the correct answer as
a. If both A and R are true and R is the correct explanation of A.
b. If both A and R are true but R is not the correct explanation of A.
c. If A is true but R is false.
d. If both A and R are false.

19. **Assertion:** The sum of the clockwise moments is equal to the sum of the anticlockwise moments.

Reason: The principle of conservation of momentum is valid if the external force on the system is zero

20. **Assertion:** The resistance of a body to change its state of rest is called inertia of rest.
    Reason: When you vigorously shake the branches of a tree, some of the leaves and fruits are detached and they fall down

21. **Assertion :** Torque is measured by the product of the force and the perpendicular distance between the fixed point or the fixed axis and the line of action of the force.
    Reason: Automobiles are fitted with springs and shock absorbers to reduce jerks while moving on uneven road.

VI. Write the answer for the following questions in word or sentence

(3 × 1 = 3)

22. What do you mean by force?
23. Who proposed the law of motion?
24. One of the irregularities in the motion of stars is called?

VII. Find the odd one out

(3 × 1 = 3)

25. Newton, Galileo, Aristotle, Einstein.

26. $F = F_1 + F_2$, $F = F_1 - F_2$, $F = F_1 = F_2$, R=0.

27. 980 dynes, 9.8 N, 10^5 dyne.

VIII. Correct the mistakes

(3 × 1 = 3)

28. Kinematics deals with the motion of bodies considering the cause of motion.
29. Inertia of rest is the resistance of a body to change its state of motion
30. Geometric radius of the Earth is Minimum in the polar region, the value of g is maximum.

IX. Write the short answer for ANY 5 of the following questions.

(5 × 2 = 10)

31. Define linear momentum.
32. What is Torque?
33. Define 1 Newton.
34. What is couple?
35. What is Impulsive force?
36. What is called apparent weight?
37. What is meant by weightlessness?

X. Write long answer for the following questions

(2 × 5 = 10)

38. Describe rocket propulsion.
      [OR]
39 Explain the types of Inertia with examples.
40. Differentiate between Mass and Weight.
      [OR]
41 Derive the relation between g and G.

☙❖❧

UNIT 2

OPTICS

Important Points

➢ Light is a form of energy which travels along a straight line.

➢ The deviation in the path of light ray is called refraction..

➢ The ratio of speed of light in vacuum to the speed of light in a medium is defined as refractive index 'μ' of that medium.

➢ Lens formula $\dfrac{1}{f} = \dfrac{1}{v} - \dfrac{1}{u}$

➢ Magnification (m) = $\dfrac{h^1}{h} = \dfrac{v}{u}$

➢ Power of lens. P = $\dfrac{1}{f}$

➢ The ability of the eye to focus nearby as well as the distant objects is called power of accommodation of the eye.

➢ A microscope is an optical instrument which helps us to see the objects which are very small in dimension.

➢ Telescope is an optical instrument used to see the distant objects clearly.

TEXT BOOK EVALUATION

I. Book Exercise – Choose the best answer

1. **The refractive index of four substances A, B, C and D are 1.31, 1.43, 1.33, 2.4 respectively. The speed of light is maximum in**
   a. A   b. B   c. C   d. D

   Ans : (a) A

2. **Where should an object be placed so that a real and inverted image of same size is obtained by a convex lens**
   a. f   b. 2f   c. infinity   d. between f and 2f

   Ans : (b) 2f

3. **A small bulb is placed at the principal focus of a convex lens. When the bulb is switched on, the lens will produce**
   a. a convergent beam of light   b. a divergent beam of light
   c. a parallel beam of light   d. a coloured beam of light

   Ans : (c) a parallel beam of light

4. **Magnification of a convex lens is**
   a. positive   b. negative
   c. either positive or negative   d. zero

   Ans : (c) either positive or negativee

5. **A convex lens forms a real, diminished point sized image at focus. Then the position of the object is at**
   a. focus   b. infinity   c. at 2f   d. between f and 2f

   Ans : (b) infinity

6. **Power of a lens is –4D, then its focal length is**
   a. 4m   b. –40 m   c. –0.25 m   d. –2.5 m

   Ans : (c) –0.25 m

7. **In a myopic eye, the image of the object is formed**
   a. behind the retina   b. on the retina   c. in front of the retina   d. on the blind spot

   Ans : (c) in front of the retina

8. **The eye defect 'presbyopia' can be corrected by**
   a. convex lens   b. concave lens   c. convex mirror   d. bi focal lenses

   Ans : (d) bi focal lenses

9. **Which of the following lens would you prefer to use while reading small letters found in a dictionary?**
   a. A convex lens of focal length 5 cm   b. A concave lens of focal length 5 cm
   c. A convex lens of focal length 10 cm   d. A concave lens of focal length 10 cm

   Ans : (a) A convex lens of focal length 5 cm

10. **If V_B, V_G, V_R be the velocity of blue, green and red light respectively in a glass prism, then which of the following statement gives the correct relation?**
   a. $V_B = V_G = V_R$ b. $V_B > V_G > V_R$ c. $V_B < V_G < V_R$ d. $V_B < V_G > V_R$

   Ans : (b) $V_B > V_G > V_R$

II. Book Exercise – Fill in the blanks

1. The path of the light is called as _____.   **Ans :** ray

2. The refractive index of a transparent medium is always greater than _____   **Ans :** one

3. If the energy of incident beam and the scattered beam are same, then the scattering of light is called as _____ scattering.   **Ans :** Elastic

4. According to Rayleigh's scattering law, the amount of scattering of light is inversely proportional to the fourth power of its _____.   **Ans :** wave length

5. Amount of light entering into the eye is controlled by _____.   **Ans :** iris

III. Book Exercise – True or False (If false correct it)

1. **Velocity of light is greater in denser medium than in rarer medium.**
   Ans : False. Velocity of light is greater in rare medium than in denser medium.

2. **The power of lens depends on the focal length of the lens.**
   Ans : True.

3. **Increase in the converging power of eye lens cause 'hypermetropia'.**
   Ans : True.

4. **The convex lens always gives small virtual image.**
   Ans : False. Only concave lens always gives small virtual image.

IV. Book Exercise – Match the following

	Column I		**Column II**
1.	**Retina**	(a)	**Path way of light**
2.	**Pupil**	(b)	**Far point comes closer**
3.	**Ciliary muscles**	(c)	**Near point moves away**
4.	**Myopia**	(d)	**Screen of the eye**
5.	**Hypermetropia**	(e)	**Power of accomodation**

Ans :

	Column I		Column II
1	Retina	d	Screen of the eye
2	Pupil	b	Path way of light
3	Ciliary muscles	f	Power of accomodation
4	Myopia	b	Far point comes closer
5	Hypermetropia	c	Near point moves away

V. Book Exercise – Assertion and Reason

Mark the correct choice as

a) If both the assertion and the reason are true and the reason is the correct explanation of assertion.

b) If both the assertion and the reason are true, but the reason is not the correct explanation of the assertion.

c) Assertion is true, but the reason is false.

d) Assertion is false, but the reason is true.

1. **Assertion:** If the refractive index of the medium is high (denser medium) the velocity of the light in that medium will be small.

   Reason: Refractive index of the medium is inversely proportional to the velocity of the light.

   Ans : (a) both the assertion and the reason are true and the reason is the correct explanation of assertion.

2. **Assertion:** Myopia is due to the increase in the converging power of eye lens.

   Reason: Myopia can be corrected with the help of concave lens.

   Ans : (b) both the assertion and the reason are true, but the reason is not the correct explanation of the assertion

## VI. Book Exercise – Answer briefly

1. **What is refractive index?**

   Refractive index as the ratio of sine of the angle incidence to the sine of angle of refraction. It can be alsobe defined as ratio of speed of light in air to the speed of light in medium. It has no unit.

2. **State Snell's law.**

   The ratio of the sine of the angle of incidence and sine of the angle of refraction is equal to the ratio of refractive indices of the two media. This law is also known as Snell's law.

   $$\frac{Sin\,i}{Sin\,r} = \frac{\mu_2}{\mu_1}$$

3. **Draw a ray diagram to show the image formed by a convex lens when the object is placed between F and 2F.**
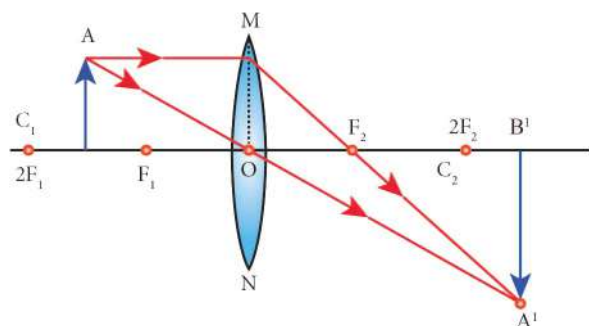
4. **Define dispersion of light.**

   When a beam of white light or composite lightis refracted through any transparent media such as glass or water, it is split into its component colours. This phenomenon is called as dispersion of light.

5. **State Rayleigh's law of scattering.**

   Rayleigh's scattering law states that "the amount of scattering of light is inversaly proportional to the fourth power of its wavelength.

   Let amount of scattering be 'A'

   $$'A'\ \alpha\frac{1}{\lambda^4}$$

6. Differentiate convex lens and concave lens.

S.No.	Convex lens	Concave lens
1	A convex lens is thicker in the middle than at edges	A concave lens is thinner in the middle than at edges
2	It is having converging lens	It is having diverging lens
3	It produces mostly real images	It produces virtual images
4	It is used to treat hypermeteropia	It is used to treat myopia

7. What is power of accommodation of eye?

The ability of the eye lens to focus nearby as well as the distant objects on the refina of the eye is called power of accommodation of the eye.

8. What are the causes of 'Myopia'?

Myopia is caused due to,

i) Lengthening of eye ball.

ii) Decrease in the focal length of the eyelens i.e., excessive curvature of the eye lens. The eyelens becomes more convergent.

9. Why does the sky appear in blue colour?

When sunlight passes through the atmosphere, the blue colour (shorter wavelength) is scattered to a greater extent than the red colour (longer wavelength). This scattering causes the sky to appear in bue colour.

10. Why are traffic signals red in colour?

Red colour has longest wavelength and scattered by a least amount and travels longer distance in atmosphere. So it used in traffic signals.

VII. Book Exercise – Give the answer in detail

1. List any five properties of light.

i) Light is a form of energy.

ii) Light always travels along a straight line.

iii) Light does not need any medium for its propagation. It can even travel through vacuum.

iv) The speed of light in vacuum or air is $C = 3 \times 10^8$ m/s. Since, light is in the form of waves, it is characterized by a wavelength (λ) and a frequency (γ), which are related by the following equation. $C = \gamma\lambda$ (C – velocity of light).

v) Different coloured light has different wavelength and frequency.

vi) Among the visible light, Violet light has the lowest wavelength and Red light has the highest wavelength.

vii) When light is incident on the interface between two media, it is partly reflected and partly refracted.

2. Explain the rules for obtaining images formed by a convex lens with the help of ray diagram.

Rule 1 : When a ray of light strikes the convex lens obliquely at its optical centre, it continues to follow its path without any deviation.
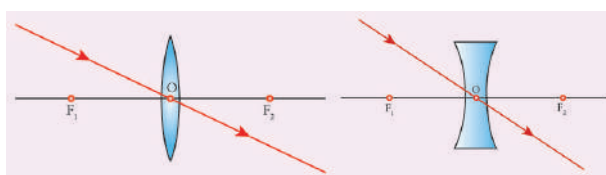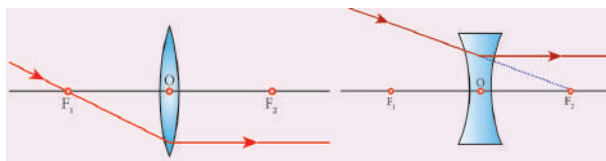

Rays passing through the optical centre

Rule 2 : When rays parallel to the principal axis strikes a convex lens, the refracted rays are converged to (convex lens) the principal focus.
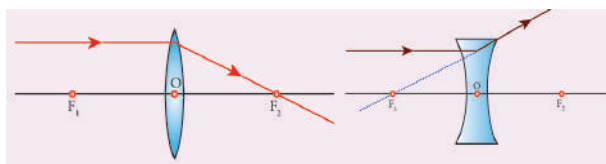
Rays passing parallel to the optic axis

Rule 3 : When a ray passing through (convex lens) the principal focus strikes a convex lens, the refracted ray will be parallel to the principal axis.

Rays passing through or directed towards the principal axis

3. **Differentiate the eye defects: Myopia and Hypermetropia.**

Ans :

S.No.	Myopia	Hypermetropia
1	It is also known as short sightedness occurs due to the lengthening of eye ball	It is also known as long sightedness, occurs due to the shortening of eye ball
2	With this defect, nearyby objects can be seen clearly but distant objects cannot be seen clearly	With this defect, distant objects can be seen clearly, but nearby objects cannot be seen clearly
3	The focal length of eye lens is reduced or the distance between eye lens and retina increases	The focal length of eye lens is increased or the distance between eye lens and retina decreases
4	The far point will not be infinity for such eyes and the far point has come closer	The near point will not be at 25 cm for such eyes and the near point has moved farther
5	Due to this the image of distant objects are formed before the retina	Due to this, the image of nearby objects are formed behind the retina
6	This defect can be corrected by using a concave less	This defect can be corrected by using a convex lens
7	A suitable focal length of the concave lens to be used to correct this defect	A suitable focal length of the convex lens to be used to correct this defect
8	 (a) Myopia (b) Myopia corrected eye	 (a) Hypermeteropia (b) Hypermeteropia corrected eye
9	The focal length of the required concave lens is $f = \dfrac{xy}{x-y}$ where x - distance upto which a person can see y - distance upto which a person want to see	The focal length of the required convex lens is $f = \dfrac{dD}{d-D}$ where D - distance of disticnt vision d - distance which can be seen beyond D

4. **Explain the construction and working of a 'Compound Microscope'.**

Compound microscope is used to see the tiny objects. It has higher magnification power than simple microscope.

Construction :

i)   A compound microscope consists of two convex lenses.

ii) The lens with the **shorter focal length** is placed **near the object** and is called as **objective lens** or **objective piece**.

iii) The lens with the **larger focal length** and **larger aperture** placed **near the observer's eye** is called **eye lens** or **eye piece**. Both the lenses are fixed in a narrow tube with adjustable provision.

Working :

i) The object (AB) is placed at a distance slightly greater than the focal length of objective lens ($u > f_o$). A real, inverted and magnified image (A'B') is formed at the other side of the object lens.

ii) This image behaves as the object for the eye lens. The position of the eye lens is adjusted in such a way, that the image (A'B') falls within the principal focus of the eye piece. This eye piece forms a virtual, enlarged and errect image (A"B") on the same side of the object.

iii) Compound microscope has 50 to 200 times more magnification power than simple microscope.
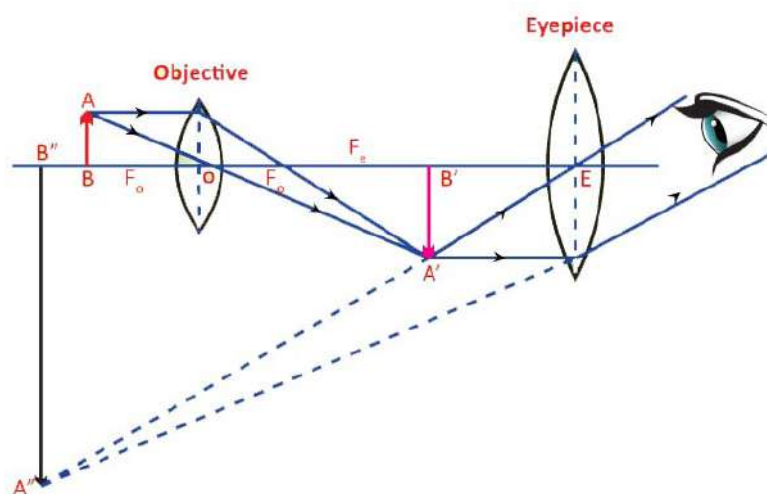
VIII. Book Exercise – Numerical problems

1. **An object is placed at a distance 20cm from a convex lens of focal length 10cm. Find the image distance and nature of the image.**

   Solution : u = −20 cm, f = 10 cm

   $$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

   $$\frac{1}{v} = \frac{1}{f} + \frac{1}{u}$$

   $$\frac{1}{v} = \frac{1}{10} - \frac{1}{20}$$

   Nature of image

   $$\frac{1}{v} = \frac{2-1}{20} = \frac{1}{20}$$

   V=20cm

   Image distance = 20 cm

   $$m = \frac{v}{u} = \frac{20}{-20} = -1$$

   This indicates the size of the image is of the same size but inverted on the other side of the object.

2. **An object of height 3cm is placed at 10cm from a concave lens of focal length 15cm. Find the size of the image.**

   Solution :

   Position of the image : f = 15 cm, u = -10 cm, height of object = h_1 height of image = h_2 , v = ?

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\frac{1}{v} = \frac{1}{f} + \frac{1}{u}$$

$$\frac{1}{v} = \frac{1}{-15} + \frac{1}{-10}$$

$$-\frac{1}{v} = \frac{1}{15} + \frac{1}{10}$$

$$-\frac{1}{v} = \frac{1}{6} \text{ cm}$$

$$- v = -6 \, cm$$

Image distance = -6 cm

Magnification

$$m = \frac{h_2}{h_1} = -\frac{v}{u} \quad \frac{6}{10} = 0.6$$

$h_2 = m \times h_1 \quad = 0.6 \times 3$

$h_2 = 1.8$ cm

IX. Book Exercise – Higher Order Thinking (HOT) questions

1. **While doing an experiment for the determination of focal length of a convex lens, Raja Suddenly dropped the lens. It got broken into two halves along the axis. If he continues his experiment with the same lens, (a) can he get the image? (b) Is there any change in the focal length?**

    a) Yes, he can get the image.

    b) Yes, focal length will get changed.

2. **The eyes of the nocturnal birds like owl are having a large cornea and a large pupil. How does it help them?**

    These features increases the field of vision and an increase retinal surface and help them to collect more ambient light during night.

Additional – Choose the best answer

1. **The path of light is called _____.**
    a) ray of light   b) beam of light   c) wave of light   d) none

    Ans : (a) ray of light

2. **Group of these rays are called _____.**
    a) ray of light   b) beam of light   c) wave of light   b) both a and b

    Ans : (b) beam of light

3. **Some of the sources emit their own light and they are called as _____.**
    a) Luminous objects   b) Non–luminous objects   c) bright object   d) both a and b

    Ans : (a) Luminous objects

4. **The speed of light in vacuum or air is _____.**
    a) C = 3 × 10^8 m/s   b) C = 3 × 10^8 m/s^2 c) C = 2 × 10^8 m/s   d) C = 2 × 10^{10} m/s^2

    Ans : (a) C = 3 × 10^8 m/s

5. **Velocity of light C = _____.**
    a) γ/λ b) $\gamma\lambda$ c) $\gamma\lambda^4$ d) $\gamma\lambda^2$

    Ans : (b) $\gamma\lambda$

6. **Violet has the _____ wave length, red light has the _____ wave length.**
    a) highest, lowest   b) lowest, highest   c) moderate, lowest   d) moderate, highest

    Ans : (b) lowest, highest

7. **The velocity of light is _____ in a rarer medium and _____ in a lesser medium.**
    a) less, more   b) more, less   c) both   d) none

    Ans : (b) more, less

8. **Refraction of light obeys _____ law.**
    a) lenzs   b) snells   c) faraday   d) henry

    Ans : (b) snells

9. **Refractive index can be represented by _____.**
    a) γ b) λ c) μ d) none

    Ans : (c) μ

10. **The speed of light in a medium is _____ and if the refractive index of the medium is _____.**
    a) high, less   b) less, high   c) both a and b   d) none

    Ans : (b) less, high

11. **When light travels from a denser medium into a rarer medium, the refracted ray is _____.**
    a) Bent away from normal   b) Bent towards normal   c) no bending   d) none

    Ans : (a) Bent away from normal

12. **When light travels from a rarer medium into a denser medium, the refracted ray is _____ the normal drawn to the interface.**
    a) Bent away from normal   b) Bent towards normal   c) no bending   d) none

    Ans : (b) Bent towards normal

13. **_____ is the fundamental and natural source of light.**
    a) Sun   b) Moon   c) asteroids   d) comets

    Ans : (a) Sun

14. **A source of light produces a light of single colour, it is known as a _____ source.**
    a). Monochromatic   b) Dichromatic   c) polychromatic   d) none

    Ans : (a) Monochromatic

15. **_____ produces a white light which contains light of different colours.**
    a). Monochromatic   b) Dichromatic   c) composite source light   d) none

    Ans : (c) Composite source of light

16. **_____ light is a composite light of different colours or wavelengths.**
    a) Sun   b) Moon   c) sodium lamp   d) none

    Ans : (a) Sun

17. **_____ is an example for a composite source.**
    a) Kerosene   b) Mercury vapour lamp   c) sodium lamp   d) none

    Ans : (b) Mercury vapour lamp

18. **The band colours is termed as _____.**
    a) Band width   b) Spectrum   c) wavelength   d) frequency

    Ans : (b) Spectrum

19. **Angle of refraction is the _____ for red and the _____ for violet.**
    a) smallest, highest   b) highest, smallest   c) either a or b   d) none

    Ans : (a) smallest, highest

20. **Refractive index of a medium is _____ on the wavelength of the light.**
    a) Dependent   b) Independent   c) either a or b   d) none

    Ans : (a) Dependent

21. **If the energy of the incident beam of light and the scattered beam of light are same. Then it is called as _____.**

a) Elastic scattering   b) Inelastic scattering   c) Rayleigh scattering   d) Mie scattering

Ans : (a) Elastic scattering

22. **If the energy of the incident beam of light and the scattered beam of light are not same. Then it is called as _____ scattering.**

a) Elastic   b) Inelastic   c) Rayleigh   d) Mie

Ans : (b) Inelastic

23. **The scattering of sunlight by the atoms or molecules of the gases in the earth's atmosphere is known as _____ scattering.**

a) Elastic   b) Inelastic   c) Rayleigh   d) Mie

Ans : (c) Rayleigh

24. **The amount of scattering is inversely proportional to _____ wavelength.**

a) λ b) λ^2 c) λ^3 d) λ^4

Ans : (d) λ^4

25. **Mie scattering is otherwise called as _____ scattering.**

a) Elastic   b) Inelastic   c) dependent   d) Tyndall

Ans : (a) Elastic

26. **_____ is a microscopically small substance that is equally dispersed throughout another material.**

a) Colloid   b) Suspension   c) pure liquid   d) solid particle

Ans : (a) Colloid

27. **When a parallel beam of monochromatic light passes through a gas or liquid or solid, a part of light rays are _____.**

a) scattered   b) not scattered   c) reflected   d) refracted

Ans : (a) scattered

28. **A _____ is an optically transparent medium bounded by two spherical refracting surfaces or one plane andone spherical surface.**

a) Convex   b) Concave   c) Lens   d) mirror

Ans : (c) Lens

29. **Convex lens is also called as _____ lens.**

a) Converging   b) Diverging   c) partly converging   d) partly diverging

Ans : (a) Converging

30. **Concave lens is also called as _____ lens.**

a) Converging   b) Diverging   c) partly converging   d) partly diverging

Ans : (b) Diverging

31. **If one of the faces of a bi–convex lens is plane, it is known as a _____.**

a) Plano–convex lens   b) Plano–concave lens   c) converging   d) diverging

Ans : (a) Plano–convex lens

32. **If one of the faces of a bi–concave lens in plane, it is known as a _____.**

a) Plano–convex lens   b) Plano–concave lens   c) converging   d) diverging

Ans : (b) Plano–concave lens

33. **If object at Infinity, the size of the image is much _____ than that of the object.**

a) smaller   b) larger   c) either a or b   d) nethier a nor b

Ans : (a) smaller

34. If object is placed between F and C, the size of the image is much _____ than thatof the object.

   a) smaller   b) larger   c) either a or b   d) none

                                                Ans : (b) larger

35. _____ lenses are used as camera lenses.

   a) Concave   b) Convex   c) bi convex   d) bi concave

                                                Ans : (b) Convex

36. _____ lenses are used as magnifying lenses.

   a) Concave   b) Convex   c) bi convex   d) bi concave

                                                Ans : (b) Convex

37. Concave lenses are used as eye lens of _____ telescope.

   a. Hubble   b. Galilean   c) terrestrial   d) astronomical

                                                Ans : (b) Galilean

38. Lens formula is _____.

   a) $\dfrac{1}{f} = \dfrac{1}{v} + \dfrac{1}{u}$ b) $\dfrac{1}{f} = \dfrac{1}{v} - \dfrac{1}{u}$ c) $\dfrac{1}{f} = \dfrac{1}{u} + \dfrac{1}{v}$ d) none

                                        Ans : (b) $\dfrac{1}{f} = \dfrac{1}{v} - \dfrac{1}{u}$

39. The distances measured against the direction of incident light are taken as _____.

   a) positive   b) negative   c) nagative or positive   d) none

                                             Ans : (b) negative

40. The distances measured upward and perpendicular to the principal axis is taken as _____.

   a) positive   b) negative   c) either positive or nagative d) none

                                             Ans : (a) positive

41. The distances measured downward and perpendicular to the pricipal axis is taken as _____.

   a) positive   b) negative   c) either positive or nagative d) none

                                             Ans : (b) negative

42. If the magnification is greater than 1, then we get an _____ image.

   a) diminished   b) enlarged   c) enlarged or diminished   d) same size

                                              Ans : (b) enlarged

43. If the magnification is less than 1, then we get an _____ image.

   a) diminished   b) enlarged   c) enlarged or diminished   d) same size

                                            Ans : (a) diminished

44. All lens are made up of transparent materials. Any optically transparent material will have a _____.

   a) velocity index   b) Refractive index   c) medium index   d) none

                                         Ans : (b) Refractive index

45. The lens maker formula is _____.

   a) $\dfrac{1}{f} = (\mu - 1)\left(\dfrac{1}{R_2} - \dfrac{1}{R_1}\right)$ b) $\dfrac{1}{f} = (\mu - 1)\left(\dfrac{1}{R_1} - \dfrac{1}{R_2}\right)$ c) $\dfrac{1}{f} = (\mu + 1)\left(\dfrac{1}{R_2} - \dfrac{1}{R_1}\right)$ d) $\dfrac{1}{f} = (\mu - 1)\left(\dfrac{1}{R_1} + \dfrac{1}{R_2}\right)$

                                        Ans : (b) $\dfrac{1}{f} = (\mu - 1)\left(\dfrac{1}{R_1} - \dfrac{1}{R_2}\right)$

46. Power of lens = _____.

   a) $\dfrac{1}{\mu}$ b) $\dfrac{1}{f}$ c) $\dfrac{1}{d}$ d) $\dfrac{1}{D}$

                                         Ans : (b) $\dfrac{1}{f}$

47. Len's formula and len's maker formula are only applicable for only _____ lenses.
  a) thick   b) thin   c) either thick or thin   d) none

            Ans : (b) thin

48. SI unit of power of lens is _____.
  a) Ampere   b) Dioptre   c) Newton   d) Gauss

            Ans : (b) Dioptre

49. 1 Diaptore = _____.
  a) 1 cm   b. 2 m   c) $1m^{-1}$ d) $2m^{-1}$

            Ans : (c) $1m^{-1}$

50. The eye ball is approximately spherical in shape with a diameter of about _____ cm.
  a) 2.6 cm   b) 2.3 cm   c) 2.1 cm   d) 2.3 mlm

            Ans : (b) 2.3 cm

51. _____ is the coloured part of the eye.
  a) Cornea   b) Iris   c) retina   d) eyeball

            Ans : (b) Iris

52. _____ is the centre part of the Iris.
  a) Cornea   b) Iris   c) Pupil   d) retina

            Ans : (c) Pupil

53. _____ is the back surface of the eye.
  a) Pupil   b) Retina   c) Iris   d) cornea

            Ans : (b) Retina

54. _____ is the important part of human eye.
  a) Pupil   b) Retina   c) Eye lens   d) cornea

            Ans : (c) Eye lens

55. _____ is convex in nature.
  a) Pupil   b) Retina   c) Eye lens   d) cornea

            Ans : (c) Eye lens

56. _____ senses it as erect image.
  a) Eye   b) Brain   c) optic nerve   d) cornea

            Ans : (b) Brain

57. The ciliary muscle releases and makes the eye lens _____.
  a) thinner   b) thicker   c) thicker or thinner   d) none

            Ans : (a) thinner

58. Time travel between two consecutive light pulses is less than _____ second.
  a) 0.4   b) 0.1   c) 0.2   d) 0.3

            Ans : (b) 0.1

59. Near point of eye is _____ cm for normal human eye.
  a) 2.5 cm   b) 25 cm   c) 25.1 cm   d) 0.25 cm

            Ans : (b) 25 cm

60. _____ is infinity for normal eye.
  a) Near point   b) Far point   c) midpoint   d) none

            Ans : (b) Far point

61. A normal human eye can clearly see all the objects placed between _____ cm and infinity.
  a) 25   b) 45   c) 20   d) 15

            Ans : (b) 25

62. Myopia is also known as _____.
  a) Short sightedness   b) Long sightedness   c) prespyopia   d) either a or c

            Ans : (a) Short sightedness

63. **Due to Myopia, the image of distant objects are formed before the _____.**
    a) Retina   b) Iris   c) cornea   d) pupil
    Ans : (a) Retina

64. **Myopia defect can be corrected using a _____ lens.**
    a) Concave   b) Convex   c) plano concave   d) bifocal
    Ans : (a) Concave

65. **The focal length of the required concave lens is f = _____.**
    a) $-x$ b) $+x$ c) x^2 d) $\dfrac{1}{x}$
    Ans : (a) $-x$

66. **The focal length of the required concave lens is f = _____.**
    a) $\dfrac{xy}{x-y}$ b) $\dfrac{xy}{x+y}$ c) both 'a' and 'b'   d) none
    Ans : (a) $\dfrac{xy}{x-y}$

67. **Hypermeteropia also known as _____.**
    a) Short sightedness   b) Long sightedness   c) myophia   d) either a or c
    Ans : (b) Long sightedness

68. **Due to hypermeteropia, the image of nearby objects are formed behind the _____.**
    a) Retina   b) Iris   c) cornea   d) pupil
    Ans : (a) Retina

69. **Hypermeteropia defect can be corrected using a _____ lens.**
    a) convex   b) concave   c) plano convex   d) bifocal
    Ans : (a) convex

70. **The focal length of the required convex lens is f = _____.**
    a) $\dfrac{dD}{d-D}$ b) $\dfrac{dD}{d+D}$ c) $\dfrac{d-D}{dD}$ d) $\dfrac{d+D}{dD}$
    Ans : (a) $\dfrac{dD}{d-D}$

71. **Which one is called as old age hypermetropia?**
    a) Presbyopia   b) Myopia   c) hypermetropia   d) hypermyopia
    Ans : (a) Presbyopia

72. **Presbyopia can be corrected by _____.**
    a) Concave   b) Convex   c) Bi focal lenses   d) none
    Ans : (c) Bi focal lenses

73. **In which, upper part consists of _____ used for distant visionand the lower part consists of _____ used for reading purposes.**
    a) concave, convex lens   b) convex, concave lens   c) convex, biconvex   d) concave, biconcave
    Ans : (a) concave, convex lens

74. **Astigmatism can be corrected by using _____ lenses.**
    a) cylindrical   b) square   c) spherical   d) rectangular
    Ans : (a) cylindrical

75. **_____ has a convex lens of short forcal length.**
    a) Simple microscope   b) Compound microscope   c) both a and b   d) none
    Ans : (a) Simple microscope

76. **For normal human eye D = _____ cm.**
    a) 45   b) 2.5   c) 25   d) 35
    Ans : (c) 25 cm

77. _____ are used by watch repairers and jewellers.
    a) Simple microscope   b) Compound microscope c) biconvex lens   d) concave lens

    Ans : (a) Simple microscope

78. _____ to observe parts of flower, insects, etc.
    a) Simple microscope   b) Compound microscope c) biconvex lens   d) none

    Ans : (a) Simple microscope

79. _____ is also used to see tiny objects.
    a) Simple microscope   b) Compound microscope c) biconvex lens   d) concave lens

    Ans : (b) Compound microscope

80. _____ works based on the principle of vernier, its least count is 0.01 mm.
    a) Simple   b) Compound   c) Travelling microscope d) none

    Ans : (c) Travelling microscope

81. The first telescope was invented by _____ in 1608.
    a) Johann Lippershey   b) Galileo   c) Newton   d) Aristotile

    Ans : (a) Johann Lippershey

82. _____ made a telescope to observe distant stars.
    a) Galileo   b) Kepler   c) Newton   d) Aristotile

    Ans : (a) Galileo

83. Astronomical telescope is similar to this _____ telescope.
    a) Kepler   b) Galileo   c) Newton   d) Aristotile

    Ans : (a) Kepler

84. _____ telescope is used to view heavenly bodies like stars and planets.
    a) Astronomical   b) Terrestial   c) both a and b   d) none

    Ans : (a) Astronomical

85. _____ provides an erect image.
    a) Astronomical   b) Terrestial telescope   c) both a and b   d) none

    Ans : (a) Astronomical

86. The speed of light in vacuum or air is _____.
    a) 6×10^8 ms^1 b) 4×10^8 ms^1 c) 3×10^8 ms^1 d) 5×10^8 ms^1

    Ans : (c) 3×10^8 ms^1

87. Power of lens is −40. its focal length is _____.
    a) 4 m   b) −40 m   c) −0.25 m   d) −25m

    Ans : (c) −0.25 m

88. The optical phenomena, twinkling of stars is due to _____.
    a) Atmospheric reflection   b) Total reflection
    c) Atmospheric refraction   d) Total refraction

    Ans : (c) Atmospheric refraction

89. Convex lens focus a real, point sized image at focus, the object is placed _____.
    a) At focus   b) Between F and 2F   c) At infinity   d) At 2F

    Ans : (c) At infinity

90. The unit of power of lens is _____.
    a) metre   b) centimeter   c) Diopter   d) M^{-1}

    Ans : (c) Diopter

91. The line perpendicular to the reflective surface is the _____.
    a) normal   b) line of refraction   c) line of reflection   d) line of incidence

    Ans : (a) normal

92. **Light travels fastest through which of the following material.**

   a) Water   b) air   c) diamond   d) glass

   Ans : (b) air

93. **Dark muscular diaphragm that controls the _____.**

   a) Pupil   b) eye lens   c) Retina   d) Iris

   Ans : (d) Iris

94. **The screen where the image is formed by the _____.**

   a) Retina   b) eye lens   c) sclera   d) Cornea

   Ans : (a) Retina

95. **The diameter of the eyeball is**

   a) 3.5 cm   b) 2.2 cm   c) 3.2 cm   d) 2.3 cm

   Ans : (d) 2.3 cm

96. **If the time interval between two consecutive light pulses is less than _____.**

   a) 0.2 sec   b) 0.1 sec   c) 0.3 sec   d) 0.4 cm

   Ans : (b) 0.1 sec

97. **Focal length of the required concave lens is _____.**

   a) $f = \dfrac{xy}{x-y}$ b) $f = \dfrac{x+y}{x-y}$ c) $f = \dfrac{x-y}{x+y}$ d) $f = \dfrac{x-y}{xy}$

   Ans : (a) $f = \dfrac{xy}{x-y}$

98. **Corrected vision using a convex lens _____.**

   a) Myopia   b) Presbyopia   c) Hypermeteropia   d) Astigmatism

   Ans : (c) Hypermeteropia

99. **Simple microscope has a _____ of short focal length.**

   a) Cylindrical lens   b) bifocal lens   c) concave lens   d) convex lens

   Ans : (d) convex lens

100. **Which of the following diseases affect the old age person.**

   a) Hypermeteropia   b) Myopia   c) Presbyopia   d) Astigmatism

   Ans : (c) Presbyopia

101. **_____ is used to measure very small length with high degree of accuracy.**

   a) Travelling microscope   b) Simple microscope

   c) Compound microscope   d) Telescope

   Ans : (a) Travelling microscope

102. **The first telescope was invented by _____.**

   a) Oersted   b) Johann Lippershey   c) Galelio Galili   d) Jeffreys Moseley

   Ans : (b) Johann Lippershey

103. **A ray from air medium is refracted to medium two in which light travels with speed of 2 x 10^8 m s^{-1} Find the refractive index of the second medium with respect to air mediu.**

   a) 0.707   b) 0.303   c) 1.5   d) 0.613

   Ans : (c) 1.5

104. **Convex mirror will produce _____ of your face.**

   a) image of the same size   b) magnified image

   c) diminished image   d) blurred image

   Ans : (c) diminished image

105. **Light which is incident on a flat surface makes an angle of 15º with the surface. What is the angle of incidence?**

   a) 85º   b) 15º   c) 180º   d) 75º

   Ans : (d) 75º

Additional – Fill in the blanks

1. _____ is a form of energy which travels in the form waves.   **Ans:** light

2. The path of light is called _____.   **Ans:** ray of light

3. Group of light rays are called as _____.   **Ans:** Beam of light

4. Any object which gives out light are termed as _____.   **Ans:** Source of light

5. Some of the sources emit their own light and they are called as _____.   **Ans:** Luminous objects

6. All the stars, including the sun, are examples for _____.   **Ans:** luminous objects

7. We need _____ to see objects.   **Ans:** Light

8. Light always travels along a _____.   **Ans:** Straight line

9. Light does not need any medium for its _____.   **Ans:** propagation

10. _____ can even travel through vaccum.   **Ans:** Light

11. The speed of light in vaccum or air is c = _____.   **Ans:** 3×10^8 ms^{-1}

12. Light is in the form of waves, it is characterized by a wavelength (λ) and a frequency (v), which are related by the following equation _____.   **Ans:** c = γ λ

13. _____ light has the lowest wavelength.   **Ans:** Violet

14. _____ light has the highest wavelength.   **Ans:** Red

15. When a ray of light travels from one transparent medium into another obliquely, the path of the light undergoes deviation. This deviation of ray of light is called _____.   **Ans:** Refraction

16. _____ takes place due to the difference in the velocity of light in different media.   **Ans:** refraction

17. The velocity of light is more in a _____ medium and less in a _____ medium. **Ans:** rarer, denser

18. Refraction of light obeys _____ law of refraction.   **Ans:** snell's

19. The incident ray , the refracted ray of light and the normal to the refracting surface all lie in the same plane is called _____.   **Ans:** first law of refraction

20. The ratio of the sine of the angle of incidence and sine of the angle of refraction is equal to the ratio of refractive indices of the two media. This law is also known as _____.   **Ans:** Snell's law

21. The speed of light in a medium is _____ if the refractive index of the medium is _____ and viceversa.   **Ans:** Low, high

22. When a light travels from a denser medium into a rarer medium, the refracted ray is _____ from the normal.   **Ans:** Bent away

23. When a light travels from a rarer medium into a denser medium, the refracted ray is _____ the normal.   **Ans:** bent towards

24. _____ is the fundamental and natural source of light.   **Ans:** Sun

25. If a source of light produces a light of single colour, it is known as a _____.   **Ans:** Monochromatic source

26. A _____ of light produces a white light which contains light of different colours.   **Ans:** Composite

27. _____ is a composite light which consists of light of various colours or wavelengths.   **Ans:** Sun light

28. Example for a composite source is a _____.   **Ans:** Mercury vapour lamp, sun

29. When beam of white light or composite light is refracted through any transparent media such as water or glass, it is split into its component colours. This phenomenon is called as _____.   **Ans:** dispersion of light

30. The band colours is termed as _____.   **Ans:** Spectrum

31. The spectrum colours are represented by the acronym is _____.   **Ans:** VIBGYOR

32. Angle of refraction is the smallest for _____ and the highest for _____.   **Ans:** red, Violet

33. Refractive index of a medium is _____ on the wavelength of the light.   **Ans:** dependent

34. The beam of light is redirected in all directions when it interacts with a particle of medium. The interacting particle of the medium is called as _____.   **Ans:** scatterer

35. If the energy of the incident beam of light and the scattered beam of light are same, then it is called as _____.   **Ans:** elastic scattering

36. If the energy of the incident beam of light and the scattered beam of light are not same, then it is called as _____.   **Ans:** in elastic scattering

37. The scattering of sunlight by the atoms or molecules of the gases in the earth's atmosphere is known as _____.   **Ans:** Rayleigh scattering

38. _____ law states that, the amount of scattering of light is inversely proportional to the fourth power of its wavelength.   **Ans:** Rayleigh's scattering

39. When sunlight passes through the atmosphere, the _____ colour is scattered to a greater extent than the red colour.   **Ans:** Blue

40. _____ colour is the shortest wavelength.   **Ans:** Violet

41. _____ colour is the longer wavelength.   Ans: Red

42. The spectral lines having frequency equal to the incident ray frequency is called _____.   **Ans:** Rayleigh line

43. _____ is responsible for the white appearance of the clouds.   **Ans:** Mie Scattering

44. The scattering of light rays by the colloidal particles in the colloidal solution is called _____.   **Ans:** tyndall scattering or tyndall effect.

45. The scattered light contains some additional frequencies other than that of incident frequency. This is known as _____.   **Ans:** Raman Scattering or Raman effect

46. The interaction of light ray with the particles of pure liquids or transparent solids, which leads to a change in _____ or _____.   **Ans:** Wavelength, frequency

47. The spectral lines which are having frequencies other than the incident ray frequency are called _____.   **Ans:** Raman lines

48. The lines having frequencies lower than the incident frequency is called _____.   **Ans:** Strokes lines

49. The lines having frequencies higher than the incident frequency is called _____.   **Ans:** Anti strokes lines

50. Lens is basically classified into two types. They are _____ and _____.   **Ans:** Convex, Concave

51. Convex lens is also called as _____.   **Ans:** converging lens

52. Concave lens is also called as _____.   **Ans:** Diverging lens

53. If one of the faces of a lens is plane, it is known as a _____.   **Ans:** plano-convex lens

54. If one of the faces of a lens is plane, it is knows as a _____.   **Ans:** plano-concave lens

55. When an object is placed at infinity, a real image is formed at the _____.   **Ans:** Principal axis

56. When an object is placed behind the centre of curvature, _____ is formed between the center of curvature and the principal zxis.   **Ans:** a real and inverted image

57. When an Object is placed _____ a real and inverted image is formed at the other center of curvature.   **Ans:** at the center of curvature.

58. When an object is placed _____ and principal focus, a real and inverted image is formed behind the center of curvature.   **Ans:** In between the centre of curvature.

59. When an object is placed at the focus a real image is formed at _____.   **Ans:** infinity

60. When an object is placed in between principal focus and optical centre, a _____ is formed.

           Ans: Virtual image

61. _____ are used as magnifying lenses.   **Ans:** convex lenses

62. _____ are used as camera lenses.   **Ans:** convex lenses

63. _____ are used in making microscope, telescope and slide projectors.   **Ans:** Convex lenses

64. Convex lenses are used to correct the defect of vision called _____.   **Ans:** Hypermetropia

65. When an object is placed at infinity a _____ is formed at the focus.   **Ans:** virtual image

66. When an object is placed at a finite distance from the lens a virtual image is formed between optical center and focus of the _____.   **Ans:** concave lens

67. Size of the image formed increases as the distance between the object and the lens is _____.   **Ans:** Decreased

68. Concave lenses are used as eye lens of _____.   **Ans:** Galilean Telescope

69. _____ are used in wide angle spy hole in doors.   **Ans:** Concave lenses

70. Concave lenses are used to correct the defect of vision called _____.   **Ans:** Myopia

71. The _____ relates the focal length of a lens with the distance of object and image.   **Ans:** Lens formula

72. _____ is applicable to both convex and concave lens.   **Ans:** Lens formula

73. _____ sign conventions are used for measuring the various distances in the ray diagrams of spherical lens.   **Ans:** Cartesian

74. The _____ can be defined as the degree of convergence or divergence of light rays.   **Ans:** Power of a lens

75. If the magnification is greater than 1, then we get an _____ image.   **Ans:** enlarged image

76. If the magnification is less than 1, then we get an _____ image.   **Ans:** Diminished image

77. All lenses are made up of _____ materials.   **Ans:** Transparent

78. Any optically transparent material will have a _____.   **Ans:** Refractive index

79. The lens formula relates the focal length of a lens with the _____ of the object and image.   **Ans:** Distance

80. _____ is the symbol of refractive index of the material of the lens.   **Ans:** μ

81. The power of lens can be defined as the degree of convergence or divergence of _____.   **Ans:** light rays

82. The power of a lens is numerically defined as the _____ of its focal length.   **Ans:** reciprocal

83. By convention, the power of a convex lenses taken as _____ where as the power of concave lens is taken as _____.   **Ans:** Positive, Negative

84. The lens formula and lens maker's formula are applicable to only for _____ lenses.   **Ans:** Thin

85. The SI unit of power of a lens is _____.   **Ans:** Dioptre

86. 1D = _____.   **Ans:** $1 \, m^{-1}$

87. For the case of _____ lens, lens maker's formula can be used with little modification.   **Ans:** Thick

88. Convex lenses produce mostly _____ images.   **Ans:** Real

89. Concave lenses produce mostly _____ images.   **Ans:** Virtual

90. Convex lens is a _____ lens.   **Ans:** converging

91. Concave lens is a _____ lens.   **Ans:** diverging

92. _____ are sensitive organs responsible for vision.   **Ans:** Human eyes

93. _____ are the gateway to the wonderful world.   **Ans:** Human eyes

94. The eye ball is approximately spherical in shape with a diameter of about _____. **Ans:** 2.3 cm

95. It consists of a tough membrane called _____. **Ans:** Sclera

96. _____ is the thin and transparent layer on the front surface of the eyeball. **Ans:** Cornea

97. _____ is the main refracting surface. **Ans:** Cornea

98. When light enters through the _____, it refracts or bends the light on to the lens. **Ans:** Cornea

99. _____ is the coloured part of the eye. **Ans:** Iris

100. _____ may be blue, brown or green in colour. **Ans:** Iris

101. Every person has a _____ colour, pattern and texture. **Ans:** Unique

102. _____ controls amount of light entering into the pupil like camera aperture. **Ans:** Iris

103. _____ is the centre part of the iris. **Ans:** Pupil

104. _____ controls amount of light entering into pupil like camera aperture. **Ans:** Iris

105. _____ is the centre part of the iris. It is the pathway for the light to retina. **Ans:** Pupil

106. _____ is the most sensitive part of the human eye, on which real and inverted image of the objects is formed. **Ans:** Retina

107. _____ is fixed between the ciliary muscles. **Ans:** Eye lens

108. _____ helps to change the foal length of the eye lens according to the position of the object. **Ans:** ciliary muscles

109. _____ is the important part of human eye. **Ans:** Eye lens

110. Eye lens is _____ in nature. **Ans:** convex

111. Eye lens is made of a _____, _____ like material. **Ans:** flexible, jelly

112. The ciliary muscle relaxes and make the eye lens _____ then the focal length of the lens increases. **Ans:** thinner

113. When we look at a closer object, the focal length of the eye lens decreased by the _____ of _____. **Ans:** contraction, ciliary muscles

114. The ability of the eye lens to focus near by as well as the distant objects is called _____ of the eye. **Ans:** power of accommodation

115. If the time interval between two consecutive light pulses is less than _____. **Ans:** 0.1 second

116. The minimum distance required to see the objects distinctly without strain is called least distance of distinct vision. It is called as _____ of eye. **Ans:** Near point

117. The maximum distance up to which the eye can see objects clearly is called as _____ of the eye. **Ans:** Far point

118. Myopia is also known as _____. **Ans:** short sightedness

119. Myopia can be corrected using a _____ lens. **Ans:** concave

120. The focal length of the required concave lens is f = _____. **Ans :** − x

121. Hypermetropia also known as _____. **Ans:** Long sightedness

122. Hypermetropia defect can be corrected using a _____ lens. **Ans:** convex

123. Myopia and hypermetropia both the defects can be corrected by using a _____ lens. **Ans:** Bifocal

124. In Astigmatism defect eye cannot see parallel and horizontal lines clearly. It may be _____ or _____. **Ans:** Inherited, acquired

125. Astigmatism can be corrected by using _____. **Ans:** Torrid lenses

126. For normal human eye distance of distinct vision D is _____ cm. **Ans:** 25

127. _____ are used by watch repairers and Jewellers. **Ans:** Simple microscope

128. _____ to read small letters clearly. **Ans:** simple microscope

129. _____ to observe parts of flower, insects etc.   **Ans:** Simple microscope

130. In a microscope the lens with the shorter focal length is placed near the object is called as _____.   **Ans:** Objective lens

131. In a microscope the lens with the larger focal length is placed near the observer's eye is called as _____.   **Ans:** Eye lens or eye piece

132. Compound microscope has _____ to _____ times more magnification power than simple microscope.   **Ans:** 50 to 200

133. _____ made a telescope to observe distant stars.   **Ans:** Galileo

134. _____ observed the satellites of _____ and the rings of _____ through his telescope.   **Ans:** Galileo, Jupiter, Saturn

135. _____ are used in reflecting microscope.   **Ans :** parabolic mirrors

136. _____ is not suitable for viewing objects on the surface of the earth.   **Ans:** Terrestial telescopes

137. An _____ telescope is used to view heavenly bodies like stars, planets, galaxies and satellites.   **Ans:** Astronamical

138. _____ telescope is erecting the final image with respect to the object.   **Ans:** Terrestrial

139. _____ can be used even with the low intensity of light.   **Ans:** Telescope

140. _____ can be attached for taking photograph for the celestial objects.   **Ans:** camera

Additional – Match the following

1.
   i) **Violet light**   (a) **Angle of icidence**
   ii) **Red light**   (b) **Angle of refraction**
   iii) **Sin i**   (c) **Lowest wave length**
   iv) **Sin r**   (d) **Highest wave length**

   Ans :

i)	Violet light	c	Lowest wave length
ii)	Red light	d	Highest wave length
iii)	Sin i	a	Angle of incidence
iv)	Sin r	b	Angle of refraction

2.
   i) **Beam of light same**   (a) **Rayleigh scattering**
   ii) **Beam of light are not same**   (b) **Mie scattering**
   iii) **Blue lights are scattering**   (c) **Inelastic scattering**
   iv) **White appearance of the clouds**   (d) **Elastic scattering**

   Ans :

i)	Beam of light same	d	Elastic scattering
ii)	Beam of light are not same	c	Inelastic scattering
iii)	Blue lights are scattering	a	Rayleigh scattering
iv)	White appearance of the clouds	b	Mie scattering

3.
   i) **Colloidal solution**   (a) **Raman effect**
   ii) **Incident frequency**   (b) **Tyndall**
   iii) **Lower frequency**   (c) **Antistokes**
   iv) **Higher frequency**   (d) **Stokes**

Ans :

i)	Colloidal solution	b	Tyndall
ii)	Incident frequency	a	Raman effect
iii)	Lower frequency	d	Stokes
iv)	Higher frequency	c	Antistokes

4.
i)	**Convex lens**	**(a)**	**bi–concave lens**
ii)	**Concave lens**	**(b)**	**bi–convex lens**
iii)	**Plano convex**	**(c)**	**Converging**
iv)	**Plano concave**	**(d)**	**Diverging**

Ans :

i)	Convex lens	c	Converging
ii)	Concave lens	d	Diverging
iii)	Plano convex	a	bi–concave lens
iv)	Plano concave	b	bi–convex lens

5.
i)		**(a)**	**Plano convex lens**
ii)		**(b)**	**Positive miniscus**
iii)		**(c)**	**Bi–convex lens**
iv)		**(d)**	**Convex lens**

Ans :

i)		d	Convex lens
ii)		c	Bi–convex lens
iii)		a	Plano convex lens
iv)		b	Positive miniscus

5.
i)		**(a)**	**Negative miniscus**
ii)		**(b)**	**Plano concave lens**
iii)		**(c)**	**Concave lens**

iv)   **(d)**   **Bi–concave lens**

Ans :

i)		c	Concave lens
ii)		d	Bi–concave lens
iii)		b	Plano concave lens
iv)		a	Negative miniscus

6.   i)   **Convex lens**   **(a)**   **Agtimatism**
     ii)   **Concave lens**   **(b)**   **Presbyopia**
     iii)   **Bi–focal lens**   **(c)**   **Short sightedness**
     iv)   **Torrid lenses**   **(d)**   **Long sightedness**

Ans :

i)	Convex lens	c	Short sightedness
ii)	Concave lens	d	Long sightedness
iii)	Bi–focal lens	b	Presbyopia
iv)	Torrid lenses	a	Agtimatism

7.   i)   **Refracting telescope**   **(a)**   **Cassegrain**
     ii)   **Reflecting telescope**   **(b)**   **Keplerian**
     iii)   **Astronomical**   **(c)**   **Erect image**
     iv)   **Terrestrial telescope**   **(d)**   **Planets, galaxies**

Ans :

i)	Refracting telescope	b	Keplerian
ii)	Reflecting telescope	a	Cassegrain
iii)	Astronomical	d	Planets, galaxies
iv)	Terrestrial telescope	c	Erect image

8.   i)   **Refracting telescope**   **(a)**   **Astronomical telescope**
     ii)   **New to nian**   **(b)**   **Not easily portable one**
     iii)   **Planets galaxies**   **(c)**   **Galilean telescope**
     iv)   **Terrestrial telescope**   **(d)**   **Reflecting telescope**

Ans :

i)	Refracting telescope	c	Galilean telescope
ii)	New to nian	d	Reflecting telescope

iii)	Planets galaxies	a	Astronomical telescope
iv)	Terrestrial telescope	b	Not easily portable one

9.

i)	**Convex lens**	**(a)**	**Travelling microscope**
ii)	**Compound microscope**	**(b)**	**Myopia**
iii)	**Measuring small length**	**(c)**	**Better magnification**
iv)	**Concave lens**	**(d)**	**Simple microscope**

Ans :

i)	Convex lens	d	Simple microscope
ii)	Compound microscope	c	Better magnification
iii)	Measuring small length	a	Travelling microscope
iv)	Concave lens	b	Myopia

Additional – True or false (correct the statement if it is false)

1. **Telescope is an optical instrument used to see distant objects clearly.**
   Ans : True.

2. **Astigmatism can be corrected by using torrid lenses**
   Ans : True.

3. **Retina is the coloured part of the eye.**
   Ans : False. Iris is the coloured part of the eye.

4. **Convex lens are used wide angle spy hole in doors.**
   Ans : False. Concave lenses are used wide angle spy hole in doors.

5. **The maximum distance required to see the objects with out strain is near point of eye.**
   Ans : False. The maximum distance required to see the objects with out strain is far point of eye.

Additional – Assertion and reason

Mark the correct choice as

i) Both the assertion and the reason are true and the reason is the correct explanation of assertion.

ii) Both the assertion and the reason are true, but the reason is not the correct explanation of the assertion.

iii) Assertion is true, but the reason is false.

iv) Assertion is false, but the reason is true.

1. **Assertion:** Hubble space telescope gives extremely sharp images.

   Reason: Hubble orbit outside the direction of earth's atmosphere allows it to take extremely sharp images with almost no background light.

   Ans : (i) Both the assertion and the reason are true and the reason is the correct explanation of the assertion

2. **Assertion:** A person can see distance objects clearly but cannot see nearby object distinctly.

   Reason: The light rays from a close by object are focused in front of the retina.

   Ans : (iii) Assertion is true, but the reason is false

3. **Assertion:** The speed of light in a medium is low if the refractive index of the medium is high.

   Reason: Refractive index gives us an idea of how fast or how slow light travels in a medium.

   Ans : (i) Both the assertion and the reason are true and the reason is the correct explanation of the assertion

4. **Assertion:**   Angle of refraction is the highest for red and the smallest for violet.
    Reason: Angle of refraction is different for different colours.

    Ans : (iv) Assertion is false, but the reason is true

5. **Assertion:**   The velocity of light is more in a rarer medium and less in a denser medium.
    Reason: The incident ray, the refracted ray of light and the normal to the refracting surface all lie in the same plane.

    Ans : (ii) Both the assertion and the reason are true, but the reason is not the correct explanation of the assertion

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Additional – Short answer questions

1. **What is called as beam of light.**

    The path of light is called ray of light and group of these rays are called as beam of light.

2. **What are called luminous objects?**

    Some of the sources emit their own light and they are called luminous objects.

3. **Give the examples for luminous objects.**

    ✦ Stars.
    ✦ Sun.

4. **If you make the light from a torch to fall on your eyes, will you able to see the object?**

    Definitely no. We can see the object only when the light is made to fall on the objects and the light reflected from the objects is viewed by our eyes.

5. **What is called refraction?**

    When a ray of light travels from one transparent medium into another obliquely, the path of the light undergoes deviation. This deviation of ray of light is called refraction.

6. **Write the first law of refraction.**

    The incident ray, the refracted ray of light and the normal to the refracting surface all lie in the same plane.

7. **Write the second law of refraction.**

    The ratio of the sine of the angle of incidence and sin e of the angle of refraction is equal to the ratio of refractive indices of the two media.

8. **What is called Morochromatic source?**

    If a source of light produces a light of single colour, with single wavelength is known as a Monochromatic source.

9. **What is called Composite source of light?**

    It produces a white light which contains light of different colours. Sunlight is a composite light which consists of light of various colours or wave lengths.

10. **What is called spectrum?**

    The band of colours is termed as spectrum. The spectrum consists of following colours. Violet, Indigo, Blue, Green, Yellow, Orange and Red.

11. **What is called scattering of light?**

    When sunlight enters the Earth's atmosphere, the atoms and molecules of different gases present in the atmosphere refract the light in all possible directions. This is called as scattering of light.

12. **What is called scatterer?**

    In this phenomenon, the beam of light is redirected in all directions, when it interacts with a particle of medium. The interacting particle of the medium is called as scatterer.

13. Based on initial and final energy of the light beam scattering can be classified into how many types?

2 types. They are;

✦ Elastic.

✦ Inelastic.

14. Define Elastic scattering.

If the energy of the incident beam of light and the scattered beam of light are same, thin it is called as Elastic scattering.

15. Write short note on "Inelastic scattering and its types".

If the energy of the incident beam of light and the scattered beam of light are not same, then it is called as inelastic scattering. The nature and size of the scatterer results in different types of scattering. They are;

✦ Rayleigh scattering.

✦ Tyndall scattering.

✦ Mie scattering.

✦ Raman scattering.

16. Define Rayleigh scattering.

The scattering of sunlight by the atoms or molecules of the gases in the earth's atmosphere is known as Rayleigh scattering.

17. What is the reason for the colour of Sun is red at sunrise and sunset?

Ans : At sunrise and sunset, the light rays from the sun have to travel alarger distance in the atmosphere than at noon. Hence most of the blue lights are scattered away and only the red light which gets least scattered reaches us. Therefore, the colour of the Sun is red at sunrise and senset.

18. Define Mie scattering.

Mie scattering takes place when the diameter of the scatterer is similar to or larger than the wave length of the incident light. It is also an elastic scattering. The amount of scattering is independent of wave length.

19. Define Tyndall scattering.

The scattering of light rays by the colloidal particles in the colloidal solution is called Tyndall scattering (or) Tyndall effect.

20. Define Raman scattering.

Raman scattering is defined as the interaction of light ray with the particles of pure liquids or transparent solids, which leads to a change in wave length or frequency.

21. Define Rayleigh line.

The spectral lines having frequency equal to the incident ray frequency is called Rayleigh line.

22. Define Raman line.

The spectral lines which are having frequencies other than the incident ray frequency are called Raman lines.

23. Define Stokes lines and Antistokes lines.

The lines having frequencies lower than the incident frequency is called Strokes lines. The lines having frequencies higher than the incident frequency are called Antistrokes lines.

24. How many types of lenses?

They are 2 types.

✦ Plano – convex lens.

✦ Plano – concave lens.

25. Write the applications of convex lenses.

✦ They are used as camera lenses.

✦ They are used as magnifying lenses.

✦ They are used in making microscope, telescope and slide projectors.

✦ They are used to correct the defect of vision called hypermetropia.

26. Write the applications of concave lenses.

✦ They are used as eye lens of Galilean telescope.

✦ They are used in wide angle spy hole in doors.

✦ They are used to correct the defect of vision called myopia.

27. Explain Lens formula.

Like spherical mirrors, we have lens formula for spherical lenses. The lens formula give the relationship among distance of the object (u), distance of the image (v) and the focal length (f) of the lens. It is expressed as $\dfrac{1}{f} = \dfrac{1}{v} - \dfrac{1}{u}$. This is applicable to both convex and concave lenses.

28. Define Magnification of a lens.

It is defined as the ratio of the height of the image to the height of an object. Magnification is denoted by the letter 'm'. If the height of the objectis 'h' and height of the image is 'h^1', the magnification produced by lens is, m = $\dfrac{\text{height of the image}}{\text{height of the object}} = \dfrac{h^1}{h}$.

29. Explain Lens Maker's formula.

The need for an equation relating the radii of curvature of the lens, the refractive index of the given material of the lens and the required focal length of the lens. The lens maker's formula is

$$\dfrac{1}{f} = (\mu - 1)\left(\dfrac{1}{R_1} - \dfrac{1}{R_2}\right).$$

f = focal length of the lens.

μ = Refractive index of the material of the lens.

R_1 and R_2 = Radii of curvature of the two faces of the lens.

30. Explain Power.

When a ray of light falls on a lens, the ability to converge or diverge these light rays depends on the focal length of the lens. This ability of a lens to converge (or) diverge is called as its power.

31. Define Power of a lens.

Power of a lens can be defined as the degree of convergence or divergence of light rays. Power of a lens is numerically defined as the reciprocal of its focal length,

P = $\dfrac{1}{f}$. SI unit of power of the lens is dioptre (D).

32. Define Persistence of vision.

If the time interval between two consecutive light pulses is less than 0.15, human eye cannot distinguish them separately. It is called Persistence of vision.

33. Explain Far point and Near point of an eye.

Near point of eye : The minimum distance required to see the objects distinctly without strain is called least distance of distinct vision. It is called as Near point of eye. It is 25 cm for normal human eye.

Far point of eye : The maximum distance upto which the eye can see object clearly is called as Far point of the eye. It is infinity for normal eye.

34. Write the defects in eye.

A normal human eye can clearly see all the objects placed between 25 cm and infinity. But for some people, the eye loses its power of accomodation. This could happen due to many reasons including ageing. Hence their vision becomes defective.

35. Explain Astigmatism.

In this defect, eye cannot see parallel and horizontal lines clearly. It may be inherited or acquired. It is due to the imperfect structure of eye lens because of the development of cataract on the lens, ulceration of cornea, injury to the refracting surfaces, etc. Astigmatism can be corrected by using cyclinderical lenses.

36. Write the types of Microscope.

✦ Simple microscope.

✦ Compound microscope.

37. Write the uses of Simple microscope.

Simple microscope are used;
- ✦   by watch repairers and jewellers.
- ✦   to read small letter clearly.
- ✦   to observe parts of flower, insects, etc.
- ✦   to observe finger prints in the field of forensic science.

38. Write a short note on Travelling telescope.

A Travelling telescope is one of the best instrument for measuring very small length with high degree of accuracy at the order of 0.01 mm. It works based on the principle of Vernier. It's least count is 0.01 mm.

39. Name the types of Telescopes?

2 types of Telescope.
- ✦   Refracting telescope.
- ✦   Reflecting telescope.

40. What are the major types of telescope?
- ✦   Astronomical telescope.
- ✦   Terrestrial telescope.

41. Listout some Refracting telescope.

Lenses are used Galilean telescope, Keplerian telescope, Achromatic refractors are some refracting telescope.

42. Name some reflection telescopes what type of mirrors are used?

Gregorian, Newtonian, Cassegrain telescope are some reflecting telescopes. Parbolic mirrors are used.

43. Write a note on Astronomical telescope.

An Astronomical telescope is used to view heavenly bodies like stars, planets, galaxies and satellites.

44. Write a note on Terrestrial telescope.

The image in an Astronomical telescope is inverted. So it is not suitable for viewing objects on the surface of the Earth. Therefore a Terrestrial telescope is used. It provides an erect image, which uses three lenses

45. Write the advantages of Telescopes.
- ✦   Elaborate view of the Galaxies, Planets, Stars and other heavenly bodies is possible.
- ✦   Camera can be attched for taking photograph for the celestial objects.
- ✦   Telescope can be viewed even with the low intensity of light.

46. Write the disadvantages of Telescope.
- ✦   Frequent maintanances needed.
- ✦   It is not easily portable one.

Additional – Long answer questions

1. Explain Rayleigh's scattering law.

Rayleigh's scattering law states that "the amount of scattering of light is inversly proportional to the fourth power of its wave length".

Amount of scattering 'S' $\alpha \dfrac{1}{\lambda^4}$.

According to this law, the shorter wave length colours are scattered much more than the longer wave length colours.
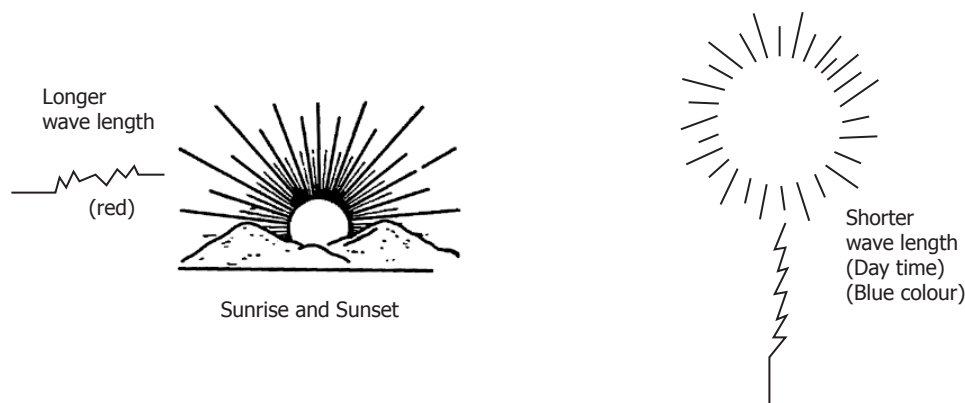
Sunrise and Sunset

When the sunlight passes through the atmosphere, the blue colour is scattered to a greater extent than the red colour (long wave length). This scattering cause the sky to appear in blue colour.

At sunrise and sunset, the light rays from the sun have to travel a larger distance in the atmosphere than at noon. Hence, most of the blue lights are scattered away and only the red light which gets least scattered reaches us. Therefore, the colour of the Sun is red at sunrise and sunset.

2.   Explain about Tyndall scattering.

When a beam of sunlight, enters into a dusty room through a window, then its path becomes visible to us. This is because, the tiny dust particles present in the air of the room scatter the beam of light. This is an example of Tyndall scattering.

The scattering of light rays by the colloidal particles in the colloidal solution is called Tyndall scattering (or) Tyndall effect.
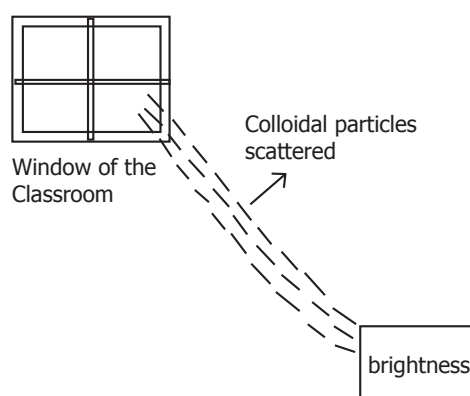
3.   Explain about Raman scattering.

When a parallel beam of monochromatic light passes through a gas (or) liquid or transparent solid, a part of light rays are scattered.

The scattered light contains some additional frequencies other than that of incident frequency. This is known as Raman scattering (or) Raman effect.

Raman scattering is defined as the interaction of light ray with the particles of pure liquids or transparent solids, which leads to a change in wave length or frequency.

The spectral lines having frequency equal to the incident ray frequency is called Rayleigh line and the spectral lines which are having frequencies other than the incident ray frequency are called Raman lines.

The lines having frequencies lower than the incident frequency is called Stokes lines and the lines having frequencies higher than the incident frequency are called Antistokes lines.

Virtual energy levels

Vibrational
energy
states

4
3
2
1
0

Infrared
absorption

Rayleigh
scattering

Stokes
Raman
Scattering

Antistokes
Raman
Scattering
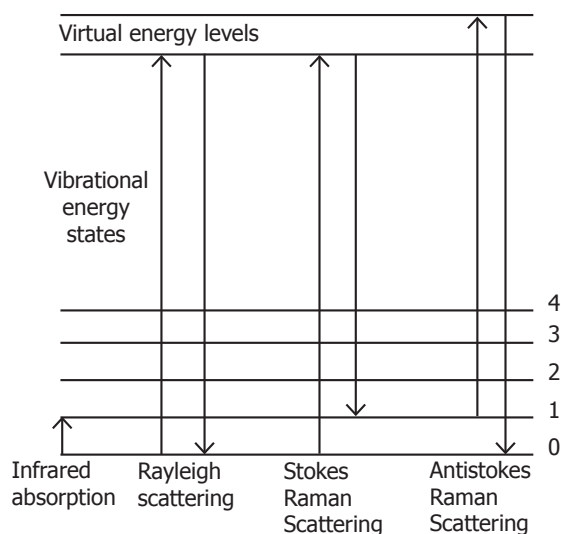
4.   Write the classification of lenses in briefly.

A lens is an optically transparent medium bounded by two spherical refracting surfaces or one plane and one spherical surface.

Lens is basically into 2 types. They are Convex lens and Concave lens.

i)   **Convex (or) bi–convex lens :**

It is a lens bounded by two spherical surfaces such that it is thicker at the centre than at the edges. A beam of light passing through it, is converged to a point. So a convex lens is also called as Converging lens.

ii)   **Concave (or) bi–concave lens :**

It is a lens bounded by two spherical surfaces such that it is thinner at the centre than at the edges. A parallel beam of light passing through it, is diverged or spread out. So a concave lens is also called as Diverging lens.

Convex Lens   Concave Lens

5.   Write the other types of lenses.

Plano – convex lens :

If one of the faces of a bi-convex lens is plane, it is known as a Plano–convex lens.

Plano – concave lens :

If one of the faces of a bi-concave lens is plane, it is known as Plano–concave lens.

CONVERGING LENSES   DIVERGING LENSES

Convex
lens

Biconvex
lens

Plano-convex
lens

Positive
meniscus

Concave
lens

Biconcave
lens

Plano-concave
lens

Negative
meniscus
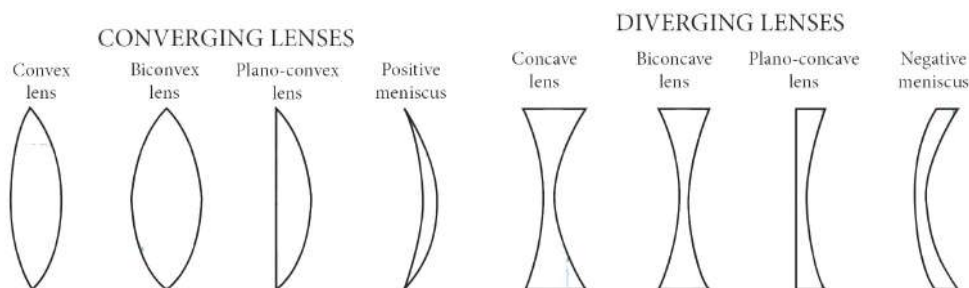
6. **Explain the Refraction through a Convex lens.**

i) Object at infinity.

ii) Object placed beyond C (>2F).

iii) Object placed at C.

iv) Object placed between F and C.

v) Object placed at the principal forces F.

vi) Object placed between the principal forces F and optical centre O.

i) **Object at infinity :**

When an object is placed at infinity, a real image is formed at the principal focus. The size of the image is much smaller than that of the object.
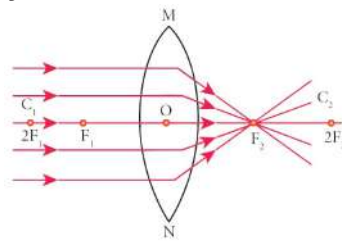
ii) **Object place beyond C (>2F) :**

When an object is placed behind the center of curvature (beyond C) a real and inverted image is formed between the center of curvature and the principal focus. The size of the image is same as that of the object.
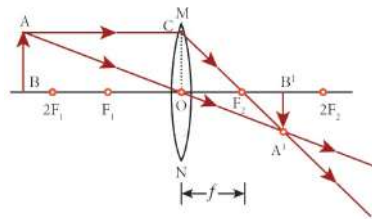
iii) **Object place at C :**

When an object is placed at the center of curvature, a real and inverted image is formed at the other center of curvature, the size of the image is the same as that of the object.
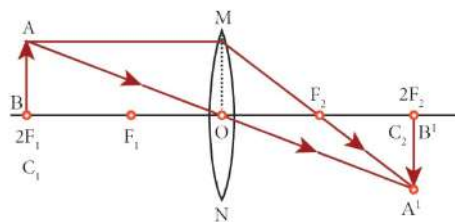
iv) **Object place between F and C :**

When an object is placed in between the center of curvature and principal focus, a real and inverted image is formed behind the center of curvature. The size of the image is bigger than that of the object.
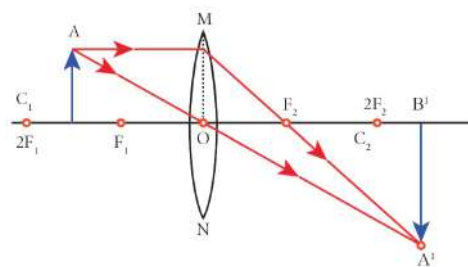
v) **Object placed at the principal focus F :**

When an object is placed at the focus, a real image is formed at infinity. The size of the image is much larger than that of the object.
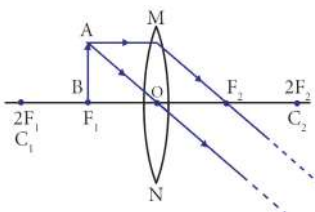
vi) **Object placed between the principal focus F and optical centre O :**

When an object is placed in between principal focus and optical centre, a virtual image is formed. The size of the image is larger than that of the object.
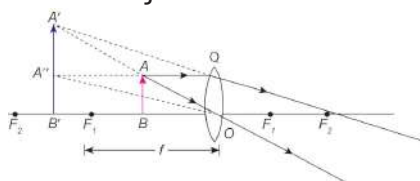
7. **Explain about the Refraction through a concave lens.**

i) Object at infinity.

ii) Object anywhere on the principal axis at a finite distance.

iii) Position and size of image with object distance.

i) **Object at infinity :**

When an object is placed at infinity, a virtual image is formed at the focus. The size of the image is much smaller than that of the object.
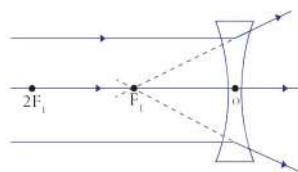
ii) **Object at infinity :**

When an object is placed at a finite distance from the lens, a virtual image is formed between optical center and focus of the concave lens. The size of the image is smaller than that of the object.
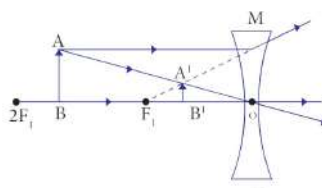
iii) **Object at infinity :**

As the distance between the object and the lens is decreased, the distance between the image and the lens also keeps decreasing. Further, the size of the image formed increases as the distance between the object and the lens is decreased.
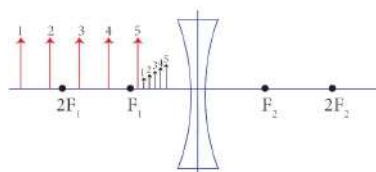
8. Write short notes about sign–convention (cartesian).

Cartesian sign conversions are used for measuring the various distances in the ray diagrams ofspherical lenses. According to Cartesian sign convention,

- ✠ The object is always placed on the left side of the lens.
- ✠ All the distances are measured from the optical centre of the lens.
- ✠ The distances measured in the same direction as that of incident light are taken as positive.
- ✠ The distances measured against the direction of incident light are taken as negative.
- ✠ The distances measured upward and perpendicular to the principal axis is taken as positive.
- ✠ The distances measured downward and perpendicular to the principal axis is taken as negative.

9. Describe the structure and working of the human eye.

The human eyes are most valuable and sensitive organs responsible for vision. They are the gateway to the wonderful world.

- ✠ **Structure of the eye :**
  - ✦ The eye ball is approximately spherical in shape with a diameter of about 2.3 cm. It consists of a tough membrane called sclera, which protects the internal parts of the eye.
- ✠ **Cornea :**
  - ✦ This is the thin and transparent layer on the front surface of the eyeball.
  - ✦ It is the main refracting surface.
  - ✦ When light enters through the cornea, it refracts or bends the light on to the lens.
- ✠ **Iris :**
  - ✦ It is the coloured part of the eye.
  - ✦ It may be blue, brown or green in colour.
  - ✦ Every person has a unique colour, pattern and texture.
  - ✦ Iris controls amount of light entering into the pupil like camera aperture.
- ✠ **Pupil :**
  - ✦ It is the centre part of the Iris. It is the pathway for the light to retina.
- ✠ **Retina :**
  - ✦ This is the back surface of the eye.
  - ✦ It is the most sensitive part of human eye, on which real and inverted image of objects is formed.
- ✠ **Ciliary muscles :**
  - ✦ Eye lens is fixed between the ciliary muscles.
  - ✦ It helps to change the focal length of the eye lens according to the position of the object.
- ✠ **Eye lens :**
  - ✦ It is the important part of human eye.
  - ✦ It is convex in nature.
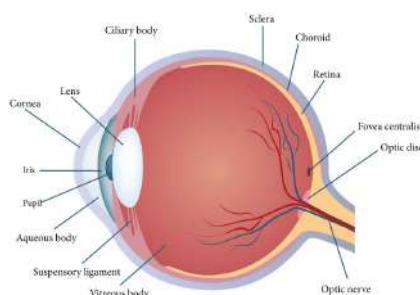
10. Explain about Telescope and its types.

Telescope is an optical instrument to see the distant object.

Types of telescope : According to optical property, it is classified into 2 groups (i) Refracting telescope (ii) Reflecting telescope.

Refracting Telescope :

Lenses are used. Galilean telescope, Keplerian telescope, Achromatic refractors, are some refracting telescopes.

Reflecting Telescope :

Parabolic mirrors are used Gregorian, Newtonian, Cassegrain telescope are some Reflecting telescopes. According to the things which are observed, Astronomical Telescope and Terrestrial Telescopes are the two major types of telescope.

Astronomical Telescope :

An astronomical telescope is used to view heavenly bodies like stars, planets galaxies and satellites.

Terrestrial Telescope :

The image in an astronomical telescope is inverted. So, it is not suitable for viewing objects on the surface of the Earth. Therefore, a terrestrial telescope is used. It provides an erect image. The major difference between astronomical and terrestrial telescope is erecting the final image with respect to the object with the help of correcting lens.

11. Write the advantages and disadvantages of Telescopes.

Advantages :

✠ Elaborate view of the Galaxies, Planets, stars and other heavenly bodies is possible.

✠ Camera can be attached for taking photograph for the celestial objects.

✠ Telescope can be viewed even with the low intensity of light.

Disadvantages :

✠ Frequent maintenance needed.

✠ It is not easily portable one.

12. Explain power of Accommodation of the human eye.

✠ The ability of the eye lens to focus nearby as well as the distant objects is called power of accommodation of the eye.

✠ This is achieved by changing the focal length of the eye lens with the help of ciliary muscles.

✠ Eye lens is made of a flexible, jelly like material.

✠ By relaxing and contracting the ciliary muscle, the curvature and hence the focal length of he eye lens can be altered.

✠ When we see distant objects the ciliary muscle relaxes and makes the eye lens thinner.

✠ This increases the focal length of the eye lens. Hence, the distant object can be clearly seen.

✠ On the other hand, when we look at a closer object, the focal length of the eye lens is decreased by the contraction of ciliary muscle.

✠ Thus, the image of the closer object is clearly formed on the retina.

Additional – Numerical problems

1. An object is placed at a distance of 12cm in front of a concave mirror. It forms a real image four times larger than the object. Calculate the distance of the image from the mirror.

u = −12 cm, m = −4

$$m = \frac{-v}{u}$$

$$\therefore v = -(-4) \times (-12)$$

$$= -48 \text{ cm.}$$

Image is formed 48 cm in front of mirror.

2. The refractive index of water is 1.33 and the speed of light in air is 3 x 10⁸ms⁻¹. Calculate the speed of light in water?

$$\text{Speed of light in water} = \frac{\text{speed of light in vacuum}}{\text{refractive index}}$$

$$= \frac{3 \times 10^8}{1.33}$$

$$= 2.25 \times 10^8 \text{ m/s.}$$

Additional – HOT questions

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1. **A girl playing with a thin beam of light from her laser torch by directing it from different directions on a convex lens held vertically. She was surprised to see that in a particular direction the beam of light continues to move along the same direction after passing through the lens. State the reason for this observation.**

   Ans : The beam of light must be passing through the optical centre. The reason being that the middle part of a lens is like a thin glass slab, so no deviation and very slight lateral displacement of the incident ray.

UNIT TEST-2

Time : 1.15 Hrs.   Marks : 50

I. Choose the best answer   (5 × 1 = 5)

1. **Magnification of a convex lens is _____.**
   a) positive   b) Negative
   c) either positive or negative   d) Zero

2. **Power of a lens is –4D, then its focal length is _____.**
   a) 4m   b) –40m   c) –0.25m   d) –2.5 m

3. **Convex lens produces a _____ beam of light.**
   a) Convergent   b) divergent   c) scattered   d) dispersed

4. **The least distance of distinct vision is _____.**
   a) 25m   b) 20cm   c) 20m   d) 2.5cm

5. **The compound microscope uses _____ lenses.**
   a) 2   b) 3   c) 4   d) 1

II. Fill in the blanks   (5 × 1 = 5)

6. Some of the sources emit their own light and they are called as _____.
7. Light always travels along a _____.
8. The velocity of light is more in a _____ medium and less in a _____ medium.
9. Snells law is _____
10. _____ is responsible for the white appearance of the clouds.

III. State whether the statements are true or false. Correct the false statement   (4 × 1 = 4)

11. The power of lens depends on the focal length of the lens.
12. Increase in the converging power of the eye lens cause hypermetropia.
13. The convex lens always gives small virtual image.
14. Concave lens is used as Magnifying lens.

IV. Match the following   (4 × 1 = 4)

15. Red light   (a)   short sightedness
16. Retina   (b)   highest wavelength
17. Pupil   (c)   screen of the eye
18. Myopia   (d)   path way of light

V. Assertion and Reasoning

(3 × 1 = 3)

Direction: In each of the following questions, a statement of Assertion is given and a corresponding statement of Reason is given just below it. Of the statements given below, mark the correct answer as
a.   If both A and R are true and R is the correct explanation of A.
b.   If both A and R are true but R is not the correct explanation of A.
c.   If A is true but R is false.
d.   If both A and R are false.

19. **Assertion :** Blue colour of sky appears due to scattering of blue colour.

     Reason: Blue colour has shortest wavelength in visible light.

20. **Assertion:** If the refractive index of the medium is high the velocity of the light in the medium will be small.

     Reason: Refractive index of the medium is inversely proportional to the velocity of the light.

21. **Assertion:** Myopia is due to the increase in the converging power of the eye lens.

     Reason: Myopia can be corrected with the help of concave lens.

VI. Write the answer for the following questions in word or sentence

(3 × 1 = 3)

22. What is the speed of light in vaccum or air?
23. Which lens used to treat Hypermetropia?
24. What is the SI unit of power of a lens?

VII. Find the odd one out

(3 × 1 = 3)

25. Convex lens, Biconvex lens, Plano convex lens, Negative miniscus.
26. Concave lens, Biconcave lens, plano-convex lens, Negative miniscus.
27. Iris, Pupil, retina, Presphobia.

VIII. Correct the mistakes

(3 × 1 = 3)

28. The amount of scattering is dependent of wave length.
29. Concave lenses are used as camera lenses.
30. Concave lens is used to treat Myopia.

IX. Write the short answer for ANY 5 of the following questions.

(5 × 2 = 10)

31. State laws of refraction.
32. Define dispersion of light.
33. What is power of accommodation of eye?
34. What is a lens?
35. What are the types of lenses?
36. What is the function of cornea?
37. What is the function of Iris?

X. Write long answer for the following questions

(2 × 5 = 10)

38. List any five properties of light.
         [OR]
39   Explain Raman scattering.
40. Explain the working of the Eye.
         [OR]
41   Differentiate the eye defects : Myopia and Hypermetropia.

CRLB ❖ CRLB

UNIT 3

THERMAL PHYSICS

Important points

➤ The SI unit of heat energy absorbed or evolved is joule (J).

➤ Heat always flows from a system at higher temperature to a system at lower temperature.

➤ Temperature is defined as the degree of hotness of a body. The SI unit of temperature is kelvin (K).

➤ All the substances will undergo one or more of the following changes when heated: i) Temperature of the substance rises. ii) The substance may change state from solid to liquid or gas. iii) The substance will expand when heated.

➤ All forms of matter (solid, liquid and gas) undergo expansion on heating.

➤ For a given rise in temperature, a liquid will have more expansion than a solid and a gaseous substance has the highest expansion than the other two.

➤ If a liquid is heated directly without using any container, then the expansion that you observe is termed as real expansion of the liquid.

➤ The expansion of a liquid apparently observed without considering the expansion of the container is called the apparent expansion of liquid.

➤ For a given heat energy, the real expansion is always more than that of apparent expansion.

➤ If the atoms or molecules of a gas do not interact with each other, then the gas is said to be an ideal gas or a perfect gas.

➤ Ideal gas equation, also called as equation of state is PV = RT. Here, R is known as universal gas constant whose value is 8.31 j mol^{-1}K^{-1}.

TEXT BOOK EVALUATION

I. Book Exercise – Choose the best answer

1. **The value of universal gas constant**
   a) 3.81 mol^{-1} K^{-1} b) 8.03 mol^{-1} K^{-1} c) 1.38 mol^{-1} K^{-1} d) 8.31 mol^{-1} K^{-1}
   Ans : d) 8.31 mol^{-1}K^{-1}

2. **If a substance is heated or cooled, the change in mass of that substance is**
   a) positive   b) negative   c) zero   d) none of the above
   Ans : c) zero

3. **If a substance is heated or cooled, the linear expansion occurs along the axis of**
   a) X or –X   b) Y or –Y   c) both (a) and (b)   d) (a) or (b)
   Ans : c) both (a) and (b)

4. **Temperature is the average _____ of the molecules of a substance.**
   a) difference in K.E and P.E   b) sum of P.E and K.E
   c) difference in T.E and P.E   d) difference in K.E and T.E
   Ans : c) difference in T.E. and P.E

5. **In the Given diagram, the possible direction of heat energy transformation**
   a) A ← B, A ← C, B ← C   b) A → B, A → C, B → C
   c) A → B, A ← C, B → C   d) A ← B, A → C, B ← C
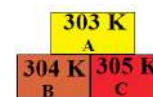
   Ans: a) A ← B, A ← C, B ← C

II. Book Exercise – Fill in the blanks

1. The value of Avogadro number _____. **Ans :** 6.023×10^{23}/mol
2. The temperature and heat are _____ quantities. **Ans :** Scalar
3. One calorie is the amount of heat energy required to raise the temperature of _____ of water through _____. **Ans :** 1g ; 1°C
4. According to Boyle's law, the shape of the graph between pressure and reciprocal of volume is _____. **Ans :** straight line

III. Book Exercise – State whether the following statements are true or false, if false explain why?

1. **For a given heat in liquid, the apparent expansion is more than that of real expansion.**
   Ans : False. For a given heat in liquid, the real expansion is more or less than that of apparent expansion.

2. **Thermal energy always flows from a system at higher temperature to a system at lower temperature.**
   Ans : True.

3. **According to Charles's law, at constant pressure, the temperature is inversely proportional to volume.**
   Ans : False. According to Charles's law, at constant pressure, the volume is directly proportional to temperature.

IV. Book Exercise – Match the items in column-I to the items in column-II

	Column I		Column II
1.	Linear expansion	(a)	change in volume
2.	Superficial expansion	(b)	hot body to cold body
3.	Cubical expansion	(c)	1.381×10^{-23} JK^{-1}
4.	Heat transformation	(d)	change in length
5.	Boltzmann constant	(e)	change in area

Ans :

	Column I		Column II
1	Linear expansion	d	change in length
2	Superficial expansion	e	change in area
3	Cubical expansion	a	change in volume
4	Heat transformation	b	hot body to cold body
5	Boltzmann constant	c	1.381×10^{-23} JK^{-1}

V. Book Exercise – Assertion and reason type questions:

a. **Both the assertion and the reason are true and the reason is the correct explanation of the assertion.**
b. **Both the assertion and the reason are true but the reason is not the correct explanation of the assertion.**
c. **Assertion is true but the reason is false.**
d. **Assertion is false but the reason is true.**

1. **Assertion:** There is no effects on other end when one end of the rod is only heated.
   Reason: Heat always flows from a region of lower temperature to higher temperature of the rod.

   Ans : c. Assertion is true but the reason is false.

2. **Assertion:** Gas is highly compressible than solid and liquid.
   Reason: Interatomic or intermolecular distance in the gas is comparably high.

   Ans : c. The assertion is true but the reason is false

VI. Book Exercise – Answer in briefly

1. **Define one calorie.**

   Calorie: One calorie is defined as the amount of heat energy required to rise the temperature of 1 gram of water through 1°C.

2. **Distinguish between linear, arial or superficial expansion and Cubical Expansion.**

Linear Expansion	Arial Expansion	Cubical Expansion
When a body is heated or cooled, the length of the body changes due to change in its temperature. Then the expansion is said to be linear or longitudinal expansion	If there is an increase in the area of a solid object due to heating, then the expansion is called superficial or areal expansion	If there is an increase in the volume of a solid body due to heating, then the expansion is called cubical or volumetric expansion.
$\Delta L / L_o = \alpha_L \Delta T$	$\Delta A / A_o = \alpha_A \Delta T$	$\Delta V / V_o = \alpha_V \Delta T$

3. **What is co-efficient of cubical expansion?**

   The ratio of increase in volume of the body per degree rise in temperature to its unit volume is called as coefficient of cubical expansion. This is also measured in K^{-1}. $\boxed{\alpha_v = \Delta V / V_o \Delta T}$

4. **State Boyle's law.**

   When the temperature of a gas is kept constant, the volume of a fixed mass of gas is inversely proportional to its pressure.

   $$P \propto 1/V$$

   In other words, for an invariable mass of a perfect gas, at constant temperature, the product of its pressure and volume is a constant.

   (i.e) PV = constant

5. **State-Charles law of volume.**

   Charles's law was formulated by a French scientist Jacques Charles. According to this law, When the pressure of gas is kept constant, the volume of a gas is directly proportional to the temperature of the gas.

   $$V \propto T$$
   $$V / T = \text{constant.}$$

6. **Distinguish between ideal gas and real gas.**

IDEAL GAS	REAL GAS
If the atoms or molecules of a gas do not interact with each other, then the gas is said to be an ideal gas or a perfect gas.	If the molecules or atoms of a gases interact with each other with a definite amount of intermolecular or inter atomic force of attraction, then the gases are said to be real gases.
when the pressure is low or the temperature is high because the interatomic or intermolecular forces of attraction are weak in ideal gas. Hence, a real gas at low pressure or high temperature can be termed as a perfect gas.	At very high temperature or low pressure, a real gases behaves as an ideal gases because in this condition there is no interatomic or intermolecular force of attraction.

7. **What is co-efficient of real expansion?**

   Coefficient of real expansion is defined as the ratio of the true rise in the volume of the liquid per degree rise in temperature to its unit volume. The SI unit of coefficient of real expansion is K^{-1}.

8. **What is co-efficient of apparant expansion?**

   Coefficient of apparent expansion is defined as the ratio of the apparent rise in the volume of the liquid per degree rise in temperature to its unit volume. The SI unit of coefficient of apparent expansion is K^{-1}.

VII. Book Exercise – Numerical problems

1. **Find the final temperature of a copper rod. Whose area of cross section changes from 10 m² to 11 m² due to heating. The copper rod is initially kept at 90 K. (Coefficient of superficial expansion is 0.0021 /K)**

   Solution :

Given
$T_i = 90k$
$A = 10m^2$
$\Delta A = 11-10 = 1m^2$
$T_f = ?$

   $\frac{\Delta A}{A} = \alpha_A \Delta T$

   $\frac{\Delta A}{A} = \alpha_A (T_f - T_i)$

   $\frac{1}{10} = 0.0021(T_f - 90)$

   $T_f = \frac{2890}{21}$

   $T_f = 137.6$ K

2. **Calculate the coefficient of cubical expansion of a zinc bar. Whose volume is increased 0.25 m³ from 0.3 m³ due to the change in its temperature of 50 K.**

   Solution :

Given
$\Delta T = 50k$
$V = 0.03 \ m^3$
$\Delta V = 0.55-0.3 \ m^3$
$\alpha_V = ?$

   $\frac{\Delta V}{V} = \alpha_V \Delta T$

   $\alpha_V = \frac{\Delta V}{V \Delta T}$

   $\alpha_V = \frac{0.25}{0.3 \times 50} = \frac{0.25}{15}$

   $\alpha_V = 0.0166 \ K^{-1}$

VIII. Book Exercise – Answer in detail

1. **Derive the ideal gas equation.**

   The ideal gas equation is an equation, which relates all the properties of an ideal gas. An ideal gas obeys Boyle's law and Charles' law and Avogadro's law. According to Boyle's law,

   PV = constant $\longrightarrow$ 1

   According to Charles's law,

   V / T = constant $\longrightarrow$ 2

   According to Avogadro's law,

   V/n = constant $\longrightarrow$ 3

   After combining equations (1), (2) and (3), we can get the following equation.

   PV/nT = constant $\longrightarrow$ 4

   The above relation is called the combined law of gases. If you consider a gas, which contains μ moles of the gas, the number of atoms contained will be equal to μ times the Avogadro number, N_A.

   i.e. $n = \mu N_A$ $\longrightarrow$ 5

   Using equation (5), equation (4) can be written as

   $PV / \mu N_A T$ = constant

   The value of the constant in the above equation is taken to be k_B, which is called as Boltzmann constant (1.38 × 10⁻²³ JK⁻¹). Hence, we have the following equation:

   $PV / \mu N_A T = k_B$

   $PV = \mu N_A k_B T$

   Here, $\mu N_A K_B = R$, which is termed as universal gas constant whose value is 8.31 J mol⁻¹K⁻¹.

   $PV = RT$ $\longrightarrow$ 6

   Ideal gas equation is also called as equation of state because it gives the relation between the state variables and it is used to describe the state of any gas.

2. Explain the experiment of measuring the real and apparent expansion of a liquid with a neat diagram.

To start with, the liquid whose real and apparent expansion is to be determined is poured in a container up to a level. Mark this level as L_1.

    Now, heat the container and the liquid using a burner.

Real and apparent expansion of liquid

    Initially, the container receives the thermal energy and it expands. As a result, the volume of the liquid appears to have reduced. Mark this reduced level of liquid as L_2.

    On further heating, the thermal energy supplied to the liquid through the container results in the expansion of the liquid. Hence, the level of liquid rises to L_3. Now, the difference between the levels L_1 and L_3 is called as apparent expansion, and the difference between the levels L_2 and L_3 is called real expansion. The real expansion is always more than that of apparent expansion.

    Real expansion = $L_3 - L_2$ Apparent expansion = $L_3 - L_1$.
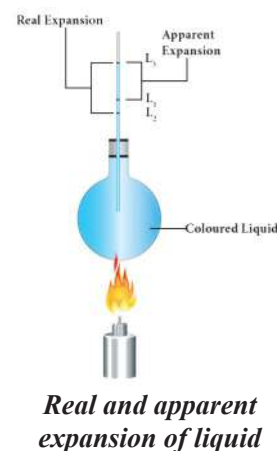
VIII. Book Exercise – HOT question

If you keep ice at 0°C and water at 0°C in either of your hands, in which hand you will feel more chillness? Why?

Ice transfer more chillness to our hands than water. Due to thermal conduction in between ice and environment. The latent heat of vaporisation for ice is more than water at 0º c.

Additional – Choose the best answer

1. _____ is the primary source of thermal energy for all living organisms.
a) Sun   b) Moon   c) stars   d) None

                  Ans : a) Sun

2. _____ is the cause and temperature is the effect.
a) Thermal energy   b) Heat energy   c) light energy   d) both a and c

                  Ans : a) Thermal Energy

3. All living organisms need a particular _____ for their survival.
a) Temperature   b) pressure   c) volume   d) none

                  Ans : a) Temperature

4. The temperature is higher for a _____ body than for a _____ body.
a) Hotter, Chiller   b) Hotter, Colder   c) Chiller, Hotter   d) Colder, Chiller

                  Ans : b) Hotter, colder

5. _____ also defined as the property which determines whether a body is in equilibrium or not with the surroundings.
a) Temperature   b) pressure   c) volume   d) none

                  Ans : a) Temperature

6. _____ is the property which determines the direction of flow of heat.
a) Temperature   b) Pressure   c) volume   d) density

                  Ans : a) Temperature

7. The SI unit of temperature is _____.
a) Joule   b) Kelvin   c) celcius   d) farenheit

                  Ans : b) Kelvin

8. It is a _____ quantity.
a) Scalar   b) Vector   c) tensor   d) all

                  Ans : a) Scalar

9. **A temperature difference of 10C is equal to that of _____.**
    a) 1 K   b) 2K   c) 3 K   d) 6k

    Ans : a) 1K

10. **_____ Kelvin is the absolute scale of temperature of the body.**
    a) One   b) Zero   c) None   d) 273

    Ans : b) Zero

11. **0K = _____.**
    a) 273 K   b) − 2730C   c) both   d) none

    Ans: b) − 2730C

12. **_____ Energy always flow from one body to the other due to a temperature difference between them**
    a) COOL   b) Heat   c) hot   d) cold

    Ans : b) Heat

13. **If two bodies are said to be in thermal equilibrium then, they will be at the _____ temperature.**
    a) Same   b) Different   c) either a or b   d) none

    Ans : a) Same

14. **The SI unit of heat energy absorbed or evolved is _____.**
    a) Kelvin   b) Joule   c) JS   d) JS^{-1}

    Ans : b) Joule

15. **The _____ energy is transferred from one body to another, this results in the rise or lowering of the temperature of either of the bodies.**
    a) Thermal   b) Heat   c) cold   d) none

    Ans : a) Thermal

16. **The expansion of _____ can be seen when a thermometer is placed in warm water.**
    a) Solids   b) Liquids   c) Gases   d) plasma

    Ans : b) Liquids

17. **All forms of matter undergo expansion on _____.**
    a) Heating   b) cooling   c) vapoursing   d) none

    Ans : a) Heating

18. **Co-efficient of cubic expansion of water is _____.**
    a) $20.7 \times 10^{-5} K^{-1}$ b) $20.7 \times 10^{-5} K^{-1}$ C) $2.07 \times 10^{-5} K^{-1}$ d) $20.7 \times 10^{5} K^{-1}$

    Ans : b) $20.7 \times 10^{-5} K^{-1}$

19. **The coefficient of cubical expansion of liquid is _____ of temperature.**
    a) dependent   b) Independent   c) either a or b   d) none

    Ans : b) Independent

20. **Value for Gases _____ on the temperature of gases.**
    a) Dependent   b) Independent   c) either a or b   d) none

    Ans : a) dependent

21. **The SI unit of coefficient of real expansion is _____.**
    a) Kelvin   b) 1/ K   c) 1/ C   d) 1/ F

    Ans : b) 1/K

22. **According to Boyle's law, pressure is _____ proportional to its pressure.**
    a) Directly   b) indirectly   c) invariably   d) either a or b

    Ans : b) indirectly

23. According to Boyle's law, the product of its pressure and volume is a _____.

a) Constant   b) not constant   c) variable   d) none

Ans : a) constant

24. According to Charles 's law, the volume of the gas is _____ proportional to the temperature of the gas.

a) Indirectly   b) directly   c) variably   d) none

Ans : b) Directly

25. According to Avogadro's law, Volume is _____ proportional to number of atoms or molecules present in it.

a) Indirectly   b) directly   c) variably   d) none

Ans : b) directly

26. _____ is the total number of atoms per mole of the substance.

a) Avogadro 's Number   b) Mole   c) both a and b   d) none

Ans : a) Avogadro's Number

27. Boltzmann constant _____.

a) 1.38×10^{-23} JK   b) 1.38×10^{-23} JK^{-1} c) 138×10^{-23} JK   b) 138×10^{-23} JK^{-1}

Ans: b) 1.38×10^{-23} JK^{-1}

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Additional – Fill in the blanks

1. _____ is the primary source of thermal energy for all living organisms.   **Ans :** Sun

2. _____ is the cause and temperature is the effect.   **Ans :** Thermal energy

3. All living organisms need a particular _____ for their survival.   **Ans :** temperature

4. _____ is defined as the degree of hotness of a body   **Ans :** Temperature

5. The temperature of hot body is _____ than that of a colder body.   **Ans :** higher

6. _____ is also be defined as the property which determines whether a body is in equilibrium or not with surroundings.   **Ans :** Temperature

7. Temperature is the property , which determines the _____ of heat.   **Ans :** direction of flow

8. Temperature is a _____ quantity.   **Ans :** scalar

9. The SI unit of temperature is _____.   **Ans :** Kelvin(K)

10. The other commonly used units of temperature are _____ and _____.

Ans : degree celsius (c°) ; degree fahrenheit (F°)

11. The temperature measured in absolute Zero using the kelvin scale is known as _____.

Ans : Absolute temperature.

12. The absolute temperature is also known as the _____ temperature.   **Ans :** thermodynamic

13. Each unit of the thermodynamic scale of temperature is defined as the fraction of _____ part of the thermodynamic temperature of the triple point of water.   **Ans :** 1/273.16th

14. A temperature difference _____.   **Ans :** of 1°C is equal to that of 1K

15. _____ is the absolute scale of temperature of the body.   **Ans :** Zero kelvin

16. _____ always flows from one body to the other due to a temperature difference between them.

Ans : Heat energy

17. If two bodies are said to be in _____, then they will be at the _____ temperature.

Ans : thermal equilibrium; same

18. When a hot object is in contact with another cold object , a form of energy flows from the hot object to the cold object, which is known as _____.   **Ans :** Thermal energy

19. Thermal energy is also known as _____. **Ans :** Heat energy

20. _____ is the agent, which produces the sensation of warmth and makes bodies hot. **Ans :** Heat energy

21. The process in which heat energy flows from a body at a higher temperature to another object a lower temperature is known as _____. **Ans :** heating

22. _____ is a Scalar quantity. **Ans :** Heat

23. The SI unit of heat energy absorbed or evolved is _____. **Ans :** Joule

24. Heat always flows from a system at _____ to a system at _____. **Ans :** higher temperature ; lower temperature

25. The _____ of a system is not altered when it is heated or cooled. **Ans :** mass

26. For any exchange of heat, the _____ is equal to _____. **Ans :** heat gained by the cold system ; heat lost by the hot system

27. Other units of heat energies are _____. **Ans :** Calorie and Kilocalorie

28. One calorie is defined as the amount of heat energy required to rise the temperature of _____. **Ans :** 1 gram of water through 1°C

29. One kilocalorie is defined as the amount of heat energy required to rise the temperature of _____. **Ans :** 1 kilogram of water through 1°C

30. The temperature depends on the nature and _____. **Ans :** mass of the substance

31. When heat energy is supplied to a body, there can be an increase in the dimension of the object. This change in the dimension due to rise in temperature is called _____. **Ans :** Thermal expansion of the object

32. The expansion of liquids can be seen when a thermometer is placed in _____. **Ans :** warm water

33. All forms of matter undergo _____ on heating. **Ans :** expansion

34. When a solid is heated, the atoms gain energy and vibrate more vigorously. This results in the _____. **Ans :** expansion of solid

35. When a body is heated or cooled , the length of the body changes due to change in its temperature . Then the expansion is said to be _____. **Ans :** linear or longitudinal expansion

36. The ratio of increase in length of the body per degree rise in temperature to its unit length is called as the _____. **Ans :** coefficient of linearexpansion

37. The linear expansion equation is _____. **Ans :** $\Delta L / L_0 = \alpha_L \Delta T$

38. ΔL is the _____. **Ans :** change in length

39. _____ is the Original length. **Ans :** L_0

40. _____ is the Coefficient of linear expansion. **Ans :** α_L

41. ΔT is the _____. **Ans :** change in Temperature

42. If there is an increase in the area of a solid object due to heating, then the expansion is called _____. **Ans :** Superficial or areial expansion

43. The ratio of increase in area of the body per degree rise in temperature to its unit area is called as _____. **Ans :** Coefficient of superficial expansion

44. The Superficial expansion equation is _____. **Ans :** $\Delta A/ A_0 = \alpha_A \Delta T$

45. ΔA is the _____. **Ans :** change in area

46. A_0 is the _____. **Ans :** Original Area

47. α_A is the _____. **Ans :** coefficient of superficial expansion

48. If there is an increase in the volume of a solid due to heating then the expansion is called _____. **Ans :** cubical or volumetric expansion

49. The ratio of increase in volume of the body per degree rise in temperature to its unit volume is called as _____.   **Ans :** coefficient of cubicalexpansion

50. Coefficient of cubical expansion is measured in _____.   **Ans :** kelvin inverse

51. The cubical expansion equation is _____.   **Ans :** $\Delta V / V_0 = \alpha_v \Delta T$

52. _____ is the change in volume.   **Ans :** ΔV

53. _____ is the original volume.   **Ans :** V_0

54. α_v is the _____.   **Ans :** coefficient of cubical expansion

55. coefficient of cubic expansion of Aluminium is _____.   **Ans :** 7×10^{-5}/K

56. coefficient of cubic expansion of Brass is _____.   **Ans :** 6×10^{-5}/K

57. coefficient of cubic expansion of Glass is _____. 2.5×10^{-5}/K

58. coefficient of cubic expansion of water is _____. 20.7×10^{-5}/K

59. coefficient of cubic expansion of Mercury is _____. 18.2×10^{-5}/K

60. The Coefficient of cubical expansion of liquid is _____ of temperature.   **Ans :** independent

61. The coefficient of cubical expansion of gases is _____ on the temperature.   **Ans :** dependent

62. If a liquid is heated directly without using any container then the expansion that you observe is termed as _____.   **Ans :** real expansion of liquid

63. _____ is defined as the ratio of the true rise in the volume of the liquid per degree rise in temperature to its unit volume.   **Ans :** Coefficient of real expansion

64. The SI unit of coefficient of real expansion is _____.   **Ans :** K^{-1}

65. The expansion of a liquid _____ observed without considering the expansion of the container is called apparent expansion of the liquid.   **Ans :** apparently

66. _____ is defined as the ratio of the apparent rise in the volume of the liquid per degree rise in temperature to its unit volume.   **Ans :** Coefficient of apparent expansion

67. The real expansion is always _____ than that of apparent expansion.   **Ans :** more

68. When the temperature of a gas is kept constant, the volume of a fixed mass of a gas is inversely proportional to its pressure. This is called _____.   **Ans :** Boyle's law

69. The law of volume is also known as _____.   **Ans :** charles's law

70. When the pressure of gas is kept constant, the volume of a gas is directly proportional to the temperature of the gas. This is called as _____.   **Ans :** Charles's law

71. _____ is constant for Charles law.   **Ans :** V/T

72. At constant temperature and pressure , the _____ is directly proportional to number of atoms or molecules present in it.This is known as _____.   **Ans :** volume of a gas ; Avogadro's law

73. V/n is constant for _____.   **Ans :** Avogadro's law

74. Avogadro's number is the total _____ per mole of the substance.   **Ans :** number of atoms

75. Avogadro's number is _____.   **Ans :** 6.023×10^{-23}/mol

76. Gases are classified as _____.   **Ans :** real gases and ideal gases

77. If the atoms or molecules of a gas do not interact with each other, then the gas is said to be _____.   **Ans :** an ideal gas or perfect gas

78. _____ obey Boyle's law, Charles's law and Avogadro's law.   **Ans :** Ideal gases

79. All these laws state the relationship between various properties of a gas such as _____.   **Ans :** pressure(p), volume (v) , temperature (t) andnumber of atoms(n)

80. Boltzmann constant is _____.   **Ans :** $1.38 \times 10^{-23}JK^{-1}$

81. Universal gas constant value is _____.   **Ans :** $8.31 \text{ J Mol}^{-1}\text{K}^{-1}$

82. Ideal gas equation is also called _____.   **Ans :** as equation of state

83. _____ gives the relation between the state variables.   **Ans :** Equation of stage

84. _____ is called a ideal gas equation.   **Ans :** PV = RT

85. Heating process of transmission of heat may be done in any of the ways like _____.   **Ans :** conduction, convection or radiation

86. The value of _____ is different for different materials.   **Ans :** coefficient of linear expansion

87. Charles's law was formulated by French scientist _____.   **Ans :** Jacques Charles

88. The molecules of any gas will have a certain _____ among them.   **Ans :** amount of interaction

89. _____ will have a definite set of values.   **Ans :** Parameters

Additional – True or false

1. **Heat always flow from a system at lower temperature to a system at higher temperature.**
   Ans : False. Heat always flow from a system at higher temperature to a system at higher temperature.

2. **The substance may not change state from solid to liquid or gas.**
   Ans : False. The substance may change state from solid to liquid or gas.

3. **All forms of matter undergo expansion on Heating.**
   Ans : True.

4. **Ideal gas equation is called as equation of state is PV = RT.**
   Ans : True.

5. **The atoms or molecules of a gas do interact with each other.**
   Ans : False. The atoms or molecules of a gas do not interact with each other.

Additional – Odd One Out

1. **Universal gas constant.**
   i) Boyle's law   ii) Charles's law
   iii) Avogadro's law   iv) Law of thermal conductivity
   Ans : Law of thermal conductivity

2. **Boltzmann constant.**
   i) $1.31 \times 10^{-23} \text{JK}^{-1}$ ii) $1.31 \times 10^{-23} \text{J/K}$ iii) 6.023×10^{-23}
   Ans : 6.023×10^{-23}

Additional – Assertion and Reason

1. **Assertion:** For a given rise in temperature, a liquid will have more expansion than a solid and gaseous substance has the highest expansion.
   Reason: The ratio of increase in volume of the body per degree rise in temperature to Its unit volume is called as coefficient of cubical expansion.
   Ans : A is correct R is not explaining to A

2. **Assertion:** Ideal gases obey Charles's law, Boyle's law and Avogadro's law.
   Reason: All these laws state the relationship between various properties of a gas such as Pressure, volume, temperature and number of atoms.
   Ans : Both A and R are true

Additional – Short answers

1. Define Temperature.

Ans : Temperature is defined as the degree of hotness of a body. The temperature is higher for a hotter body than for a colder body. It is also be defined as the property which determines whether a body is inequilibrium or not with the surroundings.

2. What are the other commonly used units of temperature?

Ans : There are other commonly used units of temperature such as degree celsius (°C) and degree fahrenheit (°F).

3. What is called thermodynamic temperature?

Ans : The temperature measured in relation to absolute zero using the kelvin scale is known as absolute temperature. It is also known as the thermodynamic temperature.

4. What is called thermodynamic scale of temperature?

Ans : Each unit of the thermodynamic scale of temperature is defined as the fraction of 1/273.16th part of the thermodynamic temperature of the triple point of water.

5. Write the relation between the different types of scale of temperature?

Ans : The relation between the different types of scale of temperature:

Celsius and Kelvin: $K = C + 273$,

Fahrenheit and Kelvin: $[K] = (F + 460) \times 5 / 9$

                       $0K = -273°C$.

6. Define thermal equilibrium.

Ans : Two or more physical systems or bodies are said to be in thermal equilibrium if there is no net flow of thermal energy between the systems.

7. Define thermal energy.

Ans : In the case of hotmilk, there is a flow of energy from the cup of milk to the environment. In the second case, the energy is transferred from the environment to the water bottle. This energy is termed as "thermal energy".

8. Define the term thermal energy.

Ans : When a hot object is in contact with another cold object, a form of energy flows from the hot object to the cold object, which is known as thermal energy.

9. Define the term Heat energy.

Ans : Thermal energy is a form of energy which is transferred between any two bodies due to the difference in their temperatures. Thermal energy is also known as 'heat energy' or simply 'heat'.

10. Define the term Heating.

Ans : The process in which heat energy flows from a body at a higher temperature to another object at lower temperature is known as heating.

11. Define the term cooling.

Ans : During the process of transferring heat energy, the body at lower temperature is heated while the body at higher temperature is cooled. Thus, sometimes, this process of transfer of heat energy is termed as 'cooling'.

12. Write the characteristics features of heat energy transfer.

Ans :

i)   Heat always flows from a system at higher temperature to a system at lower temperature.

ii)   The mass of a system is not altered when it is heated or cooled.

iii)   For any exchange of heat, the heat gained by the cold system is equal to heat lost by the hot system. Heat gained = Heat lost.

12. A. What are the other units of heat energy

Ans :

✦   Calorie

✦   Kilocalorie.

13. Define the term Kilocalorie.

Ans : Kilocalorie: One kilocalorie is defined as the amount of heat energy required to rise the temperature of 1 kilogram of water through 1°C

14. Write the effect of Heat energy.

Ans :
✦ Temperature of the substance rises.
✦ The substance may change its state from solid to liquid or from liquid to gas.
✦ The substance will expand when heated.

15. Define thermal expansion of the object.

Ans : When heat energy is supplied to a body, there can be an increase in the dimension of the object. This change in the dimension due to rise in temperature is called thermal expansion of the object.

16. How solid is expand?

Ans : When a solid is heated, the atoms gain energy and vibrate more vigorously. This results in the expansion of the solid. For a given change in temperature, the extent of expansion is smaller in solids than in liquids and gases. This is due to the rigid nature of solids.

17. Write the different types of expansion of solid.

Ans :
i) Linear expansion
ii) Superficial expansion
iii) Cubical expansion.

17. A. Write the linear or longitudinal expansion?

Ans : When a body is heated or cooled, the length of the body changes due to change in its temperature. Then the expansion is said to be linear or longitudinal expansion.

18. Write the co efficient of linear expansion.

Ans : The ratio of increase in length of the body per degree rise in temperature to its unit length is called as the coefficient of linear expansion. The SI unit of Coefficient of Linear expansion is K^{-1}.

19. Tabulate the cubical expansion of some materials.

Ans :

S.No.	Name of the material	Coefficient of cubic expansion (K^{-1})
1	Aluminium	7×10^{-5}
2	Brass	6×10^{-5}
3	Glass	2.5×10^{-5}
4	Water	20.7×10^{-5}
5	Mercury	18.2×10^{-5}

20. What are the fundamental laws of gases which connect the relation between pressure, volume and temperature?

Ans :
i) Boyle' s law
ii) Charles' s law
iii) Avogadro's law.

21. Define Avogadro's law.

Ans : Avogadro's law states that at constant pressure and temperature, the volume of a gas is directly proportional to number of atoms or molecules present in it.

     i.e. $V \alpha_n$ (or) V/n = constant

     Avogadro's number (N_A) is the total number of atoms per mole of the substance. It is equal to 6.023×10^{23} /mol.

Additional – SOLVED PROBLEMS

1. **A container whose capacity is 70 ml is filled with a liquid up to 50 ml. Then, the liquid in the container is heated. Initially, the level of the liquid falls from 50 ml to 48.5 ml. Then we heat more, the level of the liquid rises to 51.2 ml. Find the apparent and real expansion.**

   Solution : Data:

   Level of the liquid L_1 = 50 ml
   Level of the liquid L_2 = 48.5 ml
   Level of the liquid L_3 = 51.2 ml
   Apparent expansion   = $L_3 - L_1$ = 51.2ml – 50ml = 1.2ml
   Real expansion   = $L_3 - L_1$ = 51.2 ml – 48.5ml = 2.7ml
   So, Real expansion > apparent expansion

2. **Keeping the temperature as constant, a gas is compressed four times of its initial pressure. The volume of gas in the containerchanging from 20cc (V_1 cc) to V_2 cc. Find the final volume V_2.**

   Ans : Data:

   Initial pressure (P_1) = P
   Final Pressure (P_2) = 4P
   Initial volume (V_1) = 20cc = 20cm³
   Final volume (V_2) = ?
   Using Boyle's Law, PV = constant

   $$P_1 / V_1 = P_2 / V_2$$
   $$V_2 = P_1 / P_2 \times V_1$$
   $$= P / 4P \times 20cm$$
   $$= 5cm^3.$$

Additional – Long answers

1. **How to establish the thermal equilibrium?**
   ✦ Two or more physical systems or bodies are said to be in thermal equilibrium if there is no net flow of thermal energy between the systems.
   ✦ Heat energy always flows from one body to the other due to a temperature difference between them.
   ✦ If two bodies are said to be in thermal equilibrium, then, they will be at the same temperature.
   ✦ There will be a transfer of heat energy from the hot body to the cold body until a thermal equilibrium is established between them.
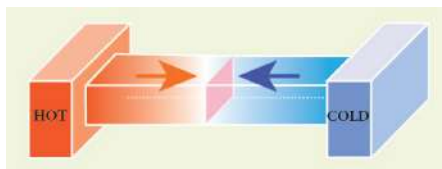
   ✦ When a cold body is placed in contact with a hot body, some thermal energy is transferred from the hot body to the cold body.
   ✦ As a result, there is some rise in the temperature of the cold body and decrease in the temperature of the hot body.
   ✦ This process will continue until these two bodies attain the same temperature.

2. **Explain about Linear expansion with a suitable diagram.**
   ✦ When a body is heated or cooled, the length of the body changes due to change in its temperature.
   ✦ Then the expansion is said to be linear or longitudinal expansion.
   ✦ The ratio of increase in length of the body per degree rise in temperature to its unit length is called as the coefficient of linear expansion.

✦ The SI unit of Coefficient of Linear expansion is K^{-1}. The value of coefficient of linear expansion is different for different materials.

Linear expansion
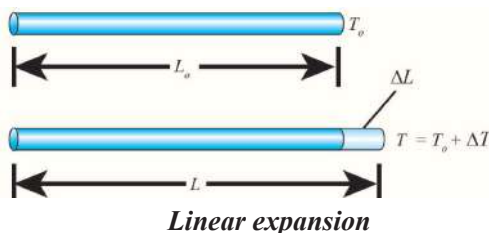
✦ The equation relating the change in length and the change in temperature of a body is given below:
- $\Delta L / L_0 = \alpha L \, \Delta T$
- ΔL - Change in length (Final Length-Original length)
- Lo -Original length
- ΔT - Change in temperature (Final temperature - Initial temperature)
- αL - Coefficient of linear expansion.

3. Explain about Superficial expansion.

✦ If there is an increase in the area of a solid object due to heating, then the expansion is called superficial or areal expansion.

✦ Superficial expansion is determined in terms of coefficient of superficial expansion.

✦ The ratio of increase in area of the body per degree rise in temperature to its unit area is called as coefficient of superficial expansion.

✦ Coefficient of superficial expansion is different for different materials.

✦ The SI unit of Coefficient of superficial expansion is K^{-1}.

✦ The equation relating to the change in area and the change in temperature is given below

$$\Delta A / A_o = \alpha_A \, \Delta T$$

ΔA - Change in area (Final area - Initial area)

A_o - Original area

ΔT - Change in temperature (Final temperature - Initial temperature)

α_A - Coefficient of superficial expansion.
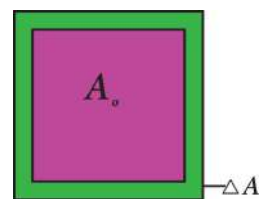
Superficial expansion

5. Explain about Real and apparent expansion.

Ans : Real expansion :

✦ If a liquid is heated directly without using any container, then the expansion that you observe is termed as real expansion of the liquid.

✦ Coefficient of real expansion is defined as the ratio of the true rise in the volume of the liquid per degree rise in temperature to its unit volume.

✦ The SI unit of coefficient of real expansion is K^{-1}.

Apparent expansion :

✦ Heating a liquid without using a container is not possible. Thus, in practice, we can heat any liquid by pouring it in a container.

✦ A part of thermal energy is used in expanding the container and a part is used in expanding the liquid.

✦ Thus, we observed is not the actual or real expansion of the liquid.

✦ The expansion of a liquid apparently observed without considering the expansion of the container is called the apparent expansion of the liquid.

✦ Coefficient of apparent expansion is defined as the ratio of the apparent rise in the volume of the liquid per degree rise in temperature to its unit volume.

✦ The SI unit of coefficient of apparent expansion is K^{-1}.

6. Explain about the Gases.

Ans : Gases are classified as real gases and ideal gases.

Real Gases :

✦ If the molecules or atoms of a gases interact with each other with a definite amount of intermolecular or inter atomic force of attraction, then the gases are said to be real gases.

✦ At very high temperature or low pressure, a real gas behaves as an ideal gas because in this condition there is no interatomic or intermolecular force of attraction.

Ideal Gases :

✦ If the atoms or molecules of a gas do not interact with each other, then the gas is said to be an ideal gas or a perfect gas.

✦ Actually, in practice, no gas is ideal. The molecules of any gas will have a certain amount of interaction among them.

✦ But, these interactions are weaker when the pressure is low or the temperature is high because the interatomic or intermolecular forces of attraction are weak in ideal gas.

✦ Hence, a real gas at low pressure or high temperature can be termed as a perfect gas. Ideal gases obey Boyle's law, Charles's law and Avogadro's law.

✦ All these laws state the relationship between various properties of a gas such as pressure (P), volume (V), temperature (T) and number of atoms (n). In a given state of the gas, all these parameters will have a definite set of values.

✦ When there is a change in the state of the gas, any one or more of these parameters change its value.

UNIT TEST - 3

Time : 1.15 Hrs.   Marks : 50

I. Choose the best answer
                                                                                     (5 × 1 = 5)

1. **If a substance is heated or cooled, the change in mass of that substance is _____**
   a) positive   b) negative   c) Zero   d) None of the above

2. **A temperature difference of 10C is equal to that of _____**
   a) 1 K   b) 2K   c) 3 K   d) 6k

3. **_____ Energy always flow from one body to the other due to a temperature difference between them**
   a) Cool   b) Heat   c) either a or b   d) none

4. **The SI unit of heat energy absorbed or evolved is _____**
   a) Kelvin   b) Joule   c) celcies   d) farenheit

5. **_____ is the total number of atoms per mole of the substance.**
   a) Avogadro's Number   b) Mole   c) either a or b   d) none

II. Fill in the blanks
                                                                                     (5 × 1 = 5)

6. The value of Avogadro number _____.

7. According to Boyle's law, the shape of the graph between pressure and reciprocal of volume is _____.

8. The temperature measured in absolute Zero using the kelvin scale is known as _____.

9. The SI unit of heat energy absorbed or evolved is _____.

10. The SI unit of coefficient of real expansionis _____.

III. State whether the statements are true or false. Correct the false statement

(4 × 1 = 4)

11. According to charle's law, at constant pressure, the temperature is inversely proportional to volume.

12. Heat always flow from a system at lower temperature to a system at higher temperature.

13. Ideal gas equation is called as equation of state is PV=RT.

14. If the atoms or molecules of a gas do interact with each other.

IV. Match the following

(4 × 1 = 4)

15. Boyle's law   (a)   Energy
16. Ideal gas equaton   (b)   Degree of hotness
17. Heat   (c)   PV = constant
18. Transmission of heat   (d)   PV = RT

V. Assertion and Reasoning

(3 × 1 = 3)

Direction: In each of the following questions, a statement of Assertion is given and a corresponding statement of Reason is given just below it. Of the statements given below, mark the correct answer as
a. If both A and R are true and R is the correct explanation of A.
b. If both A and R are true but R is not the correct explanation of A.
c. If A is true but R is false.
d. If both A and R are false.

19. **Assertion:** For a given rise in temperature, a liquid will have more expansion than a solid and gaseous substance has the highest expansion.
    Reason: The ratio of increase in volume of the body per degree rise in temperature to Its unit volume is called as coefficient of cubical expansion.

20. **Assertion:** Ideal gases obey Charles's law, Boyle's law and Avogadro's law.
    Reason: All these laws state the relationship between various properties of a gas such as Pressure, volume, temperature and number of atoms.

21. **Assertion :** There is no effects on other end when one end of the rod is only heated.
    Reason: Heat always flows from a region of lower temperature to higher temperature of the rod.

VI. Write the answer for the following questions in word or sentence

(3 × 1 = 3)

22. Define kelvin.
23. Define temperature.
24. What is kelvin's scale?

VII. Find the odd one out

(3 × 1 = 3)

25. Universal gas constant: Boyle's law, Charles's law, Avogadro's law, Law of thermal conductivity.
26. Boltzmann constant.
    $1.31 \times 10^{-23} JK^{-1}$, $1.31 \times 10^{-23} J/K$, 6.023×10^{-23}
27. Co – efficient of cubic expansion of Mercury.
    $18.5 \ K^{-1}$, $18.5 \times 10^{-5} \ K^{-1}$, $18.5 \times 10^{-2} \ K^{-1}$

VIII. Correct the mistakes

(3 × 1 = 3)

28. The SI unit of temperature is degree celcius.
29. The SI unit of heat energy absorbed or evolved is Kelvin.
30. Avogadro number is 6.023×10^{-21}.

IX. Write the short answer for ANY 5 of the following questions.

(5 × 2 = 10)

31. Define Calorie.
32. Define Kilo calorie.
33. Define Linear Expansion.
34. Define Cubic Expansion.
35. Define Boyle's law.
36. Write the effect of heat energy.
37. Write the different types of expansion of solid.

X. Write long answer for the following questions

(2 × 5 = 10)

38. Derive the Ideal gas equation.

       [OR]

39 Distinguish between linear, Arial and superficial expansion.
40. Explain about superficial expansion.

       [OR]

41 Explain the Fundamental laws of gases.

CRƎ∞❖CRƎ∞

UNIT 4	ELECTRICITY

Important Points

➤ The magnitude of current is definedas the rate of flow of charges in conductor.

➤ The SI unit of electric current is ampere (A).

➤ The SI unit of electric potential andpotential difference is volt (V).

➤ An electric circuit is a network of electricalcomponents, which forms a continuousand closed path for an electric current topass through it.

➤ The parameters of conductors likeits length, area of cross-section andmaterial, affect the resistance of theconductor.

➤ SI unit of electrical resistivity is ohm metre. The resistivity is a constant for a given material.

➤ The reciprocal of electrical resistivity of a material is called its electrical conductivity. $\sigma = 1\,\rho$

➤ The passage of electric current through a wire results in the production of heat

➤ This phenomenon is called heating effect of current.

➤ One horse power is equal to 746 watts.

➤ The function of a fuse wire or a MCB is to protect the house hold electrical appliances from excess current due to overloading or a short circuit.

TEXT BOOK EVALUATION

I. Book Exercise – Choose the best answer

1. Which of the following is correct?
   a) Rate of change of charge is electrical power.   b) Rate of change of charge is current.
   c) Rate of change of energy is current.   d) Rate of change of current is charge.

   Ans : b) Rate of change of charge is current

2. SI unit of resistance is
   a) mho   b) joule   c) ohm   d) ohm meter

   Ans : c) Ohm

3. In a simple circuit, why does the bulb glow when you close the switch?
   a) The switch produces electricity.   b) Closing the switch completes the circuit.
   c) Closing the switch breaks the circuit.   d) The bulb is getting charged.

   Ans : b) closing the switch completes the circuit

4. Kilowatt hour is the unit of
   a) resistivity   b) conductivity   c) electrical energy   d) electrical power

   Ans : c) electrical energy

II. Book Exercise – Fill in the blanks

1. When a circuit is open, _____ cannot pass through it.   **Ans :** current

2. The ratio of the potential difference to the current is known as _____.   **Ans :** Resistance

3. The wiring in a house consists of _____ circuits.   **Ans :** parallel

4. The power of an electric device is a product of _____ and _____.   **Ans :** votage and current

5. LED stands for _____.   **Ans :** Light Emitting Diode

III. Book Exercise – State whether the following statements are true or false: If false correct the statement.

1. **Ohm's law states the relationship between power and voltage.**
   Ans : False. Ohm's law states the relationship between the potential difference and current.

2. **MCB is used to protect house hold electrical appliances.**
   Ans : True.

3. **The SI unit for electric current is the coulomb.**
   Ans : False. The SI unit for electric current is the Ampere.

4. **One unit of electrical energy consumed is equal to 1000 kilowatt hour.**
   Ans : False. One unit of electrical energy consumed is equal to 1000watt hour.

5. **The effective resistance of three resistors connected in series is lesser than the lowest of the individual resistance.**
   Ans : False. The effective resistance of three resistors connected in series is greater than the highest of the individual resistance.

IV. Book Exercise – Match the items in column-I to the items in column-II:

	Column I		Column II
1.	electric current	(a)	volt
2.	potential difference	(b)	ohm meter
3.	specific resistance	(c)	watt
4.	electrical power	(d)	joule
5.	electrical energy	(e)	ampere

Ans :

	Column I		Column II
1	electric current	e	Ampere
2	potential difference	a	Volt
3	specific resistance	b	Ohm meter
4	electrical power	c	watt
5	electrical energy	d	Joule

V. Book Exercise – Assertion and reason type questions:

Mark the correct choice as

   a) if both the assertion and the reason are true and the reason is the correct explanation of the assertion.
   b) if both the assertion and the reason are true, but the reason is not the correct explanation of the assertion.
   c) if the assertion is true, but the reason is false.
   d) if the assertion is false, but the reason is true.

1. **Assertion:** Electric appliances with a metallic body have three wire connections.
   Reason: Three pin connections reduce heating of the connecting wires.
   Ans : (c) The assertion is true, but the reason is false.

2. **Assertion:** In a simple battery circuit the point of highest potential is the positive terminal of the battery.
   Reason: The current flows towards the point of the highest potential.
   Ans : (c) The assertion is true, but the reason is false.

3. **Assertion:** LED bulbs are far better than incandescent bulbs.
   Reason: LED bulbs consume less power than incandescent bulbs.
   Ans : (a) Both the assertion and the reason are true and the reason is the correct explanation of assertion.

VI. Book Exercise – Very short answer questions.

1. Define the unit of current.

The SI unit of electric current is ampere (A). The current flowing through a conductor is said to be one ampere, when a charge of one coulomb flows across any cross-section of a conductor, in one second. Hence,

1 ampere =1 coulomb/ 1 second.

2. What happens to the resistance, as the conductor is made thicker?

As the resistance is inversely proportional to the area, ($R \alpha 1/A$) thick wires will cause low resistance .

3. Why is tungsten metal used in bulbs, but not in fuse wires?

It is because tungsten has a very high melting point. Fuse wires should have low melting point. If tungsten is used as a fuse wire, then it will not melt even when large amount of current is passed through it , and the appliance will be damaged.

4. Name any two devices, which are working on the heating effect of the electric current.
- ✦ Electric Heater
- ✦ Electric Iron.

VII. Book Exercise – Short answer questions.

1. Define electric potential and potential difference.

Electrical potential :

The electric potential at a point is defined as the amount of work done in moving a unit positive charge from infinity to that point against the electric force.

Electric potential Difference :

The electric potential difference between two points is defined as the amount of work done in moving a unit positive charge from one point to another point against the electric force.

2. What is the role of the earth wire in domestic circuits?
- ✦ This wire provides a low resistance path to the electric current.
- ✦ The earth wire serves as a protective conductor, which saves us from electric shocks.

3. State Ohm's law.

According to Ohm's law, at a constant temperature, the steady current 'I' flowing through a conductor is directly proportional to the potential difference 'V' between the two ends of the conductor.

$I \alpha V$. Hence, *I/V = constant.*

The value of this proportionality constant is found to be *1/R*

Therefore,   *I   =   (1/R) V*

                V   =   IR.

4. Distinguish between the resistivity and conductivity of a conductor.

Resistivity	Conductivity
The Electrical resistivity of a material is defined as the resistance of a conductor of unit length and unit area of cross section. Its unit isohm metre.	The reciprocal of electrical resistivity of a material is called its electrical conductivity. Its unit is $Ohm^{-1} m^{-1}$ or mho m^{-1}

5. What connection is used in domestic appliances and why?

i) The connections in houses for domestic appliances are parallel so that even disconnection of one circuit does not affect the other

ii) To get equal voltages for all appliancesn, parallel circuit is used.

VIII. Book Exercise – Long answer questions.

1. **With the help of a circuit diagram derive the formula for the resultant resistance of three resistances connected: a) in series and b) in parallel.**

Let, three resistances R_1, R_2 and R_3 be connected in series,

Let the current flowing through them be I.

According to Ohm's Law, the potential differences V_1, V_2 and V_3 across R_1, R_2 and R_3 respectively, are given by:

Series connection of resistors

$$V_1 = I\,R_1 \quad \longrightarrow (1)$$
$$V_2 = I\,R_2 \quad \longrightarrow (2)$$
$$V_3 = I\,R_3 \quad \longrightarrow (3)$$
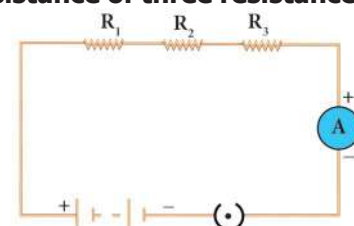
The sum of the potential differences across the ends of each resistor is given by:

$$V = V_1 + V_2 + V_3$$

Using equations (1), (2) and (3), we get

$$V = I\,R_1 + I\,R_2 + I\,R_3 \quad \longrightarrow (4)$$

The effective resistor is a single resistor, which can replace the resistors effectively, so as to allow the same current through the electric circuit. Let, the effective resistance of the series-combination be R_S.

Then, $\quad V = I\,R_s \quad \longrightarrow (5)$

Combining equations (4) and (5), you get,

$$I\,R_s = I\,R_1 + I\,R_2 + I\,R_3$$
$$R_s = R_1 + R_2 + R_3 \quad \longrightarrow (6)$$

Thus, when a number of resistors are connected in series, their equivalent resistance or effective resistance is equal to the sum of the individual resistances. When 'n' resistors of equal resistance R are connected in series, the equivalent resistance is 'n R'.

i.e., $\quad R_s = n\,R$

The equivalent resistance in a series combination is always greater than the highest of the individual resistances.

Resistances in Parallel :

Consider three resistors R_1, R_2 and R_3 are connected across two common points A and B. The potential difference across each resistance is the same and equal to the potential difference between A and B. The current I arriving at A divides into three as I_1, I_2 and I_3 passing through R_1, R_2 and R_3 respectively.

Series connection of resistors

According to the Ohm's law,

$$I_1 = V/R_1 \quad \longrightarrow (1)$$
$$I_2 = V/R_2 \quad \longrightarrow (2)$$
$$I_3 = V/R_3 \quad \longrightarrow (3)$$
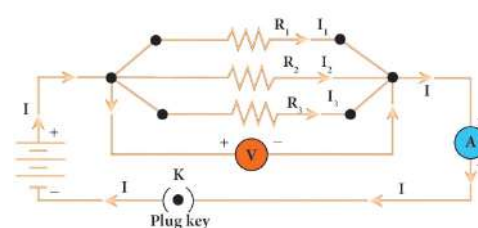
The total current through the circuit is given by

$$I = I_1 + I_2 + I_3$$

Using equations (1), (2) and (3), you get

$$I \qquad = V/R_1 + V/R_2 + V/R_3 \quad \longrightarrow (4)$$

Let the effective resistance of the parallel combination of resistors be R_P. Then,

$$I = V/R_p \quad \longrightarrow (5)$$

Combining equations (4) and (5), you have

$$V/R_p = V/R_1 + V/R_2 + V/R_3$$
$$1/R_p = 1/R_1 + 1/R_2 + 1/R_3$$

Thus, when a number of resistors are connected in parallel, the sum of the reciprocals of the individual resistances is equal to the reciprocal of the effective or equivalent resistance. When 'n' resistors of equal resistances R are connected in parallel, the equivalent resistance is R/n.

i.e. $1/R_p = 1/R + 1/R + 1/R \ldots\ldots + 1/R = n/R$

Hence, $R_p = R/n$.

The equivalent resistance in a parallel combination is less than the lowest of the individual resistances.

2. a) What is meant by electric current?

Electric current is defined as the rate of flow of charges in a conductor. If Q is the charge flowing for a time of t seconds in a conductor, then $I = Q/t$

b) Name and define its unit.

The SI unit of electric current is ampere (A). The current flowing through a conductor is said to be one ampere, when a charge of one coulomb flows across any cross-section of a conductor, in one second. Hence, **1 ampere = 1 coulomb/ 1 second.**

c) Which instrument is used to measure the electric current? How should it be connected in a circuit?

An ammeter is a device used to measure the electric current in a circuit. An ammeter is always connected in series with a device to measure its current.

3. a) State Joule's law of heating.

Let 'I' be the current flowing through a resistor of resistance 'R', and 'V' be the potential difference across the resistor. The charge flowing through the circuit for a time interval 't' is 'Q'. The work done in moving the charge Q across the ends of the resistor with a potentialdifference of V is VQ. This energy spent by the source gets dissipated in the resistor as heat. Thus, the heat produced in the resistor is:

$$H = W = VQ$$

We know that the relation between the charge and current is $Q = I t$. Using this, we get

$$H = VIt$$

From Ohm's Law, $V = IR$. Hence, you have

$$H = I^2 R t$$

This is known as Joule's law of heating.

b) An alloy of nickel and chromium is used as the heating element. Why?

Because: (i) it has high resistivity, (ii) it has a high melting point, (iii) it is not easily oxidized.

c) How does a fuse wire protect electrical appliances?

The fuse wire is connected in series, in an electric circuit. When a large current passes through the circuit, the fuse wire melts due to Joule's heating effect and hence the circuit gets disconnected. Therefore, the circuit and the electric appliances are saved from any damage. The fuse wire is made up of an alloy whose melting point is relatively low.

4. Explain about domestic electric circuits. (circuit diagram not required).

✦ The electricity produced in power stations is distributed to all the domestic and industrial consumers through overhead and underground cables.

✦ The first stage of the domestic circuit is to bring the power supply to the main-box from a distribution panel, such as a transformer. The important components of the main-box are: (i) a fuse box and (ii) a meter.

✦ The meter is used to record the consumption of electrical energy.

✦ The fuse box contains either a fuse wire or a miniature circuit breaker (MCB).

✦ The function of the fuse wire or a MCB is to protect the house hold electrical appliances from overloading due to excess current.

✦ An MCB is a switching device, which can be activated automatically as well as manually.

✦ It has a spring attached to the switch, which is attracted by an electromagnet when an excess current passes through the circuit. Hence, the circuit is broken and the protection of the appliance is ensured.

✦ The electricity is brought to houses by two insulated wires.

✦ Out of these two wires one wire has a red insulation and is called the 'live wire'.

✦ The other wire has a black insulation and is called the 'neutral wire'.

✦ The electricity supplied to your house is actually an alternating current having an electric potential of 220 V. Both, the live wire and the neutral wire enter into a box where the main fuse is connected with the live wire.

✦ After the electricity meter, these wires enter into the main switch, which is used to discontinue the electricity supply whenever required. After the main switch, these wires are connected to live wires of two separate circuits.

✦ Out of these two circuits, one circuit is of a 5 A rating, which is used to run the electric appliances with a lower power rating, such as tube lights, bulbs and fans.

✦ The other circuit is of a 15 A rating, which is used to run electric appliances with a high power rating, such as air-conditioners, refrigerators, electric iron and heaters.

✦ It should be noted that all the circuits in a house are connected in parallel, so that the disconnection of one circuit does not affect the other circuit. One more advantage of the parallel connection of circuits is that each electric appliance gets an equal voltage.

5. a) What are the advantages of LED TV over the normal TV?

     ✦ It has brighter picture quality.

     ✦ It is thinner in size.

     ✦ It uses less power and consumes very less energy.

     ✦ Its life span is more.

     ✦ It is more reliable.

b) List the merits of LED bulb.
Merits of a LED bulb

1. As there is no filament, there is no loss of energy in the form of heat. It is cooler than the incandescent bulb.

2. In comparison with the fluorescent light, the LED bulbs have significantly low power requirement.

3. It is not harmful to the environment.

4. A wide range of colours is possible here.

5. It is cost-efficient and energy efficient.

6. Mercury and other toxic materials are not used in LED bulbs.

IX. Book Exercise – Numerical problems:

1. An electric iron consumes energy at the rate of 420 W when heating is at the maximum rate and 180 W when heating is at the minimum rate. The applied voltage is 220 V. What is the current in each case?
Solution :

At maximum Rate,

$$P = VI$$
$$420 = 220 \times I$$
$$I = 420/220 = 1.9090 \text{ A}$$
$$Resistance = V/I$$
$$R = 220/1.9090$$
$$R = 115\Omega$$

> **Given**
> $P = 420$ W:
> $V = 220$ V

At minimum Rate,

$$P = VI$$
$$180 = 220 \times I$$
$$I = 180/220 = 0.8181 \text{ A}$$

> **Given**
> $P = 180$ W:
> $V = 220$ V

2.A 100 watt electric bulb is used for 5 hours daily and four 60 watt bulbs are used for 5 hours daily. Calculate the energy consumed (in kWh) in the month of January.

    Solution :

Electricity consumed by bulbs and light bulb energy

$$Power \ 1 = 100 \text{ W}$$
$$Kilo \ watt \ hour = 100/1000 = 0.1$$
$$Time = 5hrs$$
$$31 \ days = 31 \times 5 = 155 \text{ hrs}$$
$$Power \ 2 = 4 \times 60 = 240 \text{ watts}$$
$$Kilowatt = 240/1000 = 0.24 \text{ KW}$$
$$Time = 5hrs$$
$$31 \ days = 31 \times 5 = 155 \text{ hrs}$$
$$Energy \ 1 = P \times t$$
$$= 0.1 \times 155 = 15.5 \text{ kilowatt hour}$$
$$Energy \ 2 = P \times t$$
$$= 0.24 \times 155$$
$$= 37.2 \text{ KWH}$$

Total Energy in the month of January,

$$= Energy \ 1 + Energy \ 2$$
$$= 15.5 + 37.2$$
$$= 52.7 \text{ KWH}$$

3.   A torch bulb is rated at 3 V and 600 mA. Calculate it's.
    a)   power
    b)   resistance
    c)   energy consumed if it is used for 4 hour.

    Solution : $V = 3V$; $I = 600/1000 = 0.6$ A

    a)   POWER :
$$P = V \times I = 3 \times 0.6 = 1.8 \text{ W}$$

    b)   RESISTANCE:
$$R = V/I = 3/0.6 = 5 \text{ ohm}$$

    c)   ENERGY CONSUMED = Power $\times$ time
$$= 1.8 \times 4 = 7.2 \text{ watt hour.}$$

4.   A piece of wire having a resistance R is cut into five equal parts.

    a)   How will the resistance of each part of the wire change compared with the original resistance?

    b)   If the five parts of the wire are placed in parallel, how will the resistance of the combination

change?

c) **What will be ratio of the effective resistance in series connection to that of the parallel connection?**

Solution :

a) Total resistance = R

when cut into 5 equal parts

Resistance of each part = R/5

When connected in parallel $\dfrac{1}{R_1} = \dfrac{1}{R_1} + \dfrac{1}{R_2} + \dfrac{1}{R_3} + \dfrac{1}{R_4} + \dfrac{1}{R_5}$

b) $1/R_p = 1/R + 1/R + 1/R + 1/R + 1/R$

         $1/R_p = 5/R + 5/R + 5/R + 5/R + 5/R$

         $1/R_p = 25/R$

           $R_p = R/25$ ohm

when connected in services

c) $R_s = R_1 + R_2 + R_3 + R_4 + R_5$

         $R_s = 5R/5 = R$

Taking Ratio of R_s / R_p

     $R_s / R_p = \dfrac{R}{R/25}$

           $= 25 : 1.$

X. Book Exercise – HOTS:

1. **Two resistors when connected in parallel give the resultant resistance of 2 ohm; but when connected in series the effective resistance becomes 9 ohm. Calculate the value of each resistance.**

Solution :

         $R_1 + R_2 = 9$ ohm

             $R_2 = 9 - R_1$

     $1/R_1 + 1/R_2 = ½$

   $1/R_1 + 1/ 9 - R_1 = ½$

       $9 - R_1 + R_1 = 1/2$

$R_1(9 - R_1)$

         $9 / 9R_1 - R_{12} = ½$

      $R_{12} - 9 R_1 + 18 = 0$

    $(R_1 - 3) (R_1 - 6) = 0$

            $R_1 = 3,6$

When $R_1 = 3Ω, R_2 = 9 - 3 = 6Ω$

When $R_1 = 6Ω, R_2 = 9 - 6 = 3Ω.$

2. **How many electrons are passing per second in a circuit in which there is a current of 5 A?**

Solution :

    $I = \dfrac{Q}{t}$

For 1 coluomb number of electrons $= \dfrac{1}{e} = \dfrac{1}{charge}$

$\dfrac{1}{e} = \dfrac{1}{1.6 \times 10^{-19}} = 6.25 \times 10^{18}$ electrons.

For $1A = \dfrac{1c}{1s}$ =>: number of electrons for 1A= 6.25×10^{18} electrons.

For 5A of current number of electrons $= 5 \times 6.25 \times 10^{18}$

                   $= 3.125 \times 10^{19}$ electrons.

3. **A piece of wire of resistance 10 ohm is drawn out so that its length is increased to three times its original length. Calculate the new resistance.**

    Solution :

    Resistance (R) = Resistivity (r) × Length (L) / Area (A)

    $$R = \frac{\rho\,l}{A}$$

    When the length increases by three times, the cross section will reduce by three times. Hence the length will be 3L while area = A/3

    $$\text{New resistance R' } = \frac{\rho 3L}{A/_3}$$

    $$R' = 9 \times \frac{\rho L}{A}$$

    $$= 9 \times 10 = 90\ \Omega$$

    Therefore the new resistance = 90 ohm.

Additional – Choose the best answer

1. _____ **deals with the flow of electric charges through a conductor.**
    a) Electricity   b) Sound   c) nuclear power   d) atomic physics

    Ans: a) Electricity

2. **The motion of electric charges through a conductor will constitute an _____.**
    a) Electric current   b) Electric circuit   c) electric potential   d) electric flux

    Ans: a) Electric current

3. **Electric current passes from a region of _____ pressure to a region of _____ pressure.**
    a) Low, High   b) High , Low   c) either a or b   d) none

    Ans: b) High, low

4. **In Electric current passes from the _____ terminal of a battery to the _____ terminal through a wire.**
    a) Positive, Negative   b) Negative, Positive   c) either a or b   d) none

    Ans: a) Positive, Negative

5. **Electric current is the rate of flow of _____ in a conductor.**
    a) Electrons   b) Charges   c) protons   d) all

    Ans: d) all

6. **SI unit of Electric Current is _____.**
    a) Ampere   b) volt   c) watt   d) Ohm

    Ans: a) Ampere

7. **1 Ampere = _____.**
    a) $\dfrac{1\ \text{coulomb}}{1\ \text{minute}}$ b) $\dfrac{1\ \text{coulomb}}{1\ \text{second}}$ c) $\dfrac{1\ \text{coulomb}}{1\ \text{second}^2}$ d) $\dfrac{\text{second}}{\text{coulomb}}$

    Ans: b) 1 coulomb / 1 second

8. **An electric circuit is a _____ circuit.**
    a) Closed   b) open   c) either a or b   d) none

    Ans: c) either a or b

9. **Device used to fix the magnitude of the current through a circuit _____.**
    a) Resistor   b) ammeter   c) voltmeter   d) galvanometer

    Ans: a) Resistor

10. **Device used to select the magnitude of the current through a circuit _____.**
    a) Resistor   b) Ammeter   c) Rheostat   d) Galvanometer

    Ans: c) Rheostat

11. _____ **is used to measure the current.**
   a) Resistor   b) Ammeter   c) Rheostat   d) Galvanometer

   Ans: b) Ammeter

12. _____ **is used to measure the potential difference.**
   a) Resistor   b) Ammeter   c) Voltmeter   d) Galvanometer

   Ans: c) voltmeter

13. _____ **is used to indicate the direction of Current.**
   a) Resistor   b) Ammeter   c) voltmeter   d) Galvanometer

   Ans: d) Galvanometer

14. **In the circuit, if the switch is _____ the bulb glows.**
   a) On   b) Off   c) open   d) none

   Ans: a) On

15. **In the circuit, If the switch is _____ the bulb does not glow.**
   a) On   b) Off   c) open   d) closed

   Ans: b or c

16. **The _____ required for the flow of charges is provided by the battery.**
   a) Potential difference   b) electric potential   c) electrical current   d) none

   Ans: a) Potential difference

17. **The _____ flow from the negative terminal to the positive terminal of the battery.**
   a) Electrons   b) Neutrons   c) protons   d) positrons

   Ans: a) Electrons

18. **By convention, the direction of current is taken as the direction of flow of _____ charge.**
   a) Protons   b) neutrons   c) electrons   d) positrons

   Ans: a) Protons

19. **By convention, the direction of current is taken as the direction of flow of _____.**
   a) Protons   b) Electrons   c) a or b   d) none

   Ans: c) a or b

20. _____ **is defined as the amount of work done in moving a unit positive charge from one point to another point the electric force.**
   a) Electric potential difference   b) Potential energy   c) electric potential   d) none

   Ans: a) Electric potential difference

21. **Potential difference = _____.**
   a) Work done(w) / charge (Q)   b) charge (Q) / Work done (w)
   c) (Work)^2 / charge (Q)   d) charge (Q) / (Work done)^2

   Ans: a) Work done (w) / charge (Q)

22. **SI unit of electric potential difference is _____.**
   a) Ampere   b) Volt   c) ohm   d) ohm^{-m}

   Ans: b) Volt

23. **1 volt = _____.**
   a) 1 joule / 1coulomb   b) 1coulomb/ 1 joule   c) 1 watt / 1 col   d) 1 col / 1watt

   Ans: a) 1 joule / 1 coulomb

24. _____ **established the ohm's law.**
   a) George simon Ohm   b) albert Einstein   c) Lenz   d) faraday

   Ans: a) George simon Ohm

25. **George simon ohm is a _____ physicist.**
   a) German   b) England   c) American   d) French

   Ans: a) German

26. **Relation between potential difference and current is gives a _____ line.**
    a) Straight   b) curved   c) either a or b   d) none

    Ans: a) Straight

27. **SI unit of resistance is _____.**
    a) Ohm   b) volt   c) ampere   d) joule

    Ans: a) ohm

28. **Ohm is represented by the symbol of _____.**
    a) Ω b) ρ c) $\mho$ d) ϕ

    Ans: a) Ω

29. **1 ohm = _____.**
    a) 1volt / 1 ampere   b) 1 ampere / 1volt   c) 1joule / 1ampere   d) 1ampere /1joule

    Ans: a) 1 volt/ 1 ampere

30. **Resistance of the conductor is directly proportional to the _____ of the conductor.**
    a) Length   b) cross section of area   c) thickness   d) none

    Ans: a) length

31. **Resistance of the conductor is inversely proportional to its _____.**
    a) Length   b) Area of cross section   c) potential   d) voltage

    Ans: b) Area of cross section

32. **Nichrome is a conductor with high resistivity equal to _____.**
    a) 1.5×10^{-6} Ωm   b) $15 \times 10^{-1}$$\Omega$m   c) 15×10^{-6} Ωm   d) $1.5 \times 10^{+6}$ Ωm

    Ans: a) 1.5×10^{-6} Ωm

33. **The reciprocal of electrical resistivity of a material is called its _____.**
    a) Resistance   b) Electrical conductivity   c) conductance   d) none

    Ans: b) Electrical conductivity

34. **Ohm^{-1} is also represented as _____.**
    a) Ohm   b) mho   c) ohm m   d) ohm m^{-1}

    Ans: b) mho

35. **Unit of electrical conductivity is _____.**
    a) Ohm^{-1} metre^{-2} b) Ohm^{-1} metre^{-1} c) mho m   d) mho^{-1} m

    Ans: b) Ohm^{-1} metre^{-1}

36. **Conductivity is _____ for conductors than for insulators.**
    a) More   b) less   c) either a or b   d) none

    Ans: a) More

37. **A series circuit connects the components one after the other to form a _____.**
    a) Single loop   b) Double loop   c) bridge   d) either a or b

    Ans: a) Single loop

38. **The equivalent resistance in a series combination is _____ than the highest of the individual resisitances.**
    a) Greater   b) lesser   c) either a or b   d) none

    Ans: a) greater

39. **A parallel circuit has _____ or more loops.**
    a) One   b) Two   c) either a or b   d) none

    Ans: b) Two

40. **The wiring in a house consists of _____ circuits.**
    a) Series   b) parallel   c) either a or b   d) none

    Ans: b) Parallel

41. **The equivalent resistance in a parallel combination is _____ than the lowest of the individual resistances.**

a) More   b) Less   c) either a or b   d) none

           Ans: b) less

42. **Nichrome has _____.**

a) High resistivity   b) high melting point   c) not easily oxidized   d) All the above

           Ans: d) All the above

43. **The fuse wire is made up of a material whose melting point is relatively _____.**

a) High   b) low   c) either a or b   d) none

           Ans: b) Low

44. **The filament is made up of a material whose melting point is _____.**

a) High   b) Very High   c) low   d) Very low

           Ans: Very High

45. **_____ is the commonly used material to make the filaments in bulbs.**

a) Nichrome   b) Tungsten   c) alnico   d) fuse wire

           Ans: b) Tungsten

46. **Electric power is the product of _____ and _____.**

a) Electric potential and electric current   b) Electric current and electric Potential difference

c) Electric potential and resistance   d) Electric current and resistance

           Ans: b) Electric current and Electric potential Difference

47. **Horse power is equal to _____.**

a) 456 watts   b) 746 watts   c) 675 watts   d) 786 watts

           Ans : b) 746 watts

48. **A larger unit of power, which is more commonly used is _____.**

a) Kilowatt   b) Kilogram   c) watt   d) micro watt

           Ans: a) Kilowatt

49. **1KWh = _____.**

a) 100 watt hour   b) 1000 watt hour   c) 1 watt hour   d) 10 watt hour

           Ans : b) 1000 watt hour

50. **1KWh = _____.**

a) 3.6×10^5 J   b) 3.6×10^6 J   c) 36×10^5 J   d) 3.6×10^7 J

           Ans: b) 3.6× 106 J

51. **_____ is used to protect the house hold electrical appliances from overloading due to excess current.**

a) MVB   b) MCB   c) fuse wire   d) either b or c

           Ans: d) either b or c

52. **An extra _____ LED is used to display a dot.**

a) 7th   b) 8th   c) 6th   d) 4th

           Ans: b) 8th

53. **LCD is _____.**

a) Liquid crystal Display   b) Liquid cubical display   c) either a or b   d) none

           Ans: a) Liquid crystal Display.

Additional – Fill in the blanks

1. _____ deals with the flow of electric charges through a conductor.   **Ans :** Electricity

2. The usage of _____ in our day to day life is very important and indispensable.   **Ans :** Electric current

3. The electric current passes from the _____ of a battery to the _____ through a wire.
    Ans : higher electric potential; low electric potential

4. Electric current is otherwise called as _____.   **Ans :** rate of flow of charges

5. _____ is represented by the symbol of I.   **Ans :** Electric current

6. Electric current is defined as the _____ in a conductor.   **Ans :** rate of flow of charges

7. The _____ represents the amount of charges flowing in any cross section of a conductor in unit time.
    Ans : electric current

8. If a net charge Q passes through any cross section of a conductor in time t ,then the current flowing through the conductor is _____.   **Ans :** I = Q/t

9. The SI unit of electric current is _____.   **Ans :** Ampere

10. The current flowing through a conductor is said to be _____.   **Ans :** one Ampere

11. 1 Ampere = _____.   **Ans :** 1 coulomb / 1 second

12. An electric circuit is a closed conducting loop or path, which has a network of electrical components through which _____ are able to flow.   **Ans :** electrons

13. A _____ has various uses.   **Ans :** diode

14. LED means _____.   **Ans :** Light emitting Diode

15. _____ is used to fix the magnitude of the current through a circuit.   **Ans :** Resistor

16. _____ is used to select the magnitude of the current through a circuit.   **Ans :** Variable resistor or Rheostat

17. _____ is used to measure the current.   **Ans :** Ammeter

18. _____ is used to measure the potential difference.   **Ans :** Voltmeter

19. _____ is used to indicate the direction of current.   **Ans :** Galvanometer

20. _____ is used to provide protection to the electrical components.   **Ans :** Ground connection

21. _____ is also serves as reference point to measure the electric potential.   **Ans :** Ground connection

22. In this circuit if the _____ the bulb glows.   **Ans :** Switch is On

23. In this circuit if the _____ the bulb does not glow.   **Ans :** Switch is Off

24. The potential difference required for the _____ is provided by the battery.   **Ans :** flow of charges

25. The electrons flow from the _____ to the _____ of the battery.   **Ans :** negative terminal ; positive terminal

26. By convection, the direction of current is taken as the direction of flow of _____ or opposite to the direction of _____.   **Ans :** positive charge ; flow of electrons

27. The electric current passes in the circuit from the _____ to the _____.   **Ans :** positive terminal; negative terminal

28. In the conductor the charges will flow from a _____ to _____.   **Ans :** higher electric potential ; lower electric potnetial

29. Potential difference (v) = _____.   **Ans :** Work done (w) / Charge (Q)

30. The SI unit of electric potential or potential difference _____.   **Ans :** is Volt

31. The unit potential difference between two points is _____.   **Ans :** one volt

32. 1 Volt =_____.   **Ans :** 1 joule / 1 coulomb

33. The relationship between the potential difference and current which is known as _____.
    Ans : ohm's law

34. In ohm's law the current is _____ to the potential difference.   **Ans :** directly proportional
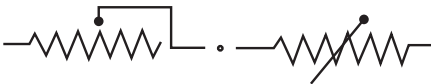
35. Relation between potential difference and current gives a _____ under constant temperature.

    Ans : straight line

36. _____ is different for different materials.   **Ans :** Resistance

37. The resistance of a conductor can be defined as the ratio between the _____ across the ends of the conductor and the _____ flowing through it.   **Ans :** potential difference ; current

38. The SI unit of resistance _____.   **Ans :** is Ohm

39. Ohm is represented by the symbol _____.   **Ans :** Ω

40. Resistance of a conductor is said to be _____ if a current of _____ flows through it when a potential difference of _____ is maintained across its ends.   **Ans :** one ohm ; one ampere ; one volt

41. 1 ohm = _____.   **Ans :** 1volt/ 1 ampere

42. _____ is called as electrical resistivity or specific resistance of the material of the conductor.

    Ans : Rho

43. _____ is defined as the resistance of a conductor of unit length and unit area of cross section.

    Ans : Electrical resistivity

44. Electrical resistivity unit is _____.   **Ans :** ohm metre

45. _____ is used to making heating materials.   **Ans :** Nichrome

46. Resistivity of Nichrome is equal to _____.   **Ans :** 1.5×10^{-6} Ωm

47. Ohm^{-1} is otherwise called _____.   **Ans :** as mho

48. The reciprocal of electrical resistivity of a material is called its _____.   **Ans :** electrical conductivity

49. Unit of electrical conductivity is _____.   **Ans :** ohm^{-1} metre^{-1}

50. The conductivity is _____ for a given material.   **Ans :** a constant

51. _____ are good conductors of electric current.   **Ans :** Copper and Aluminium

52. _____ are bad conductors of electric current.   **Ans :** Glass and wood

53. Conductivity is more for conductors than the _____.   **Ans :** insulators

54. The _____ is less for conductors than for insulators.   **Ans :** resistivity

55. Resistivity of copper is _____.   **Ans :** 1.62×10^{-8}Ωm

56. Resistivity of Nickel is _____.   **Ans :** 6.84×10^{-8}Ωm.

57. Resistivity of chromium is _____.   **Ans :** 12.9×10^{-8}Ωm

58. Resistivity of Glass is _____.   **Ans :** 10^{13} to 10^{14}

59. Resistivity of Rubber is _____.   **Ans :** 10^{13} to 10^{16}

60. A series circuit connects the components one after the other to form a _____.   **Ans :** single loop

61. A series circuit has _____ through which current can pass.   **Ans :** only one loop

62. If the circuit is _____, no current can pass through the circuit.   **Ans :** interrupted at any point in the loop

63. Series circuits are commonly used in devices such as _____.   **Ans :** Flashlights

64. The equivalent resistance in a series combination is greater than the _____ of the individual resistance.   **Ans :** highest

65. A _____ has two or more loops through which current can pass.   **Ans :** parallel circuit

66. In case of parallel circuit, if any part circuit is disconnected in one of the loops, the _____ through the other loops.   **Ans :** current can still pass

67. When a number of resistors are connected in parallel, the sum of the _____ of the individual resistance is equal to reciprocal of effective resistance.   **Ans :** reciprocals

68. The equivalent resistance in a parallel combination is less than the _____ of the individual resistance.
Ans : lowest

69. _____, Current is less as effective resistance is more.
Ans : In series

70. _____, current is more as effective resistance is less.
Ans : In parallel

71. _____ circuit if one appliance is disconnected , others also do not work.
Ans : In series

72. _____ circuit, if one appliance is disconnected others will work independently.
Ans : In Parallel

73. The motor casing is warm; this is due to the _____.
Ans : heating effect of current

74. The passage of electric current through a wire, results in production of heat. This phenomenon is called _____.
Ans : heating effect of current

75. Heating effect of current is used in devices _____.
Ans : like electric heater and electric iron

76. Joules law is directly proportional to the _____ passing through the resistor.
Ans : square of the current

77. Joules law is directly proportional to the _____ of the resistor.
Ans : resistance

78. Joules law is directly proportional to _____ for which current is passing through the resistor.
Ans : the time

79. _____ is known as Joules law.
Ans : $H = I^2Rt$

80. Nickel and chromium has _____.
Ans : High resistivity

81. Nickel and chromium has _____.
Ans : high melting point

82. _____ is not easily oxidized.
Ans : Nickel and chromium

83. _____ is connected in series in an electric circuit to protect devices.
Ans : The fuse wire

84. When a large current passes through the circuit the fuse wire melts due _____.
Ans : to Joules heating effect

85. The fuse wire is made up of a material whose _____ is relatively low.
Ans : melting point

86. In electric bulbs a small wire is used known _____.
Ans : as filament

87. The filament is made up of a material whose _____.
Ans : melting point is high

88. When current is passed through the fuse wire _____ is produced in the filament.
Ans : heat

89. The filament is heated the material glows and _____.
Ans : gives light

90. _____ is the commonly used material to make the filament in bulbs.
Ans : Tungsten

91. _____ is defined as the rate of doing work or rate of spending energy.
Ans : Power

92. _____ is defined as the rate of consumption of electrical energy.
Ans : Electric power

93. Electric power is the product of _____ and _____ due to which the current passes in a circuit.
Ans : the electric current ; the potential difference

94. The SI unit of electric power is _____.
Ans : watt

95. _____ is the power consumed when an electric device is operated at a potential difference of one volt and it carries a current of one ampere.
Ans : One watt

96. A larger unit of power which is more commonly used is _____.
Ans : kilowatt

97. The _____ is a unit in the foot- pound- second or English system, sometimes to express the electric power.
Ans : horse power

98. One Horse power is equal to _____.
Ans : to 746 watt

99. _____ is consumed both in houses and industries.
Ans : Electricity

100. Electrical energy consumed is taken as the product of _____ and _____ of usage.
Ans : electric power ; time
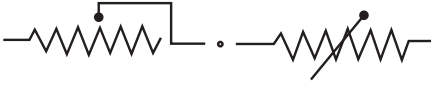
101. If 100 watt of electric power is consumed for 2 hours is $100 \times 2 =$ _____ watt hour.   **Ans :** 200

102. Consumption of electrical energy is measured and expressed in _____.   **Ans :** watt hour

103. SI unit of Consumption of electrical energy is _____.   **Ans :** watt second

104. One kilowatt hour is otherwise known as _____.   **Ans :** one unit of electrical energy

105. One kilowatt hour means that an electric power of _____ has been utilized for an hour.   **Ans :** 1000 watt

106. 1kwh = _____.   **Ans :** 3.6×10^{-6} j

107. The electricity is produced in power stations is distributed to all _____.   **Ans :** the domestic and industry

108. The important components of main boxes are _____.   **Ans :** a fuse box, meter box

109. _____ is used to record the consumption of electrical energy.   **Ans :** The meter

110. MCB means _____.   **Ans :** Miniature circuit breaker

111. The fuse box contains _____.   **Ans :** a fuse wire or MCB

112. The function of the _____ is to protect the house hold electrical appliances from overloading due to excess current.   **Ans :** fuse wire or a MCB

113. An MCB is a _____ which can be activated automatically as well as manually.   **Ans :** switching device

114. The electricity is brought to houses by _____ insulated wires.   **Ans :** two

115. _____ has a red insulation.   **Ans :** Live wire

116. Neutral wire has a _____.   **Ans :** black insulation

117. _____ are Supplied in our home.   **Ans :** 220v

118. In india, domestic circuits are supplied with an alternating current of potential _____ and frequency 50hz.   **Ans :** 220 / 230V

119. In USA and UK , domestic circuits are supplied with an alternating current of potential 110/120 v and frequency _____.   **Ans :** 60 hz

120. The fuse wire or MCB will disconnect the circuit in the event of _____ and short circuiting.   **Ans :** an overloading

121. Live wire comes in contact with a neutral wire it causes a _____.   **Ans :** short circuit

122. In domestic circuit a third wire is called the _____ having a green insulation.   **Ans :** earth wire

123. Earth wire provides a _____ path to the electric current.   **Ans :** low resistance

124. _____ serves as a protective conductor which saves us from electric shocks.   **Ans :** Earth wire

125. An LED bulb is a _____.   **Ans :** semiconductor device'

126. The chemical compounds _____ are present in the LED.   **Ans :** like Gallium Arsenide and Gallium Phosphide.

127. A seven segment display is the display used to give an output in the form of _____.   **Ans :** numbers or txt

128. A seven segment display is used _____.   **Ans :** in digital meters and digital clocks

129. A seven segment display consists of 7 segments of LED in the form of the _____.   **Ans :** digit 8

130. LED is _____ than the incandescent bulb.   **Ans :** cooler

131. LED bulbs have significantly _____ requirement.   **Ans :** low power

132. LED is not harmful to _____.   **Ans :** the environment

133. A wide range _____ is possible in LED.   **Ans :** of colours

134. LED is _____ and energy Efficient. **Ans :** cost efficient

135. _____ and other toxic materials are not required in manufacturing LED. **Ans :** Mercury

136. One way of overcoming the _____ is to use more LED bulbs. **Ans :** energy crisis

137. _____ is one of the most important applications of light emitting diodes. **Ans :** LED television

138. LCD means _____. **Ans :** Liquid crystal display

139. An LED display uses LEDs for _____ of LED act as pixels. **Ans :** backlight and an array

140. LED emitting _____ are used in monochrome TV. **Ans :** white light

141. _____ LED s are used in colour television. **Ans :** Red green and blue

142. The first LED television screen was developed by _____ in 1977. **Ans :** James p.Mitchell

143. _____ introduced the first commercial LED television. **Ans :** SONY

144. LED Has _____ picture quality. **Ans :** brighter

145. LED is thinner in _____. **Ans :** Size

146. LED uses _____ and consumes _____. **Ans :** less power ; very less energy

147. LED life span is _____. **Ans :** more

148. LED is more _____. **Ans :** Reliable

Additional – Match the following

1.

	COMPONENT	USE OF THE COMPONENT	SYMBOL USED
i)	**Resistor**	**used to fix the magnitude of the current through a circuit**	A
ii)	**Rheostat**	**Used to select the magnitude of the Current through a circuit**	V
iii)	**Voltmeter**	**Used to measure the potential difference**	G
iv)	**Ammeter**	**Used to measure the current**	
v)	**Galvanometer**	**Used to indicate the direction of current**	

Answer:

i)	Resistor	used to fix the magnitude of the current through a circuit	
ii)	Rheostat	Used to select the magnitude of the Current through a circuit	
iii)	Voltmeter	Used to measure the potential difference	V
iv)	Ammeter	Used to measure the current	A
v)	Galvanometer	Used to indicate the direction of current	G

2.		MATERIAL		RESISTIVITY(Ωm)
	i)	Copper	(a)	10^{10} to 10^{14}
	ii)	Nickel	(b)	10^{13} to 10^{16}
	iii)	Chromium	(c)	6.84×10^{-8}
	iv)	Glass	(d)	12.9×10^{-8}
	v)	Rubber	(e)	1.62×10^{-8}

Ans : (i - e); (ii - c); (iii - d); (iv - a); (v - b)

3.		MATERIAL		RESISTIVITY(Ωm)	ANSWER
	i)	Potential difference	(a)	coulomb	**Volt**
	ii)	Current	(b)	volt	**Ampere**
	iii)	Charge	(c)	ohm	**coulomb**
	iv)	Resistance	(d)	Ampere	**ohm**

Ans : (i - b); (ii - d); (iii - a); (iv - c)

Additional – True or false

1. **The electrical resistivity of a material is directly proportional to the electrical conductivity.**
   Ans : False: The electrical resistivity of a material is indirectly proportional to the electrical conductivity.

2. **A series circuit connects the components one after the other to form a two or more loop.**
   Ans : False: A parallel circuit connects the components one after the other to form a two or more loop.

3. **In series, equivalent resistance is less than the lowest resistance.**
   Ans : False: In series, equivalent resistance is more than the highest resistance.

4. **In parallel, equivalent resistance is more than the lowest resistance.**
   Ans : False: In parallel, equivalent resistance is less than the lowest resistance.

5. **Electric power is the product of the electric current and the potential difference.**
   Ans : True.

6. **One watt hour is otherwise known as one unit of electrical energy.**
   Ans : False. One kilo watt hour is otherwise known as one unit of electrical energy.

7. **1KWh = 1000 watt hour = 1000 ×(60× 60) watt sound = 3.6×10⁶ J.**
   Ans : True

8. **In India, domestic circuits are supplied with an alternating current of potential 110/120V and frequency 60Hz.**
   Ans : False. In USA And UK, domestic circuits are supplied with an alternating current of potential 110/120V and frequency 60Hz.

9. **The advantage of the parallel connection of circuits is that each electric appliance gets and different voltage.**
   Ans : False. The advantage of the parallel connection of circuits is that each electric appliance gets an equal voltage.

10. **LG introduced the first commercial LED television.**
    Ans : False. SONY introduced the first commercial LED television.

Additional – Assertion and Reason

1. **Assertion:** The relation V= IR is valid even in the case of non ohmic device.
   Reason: V/I is constant as per ohm's Law.
   A) Assertion and reason are correct and Reason is correct explanation of Assertion
   B) Assertion and reason are correct and reason is not correct explanation of Assertion
   C) Assertion is true but reason is false
   D) Assertion is false but reason is true.

   Ans : (A) Assertion and reason are correct and Reason is correct explanation of Assertion

2. **Assertion:**   Resistance between A and B is 3R.
   Reason: The 3 resistances are joined in parallel.
   A) Assertion and reason are correct and Reason is correct explanation of Assertion
   B) Assertion and reason are correct and reason is not correct explanation of Assertion
   C) Assertion is true but reason is false
   D) Assertion is false but reason is true

   Ans : (D) Assertion is false but reason is true

3. **Assertion:**   A fine wire is used in electric circuits for protecting the circuits.
   Reason: A fine wire has high resistance and low melting point.
   A) Assertion and reason are correct and Reason is correct explanation of Assertion
   B) Assertion and reason are correct and reason is not correct explanation of Assertion
   C) Assertion is true but reason is false
   D) Assertion is false but reason is true

   Ans : (A) Assertion and reason are correct and Reason is correct explanation of Assertion

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Additional – To raise the questions:

1. **The necessary condition for a conductor to obey ohm's law is that its physical conditions like temperature , length, volume etc should remain the same. Raise the questions to confirm it.**
   1. _____   2 _____
      1. What are the necessary conditions for a conductor to obey ohm's law.
      2. What is constant according to ohms law.

2. **Electric fuse is an important components of all domestic circuits. Put forth questions to show the importance of fuse.**
   1. _____   2 _____
      1. What is fuse?
      2. What is the purpose of using a fuse in a circuit?

3. **At the meter board in the house , wires pass into an electricity meter through a main fuse. Raise the questions to understand the wiring concept.**
   1. _____   2 _____
      1. In high rating power appliances , which is connected to earth wire?
      2. What do you understand by the term earthing?

4. **The variations in the current for the same values of potential difference indicate that the resistance of different materials is different.**
   Raise the questions to prove this statement.
   1. _____   2 _____
      1. Why the values of potential difference varied?
      2. What is called potential difference?

5. **Overloading can occur when the live wire and the neutral wire come into direct contact. Raise the questions based on the statement.**
   1. _____   2 _____
      1. What do you mean by short circuiting?
      2. Explain the term Overloading.

Additional – Short answers

1. **How is electric charges are moved in a conductors?**
   Ans : The motion of electric charges (electrons) through a conductor (e.g. copper wire) will constitute an electric current. This is similar to the flow of water through a channel or flow of air from a region of high

pressure to a region of low pressure.

2. How is electric current passed in conductors?

The electric current passes from the positive terminal (higher electric potential) of a battery to the negative terminal (lower electric potential) through a wire.

3. Define electric current.

Electrical current is defined as the rate of flow of charges in a conductor. If a net charge 'Q' passes through any cross section of a conductor in time 't', then the current flowing through the conductor is $I = Q/t$.

4. Write about electric circuit.

An electric circuit is a closed conducting loop (or) path, which has a network of electrical components through which electrons are able to flow. This path is made using electrical wires so as to connect an electric appliance to a source of electric charges (battery).

5. Draw the schematic diagram of an electric circuit.
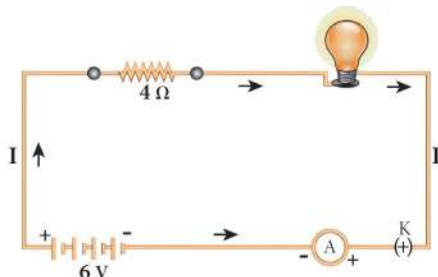
6. What are the components of electric circuit?

1. A battery   2. A switch   3. A bulb.

7. Define Volt.

The SI unit of electric potential or potential difference is volt (V). The potential difference between two points is one volt, if one joule of work is done in moving one coulomb of charge from one point to another against the electric force.

$$1 \text{ volt} = 1 \text{ joule}/ 1 \text{ coulomb}.$$

8. What is Resistance?

Resistance of a material is its property to oppose the flow of charges and hence the passage of current through it. It is different for different materials. From Ohm's Law, $V/I = R$. (OR) The resistance of a conductor can be defined as the ratio between the potential difference across the ends of the conductor and the current flowing through it.

9. Define Unit of Resistance.

The SI unit of resistance is ohm and it is represented by the symbol Ω. Resistance of a conductor is said to be one ohm if a current of one ampere flows through it when a potential difference of one volt is maintained across its ends.

$$1 \text{ Ohm} = 1 \text{ volt}/ 1 \text{ ampere}.$$

10. Write the examples of good conductors and nonconductors of electric current.

Good Conductors: Copper, Aluminum

Nonconductors: Glass, wood, rubber.

11. Tabulate the Resistivity of some materials.

Ans :

Nature of the Material	Material	Resistivity (Ωm)
Conductor	Copper	1.62×10^{-8}
	Nickel	6.84×10^{-8}
	Chromium	12.9×10^{-8}
Insulator	Glass	10^{10} to 10^{14}
	Rubber	10^{13} to 10^{16}

12. What are called system of resistors?

A simple electric circuit contains a single resistor. A complicated circuit, which uses a combination of many resistors. This combination of resistors is known as 'system of resistors' or 'grouping of resistors'. Resistors can be connected in various combinations.

13. Write the basic methods of Joining resistors together?

1. Resistors connected in Series. 2. Resistors connected in Parellel.

14. Write the difference between series and parallel circuit.

S.No.	CRITERIA	SERIES	PARALLEL
1.	Equivalent resistance	More than the highest resistance.	Less than the lowest resistance.
2.	Amount of current	Current is less as effective resistance is more.	Current is more as effective resistance is less.
3.	Switching ON/OFF	If one appliance is disconnected, others also do not work.	If one appliance is disconnected, others will work independently.

15. What is called heating effect of current?

A part of the energy from the source can be converted into useful work and the rest will be converted into heat energy. Thus, the passage of electric current through a wire, results in the production of heat. This phenomenon is called heating effect of current.

16. What are the devices used for the heating effect of current?

Electric Heaters, Electric Iron.

17. Explain Joule's law of heating state:

$$H = I^2Rt$$

✦ directly proportional to the square of the current passing through the resistor.

✦ directly proportional to the resistance of the resistor.

✦ directly proportional to the time for which the current is passing through the resistor.

18. What is called as filament? How it works?

In electric bulbs, a small wire is used, known as filament. The filament is made up ofa material whose melting point is very high. When current passes through this wire, heat is produced in the filament. When the filament is heated, it glows and gives out light. Tungsten is the commonly used material to make the filament in bulbs.

19. Define Power.

Power is defined as the rate of doing work or rate of spending energy.

20. Define Electric power.

The electric power is defined as the rate of consumption of electrical energy. It represents the rate at which the electrical energy is converted into some other form of energy.

21. Explain Electric power.

A current 'I' flows through a conductor of resistance 'R' for a time 't', then the potential difference across the two ends of the conductor is 'V'. The work done 'W' to move the charge across the ends of the conductor is given by the equation.

$$W = V I t, \text{ Power } P = \text{work/time} = V I t/t. \; P = V I.$$

22. What is called electric power?

The electric power is the product of the electric current and the potential difference due to which the current passes in a circuit.

23. What is the unit of electric power?

The SI unit of electric power is watt. When a current of 1 ampere passes across the ends of a conductor, which is at a potential difference of 1 volt, then the electric power is $P = 1 \text{ volt} \times 1 \text{ ampere} = 1 \text{ watt}$.

24. Define one watt.

One watt is the power consumed when an electric device is operated at a potential difference of one volt and it carries a current of one ampere. A larger unit of power, which is more commonly used is kilowatt.

25. Define Horse power.

Ans:The horse power (hp) is a unit in the foot-pound-second (fps) or English system, sometimes used to express the electric power. 1HP = 746 watt.

26. Write the factors for consumption of electricity.

1.Amount of electric power 2. Duration of Usage.

27. What is called consumed electrical energy?

Electrical energy consumed is taken as the product of electric power and time of usage. For example, if 100 watt of electric power is consumed for two hours, then the power consumed is $100 \times 2 = 200$ watt hour.

27. How to measure the consumption of electrical energy?

Consumption of electrical energy is measured and expressed in watt hour, though its SI unit is watt second. In practice, a larger unit of electrical energy is needed. This larger unit is kilowatt hour (kWh). One kilowatt hour is otherwise known as one unit of electrical energy. One kilowatt hour means that an electric power of 1000 watt has been utilized for an hour. Hence,

1 kWh = 1000 watt hour = $1000 \times (60 \times 60)$ watt second = 3.6×10^6 J.

28. Define the term overloading.

When the amount of current passing through a wire exceeds the maximum permissible limit, the wires get heated to such an extent that a fire may be caused. This is known as overloading.

29. What is short circuit? How It happened in our home?

When a live wire comes in contact with a neutral wire, it causes a 'short circuit'. This happens when the insulation of the wires get damaged due to temperature changes or some external force. Due to a short circuit, the effective resistance in the circuit becomes very small, which leads to the flow of a large current through the wires. This results in heating of wires to such an extent that a fire may be caused in the building.

30. What is called LED bulb?

An LED bulb is a semiconductor device that emits visible light when an electric current passes through it. The colour of the emitted light will depend on the type of materials used.

31. What are the chemical compounds used in LED?

Gallium Arsenide, Gallium Phosphide.

32. What are the colours produced from manufacture of LED?

Red, Green, Yellow and Orange.

33. Give the examples for the use of LED?

Displays in digital watches and calculators, traffic signals, street lights, decorative lights, etc.

34. Draw the diagram for seven segment Display.
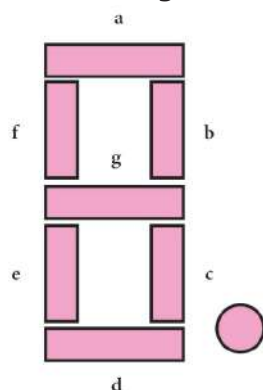
Seven Segment Display
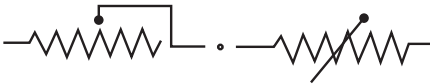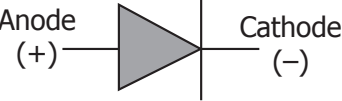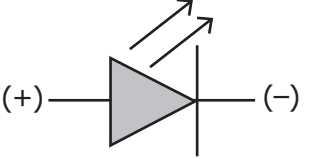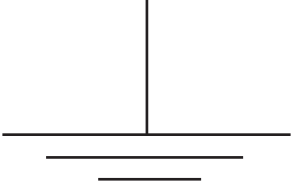
35. Explain seven segment display.

A 'Seven Segment Display' is the display device used to give an output in the form of numbers or text. It is used in digital meters, digital clocks, micro wave ovens, etc. It consists of 7 segments of LEDs in the form of the digit 8. These seven LEDs are named as a, b, c, d, e, f and g . An extra 8th LED is used to display a lot.

36. Explain about LED Television.

LED Television is one of the most important applications of Light Emitting Diodes. An LED TV is actually an LCD TV (Liquid Crystal Display) with LED display. An LED display uses LEDs for backlight andan array of LEDs act as pixels. LEDs emitting white light are used in monochrome (black and white) TV; Red, Green and Blue (RGB) LEDs are used in colour television. The first LED television screen was developed by James P. Mitchell in 1977. It was a monochromatic display. But, after about three decades, in 2009, SONY introduced the first commercial LED Television.

Additional – Long Answers

1. Tabulate the Symbols of some components of a circuit.

COMPONENT	USE OF THE COMPONENT	SYMBOL USED
Resistor	Used to fix the magnitude of the current through a circuit	
Variable resistor or Rheostat	Used to select the magnitude of the current through a circuit.	
Ammeter	Used to measure the current.	
Voltmeter	Used to measure the potential diff erence.	
Galvanometer	Used to indicate the direction of current.	
A diode	A diode has various uses, which you will study in higher classes.	Anode (+) ▶ Cathode (−)
Light Emitting Diode (LED)	A LED has various uses which you will study in higher classes.	(+) ▶ (−)
Ground connection	Used to provide protection to the electrical components. It also serves as a reference point to measure the electric potential.	

2. Explain Electrical potential difference.

✦ The electric potential difference between two points is defined as the amount of work done in moving a unit positive charge from one point to another point against the electric force.

Electric potential

✦ Electrical potential moved a charge Q from a point A to another point B. Let 'W' be the work done to move the charge from A to B. Then, the potential difference between the points A and B is given by the following expression:

✦ Potential Difference (V) = Work done (w)/ Charge (Q).

✦ Potential difference is also equal to the difference in the electric potential of these two points. If V_A and V_B represent the electric potential at the points A and B respectively, then, the potential difference between the points A and B is given by:

$$V = V_A - V_B \text{ (If } V_A \text{ is more than } V_B)$$
$$V = V_B - V_A \text{ (If } V_B \text{ is more than } V_A).$$

3.   Explain the Ohm's Law.

A German physicist, Georg Simon Ohm established the relation between the potential difference and current, which is known as Ohm's Law.

According to Ohm's law, at a constant temperature, the steady current 'I' flowing through a conductor is directly proportional to the potential difference 'V' between the two ends of the conductor.

Iα V. Hence, I/V = constant.

The value of this proportionality constant is found to be 1/R

Therefore, I = (I /R) V
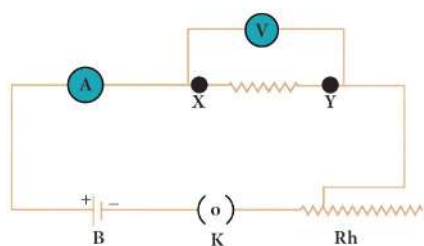
Electric circuit to understand Ohm's law
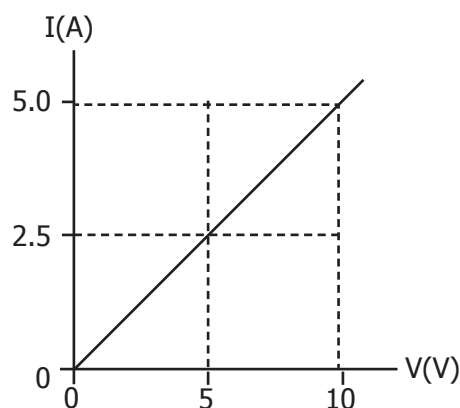
Relation between potential difference and current

V= IR Here, R is a constant for a given material (say Nichrome) at a given temperature and is known as the resistance of the material. Since, the potential difference V is proportional to the current I, the graph between V and I is a straight line for a conductor.

4.   Explain Electrical Resistivity.

✦ The resistance of any conductor 'R' is directly proportional to the length of the conductor 'L' and is inversely proportional to its area of cross section 'A'.

✦ Rα L, Rα 1/A,

Hence , Rα L/A

Therefore, R = ρ L/A

Where, ρ (rho) is a constant, called as electrical resistivity or specific resistance of the material of the conductor.

From equation (1), ρ =RA/L

If L = 1 m, A = 1 m^2 then, from the above equation), ρ =R

✦ Hence, the electrical resistivity of a material is defined as the resistance of a conductor of unit length and unit area of cross section. Its unit is ohm metre.

✦ Electrical resistivity of a conductor is a measure of the resisting power of a specified material to the passage of an electric current. It is a constant for a given material.

5.   Explain Electrical Conductance and Electrical Conductivity.

✦ Conductance of a material is the property of a material to aid the flow of charges and hence, the passage of current in it. The conductance of a material is mathematically defined as the reciprocal of its resistance (R). Hence, the conductance 'G' of a conductor is given by

✦ G = 1/R

✦ Its unit is ohm^{-1}. It is also represented as 'mho'. The reciprocal of electrical resistivity of a material is called its electrical conductivity.

✦ $\sigma = 1/\rho$

✦ Its unit is ohm^{-1} metre^{-1}. It is also represented as mho metre^{-1}.

✦ The conductivity is a constant for a given material. Electrical conductivity of a conductor is a measure of its ability to pass the current through it.

✦ Some materials are good conductors of electric current. Example: copper, aluminium, etc. While some other materials are nonconductors of electric current (insulators). Example: glass, wood, rubber, etc. Conductivity is more for conductors than for Insulators. But the resistivity is less for conductors than for insulators.

6. **Explain about the series connection in Parallel Resistors.**

If you consider the connection of a set of parallel resistors that are connected in series, you get a series – parallel circuit. Let R_1 and R_2 be connected in parallel to give an effective resistance of RP_1. Similarly, let R_3 and R_4 be connected in parallel to give an effective resistance of RP_2. Then, both of these parallel segments are connected in series.

$$1/ Rp_1 = 1/R_1 + 1/R_2$$

$$1/Rp_2 = 1/R_3 + 1/R_4$$

We get,

Net effective resistance is given by $R_{total} = Rp_1 + Rp_2$.
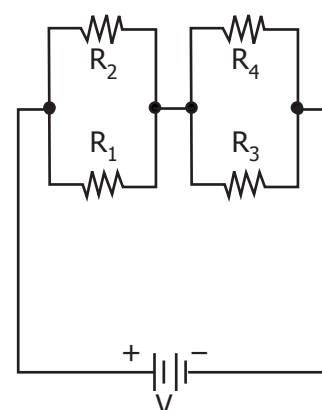
Series-parallel combination of resistors

7. **Explain about the Parallel connection of Series Resistors.**

If we consider a connection of a set of series resistors connected in a parallel circuit, we get a parallel-series circuit. Let R_1 and R_2 be connected in series to give an effective resistance of RS_1. Similarly, let R_3 and R_4 be connected in series to give an effective resistance of RS_2. Then, both of these serial segments are connected in parallel
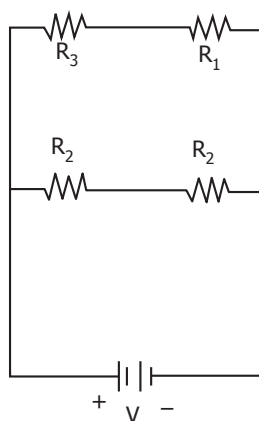
Parallel-series combination of resistors

We get $RS_1 = R_1 + R_2$, $RS_2 = R_3 + R_4$ Finally,the net effective resistance is given by $= 1 / R_{total} = 1/Rs_1 + 1/Rs_2$.

8. **Applications Of Joule's Law Of heating effect.**

    i)   **Electric Heating Device :** The heating effect of electric current is used in many home appliances such as electric iron, electric toaster, electric oven, electric heater, geyser, etc. In these appliances Nichrome, which is an alloy of Nickel and Chromium is used as the heating element. because: (i) it has high resistivity, (ii) it has a high melting point, (iii) it is not easily oxidized.

   ii)   **Fuse Wire :** The fuse wire is connected in series, in an electric circuit. When a large current passes through the circuit, the fuse wire melts due to Joule's heating effect and hence the circuit gets disconnected.

Therefore, the circuit and the electric appliances are saved from any damage. The fuse wire is made up of a material whose melting point is relatively low.

iii) **Filament in bulbs :** In electric bulbs, a small wire is used, known as filament. The filament is made up of a material whose melting point is very high. When current passes through this wire, heat is produced in the filament. When the filament is heated, it glows and gives out light. Tungsten is the commonly used material to make the filament in bulbs.

<div align="center">

Additional – Solved Problems

</div>

1. **Two bulbs are having the ratings as 60 W, 220 V and 40 W, 220 V respectively. Which one has a greater resistance?**

   Solution : Electric power $P = V^2/ R$

   For the same value of V, R is inversely proportional to P.

   Therefore, lesser the power, greater the resistance

   Hence, the bulb with 40 W, 220 V rating has a greater resistance.

2. **Calculate the current and the resistance of a 100 W, 200 V electric bulb in an electric circuit.**

   Solution : Power P = 100 W and Voltage V = 200 V

   Power $P = V I$

   So, Current, $I = P/V = 100/20 = 0.5$ A

   Resistance, $R = V/I = 200/0.5 = 400$ Ω.

3. **In the circuit diagram given below, three resistors R_1, R_2 and R_3 of 5 Ω, 10 Ω and 20 Ω respectively are connected as shown.**

   Calculate :

   A) Current through each resistor

   B) Total current in the circuit

   C) Total resistance in the circuit.

   Solution :

   A) Since the resistors are connected in parallel, the potential difference across each resistor is same (i.e. V = 10V)

   Therefore, the current through R_1 is, $I_1 = V/R_1 = 10/5 = 2$ A

   Current through $R_2 = I_2 = V/R_2 = 10/10 = 1$ A

   Current through $R_3 = I_3 = V/R_3 = 10/20 = 0.5$ A

   B) Total current in the circuit, $I = I_1 + I_2 + I_3 = 2 + 1 + 0.5 = 3.5$ A

   C) Total resistance in the circuit $1/R_p = 1/R_1 + 1/R_2 + 1/R_3$

   $= 1/5 + 1/10 + 1/20$

   $= 4 + 2 + 1/20$

   $1/R_p = 7/20$

   Hence, $R_p = 20/7 = 2.857$ Ω.

4. **Three resistors of 1 Ω, 2 Ω and 4 Ω are connected in parallel in a circuit. If a 1 Ω resistor draws a current of 1 A, find the current through the other two resistors.**

   Solution : $R_1 = 1$ Ω, $R_2 = 2$ Ω, $R_3 = 4$ Ω Current $I_1 = 1$ A

   The potential difference across the 1 Ω resistor $= I_1 R_1 = 1 \times 1 = 1$ V

   Since, the resistors are connected in parallel in the circuit, the same potential difference will exist across the other resistors also. So, the current in the 2 Ω resistor, $V/R_2 = 1/2 = 0.5$ A.

   Similarly, the current in the 4 Ω resistor,

   $V / R_3 = ¼ = 0.25$ A.
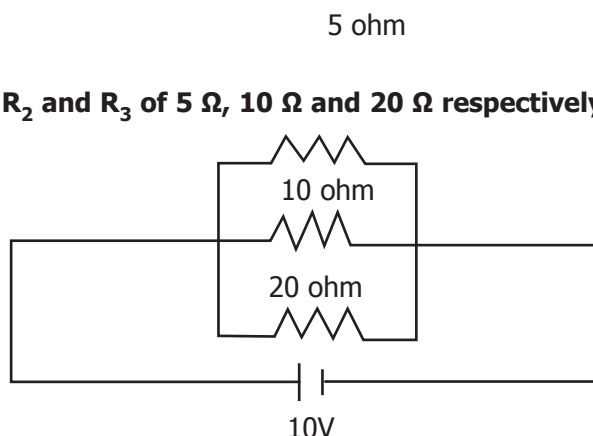
UNIT TEST - 4

Time : 1.15 Hrs.   Marks : 50

I. Choose the best answer   (5 × 1 = 5)

1. **Which of the following is correct?**
    a) Rate of change of charge is electrical power   b) Rate of change of charge is current
    c) Rate of change of energy is current   d) Rate of change of current is charge

2. **SI unit of resistance is _____.**
    a) mho   b) joule   c) ohm   d) ohm meter

3. **Kilowatt hour is the unit of _____.**
    a) resistivity   b) conductivity   c) electrical energy   d) electrical power

4. **_____ deals with the flow of electric charges through a conductor**
    a) Electricity   b) Sound   c) nuclear power   d) none of the above

5. **Used to measure the potential difference _____.**
    a) Resistor   b) Ammeter   c) Voltmeter   d) Galvanometer

II. Fill in the blanks   (5 × 1 = 5)

6. When a circuit is opencannot pass through it.
7. The ratio of the potential difference to the current is known as _____.
8. The wiring in a house consists of _____ circuits.
9. The power of an electric device is a product of _____ and _____.
10. LED stands for _____.

III. State whether the statements are true or false. Correct the false statement   (4 × 1 = 4)

11. Ohm's law states the relationship between power and voltage.
12. MCB is used to protect house hold electrical appliances.
13. Electric power is the product of the electric current and the potential difference.
14. One watt hour is otherwise known as one unit of electrical energy.

IV. Match the following   (4 × 1 = 4)

15. MCB   (a)   V I
16. Current   (b)   Fuse wire
17. Power   (c)   Tungsten
18. Filament   (d)   Ampere

V. Assertion and Reasoning   (3 × 1 = 3)

Direction: In each of the following questions, a statement of Assertion is given and a corresponding statement of Reason is given just below it. Of the statements given below, mark the correct answer as
    a.   If both A and R are true and R is the correct explanation of A.
    b.   If both A and R are true but R is not the correct explanation of A.
    c.   If A is true but R is false.
    d.   If both A and R are false.

19. **Assertion :** Resistance between A and B is 3R
    Reason :   The 3 resistances are joined in parallel

20. **Assertion :** The relation V= IR is valid even in the case of non ohmic device
    Reason : V/I is constant as per ohm's Law

21. **Assertion :** A fine wire is used in electric circuits for protecting the circuits
    Reason : A fine wire has high resistance and low melting point

VI. Write the answer for the following questions in word or sentence   (3 × 1 = 3)

22. What is electricity?
23. Define electric charge.
24. What is the full form of MCB?

VII. Find the odd one out   (3 × 1 = 3)

25. Conductor: copper, glass, rubber.
26. Insulatot : Glass, Copper, Nickel, Chromium.
27. LED: Gallium Phosphide , Gallium phosphate, Gallium Nitrate.

VIII. Correct the mistakes   (3 × 1 = 3)

28. The SI unit of potential difference is Ampere.
29. The SI unit of Resistance is Ohm.
30. Horse power is equal to 765 watt.

IX. Write the short answer for ANY 5 of the following questions.   (5 × 2 = 10)

31. Define the unit of current.
32. State Ohm's law.
33. Distinguish between the resistivity and conductivity of a conductor.
34. State Joule's of heating.
35. What connection is used in domestic appliances and why?
36. What is the heating effect of current?
37. Which material is used to make fuse wire?

X. Write long answer for the following questions   (2 × 5 = 10)

38. Explain about domestic electric circuits.
    [OR]
39. List the merits of LED bulb.

40. A torch bulb is rated at 3 V and 600 mA. Calculate it's a) power b) resistance c) energy consumed if it is used for 4 hour.
    [OR]
41. Write about LED Television.

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<table>
<tr><td>UNIT
5</td><td><h1>ACOUSTICS</h1></td></tr>
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Important Points

➢ Wave velocity is the velocity with which the wave travels through the medium.

➢ Velocity of a sound wave is maximum in solids because they are more elastic in nature than liquids and gases. Since gases are least elastic in nature.

➢ Infrasonic waves are sound wave with a frequency below 20 Hz. A human ear cannot hear these waves.

➢ Ultrasonic waves are sound waves with frequency greater than 20 kHz, A human ear cannot detect these waves.

➢ Reflection of sound waves obey the laws of reflection.

➢ When a compression hits the boundary of a rarer medium, it is reflected as a rarefaction.

➢ An echo is the sound reproduced due to the reflection of the original sound wave.

➢ The minimum distance between the source and the reflecting surface should be 17.2 m to hear an echo clearly.

➢ "The apparent frequency" is the frequency of the sound as heard by the listener.

TEXT BOOK EVALUATION

I. Book Exercise – Choose the best answer

1. **When a sound wave travels through air, the air particles**
   a) vibrate along the direction of the wave motion
   b) vibrate but not in any fixed direction
   c) vibrate perpendicular to the direction of the wave motion
   d) do not vibrate

   Ans : (a) vibrate along the direction of the wave motion

2. **Velocity of sound in a gaseous medium is 330 m s^{-1}. If the pressure is increased by 4 times without causing a change in the temperature, the velocity of sound in the gas is**
   a) 330 ms^{-1} b) 660 ms^1 c) 156 ms^{-1} d) 990 ms^{-1}

   Ans : (a) 330 ms^{-1}

3. **The frequency, which is audible to the human ear is**
   a) 50 kHz   b) 20 kHz   c) 15000 kHz   d). 10000 kHz

   Ans : (b) 20 kHz

4. **The velocity of sound in air at a particular temperature is 330 m s^{-1}. What will be its value when temperature is doubled and the pressure is halved?**
   a) 330 ms^{-1} b) 165 ms^{-1} c) 330 × $\sqrt{2}$ ms^{-1} d) 320 / $\sqrt{2}$ ms^{-1}

   Ans : (c) 330 × $\sqrt{2}$ ms^{-1}

5. **If a sound wave travels with a frequency of 1.25 × 10^4 Hz at 344 m s^{-1}, the wavelength will be**
   a) 27.52 m   b) 275.2 m   c) 0.02752 m   d) 2.752 m

   Ans : (c) 0.02752 m

6. **The sound waves are reflected from an obstacle into the same medium from which they were incident. Which of the following changes?**
   a) speed   b) frequency   c) wavelength   d) none of these

   Ans : (d) none of these

7. **Velocity of sound in the atmosphere of a planet is 500 m s⁻¹. The minimum distance between the sources of sound and the obstacle to hear the echo, should be**

     a) 17 m   b) 20 m   c) 25 m   d) 50 m

Ans : (c) 25 m

II. Book Exercise – Fill in the blanks

1. Rapid back and forth motion of a particle about its mean position is called _____.   **Ans :** vibration

2. If the energy in a longitudinal wave travels from south to north, the particles of the medium would be vibrating in _____.   **Ans :** both North and South

3. A whistle giving out a sound of frequency 450 Hz, approaches a stationary observer at a speed of 33 ms⁻¹. The frequency heard by the observer is (speed of sound = 330 ms⁻¹) _____.   **Ans :** 500 Hz

4. A source of sound is travelling with a velocity 40 km/h towards an observer and emits a sound of frequency 2000 Hz. If the velocity of sound is 1220 km/h, then the apparent frequency heard by the observer is _____.   **Ans :** 2068 Hz

III. Book Exercise – True or False (If false correct it)

1. **Sound can travel through solids, gases, liquids and even vacuum.**
   Ans : False. Sound can travel through solids, gases, liquids and cannot through vacuum.

2. **Waves created by Earth Quake are Infrasonic.**
   Ans : True.

3. **The velocity of sound is independent of temperature.**
   Ans : False. The velocity of sound is dependent of temperature.

4. **The Velocity of sound is high in gases than liquids.**
   Ans : False. The Velocity of sound is less in gases than liquids.

IV. Book Exercise – Match the following

1.   1. **Infrasonic**   (a)   **Compressions**
        2. **Echo**   (b)   **22 kHz**
        3. **Ultrasonic**   (c)   **10 Hz**
        4. **High pressure region**   (d)   **Ultrasonography**

   Ans :

1	Infrasonic	c	10 Hz
2	Echo	d	Ultrasonography
3	Ultrasonic	b	22 kHz
4	High pressure region	a	Compressions

V. Book Exercise – Assertion and reason type questions

Mark the correct choice as

    i) **If Both the assertion and the reason are true and the reason is the correct explanation of assertion.**

    ii) **If Both the assertion and the reason are true, but the reason is not the correct explanation of the assertion.**

    iii) **Assertion is true, but the reason is false.**

    iv) **Assertion is false, but the reason is true.**

1.   **Assertion:**   The change in air pressure affects the speed of sound.
       Reason: The speed of sound in a gas is proportional to the square of the pressure.

Ans : (iv) Assertion is false, but the reason is true

2.　**Assertion:**　Sound travels faster in solids than in gases.

　　Reason:　Solid posses a greater density than that of gases.

　　　　　　　　　　Ans : (ii) If both the assertion and the reason are true and the reason is not the correct explanation of the assertion

VI. Book Exercise – Answer very briefly

1.　**What is a longitudinal wave?**

　　Ans : Sound waves are longitudinal waves that can travel through any medium (solids, liquids, gases) with a speed that depends on the properties of the medium.

2.　**What is the audible range of frequency?**

　　Ans :

　　Audible waves : These are sound waves with a frequency ranging between 20 Hz and 20,000 Hz. These are generated by vibrating bodies such as vocal cords, stretched strings etc.

3.　**What is the minimum distance needed for an echo?**

　　Ans : 17.2 m.

4.　**What will be the frequency sound having 0.20 m as its wavelength, when it travels with a speed of 331 ms^{-1}?**

　　Ans :

　　λ = 0.20 m; V= 331 ms^{-1}

　　V　= nλ

　　　　　　　　　n　= V/λ

　　　　　　　　　n　= 331ms^{-1}/0.20m

　　　　　　　　　　　= 331/0.20

　　　　　　　　　　　= 1655 Hz.

5.　**Name three animals, which can hear ultrasonic vibrations.**

　　Ans : Bat, Mosquito, Dogs.

VII. Book Exercise – Answer briefly

1.　**Why does sound travel faster on a rainy day than on a dry day?**

　　Ans : During rainy days, the moisture content is more in the atmosphere and speed or velocity of sound.

2.　**Why does an empty vessel produce more sound than a filled one?**

　　Ans : The sound is produced by the vibration of the vessel. More the vibration amplitude and frequency more is the noise. The empty one will be the condition allowing more amplified vibration because of more free space inside it (less molecules) that's why empty vessels make more noise. There is a lot of space for the surface to vibrate. But when it is filled then the surface is constrained by an outward force. More is the pressure less is sound. That is why solid body makes least sound.

3.　**Air temperature in the Rajasthan desert can reach 46°C. What is the velocity of sound in air at that temperature? (V$_0$ = 331 ms^{-1})**

　　Ans :

　　Speed of the sound wave as function of temperature is given by

　　　　　　$V = (V_0)\ (\sqrt{1} + Tc/273)$

　　Where Tc is the temperature in ^{o}celcius.

　　So the speed of sound wave in air at 46°c is given by

　　　　　　$V = 331\ (\sqrt{1} + 46/273)$

　　　　　　　　= 357.8 m/s.

4.　**Explain why, the ceilings of concert halls are curved.**

　　Ans : When a person is talking at one focus, his voice can be heard distinctly at the other focus. It is due to the multiple reflections of sound waves from the curved walls.

5. **Mention two cases in which there is no Doppler effect in sound?**

    Ans :

    i) When source (S) and listener (L) both are at rest.

    ii) When S and L move in such a way that distance between them remains constant.

VIII. Book Exercise – Problem corner

1. **A sound wave has a frequency of 200 Hz and a speed of 400 ms^{-1} in a medium. Find the wavelength of the sound wave.**

    Solution : n = 200 Hz; V = 400 m/s

    $$V = n\lambda$$
    $$\lambda = V/n$$
    $$= \frac{400 \text{ m / s}}{200 \text{ Hz}}$$
    $$\lambda = 2 \text{ m.}$$

2. **The thunder of cloud is heard 9.8 seconds later than the flash of lightning. If the speed of sound in air is 330 ms^{-1}, what will be the height of the cloud?**

    Solution :

    Given,

    Speed = 330 m/s; Time = 9.8 sec

    Let Height = Distance

    Speed = Distance / time

    We know distance is = Speed × Time

    Distance of the cloud = 330 × 9.8

    = 3234 m.

3. **A person who is sitting at a distance of 400 m from a source of sound is listening to a sound of 600 Hz. Find the time period between successive compressions from the source?**

    Solution :

    Given,

    Frequency (v) = 600 Hz

    Time period = ?

    We know that frequency = 1/T

    T = 1/Frequency

    T = 1/600 Hz

    = 0.0016 Sec.

    Thus, time interval between two consecutive compression of the given wave = 0.0016 seconds.

4. **An ultrasonic wave is sent from a ship towards the bottom of the sea. It is found that the time interval between the transmission and reception of the wave is 1.6 seconds. What is the depth of the sea, if the velocity of sound in the seawater is 1400 ms^{-1}?**

    Solution :

    Given,

    V = 1400 m/s

    T = 1.6 sec

    Let distance = speed × time

    2d = V × t

    d = V × t/2

    = 1400 × 1.6 / 2

    = 700 × 1.6

    = 1120 m.

5. **A man is standing between two vertical walls 680 m apart. He claps his hands and hears two distinct echoes after 0.9 seconds and 1.1 second respectively. What is the speed of sound in the air?.**
    Solution :
    Given:

    $t_1 = 0.9$ s; $t_2 = 1.1$ s; $d = 680$ m then V= ?

    $$d_1 = Vt_1 / 2$$
    $$d_2 = Vt_2 / 2$$

    By adding the equation 1 and 2, we get

    $$d_1 + d_2 = ½ (Vt_1 + Vt_2)$$
    $$\text{but } d_1 + d_2 = d$$
    $$d = ½ (Vt_1 + Vt_2)$$

    Then factor by V in equation 3

    $$d = V/2 (t_1 + t_2)$$
    $$680 \text{ m} = V/2 (0.9 + 1.1)s$$
    $$680 \text{ m} = V/2 (2) \text{ s}$$
    $$V = 680 \text{ m/s.}$$

    Therefore the velocity of air is 680 m/s.

6. **Two observers are stationed in two boats 4.5 km apart. A sound signal sent by one, under water, reaches the other after 3 seconds. What is the speed of sound in the water?**
    Solution :
    This is a question of Speed , distance and time which can be solved by using the formula

    Speed   = distance/ time

    As sound signal sent by one boat reaches the other boat.

Here distance between two observers	= 4.5 Km
	= (4.5 × 1000) m
	= 4500 m
Total time taken by sound signal to reach other	= 3 sec
According to the formula speed of sound in water	= distance / time
	= 4500 m / 3 s
	= 1500 m/s.

7. **A strong sound signal is sent from a ship towards the bottom of the sea. It is received back after 1s. What is the depth of sea given that the speed of sound in water 1450 ms⁻¹?**
    Solution :
    This question is based on echo, the formula for echo is

    Velocity × time/2   = distance

    Velocity is 1450 time is 1 s
    Just multiply them we got,

    $$1450 / 2 = D$$
    $$725 = D$$

    The distance is 725 m.

IX. Book Exercise – Answer in detail

1. **What are the factors that affect the speed of sound in gases?**
    Ans :
    Effect of density : The velocity of sound in a gas is inversely proportional to the square root of the density of the gas. Hence, the velocity decreases as the density of the gas increases. $v \propto 1/\sqrt{d}$

    Effect of temperature : The velocity of sound in a gas is directly proportional to the square root of its temperature. The velocity of sound in a gas increases with the increase in temperature. $v \propto \sqrt{T}$. Velocity at

temperature T is given by the following equation: $v_T = (v_o + 0.61\ T)$ m s^{-1} Here, v_o is the velocity of sound in the gas at 0° C. For air, $v_o = 331$ m s^{-1}. Hence, the velocity of sound changes by 0.61 m s^{-1} when the temperature changes by one degree celsius.

Effect of relative humidity : When humidity increases, the speed of sound increases. That is why you can hear sound from long distances. clearly duringrainy seasons.

2.   **What is mean by reflection of sound? Explain.**

     Ans : When sound waves travel in a given medium and strike the surface of another medium, they can be bounced back into the first medium. This phenomenon is known as reflection. In simple the reflection and refraction of sound is actually similar to the reflection of light. Thus, the bouncing of sound waves from the interface between two media is termed as the reflection of sound. The waves that strike the interface are termed as the incident wave and the waves that bounce back are termed as the reflected waves

     a)   **Reflection at the boundary of a rarer medium.**

         Ans : Consider a wave travelling in a solid medium striking on the interface between the solid and the air. The compression exerts a force F on the surface of the rarer medium. As a rarer medium has smaller resistance for any deformation, the surface of separation is pushed backwards .As the particles of the rarer medium are free to move, a rarefaction is produced at the interface. Thus, a compression is reflected as a rarefaction and a rarefaction travels from right to left.
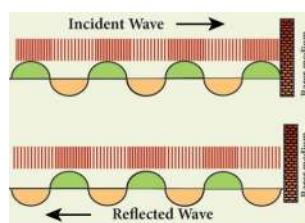
     b)   **Reflection at the boundary of a denser medium.**

         Ans : A longitudinal wave travels in a medium in the form of compressions and rarefactions. Suppose a compression travelling in air from left to right reaches a rigid wall. The compression exerts a force F on the rigid wall. In turn, the wall exerts an equal and opposite reaction $R = -F$ on the air molecules. This results in a compression near the rigid wall. Thus, a compression travelling towards the rigid wall is reflected back as a compression. That is the direction of compression is reversed.
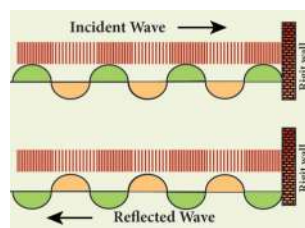
     c)   **Reflection at curved surfaces.**

         Ans : when the sound waves are reflected from the curved surfaces, the intensity of the reflected waves is changed. When reflected from a convex surface, the reflected waves are diverged out and the intensity is decreased. When sound is reflected from a concave surface, the reflected waves are converged and focused at a point. So the intensity of reflected waves is concentrated at a point.

3.   **a)**   **What do you understand by the term 'ultrasonic vibration'?**

         Ans : The vibrations whose frequencies are greater than 20000Hz are called Ultrasonic Vibrations.

     b)   **State three uses of ultrasonic vibrations.**

         Ans :

         ❖   Ultra sonic vibrations are used in SONAR to measure the depth of sea (or ocean) and to locate under water objects like Submarines, sea – rocks and shipwrecks

         ❖   It is used for scanning and imaging the position and growth of a foetus and presence of stones in the gall bladder and kidney

❖   It is used for homogenizing milk in milk plants where fresh milk is agitated with desired quantity of fat and powdered milk to obtain toned milk.

c)   Name three animals which can hear ultrasonic vibrations.

Ans : Bats can hear ultrasonic sounds having frequencies upto 1,20,000 Hz. Some animals like dogs and dolphins can hear sounds having frequencies upto 40.000 Hz.

4.   What is an echo?

Ans : An echo is the sound reproduced due to the reflection of the original sound from various rigid surfaces such as walls, ceilings, surfaces of mountains, etc. If you shout or clap near a mountain or near a reflecting surface, like a building you can hear the same sound again. The sound, which you hear is called an echo. It is due to the reflection of sound.

a)   State two conditions necessary for hearing an echo.

Ans : The persistence of hearing for human ears is 0.1 second. This means that you can hear two sound waves clearly, if the time interval between the two sounds is atleast 0.1 s. Thus, the minimum time gap between the original sound and an echo must be 0.1 s.

The above criterion can be satisfied only when the distance between the source of sound and the reflecting surface would satisfy the following equation:

$$\text{Velocity} = \text{distance travelled by sound/ time taken}$$

$$V = 2d / t$$

$$d = vt /2$$

$$\text{Since, } t = 0.1 \text{ second,}$$

$$\text{then } d = V \times 0.1/2 = V/20$$

Thus the minimum distance required to hear an echo is 1/20th part of the magnitude of the velocity of sound in air. If you consider the velocity of sound as 344 m s^{-1}, the minimum distance required to hear an echo is 17.2 m.

b)   What are the medical applications of echo?

Ans : The principle of echo is used in obstetric ultrasonography, which is used to create real-time visual images of the developing embryo or fetus in the mother's uterus. This is a safe testing tool, as it does not use any harmful radiations.

c)   How can you calculate the speed of sound using echo?

Ans : The sound pulse emitted by the source travels a total distance of 2d while travelling from the source to the wall and then back to the receiver. The time taken for this has been observed to be 't'. Hence, the speed of sound wave is given by:

Speed of Sound = distance travelled /time taken= 2d/t.

X. Book Exercise – Answer in detail

1.   Suppose that a sound wave and a light wave have the same frequency, then which one has a longer wavelength?

a) Sound   **b) Light**   **c) both a and b**   **d) data not sufficient**

Ans : (b) Light has a longer wavelength and has the greater speed.

2.   When sound is reflected from a distant object, an echo is produced. Let the distance between the reflecting surface and the source of sound remain the same.Do you hear an echo sound on a hotter day? Justify your answer.

Ans : An echo is heard when the time interval between the original sound and the reflected sound is at least 0.1s. The speed of sound in a medium increases with an increase in temperature. Hence, on a hotter day, the time interval between the original sound and the reflected sound will decrease.

Additional – Choose the best answer

1. _____ is a branch of physics that deals with production.

   a) Thermolysis   b) Acoustics   c) Nuclear physics   d) atomic physics

               Ans : (b) Acoustics

2. The vibrating bodies produce energy in the form of waves, which are nothing but _____

   a) Sound waves   b) light waves   c) either a or b   d) none

               Ans : (a) Sound waves

3. Sound can propagate through a gaseous medium or a liquid medium or a _____ medium

   a) Solid   b) solid and liquid   c) liquid and gas   d) all

               Ans : (a) solid

4. Sound waves are _____ waves.

   a) Longitudinal waves   b) transverse waves   c) either a or b   d) none

               Ans : (a) longitudinal waves

5. A series of high and low pressure regions called _____ and _____

   a) longitudinal, transverse   b) Compressions, refractions

   c) either a or b   d) none

               Ans : (b) Compressions, refractions

6. Audible waves with a frequency ranging between _____ and _____

   a) 20 Hz to 2000 Hz   b) 20 Hz to 20000Hz   c) 2 Hz to 20 Hz   d) None of the above

               Ans : (b) 20 Hz to 20000Hz

7. _____ waves are generated by vibrating bodies such as vocal cords, stretched strings etc

   a) Audible waves   b) infrasonic waves   c) Ultrasonic waves.   d) a and b

               Ans : (a) Audible waves

8. _____ waves with a frequency below 20Hz that cannot be heard by the human ear.

   a) Audible waves   b) infrasonic waves   c) Ultrasonic waves   d) a and c

               Ans : (b) infrasonic waves

9. _____ waves are produced during earth quake, ocean waves, sound produced by whales etc

   a) Audible waves   b) infrasonic waves   c) Ultrasonic waves   d) b and c

               Ans : (b) Infrasonic waves

10. _____ are sound waves with a frequency greater than 20 kHz.

    a) Audible waves   b) infrasonic waves   c). Ultrasonic waves   d) a and c

                Ans : (c) Ultrasonic waves

11. Sound wavelength ranges from _____ to _____

    a) 1.65 m to 1.75 m   b) 1.65 cm to 1.65 m   c) 1.65 cm to 1.75 cm   d) 1.65 m to 1.72 m

                Ans : (b) 1.65 cm to 1.65m

12. Light wavelength ranges from _____ to _____

    a) 4×10^{-6} m to 7×10^{-7} m   b) 4×10^{-7} m to 7×10^{-7} m

    c) 5×10^{-6} m to 7×10^{-7} m   d) none

                Ans : (b) 4×10^{-7}m to 7×10^{-7}m

13. Sound waves travels in air with a speed of about _____ m/s at NTP

    a) 320 m/s   b) 340 m/s   c) 350 m/s   d) 314 m/s

                Ans : (b) 340 m/s

14. Light waves travel in air with a speed of _____

    a) 3×10^6 m/s   b) 3×10^8 m/s   c) 3×10^{-4} m/s   d) 3×10^5 m/s

                Ans : (b) 3×10^8m/s

15. SI unit of velocity is _____

    a) m/s   b) m   c) ms   d) m²

                Ans : (b) m

16. **The velocity with which the particles of the medium vibrate in order to transfer the energy in the form of a Wave is called _____**
    a) Wave velocity b) particle velocity c) either a or b d) none

    Ans : (b) particle velocity

17. **The velocity with which the wave travels through the medium is called _____**
    a) Wave velocity b) particle velocity c) either a or b d) none

    Ans : (a) Wave velocity

18. **The compression exerts a Force F on the rigid wall, In turn, the wall exerts an equal and opposite reaction _____ on the air molecules.**
    a) R = F b) R= −F c) F = R d) F = −R

    Ans : (b) R= −F

19. **_____ surfaces are used when it is required to focus the sound at particular point.**
    a) Plane b) Curved c) parabolic d) elliptical

    Ans : (c) Parabolic

20. **_____ surface is used in designing whispering halls.**
    a) Plane b) curved c) parabolic d) elliptical

    Ans : (d) elliptical

21. **The persistence of hearing for human ears is _____ second**
    a) 0.1 m b) 0.1 sec c) 0.5 sec d) 0.1 sec

    Ans : (d) 0.1 sec

22. **The sound pulse emitted by the source travels a total distance of _____ while travelling from the source to the wall and then back to the receiver.**
    a) 4d b) 2d c) 3d d) 5d

    Ans : (b) 2d

23. **An _____ wave is emitted by a source attached to a police car.**
    a) Electromagnetic waves b) radio waves c) light waves d) mechanical waves

    Ans : (a) Electromagnetic waves

24. **_____ radio waves are sent, and the reflected waves are detected by the receiver of the station.**
    a) RADAR b) SONAR c) either a or b d) none

    Ans : (a) RADAR

25. **In _____ the speed of marine animals and submarines can be determined.**
    a) RADAR b) SONAR c) either a or b d) none

    Ans : (b) SONAR

Additional – Fill in the blanks

1. _____ plays a major role in Our lives. **Ans :** Sound

2. We communicate with each other mainly through _____. **Ans :** Sound

3. _____ a branch of physics that deals with transmission and reception. **Ans :** Acoustics

4. Sound waves are _____ waves that can travel through any medium with a speed that depends on the properties of the medium. **Ans :** longitudinal

5. As sound travels through a medium the particles of the medium vibrate along the _____ of propagation of the wave. **Ans :** direction

6. The displacement involves the _____ displacements of the individual molecules from their mean positions. **Ans :** Longitudinal

7. Longitudinal waves in a series of _____ and _____ pressure regions called compressions and rarefractions. **Ans :** High , Low

8. _____ waves are sound waves with a frequency ranging between 20Hz to 20000Hz. **Ans :** Audible

9.   _____ waves are generated by vibrating bodies such as vocal cords, stretched strings etc.
                                                                                    Ans : Audible

10. _____ waves are sound waves with a frequency below 20Hz that cannot be heard by the human ear.
                                                                                    Ans : Infrasonic

11. _____ waves are produced during earth Quake, Ocean waves, sound produced by whales, etc.
                                                                                    Ans : Infrasonic

12. _____ waves are sound waves with a frequency greater than 20KHz.   **Ans :** Ultrasonic

13. _____ ear cannot detect these waves, but certain creatures like mosquito, dogs, bats , dolphins can detect these waves.   **Ans :** Human

14. In _____ medium is required for the propagation.   **Ans :** Sound

15. In _____ medium is not required for the propagation.   **Ans :** Light

16. There are two velocities namely _____ and _____.   **Ans :** Particle, wave

17. SI unit of velocity is _____.   **Ans :** metre

18. The velocity with which the particles of the medium vibrate in order to transfer the energy in the form of a wave is called _____ velocity.   **Ans :** particle

19. The velocity with which the wave travels through the medium is called _____ velocity.   **Ans :** wave

20. _____ can be defined as the distance travelled per second by a sound wave. **Ans :** Velocity

21. Velocity of sound wave is _____ in solids because they are more elastic in nature than liquids and gases.   **Ans :** Maximum

22. Gases are _____ elastic in nature, the velocity of sound is the _____ in a gaseous medium.
                                                                                    Ans : least, least

23. The _____ of sound is directly proportional to the square root of the elastic modules.   **Ans :** speed

24. The speed of sound is _____ proportional to the square root of the density.   **Ans :** Inversely

25. The velocity of sound in solids _____ as the density increases.   **Ans :** decreases

26. The velocity of sound in solids _____ when the elasticity of the material increases.
                                                                                    Ans : Increases

27. The velocity of sound in a gas is _____ proportional to the square root of the density of the gas.
                                                                                    Ans : inversely

28. The velocity decreases as the density of the gas _____.   **Ans :** increases

29. The velocity of sound in a gas is _____ proportional to the square root of its temperature.
                                                                                    Ans : directly

30. The velocity of sound in a gas _____ with the _____ in temperature. **Ans :** increases, Increases

31. The velocity of sound in the iron is _____.   **Ans :** 1450m/s

32. The velocity of sound in the air is _____.   **Ans :** 331 m/s

33. The velocity of sound changes by _____.   **Ans :** 0.61 m/s

34. When humidity increases the speed of sound _____.   **Ans :** increases

35. The speed of sound in copper is _____.   **Ans :** 5010 m/s

36. The speed of Iron in iron is _____.   **Ans :** 5950 m/s

37. The speed of Aluminium is _____.   **Ans :** 6420 m/s

38. The speed of Kerosene is _____.   **Ans :** 1324 m/s

39. The speed of water in liquid is _____.   **Ans :** 1493 m/s

40. The speed of Sea water in liquid is _____.   **Ans :** 1533 m/s

41. The speed of air in gas is _____.   **Ans :** 331 m/s

42. The speed of Air (at 200C) is _____.   **Ans :** 343 m/s

43. When sound waves travel in a given medium and strike the surface of another medium, they can be bounced back into the first medium. This phenomenon is known as _____.   **Ans :** Reflection

44. In simple the reflection and refraction of sound is actually similar to the _____.
     Ans : reflection of light

45. The bouncing of sound waves from the interface between two media is termed as the _____ of sound.   **Ans :** Reflection

46. The incident wave, the normal to the reflecting surface and the reflected wave at the point of _____ lie in the same plane.   **Ans :** incidence

47. The angle of _____ is equal to the angle of _____.   **Ans :** Incidence, reflection

48. The sound waves that travel towards the reflecting surface are called the _____.
     Ans : incident waves

49. The sound waves bouncing back from the thereflecing surface are called _____.
     Ans : Reflected waves

50. All practical purposes the point of incidence and the point of reflection is the same point on the _____.   **Ans :** reflecting surface

51. A perpendicular line drawn at the point of incidence is called the _____.   **Ans :** Normal

52. The angle which the incident sound wave makes with the normal is called the _____.
     Ans : Angle of incidence

53. The angle which the reflected wave makes with the normal is called the _____.
     Ans : angle of reflection

54. Acoustical wonder of _____ fort is placed in Hyderabad.   **Ans :** Golconda

55. A _____ wave travels in a medium in the form of compressions and refractions.   **Ans :** longitudinal

56. The compression exerts a force F on the rigid wall . In turn, the wall exerts an equal and opposite reaction _____ on the air molecules.   **Ans :** R= −F

57. A compression travelling towards the rigid wall is reflected back as a _____.   **Ans :** compression

58. The compression exerts a force F on the surface of the _____ medium.   **Ans :** Rarer

59. As a rarer medium has _____ resistance for any deformation, the surface of separation is pushed backwards.   **Ans :** Smaller

60. The medium in which the velocity of sound _____ compared to other medium is called rarer medium.   **Ans :** increases

61. The medium in which the velocity of sound _____ compared to other medium is called denser medium.   **Ans :** decreases

62. The intensity of the reflected wave is neither _____ nor _____.   **Ans :** decreased , increased

63. When the sound waves are reflected from the curved surfaces the _____ of the reflected waves is changed.   **Ans :** intensity

64. When reflected from a convex surface the reflected waves are _____ out and the intensity is decrease.   **Ans :** diverged

65. When sound is reflected from a concave surface , the reflected waves are _____ and focused at a point.   **Ans :** Converged

66. Many halls are designed with _____ reflecting surfaces.   **Ans :** parabolic

67. In _____ surfaces sound from one focus will always be reflected to the other focus.   **Ans :** Elliptical

68. In a _____ hall, the speech of a person standing in one focus can be heard clearly by a listener standing at the other focus.   **Ans :** whispering

69. One of the famous whispering galleries is in St.Paul's cathedral church in _____.   **Ans :** London

70. An _____ is the sound reproduced due to the reflection of the original sound from various rigid surfaces such as walls , ceilings, surfaces and mountains. **Ans :** echo

71. The sound which you is hear after reflection is called an _____. **Ans :** Echo

72. The minimum time gap between the original sound and echo must be _____. **Ans :** 0.1 s

73. Velocity is equal to _____. **Ans :** distance travelled by sound/time taken

74. The minimum distance required to hear an echo is _____ part of the velocity of sound in air. **Ans :** $1/20^{th}$

75. The velocity of sound in air is _____. **Ans :** 344 m/s

76. The minimum distance required to hear an echo is _____. **Ans :** 17.2 m

77. The principle of echo is used in obstetric _____. **Ans :** ultrasonography

78. _____ is used to determine the velocity of sound waves in any medium. **Ans :** Echo

79. _____ are basically curved surfaces, which are used in auditoria and halls to improve the quality of sound. **Ans :** Sound board

80. _____ is a hearing aid. **Ans :** Ear trumpet

81. In ear trumpet, one end is _____ and the other one is _____. **Ans :** wide, narrow

82. Ear trumpet helps in concentrating the sound and the sound enters the ear drum with more _____. **Ans :** Intensity

83. A _____ is a horn-shaped device used to address a small gathering of people. **Ans :** Megaphone

84. Doppler effect was created by the _____. **Ans :** Christian Doppler

85. Doppler is an Austrian Mathematician and _____. **Ans :** Physicist

86. Whenever there is a relative motion between a source and a listener, the frequency of the sound heard by the listener is different from the original frequency of sound emitted by the source. This is known as _____. **Ans :** Doppler effect

87. It is assumed that the medium is rest. That is the velocity of the medium is _____. **Ans :** Zero

88. Both source and listener move away from each other, expression for apparent frequency is _____. **Ans :** $n' = \left(\dfrac{v - v_L}{v + v_s} \right) n$

89. Both source and listener move one behind the other, expression of apparent frequency is _____. **Ans :** $n' = \left(\dfrac{v - v_L}{v - v_s} \right) n$

90. Listener follows the source, expression of apparent frequency is _____ **Ans :** $n' = \left(\dfrac{v + v_L}{v + v_s} \right) n$

91. Source at rest listener moves towards the source, expression of apparent frequency is _____. **Ans :** $n' = \left(\dfrac{v + v_L}{v} \right) n$

92. Source at rest listener moves away from the source, expression of apparent frequency is _____. **Ans :** $n' = \left(\dfrac{v - v_L}{v} \right) n$

93. Source moves towards the listener _____. **Ans :** $n' = \left(\dfrac{v}{v - v_s} \right) n$

94. Source moves away from the listener _____. **Ans :** $n' = \left(\dfrac{v}{v + v_s} \right) n$

95. The frequency of _____ emitted by a satellite decreases as the satellite passes away from the earth. **Ans :** Radio waves

96. _____ the speed of marine animals and submarines can be determined. **Ans :** SONAR

97. A _____ wave helps to track the over speeding vehicles. **Ans :** electromagnetic

---

Additional – Match the following

1.			
1.	Audible waves	(a)	below 20 Hz
2.	Infrasonic waves	(b)	greater than 20 Hz
3.	Ultrasonic waves	(c)	high and low pressure
4.	Longitudinal waves	(d)	20 Hz and 20000 Hz

1	Audible waves	d	20 Hz and 20000 Hz
2	Infrasonic waves	a	below 20 Hz
3	Ultrasonic waves	b	greater than 20 Hz
4	Longitudinal waves	c	high and low pressure

2.
Nature of medium	Name of the medium	Speed of sound
Solid	Copper	1324 m/s
Solid	water	5950 m/s
Liquid	Iron	1493 m/s
Liquid	kerosene	5010 m/s

Nature of the medium	Name of the medium	Speed of sound
Solid	Copper	5010 m/s
Liquid	Water	1493 m/s
Solid	Iron	5950 m/s
Liquid	Kerosene	1324 m/s

Additional – Assertion and reason

1. **Assertion:** The incident wave, the normal to the reflecting surface and the reflected wave at the point of incidence lie in the same plane.
   Reason: The angle of incidence (i) is equal to the angle of reflection(r).
   a) A is right R is wrong
   b) A is wrong R is right
   c) A and R are correct
   d) R does not explain A

   Ans : (c) A and R are correct

2. **Assertion:** The medium in which the velocity of sound increases compared to other medium is called rarer medium.
   Reason: Water is rarer compared to air for Sound.
   a) A is right R is wrong
   b) A is wrong R is right
   c) R explains A
   d) R does not explain A

   Ans : (c) R explains A

3. **Assertion:** The medium in which the velocity of sound decreases compared to other medium is called denser medium.
   Reason: Air is denser compared to water for sound.
   a) A is right R is wrong
   b) A is wrong R is right
   c) R explains A
   d) R does not explain A

   Ans : (c) R explains A

4. **Assertion:** Parabolic surfaces are used when it is required to focus the sound at a particular point.
   Reason: Many halls are designed with elliptical surfaces.
   a) A is right R is wrong
   b) A is wrong R is right
   c) R explains A
   d) R does not explain A

   Ans : (a) A is right R is wrong

5. **Assertion:** Ear trumpet is a hearing aid, which is useful by people who have difficulty in hearing.
   Reason: This device is used to address a small gathering of people.
   a) A is right R is wrong
   b) A is wrong R is right
   c) R explains A
   d) R does not explain A

   Ans : (a) A is right R is wrong

Additional – True or false (correct the statement if it is false)

1. **Sound waves are transverse waves.**

   Ans : False: sound waves are longitudinal waves.

2. **Sound waves travel in air with a speed of about 326 m/s at STP.**

   Ans : False. Sound waves travel in air with a speed of about 340 m/s at NTP.

3. **Infrasonic waves produced during earth quake, ocean waves, sound produced by whales, etc.**

   Ans : True.

4. **Humidity decreases the speed of sound also increases.**

   Ans : False. Humidity increases the speed of sound also increases.

5. **The bouncing of sound waves from the interfere between two media is termed as the refraction of sound.**

   Ans : False. The bouncing of sound waves from the interfere between two media is termed as the reflection of sound.

6. **A perpendicular line drawn at the point of incidence is called the normal**

   Ans : True.

7. **The direction of compression is not reversed**

   Ans : False. The direction of compression is reversed.

8. **A rarer medium has smaller resistance for any deformation, the surface of separation is pulled backward**

   Ans : False. A rarer medium has smaller resistance for any deformation, the surface of separation is pushed backwards

9. **In sonar, the frequency change, the speed and location of the areoplanes and aircrafts are tracked**

   Ans : False. In radar, the frequency change, the speed and location of the areoplanes and aircrafts are tracked.

10. **The apparent frequency is the frequency of the sound as heard by the listener.**

    Ans : True.

Additional – Short answer questions

1. **What do you mean by acoustics?**

   Acoustics is a branch of physics that deals with production,transmission, reception, control, and effectsof sound.

2. **How is sound produced?**

   The sound is produced by vibrations.

3. **Will you able to hear any sound produced by your friend?**

   As the Moon does not have air, you will not be able to hear any sound produced by your friend. Hence, you understand that the sound produced due to the vibration of different bodies needs a material medium like air, water, steel, etc, forits propagation. Hence, sound can propagatethrough a gaseous medium or a liquid.

4. **What is called compressions and rare factions?**

   As sound travels through a medium, the particles ofthe medium vibrate along the direction ofpropagation of the wave. This displacement involves the longitudinal displacements of the individual molecules from their meanpositions. This results in a series of high andlow pressure regions called compressions and rare factions.

5. **Write a short note on Audible waves.**

   These are sound waves with a frequency ranging between 20 Hz and 20,000 Hz. These are generated by vibrating bodies such as vocal cords,stretched strings.

6.   Write a short note on Infrasonic waves

These are sound waves with a frequency below 20 Hz that cannot be heard by the human ear. e.g., waves produced during earth quake, ocean waves, sound produced by whales.

7.   Write a short note on Ultrasonic waves.

These are sound waves with a frequency greater than 20 kHz, Human ear cannot detect these waves, but certain creatures like mosquito, dogs, bats, dolphins can detect these waves. e.g., waves produced by bats.

8.   Write the types of velocities'

Particle velocity : The velocity with which the particles of the medium vibrate in order to transfer the energy in the form of a wave is called particle velocity.

Wave velocity : The velocity with which the wave travels through the medium is called wave velocity. In other words, the distance travelled by a sound wave in unit time is called the velocity of a sound.

9.   Write the difference between the sound and light waves

S.No.	Sound	Light
1	Medium is required for the propagation	Medium isnot required for the propagation
2	Sound waves are longitudinal	Light waves are transverse
3	Wavelength ranges from 1.65 cm to 1.65 m	Wavelength ranges from 4×10^{-7} m to 7×10^{-7} m
4	Sound waves travel in air with a speed of about 340 m s^{-1} at NTP	Light waves travel in air with a speed of 3×10^8 m s^{-1}

10. Write the laws of reflection.

✦   The incident wave, the normal to the reflecting surface and the reflected wave at the point of incidence lie in the same plane.

✦   The angle of incidence $\angle$i is equal to the angle of reflection $\angle$r.

11. Define Normal, angle of incidence and angle of reflection.

Normal : A perpendicular line drawn at the point of incidence is called the normal.

The angle of incidence : The angle which the incident sound wave makes with the normal is called the angle of incidence, ' i '.

The angle of reflection : The angle which the reflected wave makes with the normal is called the angle ofreflection ' r '.

12. What is meant by rarer and denser medium?

The medium in which the velocity of sound increases compared to other medium is called rarer medium. (Water is rarer compared to air for sound). The medium in which the velocity of sound decreases compared to other medium is called denser medium. (Air is denser compared to water for sound)

13. Explain the parabolic forces.

Parabolic surfaces are used when it is required to focus the sound at a particular point. Hence, many halls are designed with parabolic reflecting surfaces.

14. Explain the Elliptical surfaces.

In elliptical surfaces, sound from one focus will always be reflected to the other focus, no matter where it strikes the wall.This principle is used in designing whispering halls. In a whispering hall, the speech of a person standing in one focus can be heard clearly by a listener standing at the other focus.

15. Explain whispering gallery.

One of the famous whispering galleries is in St. Paul's cathedral church in London. It is built with elliptically shaped walls. When a person is talking at one focus, his voice can be heard distinctly at the other focus. It is due to the multiple reflections of sound waves from the curved walls.

16. Define Echo.

An echo is the sound reproduced due to the reflection of the original sound from various rigid surfaces such as walls, ceilings, surfaces of mountains, etc.

17. Define Doppler Effect.

When ever there is a relative motion between a source and a listener, the frequency of the sound heard by the listener is different from the original frequency of sound emitted by the source. This is known as "Doppler effect".

18. Write the possibilities of Doppler Effect.
- ✦ The listener moves towards or away from a stationary source.
- ✦ The source moves towards or away from a stationary listener.
- ✦ Both source and listener move towards or away from one other.
- ✦ The medium moves when both source and listener are at rest.

Additional – Long answer questions

1. Explain Longitudinal waves.
- ❖ Sound waves are longitudinal waves that can travel through any medium (solids, liquids, gases) with a speed that depends on the properties of the medium.
- ❖ As sound travels through a medium, the particles of the medium vibrate along the direction of propagation of the wave.
- ❖ This displacement involves the longitudinal displacements of the individual molecules from their mean positions.
- ❖ This results in a series of high and low pressure regions called compressions and rarefactions.
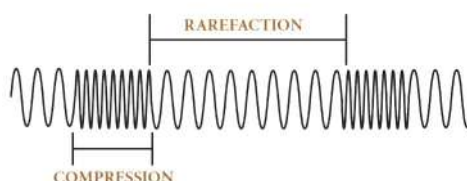
2. Write the categories of sound waves based on their frequencies.
- ❖ **Audible waves :** These are sound waves with a frequency ranging between 20 Hz and 20,000 Hz. These are generated by vibrating bodies such as vocal cords, stretched strings etc.
- ❖ **Infrasonic waves :** These are sound waves with a frequency below 20 Hz that cannot be heard by the human ear. e.g., waves produced during earth quake, ocean waves, sound produced by whales, etc.
- ❖ **Ultrasonic waves :** These are sound waves with a frequency greater than 20 kHz, Human ear cannot detect these waves, but certain creatures like mosquito, dogs, bats, dolphins can detect these waves. e.g., waves produced by bats.

3. Explain Wave Velocity.

Wave velocity: The velocity with which the wave travels through the medium is called wave velocity. In other words, the distance travelled by a sound wave in unit time is called the velocity of a sound wave.

$$\therefore \text{ Velocity = Distance / Time taken}$$

If the distance travelled by one wave is taken as one wavelength (λ) and, the time taken for this propagation is one time period (T), then, the expression for velocity can be written as;

$$V = \lambda/T.$$

Therefore, velocity can be defined as the distance travelled per second by a sound wave. Since, Frequency (n) =1/T, equationcan be written as;

$$V = n\lambda.$$

Velocity of a sound wave is maximum in solids because they are more elastic in nature than liquids and gases. Since, gases are least elastic in nature, the velocity of sound is the least in a gaseous medium.

So, vS>vL>vG.

4. Explain Reflection of sound.

❖ When sound waves travel in a given medium and strike the surface of another medium, they can be bounced back into the first medium. This phenomenon is known as reflection.

❖ In simple the reflection and refraction of sound is actually similar to the reflection of light.

❖ Thus, the bouncing of sound waves from the interface between two media is termed as the reflection of sound.

❖ The waves that strike the interface are termed as the incident wave and the waves that bounce back are termed as the reflected waves.

5. Explain the laws of reflection.

The following two laws of reflection are applicable to sound waves as well. The incident wave ϖ, the normal to the reflecting surface and the reflected wave at the point of incidence lie in the same plane.

     ϖ The angle of incidence $\angle i$ is equal to the angle of reflection $\angle r$.

     The sound waves that travel towards the reflecting surface are called the incident waves.

     The sound waves bouncing back from the reflecting surface are called reflected waves.

     For all practical purposes, the point of incidence and the point of reflection is the same point on the reflecting surface.

     A perpendicular line drawn at the point of incidence is called the normal. The angle which the incident sound wave makes with the normal is called the angle of incidence, 'i'.

     The angle which the reflected wave makes with the normal is called the angle of reflection, 'r'.
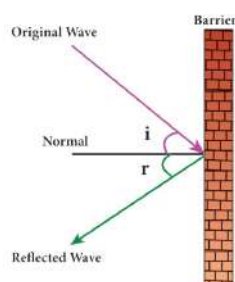
6. Write the applications of Echo.

❖ Some animals communicate with each other over long distances and also locate objects by sending the sound signals and receiving the echo as reflected from the targets.

❖ The principle of echo is used in obstetric ultrasonography, which is used to create real-time visual images of the developing embryo or fetus in the mother's uterus. This is a safe testing tool, as it does not use any harmful radiations.

❖ Echo is used to determine the velocity of sound waves in any medium.

7. How to measuring velocity of sound by echo method.

Apparatus required :

A source of sound pulses, a measuring tape, a sound receiver, and a stop watch.

Procedure :

❖ Measure the distance 'd' between the source of sound pulse and the reflecting surface using the measuring tape.

❖ The receiver is also placed adjacent to the source. A sound pulse is emitted by the source.

❖ The stopwatch is used to note the time interval between the instant at which the sound pulse is sent and the instant at which the echo is received by the receiver. Note the time interval as 't'.

❖ Repeat the experiment for three or four times. The average time taken for the given number of pulses is calculated.

8. Write the applications of Reflection of Sound.

Sound board :

These are basically curved surfaces (concave), which are used in auditoria and halls to improve the quality of sound. This board is placed such that the speaker is at the focus of the concave surface. The sound of the speaker is reflected towards the audience thus improving the quality of sound heard by the audience.

Ear trumpet :

Ear trumpet is a hearing aid, which is useful by people who have difficulty in hearing. In this device, one end is wide and the other end is narrow. The sound from the sources fall into the wide end and are reflected by its walls into the narrow part of the device. This helps in concentrating the sound and the sound enters the ear drum with more intensity. This enables a person to hear the sound better.

Megaphone :

A megaphone is a horn–shaped device used to address a small gathering of people. Its one end is wide and the other end is narrow. When a person speaks at the narrow end, the sound of his speech is concentrated by the multiple reflections from the walls of the tube. Thus, his voice can be heard loudly over a long distance.

9. **Explain Doppler effect.**

The frequency of the sound as received by a listener is different from the original frequency produced by the source whenever there is a relative motion between the source and the listener. This is known as Doppler effect This relative motion could be due to various possibilities as follows:

❖ The listener moves towards or away from a stationary source.

❖ The source moves towards or away from a stationary listener.

❖ Both source and listener move towards or away from one other.

❖ The medium moves when both source and listener are at rest

For simplicity of calculation, it is assumed that the medium is at rest. That is the velocity of the medium is zero.

Let S and L be the source and the listener moving with velocities v_S and v_L respectively. Consider the case of source and listener moving towards each other As the distance between them decreases, the apparentfrequency will be more than the actual source frequency.
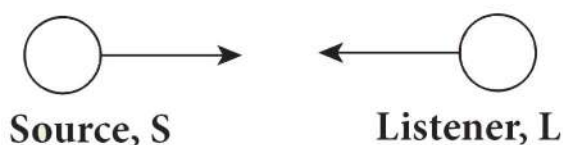
Source, S   Listener, L

Let n and n' be the frequency of the sound produced by the source and the sound observed by the listener respectively. Then, the expression for the apparent frequency n' is $n' = \dfrac{v + v_L}{v - v_S} n$

Here, v is the velocity of sound waves in the given medium. Let us consider different possibilities of motions of the source and the listener. In all such cases, the expression for the apparent frequency.

11. **Tabulate the expression for apparent frequency due to Doppler effect.**

Case No.	Position of source and listener	Note	Expression for apparent frequency
1	❖ Both source and listener move ❖ They move towards each other	✦ Distance between source and listener decreases ✦ Apparent frequency is more than actual frequency	$n' = \left(\dfrac{v + v_L}{v - v_S} \right) n$
2	❖ Both source and listener move ❖ They move away from each other	✦ Distance between source and listener increases ✦ Apparent frequency is less than actual frequency ✦ V_S and V_L become opposite to that in case–1.	$n' = \left(\dfrac{v - v_L}{v + v_S} \right) n$

Case No.	Position of source and listener	Note	Expression for apparent frequency
3	❖ Both source and listener move ❖ They move one behind the other ❖ Source follows the listener	✦ Apparent freqency depends on the velocities of the source and the listener ✦ V_S becomes opposite to that in case–2.	$n' = \left(\dfrac{v - v_L}{v - v_S}\right)n$
4	❖ Both source and listener move ❖ They move one behind the other ❖ Listener follows the source	✦ Apparent frequency depends on the velocities of the source and the listener ✦ V_S and V_L become opposite to that in case–3.	$n' = \left(\dfrac{v + v_L}{v + v_S}\right)n$
5	❖ Source at rest ❖ Listener moves towards the source	✦ Distance between source and listener decreases ✦ Apparent frequency is more than actual frequency ✦ $V_S = 0$ in case–1	$n' = \left(\dfrac{v + v_L}{v}\right)n$
6	❖ Source at rest ❖ Listener moves towards the source	✦ Distance between source and listener increases ✦ Apparent frequency is less than actual frequency ✦ $V_S = 0$ in case–2	$n' = \left(\dfrac{v - v_L}{v}\right)n$
7	❖ Listener at rest ❖ Source moves towards the listener	✦ Distance between source and listener decreases ✦ Apparent frequency is more than actual frequency ✦ $V_L = 0$ in case–1	$n' = \left(\dfrac{v}{v - v_S}\right)n$
8	❖ Listener at rest ❖ Source moves towards the listener	✦ Distance between source and listener increases ✦ Apparent frequency is less than actual frequency ✦ $V_L = 0$ in case–2	$n' = \left(\dfrac{v}{v + v_S}\right)n$

12. Write the conditions for No Doppler effect.

Under the following circumstances, there will be no Doppler effect and the apparent frequency as heard by the listener will be the same as the source frequency.

❖ When source (S) and listener (L) both are at rest.

❖ When S and L move in such a way that distance between them remains constant.

❖ When source S and L are moving in mutually perpendicular directions.

❖ If the source is situated at the center of the circle along which the listener is moving.

13. Write the applications of Doppler Effect.

❖ To measure the speed of an automobile An electromagnetic wave is emitted by a source attached to a police car. The wave is reflected by a moving vehicle, which acts as a moving source. There is a shift in the frequency of the reflected wave. From the frequency shift, the speed of the car can be determined. This helps to track the over speeding vehicles.

❖ Tracking a satellite The frequency of radio waves emitted by a satellite decreases as the satellite passes away from the Earth. By measuring the change in the frequency of the radio waves, the location of the satellites is studied.

❖ RADAR (RAdio Detection AndRanging) In RADAR, radio waves are sent, and the reflected waves are detected by the receiverof the RADAR station. From the frequency change, the speed and location of the aeroplanes and aircrafts are tracked.

❖ SONAR In SONAR, by measuring the change in the frequency between the sent signal and received signal, the speed of marine animals and submarines can be determined.

Additional – Solved problems

1. **At what temperature will the velocity of sound in air be double the velocity of sound in air at 0° C?**

   Solution : Let T° C be the required temperature. Let v1 and v2 be the velocity of sound at temperatures T1 K and T2 K respectively.

   $$T1 = 273 \text{ K } (0° \text{ C}) \text{ and}$$
   $$T2 = (T° \text{ C} + 273) \text{ K}$$
   $$v2 / v1 = \sqrt{T2} / T1 = \sqrt{273} + T = \sqrt{} = \sqrt{273} = 2$$

   Here, it is given that, v2 / v1 = 2.

   $$\text{So, } 273 + T / 273 = 4$$
   $$T = (273 \times 4) - 273$$
   $$= 819° \text{ C.}$$

2. **A source producing a sound of frequency 90 Hz is approaching a stationary listener with a speed equal to (1/10) of the speed of sound. What will be the frequency heard by the listener?**

   Solution : When the source is moving towards the stationary listener, the expression for apparent frequency is

   $$n' = \left(\frac{v}{v - v_s}\right)n$$

   $$= \left(\frac{v}{v - \left(\frac{1}{10}\right)v}\right)n = \left(\frac{10}{9}\right)n$$

   $$= \left(\frac{10}{9}\right) \times 90$$

   $$= 100 \text{ Hz.}$$

3. **A source producing a sound of frequency 500 Hz is moving towards a listener with a velocity of 30 m s^{-1}. The speed of the sound is 330 m s^{-1}. What will be the frequency heard by listener?**

   Solution : When the source is moving towards the stationary listener, the expression for apparent frequency is

   $$n' = \left(\frac{v}{v - v_s}\right)n$$

   $$n' = \left(\frac{330}{330 - 30}\right) \times 500$$

   $$= 550 \text{ Hz.}$$

4. **A source of sound is moving with a velocity of 50 m s^{-1} towards a stationary listener. The listener measures the frequency of the source as 1000 Hz. what will be the apparent frequency of the source when it is moving away from the listener after crossing him? (velocity of sound in the medium is 330 m s^{-1})**

Solution :

$$n' = \left(\frac{v}{v - v_s}\right) n$$

$$1000 = \left(\frac{330}{330 - 50}\right) n$$

$$n' = \left(\frac{1000 \times 280}{330}\right)$$

$$n = 848.48 \text{ Hz.}$$

The actual frequency of the sound is 848.48 Hz. When the source is moving away from the stationary listener, the expression for apparent frequency is

$$n' = \left(\frac{v}{v + v_s}\right) n$$

$$= \left(\frac{330}{330 + 50}\right) \times 848.48$$

$$= 736.84 \text{ Hz.}$$

5. **A source and listener are both moving towards each other with a speed v/10 where v is the speed of sound. If the frequency of the note emitted by the source is f, what will be the frequency heard by the listener?**

Solution : When source and listener are both moving towards each other, the apparent frequency is

$$n' = \left(\frac{v + v_l}{v - v_s}\right) . n$$

$$n' = \left(\frac{v + \dfrac{v}{10}}{v - \dfrac{v}{10}}\right) . n$$

$$n' = \frac{11}{9} . f$$

$$= 1.22 \text{ f.}$$

6. **At what speed should a source of sound move away from a stationary observer so that observer finds the apparent frequency equal to half of the original frequency?**

Solution :

$$n' = \left(\frac{v}{v + v_s}\right) . n$$

$$\frac{n}{2} = \left(\frac{v}{v + v_s}\right) . n$$

$$v_s = v.$$

UNIT TEST-5

Time : 1.15 Hrs.   Marks : 50

I. Choose the best answer

(5 × 1 = 5)

1. **The frequency, which is audible to the human ear is**
    a) 50 kHz   b) 20 kHz   c) 15000 kHz   d) 10000 kHz

2. **If a sound wave travels with a frequency of 1.25 × 104 Hz at 344 m s–1, the wavelength will be**
    a) 27.52 m   b) 275.2 m   c) 0.02752 m   d) 2.752 m

3. **Velocity of sound in the atmosphere of a planet is 500 m s–1. The minimum distance between the sources of sound and the obstacle to hear the echo, should be**
    a) 17 m   b) 20 m   c) 25 m   d) 50 m

4. **_____ is a branch of physics that deals with production.**
    a) Thermolysis   b) Acoustics   c) Nuclear physics   d) None

5. **_____ surface is used in designing whispering halls.**
    a) Plane   b) curved   c) parabolic   d) elliptical

II. Fill in the blanks

(5 × 1 = 5)

6. Sound waves are _____ waves that can travel through any medium with a speed that depends on the properties of the medium.

7. The velocity of sound in the air is _____.

8. The speed of Kerosene is _____.

9. One of the famous whispering galleries is in St.Paul's cathedral church in _____.

10. The minimum distance required to hear an echo is _____.

III. State whether the statements are true or false. Correct the false statement

(4 × 1 = 4)

11. Sound can travel through solids, gases, liquids and even vacuum.

12. Waves created by Earth Quake are Infrasonic.

13. The velocity of sound is independent of temperature

14. The Velocity of sound is high in gases than liquids.

IV. Match the following

(4 × 1 = 4)

15. Pitch   (a)   Noise
16. Loudness   (b)   frequency
17. Infrasonic   (c)   intensity
18. 120 dB   (d)   10Hz

V. Assertion and Reasoning

(3 × 1 = 3)

Direction: In each of the following questions, a statement of Assertion is given and a corresponding statement of Reason is given just below it. Of the statements given below, mark the correct answer as

    a.   If both A and R are true and R is the correct explanation of A.
    b.   If both A and R are true but R is not the correct explanation of A.
    c.   If A is true but R is false.
    d.   If both A and R are false.

19. **Assertion :** The change in air pressure affects the speed of sound.
    Reason: The speed of sound in a gas is proportional to the square of the pressure.

20. **Assertion:** Sound travels faster in solids than in gases.
    Reason: Solid posses a greater density than that of gases.

21. **Assertion:** Ear trumpet is a hearing aid, which is useful by people who have difficulty in hearing.
    Reason: This device is used to address a small gathering of people.

VI. Write the answer for the following questions in word or sentence

(3 × 1 = 3)

23. Write the abbreviation of SONAR.
24. What is the use of SONAR?
25. How are the wavelength and frequency of a sound related to its speed?

VII. Find the odd one out

(3 × 1 = 3)

26. Speed of Sound in Copper: 5000, 6354, 8900, 2343
27. Solid: Water, Kerosene, Seawater, Aluminium
28. Gas: Copper, Iron, lead, Air

VIII. Correct the mistakes

(3 × 1 = 3)

29. SI unit of velocity is Seconds.
30. Light waves are longitudinal.
31. The persistence of hearing for human ears is 0.2 second.

IX. Write the short answer for ANY 5 of the following questions.

(5 × 2 = 10)

32. What is a longitudinal wave?
33. What is the audible range of frequency?
34. Name three animals, which can hear Ultrasonic vibrations.
35. Write a short on Audible waves.
36. Write the difference between Sound and light.
37. Write the laws of reflection.
38. Define DOPPLER effect.

X. Write long answer for the following questions

(2 × 5 = 10)

38. Explain about the longuitudinal waves.

    [OR]

39. Write the categories of sound waves based on their frequencies.
40. Explain why, the ceilings of concert halls are curved.

    [OR]

41. Mention two cases in which there is no Doppler effect in sound.

CRIS❖CRIS

NUCLEAR PHYSICS

Important Points

➢ This phenomenon of spontaneous emission of radiation from certain elements on its own is called 'natural radioactivity'.

➢ Curie is defined as the quantity of a radioactive substance, which undergoes $3.7 \times 10_{10}$ disintegrations in one second. This is actually close to the activity of 1 g of radium–226.

➢ Rutherford (Rd) is defined as the quantity of a radioactive substance which produces 10^6 disintegrations in one second.

   1 Rd = 10^6 disintegrations per second.

➢ The SI unit of radioactivity is becquerel. It is defined as the quantity of one disintegration per second.

➢ Helium nucleus ($_2$He^4) consisting of two protons and two neutrons is known as alpha particle.

➢ Beta particles are electrons ($_{-1}$e^0), which are the basic elementary particles present in all atoms.

➢ Gamma rays are electromagnetic waves consisting of photons.

➢ A nuclear reaction in which an unstable parent nucleus emits an alpha particle and forms a stable daughter nucleus is called as 'alpha decay'.

➢ A nuclear reaction in which an unstable parent nucleus emits a beta particle and forms a stable daughter nucleus is called as 'beta decay'.

➢ The process of breaking (splitting) up of a heavier nucleus into two smaller nuclei with the release of a large amount of energy is called 'nuclear fission'.

➢ The energy released in a nuclear fission process is about 200 MeV.

➢ There are some radioactive elements which can be converted into a fissionable material. They are called as 'fertile materials'. e.g. Uranium–238, Thorium–232, Plutonium–240

➢ Controlled chain reaction is used in a nuclear reactor to produce energy in a sustained and controlled manner.

➢ The process in which two lighter nuclei combine to form a heavier nucleus is termed as 'nuclear fusion'

➢ Nuclear fusion or thermonuclear reaction is the source of light and heat energy in the Sun and other stars.

➢ The safe limit of receiving the radiation is about 100 mR per week.

TEXT BOOK EVALUATION

I. Book Exercise – Choose the best answer

1. **Man-made radioactivity is also known as _____.**
   a. Induced radioactivity
   b. Spontaneous radioactivity
   c. Artificial radioactivity
   d. a & c

   Ans : (d) a & c

2. **Unit of radioactivity is _____.**
   a. roentgen
   b. curie
   c. becquerel
   d. all the above

   Ans : (d) all the above

3. **Artificial radioactivity was discovered by _____.**
    a. Bequerel　　　　b. Irene Curie　　　　c. Roentgen　　　　d. Neils Bohr

    Ans : (b) Irene Curie

4. **In which of the following, no change in mass number of the daughter nuclei takes place**
    i) α decay　　　　ii) β decay　　　　iii) γ decay　　　　iv) neutron decay
    a. (i) is correct　　　　　　　　　　b. (ii) and (iii) are correct
    c. (i) & (iv) are correct　　　　　　d. (ii) & (iv) are correct

    Ans : (c) (i) & (iv) are correct

5. **_____ isotope is used for the treatment of cancer.**
    a. Radio Iodine　　　b. Radio Cobalt　　　c. Radio Carbon　　　d. Radio Nickel

    Ans : (b) Radio Cobalt

6. **Gamma radiations are dangerous because**
    a. it affects eyes & bones　　　　　　b. it affects tissues
    c. it produces genetic disorder　　　　d. it produces enormous amount of heat

    Ans : (c) it produces genetic disorder

7. **_____ aprons are used to protect us from gamma radiations**
    a. Lead oxide　　　b. Iron　　　c. Lead　　　d. Aluminium

    Ans : (c) Lead

8. **Which of the following statements is/are correct?**
    i) α particles are photons　　　　　ii) Penetrating power of γ radiation is very low
    iii) Ionization power is maximum for α rays　　iv) Penetrating power of γ radiation is very high
    a. (i) & (ii) are correct　　b. (ii) & (iii) are correct　　c. (iv) only correct　　d. (iii) & (iv) are correct

    Ans : (d) (iii) & (iv) are correct

9. **Proton - Proton chain reaction is an example of _____.**
    a. Nuclear fission　　b. α - decay　　c. Nuclear fusion　　d. β - decay

    Ans : (c) Nuclear fusion

10. **In the nuclear reaction $_6X^{12} \xrightarrow{\text{α decay}} {}_ZY^A$, the value of A & Z.**
    a. 8, 6　　　　　　　　　　　　b. 8, 4
    c. 4, 8　　　　　　　　　　　　d. cannot be determined with the given data

    Ans : (c) 4, 8

11. **Kamini reactor is located at _____.**
    a. Kalpakkam　　　b. Koodankulam　　　c. Mumbai　　　d. Rajasthan

    Ans : (a) Kalpakkam

12. **Which of the following is/are correct?**
    i) Chain reaction takes place in a nuclear reactor and an atomic bomb.
    ii) The chain reaction in a nuclear reactor is controlled
    iii) The chain reaction in a nuclear reactor is not controlled
    iv) No chain reaction takes place in an atom bomb
    a. (i) only correct　　b. (i) & (ii) are correct　　c. (iv) only correct　　d. (iii) & (iv) are correct

    Ans : (b) (i) & (ii) are correct

II. Book Exercise – Fill in the blanks

1. One roentgen is equal to _____ disintegrations per second.　　**Ans :** 2.58×10^{-4}

2. Positron is an _____.　　**Ans :** Elementary particle

3. Anemia can be cured by _____ isotope.　　**Ans :** Fe^{59}

4. Abbreviation of ICRP _____.　　**Ans :** International Commission on Radiological Protection

5. _____ is used to measure exposure rate of radiation in humans.　　　　**Ans :** Roentegen

6. _____ has the greatest penetration power.　　　　**Ans :** γ–rays

7. $_ZY^A \rightarrow {_{Z+1}}Y^A + X$; Then, X is _____.　　　　**Ans :** beta

8. $_ZX^A \rightarrow {_Z}Y^A$ This reaction is possible in _____ decay.　　　　**Ans :** γ

9. The average energy released in each fusion reaction is about _____ J.　　**Ans :** 3.84×10^{-12}

10. Nuclear fusion is possible only at an extremely high temperature of the order of _____ K.

　　　Ans : 10^7 to 10^9

11. The radio isotope of _____ helps to increase the productivity of crops.　　**Ans :** Phosphorus 32

12. If the radiation exposure is 100 R, it may cause _____.　　**Ans :** fatal diseases like leukemia

III. Book Exercise – True or False (If false correct it)

1. **Plutonium -239 is a fissionable material.**
   Ans : True.

2. **Elements having atomic number greater than 83 can undergo nuclear fusion.**
   Ans : False. Elements having atomic number lesser than 83 can undergo nuclear fusion.

3. **Nuclear fusion is more dangerous than nuclear fission.**
   Ans : False. Nuclear fission is more dangerous than Nuclear fusion.

4. **Natural uranium U-238 is the core fuel used in a nuclear reactor.**
   Ans : False. Natural plutonium is the core fuel used in a nuclear reactor.

5. **If a moderator is not present, then a nuclear reactor will behave as an atom bomb.**
   Ans : True.

6. **During one nuclear fission on an average, 2 to 3 neutrons are produced.**
   Ans : True.

7. **Einstein's theory of mass energy equivalence is used in nuclear fission and fusion.**
   Ans : True.

IV. Book Exercise – Match the following

1.
1.	BARC	(a)	Kalpakkam
2.	India's first atomic power station	(b)	Apsara
3.	IGCAR	(c)	Mumbai
4.	First nuclear reactor in India	(d)	Tarapur

   Ans :

1	BARC	c	Mumbai
2	India's first atomic power station	d	Tarapur
3	IGCAR	a	Kalpakkam
4	First nuclear reactor in India	b	Apsara

2.
1.	Fuel	(a)	Lead
2.	Moderator	(b)	Heavy water
3.	Coolant	(c)	Cadmium rods
4.	Shield	(d)	Uranium

   Ans :

1	Fuel	d	Uranium
2	Modertaor	b	Heavy water
3	Coolant	c	Cadmium rods
4	Shielf	a	Lead

3.   **1.**   **Soddy Fajan**   **(a)**   **Natural radioactivity**

    2.   **Irene Curie**   **(b)**   **Displacement law**

    3.   **Henry Bequerel**   **(c)**   **Mass energy equivalence**

    4.   **Albert Einstein**   **(d)**   **Artificial Radioactivity**

    Ans :

1	Soddy Fajan	b	Displacement law
2	Irene Curie	d	Artificial Radioactivity
3	Henry Bequerel	a	Natural radioactivity
4	Albert Einstein	c	Mass energy equivalence

4.   **1.**   **Uncontrolled fission reaction**   **(a)**   **Hydrogen bomb**

    2.   **Fertile material**   **(b)**   **Nuclear reactor**

    3.   **Controlled fission reaction**   **(c)**   **Breeder reactor**

    4.   **Fusion reaction**   **(d)**   **Atom bomb**

    Ans :

1	Uncontrolled fission reaction	d	Atom bomb
2	Fertile material	c	Breeder reactor
3	Controlled fission reaction	b	Nuclear reactor
4	Fusion reaction	a	Hydrogen bomb

5.   **1.**   **Co – 60**   **(a)**   **Age of fossil**

    2.   **I – 131**   **(b)**   **Function of heart**

    3.   **Na – 11**   **(c)**   **Leukemia**

    4.   **C – 14**   **(d)**   **Thyroid disease**

    Ans :

1	Co – 60	c	Leukemia
2	I – 131	d	Thyroid disease
3	Na – 11	b	Function of heart
4	C – 14	a	Age of fossil

V. Book Exercise – Answer the following in correct sequence

1.   **Arrange in descending order, on the basis of their penetration power**

    Alpha rays, beta rays, gamma rays, cosmic rays

    Gamma rays, Beta rays, Alpha rays, Cosmic rays.

2.   **Arrange the following in the chronological order of discovery**

    Nuclear reactor, radioactivity, artificial radioactivity, discovery of radium.

    radioactivity, Discovery of radium, artificial radioactivity, Nuclear reactor.

VI. Book Exercise – Use the analogy to fill in the blank

1.   Spontaneous process : Natural Radioactivity, Induced process : _____.   **Ans :** Artificial Radioactivity

2.   Nuclear Fusion : Extreme temperature, Nuclear Fission : _____.   **Ans :** Low Temperature

3.   Increasing crops : Radio phosphorous, Effective functioning of heart : _____.   **Ans :** Radio sodium

4.   Deflected by electric field : α ray, Null Deflection : _____.   **Ans :** γ rays

VII. Book Exercise – Numerical problems

1. $_{88}Ra^{226}$ **experiences three** α **- decay. Find the number of neutrons in the daughter element.**
132 Neutrons.

1. **A cobalt specimen emits induced radiation of 75.6 millicurie per second. Convert this disintegration into becquerel (one curie = 3.7×10^{10} Bq)**
2797200000 becquerel = 75.6 millicurie.

VIII. Book Exercise – Assertion and reason type questions

Mark the correct choice as

    i)   **If Both the assertion and the reason are true and the reason is the correct explanation of assertion.**

    ii)   **Both the assertion and the reason are true, but the reason is not the correct explanation of the assertion.**

    iii)   **Assertion is true, but the reason is false.**

    iv)   **Assertion is false, but the reason is true.**

1. **Assertion:** A neutron impinging on U^{235}, splits it to produce Barium and Krypton.
   Reason: U - 235 is a fissile material.

             Ans : (i) Both the assertion and the reason are true and the reason is the correct explanation of the assertion

2. **Assertion:** In a β - decay, the neutron number decreases by one.
   Reason: In β - decay atomic number increases by one.

          (i) If Both the assertion and the reason are true and the reason is the correct explanation of assertion

3. **Assertion:** Extreme temperature is necessary to execute nuclear fusion.
   Reason: In a nuclear fusion, the nuclei of the reactants combine releasing high energy.

             Ans : (i) Both the assertion and the reason are true and the reason is the correct explanation of the assertion

4. **Assertion:** Control rods are known as 'neutron seeking rods'.
   Reason: Control rods are used to perform sustained nuclear fission reaction.

             Ans : (i) Both the assertion and the reason are true and the reason is the correct explanation of the assertion

IX. Book Exercise – Answer in one or two word (VSA)

1. **Who discovered natural radioactivity?**
Henri Becquerel.

2. **Which radioactive material is present in the ore of pitchblende?**
Uranium.

3. **Write any two elements which are used for inducing radioactivity?**
Boron, Aluminium.

4. **Write the name of the electromagnetic radiation which is emitted during a natural radioactivity.**
α – rays.

5. **If A is a radioactive element which emits an α - particle and produces** $_{104}Rf^{259}$. **Write the atomic number and mass number of the element A.**
$_{106}Sg^{263}$ Atomic number of A = 106, Mass number of A = 263.

6. **What is the average energy released from a single fission process?**
3.2×10^{-11}J.

7. **Which hazardous radiation is the cause for the genetic disease?**
γ – rays.

8. **What is the amount of radiation that may cause death of a person when exposed to it?**

Acute radiation Syndrome is a collection of health effects that are present within 24 hrs of exposure to ionizing radiation. It is also called radiation poisoning, radiation sickness and radiation toxicity.

9. **When and where was the first nuclear reactor built?**

Chicago, USA 1942.

10. **Give the SI unit of radioactivity.**

Becquerel.

10. **Which material protects us from radiation?**

Lead.

X. Book Exercise – Answer the following in few sentences

1. **Write any three features of natural and artificial radioactivity.**

S.No.	Natural radioactivity	Artificial radioactivity
1	Emission of radiation due to self–disintegration of a nucleus.	Emission of radiation due to disintegration of anucleus through induced process
2	Alpha, beta and gamma radiations are emitted.	Mostly elementary particles such as neutron, positron, etc., are emitted.
3	it is a spontaneous process.	It is an induced process.
4	Exhibited by elements with atomic number more than 83.	Exhibited by elements with atomic number less than 83.
5	This cannot be controlled.	This can be controlled.

2. **Define critical mass.**

The minimum mass of a fissile material necessary to sustain the chain reaction is called 'critical mass (mc)'. It depends on the nature, density and the size of the fissile material.

3. **Define one roentgen.**

Roentgen (R): It is The radiation exposure of y and x-rays is measured by another unit called roentgen. One roentgen is defined as the quantity of radioactive substance which produces a charge of 2.58×10^{-4} coulomb in 1 kg of air under standard conditions of pressure, temperature and Humidity.

4. **State Soddy and Fajan's displacement law.**

i) When a radioactive element emits an alpha particle, a daughter nucleus is formed whose mass number is less by 4 units and the atomic number is less by 2 units, than the mass number and atomic number of the parent nucleus.

ii) When a radioactive element emits a beta particle, a daughter nucleus is formed whose mass number is the same and the atomic number is more by 1 unit, than the atomic number of the parent nucleus.

5. **Give the function of control rods in a nuclear reactor.**

Control rod : Control rods are used to control the number of neutrons in order to have sustained chain reaction. Mostly boron or cadmium rods are used as control rods. They absorb the neutrons.

6. **In Japan, some of the new born children are having congenital diseases. Why?**

The nuclear bomb that was dropped in Hiroshima during World War II was called as 'Little boy'. It was a gun-type bomb which used a uranium core. The bomb, which was subsequently dropped over Nagasaki was called as 'Fat man'. It was an explosion type bomb, which used a plutonium core. Due to this some of the new born children are having congenital diseases.

7. **Mr. Ramu is working as an X - ray technician in a hospital. But, he does not wear the lead aprons. What suggestion will you give to Mr. Ramu?**

Lead aprons are the most effective personal radiation protection means and should be worn by everyone in a fluoroscopy room (except the patient).Lead aprons may reduce the dose received by over 90% depending on the energy of the X- rays and the lead equivalent thickness of the apron.

8. What is stellar energy?

Fusion reaction that takes place in the cores of the Sun and other stars results in an enormous amount of energy, which is called as 'stellar energy'. Thus, nuclear fusion or thermonuclear reaction is the source of light and heat energy in the Sun and other stars.

9. Give any two uses of radio isotopes in the field of agriculture?

Phosphorus- 32 and Nitrogen-15.

10. What is stellar energy?

Fusion reaction that takes place in the cores of the Sun and other stars results in an enormous amount of energy, which is called as 'stellar energy'. Thus, nuclear fusion or thermonuclear reaction is the source of light and heat energy in the Sun and other stars.

XI. Book Exercise – Answer the following questions in detail

1. Explain the process of controlled and uncontrolled chain reactions.

Two kinds of chain reactions are possible. They are;

(i) controlled chain reaction and (ii) uncontrolled chain reaction.

i)   Controlled chain reaction In the controlled chain reaction the number of neutrons released is maintained to be one. This is achieved by absorbing the extra neutrons with a neutron absorber leaving only one neutron to produce further fission. Thus, the reaction is sustained in a controlled manner. The energy released due to a controlled chain reaction can be utilized for constructive purposes. Controlled chain reaction is used in a nuclear reactor to produce energy in a sustained and controlled manner.

ii) Uncontrolled chain reaction In the uncontrolled chain reaction the number of neutrons multiplies indefinitely and causes fi ssion in a large amount of the fissile material. Th is results in the release of a huge amount of energy within a fraction of a second. Th is kind of chain reaction is used in the atom bomb to produce an explosion. Figure 6.3 represents an uncontrolled chain reaction.
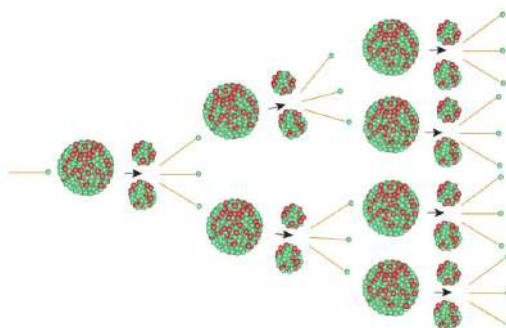
2. Compare the properties of alpha, beta and gamma radiations.

Properties	α rays	β rays	γ rays
What are they? (Nature)	Helium nucleus ($_2$He^4) consisting of two protons and two neutrons.	They are electrons ($_{-1}$e^0), basic elementary particle in all atoms.	They are electromagnetic waves consisting of photons.
Charge	Positively charged particles. Charge of each alpha particle = +2e	Negatively charged particles. Charge of each beta particle = −e	Neutral particles. Charge of each gamma particle = zero
Ionising power	100 time greater than β rays and 10,000 times greater than γ rays	Comparatively low	Very less ionization power

Properties	α **rays**	β **rays**	γ **rays**
Penetrating power	Low penetrating power (even stopped by a thick paper)	Penetrating power is greater than that of α rays. They can penetrate through a thin metal foil.	They have a very high penetrating power greater than that of β rays. They can penetrate through thick metal blocks.
Effect of electric and magnetic field	Deflected by both the fields. (in accordance with Fleming's left hand rule)	Deflected by both the fields; but the direction of deflection is opposite to that for alpha rays. (in accordance with Fleming's left hand rule)	They are not deflected by both the fields.
Speed	Their speed ranges from 1/10 to 1/20 times the speed of light.	Their speed can go up to 9/10 times the speed of light.	They travel with the speed of light.

3. What is a nuclear reactor? Explain its essential parts with their functions.

A Nuclear reactor is a device in which the nuclear fission reaction takes place in a self-sustained and controlled manner to produce electricity. The first nuclear reactor was built in 1942 at Chicago, USA.

Components of a nuclear reactors : The essential components of a nuclear reactor are (i) fuel, (ii) moderator, (iii) control rod, (iv) coolant and (v) protection wall.

i) **Fuel :** A fissile material is used as the fuel. The commonly used fuel material is uranium.

ii) **Moderator :** A moderator is used to slow down the high energy neutrons to provide slow neutrons. Graphite and heavy water are the commonly used moderators.

iii) **Control rod :** Control rods are used to control the number of neutrons in order to have sustained chain reaction. Mostly boron or cadmium rods are used as control rods. They absorb the neutrons.

iv) **Coolant :** A coolant is used to remove the heat produced in the reactor core, to produce steam. This steam is used to run a turbine in order to produce electricity. Water, air and helium are some of the coolants.

v) **Protection wall :** A thick concrete lead wall is built around the nuclear reactor in order to prevent the harmful radiations from escaping into the environment.
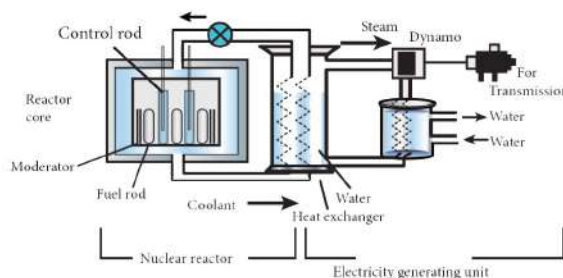
XII. Book Exercise – HOT questions

1. Mass number of a radioactive element is 232 and its atomic number is 90. When this element undergoes certain nuclear reactions, it transforms into an isotope of lead with a mass number 208 and an atomic number 82. Determine the number of alpha and beta decay that can occur.?

Determine the number of alpha decay:

$208 = 232 - 4X$

Solve for X

$232 - 4X - 232 = 208 - 232$ (substract 232 from both sides)

$-4X = -24$

$-X = -6$

$X = 6.$

This means that this progress undergoes 6 α-decays, which means 6 nuclei of He have been emitted. Determine the number of Beta decay is four.

2. 'X – rays should not be taken often'. Give the reason.

X- rays and gamma rays can cause a number of other problems besides cancer. Lower doses of radiation, such as from imaging tests are not known to cause short – term health problems.

3. Cell phone towers should be placed far away from the residential area – why?

Cell towers produce non ionizing radiation with a wavelength longer than that of visible light. If cell towers residing in our area, then turnoff all lights, because short wavelength,like X-rays and Gamma rays are dangerous, ionizing radiation. Long wave ultra violet light, with a wave length shorter than visible light, causes sunburn. Shorter still is short UV light, that with continued exposure can cause melanoma (wear sunscreen).

===

Additional – Choose the best answer

1. Matter is made up of tiny indestructible units called _____ .
a) Atoms b) molecules c) element d) compound
Ans : (a) Atoms

2. _____ discovered cathode rays known as electrons.
a) Democritus b) JJ Thomson c. Goldstein d) milikan
Ans : (b) JJ Thomson

3. _____ discovered positive rays which were named as protons.
a) Democritus b) JJ Thomson c. Goldstein d) milikan
Ans : (c) Goldstein

4. _____ discovered charge less particles called Neutrons.
a) JJ Thomson b) Democritus c) Goldstein d) milikan
Ans : (c) Goldstein

5. _____ explained that the mass of an atom is concentrated in its central part called nucleus.
a) JJ Thomson b) Democritus c) Rutherford d) milikan
Ans : (c) Rutherford

6. _____ discovered that he could reproduce the effect whenever he placed uranium near a photographic film.
a) JJ Thomson b) Democritus c) Henri Becquerel d) Marie curie
Ans : (c) Henri Becquerel

7. _____ was identified to be a radioactive element.
a) Thorium b) Uranium c) Polonium d) radium
Ans : (b) Uranium

8. Henri Becqurrel is a _____ physicist.
a) French b) English c) Italian d) german
Ans : (a) French

9. The elements whose atomic number is more than _____ undergo spontaneous radioactivity.
a) 85 b) 83 c) 89 d) 90
Ans : (b) 83

10. Technecium with atomic number _____ .
a) 40 b) 43 c) 67 d) 50
Ans : (b) 43

11. Promethium with atomic number _____ .
a) 40 b) 67 c) 34 d) 61
Ans : (d) 61

12. There have been _____ radioactive substances discovered so far. Most of them are rare earth metals and transition metals.
a) 30 b) 29 c) 28 d) 31
Ans : (b) 29

13. During such a disintegration, the nucleus which undergoes disintegration is called _____.
   a) parent nucleus   b) daughter nucleus   c) either a or b   d) none

   Ans : (a) parent nucleus

14. _____ is a induced process.
   a) Natural radioactivity   b) Artificial radioactivity   c) either a or b   d) none

   Ans : (b) Artificial radioactivity

15. _____ rays electromagnetic waves consisting of photons.
   a) α rays   b) γ rays   c) cosmic rays   d) β rays

   Ans : (b) γ rays

16. Decay of Uranium to thorium with the emission of an _____ particles.
   a) α b) γ c) cosmic   d) β

   Ans : (a) α

17. Fissile Materials are _____ and _____.
   a) Uranium-235 and Plutonium 239, 241   b) Thorium 232, Uranium 238
   c) aluminium - 27 thorium232   d) non

   Ans : (a) Uranium-235 and plutonium 239, 241

18. Fertile materials are _____.
   a) Uranium–238   b) Thorium–232   c) Plutonium–240   d) all the above

   Ans : (d) All the above

19. The energy released in a nuclear fission process is about _____ MeV.
   a) 200   b) 300   c) 250   d) 350

   Ans : (a) 200

20. _____ is based on the principle of nuclear fusion.
   a) Hydrogen Bomb   b) Atom bomb   c) nuclear reactor   d) none

   Ans : (a) Hydrogen Bomb

21. _____ is used to diagnose anemia and also to provide treatment for the same.
   a) Radio–Iodine   b) Radio–iron   c) Radio–sodium   d) all the above

   Ans : (b) Radio-Iron

22. _____ is a device used to detect the levels of exposure to an ionizing radiation.
   a) Dosimeter   b) pocket dosimeter   c) either a or b   d) none

   Ans : (a) Dosimeter

Additional – Fill in the blanks

1. A Greek philosopher _____ in 400 BC believed that matter is made up of tiny indestructible units called atoms. **Ans :** Democritus

2. In 1803, _____ considered that elements consist of atoms, which are identical in nature. **Ans :** John Dalton

3. _____ and her husband _____ detected radioactivity in Pitchblende. **Ans :** Marie curie, Pierre curie

4. _____ is a tiny black ore substance. **Ans :** Pitchblende

5. _____ is known as an ore of Uranium. **Ans :** Pitchblende

6. _____ and _____ are radioactive elements. **Ans :** Uranium, radium

7. The natural radioactive elements emit harmful radioactive radiations like _____,_____ and _____. **Ans :** alpha, beta and gamma rays

8. The phenomenon of nuclear decay of certain elements with the emission of radiations like alpha, beta and gamma rays is called _____. **Ans :** natural radioactivity

9. The elements, which undergo this phenomenon are called _____. **Ans :** radioactive elements

10. The phenomenon of spontaneous emission of radiation from certain elements on their own is called _____. **Ans :** Natural radioactivity

11. The elements whose atomic number is more than 83 undergo _____. **Ans :** spontaneous radioactivity

12. _____ and _____ there are only two elements which have been identified as radioactive substances with atomic number less than 83. **Ans :** Uranium and radium

13. The phenomenon by which even light elements are made radioactive, by artificial or induced methods, is called _____ or _____. **Ans :** Artificial radioactivity or man made radioactivity

14. Artificial radioactivity was discovered by _____ and _____ in 1934. **Ans :** Irene curie , F. Joliot

15. _____ particles emitted during the natural radioactivity of Uranium. **Ans :** Alpha

16. During such a disintegration, the nucleus which undergoes disintegration is called _____ nucleus. **Ans :** parent

17. Radiations produced after the disintegration is called a _____. **Ans :** Daughter nucleus

18. The particle is used to induce the artificial disintegration is termed as _____. **Ans :** Projectile

19. The particle which is produced after the disintegration is termed as _____ particle. **Ans :** Ejected particle

20. _____ is unstable and is radioactive. **Ans :** $_6C^{12}$

21. _____ radioactivity cannot be controlled. **Ans :** Natural

22. _____ radioactivity can be controlled. **Ans :** Artificial

23. _____ is the traditional unit of radioactivity. **Ans :** Curie

24. Curie is defined as the quantity of a radioactive substance which undergoes _____ disintegrations in one second. **Ans :** 3.7×10^{10}

25. Cuire is actually close to the activity of 1g of _____. **Ans :** radium 226

26. 1 curie = _____ disintegrations per second. **Ans :** 3.7×10^{10}

27. _____ is another unit of radioactivity. **Ans :** Rutherford

28. Rutherford is defined as the quantity of a radioactive substance, which produces _____ disintegrations per second. **Ans :** 10^6

29. 1Rd = _____ disintegrations per second. **Ans :** 10^6

30. _____ SI unit of radioactivity. **Ans :** Becqurel

31. Becqurel is defined as the quantity of _____ disintegration per Second. **Ans :** one

32. _____ is the radiation exposure of ɣ and x–rays is measured by another unit. **Ans :** Roentgen

33. One roentgen is defined as the quantity of radioactive substance which produces a charge of _____ coulomb in 1kg of air. **Ans :** 2.58×10^{-4}

34. Uranium, named after the planet _____. **Ans :** Uranus

35. Pitchblende mineral was discovered by _____. **Ans :** Martin Klaproth

36. In1913, _____ and _____ framed the displacement law. **Ans :** Soddy and Fajan.

37. When a radio active element emits an _____ particle, a daughter nucleus is formed whose mass number is less by 4 units. **Ans :** Alpha

38. The atomic number is less by 2 units, than the mass number and atomic number of the _____. **Ans :** Parent nucleus

39. When a radioactive element emits a _____ particle, a daughter nucleus is formed. **Ans :** Beta or alfa

40. _____ nucleus consisting of two protons and two neutrons. **Ans :** Helium

41. _____ rays are electrons basic elementary particle in all atoms. **Ans :** Beta

42. _____ positively charged particles.   **Ans :** Alpha rays

43. _____rays are Negatively charged particles.   **Ans :** Beta

44. _____ neutral particles.   **Ans :** Gamma

45. Charge of each gamma ray is _____.   **Ans :** Zero

46. _____ rays are comparatively low.   **Ans :** Beta

47. _____ rays are very less ionization power.   **Ans :** gamma

48. _____ rays have low penetrating power.   **Ans :** Alpha

49. _____ rays are penetrate through a thin metal foil.   **Ans :** beta

50. _____ rays are penetrate through thick metal blocks.   **Ans :** Gamma

51. Alpha rays their speed ranges from _____ times the speed of light.   **Ans :** 1/10 to 1/20

52. Beta rays speed can go up to _____ times the speed of light.   **Ans :** 9/10

53. _____ rays travel with the speed of light.   **Ans :** Gamma

54. A nuclear reaction in which an unstable parent nucleus emits an alpha particle and forms a stable daughter nucleus is called _____ decay.   **Ans :** Alpha

55. Decay of Uranium to thorium with the emission of an _____ particle.   **Ans :** Alpha

56. A nuclear reaction, in which an _____ parent nucleus emits a beta particle and forms a stable daughter nucleus is called beta decay.   **Ans :** Unstable

57. In Gamma decay, only the energy level of the _____ changes.   **Ans :** nucleus

58. In 1939, german scientist _____ and _____ discovered nuclear fission reaction.
                                                                             Ans : Otta Hahn and F.Strassman

59. When a Uranium nucleus is bombarded with a neutron, it breaks up into smaller nuclei of comparable mass along with the emission of few neutrons and _____.   **Ans :** energy

60. The process of breaking up of a heavier nucleus into two smaller _____ with the release of _____ amount of energy and a few neutrons is called Nuclear fission.   **Ans :** nuclei, large

61. A fissionable material is a radioactive element, which undergoes fission in a sustained manner when it absorbs a neutron. It is also termed as _____ material.   **Ans :** fissile

62. All isotopes of _____ do not undergo nuclear fission when they absorb a neutron.   **Ans :** uranium

63. Uranium 235 is a ------------ material and Uranium 238 is a _____.   **Ans :** Fissionable , Non fissionable

64. A Uranium nucleus when bombarded with a neutron undergoes fission producing _____ neutrons.
                                                                                                Ans : three

65. _____ chain reaction is used in a nuclear reactor to produce energy in a sustained and controlled manner.   **Ans :** Controlled

66. In _____ reaction a huge amount of energy within a fraction of second.   **Ans :** Umcontrolled chain

67. The minimum mass of a fissile material necessary to sustain the chain reaction is called _____.
                                                                                          Ans : critical mass

68. ----------- depends on the nature, density and the size of the fissile material.   **Ans :** Critical mass

69. If the mass of the fissile material is _____ than the critical mass it is termed as _____.
                                                                                            Ans : Subcritical

70. If the mass of the fissile material is more than the critical mass it is termed as _____.
                                                                                          Ans : Supercritical

71. The _____ is based on the principle of uncontrolled reaction.   **Ans :** Atom bomb

72. In an _____ chain reaction , the number of neutrons and the number of fission reactions multiply almost in a geometrical progression.   **Ans :** Uncontrolled

73. Atom bomb releases a _____ amount of energy in a very small time interval and leads to an explosion.   **Ans :** Huge

74. During atombomb explosion tremendous amount of energy in the form of _____, _____ and _____ is released.   **Ans :** heat, light and radiation

75. Atom bombs were exploded in 1945 at _____ and _____ in japan during the world war II.   **Ans :** Hiroshima and Nagasaki

76. _____ is the unit used in nuclear physics to measure the energy of small particles. **Ans :** Electron Volt

77. Electron volt is nothing but the energy of one electron when it is accelerated using an electric potential of _____.   **Ans :** One volt

78. 1 electron volt = _____.   **Ans :** 1.602×10^{-19} Joule

79. I million electron volt = _____.   **Ans :** 1 MeV = 10^6 electron volt

80. The energy released in a nuclear fission process is about _____.   **Ans :** 200Mev

81. A heavy nucleus is split up into smaller nuclei. Energy can be produced when two lighter nuclei combine to form a heavier nucleus. This phenomenon known as _____.   **Ans :** Nuclear fusion

82. The process in which two lighter nuclei combine to form a heavier nucleus is termed as _____.   **Ans :** nuclear fusion

83. $_1H^2$ represents an isotope of hydrogen known as _____.   **Ans :** Deuterium

84. The average energy released in each fusion reaction is about _____.   **Ans :** 3.84×10^{-12}J

85. The concept of mass- energy equivalence was proposed by _____ in 1905.   **Ans :** Einstein

86. The velocity of light in vaccum and is equal to _____.   **Ans :** 3×10^8 m/s

87. The nuclear bomb that was dropped in Hiroshima during World War II called as _____.   **Ans :** Little Boy

88. The little boy was a _____ type bomb which used a uranium Core.   **Ans :** GUN

89. The bomb , which was subsequently dropped over _____ Was called as _____.   **Ans :** Nagasaki, Fatman

90. _____ was an explosion type bomb, which used in plutonium core.   **Ans :** Fatman

91. Earth's atmosphere contains a small trace of _____.   **Ans :** hydrogen

92. _____ is a Spontaneous process at normal temperature and pressure.   **Ans :** Nuclear fusion

93. Nuclear fusion is possible only at an extremely high temperature of the order of 10^7 to 10^9 K. This is called as _____ reaction.   **Ans :** Thermonuclear

94. _____ is the combination of two lighter nuclei.   **Ans :** Nuclear Fusion

95. The charge of nuclei is _____.   **Ans :** Positive

96. According to electrostatic theory , when they come closer they tend to _____ each other. **Ans :** repel

97. _____ force will be overcome by the kinetic energy of the nuclei at higher temperature of the order of _____.   **Ans :** ans: Repulsive, 10^7 to 10^9 K

98. The stars like our sun emit a large amount of energy in the form of _____ and _____.   **Ans :** Light and heat

99. All stars contain a large amount of _____.   **Ans :** Hydrogen

100. The surface temperature of the stars is very _____ which is sufficient to induce fusion of the hydrogen nuclei.   **Ans :** high

101. _____ reaction that takes place in the cores of the sun and other stars results in an enormous amount of energy, which is called as stellar energy.   **Ans :** Fusion

102. Nuclear fusion or _____ is the source of light and heat energy in the sun and other stars.   **Ans :** thermonuclear reaction

103. _____ is based on the principle of nuclear fusion.   **Ans :** Hydrogen bomb

104. A _____ bomb is always designed to have an inbuilt atom bomb which creates the high temperature and pressure required for fusion when it explodes.   **Ans :** Hydrogen

105. The energy released in a _____ is much higher than that released in an atom bomb.   **Ans :** Hydrogen

106. Sun fuses about _____ million metric tons of hydrogen each second and radiates about _____ J of energy per second.   **Ans :** 620, 3.8×10^{26}

107. Radio isotope of Phosphorous (P^{32}) Helps to increase the _____.   **Ans :** productivity of crops

108. Radio Sodium (Na^{24}) is used for the effective _____.   **Ans :** Functioning of the heart

109. Radio Iodine (I^{131}) is used to cure _____.   **Ans :** Goiter

110. Radio-Iron is (Fe^{59}) is used to diagnose _____ and also to provide treatment for the same.   **Ans :** Anaemia

111. Radio-phosphorus (P^{32}) is used in the treatment of _____ diseases.   **Ans :** Skin

112. Radio cobalt (Co^{60}) and Radio gold (Au^{198}) are used in the treatment of _____ cancer.   **Ans :** Skin

113. Radiations are used to sterilize the surgical devices as they can kill the _____ and _____.   **Ans :** germs and microbes

114. In industries, radioactive isotopes are used as tracers to detect any manufacturing defects such as _____ and _____.   **Ans :** Cracks and leaks

115. An isotope of _____ is used in the airlines to detect the explosives in the luggage.   **Ans :** Californium–252

116. An isotope of Americium (Am-241) is used in many industries as a _____.   **Ans :** Smoke detector

117. _____ research used to identify the radio carbon dating the age of earth , fossils , old paintings and Monuments.   **Ans :** Archeological

118. The second source of radiation exposure is _____.   **Ans :** Man made

119. Safe limit of overall exposure is given as _____ milli Sievert per year.   **Ans :** 20

120. In terms of Roentgen, the safe limit of receiving the radiation is about _____ mR per week. **Ans :** 100

121. Leukemia is a death of _____ in the blood.   **Ans :** red blood corpuscle

122. _____ is a device used to detect the levels of exposure to an ionizing radiation.   **Ans :** Dosimeter

123. _____ is used to provide the wearer with an immediate reading of exposure to X–rays and Y–rays.   **Ans :** Pocket dosimeter

124. Radioactive materials should be kept in a thick walled _____ container.   **Ans :** Lead

125. _____ and _____ should be used while working with hazardous radioactive materials.   **Ans :** Lead coated aprons and Lead gloves

126. A _____ is a device in which the nuclear fission reaction takes place in a self- sustained and controlled manner to produce electricity.   **Ans :** Nuclear reactor

127. The first nuclear reactor was built in 1942 at _____, USA.   **Ans :** Chicago

128. _____ and _____ are the commonly used moderators.   **Ans :** Graphite and Heavy water

129. Mostly _____ or _____ rods are used as control rods.   **Ans :** boron , cadmium

130. Water, air and _____ are some of the coolants.   **Ans :** Helium

131. _____ are widely used in power generation.   **Ans :** Nuclear reactors

132. _____ are used to convert non-fissionable materials into fissionable materials.   **Ans :** breeder reactors

133. _____ was the first chairman of Indian Atomic energy commission.   **Ans :** Homi Jahangir bhaba

134. BARC _____.   **Ans :** Baba Atomic Research centre

135. Nuclear power is the _____ largest source of power in India. **Ans :** Fifth

136. Total number of power stations in India is _____. **Ans :** 7

137. _____ was the first nuclear reactor built in India and Asia. **Ans :** Apsara

138. There are _____ nuclear reactors which are opening in India. **Ans :** 22

Additional – True or false (correct the statement if it is false)

1. **Pitchblende had less concentration of Uranium.**
   Ans : True.

2. **Gamma rays are not defelected by both the fields**
   Ans : False.Alpha rays deflected by both the fields.

3. **A chain reaction is self propagating process in which the number of neutrons goes on multiplying rapidly almost in a geometrical progression.**
   Ans : True

4. **The energy released due to a controlled chain reaction can be not utilized for constructive purposes.**
   Ans : False. The energy released due to a controlled chain reaction can be utilized for constructive purposes.

5. **Tarapur Atomic power station is India's first nuclear power Station.**
   Ans : True.

Additional – Assertion and reason

1. **Assertion:** Alpha, Beta and Gamma radiations are emitted.
   Reason: It says about Natural radioactivity.
   a. A is right R is wrong
   b. R explains A
   c. R is right A is wrong
   d. R does not explain A
   Ans : (c) R is right A is wrong

2. **Assertion:** Gamma rays have a very high penetrating power greater than that of Beta rays.
   Reason: They can penetrate through thick metal blocks.
   a. A is right R is wrong
   c. A and R are right
   b. R is right A is wrong
   d. A and R are wrong
   Ans : (c) A and R are right

3. **Assertion:** The minimum mass of a fissile material necessary to sustain the chain reaction is called Critical Mass.
   Reason: It does not depends on the nature ,density and the size of the fissile material.
   a. A is right R is wrong
   c. A and R are right
   b. R is right A is wrong
   d. A and R are wrong
   Ans : (a) A is right R is wrong

4. **Assertion:** Alpha, beta and gamma radiations are emitted in Nuclear fission.
   Reason: Alpha rays , positrons and neutrinos are emitted in Nuclear fusion.
   a. A is right R is wrong
   c. A and R are right
   b. R is right A is wrong
   d. A and R are wrong
   Ans : (c) A and R are right

5. **Assertion:** A coolant is used to remove the heat produced in the reactor core, to produce steam.
   Reason: This steam is used to run a turbine in order to produce electricity.
   a. A is right R is wrong
   c. R explains A
   b. R is right A is wrong
   d. R does not explain A
   Ans : (c) R explains A

1. Define radioactivity.

Ans : The nucleus of some elements is unstable. Such nuclei undergo nuclear decay and get converted into more stable nuclei. During this nuclear reaction, these nuclei emit certain harmful radiations and elementary particles. The phenomenon of nuclear decay of certain elementwith the emission of radiations like alpha, beta, and gamma rays is called 'radioactivity.

2. What are called radio active elements?

The nucleus of some elements is unstable. Such nuclei undergo nuclear decay and get converted into more stable nuclei. During this nuclear reaction, these nuclei emit certain harmful radiations and elementary particles. The phenomenon of nuclear decay of certain elementwith the emission of radiations like alpha, beta, and gamma rays is called 'radioactivity.and the elements, which undergo this phenomenon are called radio active elements.

3. What is called Natural Radio activity?

The elements such as uranium and radium undergo radioactivity and emit the radiations on their own without any human intervention. This phenomenon of spontaneous emission of radiation from certain elements on their own is called 'natural radioactivity'.

4. What is called Artificial Radio activity?

The phenomenon by which even light elements are made radioactive, by artificial or induced methods, is called 'artificial radioactivity' or 'man-made radioactivity'.

5. Compare between Natural and Artificial Radioactivity.

S.No.	Natural radioactivity	Artificial radioactivity
1	Emission of radiation due to self–disintegration of a nucleus.	Emission of radiation due to disintegration of anucleus through induced process
2	Alpha, beta and gamma radiations are emitted.	Mostly elementary particles such as neutron, positron, etc., are emitted.
3	it is a spontaneous process.	It is an induced process.
4	Exhibited by elements with atomic number more than 83.	Exhibited by elements with atomic number less than 83.
5	This cannot be controlled.	This can be controlled.

6. Define the term Curie.

Ans :

Curie: It is the traditional unit of radioactivity. It is defined as the quantity of a radioactive substance which undergoes 3.7×10^{10} disintegrations in one second. This is actually close to the activity of 1 g of radium 226. 1 curie = 3.7×10^{10} disintegrations per second.

7. Define the unit Ruther ford.

Ans : It is another unit of radioactivity. It is defined as the quantity of a radioactive substance, which produces 10^6 disintegrations in one second. 1 Rd = 10^6 disintegrations per second.

8. Define the unit Becquerel.

Ans : It is The SI unit of radioactivity is becquerel. It is defined as the quantity of one disintegration per second.

9. Define the unit Roentgen.

Ans : It is The radiation exposure of γ and x-rays is measured by another unit called roentgen. One roentgen is defined as the quantity of radioactive substance which produces a charge of 2.58×10^{-4} coulomb in 1 kg of air under standard conditions of pressure, temperature and Humidity.

10. Write the types of Rays.

Ans : When a radioactive nucleus undergoes radioactivity, it emits harmful radiations. These radiations are usually comprised of any of the three types of particles. They are alpha (α), beta (β) and gamma (γ) rays.

11. Write a short note on Alpha Decay.

Ans : A nuclear reaction in which an unstable parent nucleus emits an alpha particle and forms a stable daughter nucleus, is called 'alpha decay'. E.g.: Decay of uranium (U^{238}) to thorium (Th^{234}) with the emission of an alpha particle. $_{92}U^{238} \rightarrow {}_{90}Th^{234} + {}_{2}He^{4}$ (α - decay) In α - decay, the parent nucleus emits an α particle and so it is clear that for the daughter nucleus, the mass number decreases by four and the atomic number decreases by two.
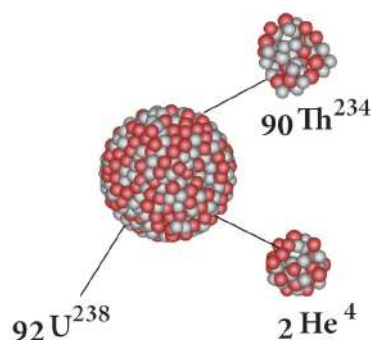
12. Write a short note on Beta Decay.

Ans : A nuclear reaction, in which an unstable parent nucleus emits a beta particle and forms a stable daughter nucleus, is called 'beta decay'. E.g.: Beta decay of phosphorous. $_{15}P^{32}$ $_{16}S^{32} + {}_{-1}e^{0}$ (β - decay) In β - decay there is no change in the mass number of the daughter nucleus but the atomic number increases by one.

13. Write a short note on Gamma Decay

Ans : In a γ - decay, only the energy level of the nucleus changes. The atomic number and mass number of the radioactive nucleus remain the same.

14. Differentiate between fissile material and fertile material.

Ans :

Fissile Material :

A fissionable material is a radioactive element, which undergoes fission in a sustained manner when it absorbs a neutron. It is also termed as 'fissile material'. E.g.: U^{235}, plutonium (Pu^{239} and Pu^{241}).

Fertile material :

There are some radioactive elements, which can be converted into fissionable material. They are called as fertile materials. E.g.: Uranium–238, Thorium–232, Plutonium–240.

15. What is called subcritical and supercritical?

Ans : If the mass of the fissile material is less than the critical mass, it is termed as 'subcritical'. If the mass of the fissile material is more than the critical mass, it is termed as 'supercritical'.

16. Explain Electron Volt

Ans : Electron Volt (eV) is the unit used in nuclear physics to measure the energy of small particles. It is nothing but the energy of one electron when it is accelerated using an electric potential of one volt. $1eV = 1.602 \times 10^{-19}$ joule. 1 million electron volt = 1 MeV = 10^{6} eV (mega electron volt) The energy released in a nuclear fission process is about 200 MeV.

17. What is called nuclear fusion?

Ans : When a heavy nucleus is split up into two smaller nuclei. Similarly, energy can be produced when two lighter nuclei combine to form a heavier nucleus. This phenomenon is known as Nuclear Fusion.

18. Define Nuclear Fusion

Ans : The process in which two lighter nuclei combine to form a heavier nucleus is termed as 'nuclear fusion'. E.g.: $_1H2 + _1H2 \rightarrow _2He^4 + Q$ (Energy) Here, $_1H^2$ represents an isotope of hydrogen known as 'deuterium'. The average energy released in each fusion reaction is about 3.84×10^{-12} J.
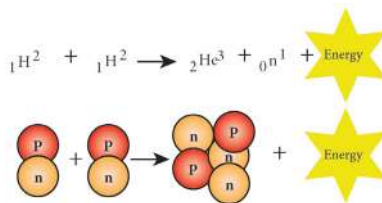
19. Tabulate the features of Nuclear fission and Nuclear Fusion

Ans :

S.No.	Nuclear Fission	Nuclear Fusion
1	The process of breaking up (splitting) of a heavy nucleus into two smaller nuclei is called 'nuclear fission'.	Nuclear fusion is the combination of two lighter nuclei to form a heavier nucleus.
2	Can be performed at room temperature.	Extremely high temperature and pressure is needed.
3	Alpha, beta and gamma radiations are emitted.	Alpha rays, positrons, and neutrinos are emitted.
4	Fission leads to emission of gamma radiation. This triggers the mutation in the human gene and causes genetic transform diseases.	Only light and heat energy is emitted.

20. How old is our mother Earth? Any guess??

Ans : It is nearly 4.54×10^9 years (around 45 Crore 40 lakh years).

21. Write the types of Nuclear reactors.

Ans : Breeder reactor, fast breeder reactor, pressurized water reactor, pressurized heavy water reactor, boiling water reactor, watercooled reactor, gas-cooled reactor, fusion reactor and thermal reactor are some types of nuclear reactors, which are used in different places world wide.

22. Write the uses of a Nuclear reactor.

Ans :

✦ Nuclear reactors are widely used in power generation.
✦ They are also used to produce radio isotopes, which are used in a variety of applications.
✦ Some reactors help us to do research in the field of nuclear physics.
✦ Breeder reactors are used to convert nonfissionable materials into fissionable materials.

Additional – Long answer questions

1. Explain the structure and working principle of Atom Bomb.

Ans :

❖ The atom bomb is based on the principle of uncontrolled chain reaction.
❖ In an uncontrolled chain reaction, the number of neutrons and the number of fission reactions multiply almost in a geometrical progression.
❖ This releases a huge amount of energy in a very small time interval and leads to an explosion.
❖ Structure : An atom bomb consists of a piece of fissile material whose mass is subcritical.
❖ This piece has a cylindrical void. It has a cylindrical fissile material which can fit into this void and its mass is also subcritical.
❖ When the bomb has to be exploded, this cylinder is injected into the void using a conventional explosive.

❖　Now, the two pieces of fissile material join to form the supercritical mass, which leads to an explosionDuring this explosion tremendous amount of energy in the form of heat, light and radiation is released.

❖　A region of very high temperature and pressure is formed in a fraction of a second along with the emission of hazardous radiation like γ rays, which adversely affect the living creatures.
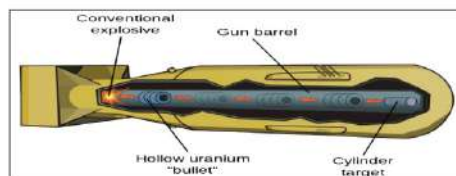
2.　Explain the principle of Hydrogen Bomb.

Ans : Hydrogen bomb is based on the principle of nuclear fusion. A hydrogen bomb is always designed to have an inbuilt atom bomb which creates the high temperature and pressure required for fusion when it explodes. Then, fusion takes place in the hydrogen core and leads to the release of a very large amount of energy in an uncontrolled manner. The energy released in a hydrogen bomb (or fusion bomb) is much higher than that released in an atom bomb (or fission bomb).

3.　Write the Uses of Radio acticity.

Ans : Many radio isotopes can be obtained from radioactivity. These radio isotopes have found wide variety of applications in the fields of medicine, agriculture, industry and archeological research.

Agriculture :

The radio isotope of phosphorous (P–32) helps to increase the productivity of crops. The radiations from the radio isotopes can be used to kill the insects and parasites and prevent the wastage of agricultural products. Certain perishable cereals exposed to radiations remain fresh beyond their normal life, enhancing the storage time. Very small doses of radiation prevent sprouting and spoilage of onions, potatoes and gram.

Medicine Medical applications of radio isotopes can be divided into two parts:

❖　Diagnosis.

❖　Therapy Radio isotopes are used as tracers to diagnose the nature of circulatory disorders of blood, defects of bone metabolism, to locate tumors, etc.

❖　Some of the radio isotopes which are used as tracers are: hydrogen, carbon, nitrogen, sulphur, etc.

❖　Radio sodium (Na^{24}) is used for the effective functioning of heart.

❖　Radio – Iodine (I^{131}) is used to cure goiter.

❖　Radio-iron is (Fe^{59}) is used to diagnose anaemia and also to provide treatment for the same.

❖　Radio phosphorous (P^{32}) is used in the treatment of skin diseases.

❖　Radio cobalt (Co^{60}) and radio-gold (Au^{198}) are used in the treatment of skin cancer.

❖　Radiations are used to sterilize the surgical devices as they can kill the germs and microbes.

❖　Industries.

❖　In industries, radioactive isotopes are used as tracers to detect any manufacturing defects such as cracks and leaks. Packaging faults can also be identified through radio activity. Gauges, which have radioactive sources are used in many industries to check the level of gases, liquids and solids.

❖　An isotope of californium (Cf^{252}) is used in the airlines to detect the explosives in the luggage.

❖　An isotope of Americium (Am^{241}) is used in many industries as a smoke detector.

Archeological research :

Using the technique of radio carbon dating, the age of the Earth, fossils, old paintings and monuments can be determined. In radio carbon dating, the existing amount of radio carbon is determined and this gives an estimate about the age of these things.

4. Explain the safety measures , permitted range and preventive measures of Radioactivity.

Safty measures :

In day to day life, you do receive some natural radiation from the Sun. The radioactive elements present in the soil and rocks, the house hold appliances like television, microwave ovens, cell phones and the X-rays used in hospitals.

❖ These radiations do not produce any severe effects as they are very low in intensity.The second source of radiation exposure is man-made.

❖ These are due to nuclear reactors and during the testing of the nuclear devices in the atmosphere or in the ground.

❖ Improper and careless handling of radioactive materials release harmful radiations in our environment.

❖ These radiations are very harmful to the human body. A person who is exposed to radiations very closely or for a longer duration, is at a greater health risk and can be affected genetically.

Permitted range :

❖ The International Commission on Radiological Protection (ICRP) has recommended certain maximum permissible exposure limits to radiation that is believed to be safe without producing any appreciable injury to a person.

❖ Safe limit of overall exposure to radiation is given as 20 millisievert per year. In terms of roentgen, the safe limit of receiving the radiation is about 100 mR per week.

❖ If the exposure is 100 R, it may cause fatal diseases like leukemia (death of red blood corpuscle in the blood) or cancer.

❖ When the body is exposed to about 600 R, it leads to death.

Preventive measures :

❖ Radioactive materials should be kept in a thick walled lead container.

❖ Lead coated aprons and lead gloves should be used while working with hazardous radioactive materials.

❖ You should avoid eating while handling radioactive materials.

❖ The radioactive materials should be handled only by tongs or by a remote control device.

❖ Dosimeters should be worn by the users to check the level of radiation.

5. Explain the nuclear power plants in India.

Ans :

❖ Indian Atomic Energy Commission (AEC) was established in August 1948 by theDepartment of Indian Scientific Research committee at Bombay (now Mumbai) in Maharashtra.

❖ It is the nodal agency for all the research done in the field of atomic energy.

❖ Dr. Homi Jahangir Bhaba was the first chairman of Indian Atomic Energy Commission.

❖ Now, it is known as Bhaba Atomic Research Centre (BARC). Nuclear power is the fifth largest source of power in India.

❖ Tarapur Atomic Power Station is India's first nuclear power station.

❖ Now, there are a total of seven power stations, one each inMaharashtra, Rajasthan, Gujarat, Uttar Pradesh and two in Tamilnadu. In Tamilnadu, we have nuclear power stations in Kalpakkam and Kudankulam.

❖ Apsara was the first nuclear reactor built in India and Asia. Now, there are 22 nuclear reactors which are operating in India.

❖ Some other operating reactors are;

❖ Cirus.

❖ Dhuruva.

❖ Purnima.

Additional – Solved problems

1. **Identify A, B, C, and D from the following nuclear reactions.**

   i) $_{13}Al^{27} + A \longrightarrow {}_{15}P^{30} + B$

   ii) $_{12}Mg^{24} + B \longrightarrow {}_{11}Na^{24} + C$

   iii) $_{92}U^{238} + B \longrightarrow {}_{93}Np^{239} + D$

   Ans :

   i) $_{13}Al^{27} + {}_2He^4 \longrightarrow {}_{15}P^{30} + {}_0n^1$

   ii) $_{12}Mg^{24} + {}_0n^1 \longrightarrow {}_{11}Na^{24} + {}_1H^1$

   iii) $_{92}U^{238} + {}_0n^1 \longrightarrow {}_{93}Np^{239} + {}_{-1}e^0$
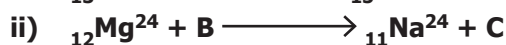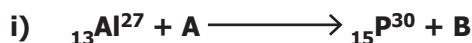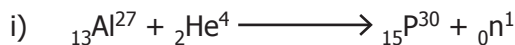
   A is alpha particle, B is neutron, C is proton, and D is electron.

2. **A radon specimen emits radiation of 3.7×10^3 GBq per second. Convert this disintegration in terms of curie. (one curie = 3.7×10^{10} disintegration per second)**

   Ans :

   $$1 \text{ Bq } = \text{ one disintegration per second}$$

   $$\text{one curie } = 3.7 \times 10^{10} \text{ Bq}$$

   $$1 \text{ Bq } = \frac{1}{3.7 \times 10^{10}} \text{ curie}$$

   $$\therefore 3.7 \times 10^3 \text{ G Bq } = 3.7 \times 10^3 \times 10^9 \times \frac{1}{3.7 \times 10^{10}}$$

   $$= 100 \text{ curie.}$$

3. **$_{92}U^{235}$ experiences one α - decay and one β - decay. Find number of neutrons in the final daughter nucleus that is formed.**

   Ans : Let X and Y be the resulting nucleus after the emission of the alpha and beta particles respectively.

   $$_{92}U^{235} \xrightarrow{\alpha \text{ decay}} {}_{90}X^{231} + {}_2He^4$$

   $$_{90}X^{231} \xrightarrow{\beta \text{ decay}} {}_{91}Y^{231} + {}_{-1}e^0$$
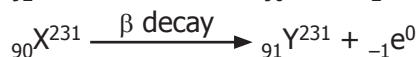
   $$\text{Number of neutrons } = \text{ Mass number } - \text{ Atomic number}$$

   $$= 231 - 91$$

   $$= 140.$$

4. **Calculate the amount of energy released when a radioactive substance undergoes fusion and results in a mass defect of 2 kg.**

   Ans :

   Mass defect in the reaction (m) = 2 kg

   Velocity of light (c) = 3×10^8 m s^{-1}

   By Einstein's equation,

   $$\text{Energy released } E = mc^2$$

   $$\text{So } E = 2 \times (3 \times 10^8)^2$$

   $$= 1.8 \times 10^{17} \text{ J.}$$

UNIT TEST-6

Time : 1.15 Hrs.   **Marks : 50**

I. Choose the best answer

                                                         (5 × 1 = 5)

1. **Unit of Radioactivity is _____.**

   a) Roentgen   b) Curie   c) Bequrrel   d) All the above

2. **Artificial radioactivity was discovered by _____.**
   a) Bequrrel   b) Irene curie   c) Roentgen   d) Neilsbohr
3. **_____ aprons are used to protect us from gamma radiations**
   a) Lead oxide   b) lead   c) Aluminium   d) none
4. **Proton-Proton chain reaction is an example of _____.**
   a) Nuclear fusion   b) Nuclear fission   c) Alpha decay   d) beta decay
5. **Kamini reactor is located at _____.**
   a) Kalpakkam   b) Koodankulam   c) Mumbai   d) Rajasthan

II. Fill in the blanks
(5 × 1 = 5)

6. _____ is the traditional unit of radioactivity.
7. 1 curie = _____ disintegrations per second.
8. _____ SI unit of radioactivity.
9. A Uranium nucleus when bombarded with a neutron undergoes fission producing _____ neutrons.
10. The little boy was a _____ type bomb which used a uranium Core.

III. State whether the statements are true or false. Correct the false statement
(4 × 1 = 4)

11. Pitchblende had less concentration of Uranium.
12. Gamma rays defelected by both the fields.
13. Tarapur Atomic power station is India's first nuclear power Station.
14. Plutonium −239 is a fissionable material.

IV. Match the following
(4 × 1 = 4)

15. BARC   (a)   Displacement law
16. IGCAR   (b)   Leukemia
17. Soddy Fajan   (c)   Mumbai
18. Co − 60   (d)   Kalpakkam

V. Assertion and Reasoning
(3 × 1 = 3)

Direction: In each of the following questions, a statement of Assertion is given and a corresponding statement of Reason is given just below it. Of the statements given below, mark the correct answer as
   a. If both A and R are true and R is the correct explanation of A.
   b. If both A and R are true but R is not the correct explanation of A.
   c. If A is true but R is false.
   d. If both A and R are false.

19. **Assertion :** Alpha, Beta and Gamma radiations are emitted.
    Reason : It says about Natural radioactivity.

20. **Assertion :** Gamma rays have a very high penetrating power greater than that of Beta rays.
    Reason : They can penetrate through thick metal blocks.

21. **Assertion :** The minimum mass of a fissile material necessary to sustain the chain reaction is called Critical Mass.
    Reason : It does not depends on the nature ,density and the size of the fissile material.

VI. Write the answer for the following questions in word or sentence
(3 × 1 = 3)

22. Who discovered natural radioactivity?
23. Which radioactive material is present in the ore of pitchblende?
24. Which material protects us from radiation?

VII. Arrange the following in the correct sequence

(3 × 1 = 3)

25. Arrange in descending order, on the basis of their penetration power.
    Alpha rays, beta rays, gamma rays, cosmic rays

26. Arrange the following in the chronological order of discovery:
    Nuclear reactor, radioactivity, artificial radioactivity, discovery of radium

VIII. Use the analogy to fill in the blank

(3 × 1 = 3)

27. Spontaneous process : Natural Radioactivity, Induced process : _____.
28. Nuclear Fusion : Extreme temperature, Nuclear Fission : _____.
29. Increasing crops : Radio phosphorous, Effective functioning of heart : _____.
30. Deflected by electric field: αray :Null deflection _____.

IX. Write the short answer for ANY 5 of the following questions.

(5 × 2 = 10)

31. Write any three features of natural and artificial radioactivity.
32. Define critical mass.
33. Define one roentgen.
34. State Soddy and Fajan's displacement law.
35. Give the function of control rods in a nuclear reactor.
36. What is stellar energy.
37. Differentiate the Nuclear fusion and Nuclear fission.

X. Write long answer for the following questions

(2 × 5 = 10)

38. Explain the process of controlled and uncontrolled chain reaction.
        [OR]
39. Explain the structure and working principle of Atom Bomb.

40. Explain the principle of Hydrogen Bomb.
        [OR]
41. Write the Uses of Radio activity.

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ATOMS AND MOLECULES

Points to Remember

➢ Two or more forms of an element having the same atomic number, but different mass number are called Isotopes ($_{17}Cl^{35}$, $_{17}Cl^{37}$).

➢ Atoms of different elements having the same mass number, but different atomic numbers are called Isobars ($_{18}Ar^{40}$, $_{20}Ca^{40}$).

➢ Atoms of different elements having the same number of neutrons, but different atomic number and different mass number are called Isotones ($_6C^{13}$, $_7N^{14}$).

➢ Relative atomic mass of an element is the ratio between the mass of one atom of the element to 1/12th of the mass of the atom of carbon -12.

➢ Average atomic mass of an element is calculated by adding the masses of its isotopes, each multiplied by their natural abundance on the Earth.

➢ Relative molecular mass of a molecule is the ratio between the mass of one molecule of the substance to 1/12th of the mass of the atom of carbon – 12.

➢ The Avogadro's law states that "equal volumes of all gases under similar conditions of temperature and pressure contain equal number of molecules".

➢ The vapour density is defined as "the ratio between the masses of equal volumes of a gas (or a vapour) and hydrogen under the same condition".

➢ Atomicity of a monoatomic element = Molecular mass / Atomic Mass.

➢ Molecular mass = 2 × Vapour density.

PART - A

I. Book Exercise – Choose the best answer

1. Which of the following has the smallest mass?
   a) 6.023×10^{23} atoms of He
   b) 1 atom of He
   c) 2 g of He
   d) 1 mole atoms of He

        Ans : (b) 1 atom of He

2. Which of the following is a triatomic molecule?
   a) Glucose   b) Helium   c) Carbon dioxide   d) Hydrogen

        Ans : (c) Carbon dioxide

3. The volume occupied by 4.4 g of CO2 at S.T.P
   a) 22.4 litre   b) 2.24 litre   c) 0.24 litre   d) 0.1 litre

        Ans : (b) 2.24 litre

4. Mass of 1 mole of Nitrogen atom is
   a) 28 amu   b) 14 amu   c) 28 g   d) 14 g

        Ans : (c) 28 g

5. Which of the following represents 1 amu?
   a) Mass of a C – 12 atom
   b) Mass of a hydrogen atom
   c) 1/12th of the mass of a C – 12 atom
   d) Mass of O – 16 atom

        Ans : (c) 1/12th of the mass of C – 12 atom

6. **Which of the following statement is incorrect?**
   a) One gram of C – 12 contains Avogadro's number of atoms.
   b) One mole of oxygen gas contains Avogadro's number of molecules.
   c) One mole of hydrogen gas contains Avogadro's number of atoms.
   d) One mole of electrons stands for 6.023×10^{23} electrons.

   Ans : (d) One mole of electrons stands for 6.023×10^{23} electrons.

7. **The volume occupied by 1 mole of a diatomic gas at S.T.P is**
   a) 11.2 litre   b) 5.6 litre   c) 22.4 litre   d) 44.8 litre

   Ans : (c) 22.4 litre

8. **In the nucleus of $_{20}Ca^{40}$, there are**
   a) 20 protons and 40 neutrons   b) 20 protons and 20 neutrons
   c) 20 protons and 40 electrons   d) 40 protons and 20 electrons

   Ans : (b) 20 protons and 20 neutrons

9. **The gram molecular mass of oxygen molecule is**
   a) 16 g   b) 18 g   c) 32 g   d) 17 g

   Ans : (c) 32 g

10. **1 mole of any substance contains _____ molecules.**
    a) 6.023×10^{23} b) 6.023×10^{-23} c) 3.0115×10^{23} d) 12.046×10^{23}

    Ans : (a) 6.023×10^{23}

II. Book Exercise – Fill in the blanks

1. Atoms of different elements having _____ mass number, but _____ atomic numbers are called isobars.   **Ans :** same, different

2. Atoms of different elements having same number of _____ are called isotones.   **Ans :** neutrons

3. Atoms of one element can be transmuted into atoms of other element by _____.
   Ans : artificial transmutation

4. The sum of the numbers of protons and neutrons of an atom is called its _____.   **Ans :** Mass number

5. Relative atomic mass is otherwise known as _____.   **Ans :** Standard atomic weight

6. The average atomic mass of hydrogen is _____ amu.   **Ans :** 1.008

7. If a molecule is made of similar kind of atoms, then it is called _____ atomic molecule.   **Ans :** Homo

8. The number of atoms present in a molecule is called its _____.   **Ans :** Atomicity

9. One mole of any gas occupies _____ ml at S.T.P.   **Ans :** 22400

10. Atomicity of phosphorous is _____.   **Ans :** 4

III. Book Exercise – Match the following

1.	**8 g of O_2**	-	**4 moles**
2.	**4 g of H_2**	-	**0.25 moles**
3.	**52 g of He**	-	**2 moles**
4.	**112 g of N_2**	-	**0.5 moles**
5.	**35.5 g of Cl_2**	-	**13 moles**

Ans :

1	8 g of O_2	b	0.25 moles
2	4 g of H_2	c	2 moles
3	52 g of He	e	13 moles
4	112 g of N_2	a	4 moles
5	35.5 g of Cl_2	d	0.5 moles

IV. Book Exercise – True or false (If false give the correct statement)

1. **Two elements sometimes can form more than one compound.**
   Ans : True.

2. **Noble gases are Diatomic.**
   Ans : False. Monoatomic.

3. **The gram atomic mass of an element has no unit.**
   Ans : False. Relative atomic mass of an element has no unit.

4. **1 mole of Gold and Silver contain same number of atoms.**
   Ans : True.

5. **Molar mass of CO_2 is 42g.**
   Ans : False. 44 g.

V. Book Exercise – Assertion and Reason

Answer the following questions using the data given below:

a) **A and R are correct, R explains the A.**
b) **A is correct, R is wrong.**
c) **A is wrong, R is correct.**
d) **A and R are correct, R doesn't explains A.**

1. **Assertion: Atomic mass of aluminium is 27**
   Reason: An atom of aluminium is 27 times heavier than 1/12th of the mass of the C − 12 atom.

   Ans : (d) A and R are correct, R doesn't explains A

2. **Assertion: The Relative Molecular Mass of Chlorine is 35.5 a.m.u.**
   Reason: The natural abundance of Chlorine isotopes are not equal.

   Ans : (a) A and R are correct, R explains the A

VI. Book Exercise – Short answer questions

1. **Define: Relative atomic mass.**

   Relative atomic mass of an element in the ratio between the average mass of its isotopes to 1/12th part of the mass of a carbon–12 atoms. It is denoted as A. It is otherwise called Standard Atomic Weight.

   $$An = \frac{\text{Average mass of the isotopes of the element}}{\frac{1}{12}\text{th of the mass of one carbon} - 12\,\text{atom}}$$

2. **Write the different types of isotopes of oxygen and its percentage abundance.**

Isotope	Mass (amu)	% abundance
$_8O^{16}$	15.9949	99.757
$_8O^{17}$	16.9991	0.038
$_8O^{18}$	17.9992	0.205

3. **Define: Atomicity.**

   The number of atoms present in the molecule is called its Atomicity.

   $$\text{Atomicity} = \frac{\text{Molecular Mass}}{\text{Atomic Mass}}$$

4. **Give any two examples for heterodiatomic molecules.**
   HCl, H_2O, NH_4.

5. **What is Molar volume of a gas?**
   One mole of any gas occupies 22.4 litre or 22400 ml at STP. The volume occupied by one mole of any gas at S.T.P is called molar volume.

6. Find the percentage of nitrogen in ammonia.

Molar mass of Ammonia $= 14 + 3 = 17$ g.

% of Nitrogen $= \dfrac{14}{17} \times 100 = 82.35\%$.

VII. Book Exercise – Long answer questions

1. Calculate the number of water molecule present in one drop of water which weighs 0.18 g.

Given Mass	$= 0.18$ g
Avogadro Number	$= 6.023 \times 1023$
Molecular Mass of water	$= 18$ g ($H2O = 2(1) + 1(16) = 2 + 16 = 18$)

No. of water molecules $= \dfrac{\text{Avogadro number} \times \text{given man}}{\text{Molecular Mass of water}}$

$= \dfrac{6.023 \times 10^{23} \times 0.18 \, \cancel{g}}{18 \, \cancel{g}}$

$= \dfrac{6.023 \times 10^{23} \times 0.18 \times 100}{18 \times 10^2}$

$= \dfrac{6.023 \times 10^{23} \times 18}{18 \times 10^2}$

$= \dfrac{6.023 \times 10^{23} \times 10^{-2} \times \cancel{18}}{\cancel{18}}$

$= 6.023 \times 10^{23} \times 10^{-2}$

$= 6.023 \times 10^{21}$ molecules of water.

2. $N_2 + 3H_2 \rightarrow 2NH_3$.
(The atomic mass of nitrogen is 14, and that of hydrogen is 1)
1 mole of nitrogen (_____g) +
3 moles of hydrogen (_____ g) →
2 moles of ammonia (_____ g)

1 mole of nitrogen (**28** g) +
3 moles of hydrogen (**3×1** g) →
2 moles of Ammonia (**34** g)
28, 3, 34

3. Calculate the number of moles in
i) 27g of Al ii) 1.51×10^{23} molecules of NH$_4$Cl.

i) No. of moles $= \dfrac{\text{Mass}}{\text{Atomic Mass}}$

$= \dfrac{27g}{27g}$

$= 1$ mole.

ii) No. of moles $= \dfrac{\text{No. of molecules of NH}_4\text{Cl}}{\text{Avogadro's number}}$

$= \dfrac{1.51 \times 10^{23}}{6.023 \times 10^{23}}$

$= \dfrac{1}{4}$

$= 0.25$ mole.

4. **Give the salient features of "Modern atomic theory".**

    Modern Atomic Theory:

    ✦ **An atom is no longer indivisible** (after the discovery of the electron, proton and neutron).

    ✦ Atoms of the same element may have different atomic mass (discovery of **Isotopes** $_{17}Cl^{35}$, $_{17}Cl^{37}$).

    ✦ Atoms of different elements may have same atomic masses (discovery of **Isobars** $_{20}Ar^{40}$, $_{20}Ca^{40}$).

    ✦ Atoms of one element can be transmuted into atoms of other elements. In otherwords, atom is no longer indestructible (discovery of **artificial transmutation**).

    ✦ Atoms may not always combine in a simple whole number ratio (Eg. Glucose $C_6H_{12}O_6$ C:H:O = 6:12:6 or 1:2:1 and Sucrose $C_{12}H_{22}O_{11}$ C:H:O = 12:22:11).

    ✦ Atom is the **smallest particle that take part in a chemical reaction**.

    ✦ The mass of an atom can be converted into energy (**E=MC^2**).

5. **Derive the relationship between Relative molecular mass and Vapour density.**

    Relative Molecular Mass : The ratio of Mass of one molecule of gas or vapour to the mass of one atom of hydrogen.

    Relative Molecular Mass $= \dfrac{\text{Mass of one molecule of gas or vapour}}{\text{Mass of one atom of hydrogen}}$ ....(1)

    Vapour density : The ratio of mass of a certain volume of a gas or vapour to the mass of an equal volume of hydrogen, measured under the same conditions of temperature and pressure.

    Vapour Density $= \dfrac{\text{Mass of 1 volume of gas or vapour}}{\text{Mass of 1 volume of hydrogen}}$ ....(2)

    VD $= \dfrac{\text{Mass of 1 volume of gas or vapour}}{\text{Mass of 1 volume of hydrogen}}$ ....(3)

    Applying Avogadro's law,

    VD $= \dfrac{\text{Mass of 1 molecule of gas or vapour}}{\text{Mass of 1 molecule of hydrogen}}$ ....(4)

    Hence hydrogen is diatomic

    VD $= \dfrac{\text{Mass of 1 molecule of gas or vapour}}{\text{Mass of 2} \times \text{atoms of hydrogen}}$ ....(5)

    VD $= \dfrac{\text{Mass of 1 molecule of gas or vapour}}{2 \times \text{mass of 1 atom of hydrogen}}$ ....(6)

    Multiplying '2' on both sides

    $2 \times$ VD $= \dfrac{\cancel{2} \times \text{Mass of 1 molecule of gas or vapour}}{\cancel{2} \times \text{Mass of 1 atom of hydrogen}}$ ....(7)

    $2 \times$ VD $= \dfrac{\text{Mass of 1 molecule of gas or vapour}}{\text{Mass of 1 atom of hydrogen}}$ ....(8)

    $2 \times$ VD $=$ Relative Molecular Mass ....(9)

    VD $= \dfrac{\text{RMM}}{2}$ or $\dfrac{\text{Molecular Weight}}{2}$ ....(10)

VIII. Book Exercise – HOT question

1. **Calcium Carbonate is decomposed on heating in the following reaction.**

    $CaCO_3 \rightarrow CaO + CO_2$

    i) **How many moles of Calcium Carbonate are involved in this reaction?**

        Ans : 1 mole of Calcium carbonate.

ii) **Calculate the gram molecular mass of Calcium Carbonate involved in this reaction.**

Ans : GMM of $CaCO_3$ $= 1\,(Ca) + 1\,(C) + 3\,(O)$

$= 1\,(40) + 1\,(12) + 3\,(16) = 1\,(40) + 1\,(12) + 48$

$= 40 + 12 + 48 = 100$ g.

iii) **How many moles of CO_2 are there in this equation?**

Ans : 1 mole of CO_2.

IX. Book Exercise – Solve the following problems

1. **How many grams are there in the following?**

i) **2 moles of hydrogen molecule, H_2.**

Mass = No. of moles × Molecular Mass.

Mass = $2 × (2×1) = 4$ g.

ii) **3 moles of chlorine molecule, Cl_2.**

Mass = No. of moles × Molecular Mass.

Mass = $(35.5×2) × 3$

$= 71 × 3$

$= 213$ g.

iii) **5 moles of sulphur molecule, S_8.**

Mass = No. of moles × Molecular Mass.

Mass = $(8×32) × 5$

$= 256 × 5$

$= 1280$ g.

iv) **4 moles of phosphorous molecule, P_4.**

Mass = No. of moles × Molecular Mass.

Mass = $(4 × 31) × 4$

$= 124 × 4$

$= 496$ g.

2. **Calculate the % of each element in calcium carbonate. (Atomic mass: C-12, O-16, Ca -40).**

$CaCO_3$.

Molar Mass of $CaCO_3$ $= 1\,(Ca) + 1\,(C) + 3\,(O)$

$= 1\,(40) + 1\,(12) + 3\,(16)$

$= 40 + 12 + 48$

$= 100$ g.

% of Ca in $CaCO_3$ $= \dfrac{\text{Mass of Ca}}{\text{Molar Mass of } CaCO_3} × 100$

$= \dfrac{40\ \cancel{g}}{100\ \cancel{g}} × \cancel{100}$

$= 40\%$.

% of C in $CaCO_3$ $= \dfrac{\text{Mass of Carbon}}{\text{Molar Mass of } CaCO_3} × 100$

$= \dfrac{12\ \cancel{g}}{100\ \cancel{g}} × \cancel{100}$

$= 12\%$.

% of O in $CaCO_3$ $= \dfrac{\text{Mass of Oxygen}}{\text{Molar Mass of Calcium}} × 100$

$= \dfrac{48\ \cancel{g}}{100\ \cancel{g}} × \cancel{100}$

$= 48\%$.

3. **Calculate the % of oxygen in $Al_2(SO_4)_3$. (Atomic mass: Al-12, O-16, S -32)**

$Al_2(SO_4)_3$.

Molar Mass of $Al_2(SO_4)_3$ $\quad = 2\,(Al) + 3\,(S) + 12\,(O)$

$\qquad\qquad\qquad\qquad\quad = 2\,(27) + 3\,(32) + 12\,(16)$

$\qquad\qquad\qquad\qquad\quad = 54 + 96 + 192$

$\qquad\qquad\qquad\qquad\quad = 342\ g.$
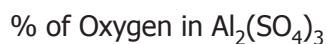
% of Oxygen in $Al_2(SO_4)_3$

% of Oxygen $\qquad\qquad = \dfrac{\text{Mass of Oxygen}}{\text{Molecular Mass of } Al_2(SO_4)_3}$

$\qquad\qquad\qquad\quad = \dfrac{192\ \cancel{g}}{342\ \cancel{g}} \times 100$

$\qquad\qquad\qquad\quad = 56.14\%.$

4. **Calculate the % relative abundance of B -10 and B -11, if its average atomic mass is 10.804 amu.**

B10 and B11.

$\qquad\qquad\qquad$ Let B10 $\quad = X\%$

$\qquad\qquad\qquad\quad$ B11 $\quad = (100 - X)\%$

$\qquad$ Average atomic mass $\quad = 10X + \dfrac{11(100 - x)}{100} \ = 10.80$

$10X + 11\,(100{-}X) \qquad = 10.80 \times 100$

$10X + 1100 - 11X \qquad = 1080$

$\qquad\qquad 1100 - X \qquad = 1080$

$\qquad\qquad\qquad - X \qquad = 1080 - 1100$

$\qquad\qquad\qquad - X \qquad = -20$

$\qquad\qquad\qquad\ X \qquad = 20$

B10 = 20%.
B11 = (100–X) = 80%.

Additional – Choose the best answer

1. **The first scientific theory of the atom was proposed by _____.**
    a) John Dalton   b) J.J. Thomson   c) Ruther Ford   d) Neils Bohr

    Ans : (a) John Dalton

2. **The atoms are having same atomic number but differ in their mass number is known as _____.**
    a) Isobars   b) Isotopes   c) Isotones   d) None

    Ans : (b) Isotopes

3. **The atoms are having same mass number but differ in their atomic number is known as _____.**
    a) Isobars   b) Isotopes   c) Isotones   d) None

    Ans : (a) Isobars

4. **The atoms are having different atomic number, different mass number but it contains same number of neutrons are called as _____.**
    a) Isobars   b) Isotopes   c) Isotones   d) None

    Ans : (c) Isotones

5. **An Isotope of Carbon, which contains <u>6</u> protons and <u>6</u> neutrons.**
    a) 6 protons 6 neutrons   b) 6 protons 7 neutrons   c) 6 protons 8 neutrons   d) 8 protons 6 neutrons

    Ans : (a) 6 protons 6 neutrons

6. **If the molecule is made of similar kind of atoms. Then it is called _____.**
   a) Homo Atomic Molecule
   b) Di Atomic Molecule
   c) Hetero Atomic Molecule
   d) Poly Atomic Molecule

   Ans : (a) Homo Atomic Molecule

7. **If a molecule contains more than three atoms, then it is called _____.**
   a) Homo Atomic Molecule
   b) Di Atomic Molecule
   c) Tri Atomic Molecule
   d) Poly Atomic Molecule

   Ans : (d) Poly Atomic Molecule

8. **Gram Atomic Mass of Carbon = _____ g.**
   a) 16   b) 12   c) 10   d) 8

   Ans : (b) 12

9. **Gram Molecular Mass of HCl is _____ g.**
   a) 35.5 g   b) 34.5 g   c) 36.5 g   d) 31.5 g

   Ans : (c) 36.5 g

10. **The value of Avogadro number is _____.**
    a) 6.023×10^{23} b) 6.023×10^{22} c) 6.023×10^{21} d) 6.023×10^{-21}

    Ans : (a) 6.023×10^{23}

11. **One litre is equal to _____.**
    a) $1 dm^2$ b) $1 dm^3$ c) $1 cm^2$ d) $1 mm^2$

    Ans : (b) $1 dm^3$

12. **Gram molar volume of gas at STP is _____.**
    a) 22.4 lit   b) 22.5 lit   c) 224 lit   d) none

    Ans : (a) 22.4 lit

13. **Gram molecular mass of Water _____ g.**
    a) 18   b) 16   c) 15   d) 1.8

    Ans : (a) 18

14. **Vapour density = _____.**
    a) RMM × 2   b) RMM / 2   c) RAM × 2   d) RMM / 2

    Ans : (b) RMM / 2

15. **Gram atomic mass of Hydrogen _____ g.**
    a) 2   b) 1   c) 3   d) 4

    Ans : (b) 1

16. **Gram atomic mass of Nitrogen _____ g.**
    a) 12   b) 14   c) 28   d) 20

    Ans : (b) 14

17. **Atomic mass of Hydrogen is _____ amu.**
    a) 1.008   b) 1.006   c) 1.005   d) 1.004

    Ans : (a) 1.008

18. **Atomic mass of Helium is _____ amu.**
    a) 3.003   b) 4.003   c) 2.003   d) 1.003

    Ans : (b) 4.003

19. **Atomic mass of Lithium is _____ amu.**
    a) 7.641   b) 6.941   c) 8.451   d) 9.412

    Ans : (b) 6.941

20. **Atomic mass of Beryllium is _____ amu.**
    a) 9.012   b) 8.012   c) 7.012   d) 6021

    Ans : (a) 9.012

21. Example of Triatomic molecule is _____.

 a) O_2 b) O_3 c) NH3   d) none

                               Ans : (b) O_3

22. Gram molecular mass of Oxygen is _____ g.

 a) 16   b) 30   c) 32   d) 26

                               Ans : (c) 32

Additional – Fill in the blanks

1. _____ is made of atoms. **Ans :** Matter

2. The first scientific theory of the atom was proposed by _____. **Ans :** John Dalton

3. An atom is _____ divisible. **Ans :** no longer

4. Atoms of the same element may have different atomic mass. These elements are called as _____. **Ans :** Isotopes

5. An example of isotopes _____. **Ans :** $_{17}Cl^{35}._{17}Cl^{37}$

6. Atoms of different elements may have same atomic mass. These elements are called as _____. **Ans :** Isobars

7. An example of Isobars are _____. **Ans :** $_{18}Ar^{40}._{20}Ca^{40}$

8. Atoms of one element can be _____ into atoms of other elements. In other words, atom is no longer indestructible. **Ans :** transmuted

9. Atoms may not always combine in a _____ whole number ratio. **Ans :** simple

10. Atom is the _____ that takes part in chemical reaction. **Ans :** smallest particle

11. The _____ of an atom can be converted into energy ($E=mc^2$). **Ans :** mass

12. An atom contains such as protons, neutrons and _____. **Ans :** electrons

13. _____ have considerable mass. **Ans :** Protons and neutrons

14. _____ does not have a considerable mass. **Ans :** Electrons

15. The sum of the number of protons and neutrons of an atom is called its _____. **Ans :** mass number

16. The mass of an atom is measured in _____ (amu). **Ans :** atomic mass unit

17. The mass of a proton or neutron is approximately _____. **Ans :** 1 amu

18. An _____ which contains 6 protons and 6 neutrons. **Ans :** isotope of carbon

19. _____ is unified atomic mass. **Ans :** Amu

20. Isotopic character of hydrogen is _____. **Ans :** $_{1}H^1$, $_{1}H^2$, $_{1}H^3$

21. Relative atomic mass of an element is the ratio between the average mass of its isotopes to $1/12^{th}$ part of the mass of a carbon–12 atom. It is otherwise called _____. **Ans :** Standard Atomic Weight

22. Relative Atomic Mass is only a ratio, so it has _____. **Ans :** no unit

23. If the atomic mass of an element is expressed in grams, it is called as _____. **Ans :** Gram Atomic Mass

24. Gram atomic Mass of _____ = 1g. **Ans :** Hydrogen

25. Gram atomic mass of _____ = 12g. **Ans :** Carbon

26. Gram atomic mass of _____ = 14g. **Ans :** Nitrogen

27. Gram atomic mass of _____ = 16g. **Ans :** Oxygen

28. Atomic mass of _____ = 1. **Ans :** Hydrogen

29. Atomic mass of _____ = 12. **Ans :** Carbon

30. Atomic mass of _____ = 14. **Ans :** Nitrogen

31. Atomic mass of _____ = 16.　　**Ans :** Oxygen

32. Atomic mass of _____ = 23.　　**Ans :** Sodium

33. Atomic mass of _____ = 24.　　**Ans :** Magnesium

34. Atomic mass of _____ = 32.　　**Ans :** Sulphur

35. The natural abundance of C-12 and C-13 are _____ .　　**Ans :** 98.90% and 1.10%

36. The average of the atomic mass of carbon is _____ amu.　　**Ans :** 12.011

37. The average of the atomic mass of Hydrogen is _____ amu.　　**Ans :** 1.008

38. The average of the atomic mass of Helium is _____ amu.　　**Ans :** 4.003

39. The average of the atomic mass of Lithium is _____ amu.　　**Ans :** 6.941

40. The average of the atomic mass of Beryllium is _____ amu.　　**Ans :** 9.012

41. The average of the atomic mass of Boron is _____ amu.　　**Ans :** 1.008

42. Mass of $_8O^{16}$ isotope is _____.　　**Ans :** 15.9949

43. % of abundance $_8O^{16}$ isotope is _____.　　**Ans :** 99.757

44. Mass of $_8O^{17}$ isotope is _____.　　**Ans :** 16.9991

45. % of abundance $_8O^{17}$ isotope is _____.　　**Ans :** 0.038

46. Mass of $_8O^{18}$ isotope is _____.　　**Ans :** 17.9992

47. % of abundance $_8O^{18}$ is _____.　　**Ans :** 0.205

48. Except noble gases, atoms of most of the elements are found in the combined form with itself or atoms of other elements. It is called as a _____.　　**Ans :** molecule

49. A molecule is a combination of two or more held together by strong chemical _____ in chemical bonds.　　**Ans :** forces of attraction

50. If the molecule is made of similar kind of atoms then it is called _____ molecule.　　**Ans :** homoatomic

51. The molecule that consist of atoms of different elements is called _____ molecule.　　**Ans :** hetero atomic molecule

52. The compound NH_3 is a _____.　　**Ans :** hetero atomic molecule

53. The number of atoms present in the molecule is called its _____.　　**Ans :** atomicity

54. Number of atoms are present in Monoatomic is _____.　　**Ans :** 1

55. Number of atoms are present in Diatomic .is _____.　　**Ans :** 2

56. Number of atoms are present in triatomic is _____.　　**Ans :** 3

57. Number of atoms are present in Polyatomic is _____.　　**Ans :** more than 3

58. An example of mono atomic molecule is _____.　　**Ans :** Helium (He)

59. An example of Di atomic molecule is _____.　　**Ans :** Hydrogen (H_2)

60. An example of Tri atomic molecule is _____.　　**Ans :** Ozone (O_3)

61. An example of poly atomic molecule is _____.　　**Ans :** Sulphur (S_8)

62. An example of _____ molecule is hydrogen chloride.　　**Ans :** hetero atomic

63. The relative molecular mass of a molecule is the ratio between the mass of one molecule of the substance to 1./12th mass of an atom _____.　　**Ans :** carbon − 12

64. Relative molecular mass is only a ratio. It has _____.　　**Ans :** no unit

65. If the molecular mass of a compound is expressed in grams it is called _____.　　**Ans :** gram molecular mass

66. Gram molecular mass of _____ is 18 g.　　**Ans :** water

67. Gram molecular mass of _____ is 44 g.　　**Ans :** carbon di oxide

68. Gram molecular mass of _____ is 17 g.   **Ans :** ammonia

69. Gram molecular mass of _____ is 36.5 g.   **Ans :** HCl

70. The _____ is obtained by adding together the relative atomic masses of all the atoms present in a molecule.   **Ans :** relative molecular mass

71. Molecules are _____.   **Ans :** less reactive

72. Atoms are _____.   **Ans :** highly reactive

73. An atom is the _____ particle of an element.   **Ans :** smallest

74. A _____ is the smallest particle of an element or compound.   **Ans :** molecule

75. Atom does not have a _____.   **Ans :** chemical bond

76. Atoms in a _____ are held by chemical bonds.   **Ans :** molecule

77. The _____ is the amount of substance that contains as many atoms or molecules or other particles as there are atoms in exactly 12 g of the carbon–12 isotope.   **Ans :** mole

78. _____ was proposed the Avogadro number.   **Ans :** Amedo Avogadro

79. Amedo Avogadro is an _____.   **Ans :** Italian Scientist

80. Value of Avogadro number is _____.   **Ans :** 6.023×10^{23}

81. One mole of substance contains _____.   **Ans :** 6.023×10^{23} molecules

82. Standard molar volume at STP = _____.   **Ans :** 22.4 litres

83. STP means _____.   **Ans :** Standard Temperature and Pressure

84. Standard Temperature is _____.   **Ans :** 273.15 K

85. Standard Pressure is _____.   **Ans :** 1.00 atm

86. One mole of an element contains 6.023×10^{-23} atoms and it is equal to its _____.
   Ans : gram atomic mass

87. One mole of matter contains 6.023×10^{-23} molecules and it is equal to its _____.
   Ans : gram molecular mass

88. One mole of oxygen contains 6.023×10^{-23} molecules of oxygen and its gram molecular mass is _____.   **Ans :** 32 g

89. One mole of any gas occupies _____ at STP. This volume is called as molar volume.
   Ans : 22.4 litre (or) 22400 ml

90. Number of moles = _____.   **Ans :** Mass / Atomic mass

91. Number of moles = _____.   **Ans :** Mass / Molecular mass

92. Number of moles = _____.   **Ans :** Number of atoms / Avogadro number

93. Number of moles = _____.   **Ans :** Number of molecules / Avogadro number

94. The _____ of a compound represents the mass of each element present in 100 g of the compound.
   Ans : percentage composition

95. In 1811 Avogadro framed a _____.   **Ans :** hypothesis

96. Equal volume of all gases under similar conditions of temperature and pressure contain equal number of molecules. This is called _____.   **Ans :** Avogadro Hypothesis

97. V = _____ is stated that Avogadro hypothesis.   **Ans :** constant × n

98. One litre = _____.   **Ans :** $1 \, dm^3$

99. One litre of hydrogen contains the _____ number of molecules as in one litre of oxygen.   **Ans :** same

100. The volume of the gas is _____ to the number of molecules of the gas.   **Ans :** directly proportional

101. One molecule of hydrogen is react with one molecule of chlorine to give 2 molecules of _____.
Ans : hydrogen chloride

102. Avogadro explains _____.   **Ans :** Gay–Lussac's law

103. Avogadro helps in the determination of _____.   **Ans :** atomicity of gases

104. Avogadro derived the _____.   **Ans :** molecular formula of gases

105. Avogadro determines the relation between _____ and _____.
Ans : molecular mass, vapour density

106. Avogadro helps to determine _____ (22.4 lit at STP).   **Ans :** gram molar volume of gases

107. The relative molecular mass is the ratio between the mass of one molecule of the gas or vapour to mass of _____.   **Ans :** one atom of hydrogen

108. _____ is defined as the ratio of mass of a certain volume of a gas or vapour to the mass of an equal volume of hydrogen, measured under the same conditions of temperature and pressure.
Ans : Vapour density

109. VD = _____.   **Ans :** Relative molecular mass / 2

110. VD = _____.   **Ans :** RMM / 2

111. VD = _____.   **Ans :** Molecular weight / 2

112. 2 × VD = _____.   **Ans :** RMM

113. Gram molar mass of _____ = 18 g.   **Ans :** water

114. Gram molar mass of CO_2 = _____.   **Ans :** 44 g

115. Gram molar Mass of _____ =308 g.   **Ans :** $Ca_3(PO_4)_2$

116. Gram Molar mass of H_2SO_4 = _____.   **Ans :** 98 g

117. Atomicity of _____ = 2.   **Ans :** Chlorine

118. Atomicity of _____ = 2.   **Ans :** Nitrogen

119. Atomicity of _____ = 2.   **Ans :** Oxygen

120. Atomicity of _____ = 3.   **Ans :** Ozone

121. Atomicity of _____ = 4.   **Ans :** Phosphorous

122. Atomicity of _____ = 8.   **Ans :** Sulphur

123. _____ is made up atoms.   **Ans :** Matter

124. An atom is no longer _____.   **Ans :** indivisible

125. E = _____.   **Ans :** MC^2

126. The mass of an atom is measured in _____ (amu).   **Ans :** atomic mass unit

127. Relative atomic mass is measured in _____ (amu).   **Ans :** Standard Atomic Weight

128. Atomic mass of an element is expressed in terms of grams is called _____.   **Ans :** Gram Atomic Mass

129. The number of atoms present in the one molecule of an element is called _____.   **Ans :** Atomicity

130. Avogadro number is denoted as _____.   **Ans :** N

131. STP is equal to _____, _____.   **Ans :** 273.15 K, 1.00 atm

132. Atomicity is equal to _____.   **Ans :** Molecular Mass / Atomic Mass

Additional – Match the following

1.
1. Mono atomic molecule (a) O_2, N_2
2. Di atomic molecule (b) He, Ne
3. Tri atomic molecule (c) P_4
4. Tetra atomic molecule (d) O_3

Ans :

1	Mono atomic molecule	b	He, Ne
2	Di atomic molecule	a	O_2, N_2
3	Tri atomic molecule	d	O_3
4	Tetra atomic molecule	c	P_4

2.
1. GMM of Water (a) 36.5 g
2. GMM of CO_2 (b) 18 g
3. GMM of Ammonia (c) 44 g
4. GMM of HC*l* (d) 17 g

Ans :

1	GMM of Water	b	18 g
2	GMM of CO_2	c	44 g
3	GMM of Ammonia	d	17 g
4	GMM of HC*l*	a	36.5 g

3.
1. Atom (a) chlorine
2. De–broglie (b) argon and calcium
3. Isobars (c) Tri atomic
4. Isotopes (d) poly atomic
5. Hydrogen (e) helium
6. Ozone (f) $6.023 \times 10_{23}$
7. Phosphorus (g) wave
8. Avogadro number (h) indivisible
9. Mono atomic (i) homo di atomic
10. Di atomic (j) cl –35, cl –37

Ans :

1	Atom	h	indivisible
2	De–broglie	g	wave
3	Isobars	b	argon and calcium
4	Isotopes	j	cl –35, cl –37
5	Hydrogen	i	homo diatomic
6	Ozone	c	tri atomic
7	Phosphorus	d	poly atomic
8	Avogadro number	f	$6.023 \times 10_{23}$
9	Mono atomic	e	helium
10	Di atomic	a	chlorine

4.
1. 0.5 mole of SO_2 (a) Heisenberg
2. Uncertinity principle (b) 3.0115×10^{-23}
3. Atomic mass (c) 11.2 lit
4. Volume of 16 g of oxygen at STP (d) atomic mass unit

Ans :

1	0.5 mole of SO_2	b	3.0115×10^{-23}
2	Uncertinity principle	a	Heisenberg
3	Atomic mass	d	atomic mass unit
4	Volume of 16 g of oxygen at STP	c	11.2 lit

Additional – Spot the error

1. **The molecule that consist of atoms of different elements is called homo atomic molecule.**

   Ans: The molecule that consist of atoms of different elements is called hetero atomic molecule.

2. **Oxygen gas does not exist in two allotropic forms they are Oxygen and ozone.**

   Ans: Oxygen gas exist in two allotropic forms they are oxygen and ozone.

3. **Ozone contains three oxygen atoms and hence it is called homo di atomic molecule.**

   Ans: Ozone contains three oxygen atoms and hence it is called homo tri atomic molecule.

4. **Hydrogen chloride is a homo diatomic molecule.**

   Ans: Hydrogen chloride is a hetero diatomic molecule.

5. **Oxygen is a second most abundant element in the earth crust.**

   Ans: Oxygen is a first most abundant element in the earth crust.

Additional – Assertion and Reason

1. **Assertion :** A molecule is a combination of two or more atoms held together by chemical forces of attraction.
   Reason : These are formed by chemical bonds.
   a. **A is right R is wrong**　　　　b. **A is wrong R is right**
   c. **R explains A**　　　　d. **R does not explain A**

   Ans : (c) R explains A

2. **Assertion :** Homoatomic molecules are made up of atoms of the same elements.
   Reason : Hcl consist of hydrogen and chlorine.
   a. **A is right R is wrong**　　　　b. **A is wrong R is right**
   c. **R explains A**　　　　d. **R does not explain A**

   Ans : (a) A is right R is wrong

3. **Assertion :** Ammonia is a molecule.
   Reason : Ammonia is a hetero atomic molecule.
   a. **A is right R is wrong**　　　　b. **A is wrong R is right**
   c. **R explains A**　　　　d. **R does not explain A**

   Ans : (b) R explains A

4. **Assertion :** one mole of any gas occupies 22.4 litres or 22400 ml at STP.
   Reason : one mole matter contains Avogadro number of particles.
   a. **A is right R is wrong**　　　　b. **A is wrong R is right**
   c. **R explains A**　　　　d. **R does not explain A**

   Ans : (d) R does not explain A

5. **Assertion :** The volume of the gas is directly proportional to the number of molecules of the gas.
   Reason : Equal volume of all gases contain equal number of molecules.
   a. **A is right R is Wrong**　　　　b. **A is wrong R is right**
   c. **R explains A**　　　　d. **R does not explain A**

   Ans : (c) R explains A

Additional – True or False (If False give the Correct Statement

1. **The sum of the number of protons and neutrons of an atom is called its atomic number.**
   Ans : False: The sum of the number of protons and neutrons of an atom is called its mass number.

2. **The molecule that consist of atoms of different elements is called hetero atomic molecule.**
   Ans : True.

3. **If a molecule contains more than three atoms then it is called triatomic molecule.**
   Ans : False: If a molecule contains more than three atoms then it is called poly atomic molecule.

4. **One mole of oxygen contains 6.023×10^{23} molecules of oxygen and its gram molecular mass is 32 g.**
   Ans : True.

5. **The percentage composition of a compound represents the mass of each element present in 100 g of the compound.**
   Ans : True.

6. **One mole of any gas contains $22400 cm^3$ at STP.**
   Ans : False : One mole of any gas contains 22400 ml at STP.

7. **Avogadro law does not explains Gay Lussac's law.**
   Ans : False. Avogadro law explains Gay Lussac's law.

8. **Gay lussac law helps to determine gram molar volume of all gases.**
   Ans : False: Avogadro law helps to determine gram molar volume of all gases.

9. **Relative molecular mass is equal to 4 times of vapour density.**
   Ans : False: Relative molecular mass is equal to 2 times of vapour density.

10. **Gram molecular mass of calcium phosphate is 208 g.**
    Ans : False: Gram molecular mass of Calcium Phosphate is 308 g.

Additional – Short answer questions

1. **Define Mass number.**
   The sum of the number of protons and neutrons of an atom is called its mass number.

2. **Define RAM.**
   Relative atomic mass of an element is the ratio between the average mass of its isotopes to 1/12th part of the mass of a Carbon–12 atom. It is denoted as A. It is otherwise called as Standard Atomic Weight.

   $$Ar = \frac{\text{Average mass of the Isotopes of the element}}{\frac{1}{12} \text{th of the mass of one Carbon atom}}$$

3. **Define average atomic mas of an element.**
   The average atomic mass of an element in the weighed average of the masses of its naturally occuring isotopes.

   Average atomic mass   = (Mass of 1st Isotope × % abundance of 1st Isotope) +
           (Mass of 2nd Isotope × % abundance of 2nd Isotope)

4. **Calculate the abundance of C–12 and C–13 are 98.90% and 1.10% respectively.**

   Average atomic mass of Carbon $= 12 \times \left(\frac{98.9}{100}\right) + 13 \times \left(\frac{1.1}{100}\right)$

           $= 12 \times 0.989 + 13 \times 0.011$

           $= 11.868 + 0.143$

           $= 12.011$ amu.

5. **Define molecule.**
   A molecule is a combination of 2 (or) more atoms held together by strong chemical forces of attraction. i.e., chemical bonds.

6. Differentiate Homo and Hetero atomic molecule.

S.No.	Homo Atomic	Hetero Atomic
1.	The molecule is made of similar kind of atoms, then it is called Homo atomic molecule.	The molecule that consist of atoms of different elements is called Hetero atomic molecule.
2.	eg: H_2, Cl_2, N_2	eg: NH_3, HCl

7. Define homotriatomic molecule. Give an example.

Ozone contains three oxygen atoms and hence it is called homo triatomic molecule. Eg.: O_3.

8. Define polyatomic molecule. Give an example.

If a molecule contains more than three atoms, then it is called polyatomic molecule. Eg.: P_4, S_8.

9. Draw the structure of HC*l* and H$_2$O.

HC*l* (Hydrogen Chloride)   Water (H$_2$O)

10. Define Relative Molecular Mass.

The Relative Molecular Mass of a molecule is the ratio between the mass of one molecule of the substance to 1/12th mass of an atom of Carbon–12.

11. Write the difference between atoms and molecules.

S.No.	Atom	Molecule
1.	An atom is the smallest particle of an element.	A molecule is the smallest particle of an element or compound.
2.	Atom does not exist in free state except in a noble gas.	Molecule exists in free a state.
3.	Except some of noble gas, other atoms are highly reactive.	Molecules are less reactive.
4.	Atom does not have a chemical bond.	Atoms in a molecule are held by chemical bonds.

12. Define Mole.

The mole is the amount of substance that contains as many elementary entities as there are atoms in exactly 12g of the Carbon–12 Isotope.

13. Define Avogadro number.

The actual number of atoms in 12g of Carbon–12 is determined experimentally. This is called Avogadro number and it is denoted as NA. It's value is 6.023×10^{23}.

14. How to calculate the number of moles of a substance?

➢ Number of moles of molecules.
➢ Number of moles of atoms.
➢ Number of moles of a gas.
➢ Number of moles of Ions.

15. Define Mole.

One mole of an element contains 6.023×10^{23} atoms and it is equal to its gram atomic mass. Eg.: One mole of oxygen contains 6.023×10^{23} atoms of oxygen and its Gram atomic mass is 16g.

16. Define Mole of molecules.

One mole of matter contains 6.023×10^{23} molecules and its equal to its gram molecular mass. Eg.: One mole of oxygen contains 6.023×10^{23} molecules of oxygen and its gram molecular mass is 32g.

17. Calculate the number of moles by different modes.

Number of moles	=	Mass / Atomic mass.
	=	Mass / Molecular mass.
	=	Number of atoms / 6.023×10^{23}.
	=	Number of molecules / 6.023×10^{23}.

18. Define Percent composition.

The percentage composition of the compound represents the mass of each element present is 100g of the compound.

19. State Avogadro's law.

Equal volumes of all gases under similar conditions of temperature and pressure contain equal number of molecules.

20. Define vapour density.

Vapour density is the ratio of the mass of a certain volume of gas or vapour to the mass of an equal volume of hydrogen measured under the same conditions of temperature and pressure.

Additional – Long answer questions

1. Explain Avogardo hypothesis.

The volume of any given gas must be propostional to the number of molecules in it. If 'V' is the volume, 'n' is the number of molecules of a gas, then Avogadro law is represented mathematically as follows.

$$V \alpha n$$

$$V = \text{Constant} \times n.$$

Thus one litre (1 dm3) of hydrogen contains the same number of moecules as in one litre of oxygen. i.e., the volume of the gas is directly propostional to the number of molecules of the gas.

Explanation : Let us consider the reaction between hydrogen and chlorine to form hydrogen chloride gas.

$$H_2 + Cl_2 \rightarrow 2HCl_{(g)}$$
(g)   (g)   2 volumes.
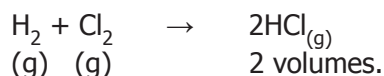
According to Avogadro's law, 1 volume of any gas is occupied by 'n' number of molecules.

'n' molecules + 'n' molecules → 2n molecules

if 'n' = 1 then,

1 molecule + 1 molecule → 2 molecules.

½ molecule + ½ molecule → 1 molecule.

1 molecule of hydrogen chloride gas is made up of ½ molecule of chlorine. Hence the molecules can be subdivided. This law obeys the Dalton's Atomic Theory.

2. Write the applications of Avogadro's law.

➢ It explains Gay – lussac's law.
➢ It helps in the determination of atomicity of gases.
➢ Molecular formula of gases can be derived from Avogadro's law.
➢ It determines the relation between molecular mass and vapour density.
➢ It helps to determine gram molar volume of all gases. (22.4 lit at STP)

SOLVED PROBLEMS

1. Boron naturally occurs as a mixture of boron-10 (5 protons + 5 neutrons) and boron-11 (5 protons + 6 neutrons) isotopes. The percentage abundance of B-10 is 20 and that of B-11 is 80. Then, the atomic mass of boron is calculated as follows :

Solution : Atomic mass of Boron $= \left(10 \times \dfrac{20}{100}\right) + \left(11 \times \dfrac{80}{100}\right)$

$= (10 \times 0.20) + (11 \times 0.80)$

$= 2 + 8.8$

$= 10.8$ amu.

2. **Relative molecular mass of sulphuric acid (H_2SO_4) is calculated as follows: Sulphuric acid conatins 2 atoms of hydrogen, 1 atom of sulphur and 4 atoms of oxygen.**
   Solution : Therefore, Relative molecular mass of sulphuric acid

$$= (2 \times \text{mass of hydrogen}) + (1 \times \text{mass of sulphur}) + (4 \times \text{mass of oxygen})$$
$$= (2 \times 1) + (1 \times 32) + (4 \times 16)$$
$$= 98.$$

   i.e., one molecule of H2SO4 is 98 times as heavy as $\dfrac{1}{12^{th}}$ of the mass of a carbon – 12.

3. **Relative molecular mass of water (H_2O) is calculated as follows: A water molecule is made of 2 atoms of hydrogen and one atom of oxygen.**
   Solution : So, the relative molecular mass of water

$$= (2 \times \text{mass of hydrogen}) + (1 \times \text{mass of oxygen})$$
$$= (2 \times 1) + (1 \times 16)$$
$$= 18.$$

   i.e., one molecule of H2O is 18 times as heavy as $\dfrac{1}{12^{th}}$ of the mass of carbon – 12.

4. **Find the mass percentage composition of methane (CH_4).**
   Solution : Molar mass of CH4 $= 12 + 4 = 16$ g.

$$\text{Mass \% carbon} = \dfrac{12}{16} \times 100$$
$$= 75\%.$$
$$\text{Mass \% of hydrogen} = \dfrac{4}{16} \times 100$$
$$= 25\%.$$

5. **Calculation of molar mass.**
   Calculate the gram molar mass of the following.

   i) **H_2O.**
   Solution :
   Atomic masses of H = 1, O $= 16$.
   Gram molar mass of H_2O $= (1 \times 2) + (16 \times 1)$
        $= 2 + 16$
   Gram molar mass of H_2O $= 18$ g.

   ii) **CO_2.**
   Solution :
   Atomic masses of C = 12, O $= 16$.
   Gram molar mass of CO_2 $= (12 \times 1) + (16 \times 2)$
        $= 12 + 32$
   Gram molar mass of CO_2 $= 44$ g.

   iii) **$Ca_3(PO_4)_2$.**
   Solution :
   Atomic masses of Ca = 40, P = 30, O = 16.
   Gram molar mass of $Ca_3(PO_4)_2$ $= (40 \times 3) + [30 + (16 \times 4)] \times 2$
        $= 120 + (94 \times 2)$
        $= 120 + 188$
   Gram molar mass of $Ca_3(PO_4)_2$ $= 308$ g.

6. **Calculation based on number of moles from mass and volume.**

   i) **Calculate the number of moles in 46 g of sodium?**
   Solution :

$$\text{Number of moles} = \frac{\text{Mass of the element}}{\text{Atomic mass of the element}}$$

$$= \frac{46}{23}$$

$$= \text{2 moles of sodium.}$$

ii) 5.6 litre of oxygen at S.T.P
Solution :

$$\text{Number of moles} = \frac{\text{Given volume of } O_2 \text{ at S.T.P}}{\text{Molar volume at S.T.P}}$$

$$\text{Number of moles of oxygen} = \frac{5.6}{22.4}$$

$$= \text{0.25 mole of oxygen.}$$

iii) Calculate the number of moles of a sample that contains 12.046×10^{23} atoms of iron?
Solution :

$$\text{Number of moles} = \frac{\text{Number of atoms of iron}}{\text{Avogadro's number}}$$

$$= \frac{12.046 \times 10^{23}}{6.023 \times 10^{23}}$$

$$= \text{2 moles of iron.}$$

7. Calculation of mass from mole. Calculate the mass of the following

i) 0.3 mole of aluminium (Atomic mass of Al = 27)
Solution :

$$\text{Number of moles} = \frac{\text{Mass of Al}}{\text{Atomic mass of Al}}$$

$$\text{Mass} = \text{No. of moles} \times \text{atomic mass}$$

$$\text{So, mass of Al} = 0.3 \times 27$$

$$= \text{8.1 g.}$$

ii) Calculate the number of moles in 46 g of sodium?
Solution :

$$\text{Molecular mass of } SO_2 = 32 + (16 \times 2)$$

$$= 32 + 32 = 64.$$

$$\text{Number of moles of } SO_2 = \frac{\text{Given volume of } SO_2 \text{ at S.T.P}}{\text{Molar volume of } SO_2 \text{ at S.T.P}}$$

$$\text{Number of moles of } SO_2 = \frac{2.24}{22.4}$$

$$= \text{0.1 mole.}$$

$$\text{Number of moles} = \frac{\text{Mass}}{\text{Molecular mass}}$$

$$\text{Mass} = \text{No. of moles} \times \text{molecular mass}$$

$$\text{Mass} = 0.1 \times 64$$

$$\text{Mass of } SO_2 = \text{6.4 g.}$$

iii) 1.51×10^{23} molecules of water
Solution :

$$\text{Molecular mass of } H_2O = 18$$

$$\text{Number of moles} = \frac{\text{Number of molecules of water}}{\text{Avogadro's number}}$$

$$= 1.51 \times 10^{23} / 6.023 \times 10^{23}$$

$$= 1/4$$

$$= 0.25 \text{ mole.}$$

$$\text{Number of moles} = \frac{\text{Mass}}{\text{Molecular mass}}$$

$$0.25 = \text{mass} / 18$$
$$\text{Mass} = 0.25 \times 18$$
$$\text{Mass} = 4.5 \text{ g.}$$

iv) 5×10^{23} molecules of glucose?
Solution :

Molecular mass of glucose $= 180$

$$\text{Mass of glucose} = \frac{\text{Molecular mass} \times \text{number of particles}}{\text{Avogadro's number}}$$

$$= (180 \times 5 \times 10^{23}) / 6.023 \times 10^{23}.$$
$$= 149.43 \text{ g.}$$

8. Calculation based on number of atoms/molecules.

i) Calculate the number of molecules in 11.2 litre of CO_2 at S.T.P
Solution :

$$\text{Number of moles of } CO_2 = \frac{\text{Volume at S.T.P}}{\text{Molar volume}}$$

$$= 11.2 / 22.4$$
$$= 0.5 \text{ mole.}$$
$$\text{Number of molecules of } CO_2 = \text{number of moles } CO_2 \times \text{Avogadro's number.}$$
$$= 0.5 \times 6.023 \times 10^{23}.$$
$$= 3.011 \times 10^{23} \text{ molecules of } CO_2.$$

ii) Calculate the number of atoms present in 1 gram of gold (Atomic mass of Au = 198)
Solution :

$$\text{Number of atoms of Au} = \frac{\text{Mass of Au} \times \text{Avogadro's number}}{\text{Atomic mass of Au}}$$

$$\text{Number of atoms of Au} = \frac{1}{198} \times 6.023 \times 10^{23}$$

$$\text{Number of atoms of Au} = 3.042 \times 10^{23} \text{ g.}$$

iii) Calculate the number of molecules in 54 gm of H_2O?
Solution :

$$\text{Number of molecules} = \frac{(\text{Avogadro number} \times \text{Given mass})}{\text{Gram molecular mass}}$$

$$\text{No. of molecules of water} = 6.023 \times 10^{23} \times 54 / 18.$$
$$= 18.069 \times 10^{23} \text{ molecules.}$$

iv) Calculate the number of atoms of oxygen and carbon in 5 moles of CO_2.
Solution :

➢ 1 mole of CO_2 contains 2 moles of oxygen.
➢ 5 moles of CO_2 contains 10 moles of oxygen.

$$\text{Number of atoms of oxygen} = \text{Number of moles of oxygen} \times \text{Avogadro's number}$$
$$= 10 \times 6.023 \times 10^{23}$$
$$= 6.023 \times 10^{24} \text{ atoms of oxygen.}$$

➢ 1 mole of CO_2 contains 1 mole of carbon.
➢ 5 moles of CO_2 contains 5 moles of carbon.

$$\text{No. of atoms of carbon} = \text{No. of moles of carbon} \times \text{Avogadro's number.}$$
$$= 5 \times 6.023 \times 10^{23}.$$
$$= 3.011 \times 10^{24} \text{ atoms of carbon.}$$

9. Calculation based on molar volume. Calculate the volume occupied by:

i) 2.5 mole of CO_2 at S.T.P.

Solution :

$$\text{Number of moles of } CO_2 = \frac{\text{Given volume at S.T.P}}{\text{Molar volume at S.T.P}}$$

$$\text{2.5 mole of } CO_2 = \frac{\text{Volume of } CO_2 \text{ at S.T.P}}{22.4}$$

Volume of CO_2 at S.T.P $= 22.4 \times 2.5$
                              $= 56$ litres.

ii) 3.011×10^{23} of ammonia gas molecules.
   Solution :

$$\text{Number of moles} = \frac{\text{Number of molecules}}{\text{Avogadro's number}}$$

$\quad = 3.011 \times 10^{23} / 6.023 \times 10^{23}.$
$\quad = 2$ moles.
Volume occupied by NH_3 $=$ number of moles × molar volume
$\quad = 2 \times 22.4$
$\quad = 44.8$ litres at S.T.P.

iii)   14 g nitrogen gas.
   Solution :

Number of moles $= 14 / 28.$
$\quad = 0.5$ mole
Volume occupied by N_2 at S.T.P $=$ no. of moles × molar volume
$\quad = 0.5 \times 22.4$
$\quad = 11.2$ litres.

10. Calculation based on % composition. Calculate % of S in H_2SO_4.
   Solution :

Molar mass of H_2SO_4 $= (1 \times 2) + (32 \times 1) + (16 \times 4)$
$\quad = 2 + 32 + 64$
$\quad = 98$ g

$$\text{\% of S in } H_2SO_4 = \frac{\text{Mass of sulphur}}{\text{Molar mass of } H_2SO_4} \times 100$$

$$\text{\% of S in } H_2SO_4 = \frac{32}{98} \times 100$$

$\quad = 32.65\%.$

UNIT TEST - 7

Time : 1.15 Hrs.   Marks : 50

I. Choose the best answer

(5 × 1 = 5)

1.   Which of the following is a triatomic molecule?
   a) Glucose   b) Helium   c) Carbondioxide   d) hydrogen

2.   The volume occupied by 4.4 g of CO_2 at STP _____.
   a) 22.4 lit   b) 2.24 lit   c) 0.24 lit   d) 0.1 lit

3.   Mass of 1 mole of Nitrogen atom is _____.
   a) 28amu   b) 14amu   c) 28g   d) 14g

4. **The gram molecular mass of oxygen molecule is _____.**

    a) 16g   b) 18g   c) 32g   d) 17g

5. **The volume occupied by 1 mole of a diatomic gas at STP is _____.**

    a) 11.2 lit   b) 22.4 lit   c) 44.8 lit   d) 5.6lit

II. Fill in the blanks

(5 × 1 = 5)

6. The first scientific theory of the atom was proposed by _____.

7. The sum of the number of protons and neutrons of an atom is called its _____.

8. The number of atoms present in the molecule is called _____.

9. _____ was proposed the Avogadro number

10. One mole of substance contains _____.

III. State whether the statements are true or false. Correct the false statement

(4 × 1 = 4)

11. The sum of the number of protons and neutrons of an atom is called its atomic number

12. The molecule that consist of atoms of different elements is called hetero atomic molecule

13. If a molecule contains more than three atoms then it is called triatomic molecule

14. One mole of oxygen contains 6.023×10^{23} molecules of oxygen and its gram molecular mass is 32 g

IV. Match the following

(4 × 1 = 4)

15. 0.5 mole of So2   (a)   heisenberg

16. Uncertinity principle   (b) 3.0115×10^{-23}

17. Atomic mass   (c)   11.2 lit

18. Volume of 16g of oxygen at STP   (d)   Atomic mass unit

V. Assertion and Reasoning

(3 × 1 = 3)

Direction: In each of the following questions, a statement of Assertion is given and a corresponding statement of Reason is given just below it. Of the statements given below, mark the correct answer as

a.   If both A and R are true and R is the correct explanation of A.

b.   If both A and R are true but R is not the correct explanation of A.

c.   If A is true but R is false.

d.   If both A and R are false.

19. **Assertion:**   A molecule is a combination of two or more atoms held together by chemical forces of attraction.

      Reason: These are formed by chemical bonds.

20. **Assertion:**   Homoatomic molecules are made up of atoms of the same elements.

      Reason: Hcl consist of hydrogen and chlorine.

21. **Assertion:**   Ammonia is a molecule.

      Reason: Ammonia is a hetero atomic molecule.

VI. Write the answer for the following questions in word or sentence

(3 × 1 = 3)

22. Define atomicity.
23. Define Average atomic mass.
24. Define atom.

VII. Find the odd one out

(3 × 1 = 3)

25. $_{17}Cl^{35}$ $_{17}Cl^{37}$, $_{18}Ar^{40}$ $_{20}Ca^{40}$, $_{1}H^{1}$ $_{1}H^{2}$ $_{1}H^{3}$.
26. Fluorine, Hydrogen, Sulphur, Carbondioxide
27. Ammonia, Methane, Sulphuric acid, Phosphorus

VIII. Correct the mistakes

(3 × 1 = 3)

28. The molecule that consist of atoms of different elements is called homo atomic molecule.
29. Ozone contains three oxygen atoms and hence it is called homo di atomic molecule.
30. Oxygen is a second most abundant element in the earth crust.

IX. Write the short answer for ANY 5 of the following questions.

(5 × 2 = 10)

31. Define Relative atomic mass.
32. Write the different types of isotopes of oxygen and its percentage abundance.
33. Define Atomicity.
34. What is the molar volume of a gas.
35. Give any 2 examples of Homo and Hetero atomic molecules.
36. Find the percentage of nitrogen in ammonia.
37. Calculate the % of each element in calcium carbonate (Atomic mass C–12, O–16, Ca–40).

X. Write long answer for the following questions

(2 × 5 = 10)

38. Calculate the number of water molecules present in one drop of water which weighs 0.18g.
        [OR]
39 Give the salient features of Modern Atomic theory.
40. Derive the relationship between VD and RMM.
        [OR]
41 Write the Applications of Avogadro's law.

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UNIT

8

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PERIODIC CLASSIFICATION OF ELEMENTS

Points to Remember

➢ Modern periodic law states that, the physical and chemical properties of the elements are the periodic functions of their atomic numbers.

➢ The table in which elements are arranged in rows and columns in regular gradation is called periodic table.

➢ Smelting is the process of reducing the roasted metallic oxide into metal in molten condition.

➢ Dilute or con. HNO_3 does not attack aluminium metal ,as it renders aluminium passive due to oxide film formation on its surface.

➢ The charge used in the metallurgy of iron consists of roasted ore, coke and limestone in the ratio, 8:4:1.

➢ Copper vessel on exposure to air and moisture forms a green layer on its surface due to basic copper carbonate.

➢ An alloy is a homogeneous mixture of two or more metals.

➢ An amalgam is an alloy of mercury with another metal. E.g. Ag-Sn amalgam is used for dental filling.

➢ The chemical name of rust is hydrated ferric oxide and its formula is $Fe_2O_3.xH_2O$.

PART – A

I. Book Exercise – Choose the best answer

1. The number of periods and groups in the periodic table are _____.
   a) 6,16   b) 7,17   c) 8,18   d) 7,18

               Ans : (d) 7,18

2. The basis of modern periodic law is _____.
   a) atomic number   b) atomic mass   c) isotopic mass   d) number of neutrons

               Ans : (a) atomic number

3. _____ group contains the member of halogen family.
   a) 17th   b) 15th   c) 18th   d) 16th

               Ans : (a) 17th

4. _____ is a relative periodic property.
   a) Atomic radii   b) Ionic radii   c) Electron affinity   d) Electronegativity

               Ans : (d) Electronegativity

5. Chemical formula of rust is _____.
   a) $FeO.xH_2O$ b) $FeO_4.xH_2O$ c) $Fe_2O_3.xH_2O$ d) FeO

               Ans : (c) $Fe_2O_3.xH_2O$

6. In the alumino thermic process the role of Al is _____.
   a) oxidising agent   b) reducing agent   c) hydrogenating agent   d) sulphurising agent

               Ans : (b) reducing agent

7. The process of coating the surface of metal with a thin layer of zinc is called _____.
   a) painting   b) thinning   c) galvanization   d) electroplating

               Ans : (c) galvanization

8. **Which of the following have inert gases 2 electrons in the outermost shell.**
   a) He
   b) Ne
   c) Ar
   d) Kr

   Ans : (a) He

9. **Neon shows zero electron affinity due to _____.**
   a) Stable arrangement of neutrons
   b) Stable configuration of electrons
   c) Reduced size
   d) Increased density

   Ans : (b) Stable configuration of electrons

10. **_____ is an important metal to form amalgam.**
    a) Ag
    b) Hg
    c) Mg
    d) Al

    Ans : (b) Hg

II. Book Exercise – Fill in the blanks

1. If the electronegativity difference between two bonded atoms in a molecule is greater than 1.7, the nature of bonding is _____. **Ans :** Ionic

2. _____ is the longest period in the periodical table. **Ans :** 6, 7

3. _____ forms the basis of modern periodic table. **Ans :** Atomic Number

4. If the distance between two Cl atoms in Cl_2 molecule is 1.98Å, then the radius of Cl atom is _____. **Ans :** 0.99 A

5. Among the given species A^-, A^+, and A, the smallest one in size is _____. **Ans :** A^+

6. The scientist who propounded the modern periodic law is _____. **Ans :** Henry Moseley

7. Across the period, ionic radii _____ (increases,decreases). **Ans :** decreases

8. _____ and _____ are called inner transition elements. **Ans :** Lanthanides, Actinides

9. The chief ore of Aluminium is _____. **Ans :** Bauxite

10. The chemical name of rust is _____. **Ans :** hydrated ferric hydroxide

III. Book Exercise – Match the following

1.	Galvanisation	-	Noble gas elements
2.	Calcination	-	Coating with Zn
3.	Redox reaction	-	Silver–tin amalgam
4.	Dental filling	-	Alumino thermic process
5.	Group 18 elements	-	Heating in the absence of air

Ans :

1	Galvanisation	b	Coating with Zn
2	Calcination	e	Heating in the absence of air
3	Redox reaction	d	Alumino thermic process
4	Dental filling	c	Silver–tin amalgam
5	Group 18 elements	a	Noble gas elements

IV. Book Exercise – True or false (If false give the correct statement)

1. **Moseley's periodic table is based on atomic mass.**
   Ans : False. Mosley's periodic table is based on atomic numbers.

2. **Ionic radius increases across the period from left to right.**
   Ans : False. Ionic radius decreases across the period from left to right.

3. **All ores are minerals; but all minerals cannot be called as ores;**
   Ans : True.

4. **Al wires are used as electric cables due to their silvery white colour.**
   Ans : False. Aluminium wires are used as electric cables due to their good conductor of heat and electricity.

5. **An alloy is a heterogenous mixture of metals.**
   Ans : False. An alloy is a homogeneous mixture of metals.

V. Book Exercise – Assertion and Reason

Answer the following questions using the data given below:
a) **A and R are correct, R explains the A.**
b) **A is correct, R is wrong.**
c) **A is wrong, R is correct.**
d) **A and R are correct, R doesn't explains A.**

1. **Assertion:** The nature of bond in HF molecule is ionic.
    Reason: The electronegativity difference between H and F is 1.9.

    Ans : (a) A and R are correct, R explains the A

2. **Assertion:** Magnesium is used to protect steel from rusting.
    Reason: Magnesium is more reactive than iron.

    Ans : (c) A is wrong, R is correct

3. **Assertion:** An uncleaned copper vessel is covered with greenish layer.
    Reason: Copper is not attacked by alkali.

    Ans : (a) A and R are correct, R explains the A

VI. Book Exercise – Short answer questions

1. **A is a reddish brown metal, which combines with O_2 at < 1370 K gives B, a black coloured compound. At a temperature > 1370 K, A gives C which is red in colour. Find A,B and C with reaction.**
    The reddish brown metal 'A' is copper.
    Result :

compound	molecular formula	name
A	Cu	copper
B	CuO	copper (ii) oxide
C	Cu_2O	copper (i) oxide

    On heating at different temperatures in the presence of oxygen, copper forms two types of oxides CuO, Cu_2O.

    $$2\ Cu + O_2 \xrightarrow{\text{below 1370K}} 2\ CuO$$
    $$\text{(copper II oxide- black)}$$

    $$4\ Cu + O_2 \xrightarrow{\text{above 1370K}} 2\ Cu_2O$$
    $$\text{(copper I oxide – red)}$$
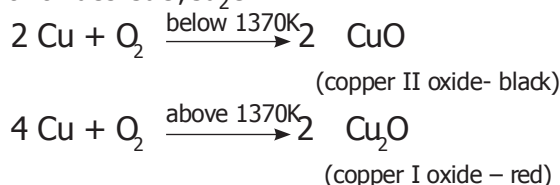
2. **A is a silvery white metal. A combines with O_2 to form B at 800°C, the alloy of A is used in making the aircraft. Find A and B.**
    The silvery white metal. A is Aluminium.

compound	molecular formula	name
A	Al	Aluminium
B	Al_2O_3	Aluminium Oxide

    $$4Al + 3O_2 \xrightarrow{\text{800°C}} 2Al_2O_3 \text{ (Aluminium Oxide) (B)}$$
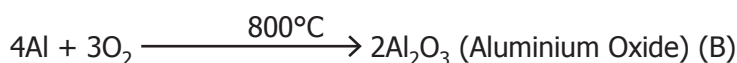
3. **What is rust? Give the equation for formation of rust.**
    When iron is exposed to moist air, it forms a layer of brown hydrated ferric oxide on its surface. This compound is known as rust and the phenomenon of formation of rust is known as rusting.
    $$4Fe + 3O_2 + xH_2O \longrightarrow 2Fe_2O_3.xH_2O \text{ (Rust)}$$
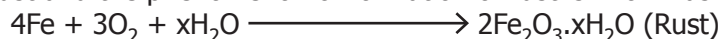
4. **State two conditions necessary for rusting of iron.**
    Air and Moisture are necessary for rusting of iron.

VII. Book Exercise – Long answer questions

1. **a) State the reason for addition of caustic alkali to bauxite ore during purification of bauxite.**
    Reason : Because Bauxite ore is finely ground and heated under pressure with a solution of concentrated caustic soda at 150°C to obtain Sodium meta aluminate. On diluting sodium meta aluminate with water, a precipetate of aluminium hydroxide is formed. This precipitate is filtered, washed, dried and ignited at 1000°C to get alumina.

    b) Along with cryolite and alumina, another substance is added to the electrolyte mixture. Name the substance and give one reason for the addition.
    Fluorspar. (It lowers the fusion temperature of electrolyte)

2. **The electronic configuration of metal A is 2,8,18,1.**
    The metal A when exposed to air and moisture forms B a green layered compound. A with con. H_2SO_4 forms C and D along with water. D is a gaseous compound. Find A,B,C and D.
    i) Metal A is copper.
    ii) **Action of Air and Moisture :** Copper gets covered with agreen layer of Basic Copper Carbonate in the presence of CO_2 and moisture.

    $$2\,Cu + O_2 + CO_2 + H_2O \longrightarrow CuCO_3.Cu(OH)_2$$
    $$\underset{copper}{(A)} \qquad\qquad\qquad \underset{\substack{\text{Basic copper carbonate} \\ \text{(Malachite green)} \\ B}}{}$$

    iii) Copper is react with Conc.H_2SO_4 to form copper sulphate and sulphur dioxide.

    $$Cu + 2H_2SO_4 \longrightarrow \underset{\substack{\text{Copper Sulphate} \\ (C)}}{CuSO_4} + \underset{\substack{\text{Sulphur dioxide} \\ (D)}}{SO_2\uparrow} + 2H_2O$$
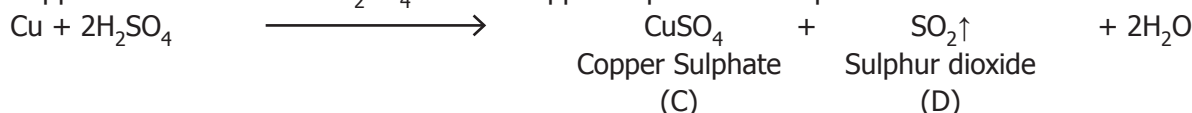
compound	molecular formula	name
A	Cu	copper
B	$CuCO_3. Cu(OH)_2$	malachite green
C	$CuSO_4$	copper sulphate
D	SO_2	sulphurdioxide

3. **Explain smelting process.**
    Smelting is the process of reducing the roasted metallic oxide from the metal in its molten condition. In this process, impurities are removed as slag by the addition of flux.

VIII. Book Exercise – HOT question

1. **Metal A belongs to period 3 and group 13. A in red hot condition reacts with steam to form B. A with strong alkali forms C. Find A,B and C with reactions.**
    i) The metal A is Aluminium.
    ii) When steam is passed over red hot aluminium, hydrogen only produced.

    $$2Al + 3H_2O \longrightarrow \underset{(B)}{Al_2O_3} + 3H_2\uparrow$$
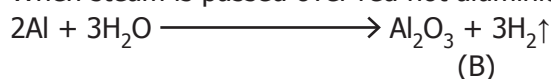
    $$B \longrightarrow \text{Aluminium Oxide}$$

    iii) It reacts with strong caustic alkalis forming aluminates.

    $$2Al + 2NaOH + 2H_2O \longrightarrow \underset{(C)}{2NaAlO_2} + 3H_2\uparrow$$
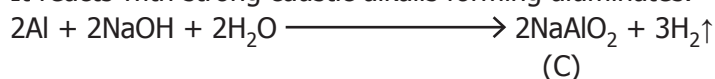
    $$C \longrightarrow \text{Sodium meta Aluminate}$$

compound	molecular formula	name
A	Al	aluminium
B	Al_2O_3	aluminium oxide
C	$NaAlO_2$	sodium meta aluminate

2. Name the acid that renders aluminium passive. Why?

Conc. Nitric Acid (Conc.HNO_3). Concentrated and dil Nitric acid does not attack aluminium, but it renders aluminum passive due to the formation of an oxide film on its surface.

3. i) Identify the bond between H and F in HF molecule.

Ionic.

ii) What property forms the basis of identification?

Electronegativity.

iii) How does the property vary in periods and in groups?

Along the period from left to right in the periodic table, the electronegativity increases because of the increase in nuclear charge which in turn attracts the electrons more strongly. On moving down a group, the electronegativity of the elements decreases because of the increased number of energy levels.

Additional – Choose the best answer

1. The physical and chemical properties of the elements are the periodic functions of their _____.

a) Atomic numbers   b) Mass numbers   c) Atomic Mass   d) Molecular Mass

Ans : (a) Atomic numbers

2. Horizontal rows are called _____ and vertical columns are called _____.

a) Periods and groups

b) Groups and Periods

c) either period or group

d) neither period nor group

Ans : (a) Periods and groups

3. Number of periods and groups are _____.

a) 7,18   b) 6,18   c) 7,15   d) 8,15

Ans : (a) 7,18

4. First period contains _____ elements.

a) 4   b) 2   c) 5   d) 3

Ans : (b) 2

5. Second period contains _____ elements.

a) 5   b) 4   c) 8   d) 10

Ans : (c) 8

6. Third period contains _____ elements.

a) 5   b) 4   c) 8   d) 10

Ans : (c) 8

7. Fourth and fifth period contains _____ elements.

a) 15   b) 16   c) 18   d) 20

Ans : (c) 18

8. Fourth and fifth period called as _____ period.

a) short   b) shortest   c) longer   d) longest

Ans : (c) longer

9. Sixth period is the _____ period.

a) short   b) shortest   c) longer   d) longest

Ans : (d) longest

10. How many elements are present in 6th and 7th periods?
    a) 2   b) 8   c) 18   d) 32

Ans : (d) 32

11. First period is the _____ period.
    a) short   b) shortest   c) long   d) longest

Ans : (b) shortest

12. Second period is the _____ period.
    a) short   b) shortest   c) longer   d) longest

Ans : (a) short

13. Third period is the _____ period.
    a) short   b) shortest   c) longer   d) longest

Ans : (a) short

14. Atomic number from 1 to 2 are called as _____.
    a) first   b) second   c) third   d) fourth

Ans : (a) first

15. Atomic number from 3 to 10 are called as _____.
    a) first   b) second   c) third   d) fourth

Ans : (b) second

16. Atomic number from 11 to 18 are called as _____.
    a) first   b) second   c) third   d) fourth

Ans : (d) fourth

17. Atomic number from 19 to 36 are called as _____.
    a) first   b) second   c) third   d) fifth

Ans : (d) fifth

18. Atomic number from 37 to 54 are called as _____.
    a) first   b) second   c) third   d) fifth

Ans : (d) fifth

19. Atomic number from 55 to 86 are called as _____.
    a) first   b) second   c) fifth   d) sixth

Ans : (d) sixth

20. Atomic number from 87 to 118 are called as _____.
    a) first   b) fifth   c) sixth   d) seventh

Ans : (d) seventh

21. The lanthanides and actinides which form part of Group 3 are called _____ elements.
    a) S block   b) P block
    c) Transition elements   d) Inner transition elements

Ans : (d) Inner transition elements

22. Group 18 called as _____.
    a) Alkali metals   b) Alkaline earth metals c) Halogens   d) Noble gases

Ans : (d) Noble gases

23. Group 17 called as _____.
    a) Alkali metals   b) Alkaline earth metals c) Halogens   d) Noble gases

Ans : (c) Halogens

24. Group 16 called as _____.
    a) Alkali metals   b) Alkaline earth metals
    c) Oxygen (or) Chalcogen family   d) Rare gases

Ans : (c) Oxygen (or) Chalcogen family

25. **Oxygen family also called as _____.**
    a) Nitrogen   b) Halogen   c) Chalcogen   d) Carbon

    Ans : (c) Chalcogen

26. **'S' block elements are otherwise known as _____.**
    a) Alkali and alkaline earth metals   b) Representative elements
    c) Transistion elements   d) Inner transistion elements

    Ans : (a) Alkali and alkaline earth metals

27. **13th Group is called as _____.**
    a) Boron family   b) Carbon family   c) Nitrogen family   d) Oxygen family

    Ans : (a) Boron family

28. **14th Group is called as _____.**
    a) Boron family   b) Carbon family   c) Nitrogen family   d) Oxygen family

    Ans : (b) Carbon family

29. **3 to 12 groups are called as _____.**
    a) S block elements   b) P block elements
    c) Transistion elements   d) Inner transistion elements

    Ans : (c) Transistion elements

30. **1st group is called as _____.**
    a) Alkaline earth metals   b) Alkali metals   c) Earth metals   d) none

    Ans : (b) Alkali metals

31. **2nd group is called as _____.**
    a) Alkaline earth metals   b) Alkali metals   c) Earth metals   d) all the above

    Ans : (a) Alkaline earth metals

32. **Along the period from left to right, the atomic radius of the elements _____ whereas along the groups from top to bottom the atomic radius _____.**
    a) Decreases, Increases   b) Decreases, decreases   c) Increases, increases   d) Increases, Decreases

    Ans : (a) Decreases, Increases

33. **The shell number _____ the distance between the valence shell and nucleus _____.**
    a) Increases, decreases   b) Decreases, decreases   c) Increases, increases   d) Decreases, increases

    Ans : (c) Increases, increases

34. **More and more positive charges impose a strong attraction over the electrons and thus the electron cloud shrinks towards thenucleus which results in the _____ in the atomic size.**
    a) increases   b) decreases
    c) increases and then decreases   d) none

    Ans : (b) decreases

35. **When a neutral atom loses an electron, it becomes a positively charged ion called _____.**
    a) Cation   b) Anion   c) Neutral ion   d) all the above

    Ans : (a) Cation

36. **When a neutral atom gain an electron, it becomes a negatively charged ion called _____.**
    a) Cation   b) Anion   c) Neutral ion   d) all the above

    Ans : (b) Anion

37. **Ionic radii also _____ along the period from left to right and _____ down the group.**
    a) Increases, decreases   b) Decreases, increases   c) Increases, increases   d) Decreases, decreases

    Ans : (b) Decreases, increases

38. **Ionisation energy is otherwise called _____.**
    a) Atomic energy   b) Ionisation energy   c) Ionisation enthalpy   d) Entropy

    Ans : (c) Ionisation enthalpy

39. **Ionisation energy is measured in _____.**
    a) KJ/mol   b) J/mol   c) K/mol   d) KgJ/mol
    Ans : (a) KJ/mol

40. **Ionisation energy _____ along the period _____ down the group in the periodic table.**
    a) Increases, decreases   b) Increases, increases   c) Decreases, decreases d) Decreases, increases
    Ans : (a) Increases, decreases

41. **As a positive charge _____ the size of the Cation _____.**
    a) Increases, decreases   b) Increases, increases   c) Decreases, decreases d) Decreases, increases
    Ans : (a) Increases, decreases

42. **The negative charge _____ the size of the Anion _____.**
    a) Increases, decreases   b) Increases, increases   c) Decreases, decreases d) Decreases, increases
    Ans : (b) Increases, increases

43. **Electron affinity _____ from left to right in a period and _____ from top to bottom in a group.**
    a) Increases, decreases   b) Decreases, decreases   c) Increases, increases   d) Decreases, increases
    Ans : (a) Increases, decreases

44. **Electronegativity _____ from left to right in a period and _____ from top to bottom in a group.**
    a) Increases, decreases   b) Increases, increases   c) Decreases, decreases d) Decreases, increases
    Ans : (b) Increases, decreases

45. **Oxide ores are purified by this method.**
    a) Gravity separation method   b) Magnetic separation method
    c) Froth floatation method   d) Chemical method (or) leaching
    Ans : (a) Gravity separation method

46. **Tinstone – the ore of tin can be separated by this method.**
    a) Gravity separation method   b) Magnetic separation method
    c) Froth floatation method   d) Chemical method
    Ans : (b) Magnetic separation method

47. **Lighter ores such as sulphide ores are concentrated by the following method.**
    a) Froth floatation method   b) Magnetic separation method
    c) Gravity separation method   d) Chemical method
    Ans : (a) Froth separation method

48. **Chemical method is otherwise called as _____.**
    a) Leaching   b) Reduction   c) a and b   d) b only
    Ans : (c) a and b

49. **Bauxite ore is purified by this method.**
    a) Froth floatation method   b) Magnetic separation method
    c) Chemical method   d) Gravity separation method
    Ans : (c) Chemical method

50. **Aluminium melting point is _____.**
    a) 520°C   b) 660°C   c) 620°C   d) 720°C
    Ans : (c) 660°C

51. **_____ is used in household utensils.**
    a) Al   b) F3   c) Cu   d) none
    Ans : (a) Al

52. Matte is a mixture of _____.
a) $Cu_2S + FeS$ b) $CuS + FeS$ c) $Cu_2O + FeS$ d) $CuO + FeS$

Ans : (a) $Cu_2S + FeS$

53. Blister copper contains _____% of pure copper and _____% of impurities.
a) 98%, 2%   b) 90%, 10%   c) 96%, 4%   d) 99%, 1%

Ans : (a) 98%, 2%

54. _____ is a strong reducing agent.
a) Iron   b) Aluminium   c) Copper   d) Hydrogen

Ans : (b) Aluminium

55. Copper is found in the _____ state as well as _____ state.
a) Native state   b) Combined state   c) Native and combined   d) none

Ans : (c) Native and combined

56. The chief ore of copper is _____.
a) Copper pyrite   b) Cuprite   c) Copper glance   d) None

Ans : (a) Copper pyrite

57. The concentrated ore is roasted in _____ of air.
a) Roasted in excess of air   b) Roasted in less air
c) Roasted in absence of air   d) None

Ans : (a) Roasted in excess of air

58. In electrolytic refining, Copper metal acts as a _____.
a) Cathode   b) Anode   c) electrode   d) none

Ans : (a) Cathode

59. In electrolytic refining, Impure copper metal acts as a _____.
a) Cathode   b) Anode   c) electrode   d) none

Ans : (b) Anode

60. Melting point of copper is _____.
a) 760°C   b) 1356°C   c) 1280°C   d) 456°C

Ans : (b) 1356°C

61. The formula for malachite green is _____.
a) $CuCO_3.Cu(OH)_2$ b) $CuCO_3.Al(OH)_3$ c) $CuCO_3.Fe_2O_3$ d) $CuCO_3.Fe(OH)_3$

Ans : (a) $CuCO_3.Cu(OH)_2$

62. _____ is the first most abundant element in the earth crust.
a) Oxygen   b) Aluminium   c) Silicon   d) 'a' only

Ans : (d) 'a' only

63. _____ is the second most abundant element in the earth crust.
a) Aluminium   b) Iron   c) Copper   d) None

Ans : (b) Iron

64. The chief ore of Iron is _____.
a) Aluminium hydroxide   b) Ferric oxide   c) Ferrous oxide   d) Ferrous sulphide

Ans : (b) Ferric oxide (Fe_2O_3)

65. The other name of magnetic oxide is _____.
a) Ferroso ferrous oxide   b) Ferroso ferric oxide
c) Ferric oxide.Ferrous oxide   d) 'a' and 'c'

Ans : (d) 'a' and 'c' only

66. The chemical formula for the rust is _____.
a) $Fe_2O_3.xH_2O$ b) $Fe_2O_3.H_2O$ c) $Fe_3O_4.H_2O$ d) $FeO.H_2O$

Ans : (a) $Fe_2O_3.xH_2O$

67. The charge consisting of roasted ore, coke and limestone in the ratio is _____.

a) 5:4:1 b) 8:4:1 c) 5:6:2 d) none

Ans : (b) 8:4:1

68. Iron with 2 – 4.5% of carbon is called _____.

a) Pig iron b) Steel c) Wrought iron d) None

Ans : (a) Pig iron

69. Iron with < 0.25% of carbon is called _____.

a) Pig iron b) Steel c) Wrought iron d) None

Ans : (b) Steel

70. Iron with 0.25 – 2% of carbon is called _____.

a) Pig iron b) Steel c) Wrought iron d) None

Ans : (c) Wrought iron

71. _____ amalgam is used for dental filling.

a) Ag – Sn b) Hg – Sn c) Hg – Ag d) None

Ans : (a) Ag – Sn

72. Brass is a solid solution of _____ in copper.

a) Magnesium b) Zinc c) Manganese d) Aluminium

Ans : (b) Zinc

73. Statues are made up of _____ Alloy.

a) Cu, Sn b) Cu, Zn c) Al, mg, Mn d) Al, mg

Ans : (a) Cu, Sn

74. Stainless steel is an alloy of _____.

a) Aluminium b) Iron c) Copper d) None

Ans : (b) Iron

75. Iron alloys are also called as _____.

a) Ferrous alloys b) Ferrous alloys (non) c) Ferric alloys d) Non Ferric alloys

Ans : (a) Ferrous alloys

76. Aluminium alloys are also called as _____.

a) Ferrous alloys b) Ferrous alloys (non) c) Ferric alloys d) Non Ferric alloys

Ans : (b) Non-ferrous alloys

77. Rust is chemically known as _____.

a) hydrated ferric oxide b) hydrated ferrous oxide c) hydrated cupric oxide d) hydrated cuprus oxide

Ans : (a) hydrated ferric oxide

78. _____ is the process of coating Zinc on Iron sheets by using electric current.

a) Galvanisation b) Anodixing c) Cathodic protection d) Electroplating

Ans : (a) Galvanisation

79. _____ is used widely for anodizing process.

a) Aluminium b) Copper c) Zinc d) Iron

Ans : (a) Aluminium

80. An alloy is a _____ mixture of two or more metals.

a) Homogeneous b) Heterogeneous c) Both d) none

Ans : (a) Homogeneous

Additional – Fill in the blanks

1. The atomic mass of argon is _____ than that of potassium in the periodic table. **Ans :** greater

2. Lithium and sodium are _____ metals. **Ans :** highly reactive

3. _____ discovered a new property of elements called atomic number. **Ans :** Henry Moseley

4. Henry Moseley is a _____. **Ans :** British Scientist

5. The _____ of an element is equal to the number of protons or the number of electrons present in the

neutral atom of an element.   **Ans :** atomic number

6. Modern periodic law which states that the physical and chemical properties of the elements are the periodic functions of their _____.   **Ans :** atomic numbers

7. Modern periodic law, the elements were arranged in the _____ order of their atomic numbers.
    Ans : increasing

8. The modern periodic table is a tabular arrangement of elements in rows and columns, highlighting the _____ of properties of the elements.   **Ans :** regular repetition

9. The horizontal rows are called _____.   **Ans :** periods

10. There are _____ in the periodic table.   **Ans :** seven periods

11. First period is the _____.   **Ans :** shortest period

12. First period contains _____ elements.   **Ans :** 2

13. Second period is the _____.   **Ans :** short period

14. Second period contains _____ elements.   **Ans :** 8

15. Third period is also called as _____.   **Ans :** short period

16. Third period contains _____ elements.   **Ans :** 8

17. Fourth period is the _____.   **Ans :** long period

18. Fourth period contains _____ elements.   **Ans :** 18

19. Fifth period is also called as _____.   **Ans :** long period

20. Fifth period contains _____ elements.   **Ans :** 18

21. Sixth period is the _____.   **Ans :** longest period

22. Sixth period contains _____ elements.   **Ans :** 32

23. Seventh period is also called as the _____.   **Ans :** longest period

24. Seventh period contains _____ elements.   **Ans :** 32

25. The vertical columns in the periodic table starting from top to bottom are called _____.   **Ans :** groups

26. There are _____ in the periodic table.   **Ans :** 18 groups

27. Group 1 is called _____.   **Ans :** alkali metals

28. Group 2 is called as _____.   **Ans :** alkaline earth metals

29. Group 3 to 12 are called _____.   **Ans :** transistion elements

30. Group 13 is called as _____.   **Ans :** Boron family

31. Group 14 is called as _____.   **Ans :** Carbon family

32. Group 15 is called as _____.   **Ans :** Nitrogen family

33. Group 16 is called as _____.   **Ans :** Oxygen family (or) Chalcogen family

34. Group 17 is called as _____.   **Ans :** Halogens

35. Group 18 is called as _____.   **Ans :** Noble gases

36. The lanthanides and actinides which form part of Group 3 are called _____ Elements.
    Ans : innertransistion

37. 18th group is called as _____.   **Ans :** Noble gases (or) Rare gases (or) Inert gases

38. The physical properties of the elements in a group such as _____, _____ and _____ vary gradually.   **Ans :** melting point, boiling point, density

39. The atoms of the group _____ elements have stable electronic configuration in their valence shells and hence they are unreactive.   **Ans :** ZERO

40. The _____ of elements helps us to explain the periodic recurrence of physical and chemical properties.   **Ans :** electronic configurations

41. Anything which repeats itself after a regular interval is called periodic. And this behavior is called _____.   **Ans :** periodicity

42. Some of the _____ of the elements are periodic.   **Ans :** atomic properties

43. Periodic properties are _____, _____, Ionisation energy, electronegativity, electron affinity.
Ans : Atomic radius, Ionic radius

44. _____ of an atom is defined as the distance between the centre of its nucleus and the outermost shell containing the valence electron. **Ans :** Atomic radius

45. Direct measurement of the radius of an isolated atom is _____. **Ans :** not possible

46. Covalent radius or metallic radius _____ the nature of the bonding between the concerned atoms.
Ans : depending on

47. Atomic radius in metal atoms is known as _____. **Ans :** Metallic radius

48. _____ defined as Half the distance between the nuclei of adjacent metal atoms. **Ans :** Metallic radius

49. In non-metallic elements, their atomic radius is known as _____. **Ans :** covalent radius

50. _____ is defined as half the distance between the nuclei of two covalently bonded atoms of the same element in a molecule. **Ans :** Covalent radius

51. The distance between the two hydrogen nuclei of the molecule is 0.74A0. So its covalent radius is _____. **Ans :** 0.74/2 = 0.37Å

52. Along the period, from left to right, the atomic radius of the elements _____. **Ans :** decreases

53. From top to bottom the atomic radius of the elements _____. **Ans :** increases

54. The increase, down a group is due to the _____ number down the group.
Ans : increase in the valence shell

55. As _____ increases the distance between the valence shell and the nucleus increases.
Ans : shell number

56. Along the period the shell number remains the same but the _____ increases.
Ans : number of protons

57. More and more positive charges impose a strong attraction over the electrons and thus electron cloud shrinks towards the nucleus which results in the _____. **Ans :** decrease in the atomic size

58. _____ is defined as the distance from the centre of the nucleus of the ion. **Ans :** Ionic radii

59. When a neutral atom loses an electron, it becomes a positively charged ion called _____. **Ans :** cation

60. When a neutral atom gains an electron, it becomes a negatively charged ion called _____. **Ans :** anion

61. The size of a cation is _____ than its corresponding neutral atom. But the anion is larger than its neutral atom. **Ans :** always smaller

62. _____ lose the single electron from their outermost energy level to form cations.
Ans : Lithium and sodium

63. _____ become negative ions by gaining an electron. **Ans :** Fluorine and chlorine

64. _____ also decrease along the period from left to right and increase down the group.
Ans : Atomic radius, ionic radii

65. Ionisation energy is the _____ required to remove an electron from a gaseous atom in its ground state to form cation. **Ans :** minimum energy

66. Ionisation energy is also known as _____. **Ans :** ionization enthalpy

67. Ionization enthalpy is measured in _____. **Ans :** KJ/mol

68. Higher the ionization energy, it is more _____ to remove the electron. **Ans :** difficult

69. _____ decreases from left to right in a period, more energy is required to remove the electrons.
Ans : Atomic size

70. Ionisation energy _____ along the period. **Ans :** increases

71. Down the group the ionization energy _____. **Ans :** decreases

72. As the positive charge increases the _____ decreases. **Ans :** size of the cation

73. As the negative charge increases the _____ increases. **Ans :** size of the anion

74. _____ is the amount of energy released when a gaseous atom gains an electron to form its anion.
Ans : Electron affinity

75. _____ increases from left to right, decreases from top to bottom in a group. **Ans :** Electron affinity

76. Electron affinities zero in _____. **Ans :** noble gases

77. Electronegativity of an element is the measure of the tendency of its atom to attract the _____ towards itself in a covalent bond. **Ans :** shared pair of electrons

78. _____ is based on various experimental data such as bond energy, ionization potential and electron affinity. **Ans :** Electronegativity

79. _____ is the widely used scale to determine the electronegativity, which in turn predicts the nature of the bonding between the atoms in a molecule. **Ans :** Pauling scale

80. Electronegativity of _____. **Ans :** Fluorine is 4.0

81. Electronegativity of _____. **Ans :** Chlorine is 3.0

82. Electronegativity of _____. **Ans :** Bromine is 2.8

83. Electronegativity of _____. **Ans :** Iodine is 2.5

84. Electronegativity of _____. **Ans :** Hydrogen is 2.1

85. Electronegativity of _____. **Ans :** Sodium is 1.0

86. If the difference in electronegativity between two elements is 1.7,the _____ and _____. **Ans :** bond 50% ionic character, 50% covalent character

87. If the difference is _____, the bond is considered to be covalent. **Ans :** less than 1.7

88. If the difference is _____, the bond is considered to be ionic. **Ans :** greater than 1.7

89. Along the period , from left to right in the periodic table, the _____ increases. **Ans :** electronegativity

90. On moving down a group the electronegativity of the elements _____. **Ans :** decreases

91. _____ is the process of removal of impurities from the ore. **Ans :** Concentration or separation of the ore

92. _____ is the conversion of the ore into metals. **Ans :** Production of the metal

93. _____ is the process of purification of the metal. **Ans :** Refining of the metal

94. A _____ may be a single compound or a complex mixture of various compounds of metals found in the earth. **Ans :** mineral

95. The _____ from which a metal can be readily and economically extracted on a large scale is said to be an ore. **Ans :** mineral

96. _____ is a ore of alumninium. **Ans :** Bauxite

97. _____ is a mineral of aluminium. **Ans :** Clay

98. _____ is the process of extracting the ores from the earth's crust. **Ans :** Mining

99. _____ is the rocky impurity associated with an ore is called gangue or matrix. **Ans :** Gangue or Matrix

100. _____ is the substance added to the ore to reduce the fusion temperature and to remove the impurities. **Ans :** Flux

101. _____ is the fusible product formed when a flux reacts with a Gangue during the extraction of metals. **Ans :** Slag

102. _____ is the process of reducing the roasted metallic oxide from the metal in its molten condition. **Ans :** Smelting

103. Oxide ores are purified by _____ method. **Ans :** Hydraulic or gravity separation

104. The difference in the densities or specific gravities of the ore and gangue are purified by _____. **Ans :** Hydraulic method

105. _____ can be separated by Magnetic separation method. **Ans :** Magnetic ores

106. The lighter ores such as sulphide ores are concentrated by _____. **Ans :** Froth floatation method

107. Chemical method is also called as _____. **Ans :** Leaching

108. _____ occurs in Coimbatore ,Cuddalore, and Dindugul. **Ans :** Lime stone ores

109. _____ occurs in Trichy, Coimbatore districts. **Ans :** Gypsum ores

110. _____ occurs in Kanyakumari ,tirunelveli and tuticorin.   **Ans :** Titanium ores

111. _____ occurs in Coimbatore and Salem district.   **Ans :** Chromite ores

112. _____ occurs in Dharmapuri, Erode, Salem and Tiruvannamalai.   **Ans :** Magnetite ores

113. _____ occurs in Madurai and Dindugal.   **Ans :** Tungsten ores

114. All metals are _____ at room temperature except mercury and gallium.   **Ans :** solids

115. Metals possess a _____.   **Ans :** high lustre

116. Most of the metals are _____.   **Ans :** strong and hard

117. The _____ are sodium and potassium.   **Ans :** soft metals

118. Metal possess _____ melting and boiling points.   **Ans :** high

119. Metals have a _____.   **Ans :** high density

120. Sodium and potassium are _____ than water.   **Ans :** less dense

121. Metals are _____. They can be drawn into thin wires without breaking. **Ans :** ductile

122. Metals are usually _____.   **Ans :** malleable

123. Metals are _____ of heat and electricity.   **Ans :** good conductors

124. Metals do not dissolve in _____.   **Ans :** liquid solvents

125. _____ is the first most abundant metal in the earth crust.   **Ans :** Aluminium

126. Formula for _____ is _____.   **Ans :** Na_3AlF_6

127. Formula for Corundum is _____.   **Ans :** Al_2O_3

128. The temperature is used in hall's process _____.   **Ans :** $900 - 950°C$

129. The voltage is used in hall's process _____.   **Ans :** $5 - 6$ V

130. _____ is a silvery white metal.   **Ans :** Aluminium

131. _____ has low density and it is light.   **Ans :** Aluminium

132. _____ is malleable and ductile.   **Ans :** Aluminiium

133. Melting point of aluminium is _____.   **Ans :** aluminium

134. Aluminium can be polished to produce a _____ attractive appearance.   **Ans :** shiny

135. Aluminium is a powerful _____.   **Ans :** reducing point

136. Dilute and concentrated _____ does not attack aluminium passive due to the formation of an _____ on its surface.   **Ans :** nitric acid, oxide film

137. _____ is used in household utensils.   **Ans :** Aluminium

138. _____ is used in Electric cable industry.   **Ans :** Aluminium

139. _____ is used in making aeroplanes and other industrial machine parts. **Ans :** Aluminium

140. Copper is found in the _____ as well as _____.   **Ans :** native state, combined state

141. The chief ore of copper is _____.   **Ans :** copper pyrites

142. _____ yields nearly 76% of the world production of copper.   **Ans :** Copper pyrites

143. _____ contains copper II sulphide and ferrous sulphide.   **Ans :** Matte

144. Blister copper _____ and _____.   **Ans :** contains 98% of copper, 2% of impurities

145. The impurities settles at the bottom of the anode in the form of sludge called _____.
                                                                                  Ans : anode mud

146. Copper is a _____.   **Ans :** reddish brown metal

147. Melting point of copper is _____.   **Ans :** 1356°C

148. Malachite green formula is _____.   **Ans :** $CuCO_3.Cu(OH)_2$

149. _____ is used for making utensils, containers and coins.   **Ans :** Copper

150. _____ is alloyed with Gold and Silver for making coins and jewels.   **Ans :** Copper

151. _____ is the second most abundant metal next to aluminium.   **Ans :** Iron

152. Iron is chiefly extracted from _____ .   **Ans :** haematite ore

153. _____ has high tensility , Malleability and ductility.   **Ans :** Iron

154. Formula for rust is _____ .   **Ans :** $Fe_2O_3.xH_2O$

155. Chemical name for the rust is _____ .   **Ans :** Hydrated ferric oxide

156. Magnetic oxide formula is _____ .   **Ans :** $FeO.Fe_2O_3$ (Ferroso ferric oxide)

157. _____ is used in making pipes, stoves, etc.   **Ans :** Pig iron (2–4.5% of carbon)

158. _____ is used in the construction of buildings, Machinery, transmission cables and making alloys.   **Ans :** Steel (Iron with <0.25% of carbon)

159. _____ is used in making springs, anchors and electromagnet.   **Ans :** Wrought iron (Iron with 0.25–2% of carbon)

160. An _____ is a homogeneous mixture of two or more metals or more metals or of one or more metals with certain non-mettalic elements.   **Ans :** alloy

161. _____ amalgam is used for dental fillings.   **Ans :** Silver tin

162. _____ contain Iron as a Major component.   **Ans :** Ferrous alloys

163. Non-Ferrous alloys _____ contain Iron as a major component.   **Ans :** do not

164. _____ is used for making Bells and gongs.   **Ans :** Bronze

165. _____ is used for making pressure cookers.   **Ans :** Duralumin

166. _____ is used for making cables.   **Ans :** Nickel steel

167. Rust is chemically known as _____ .   **Ans :** Hydrated ferric oxide

168. _____ is used for galvanization process.   **Ans :** Zinc

169. _____ by a periodical protective coating which will be the strong example for applied chemistry.   **Ans :** Pamban bridge

170. _____ discovered a new property of elements called atomic number.   **Ans :** Honry Moseley

171. _____ elements are unreactive.   **Ans :** Zero group

172. Anything which repeats itself after a regular interval is called periodic and this behaviour is called _____ .   **Ans :** periodicity

173. Atomic radius in metal atoms is known as _____ .   **Ans :** metallic radius

174. Half the distance between the nuclei of adjacent _____ .   **Ans :** metal atoms

175. In non–metallic elements their atomic radius is known as _____ .   **Ans :** Covalent radius

176. The size of a cation is always _____ than its corresponding neutral atom.   **Ans :** smaller

177. _____ and _____ become negative ions by gaining an electron.   **Ans :** Fluorine, Chlorine

178. Electron affinity is measured in _____ .   **Ans :** KJ/mol

179. Electron affinities for noble gases are _____ .   **Ans :** zero

180. Formula for clay is _____ .   **Ans :** $Al_2O_3.2SiO_2.2H_2O$

181. Formula for Bauxite is _____ .   **Ans :** $Al_2O_3.2H_2O$

182. Calcium oxide is _____ .   **Ans :** basic

183. Silica is _____ .   **Ans :** Acidic

184. Flux + Gangue → _____ .   **Ans :** slag

185. Smelting is the process of Roasting the _____ oxide from the metal.   **Ans :** metallic

186. Hydraulic method is also called as _____ .   **Ans :** Gravity separation method

187. _____ oil can be used in froth floatation process.   **Ans :** Pine

188. Sulphide ores are concentrated by _____. **Ans :** Froth floatation method

189. Metals have a _____ density. **Ans :** high

190. Metals do not dissolve in liquid _____. **Ans :** solvents

191. Oxides of metals are usually _____. **Ans :** basic

192. Formula for cryolite is _____. **Ans :** Na_3AlF_6

193. Formula for corundum is _____. **Ans :** Al_2O_3

194. Aluminium occurs in _____ state. **Ans :** combined

195. In Hall's process temperature maintains at _____. **Ans :** $900 - 950°C$

196. _____ used in Hall's process. **Ans :** $5 - 6$ volt

197. _____ is a good conductor of heat and electricity. **Ans :** Aluminium

198. _____ is a silvery white metal. **Ans :** Aluminium

199. _____ is a powerful reducing agent. **Ans :** Aluminium

200. Copper is found in the _____ as well as _____. **Ans :** native state, combined state

201. _____ is a reddish brown metal. **Ans :** Copper

202. _____ is used for making utensils, containers calorimeters and coins. **Ans :** Copper

203. Iron occurs in nature as oxides, _____ and _____. **Ans :** sulphides, carbonate

204. The formula for magnetite is _____. **Ans :** Fe_3O_4

205. The formula for Iron pyrite is _____. **Ans :** FeS_2

206. The temperature is present in combastion zone is at _____. **Ans :** 1500°C

207. The temperature is present in fusion zone at _____. **Ans :** 1000°C

208. The temperature prevails at _____ for the reduction zone. **Ans :** 400°C

209. _____ can be magnetized. **Ans :** Iron

210. Types of Iron alloys are _____. **Ans :** Ferrous alloys and non-ferrous alloys

211. Dry corrosion occurs at _____ temperature. **Ans :** high

212. The corrosive action in the presence of moisture is called _____. **Ans :** wet corrosion

213. The metals can be alloyed to prevent the process of corrosion is called _____. **Ans :** Alloying

214. _____ metal is called sacrificial metal to act as anode ensuring cathodic protection. **Ans :** Magnesium

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Additional – Match the following

1.   **Group**   **Family**
   1.   **1**   (a)   **Boron family**
   2.   **2**   (b)   **Alkali metals**
   3.   **3 to 12**   (c)   **Carbon family**
   4.   **13**   (d)   **Transition metals**
   5.   **14**   (e)   **Alkaline earth metals**

   Ans :

S.No.	Group		Family
1	1	b	Alkali metals
2	2	e	Alkaline earth metals
3	3 to 12	d	Transition metals
4	13	a	Boron family
5	14	c	Carbon family

2.   **Group**   **Family**

     1.   **15**   **(a)**   **Noble gases**

     2.   **16**   **(b)**   **Halogens**

     3.   **17**   **(c)**   **Nitrogen family**

     4.   **18**   **(d)**   **Oxygen family**

     Ans :

S.No.	Group		Family
1	15	c	Nitrogen family
2	16	d	Oxygen family
3	17	b	Halogens
4	18	a	Noble gases

3.   **Elements**   **Electronegativity**

     1.   **F**   **(a)**   **2.1**

     2.   **Cl**   **(b)**   **2.5**

     3.   **Br**   **(c)**   **4.0**

     4.   **I**   **(d)**   **1.0**

     5.   **H**   **(e)**   **3.0**

     6.   **Na**   **(f)**   **2.8**

     Ans :

S.No.	Elements		Electronegativity
1	F	c	4.0
2	Cl	e	3.0
3	Br	f	2.8
4	I	b	2.5
5	H	a	2.1
6	Na	d	1.0

4.   **Molecules**   **Nature of Bond**

     1.   **Nacl**   **Covalent**

     2.   **NaBr**   **Covalent**

     3.   **NaI**   **Ionic**

     4.   **NaF**   **Ionic**

     5.   **NaH**   **Ionic**

     Ans :

S.No.	Molecules	Nature of Bond
1	Nacl	Ionic
2	NaBr	Ionic
3	NaI	Covalent
4	NaF	Ionic
5	NaH	Covalent

5.   **Carbonate Ores**   **Formula**

     1.   **Marble** $FeCO_3$

     2.   **Siderite** $MgCO_3$

     3.   **Magnesite** $CaCO_3$

     4.   **Limestone** $CaCO_3$

     Ans :

S.No.	Carbonate Ores	Formula
1	Marble	$CaCO_3$
2	Siderite	$FeCO_3$
3	Magnesite	$MgCO_3$
4	Limestone	$CaCO_3$

6.   **Halide Ores**   **Formula**
1.   **Cryolite**   **(a)**   **Nacl**
2.   **Fluorspar**   **(b)**   **Na_3AlF_6**
3.   **Rock salt**   **(c)**   **CaF_2**
Ans :

S.No.	Halide Ores		Formula
1	Cryolite	b	Na_3Alf_6
2	Fluorspar	c	CaF_2
3	Rock salt	a	Nacl

7.   **Sulphide Ores**   **Formula**
1.   **Galena**   **(a)**   **Zns**
2.   **Iron pyrite**   **(b)**   **FeS_2**
3.   **Zinc blende**   **(c)**   **PbS**
Ans :

S.No.	Sulphide Ores		Formula
1	Galena	c	PbS
2	Iron pyrite	b	FeS_2
3	Zinc blende	a	Zns

8.   **Oxide Ores**   **Formula**
1.   **Bauxite**   **(a)**   **Cu_2O**
2.   **Cuprite**   **(b)**   **Fe_2O_3**
3.   **Haematite**   **(c)**   **$Al_2O_3.2H_2O$**
Ans :

S.No.	Oxide Ores		Formula
1	Bauxite	c	$Al_2O_3.2H_2O$
2	Cuprite	a	Cu_2O
3	Haematite	b	Fe_2O_3

9.   **Oxide Ores**   **Places**
1.   **Limestone**   **(a)**   **Trichy**
2.   **Gypsum**   **(b)**   **Cuddalore**
3.   **Titanium**   **(c)**   **Salem**
4.   **Chromite**   **(d)**   **Tirunelveli**
Ans :

S.No.	Oxide Ores		Formula
1	Limestone	b	Cuddalore
2	Gypsum	a	Trichy
3	Titanium	d	Tirunelveli
4	Chromite	c	Salem

10.

	Oxide Ores		Places
1.	Limestone	(a)	Erode
2.	Gypsum	(b)	Coimbatore
3.	Magnetite	(c)	Madurai
4.	Tungsten	(d)	Dindugul

Ans :

S.No.	Oxide Ores		Formula
1	Limestone	b	Coimbatore
2	Gypsum	d	Dindugul
3	Magnetite	a	Erode
4	Tungsten	c	Madurai

11.

	Alloys		Uses
1.	Brass	(a)	bells & gongs
2.	Bronze	(b)	hardware
3.	Stainless steel	(c)	cables
4.	Nickel steel	(d)	cutlery

Ans :

S.No.	Alloys		Uses
1	Brass	b	hardware
2	Bronze	a	bells & gongs
3	Stainless steel	d	cutlery
4	Nickel steel	c	cables

Additional – True or false (If false give the correct statement)

1. Fifth period includes 8 normal elements and 10 transition elements.
Ans : True.

2. Seventh period accommodates 38 elements.
Ans : True.

3. Horizontal rows are called groups. Vertical columns are called periods.
Ans : False. Horizontal rows are called periods. Vertical columns are called groups.

4. There are 9 groups in the periodic table.
Ans : False. There are 18 groups in the periodic table.

5. The size of a cation is always smaller than its corresponding neutral atom. But the anion is larger than its neutral atom.
Ans : True.

6. Atomic radius, Ionic radii also decrease along the period from left to right and decrease downt he group.
Ans : False. Atomic radius, Ionic radii also decrease along the period from left to right and increases down the group.

7. Ionisation energy increases down the group.
Ans : False. Ionisation energy decreases down the group.

8. If the difference is less than 1.7 the bond is considered to be Ionic.
Ans : False. If the difference is less than 1.7 the bond is considered to be covalent.

9. If the difference is greater than 1.7 the bond is considered to be covalent.
Ans : False. If the difference is greater than 1.7, the bond is considered to be ionic.

10. Bauxite is an ore of aluminium and clay is its mineral.
Ans : True.

11. Sodium (Na) and Potassium (K) are m ore reactive metals.
Ans : True.

12. Zn and Pb are less reactive metals.
Ans : False. Zn and lead are medium reactive metals.

13. Ag and Hg are more reactive metals.
Ans : False. Ag and Hg are less reactive metals.

14. Dilute or concentrated nitric acid does not attack aluminium.
Ans : True.

15. Copper is heated with above 1370 K to give black colour of copper II oxide.
Ans : False. Copper is heated with above 1370 K to give red colour of copper II oxide.

16. Copper is attacked by alkalis.
Ans : False. Copper is not attacked by alkalis.

17. Iron is a lustrous metal.
Ans : True.

18. An alloy is a heterogeneous mixture of two or more metals.
Ans : False. An alloy is a homogeneous mixture of two (or) more metals.

19. Non–ferrous alloys contain Iron as a major component.
Ans : False. Ferrous alloys contain Iron as a major component.

20. Non–ferrous alloys do not contain Iron as a major component.
Ans : True.

21. Automobile parts are used in ferrous alloys.
Ans : False. Ferrous alloys are used in automobile parts.

22. Amalgam melting point is low.
Ans : True.

23. Rusting results in the formation of scaling reddish brown hydrated Ferric oxide.
Ans : True.

24. The corrosion action in the presence of moisture is called dry corrosion.
Ans : False. The corrosion action in the presence of moisture is called wet corrosion.

25. The corrosive action in the absence of moisture is called dry corrosion.
Ans : True.

26. Stainless steel is used to prevent the corrosion.
Ans : True.

Additional – Odd one out

1. Alkali metals, Boron family, Carbon family and Oxygen family.
Ans : Alkali metals, others are 'p' block elements.

2. Cl, Ag, F, Br.
Ans : Ag, others are Halogens.

3. P, Ne, Ar, Xe.
Ans : Phosphorus (P), others are rare gases.

4. Nacl, NaBr, NaF, NaI.
Ans : NaI, others are Ionic.

5. Cu_2O, CaF_2, Na_3AlF_6, Rocksalt (Nacl).
Ans : Cu_2O, others are Halide ores.

6. **$CuFeS_2$, Fe_2O_3, Fe_3O_4, FeS_2.**

   Ans : $CuFeS_2$, others are Iron ores.

7. **Nickel steel, Aluminium alloy, Copper alloy.**

   Ans : Nickel steel, others are Non–ferrous alloys.

Additional – Assertion and Reason

1. **Assertion :** Magnesium is used for cathodic protection.

   Reason : Magnesium is more reactive than iron and it is easily corrodible metal is called sacrificial metal to act as anode ensuring cathodic protection.

   a) **A is right R is wrong**   b) **A is wrong R is right**

   c) **R explains A**   d) **R does not explain A**

                                                            Ans : (c) R explains A

2. **Assertion :** Ionization energy decreases from top to bottom as we move down the group.

   Reason : As we move down the group, Atomic radii increases.

   a) **A is right R is wrong**   b) **A is wrong R is right**

   c) **R explains A**   d) **R does not explain A**

                                                            Ans : (c) R explains A

3. **Assertion :** Matte is copper(I) sulphide and iron(II) sulphide.

   Reason : Roasting removes volatile impurities.

   a) **A is right R is wrong**   b) **A is wrong R is right**

   c) **R explains A**   d) **R does not explain A**

                                         Ans : (d) R does not explain A

4. **Assertion :** Aluminium is used in thermite welding.

   Reason : Aluminium is a powerful reducing agent.

   a) **A is right R is wrong**   b) **A is wrong R is right**

   c) **R explains A**   d) **R does not explain A**

                                                            Ans : (c) R explains A

5. **Assertion :** Rusting results in the formation of scaling reddish brown hydrated ferric oxide on the surface of iron and iron containing materials.

   Reason : Rusting takes place in the presence of air and moisture.

   a) **A is right R is wrong**   b) **A is wrong R is right**

   c) **Both A and R are right**   d) **R does not explain A**

                                            Ans : (c) Both A and R are right

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Additional – Short answer questions

1. **State modern periodic law.**

   The physical and chemical properties of the elements are the periodic functions of their atomic numbers.

2. **What are physical properties of the elements?**

   ✦ Melting point.

   ✦ Boiling point.

   ✦ Density.

3. **What are called periodic properties?**

   Properties such as atomic radius, ionic radius, ionisation energy, electronegativity, electron affinity show a regular periodicity. They are called periodic properties.

4. **Define atomic radius.**

   Atomic radius of an atom is defined as the distance between the centre of its nucleus and the outermost shell containing the valence electron.

5. Define metallic radius.

Atomic radius in metal atom is known as metallic radius. It is defined as half the distance between the nuclei of adjecent metal atoms.

6. Define covalent radius.

In Non–metallic elements their atomic radius is known as covalent radius. It is defined as half the distance between the nuclei of two covalently bonded atoms of the same element in a molecule.

7. Define ionic radius.

It is defined as the distance from the centre of the nucleus of the ion upto the point where it exerts its influence on the electron cloud of the ion.

8. Define ionisation energy.

Ionisation energy is the minimum energy required to remove an electron from a gaseous atom in its ground state to form a cation. It is otherwise called Ionisation enthalpy.

9. Define electron affinity.

Electron affinity is the amount of energy released when a gaseous atom gains an electron to form its anion. It is also measured in KJ/mol.

10. Noble gases show no tendency to accept electron. How?

Because the outer S and p orbitals of noble gases are completely filled. No more electrons can be added to them and hence their electron affinities are zero.

11. Define electronegativity.

Electronegativity of an element is the measure of the tendency of its atom to attract the shared pair of electrons towards itself in a covalent bond.

12. What are the experimental data based on the electronegativity?

Bond energy, Ionisation potential, Electron affinity, etc.

13. Explain pauling scale.

Pauling scale is the widely used scale to determine the electronegativity, which in turn predicts the nature of bonding between the atoms in a molecule.

14. Define the term Metallurgy.

Metallurgy is a science of extracting metals from their ores and modifying the metals into alloys for various uses based on their physical and chemical properties and their structural arrangement of atoms.

15. How many metallurgical process involved in metallurgy? What are they?

Three steps.

✦ Concentration or separation of the ore.

✦ Production of the metal.

✦ Refining of the metal.

16. Define minerals.

A mineral may be a single compound or a complex mixture of various compounds of metals found in the earth.

17. Define Ores.

The mineral from which a metal can be readily and economically extracted on a large scale is said to be an ore.

18. Clay is a mineral bauxite is a ore of Aluminium. Why?

Aluminium is profitably extracted only from Bauxite. So Bauxite is an ore of aluminium.

19. Define Mining.

The process of extracting the ores from the Earth's crust is called mining.

20. Define Gangue or Matrix.

The rocky impurity associated with an ore is called gangue or matrix.

21. Define flux.

It is the substance added to the ore to reduce the fusion temperature and to remove the impurities. Eg. Calcium oxide, silica. If the gangue is acidic then basic flux is added and vice versa.

22. Define slag.

It is the fusible product formed when a flux reacts with a gangue during the extraction of metals.

$$Flux + Gangue \rightarrow slag.$$

23. Define smelting.

Smelting is the process of reducing the roasted metallic oxide from the metal in its molten condition. In this process impurities are removed as slag by the addition of flux.

24. Write the oxide ores.

Bauxite – $Al_2O_3.2H_2O$.

Cuprite – Cu_2O.

Haematite – Fe_2O_3.

25. Write the carbonate ores.

Marble – $CaCO_3$.

Magnesite – $MgCO_3$.

Siderite – $FeCO_3$.

26. Write the halide ores.

Cryolite – Na_3AlF_6.

Fluosspar – CaF_2.

Rock salt – NaCl.

27. Write the sulphide ores.

Galena – PbS.

Ironpyrite – FeS_2.

Zinc blende – ZnS.

28. How categorized the extraction of metal from metal oxide?

More Reactive Metals	Medium Reactive Metals	Low Reactive Metals
Na, K, Ca, Mg	Zn, Fe, Pb, Cu	Ag, Hg
Electrolytic reduction of metal oxide into metal	Chemical reduction of metal oxide into metal using coke	Thermal decomposition of metal oxide into metal

29. Write the ores of Aluminium and their formula.

Ores of Aluminium	Formula
Bauxite	$Al_2O_3.2H_2O$
Cryolite	Na_3AlF_6
Corumdum	Al_2O_3

30. Define Alumino thermic process.

Aluminium is a powerful reducing agent. When a mixture of aluminium powder and iron oxide is ignited, the latter is reduced to metal. This process is known as aluminothermic process.

$$Fe_2O_3 + 2Al \rightarrow 2Fe + Al_2O_3 + Heat$$

31. Write the uses of Aluminium.

✦ Household utensils.

✦ Electrical cable industry.

✦ Making aeroplanes and other industrial machine parts.

32. Write the ores of Copper and their formula.

Copper Pyrites – $CuFeS_2$.

Cuprite or Ruby copper – Cu_2O.

Copper glance – Cu_2S.

33. Write the physical properties of copper.

Copper is a reddish brown metal with high lustre, high density and high melting point (1356°C).

34. Uses of Copper.

✦ It is extensively used in manufacturing electric cables and other electric appliances.

✦ It is used for making utensils, containers, calorimeters and coins.

✦ It is used in electroplating.

✦ It is alloyed with gold and silver for making coins and jewels.

35. Write the ores of Iron and their formula.

Haematite – Fe_2O_3.

Magnetite – Fe_3O_4.

Iron pyrite – FeS_2.

36. Write the physical properties of iron.

✦ It is lustrus metal, greyish white in colour.

✦ It has high tensility, malleability and ductility.

✦ It can be magnetized.

37. Write the uses of iron.

✦ **Pig iron (Iron with 2 − 4.5% of Carbon) :** it is used in making pipes, stoves, radiators, railing, manhole covers and drain pipes.

✦ **Steel (Iron with < 0.25%) :** It is used in the construction of buildings, machinery, transmission cables and T.V. towers and in making alloys.

✦ **Wrought Iron (Iron with 0.25% − 2%) :** It is used in making springs, anchors and electromagnets.

38. Define Alloy.

An Alloy is a homogeneous mixture of two or more metals or of one or more metals with contain non–metallic elements.

39. Define Amalgam.

An amalgam is an alloy of mercury with another metal. These alloys are formed through metallic bonding with the electrostatic force of attraction between the electrons and the positively charged metal ions. Silve, Tin, Amalgam is used for dental filling.

40. What are the reasons for alloying.

✦ To modify appearance and colour.

✦ To modify chemical activity.

✦ To lower the melting point.

✦ To increase hardness and tensile strength.

✦ To increase resistance to electricity.

41. Write the method of making alloys.

a)   by fusing the metals together. eg: Brass is made by melting Zinc and copper.

b)   by compressing finely divided metals.

42. Alloys are solid solutions. Why?

Alloys can be considered solid solutions in which the metal with high concentration is solvent and other metals are solute. For example, brass is a solid solution of zinc in copper.

43. Write the types of Alloys.

✦   **Ferrous alloys :** It contain iron as a major component. A few examples of ferrous alloys are stainless steel, nickel steel, etc.

✦   **Non–ferrous alloys :** These are alloys do not contain iron as a manor component. For example, aluminium alloy, copper alloy, etc.

44. Write the copper alloys and their uses.

Alloys	Uses
Brass (Cu, Zn)	Electrical fittings, medal, decorative items, hardware.
Bronze (Cu, Sn)	Statues, coins, bells and gongs.

45. Write the aluminium alloys and their uses.

Alloys	Uses
Duralumin (Al, Mg.Mn, Cu)	Aircrafts, tools, pressure cookers.
Magnalium (Al, Mg)	Aircraft, scientific instruments.

46. Write the iron alloys and their uses.

Alloys	Uses
Stainless steel (Fe, C, Ni, Cr)	Utensils, cutlery, automobile parts.
Nickel steels (Fe, Cu, Ni)	Cables, aircrafts, propellers.

47. What is called rusting?

Rust is chemically known as hydrated ferric oxide (it is formulated as $Fe_2O_3.xH_2O$). Rusting results in the formation of scaling reddish brown hydrated ferric oxide on the surface of iron and iron containing materials.

Additional – Long answer questions

1.   Explain Atomic Radius in briefly.

Atomic radius of an atom is defined as the distance between the centre of its nucleus and the outermost shell containing the valence electron. Direct measurement of the radius of an isolated atom is not possible. Except for noble gases, usually the atomic radius is referred to as covalent radius or metallic radius depending on the nature of the bonding between the concerned atoms. Atomic radius in metal atoms is known as metallic radius. It is defined as half the distance between the nuclei of adjacent metal atoms.

(a)

(b)
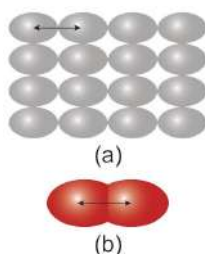
(a)   Metallic Radius.

(b)   Covalent Radius.

a)   In non-metallic elements, their atomic radius is known as Covalent radius. It is defi ned as half the distance between the nuclei of two covalently bonded atoms of the same element in a molecule (Figure 8.2 (b)). For example, let us consider H2 molecule. Th e distance between the two hydrogen nuclei of the molecule is 0.74 Å. So its covalent radius is 0.74/2 = 0.37 Å.

When you look at the variation of the atomic radii in the periodic table, there are two distinct trends. Along the period, from left to right, the atomic radius of the elements decreases whereas along the groups, from the top to bottom, the atomic radius increases. The increase, down a group, is due to the increase in the valence shell number down the group. As the shell number increases, the distance between the valence shell and the nucleus increases. In contrast, when you observe along the period, the shell number remains the same but the number of protons (i.e. atomic number) increases. More and more positive charges impose a strong attraction over the electrons and thus the electron cloud shrinks towards the nucleus, which results in the decrease in the atomic size. Figure 8.4 shows how the atomic radius decreases from lithium to boron.
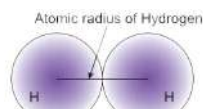
Figure 8.3
Atomic radius
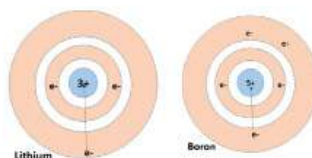
Figure 8.4 Variation of atomic radius

2. Explain Ionic Radii.

It is defined as the distance from the centre of the nucleus of the ion upto the point where it exerts its influence on the electron cloud of the ion. You know that ions are formed when an atom lose or gain electrons. When a neutral atom loses an electron, it becomes a positively charged ion called cation, whereas the gain of an electron by a neutral atom forms a negatively charged ion called anion. The size of the ions is important to determine their behaviours in solutions and the structure of ionic solids. The size of a cation is always smaller than its corresponding neutral atom. But, the anion is larger than its neutral atom.

Radii in Picometers
Figure 8.5 Relative ionic radii of cation and anion

For instance, lithium and sodium lose the single electron from their outermost energy level to form cations. The ions so formed are smaller because the remaining electrons are at a inner cells and attracted more strongly by the nucleus. Fluorine and chlorine become negative ions by gaining an electron. When electrons are added, the charge on the nucleus is not great enough to hold the increased number of electrons as closely as it holds the electrons in the neutral atom. So, as seen in atomic radius, ionic radii also decrease along the period from left to right and increase down the group.

3. Explain Ionisation energy.

Ionisation energy is the minimum energy required to remove an electron from a gaseous atom in its ground state to form a cation. It is otherwise called ionisation enthalpy. It is measured in kJ/mol. Higher the ionisation energy, it is more difficult to remove the electron.

As the atomic size decreases from left to right in a period, more energy is required to remove the electrons. So, the ionisation energy increases along the period. But, down the group, the atomic size increases and hence the valence electrons are loosely bound. They require relatively less energy for the removal. Thus, ionisation energy decreases down the group in the periodic table.

Note: As the positive charge increases the size of the cation decreases.

As the negative charge increases the size of the anion increases.

4. Explain Electron affinity.

Electron affinity is the amount of energy released when a gaseous atom gains an electron to form its anion. It is also measured in kJ/mol and represented by the following equation:

$$A_{(g)} + e^- \rightarrow A^-_{(g)} + \text{energy}$$
$$Cl_{(g)} + e^- \rightarrow Cl^-_{(g)} + \text{energy}$$
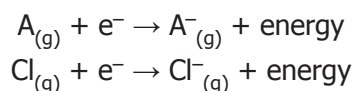
Like ionisation energy, electron affinity also increases from left to right in a period and decreases from top to bottom in a group.

5.   Explain Electronegativity.

Electronegativity of an element is the measure of the tendency of its atom to attract the shared pair of electrons towards itself in a covalent bond. Let us consider HCl molecule. Both the hydrogen and chlorine atoms share one electron each to form the covalent bond between them. chlorine atom has a higher electronegativity and hence it pulls the shared electrosns towards itself more strongly than hydrogen. Thus, when the bond breaks, the bonding electrons are left with chlorine forming H^+ and Cl^- ions. It is represented, diagrammatically, as shown below:

Figure 8.6 Relative electronegativity of H and Cl
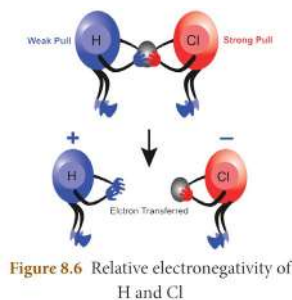
Electronegativity is based on various experimental data such as bond energy, ionization potential, electron affinity, etc.

Pauling scale is the widely used scale to determine the electronegativity, which in turn predicts the nature of bonding (ionic or covalent) between the atoms in a molecule.

Electronegativity of some of the elements are given below.

F = 4.0, Cl = 3.0, Br = 2.8, I = 2.5, H = 2.1, Na = 1

If the difference in electronegativity between two elements is 1.7, the bond has 50% ionic character and 50% covalent character.

If the difference is less than 1.7, the bond is considered to be covalent.

If the difference is greater than 1.7, the bond is considered to be ionic.

Along the period, from left to right in the periodic table, the electronegativity increases because of the increase in the nuclear charge which in turn attracts the electrons more strongly. On moving down a group, the electronegativity of the elements decreases because of the increased number of energy levels.

6.   Explain Hydraulic (Gravity separation method) method.

Principle : The difference in the densities or specific gravities of the ore and the gangue is the main principle behind this method. Oxide ores are purified by this method. Eg. Haematite Fe_2O_3 ore of iron.

Method : The ore is poured over a sloping, vibrating corrugated table with grooves and a jet of water is allowed to flow over it. The denser ore particles settle down in the grooves and lighter gangue particles are washed down by water.

7. Explain Magnetic separation method.

Principle : The magnetic properties of the ores form the basis of separation. When either the ore or the gangue is magnetic, this method is employed. e.g., Tinstone SnO_2, the ore of tin.
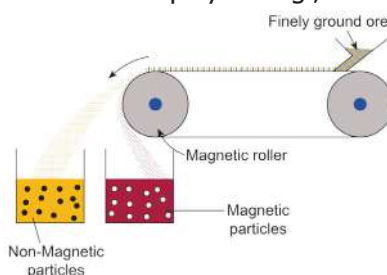
Figure 8.8 Magnetic separation

Method : The crushed ore is placed over a conveyer belt which rotates around two metal wheels, one of which is magnetic. The magnetic particles are attracted to the magnetic wheel and fall separately apart from the non–magnetic particles.

8. Explain Froth floatation.

Principle : This process depend on the preferential wettability of the ore with oil (pine oil) and the gangue particles by water. Lighter ores such as sulphide ores are concentrated by this method. Eg. Zinc blende (ZnS).
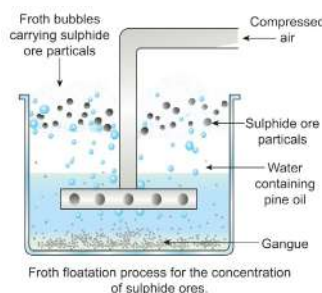
Figure 8.9 Froth floatation

Method : The rused ore is taken in a large tank containing oil and water and agitated with a current of compressed air. The ore is wetted by the oil and gets separated from the gangue in the form of froth. Since the ore is lighter, it comes on the surface with the frothand the impurities are left behind. eg: Zinc blende.

9. Chemical method (or) leaching – Explain.

This method is employed when the ore is in a very pure form. The ore is treated with a suitable reagent such that the ore is soluble in it but the impurities are not. The impurities are removed by filtration. The solution of the ore, i.e., the filtrate is treated with a suitable reagent which precipitates the ore.

eg: Bauxite $Al_2O_3.2H_2O$ is the ore of Aluminium.

10. Write the physical properties of metals.

Physical state :	All metals are solids at room temperature except mercury and gallium.
Lustre :	Metals possess a high lustre (called metallic lustre).
Hardness :	Most of the metals are hard and strong.
Melting point & Boiling point :	Usually metals possess high melting and boiling points are vaporize only at high temperatures.
Density :	Metals have a high density.
Ductility :	Metals are usually ductile. In other words, they can be drawn into thin wires without breaking.
Malleability :	Metals are usually malleable. They can be beaten into thin sheets

without cracking.

Conduction of heat & electricity : Metals are good conductorsof heat and electricity. Silver and copper except in this property.

Solubility : Usually metals do not dissolve in liquid solvents.

11. Write the chemical properties of metals.

Valence electrons : Atoms of metals usually have 1, 2 or 3 electrons in their outermost shell.

Formation of ions : Metals form positive ions by the loss of electrons and hence they are electro positive.

Discharge of ions : Metals are discharged at the cathode during the electrolysis of their compounds.

Atomicity : Molecules of metals in their vapour state are usually mono atomic.

Nature of oxides : Oxides of metals are usually basic.

12. How will you extract the Aluminium from Bauxite?

i) Conversion of bauxite into alumina :

Baeyer's Process : The conversion of bauxite into alumina involving the following steps.

a) Bauxite ore is finely ground and heated under pressure with a solution of concentrated caustic soda solution at 150°C to obtain sodium metaaluminate.

b) On diluting sodium meta aluminate with water, a precipitate of aluminium hydroxide is formed.

c) The precipitate is filtered, washed and dried, ignited at 1000°C to get alumina.

$$2Al(OH)_3 \xrightarrow{\text{1000°C}} Al_2O_3 + H_2O.$$
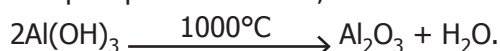
ii) Conversion of bauxite into alumina :

Hall's Process : Aluminium is produced by the electrolytic reduction of fused alumina (Al_2O_3) in the electrolytic cell.

Cathode : Iron tank lined with graphite.

Anode : A bunch of graphite rods suspended in molten electrolyte.

Electrolyte : Pure alumina + Molten cryolite + Fluorspar (fluorspar lowers the fusion temperature of electrolyte).

Temperature : 900 – 950°C.

Voltage used : 5 – 6 V.

Overall reaction : $2Al_2O_3 \rightarrow 4Al + 3O_2\uparrow$.
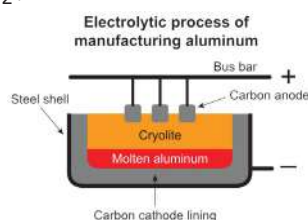
Figure 8.10 Hall's Process

Aluminium is deposited at the cathode and oxygen is liberated at the anode. Oxygen combines with graphite to form CO_2.

13. Write the physical properties of Aluminium.

✦ It is a silvery white metal.

✦ It has low density (2.7) and it is light.

✦ It is malleable and ductile.

✦ It is a good conductor of heat and electricity.

✦ It's melting point is 660°C.

✦ It can be polished to produce a shiny attractive appearance.

14. Chemical Properties of Aluminium.

i) **Reaction with air :** It is not affected by dry air. On heating at 800°C, aluminium burns very brightly forming it's oxide and nitride.

$$4\ Al + 3\ O_2 \rightarrow 2\ Al_2O_3 \text{ (Aluminium oxide)}$$
$$2\ Al + N_2 \rightarrow 2\ AlN \text{ (Aluminium Nitride)}$$
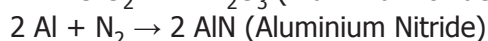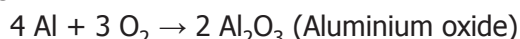
ii) **Reaction with water :** Water does not react with aluminium due to the layer of oxide on it. When steam is passed over red hot aluminium, hydrogen is produced.

$$2\ Al + 3\ H_2 O \rightarrow Al_2O_3 + 3\ H_2\uparrow$$
(steam)   (aluminium oxide)
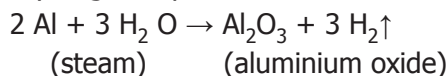
iii) **Reaction with alkalis :** It reacts with strong caustic alkalis forming aluminates.

$$2\ Al + 2\ NaOH + 2\ H_2 O \rightarrow 2\ NaAlO_2 + 3\ H_2\uparrow$$
(sodium meta aluminate)
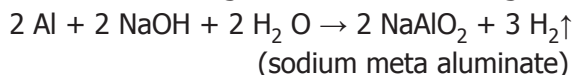
iv) **Reaction with acids :** With dilute and con. HCl it liberates H_2 gas.

$$2\ Al + 6\ HCl \rightarrow 2\ AlCl_3 + 3\ H_2\uparrow$$
(Aluminium chloride)
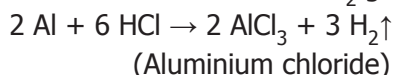
Aluminium liberates hydrogen on reaction with dilute sulphuric acid. Sulphur dioxide is liberated with hot concentrated sulphuric acid.

$$2\ Al + 3\ H_2 SO_4 \rightarrow Al_2(SO_4)_3 + 3\ H_2$$
$$2\ Al + 6\ H_2SO_4 \rightarrow Al_2(SO_4)_3 + 6H_2O + 3\ SO_2\uparrow$$
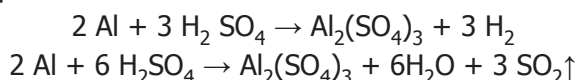
v) **As reducing agent :** Aluminium is a powerful reducing agent. When a mixure of aluminium powder and iron oxide is ignited, the latter is reduced to metal. This process is known as Aluminothermic process.

$$Fe_2O_3 + 2\ Al \rightarrow 2\ Fe + Al_2O_3 + Heat$$

15. How will you extract copper from copper pyrites?

Extraction of copper from copper pyrites involves the following steps.

i) **Concentration of ore :** The ore is crushed and the concentrated by froth floatation process.

ii) **Roasting :** The concentrated ore is roasted in excess of air. During the process of roasting, the moisture and volatile impurities are removed. Sulphur, phosphorus, arsenic and antimony are removed as oxides. Copper pyrite is partly converted into sulphides of copper and iron.

$$2\ CuFeS_2 + O_2 \rightarrow Cu_2S + 2\ FeS + SO_2\uparrow$$

iii) **Smelting :** The roasted ore is mixed with powdered coke and sand and is heated in a blast furnace to obtain matte (Cu_2S + FeS) and slag. The slag is removed as waste.

iv) **Bessemerisation :** The molten matte is transferred to Bessemer converter in order to obtain blister copper. Ferrous sulphide from matte is oxidized to ferrous oxide, which is removed as slag using silica.

$$2\ FeS + 3\ O_2 \rightarrow 2\ FeO + 2\ SO_2\uparrow$$
$$FeO + SiO_2 \rightarrow FeSiO_3 \text{ (slag)}$$
(Iron silicate)
$$2\ Cu_2S + 3O_2 \rightarrow 2\ Cu_2O + 2\ SO_2\uparrow$$
$$2\ CuO + Cu_2S \rightarrow 6\ Cu + SO_2$$
(Blister copper)
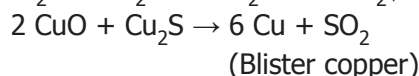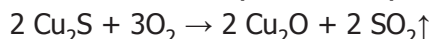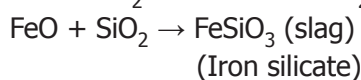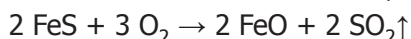
v) **Refining :** Blister copper contains 98% of pure copper and 2% of impurities and is purified by electrolytic refining. This method is used to get metal of a high degree of purity. For electrolytic refining of copper, we use:

Cathode : A thin plate of pure copper metal.

Anode : A block of impure copper metal.

Electrolyte : Copper sulphate solution acidified with sulphuric acid.

When electric current is passed through the electrolytic solution, pure copper gets deposited at the cathode and the impurities settle at the bottom of the anode in the form of sludge called anode mud.

16. Chemical properties of copper.

i) **Action of Air and Moisture :** Copper gets covered with a green layer of basic copper carbonate in the presence of CO_2 and moisture.

$$2\ Cu + O_2 + CO_2 + H_2O \rightarrow CuCO_3.Cu(OH)_2$$
basic copper carbonate
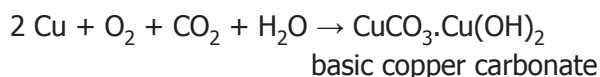
ii) **Action of Heat :** On heating at different temperatures in the presence of oxygen, copper forms two types of oxides CuO, Cu$_2$O.

$$2\ Cu + O_2 \xrightarrow{\text{below 1370 K}} 2\ CuO$$
(copper II oxide- black)

$$4\ Cu + O_2 \xrightarrow{\text{above 1370 K}} 2\ Cu_2O$$
(copper I oxide – red)
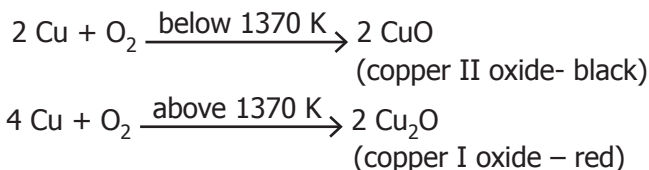
iii) **Action of Acids :**

a) **With dilute HCl and dilute H$_2$SO$_4$:**

Dilute acids such as HCl and H$_2$SO$_4$ have no action on these metals in the absence of air. Copper dissolves in these acids in the presence of air.

$$2\ Cu + 4\ HCl + O_2\ (air) \rightarrow 2\ CuCl_2 + 2\ H_2O$$

b) **With dil. HNO$_3$:**

Copper reacts with dil. HNO$_3$ with the liberation of Nitric Oxide gas.

$$3\ Cu + 8\ HNO_3 \rightarrow Cu(NO_3)_2 + 2\ NO \uparrow + 2H_2O$$
$$Cu + 2\ H_2SO_4 \rightarrow CuSO_4 + SO_2 \uparrow + 2\ H_2O$$
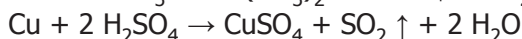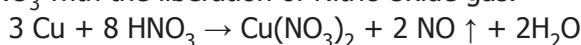
iv) **Action of Chlorine :**

Chlorine reacts with copper, resulting in the formation of copper(II) chloride.

$$Cu + Cl_2\ CuCl_2$$

v) **Action of Alkalis :**

Copper is not attacked by alkalis.

17. **How will you extract iron from iron pyrites?**

Iron is chiefly extracted from haematite ore (Fe$_2$O$_3$).

i) **Concentration by Gravity Separation :** The powdered ore is washed with a steam of water. As a result, the lighter sand particles and other impurities are washed away and the heavier ore particles settle down.

ii) **Roasting and Calcination :** The concentrated ore is strongly heated in a limited supply of air in a reverberatory furnace. As a result, moisture is driven out and sulphur, arsenic and phosphorus impurities are oxidized off.

iii) **Smelting (in a Blast Furnace) :** The charge consisting of roasted ore, coke and limestone in the ratio 8:4:1 is smelted in a blast furnace by introducing it through the cup and cone arrangement at the top. There are three important regions in the furnace.

a) **The Lower Region (Combustion Zone) :** The temperature is at 1500°C. In this region, coke burns with oxygen to form CO$_2$ when the charge comes in contact with a hot blast of air.

$$C + O_2 \xrightarrow[\Delta]{1500°C} CO_2 + Heat$$
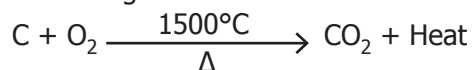
It is an exothermic reaction since heat is liberated.

b) **The Middle Region (Fusion Zone) :** The temperature prevails at 1000°C. In this region, CO$_2$ is reduced to CO.

$$CO_2 + C \xrightarrow[\Delta]{1000°C} 2\ CO - Heat$$
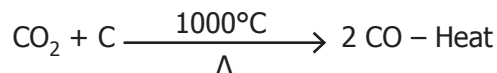
Limestone decomposes to calcium oxide and CO$_2$.

$$CaCO_3 \xrightarrow[\Delta]{} CO_2 - Heat$$

These two reactions are endothermic due to absorption of heat. Calcium oxide combines with silica to form calcium silicate slag.

$$CaO + SiO_2 \rightarrow CaSiO_3$$
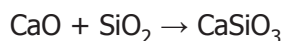
c) **The Upper Region (Reduction Zone) :** The temperature prevails at 400°C . In this region carbon monoxide reduces ferric oxide to form a fairly pure spongy iron.

$$Fe_2O_3 + 3CO \xrightarrow{400°C} 2Fe + 3CO_2$$
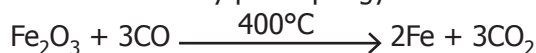
The molten iron is collected at the bottom of the furnace after removing the slag.

The iron thus formed is called pig iron. It is remelted and cast into different moulds. This iron is called cast iron.

18. Write the chemical properties of iron.

Physical properties :

i) It is a lustrous metal, greyish white in colour.

ii) It has high tensility, malleability and ductility.

iii) It can be magnetized.

Chemical properties :

i) **Reaction with air or oxygen :** Only on heating in air, iron forms magnetic oxide.

$$3\ Fe + 2\ O_2 \rightarrow Fe_3O_4\ (black)\ ferrouso\ ferric\ oxide$$

ii) **Reaction with moist air :** When iron is exposed to moist air, it forms a layer of brown hydrated ferric oxide on its surface. This compound is known as rust and the phenomenon of formation of rust is known as rusting.

$$4\ Fe + 3\ O_2 + x\ H_2O \rightarrow 2\ Fe_2O_3 \cdot xH_2O(rust)$$
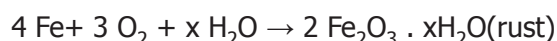
iii) **Reaction with steam :** When steam is passed over red hot iron, magnetic oxide is formed.

$$3\ Fe + 4\ H_2O\ (steam) \rightarrow Fe_3O_4 + 4\ H_2 \uparrow$$
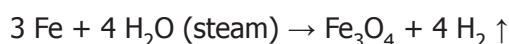
iv) **Reaction with chlorine :** Iron combines with chlorine to form ferric chloride.

$$2Fe + 3Cl_2 \rightarrow 2FeCl_3\ (ferric\ chloride)$$

v) **Reaction with acids :** With dilute HCl and dilute H_2SO_4 it liberates H_2 gas.

$$Fe + 2HCl \rightarrow FeCl_2 + H_2 \uparrow$$
$$Fe + H_2SO_4 \rightarrow FeSO_4 + H_2 \uparrow$$
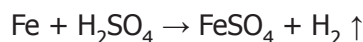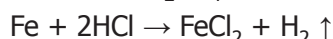
With dilute HNO_3 in cold condition it gives ferrous nitrate.

$$4\ Fe + 10\ HNO_3 \rightarrow 4\ Fe(NO_3)_2 + NH_4NO_3 + 3\ H_2O$$
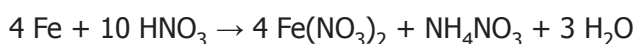
With con. H_2SO_4 it forms ferric sulphate.

$$2\ Fe + 6\ H_2SO_4 \rightarrow Fe_2(SO_4)_3 + 3\ SO_2 + 6\ H_2O$$
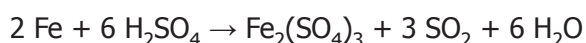
When iron is dipped in con. HNO_3 it becomes chemically passive or inert due to the formation of a layer of iron oxide (Fe_3O_4) on its surface.

19. Write the types of corrosion.

i) **Dry Corrosion or Chemical Corrosion :** The corrosive action in the absence of moisture is called dry corrosion. It is the process of a chemical attack on a metal by a corrosive liquids or gases such as O_2, N_2, SO_2, H_2S etc. It occurs at high temperature. Of all the gases mentioned above O_2 is the most reactive gas to impart the chemical attack.

ii) **Wet Corrosion or Electrochemical Corrosion :** The corrosive action in the presence of moisture is called wet corrosion. It occurs as a result of electrochemical reaction of metal with water or aqueous solution of salt or acids or bases.

20. Write the methods of preventing corrosion.

i) **Alloying :** The metals can be alloyed to prevent the process of corrosion. eg: Stainless Steel.

ii) **Surface Coating :** It involves application of a protective coating over the metal. It is of the following types:

a) **Galvanization :** It is a method of coating one metal over another metal by passing electric current.

b) **Electroplating :** It is a method of coating one metal over another metal by passing electric current.

c) **Anodizing :** It is an electrochemical process that converts the metal surface into a decorative, durable and corrosion resistant. Aluminium is widely used for anodizing process.

d) **Cathodic Protection :** It is the method of controlling corrosion of a metal surface protected is coated with the metal which is easily corrodible. The easily corrodible metal is called Sacrificial metal to act as anode ensuring cathodic protection.

21. Complete the following equations.

1. $Al + O_2 \longrightarrow$

2. $Al + N_2 \longrightarrow$

3. $Al + H_2O \longrightarrow Al_2O_3 + \underline{\quad\quad}$

4. $Al + NaOH + H_2O \longrightarrow \underline{\quad\quad\quad\quad} + H_2$

5. $Al + H_2SO_4 \longrightarrow Al_2(SO_4)_3 + H_2O + \underline{\quad\quad}$

6. $Cu + O_2 + CO_2 + H_2O \longrightarrow \underline{\quad\quad\quad}$

7. $Cu + O_2 \xrightarrow[1370k]{below} \underline{\quad\quad}$ **(black colour compound)**

8. $Cu + O_2 \xrightarrow[1370k]{above} \underline{\quad\quad}$ **(red colour compound)**

9. $Cu + HNO_3 \longrightarrow Cu(NO_3)_2 + \underline{\quad\quad} + H_2O$

10. $Fe + O_2 + H_2O \longrightarrow \underline{\quad\quad\quad\quad}.$

i) $2Al + 3O_2 \longrightarrow Al_2O_3.$

ii) $2Al + N_2 \longrightarrow 2AlN.$

iii) $2Al + 3H_2O \longrightarrow Al_2O_3 + 3H_2\uparrow$

iv) $2Al + 2NaOH + 2H_2O \longrightarrow 2NaAlO_2 + 3H_2\uparrow$

v) $2Al + 6H_2SO_4 \longrightarrow Al_2(SO_4)_3 + H_2O + So_2\uparrow$

vi) $2Cu + O_2 + CO_2 + H_2O \longrightarrow CuCO_3 \cdot Cu(OH)_2$

7. $Cu + O_2 \xrightarrow[1370k]{below} 2CuO$ **Copper (II) oxide.**

8. $Cu + O_2 \xrightarrow[1370k]{above} 2Cu_2O$ **Copper (I) oxide.**

9. $Cu + HNO_3 \longrightarrow Cu(NO_3)_2 + 2NO\uparrow + H_2O.$

10. $Fe + O_2 + H_2O \longrightarrow 2Fe_2O_3 \cdot XH_2O$ **(rust).**

UNIT TEST - 8

Time : 1.15 Hrs.   **Marks : 50**

I. Choose the best answer

(5 × 1 = 5)

1. **The number of periods and groups in the periodic table are _____.**
   a) 6,16   b) 7,17   c) 8,18   d) 7,18

2. **The basis of modern periodic law is _____.**
    a) Atomic number   b) Atomic mass   c) Mass number   d) All above

3. **_____ is a relative periodic property.**
    a) Atomic radii   b) Ionic radii   c) electron affinity   d) electronegativity

4. **The process of coating the surface of metal with a thin layer of zinc is called _____.**
    a) painting   b) thinning   c) galvanisation   d) electroplating

5. **Which of the following have inert gases 2 electrons in the outermost shell**
    a) He   b) Ne   c) Ar   d) Kr

II. Fill in the blanks
(5 × 1 = 5)

6. Along the period, from left to right, the atomic radius of the elements _____.

7. From top to bottom the atomic radius of the elements _____.

8. The increase, down a group is due to the _____ number down the group.

9. As _____ increases the distance between the valence shell and the nucleus increases.

10. Along the period the shell number remains the same but the _____ increases.

III. State whether the statements are true or false. Correct the false statement
(4 × 1 = 4)

11. Moseley's periodic table is based on atomic mass.

12. Ionic radius increases across the period from left to right.

13. All ores are minerals but all the minerals cannot be called as ores.

14. Al wires are used as electric cables due to their silvery white colour.

IV. Match the following
(4 × 1 = 4)

15. Calcination   (a)   Silver–tin amalgum

16. Roasting   (b)   Alumino thermic process

17. Redox reaction   (c)   presence of excess of air

18. Dental filling   (d)   Absence of excess of air

V. Assertion and Reasoning
(3 × 1 = 3)

Direction: In each of the following questions, a statement of Assertion is given and a corresponding statement of Reason is given just below it. Of the statements given below, mark the correct answer as
a.   If both A and R are true and R is the correct explanation of A.
b.   If both A and R are true but R is not the correct explanation of A.
c.   If A is true but R is false.
d.   If both A and R are false.

19. **Assertion:**   Magnesium is used for cathodic protection.
    Reason: Magnesium is more reactive than iron and it is easily corrodible metal is called sacrificial metal to act as anode ensuring cathodic protection.

20. **Assertion:**   Ionization energy decreases from top to bottom as we move down the group.
    Reason: As we move down the group, Atomic radii increases.

21. **Assertion:**   Matte is copper (I) sulphide and iron (II) sulphide.
    Reason: Roasting removes volatile impurities.

VI. Write the answer for the following questions in word or sentence
(3 × 1 = 3)

22. Write the formula for rust.

23. Write the examples of minerals and ores

24. What is the other name of basic copper carbonate?

VII. Find the odd one out

(3 × 1 = 3)

25. Stainless steel, Nickel steel, Aluminium Alloy.
26. Aluminium Alloy, Copper Alloy, Stainless steel.
27. $CuFeS_2$, Cu_2S, Cu_2O.

VIII. Correct the mistakes

(3 × 1 = 3)

28. The chief ore of aluminium is clay.
29. The chemical name of rust is Ferric hydroxide.
30. Across the period, ionic radii increases.

IX. Write the short answer for ANY 5 of the following questions.

(5 × 2 = 10)

31. Define Atomic radius.
32. Define Ionic radii.
33. Define Ionisation energy.
34. Define Electron affinity.
35. Define electronegativity.
36. Define Matrix.
37. Define Metallurgy.

X. Write long answer for the following questions

(2 × 5 = 10)

38. Write the chemical properties of Aluminium.
         [OR]
39 Write the uses of Aluminium and Copper.
40. Write the extraction of Iron from its ore.
         [OR]
41. i)   Define alloy.
    ii)   Write the methods of making alloys.
    iii) Write the uses of alloys.

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UNIT 9	SOLUTIONS

Points to Remember

➤ A solution is a homogeneous mixture of two or more substances.

➤ An aqueous solution is a solution in which the solvent is water.

➤ A non-aqueous solution is a solution in which the solvent is a liquid, other than water.

➤ A solution in which no more solute can be dissolved in a definite amount of the solvent at a given temperature is called saturated solution.

➤ An unsaturated solution is one that contains less solute than the saturated solution at a given temperature.

➤ A supersaturated solution is one that contains more solute than the saturated solution at a given temperature.

➤ Polar compounds are soluble in polar solvents.

➤ Non-polar compounds are soluble in non-polar solvents.

➤ In endothermic process, solubility of solid solute increases with increase in temperature.

➤ In exothermic process, solubility of solid solute decreases with increase in temperature.

TEXT BOOK EVALUATION

I. Book Exercise – Choose the best answer

1. **A solution is a _____ mixture.**
   a) homogeneous
   b) heterogeneous
   c) homogeneous and heterogeneous
   d) non homogeneous

   Ans : (a) homogeneous

2. **The number of components in a binary solution is _____.**
   a) 2   b) 3   c) 4   d) 5

   Ans : (a) 2

3. **Which of the following is the universal solvent?**
   a) Acetone   b) Benzene   c) Water   d) Alcohol

   Ans : (c) Water

4. **A solution in which no more solute can be dissolved in a definite amount of solvent at a given temperature is called _____.**
   a) Saturated solution
   b) Un saturated solution
   c) Super saturated solution
   d) Dilute solution

   Ans : (a) Saturated solution

5. **Identify the non aqueous solution.**
   a) sodium chloride in water
   b) glucose in water
   c) copper sulphate in water
   d) sulphur in carbon–di–sulphide

   Ans : (d) sulphur in carbon–di–sulphide

6. **When pressure is increased at constant temperature the solubility of gases in liquid _____.**
   a) No change   b) increases   c) decreases   d) no reaction

   Ans : (b) increases

7. **Solubility of NaCl in 100 ml water is 36 g. If 25 g of salt is dissolved in 100 ml of water how much more salt is required for saturation _____.**

   a) 12g   b) 11g   c) 16g   d) 20g

                                                                 Ans : (b) 11g (36–25)

8. **A 25% alcohol solution means;**

   a) 25 ml alcohol in 100 ml of water   b) 25 ml alcohol in 25 ml of water

   c) 25 ml alcohol in 75 ml of water   d) 75 ml alcohol in 25 ml of water

                                       Ans : (c) 25 ml alcohol in 75 ml of water

9. **Deliquescence is due to _____.**

   a) Strong affinity to water   b) Less affinity to water

   c) Strong hatred to water   d) Inertness to water

                                            Ans : (a) Strong affinity to water

10. **Which of the following is hygroscopic in nature?**

   a) ferric chloride   b) copper sulphate penta hydrate

   c) silica gel   d) none of the above

                                                       Ans : (c) silica gel

II. Book Exercise – Fill in the blanks

1. The component present in lesser amount, in a solution is called _____.   **Ans :** solute

2. Example for liquid in solid type solution is _____.   **Ans :** Mercury with sodium

3. Solubility is the amount of solute dissolved in _____ g of solvent.   **Ans :** 100

4. Polar compounds are soluble in _____ solvents.   **Ans :** polar

5. Volume persentage decreases with increases in temperature because _____. **Ans :** expansion of liquid

III. Book Exercise – Match the following

   1.   **Blue vitriol**   **(a)**   **CaSO$_4$.2H$_2$O**

   2.   **Gypsum**   **(b)**   **CaO**

   3.   **Deliquescence**   **(c)**   **CuSO$_4$.5H$_2$O**

   4.   **Hygroscopic**   **(d)**   **NaOH**

   Ans :

1	Blue vitriol	c	CuSO$_4$.5H$_2$O
2	Gypsum	a	CaSO$_4$.2H$_2$O
3	Deliquescence	d	NaOH
4	Hygroscopic	b	CaO

IV. Book Exercise – True or false (If false give the correct statement)

1. **Solutions which contain three components are called binary solution.**

   Ans : False. Solutions which contains two components are called binary solution.

2. **In a solution the component which is present in lesser amount is called solvent.**

   Ans : False. In a solution, the component which is present in higher amount is called solvent.

3. **Sodium chloride dissolved in water forms a non-aqueous solution.**

   Ans : False. Sodium chloride dissolved in water forms a aqueous solution.

4. **The molecular formula of green vitriol is MgSO$_4$.7H$_2$O.**

   Ans : False. The molecular formula of epsom salt is MgSO$_4$.7H$_2$O.

5. **When Silica gel is kept open, it absorbs moisture from the air, because it is hygroscopic in nature.**

   Ans : True.

V. Book Exercise – Short answer questions

1. Define the term: Solution.

Solution is a homogeneous mixture of two or more substances.

2. What is mean by binary solution.

A solution contains two components is called Binary solution. Eg. Salt in water, Sugar in water.

3. Give an example each.

i) gas in liquid.

Soda water.

ii) solid in liquid.

Sodium chloride in water.

iii) solid in solid.

Copper dissolved in Gold (alloys).

iv) gas in gas.

Mixture of $He - O_2$ gases.

4. What is aqueous and non-aqueous solution? Give an example.

i) **Aqueous solution :** The solution in which water acts as a solvent is called aqueous solution. eg: Common salt in water, sugar in water.

ii) **Non–aqueous solution :** The solution in which any liquid other than water, acts as a solvent is called non–aqueous solution. eg: Sulphur dissolved in carbon di sulphide, iodine dissolved in ccl_4.

5. Define Volume percentage.

Volume percentage is defined as the percentage by volume of solute present in the given volume of the solution.

$$\text{Volume percentage} = \frac{\text{Volume of the solute}}{\text{Volume of the solute + Volume of the solvent}} \times 100$$

$$\text{Volume percentage} = \frac{\text{Volume of the solute}}{\text{Volume of the solution}} \times 100$$

6. The aquatic animals live more in cold region. Why?

Because, more amount of dissolved oxygen is present in the water of cold regions. This shows that the solubility of oxygen in water is more at low temperature.

7. Define Hydrated salt.

The number of water molecules found in the crystalline substance is called water of crystallisation. Such salts are called hydrated salts.

8. A hot saturated solution of copper sulphate forms crystals as it cools. Why?

The number of water molecules in blue vitriol is five, so its water of crystallisation is 5. When blue coloured copper sulphate crystals are gently heated, it loses its 5 water molecules and becomes anhydrous copper sulphate. Then add a few drops of water or allow it to cool, the colourless anhydrous salt again turns back into blue coloured hydrated salt.

9. Classify the following substances into deliquescent, hygroscopic.

Conc. Sulphuric acid, Copper sulphate penta hydrate, Silica gel, Calcium chloride, and Gypsum salt.

Deliquescent	Hygroscopic
Calcium Chloride	i) conc. H_2SO_4
	ii) Silica gel
	iii) Copper sulphate penta hydrate
	iv) Gypsum salt

VI. Book Exercise – Long answer questions

1. **Write notes on;**
   i) **Saturated solution.**
   ii) **Unsaturated solution.**

Saturated Solution	Unsaturated Solution
A solution in which no more solute can be dissolved in a definite amount of the solvent at a given temperature is called saturated solution. eg: 36 g of sodium chloride in 100 g of water at 25° C.	A solution is one that contains less solute than that of the saturated solution at a given temperature. eg: 10 g (or) 20 g (or) 30 g of sodium chloride in 100 g of water at 25° C form unsaturated solution.

2. **Write notes on various factors affecting solubility.**
   Factors affecting solubility : There are three main factors which govern the solubility of solute. They are;
   i) Nature of the solute and solvent.
   ii) Temperature.
   iii) Pressure.

   Nature of the solute and solvent :

   The nature of the solute and solvent plays an important role in solubility. Although water dissoves an enormous variety of substances, both ionic and covalent, it does not dissove everything. For example: Common salt is a polar compound and dissolves in polar solvent like water. Non–polar compounds are soluble in non–polar solvents. For example: Fat dissolved in Ether.

   Effect of temperature :

   Solubility of a soled solute in a liquid solvent increases with increase in temperature.

   In endothermic Process :

   Solubility increases with increase in temperature.

   In exothermic Process :

   Solubility decreases with increase in temperature.

   Solubility of gases in liquid :

   Solubility of gases in liquid decrease with increase in temperature. Generally water contains dissolved oxygen. When water is boiled the solubility of oxygen in water decreases. So oxygen escapes in the form of bubbles.

   Effect of pressure :

   When the pressure is increased, the solubility of a gas in liquid increases. Eg.: Carbonated beverages.

3. a) **What happens when $MgSO_4.7H_2O$ is heated? Write the appropriate equation.**

   Its water of crystallisation is 7. When magnesium sulphate hepta hydrate crystals are genetly heated, it loses seven water molecules and becomes an hydrous magnesium sulphate.

$$MgSO_4.7H_2O \underset{\text{Cooling}}{\overset{\text{Heating}}{\rightleftharpoons}} MgSO_4 + 7H_2O$$

   (Magnesium sulphate   (Anhydrous Magnesium
   heptahydrate)   sulphate)
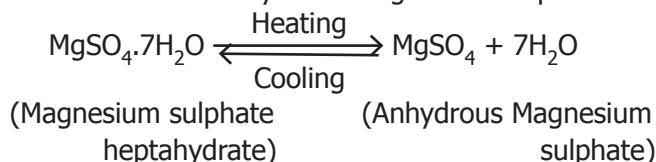
   b) **Define solubility.**

   Solubility is defined as the number of grams of solute that can be dissolved in 100 g of a solvent to form its saturated solution at a given temperature and pressure. For example 36 g of sodium chloride need to be dissolved in 100 g of water to form its saturated solution at 25° C. Thus the solubility of NaCl in water is 36 g at 25° C. The solubility is mathematically expressed as,

$$\text{Solubility} = \frac{\text{Mass of the solute}}{\text{Mass of the solvent}} \times 100$$

4. **In what way hygroscopic substances differ from deliquescent substances.**

Hygroscopic	Deliquescent
When exposed to the atmosphere at ordinary temperature, they absorb moisture and do not dissolve.	When exposed to the atmospheric air at ordinary temperature, they absorb moisture and dissolve.
Hygroscopic substances do not change its physical state on exposure to air.	Deliquescent substances change its physical state on exposure to air.
Hygroscopic substances may be amorphous solids or liquids.	Deliquescent substances are crystalline solids.

5. **A solution is prepared by dissolving 45 g of sugar in 180 g of water. Calculate the mass percentage of solute.**

Given :   Mass of the solute   =   45 g

               Mass of the solvent   = 180g

$$\text{Mass Percentage} = \frac{\text{Mass of the solute}}{\text{Mass of the solute} + \text{Mass of the solvent}} \times 100$$

$$= \frac{45g}{45g + 180g} \times 100$$

$$= \frac{45}{225} \times 100$$

$$= 20\%.$$

6. **3.5 litres of ethanol is present in 15 litres of aqueous solution of ethanol. Calculate volume percent of ethanol solution.**

Given :   Volume of the solute   =   3.5 lit of ethanol.

           Volume of the solution   =   15 lit.

$$\text{Volume Percentage} = \frac{\text{Volume of the solute}}{\text{Volume of the solution}} \times 100$$

$$= \frac{3.5 \, \cancel{lit}}{15 \, \cancel{lit}} \times 100$$

$$= \frac{0.7 \, \cancel{3.5}}{3 \, \cancel{15}} \times 100$$

$$= \frac{70}{3}$$

Volume Percentage = 23.33%.

VIII. Book Exercise – HOT question

1. **Vinu dissolves 50 g of sugar in 250 ml of hot water, Sarath dissolves 50 g of same sugar in 250 ml of cold water. Who will get faster dissolution of sugar? and Why?**

50 g of sugar in 250 ml of hot water. Because heat is expanse the molecules of water. So it is easily dissolved.

2. **'A' is a blue coloured crystaline salt. On heating it loses blue colour and to give 'B'. When water is added, 'B' gives back to 'A'. Identify A and B, write the equation.**

A is a blue coloured crystalline salt => Copper Sulphate Penta hydrate

$$CuSO_4.5H_2O \text{ (blue vitriol)}$$

The equation is,

$$CuSO_4.5H_2O \underset{\text{Cooling}}{\overset{\text{Heating}}{\rightleftharpoons}} CuSO_4 + 5H_2O$$
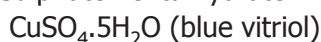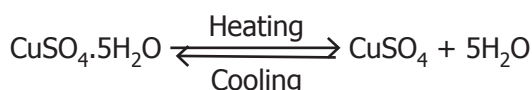
Copper sulphate penta hydrate   Anhydrous copper sulphate
(blue colour)   (colourless)

3. **Will the cool drinks give more fizz at top of the hills or at the foot? Explain.**

Cool drinks give more fizz at top of hills because solubility of gas is low at altitude and hence the carbon dioxide less soluble in cool drinks at altitude gives more fizz.

Additional – Choose the best answer

1. **Solution is a _____ mixture.**
    a) homogeneous
    b) heterogeneous
    c) either homogeneous or heterogeneous
    d) neither homogeneous nor heterogeneous

    Ans : (a) homogeneous

2. **_____ is a homogeneous mixture of two or more substances.**
    a) solution   b) solute   c) solvent   d) colloid

    Ans : (a) solution

3. **In a solution that component which is present in lesser amount by weight is called _____.**
    a) solution   b) solute   c) solvent   d) colloid

    Ans : (b) solute

4. **In a solution the component which is present in higher amount by weight is called _____.**
    a) solution   b) solute   c) solvent   d) colloid

    Ans : (c) solvent

5. **The process of uniform distribution of solute into solvent is called _____.**
    a) solution   b) dissolution   c) coagulation   d) solvent

    Ans : (b) dissolution

6. **Solution which are made of one solute and one solvent are called _____.**
    a) solutions   b) binary solutions   c) ternary solutions   d) tetranary solutions

    Ans : (b) binary solutions

7. **A solution contain more than two components are called _____.**
    a) solution   b) binary solution   c) ternary solution   d) tetranary solutions

    Ans : (c) ternary solution

8. **Give an example of solid–solid mixture _____.**
    a) Alloys   b) Amalgam   c) Nacl in water   d) None

    Ans : (a) Alloys

9. **Give an example of liquid–solid mixture _____.**
    a) Alloys   b) Amalgam   c) Nacl in water   d) None

    Ans : (b) Amalgam

10. **Give an example of solid–liquid mixture _____.**
    a) Sodium chloride in water
    b) ethyl alcohol in water
    c) CO_2 dissolved in water
    d) methyl alcohol in water

    Ans : (a) Sodium chloride in water

11. **Give an example of liquid–liquid mixture is _____.**
    a) C_2H_5OH in water   b) NaCl in water   c) CO_2 in water   d) none

    Ans : (a) C_2H_5OH in water

12. **Give an example of gas–liquid mixture is _____.**
    a) C_2H_5OH in water   b) NaCl in water   c) CO_2 in water   d) none

    Ans : (c) CO_2 in water

13. **Give an example of liquid–gas mixture is _____.**
    a) Water vapour in air (cloud)
    b) Mixture of helium oxygen gas
    c) CO_2 in water
    d) NaCl in water

    Ans : (a) Water vapour in air (cloud)

14. **Give an example of gas–gas mixture is _____.**
    a) Water vapour in air
    b) CO2 in water
    c) Mixture of helium oxygen gas
    d) NaCl in water

    Ans : (c) Mixture of helium oxygen gas

15. **_____ is called as universal solvent.**
    a) Water
    b) Acetone
    c) Benzene
    d) Ether

    Ans : (a) Water

16. **The solvent in which water acts as a solvent is called _____.**
    a) aqueous solution
    b) non–aqueous solution
    c) either a or b
    d) neither a nor b

    Ans : (a) aqueous solution

17. **The solution in which any liquid other than water acts as a solvent is called _____.**
    a) aqueous solution
    b) non–aqueous solution
    c) either a or b
    d) neither a nor b

    Ans : (b) non–aqueous solution

18. **Give an example of non–aqueous solution.**
    a) Water
    b) Iodine dissolved in CCl_4
    c) either a or b
    d) neither a nor b

    Ans : (b) Iodine dissolved in CCl_4

19. **Give an example of saturated solution.**
    a) 16 g of NaCl in 100 g of water
    b) 36 g of NaCl in 100 g of water
    c) 45 g of NaCl in 100 g of water
    d) Iodine dissolved in CCl_4

    Ans : (b) 36 g NaCl in 100 g of water

20. **Give an example of unsaturated solution.**
    a) 16 g of NaCl in 100 g of water
    b) 36 g of NaCl in 100 g of water
    c) 45 g of NaCl in 100 g of water
    d) 100 g of NaCl in 36 g of water

    Ans : (a) 16 g of NaCl in 100 g of water

21. **Give an example of super saturated solution**
    a) 16 g of NaCl in 100 g of water
    b) 36 g of NaCl in 100 g of water
    c) 45 g of NaCl in 100 g of water
    d) 100 g of NaCl in 16 g of water

    Ans : (c) 45 g of Nacl in 100 g of water

22. **Polar compound is _____.**
    a) Sodium chloride is dissolved in water
    b) Fat dissolved in ether
    c) either a or b
    d) neither a nor b

    Ans : (a) Sodium chloride is dissolved in water

23. **Non–polar compounds are _____ is non–polar solvents.**
    a) soluble
    b) insoluble
    c) either a or b
    d) neither a nor b

    Ans : (a) soluble

24. **In endothermic process, solubility increases with _____ in temperature.**
    a) increases
    b) decreases

c) either a or b   d) neither a nor b

Ans : (a) increases

25. In exothermic process, solubility decreases with _____ is temperature.
a) increases   b) decreases   c) either a or b   d) neither a nor b

Ans : (a) increases

26. The pressure is increased, the solubility of a gas in liquid _____.
a) increases   b) decreases   c) either a or b   d) neither a nor b

Ans : (b) decreases

27. Mass percentage is expressed as _____.
a) weight / weight   b) weight / mass
c) mass / weight   d) none

Ans : (a) weight / weight

28. Volume percentage is expressed as _____.
a) volume / mass   b) volume / volume
c) mass / volume   d) mass / mass

Ans : (b) volume / volume

29. Volume percentage _____ with increases in temperature.
a) decreases   b) increases   c) either a or b   d) neither a nor b

Ans : (a) decreases

30. The number of water molecules found in the crystalline substance is called _____.
a) hydrated salts   b) deliquiscent salts
c) collidal salts   d) suspension

Ans : (a) hydrated salts

31. Copper sulphate penta hydrate $CuSO_4.5H_2O$ is _____.
a) blue vitriol   b) green vitriol   c) greenish blue vitriol   d) none

Ans : (a) blue vitriol

32. Magnesium sulphate hepta hydrate $MgSO_4.7H_2O$ is _____.
a) blue vitriol   b) green vitriol   c) epsom salt   d) none

Ans : (c) epsom salt

33. Formula for Phosphorus pentoxide is _____.
a) F_2O_3 b) P_2O_5 c) $P_2H_4O_7$ d) none

Ans : (b) P_2O_5

34. Dehydrating agent is _____.
a) Anhydrous calcium chloride   b) Anhydrous potassium chloride
c) hydrous calcium chloride   d) hydrous potassium chloride

Ans : (a) Anhydrous calcium chloride

35. Formula for Silica gel is _____.
a) SiO_2 b) SiO_3 c) SiO_4 d) SiO

Ans : (a) SiO_2

Additional – Fill in the blanks

1. The substances present in a _____ may exist in one or more physical state.   **Ans :** Mixture
2. When we burn wood, the smoke released is a mixture of solid carbon and gases like _____, _____.   **Ans :** CO_2, CO
3. Salt is dissolves in _____.   **Ans :** water

4. Sand _____ dissolves in water.   **Ans :** does not

5. Sand in water can be separated by _____.   **Ans :** Filtration

6. Salt is dissolved in water is an example of _____.   **Ans :** Homogeneous

7. _____ is a mixture of many dissolved salts.   **Ans :** Sea water

8. Most of the liquids found in human body including blood , Lymph and urine are _____.
    Ans : Solutions

9. _____ is a homogeneous mixture of two or more substances.   **Ans :** Solutions

10. In a solution the component which is present in a lesser amount by weight is called _____.
    Ans : Solute

11. In a solution the component which is present in a larger amount by weight is called _____.
    Ans : Solvent

12. Solute + Solvent = _____.   **Ans :** Solution

13. The _____ gets distributed uniformly throughout the solvent and thus forming the mixture homogeneous.   **Ans :** Solute

14. The _____ acts as a dissolving medium in a solution.   **Ans :** Solvent

15. The process of uniform distribution of solute into solvent is called _____.   **Ans :** Dissolution

16. Solutions in which contains two components are called _____.   **Ans :** Binary solution

17. If salt and sugar are added in water, both dissolve in water forming a solution. Here two solutes are dissolved in one solvent. Such kind of solutions which contain three components are called _____.
    Ans : Ternary solution

18. The substances normally exist in _____ physical states.   **Ans :** Three

19. The three physical states are _____ , _____ , and _____.   **Ans :** Solid , Liquid and gas

20. In _____ solutions both the solute and solvent may exist in any of these physical states.   **Ans :** Binary

21. _____ state is the primary factor which determine the characteristics of the solution.   **Ans :** Physical

22. An example of Solid – Solid solution is _____.   **Ans :** Alloys

23. An example of Liquid-solid solution is _____.   **Ans :** Amalgum

24. An example of solid – liquid solution is _____.   **Ans :** Nacl in water

25. An example of Liquid – liquid solution is _____.   **Ans :** Ethyl alcohol in water

26. An example of Gas – Liquid solution is _____.   **Ans :** Sodawater

27. An example of liquid-Gas solution is _____.   **Ans :** cloud

28. An example of Gas – Gas solution is _____.   **Ans :** Mixture of Helium-oxygen gases

29. Most of the substances are soluble in water. So water is called as _____.   **Ans :** Universal Solvent

30. On the basis of type of solvent, solutions are classified into _____ types.   **Ans :** two

31. On the basis of type of solvent, solutions are classified into _____ and _____.
    Ans : Aqueous and non aqueous solutions

32. Common salt is dissolved in water is an example of _____.   **Ans :** Aqueous solution

33. Sugar in water is an example of _____.   **Ans :** Aqueous Solution

34. Copper Sulphate in water is an example of _____.   **Ans :** Aqueous Solution

35. The solution in which any liquid other than water, acts as a solvent is called _____.
    Ans : Non-aqueous Solution

36. Sulphur dissolved in Carbondisulphide is an example of _____.   **Ans :** Non-aqueous Solution

37. Iodine dissolved in Carbon tetra chloride is an example of _____.   **Ans :** Non- aqueous solution

38. Based on the amount of solute, solutions are classified into _____ types.   **Ans :** 3

39. Based on the amount of solute, solutions are classified into _____ , _____ and _____.
    Ans : Unsaturated, Saturated and Super saturated

40. A solution in which no more solute can be dissolved in a definite amount of the solvent at a given temperature

is called _____. **Ans :** Saturated Solution

41. A solution in which less solute than that of the saturated solution at a given temperature is called _____. **Ans :** Unsaturated Solution

42. A solution in which more solute than that of the saturated solution at a given temperature is called _____. **Ans :** super saturated solution

43. Super saturated solutions are _____. **Ans :** Unstable

44. Concentration of two solutions with respect to their _____ present in the given amount of the solvent. **Ans :** solutes

45. The solution contains higher amount of solute per the given amount of solvent is said to be _____. **Ans :** concentrated solution

46. The solution contains lesser amount of solute per the given amount of solvent is said to be _____. **Ans :** dilute solution

47. _____ is defined as the number of grams of a solute that can be dissolved in 100 g of a solvent to form its saturated solution at a given temperature and pressure. **Ans :** Solubility

48. Solubility of solid calcium carbonate is _____. **Ans :** 0.0013 g/100g water

49. Solubility of solid sodium chloride is _____. **Ans :** 36 g/100g water

50. Solubility of Ammonia gas is _____. **Ans :** 48 g/100g water

51. Solubility of solid sodium Hydroxide is _____. **Ans :** 80 g/100g water

52. Solubility of solid glucose is _____. **Ans :** 91 g/100g water

53. Solubility of solid sodium bromide is _____. **Ans :** 95 g/100g water

54. Solubility of solid sodium iodide is _____. **Ans :** 184g/100g water

55. Polar compounds dissolves in polar _____ only. **Ans :** water

56. Non polar compounds are soluble in _____. **Ans :** Non polar solvents

57. In exothermic process, _____ decreases with increase in temperature. **Ans :** Solubility

58. In endothermic process solubility increase with _____ in temperature. **Ans :** increases

59. Solubility of oxygen in water is _____ at low temperatures. **Ans :** More

60. When the pressure is increases, the solubility of a gas in liquid _____. **Ans :** Increases

61. The effect of pressure on the solubility of a gas in liquid is given by _____. **Ans :** Henry's law

62. Mass percentage is independent of _____. **Ans :** temperature

63. Volume percentage decreases with increases in _____. **Ans :** Temperature

64. In Syrups and mouth wash, the concentration of the ingredients is expressed as _____. **Ans :** V/V

65. In Ointments and antacid , the concentration of solutions are expressed as _____. **Ans :** W/W

66. The number of water molecules found in the crystalline substance is called _____. **Ans :** water of crystallization

67. Common name of $CuSO_4.5H_2O$ is _____. **Ans :** Blue vitriol

68. IUPAC Name of $CuSO_4.5H_2O$ is _____. **Ans :** Copper(II) Sulphate pentahydrate

69. Common name of $MgSO_4.7H_2O$ is _____. **Ans :** Epsom Salt

70. IUPAC name of $MgSO_4.7H_2O$ is _____. **Ans :** Magnesium Sulphatehepta Hydrate

71. Common Name of $CaSO_4.2H_2O$ is _____. **Ans :** Gypsum

72. IUPAC Name of $CaSO_4.2H_2O$ is _____. **Ans :** calcium sulphate dehydrate

73. Common name of $FeSO_4.7H_2O$ is _____. **Ans :** Green Vitriol

74. IUPAC name of $FeSO_4.7H_2O$ is _____. **Ans :** Iron(II) Sulphateheptahydrate

75. Common name of $ZnSO_4.7H_2O$ is _____. **Ans :** White vitriol

76. IUPAC name of $ZnSO_4.7H_2O$ is _____. **Ans :** Zinc sulphateheptahydrate

77. The number of water molecules in blue vitriol is _____. **Ans :** 5

78. The number of water molecules in Epsum salt is _____.   **Ans :** 7

79. Conc.sulphuric acid is a _____.   **Ans :** Hygroscopic substance

80. Phosphorus Pentoxide is a _____.   **Ans :** Hygroscopic substance

81. Quick lime is a _____.   **Ans :** Hygroscopic substance

82. Silica gel is a _____.   **Ans :** Hygroscopic substance

83. Anhydrous calcium chloride is a _____.   **Ans :** Hygroscopic substance

84. Calcium chloride is a _____.   **Ans :** Deliquescent substance

85. Caustic Soda is a _____.   **Ans :** Deliquescent substance

86. Caustic potash is a _____.   **Ans :** Deliquescent substance

87. Ferric chloride is a _____.   **Ans :** Deliquescent substance

88. Hygroscopic substances may be _____.   **Ans :** amorphous solids or liquids

89. Deliquescent substances are _____.   **Ans :** Crystalline Solids

90. Sand in water can be separated by _____.   **Ans :** filtration

91. _____ is a mixture of many dissoved salts.   **Ans :** Sea water

92. _____ is a mixture of many gases like nitrogen, oxygen, carbon di oxide and other gases.   **Ans :** Air

93. On the basis of type of solvent sulutions are classified into _____ types.   **Ans :** 2

94. _____ is an example for aqueous solution.   **Ans :** Copper sulphate in water

95. Sugar in water is an example of _____.   **Ans :** aqueous solution

96. 36 g of Sodium chloride in 100 g of water at 25° C forms _____.   **Ans :** saturated solution

97. 10 g (or) 20 g (or) 30 g of Sodium chloride in 100 g of water at 25° C form _____.   **Ans :** unsaturated solution

98. 40 g of Sodium chloride in 100 g of water at 25° C form _____.   **Ans :** super saturated solution

99. _____ is defined as the number of grams of a solute that can be dissolved in 100 g of solvent to form its saturated solution at a given temperature and pressure.   **Ans :** Solubility

100. _____ do not dissolve in polar solvents, _____ do not dissolve in non–polar solvents.   **Ans :** Non–polar compounds, Polar compounds

101. A _____ amount of sugar will dessolve in warm water than in cold water.   **Ans :** greater

102. The effect of pressure on the solubility of a gas in liquid is given by _____.   **Ans :** Henry's law

103. _____ may be defined as the amount of solute present in a given amount of solution or solvent.   **Ans :** Concentration of a solution

104. The number of water molecules in blue vitriol is _____.   **Ans :** 5

105. On heating, copper sulphate pentahydrate _____ its five water molecules and becomes _____ anhydrous copper sulphate.   **Ans :** loses, colourless

106. The number of water molecules in Epsom salt is _____.   **Ans :** 7

107. Hygroscopic substances are used as _____.   **Ans :** drying agents

108. _____ lose their crystalline shape and ultimately dissolve in theabsorbed water forming a saturated solution.   **Ans :** Deliquescent substances

109. _____ is an example of deliquescent substances.   **Ans :** $FeCl_3$

Additional – Match the following

1.
1. Solid – solid   (a) Mixture of helium – oxygen gas
2. Liquid – solid   (b) Alloys
3. Gas – gas   (c) Mercury with Amalgam
4. Solid – liquid   (d) NaCl in water

Ans :

1	Solid – solid	b	Alloys
2	Liquid – solid	c	Mercury with Amalgam
3	Gas – gas	a	Mixture of helium – oxygen gas
4	Solid – liquid	d	NaCl in water

2.

	Name of the solute	Formula of the solute	Solubility 8/100 g water
1.	Calcium carbonate	NaOH	36
2.	Sodium chloride	NH_3	124
3.	Ammonia	$CaCO_3$	48
4.	Sodium hydroxide	$C_6H_{12}O_6$	0.0013
5.	Glucose	NaBr	95
6.	Sodium bromide	NaI	91
7.	Sodium Iodide	NaCl	80

Ans :

S.No.	Name of the solute	Formula of the solute	Solubility 8/100 g water
1	Calcium carbonate	$CaCo_3$	0.0013
2	Sodium chloride	NaCl	36
3	Ammonia	NH_3	48
4	Sodium hydroxide	NaOH	80
5	Glucose	$C_6H_{12}O_6$	91
6	Sodium bromide	NaBr	95
7	Sodium Iodide	NaI	184

3.

	Common Name	IUPAC Name	Molecular Formula
1.	Blue vitriol	Copper (II) sulphate penta hydrate	$CaSO_4.2H_2O$
2.	Epsom salt	Magnesium sulphate hepta hydrate	$FeSO_4.7H_2O$
3.	Gypsum	Calcium sulphate di dyhdrate	$ZnSO_4.7H_2O$
4.	Green vitriol	Iron (II) sulphate hepta hydrate	$MgSO_4.7H_2O$
5.	White vitriol	Zinc sulphate hepta hydrate	$CuSO_4.5H_2O$

Ans :

S.No.	Common Name	IUPAC Name	Molecular Formula
1	Blue vitriol	Copper (II) sulphate penta hydrate	$CuSO_4.5H_2O$
2	Epsom salt	Magnesium sulphate hepta hydrate	$MgSO_4.7H_2O$
3	Gypsum	Calcium sulphate di dyhdrate	$CaSO_4.2H_2O$
4	Green vitriol	Iron (II) sulphate helta hydrate	$FeSO_4.7H_2O$
5	White vitriol	Zinc sulphate hepta hydrate	$ZnSO_4.7H_2O$

Additional – Assertion and Reason

1. **Assertion :** Salt water is a Homogeneous solution.
Reason : It contains two or more substances.
a) **A is right R is wrong**
b) **A is wrong R is right**
c) **R explains A**
d) **R does not explain A**

Ans : (c) R explain A

2.   **Assertion :**   Solution which contain three components are ternary solution.

     Reason :   Salt and sugar are dissolved in water.

     a) **A is right R is wrong**   b) **A is wrong R is right**

     c) **A and R are correct**   d) **Both are not correct**

                        Ans : (c) A and R are correct

3.   **Assertion :**   Copper is dissolved in Gold is an example of Solid-liquid.

     Reason :   Mercury with sodium is an example of Liquid – liquid.

     a) **A is right R is wrong**   b) **A is wrong R is right**

     c) **A and R are correct**   d) **Both are not correct**

                        Ans : (d) Both are not correct

4.   **Assertion :**   Deep sea divers used helium-oxygen mixture.

     Reason :   Helium and oxygen mixtures are weightless.

     a) **A is right R is wrong**   b) **A is wrong R is right**

     c) **A and R are correct**   d) **Both are not correct**

                        Ans : (c) A and R are correct

5.   **Assertion :**   Hygroscopic substances do not change its physical state on exposure to air.

     Reason :   Deliquescent substances change its physical state on exposure to air.

     a) **A is right R is wrong**   b) **A is wrong R is right**

     c) **R explains A**   d) **R does not explain A**

                        Ans : (a) A is right R is wrong

Additional – True or false (If false give the correct statement)

1.   **Sea water is a mixture of many dissolved salts. Air contains mixture of gases.**

     Ans : True.

2.   **Cloud is an example of Liquid – liquid mixture.**

     Ans : False. Cloud is an example of liquid – gas mixture.

3.   **16 g of Sodium chloride dissolved in 100 g of water is an example of saturated solution.**

     Ans : False. 16 g of Sodium chloride dissolved in 100 g of water is an example of unsaturated solution.

4.   **Aquatic animals live more in cold regions because less amount of dissolved oxygen is present in the water cold regions.**

     Ans : False. Aquatic animals live more in cold regions because more amount of dissolved oxygen is present in the water cold regions.

5.   **Certain substances, when exosed to the atmospheric air at ordinary temperature, absorb moisture without changing their physical state. Such substances are calld Hygroscopic substances.**

     Ans : True.

6.   **Certain substances which are so hygroscopic, when exposed to the atmospheric air at ordinary temperature, absorb enough water and get completely dissolved. Such substances are called Hygroscopic substances.**

     Ans : False. Certain substances which are so hygroscopic, when exposed to the atmospheric air at ordinary temperature, absorb enough water and get completely dissolved. Such substances are called Deliquescent substances.

7.   **Deliquescence is maximum when the temperature is high.**

     Ans : False. Deliquescence is maximum, when the temperature is low.

8.   **Calcium oxide is example of Hygroscopic.**

     Ans : True.

9. **Calcium chloride is an example of Deliquescence substance.**
   Ans : True.

10. **Deliquescence substances gain their crystalline shape.**
    Ans : False. Deliquescence substances lose their crystalline shape.

Additional – Spot the error

1. **Sulphur dissolved in Carbon disulphide is an example of aqueous solution.**

   Ans : Sulphur dissolved in Carbon disulphide is an example of Non–aqueous solution.

2. **10 g of Sodium chloride in 100 g of water at 25° C forms a super saturated solution.**

   Ans : 10 g of Sodium chloride in 100 g of water at 25° C forms an unsaturated solution.

3. **36 g of Sodium chloride need to be dissolved in 100 g of water to form its saturated solution at 25° C. This is an example of solubility of copper sulphate.**

   Ans : 36 g of sodium chloride need to be dissolved in 100 g of water to form its saturated solution at 25° C. This is an example of solubility of Sodium Chloride.

4. **When red coloured copper sulphate crystals are gently heated, it loses its five water molecules and becomes colourless anhydrous copper sulphate.**

   Ans : When blue coloured copper sulphate crystals are gently heated, it loses its five water molecules and becomes colourless anhydrous copper sulphate.

Additional – Short answer questions

1. **Define solution.**
   A solution is a homogeneous mixture of two or more substances.

2. **What are the different kind of solution present in our body?**
   ✦ Blood.
   ✦ Lymph.
   ✦ Urine.

3. **Define solute and solvent.**
   Solute : In a solution, the component which is present in lesser amount by weight is called solute.
   Solvent : In a solution, the component which is present in larger amount by weight is called solvent.

4. **Define Ternary solution.**
   A solution may contain more than two components. Two solutes are dissolved in one solvent. This type of solution is called Ternary solution.

5. **Why water acts as a universal solvent?**
   Most of the substances are soluble in water. So water acts as a universal solvent.

6. **Define aqueous solution.**
   The solution in which water acts as a solvent is called aqueous solution.

7. **Write the other solvents except water.**
   ✦ Ethers.
   ✦ Benzene.
   ✦ Alcohols.

8. **Based on the amount of solute, solutions are classified into how many types? What are they?**
   Solutions are classified into 3 types. They are;
   ✦ Saturated solution.
   ✦ Unsaturated solution.
   ✦ Super saturated solution.

9. Define Super saturated solution.

Super saturated solution is one that contains more solute than the saturated solution at a given temperature. eg: 40 g of Sodium chloride in 100 g of water.

10. Define concentration of the solution.

Concentration of two solutions with respect to their solutes present in the given amount of the solvent.

11. Define concentrated and dilute solution.

Two having same solute and solvent in a solutions, the one which contain higher amount of solute per the given amount of solvent is said to be concentrated solution and another is said to be dilute solution.

12. Do you know why is it bubbling when water is boiled?

Solubility of gases in liquid decrease with increase in temperature. Generally water contains dissolved oxygen. When water is boiled the solubility of oxygen in water decreases, so oxygen escapes in the form of bubbles.

13. Define Henry's law.

The solubility of a gas in a liquid is directly proportional to the pressure of the gas over the solution at a definite temperature.

14. Define concentration of a solution.

It may be defined as the amount of solute present in a given amount of solution or solvent.

15. Define Mass percentage.

It is defined as the percentage by mass of the solute present in the solution. It is mostly used when solute is solid and solvent is liquid.

$$\text{Mass percentage} = \frac{\text{Mass of the solute}}{\text{Mass of the solvent}} \times 100$$

(or)

$$\text{Mass percentage} = \frac{\text{Mass of the solute}}{\text{Mass of the solute + Mass of the solvent}} \times 100$$

16. Define hydration.

When ionic substances are dissolved in water to make their saturated aqueous solution, their ions attract water molecules which then attached chemically in certain ratio. This process is called hydration.

17. Define Hygroscopy.

Certain substances, when exposed to the atmospheric air at ordinary temperature absorb moisture without changing their physical state. Such substances are called hygroscopic substances and their property is called Hygroscopy.

18. Write the examples hygroscopic substances.

✦   Conc. H_2SO_4 (Sulphuric Acid).
✦   Phosphorous pentoixide (P_2O_5).
✦   Quick lime (CaO).
✦   Silica gel (SiO_2).
✦   Anhydrous calcium chloride ($CaCl_2$).

19. What are called deliquescent substances?

Certain substances which as so hygroscopic, when exposed to the atmospheric air at ordinary temperature, absorb enough water to get completely dissolved. Such substances are called deliquescent substances.

20. What are important characters of the deliquescent substances?

Deliquescent substances lose their crystalline shape and ultimately dissolve in the absorbed water forming a saturated solution.

21. When, deliquiescent substance is maximum?

✦   The temperature is low.
✦   The atmosphere is humid.

22. Write the example of deliquiescent substances.
- ✦ Calcium chloride – $CaCl_2$.
- ✦ Caustic soda – NaOH.
- ✦ Caustic potash – KoH.
- ✦ Ferric chloride – $FeCl_3$.

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Additional – Problems

1. **1.5 g of solute is dissolved in 15 g of water to form a saturated solution at 298K. Find out the solubility of the solute at the temperature.**

Solution : Mass of the solute = 1.5 g

Mass of the solvent = 15 g

Solubility of the solute $= \dfrac{\text{Mass of solute}}{\text{Mass of the solution}} \times 100$

Solubility of the solute $= \dfrac{1.5}{15} \times 100$

$= 10$ g.

2. **Find the mass of potassium chloride would be needed to form a saturated solution in 60 g of water at 303 K? Given that solubility of the KCl is 37/100 g at this temperature.**

Solution :

Mass of Pottasium chloride in 100 g of water in saturated solution = 37 g.

Mass of Pottasium chloride in 60 g of water in saturated solution $= \dfrac{37}{100} \times 60$

$= 22.2$ g.

3. **What is the mass of sodium chloride that would be needed to form a saturated solution in 50 g of water at 30° C. Solubility of sodium chloride is 36 g at 30° C?**

Solution : At 30° C, 36 g of sodium chloride is dissolved in 100 g of water.

∴ Mass of sodium chloride that would be need for 100 g of water = 36 g.

∴ Mass of sodium chloride dissolved in 50 g of water $= \dfrac{36 \times 50}{100}$

$= 18$ g.

4. **The Solubility of sodium nitrate at 50° C and 30° C is 114 g and 96 g respectively. Find the amount of salt that will be thrown out when a saturated solution of sodium nitrate containing 50 g of water is cooled from 50° C to 30° C?**

Solution : Amount of Sodium nitrate dissolved in 100 g of water at 50° C is 114 g.

∴ Amount of Sodium nitrate dissolving in 50 g of water at 50° C is $= \dfrac{114 \times 50}{100}$

$= 57$ g.

Similarly amount of Sodium nitrate dissolving in 50 g of water at 30° C is $= \dfrac{96 \times 50}{100}$

$= 48$ g.

Amount of Sodium nitrate thrown when 50 g of water is cooled from 50° C to 30° C is $= 57 - 48 = 9$ g.

5. **A solution was prepared by dissolving 25 g of sugar in 100 g of water. Calculate the mass percentage of solute.**

Solution : Mass of the solute = 25 g

$$\text{Mass of the solvent} = 100 \text{ g}$$

$$\text{Mass Percentage} = \frac{\text{Mass of the solute}}{\text{Mass of the solvent}} \times 100$$

$$\text{Mass Percentage} = \frac{\text{Mass of the solute}}{\text{Mass of the solute + Mass of the solvent}} \times 100$$

$$= \frac{25}{25+100} \times 100$$

$$= \frac{25}{125} \times 100$$

$$= 20\%.$$

6. **16 grams of NaOH is dissolved in 100 grams of water at 25°C to form a saturated solution. Find the mass percentage of solute and solvent.**

Solution : $\text{Mass of the solute (NaOH)} = 16 \text{ g}$
$\text{Mass of the solvent } H_2O = 100 \text{ g}$

i)   Mass Percentage of the solute

$$\text{Mass percentage of solute} = \frac{\text{Mass of the solute}}{\text{Mass of the solute + Mass of the solvent}} \times 100$$

$$= \frac{16 \times 100}{16 + 100}$$

$$= \frac{1600}{116}$$

$$\text{Mass percentage of the solute} = 13.79\%.$$

ii)   Mass percentage of solvent $= 100 - (\text{Mass percentage of the solute})$
$= 100 - 13.79$
$= 86.21\%.$

7. **Find the amount of urea which is to be dissolved in water to get 500 g of 10% w/w aqueous solution?**

Solution : $\text{Mass percentage (w/w)} = \dfrac{\text{Mass of the solute}}{\text{Mass of the solvent}} \times 100$

$$10 = \frac{\text{Mass of the area}}{500} \times 100$$

$$\text{Mass of area} = 50 \text{ g}.$$

8. **A solution is made from 35 ml of Methanol and 65 ml of water. Calculate the volume percentage.**

Solution : $\text{Volume of the ethanol} = 35 \text{ ml}$
$\text{Volume of the water} = 65 \text{ ml}$

$$\text{Volume percentage} = \frac{\text{Volume of the solute}}{\text{Volume of the solution}} \times 100$$

$$\text{Volume percentage} = \frac{\text{Volume of the solute}}{\text{Volume of the solute + Volume of the solvent}} \times 100$$

$$\text{Volume percentage} = \frac{35}{35+65} \times 100$$

$$\text{Volume percentage} = \frac{35}{100} \times 100$$

$$= 35\%.$$

9. **Calculate the volume of ethanol in 200 ml solution of 20% v/v aqueous solution of ethanol.**

Solution :　　Volume of aqueous solution = 200 ml.

$$\text{Volume percentage} = \frac{\text{Volume of the solute}}{\text{Volume of the solution}} \times 100$$

$$20 = \frac{\text{Volume of ethanol}}{200} \times 100$$

$$\text{Volume of ethanol} = \frac{20 \times 200}{100}$$

$$= 40 \text{ ml.}$$

Additional – Long answer questions

1. **Tabulate the different types of binary solutions.**

S.No.	Solute	Solvent	Example
1	Solid	Solid	Alloys
2	Liquid	Solid	Amalgam
3	Solid	Liquid	NaCl dissolved in water
4	Liquid	Liquid	Ethyl alcohol dissolved in water
5	Gas	Liquid	Soda water
6	Liquid	Gas	Cloud
7	Gas	Gas	Mixture of Helium, oxygen gases

2. **Explain the classification of based on the amount of solvent.**

i) **Aqueous Solutions :**

The solution in which water acts as a solvent is called aqueous solution. In general, ionic compounds are soluble in water and form aqueous solutions more readily than covalent compounds. E.g. Common salt in water, Sugar in water, Copper sulphate in water etc.

ii) **Non–aqueous Solutions :**

The solution in which any liquid, other than water, acts as a solvent is called non-

aqueous solution. Solvent other than water is referred to as non-aqueous solvent. Generally, alcohols, benzene, ethers, carbon disulphide, acetone, etc., are used as non-aqueous solvents. Examples for non-aqueous solutions: Sulphur dissolved in carbon disulphide, Iodine dissolved in carbon tetrachloride.

3. **Explain the classification of based on the amount of solute.**

i) **Saturated solution :**

A solution in which no more solute can be dissolved in a definite amount of the solvent at a given temperature is called saturated solution. e.g. 36 g of sodium chloride in 100 g of water at 25°C forms saturated solution. Further addition of sodium chloride, leave it undissolved.

ii) **Unsaturated solution :**

Unsaturated solution is one that contains less solute than that of the saturated solution at a given temperature. e.g. 10 g or 20 g or 30 g of Sodium chloride in 100 g of water at 25°C forms an unsaturated solution.

iii) **Super saturated solutions :**

Supersaturated solution is one that contains more solute than the saturated solution at a given temperature. e.g. 40 g of sodium chloride in 100 g of water at 25°C forms super saturated solution.

UNIT TEST - 9

Time : 1.15 Hrs.   Marks : 50

I. Choose the best answer
(5 × 1 = 5)

1. **A solution is a _____ mixture.**
   a) Homogeneous
   b) Heterogeneous
   c) Homogeneous and Heterogeneous
   d) Homogeneous or Heterogeneous

2. **The number of components in a binary solution is _____.**
   a) 2   b) 3   c) 4   d) 5

3. **When pressure is increased at constant temperature the solubility of gases in liquid _____.**
   a) no change   b) increases   c) decreases   d) no reaction

4. **Deliquescence is due to _____.**
   a) Strong affinity to water
   b) Less affinity to water
   c) Strong hatred to water
   d) Inertness to water

5. **Which of the following is hygroscopic in nature?**
   a) Ferric chloride   b) Copper sulphate $5H_2O$ c) Silica gel   d) sodium chloride

II. Fill in the blanks
(5 × 1 = 5)

6. An example of Solid – Solid solution is _____.
7. An example of Liquid – solid solution is _____.
8. An example of solid – liquid solution is _____.
9. An example of Liquid – liquid solution is _____.
10. An example of Gas – Liquid solution is _____.

III. State whether the statements are true or false. Correct the false statement
(4 × 1 = 4)

11. 16g of Sodium chloride dissolved in 100 g of water is an example of Saturated solution.
12. Aquatic animals live more in cold regions because less amount of dissolved oxygen is present in the water cold regions.
13. Certain substances, when exposed to the atmospheric air at ordinary temperature, absorb moisture without changing their physical state. Such substances are called Hygroscopic substances.
14. Deliquescence is maximum when the temperature is High.

IV. Match the following
(4 × 1 = 4)

15. Blue vitriol   (a)   CalciumSulphate . Di hydrate
16. Gypsum   (b)   Calcium Oxide
17. Deliquescence   (c)   Calcium Sulphate . penta hydrate
18. Hygroscopic   (d)   Sodium hydroxide

V. Assertion and Reasoning
(3 × 1 = 3)

Direction: In each of the following questions, a statement of Assertion is given and a corresponding statement of Reason is given just below it. Of the statements given below, mark the correct answer as
a. If both A and R are true and R is the correct explanation of A.
b. If both A and R are true but R is not the correct explanation of A.
c. If A is true but R is false.
d. If both A and R are false.

19. **Assertion:** Salt water is a Homogeneous solution.
    Reason: It contains two or more substances.

20. **Assertion:** Solution which contain three components are ternary solution.
    Reason: Salt and sugar are dissolved in water.

21. **Assertion:** Deep sea divers used helium-oxygen mixture.
    Reason: Helium and oxygen mixtures are weightless.

VI. Write the answer for the following questions in word or sentence

(3 × 1 = 3)

22. Define solute.
23. Define solvent.
24. Define solution.

VII. Find the odd one out

(3 × 1 = 3)

25. Hygroscopy : quicklime , caustic soda, caustic potash , ferric chloride.
26. Deliquescence: phosphorous pentoxide, sulphuric acid, silica Gel, calcium chloride.
27. Gypsum: Copper II sulphate. Penta hydrate, Calcium sulphate. dihydrate, Zinc sulphate. Heptahydarte.

VIII. Correct the mistakes

(3 × 1 = 3)

28. Solutions which contains three components are called binary solution.
29. Sodium chloride dissolved in water forms a non – Aqueous solution.
30. Sodium chloride dissolved in water forms a non- Aqueous solution.

IX. Write the short answer for ANY 5 of the following questions.

(5 × 2 = 10)

31. Define the term Solution.
32. Define volume percentage.
33. Define Hydrated Salt.
34. What is mean by binary solution?
35. What is aqueous and non aqueous solution?
36. Define solubility.
37. A solution is prepared by dissolving 45g of sugar in 180g of water. Calculate the mass percentage of solute.

X. Write long answer for the following questions

(2 × 5 = 10)

38. Write notes on various factors affecting solubility.
    [OR]
39 Write notes on saturated and unsaturated solution.
40. Explain the types of chemical reactions.
    [OR]
41 Tabulate the different types of Binary solutions.

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TYPES OF CHEMICAL REACTIONS

UNIT 10

Points to Remember

- A chemical change is a change in which one or more new substances are formed.
- Aerobic: Presence of oxygen.
- Anaerobic: Absence of oxygen.
- Most combination reactions are exothermic.
- Electrolytic decomposition reaction may occur in the presence of heat or light.
- All photo decomposition reaction are endothermic reactions.
- Double displacement reaction or metathesis may occur by the mutal exchange of ions.
- Precipitation reaction gives an insoluble salt as the product.
- Neutralisation reactions are reactions between an acid and a base that forms salt and water.
- Plants can not grow in an acidic soil.
- Neutralisation prevents tooth decay.
- Most reactions in chemistry are irreversible reactions.
- Chemical equilibrium–the rate of the forward reaction is equal to rate of the back ward reactions.
- Equilibrium is possible in a closed system.
- Temperature increases the reaction rate.
- Pressure increases the reaction rate.
- The term pH means power of hydrogen.
- pH plays a vital role in everyday life.
- In humans all bio chemical reactions take place between the pH value of 7.0 to 7.8.
- If pH of rain water is below 5.6 its called acid rain.
- Pure water is a weak electrolyte.

TEXT BOOK EVALUATION

I. Book Exercise – Choose the best answer

1. $H_{2(g)} + Cl_{2(g)} \rightarrow 2HCl_{(g)}$ is a
   a) Decomposition Reaction
   b) Combination Reaction
   c) Single Displacement Reaction
   d) Double Displacement Reaction

   Ans : (b) Combination Reaction

2. Photolysis is a decomposition reaction caused by _____.
   a) heat
   b) electricity
   c) light
   d) mechanical energy

   Ans : (c) light

3. A reaction between carbon and oxygen is represented by $C_{(s)} + O_{2(g)} \rightarrow CO_{2(g)} +$ Heat. In which of the type(s), the above reaction can be classified?
   i) Combination Reaction
   ii) Combustion Reaction
   iii) Decomposition Reaction
   iv) Irreversible Reaction
   a) i and ii
   b) i and iv
   c) i, ii and iii
   d) i, ii and iv

   Ans : (d) i, ii and iv
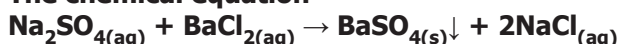
4. **The chemical equation**
    $Na_2SO_{4(aq)} + BaCl_{2(aq)} \rightarrow BaSO_{4(s)}\downarrow + 2NaCl_{(aq)}$
    represents which of the following types of reaction?
    a) Neutralisation   b) Combustion   c) Precipitation   d) Single displacement

    Ans : (c) Precipitation

5. **Which of the following statements are correct about a chemical equilibrium?**
    i)   **It is dynamic in nature**
    ii) **The rate of the forward and backward reactions are equal at equilibrium**
    iii) **Irreversible reactions do not attain chemical equilibrium**
    iv) **The concentration of reactants and products may be different**
    a) i, ii and iii   b) i, ii and iv   c) ii, iii and iv   d) i, iii and iv

    Ans : (b) i, ii and iv

6. **A single displacement reaction is represented by $X_{(s)} + 2HCl_{(aq)} \rightarrow XCl_{2(aq)} + H_{2(g)}$. Which of the following(s) could be X.**
    i) Zn   **ii) Ag**   **iii) Cu**   **iv) Mg**
    Choose the best pair.
    a) i and ii   b) ii and iii   c) iii and iv   d) i and iv

    Ans : (d) i and iv

7. **Which of the following is not an "element + element → compound" type reaction?**
    a) $C_{(s)} + O_{2(g)} \rightarrow CO_{2(g)}$ b) $2K_{(s)} + Br_{2(l)} \rightarrow 2KBr_{(s)}$
    c) $2CO_{(g)} + O_{2(g)} \rightarrow 2CO_{2(g)}$ d) $4Fe_{(s)} + 3O_{2(g)} \rightarrow 2Fe_2O_{3(s)}$

    Ans : (a) $C_{(s)} + O_{2(g)} \rightarrow CO_{2(g)}$

8. **Which of the following represents a precipitation reaction?**
    a) $A_{(s)} + B_{(s)} \rightarrow C_{(s)} + D_{(s)}$ b) $A_{(s)} + B_{(aq)} \rightarrow C_{(aq)} + D_{(l)}$
    c) $A_{(aq)} + B_{(aq)} \rightarrow C_{(s)} + D_{(aq)}$ d) $A_{(aq)} + B_{(s)} \rightarrow C_{(aq)} + D_{(l)}$

    Ans : (c) $A_{(aq)} + B_{(aq)} \rightarrow C_{(s)} + D_{(aq)}$

9. **The pH of a solution is 3. Its $[OH^-]$ concentration is**
    a) 1×10^{-3} M   b) 3 M   c) 1×10^{-11} M   d) 11 M

    Ans : (c) 1×10^{-11} M

10. **Powdered CaCO$_3$ reacts more rapidly than flaky CaCO$_3$ because of _____.**
    a) large surface area   b) high pressure   c) high concentration   d) high temperature

    Ans : (a) large surface area

II. Book Exercise – Fill in the blanks

1. A reaction between an acid and a base is called _____.   **Ans :** neutralisation reaction
2. When lithium metal is placed in hydrochloric acid, _____ gas is evolved.   **Ans :** hydrogen
3. The equilibrium attained during the melting of ice is known as _____.   **Ans :** Physical equilibrium
4. The pH of a fruit juice is 5.6. If you add slaked lime to this juice, its pH _____ (increse/decrese)

    Ans : increases
5. The value of ionic product of water at 250 C is _____.   **Ans :** 1.00×10^{-14} mol^2 dm^{-6}
6. The normal pH of human blood is _____.   **Ans :** 7.35 to 7.45
7. Electrolysis is type of _____ reaction.   **Ans :** decomposition
8. The number of products formed in a synthesis reaction is _____.   **Ans :** one
9. Chemical volcano is an example for _____ type of reaction.   **Ans :** decomposition
10. The ion formed by dissolution of H^+ in water is called _____.   **Ans :** Hydronium ion H_3O^+

III. Book Exercise – Match the following

Identify the types of reaction :

Reaction	Type
1. $NH_4OH_{(aq)} + CH_3COOH_{(aq)} \rightarrow CH_3COONH_{4(aq)} + H_2O_{(l)}$	(a) Single Displacement
2. $Zn_{(s)} + CuSO_{4(aq)} \rightarrow ZnSO_{4(aq)} + Cu_{(s)}$	(b) Combustion
3. $ZnCO_{3(s)} + Heat \xrightarrow{Heat} ZnO_{(s)} + CO_{2(g)}$	(c) Neutralisation
4. $C_2H_{4(g)} + 4O_{2(g)} \rightarrow 2CO_{2(g)} + 2H_2O_{(g)} + Heat$	(d) Thermal decomposition

Ans :

S.No.	Reaction		Type
1	$NH_4OH_{(aq)} + CH_3COOH_{(aq)} \rightarrow CH_3COONH_{4(aq)} + H_2O_{(l)}$	c	Neutralisation
3	$Zn_{(s)} + CuSO_{4(aq)} \rightarrow ZnSO_{4(aq)} + Cu_{(s)}$	a	Single Displacement
4	$ZnCO_{3(s)} + Heat \xrightarrow{Heat} ZnO_{(s)} + CO_{2(g)}$	d	Thermal decomposition
4	$C_2H_{4(g)} + 4O_{2(g)} \rightarrow 2CO_{2(g)} + 2H_2O_{(g)} + Heat$	b	Combustion

IV. Book Exercise – True or false (If false give the correct statement)

1. **Silver metal can displace hydrogen gas from nitric acid.**
   Ans : False. Silver metal cannot displace hydrogen gas from Nitric acid.

2. **The pH of rain water containing dissolved gases like SO_3, CO_2, NO_2 will be less than 7.**
   Ans : True.

3. **At the equilibrium of a reversible reaction, the concentration of the reactants and the products will be equal.**
   Ans : True.

4. **Periodical removal of one of the products of a reversible reaction increases the yield.**
   Ans : True.

5. **On dipping a pH paper in a solution, it turns into yellow. Then the solution is basic.**
   Ans : True.

V. Book Exercise – Short answer questions

1. **When an aqueous solution of potassium chloride is added to an aqueous solution of silver nitrate, a white precipitate is formed. Give the chemical equation of this reaction.**
   $KCl + AgNO_3 \rightarrow AgCl \downarrow + KNO_3$.

2. **Why does the reaction rate of a reaction increase on raising the temperature?**
   Most of the reactions go faster at higher temperature. Because adding heat to the reactants provides energy to break more bonds and thus speed up the reaction.

3. **Define combination reaction. Give one example for an exothermic combination reaction**
   A combination reaction is a reaction in which two or more reactants combine to form a compound. It is otherwise called synthesis reaction (or) composition reaction.
   $2 Mg_{(s)} + O_{2(s)} \rightarrow 2 MgO_{(s)}$

4. **Differentiate reversible and irreversible reactions.**

REVERSIBLE REACTION	IRREVERSIBLE REACTION
It can be reversed under suitable conditions.	It cannot be reversed.
Both forward and backward reactions take place simultaneously.	It is unidirectional. It proceeds only in forward direction.
It attains equilibrium.	Equilibrium is not attained.

REVERSIBLE REACTION	IRREVERSIBLE REACTION
The reactants cannot be converted completely into products.	The reactants can be completely converted into products.
It is relatively slow.	It is fast.

VI. Book Exercise – Long answer questions

1. What are called Thermolysis reactions?

Ans : In this type of reaction, the reactant is decomposed by applying heat. For example, on heating Mercury (II) oixde is decomposed into Mercury metal and oxygen gas. As the molecule is dissociated by the absorbtion of heat, it is otherwise called Thermolysis. It is a class of compound to element/element decomposition. i.e., a compound HgO is decomposed into 2 elements (Hg and Oxygen).

$$2\,HgO_{(s)} \xrightarrow{\text{Heat}} 2\,Hg_{(l)} + O_{2(g)}$$
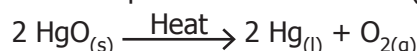
Similarly, when Calcium carbonate is heated, it breaks down into Calcium oxide and CO_2. It is a type of compound to compound/compound decomposition.
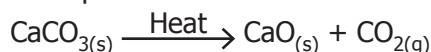
$$CaCO_{3(s)} \xrightarrow{\text{Heat}} CaO_{(s)} + CO_{2(g)}$$

In thermal decomposition reaction, heat is supplied to break the bonds. Such reactions, in which heat is absorbed are called Endothermic reactions.

2. Explain the types of double displacement reactions with examples.

Ans : Double displacement reactions are classifies into 2 types. They are;

i) Precipitation reaction.

ii) Neutralisation reaction.

Precipitation Reaction :

When aqueous solutions of two compounds are mixed, if they react to form an insoluble compound and a solute compound, then it is called Precipitation reaction. Because the insoluble compound formed as one of the products and hence the reaction is so called.

Eg.: The aqueous solution of Potassium iodide and Lead (II) nitrate are mixed, a double displacement reactions take place between them.

$$Pb(NO_3)_{2(aq)} + 2KI_{(aq)} \rightarrow PbI_{2(s)} \downarrow + 2KNO_{3(aq)}$$
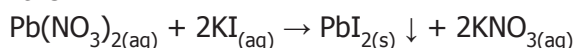
Potassium and Lead displace one other and form a yellow precipitate of Lead (II) iodide.

Neutralisation Reaction :

The reaction between an acid and a base. It is called Neutralisation reaction.

Acid + Base → Salt + Water
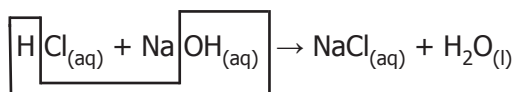
$$H|Cl_{(aq)} + Na|OH_{(aq)} \rightarrow NaCl_{(aq)} + H_2O_{(l)}$$

Similarly, when Ammonium hydroxide reacts with Nitric acid, it forms Ammonium Nitrate and Water.

$$H|NO_{3(aq)} + NH_4|OH_{(aq)} \rightarrow NH_4NO_{3(aq)} + H_2O_{(l)}$$
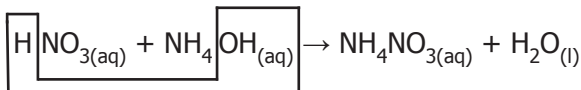
3. Explain the factors influencing the rate of a reaction.

Ans : Important factors that affect rate of reaction are;

i) Nature of the reactants.

ii) Concentration of the reactants.

iii) Temperture.

iv) Catalyst.

v) Pressure.

vi) Surface area of the reactants.

i)   **Nature of the Reactants** :

The reaction of sodium with hydrochloric acid is faster than that with acetic acid. Because, Hydrochloric acid is a stronger acid than acetic acid and thus more reactive. So, the nature of the reactants influence the reaction rate.

$$2Na_{(s)} + 2HCl_{(aq)} \rightarrow 2NaCl_{(aq)} + H_{2(g)} \text{ (fast)}$$
$$2Na_{(s)} + 2CH_3COOH_{(aq)} \rightarrow 2CH_3COONa_{(aq)} + H_{2(g)} \text{ (slow)}$$
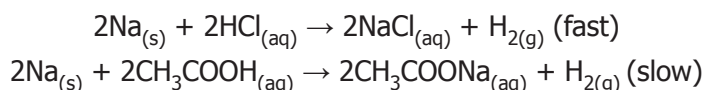
ii) **Concentration of the Reactants** :

Changing the amount of the reactants also increases the reaction rate. The amount of the substance present in a certain volume of the solution is called 'concentration'. More the concentration, more particles per volume exist in it and hence faster the reaction. Granulated zinc reacts faster with 2M hydrochloric acid than 1M hydrochloric acid.

iii) **Temperature** :

Most of the reactions go faster at higher temperature. Because adding heat to the reactants provides energy to break more bonds and thus speed up the reaction. Calcium carbonate reacts slowly with hydrochloric acid at room temperature. When the reaction mixture is heated the reaction rate increases.

iv) **Pressure** :

If the reactants are gases, increasing their pressure increases the reaction rate. This is because, on increasing the pressure the reacting particles come closer and collide frequently.

v)   **Catalyst** :

A catalyst is a substance which increases the reaction rate without being consumed in the reaction. In certain reactions, adding a substance as catalyst speeds up the reaction. For example, on heating potassium chlorate, it decomposes into potassium chloride and oxygen gas, but at a slower rate. If manganese dioxide is added, it increases the reaction rate. (Here, MnO_2 act as a catalyst)

$$2KClO_3 \xrightarrow{\;MnO_2\;} 2KCl + 3O_2$$
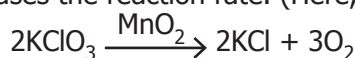
vi) **Surface Area of the Reactants** :

When solid reactants are involve in a reaction, their powdered form reacts more readily. For example, powdered calcium carbonate reacts more readily with hydrochloric acid than marble chips. Because, powdering of the reactants increases the surface area and more energy is available on collision of the reactant particles. Thus, the reaction rate is increased.

4.   How does pH play an important role in everyday life?

(i) Living organisms can survive only in a narrow range of pH change. Different body fluids have different pH values.

(ii) pH of blood is ranging from 7.35 to 7.45. Any increase or decrease in this value leads to diseases. The ideal pH for blood is 7.4.

(iii) Our stomach produces hydrochloric acid. It helps in the digestion of food without harming the stomach. During indigestion the stomach produces too much acid and this causes pain and irritation. pH of the stomach fl uid is approximately 2.0.

(iv) pH of the saliva normally ranges between 6.5 to 7.5.

(v) When the pH of the mouth saliva falls below 5.5, the enamel gets weathered. Toothpastes, which are generally basic are used for cleaning the teeth that can neutralise the excess acid and prevent tooth decay.

(vi) The pH of rain water is approximately 7, which means that it is neutral and also represents its high purity. If the atmospheric air is polluted with oxide gases of sulphur and nitrogen, they get dissolved in the rain water and make its pH less than 7. Thus, if the pH of rain water is less than 7, then it is called acid rain. When acid rain flows into the rivers it lowers the pH of the river water also.

(vii) In agriculture, the pH of soil is very important. It depends upon the nature and the range of different soil, different crops are cultivated.

5.   What is a chemical equilibrium? What are its characteristics?

Chemical Equilibrium :

It is state of a reversible chemical reaction in which no change in the amount of the reactants and products takes place. At equilibrium,

Rate of Forward reaction = Rate of Backward reaction

Characteristics of Equilibrium :

✦   In a chemical equilibrium, the rates of the forward and backward reactions are equal.

✦   The observable properties such as pressure, concentration, colour, density, viscosity etc., of the system remain unchanged with time.

✦   The chemical equilibrium is a dynamic equilibrium, because both the forward and backward reactions continue to occur even though it appears static externally.

✦   In physical equilibrium, the volume of all the phases remain constant.

VII. Book Exercise – HOT question

1.   A solid compound 'A' decomposes on heating into 'B' and a gas 'C'. On passing the gas 'C' through water, it becomes acidic. Identify A, B and C.

A solid compound 'A' is Calcium carbonate decomposes on heating into Calcium (B) oxide and a gas Carbon dioxide (O). On passing this Carbon dioxide (O) through water, it becomes audic because the formation of Carbonic acid.

compound	molecular formula	name
A	$CaCO_3$	calcium carbonate
B	CaO	calcium oxide
C	CO_2	carbon dioxide

$$CaCO_3 \rightarrow CaO + CO_2$$
$$A \qquad B \quad C$$
$$CO_2 + H_2O \rightarrow H_2CO_3$$
$$\text{Carbonic acid}$$
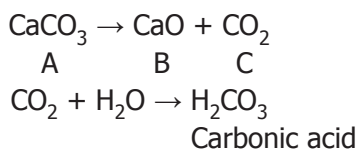
2.   Can a nickel spatula be used to stir copper sulphate solution? Justify your answer.

The standard electrode reduction potentials are;

Since the EMF of the cell is positive the reaction will displace Copper from its solution and Copper will be deposited on the Nickel spatula. Thus Nickel cannot be used as to stir the Copper sulphate solution.

VIII. Book Exercise – Solve the problems

1.   Lemon juice has a pH 2, what is the concentration of H⁺ ions?

Solution :

$$pH = 2$$
$$[H^+] = ?$$
$$pH = - \log [H^+]$$
$$\log_{10} [H^+] = - 2$$
$$[H^+] = 10^{-2}$$
$$[H^+] = 0.01 \text{ mole}^{-1}$$

2. **Calculate the pH of 1.0 ×10⁻⁴ molar solution of HNO₃.**

   Solution :

   $$[H^+] = 1 \times 10^{-4}$$
   $$pH = -\log_{10}[H^+]$$
   $$= -(\log_{10} - \log_{10}10^4)$$
   $$= -(0 - 4 \times \log_{10}10)$$
   $$= -(4 \times 1)$$
   $$pH = 4.$$

3. **What is the pH of 1.0 × 10⁻⁵ molar solution of KOH?**

   Solution : KOH is a strong base and dissociates in its solution as,

   $$KOH_{(aq)} \rightarrow K^+_{(aq)} + OH^-_{(aq)}$$
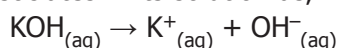
   One mole of KOH would give one mole of OH− ions.

   Therefore,

   $$OH^- = 1 \times 10^{-5} \text{ mole lit}^{-1}$$
   $$pOH = -\log[OH^-] = -\log \times [10^{-5}]$$
   $$= -(-5 \times \log_{10}{}^{10}) = -(-5) = 5.$$

   Since,

   $$pH + pOH = 14$$
   $$pH + 5 = 14$$
   $$pH = 14 - 5$$
   $$pH = 9.$$

4. **The hydroxide ion concentration of a solution is 1 × 10⁻¹¹M. What is the pH of the solution?**

   Solution : A

   $$pOH = 1 \times 10^{-11}M.$$
   $$p[OH] = -\log[OH^-]$$
   $$pOH = -\log(1 \times 10^{-11})M$$
   $$= -\log_{10}(1.0 \times 10^{-11})$$
   $$pOH = -(-11)$$
   $$pOH = 11.$$
   $$pH + pOH = 14$$
   $$pH = 14 - pOH$$
   $$pH = 14 - 11$$
   $$pH = 3.$$

Additional – Choose the best answer

1. **When Methane reacts with oxygen it forms _____.**
   a) Carbon dioxide and water
   b) Carbon monoxide and water
   c) Carbon and water
   d) Carbon dioxide and hydrogen

   Ans : (a) Carbon dioxide and water

2. **Combination reactions are otherwise called as _____.**
   a) Precipitation reaction
   b) Synthesis reaction
   c) Thermal decomposition reaction
   d) Single displacement reaction

   Ans : (b) Synthesis reaction

3. **Hydrogen gas combines with Chlorine gas to form _____ gas.**
   a) Hydrogen chloride gas
   b) Hydrogen and chlorine
   c) Hydrogen chloric acid
   d) Hydro chloric acid

   Ans : (a) Hydrogen chloride

4. **Element + Element → _____ .**
    a) Element   b) Compound   c) element or compound d) compound or element

    Ans : (b) Compound

5. **Compound + Compound → _____ .**
    a) Element   b) Compound   c) element or compound d) compound or element

    Ans : (b) Element

6. **Compound + Element → _____ .**
    a) Element   b) Compound   c) element or compound d) compound or element

    Ans : (b) Compound

7. **A + B → AB.**
    a) Decomposition reaction   b) Precipitation reaction
    c) Double decomposition reaction   d) None

    Ans : (a) Decomposition reaction

8. **A solution of _____ is used for white washing walls.**
    a) Calcium carbonate   b) Calcium hydroxide   c) Calcium chloride   d) None

    Ans : (a) Calcium carbonate

9. **Other name for Calcium hydroxide is _____ .**
    a) Quick lime   b) Slaked lime   c) Soda water   d) None

    Ans : (b) Slaked lime

10. **Chemical name for marble is _____ .**
    a) Calcium hydroxide   b) Calcium carbonate   c) Calcium oxide   d) None

    Ans : (b) Calcium carbonate

11. **$Ca(OH)_2 + CO_2 → CaCO_3 + H_2O$.**
    a) Decomposition reaction   b) Combination reaction
    c) Double decomposition reaction   d) None of the above

    Ans : (a) Decomposition reaction

12. **Thermal decomposition reaction is also called as _____ .**
    a) Exothermic reaction   b) Endothermic reaction   c) Entrophy   d) None of the above

    Ans : (b) Endothermic reaction

13. **Compound → Element + Element. Example for this reaction is _____ .**
    a) Thermal decomposition   b) Photo decomposition
    c) Electrolytic decomposition   d) Thermal photo decomposition

    Ans : (d) Thermal photo decomposition

14. **$Zn + HCl → ZnCl_2 + H_2$. This type of reaction is _____ .**
    a) Decomposition reaction   b) Combination reaction
    c) Displacement reaction (single)   d) Double displacement reaction

    Ans : (c) Displacement reaction (single)

15. **$Fe + CuSO_4 → FeSO_4 + Cu$. This type of reaction is _____ .**
    a) Decomposition reaction   b) Combination reaction
    c) Displacement reaction   d) Double displacement reaction

    Ans : (c) Displacement reaction

16. **Fluorine is _____ reactive than Chorine.**
    a) more   b) less   c) intermediate   d) none

    Ans : (a) more

17. **AB + CD → AD + CB. This reaction is called as _____ .**
    a) Decomposition reaction   b) Combination reaction

   c) Displacement reaction   d) Double displacement reaction

                                              Ans : (d) Double displacement reaction

18. Doube displacement reaction is also called as _____.
a) Thermolysis reaction   b) Metathesis reaction
c) Photolysis reaction   d) None

                                                      Ans : (c) Metathesis reaction

19. Ions are exchanged in this reactions. What type of reaction takes place?
a) Decompositon reaction   b) Combination reaction
c) Double displacement reaction   d) Single displacement reaction

                                  Ans : (c) Double displacement reaction

20. Double decomposition reaction is otherwise called as _____.
a) Combination reaction   b) Decomposition reaction
c) Precipitation reaction   d) None

                                                Ans : (c) Precipitation reaction

21. $Pb(NO_3)_2 + 2KI \rightarrow PbI_2 + KNO_3$. It is an example of _____ reaction.
a) Combination reaction   b) Decomposition reaction
c) Precipitation reaction   d) Displacement reaction

                                                Ans : (c) Precipitation reaction

22. Acid + Base → Salt + Water.
a) Decomposition reaction   b) Combination reaction
c) Neutralisation reaction   d) None

                                                Ans : (c) Neutralisation reaction

23. Combustion reactions otherwise called as _____.
a) Decomposition reaction   b) Combination reaction
c) Neutralisation reaction   d) Exothermic reaction

                                                  Ans : (d) Exothermic reaction

24. Rusting of Iron is an example of _____ reaction.
a) Exothermic oxidation   b) Endothermic reaction
c) Slow reaction   d) Combination reaction

                                                      Ans : (c) Slow reaction

25. Combustion reaction is also called as _____.
a) Oxidation   b) Reduction   c) both 'a' and 'b'   d) none

                                                         Ans : (a) Oxidation

26. Hydrocarbons burns with Oxygen to form Carbon dioxide and water.
a) Combintion reaction   b) Decomposition reaction
c) Combustion reaction   d) None of the above

                                                Ans : (c) Combustion reaction

27. Physical changes are called as _____.
a) Reversible reaction   b) Irreversible reaction   c) Periodic   d) Non–periodic

                                                Ans : (a) Reversible reaction

28. Our mobile phone gets energy from its Lithium ion battery by chemical reaction. What type of chemical reaction is takes place?
a) Reversible   b) Irreversible   c) Discharging   d) None of the above

                                                         Ans : (c) Discharging

29. AB $\Longleftrightarrow$ A + B. This type of chemical reaction is _____.

     a) Reversible   b) Irreversible   c) either a or b   d) None of the above

     Ans : (a) Reversible

30. The reaction that cannot be reversed is called _____ reaction.

     a) Reversible   b) Irreversible   c) either a or b   d) None of the above

     Ans : (b) Irreversible

31. The Irreversible reactions are _____.

     a) directional   b) unidirectional   c) bydirectional   d) None of the above

     Ans : (b) unidirectional

32. The Irreversible reaction always carried _____ reaction only.

     a) forward   b) backward   c) both   d) can't be specified

     Ans : (a) forward

33. The Reversible reaction always carried _____ reaction only.

     a) forward   b) backward   c) both   d) can't be specified

     Ans : (c) both

34. Hydrogen peroxide is poured on a wound. It decomposes into _____ and _____.

     a) water and oxygen   b) water and oxides

     c) hydrogen and oxygen   d) none of the above

     Ans : (a) water and oxygen

35. Rusting of Iron is an example of _____ reaction.

     a) slow   b) fast   c) either a or b   d) neither a nor b

     Ans : (a) slow

36. Burning of petrol is an example of _____ reaction.

     a) slow   b) fast   c) intermediate   d) can't be specified

     Ans : (b) fast

37. Iron gets rusted faster in an acid than _____.

     a) water   b) bases   c) solvents   d) suspension

     Ans : (a) water

38. Hydrochloric acid is a _____ than acetic acid.

     a) stronger   b) weaker   c) intermediate   d) same as

     Ans : (a) stronger

39. Granulated Zinc reacts _____ with 2 M Hydrochloric acid than 1 M hydrochloric acid.

     a) faster   b) slower   c) intermediate   d) can't be specified

     Ans : (a) faster

40. In reactants are gases, the pressure is _____ the reaction rate is also _____.

     a) increases, increases   b) increases, decreases

     c) decreases, decreases   d) decreases, increases

     Ans : (a) increases, increases

41. Powdering of the reactants _____ the surface area and more energy produced.

     a) increases   b) decreases   c) no change   d) can't be specified

     Ans : (a) increases

42. MnO_2 acts as a _____.

     a) Catalyst   b) Dehydrating agent   c) hydrating agent   d) solvent

     Ans : (a) Catalyst

43. Surface area of the reactants increases the rate of the reaction also _____.

  a) increases   b) decreases   c) no change   d) can't be specified

                         Ans : (a) increases

44. In equilibrium state _____.

  a) Rate of forward reaction = Rate of backward reaction

  b) Rate of backward reaction = Reat of forward reaction

  c) forward reaction =backward reaction

  d) backward reaction = forward reaction

                         Ans : (a) Rate of forward reaction = Rate of backward reaction

45. The rate of the reaction is _____ proportional to the concentration.

  a) directly   b) indirectly   c) variably   d) invariably

                         Ans : (a) directly

46. At this state, the volume of the liquid and gaseous phases remain constant. Since it is a physical change, the equilibrium attained is called _____ equilibrium.

  a) physical   b) chemical   c) mechanical   d) none

                         Ans : (a) physical

47. Pure water is _____ of electricity.

  a) poor conductor   b) good conductor   c) either a or b   d) none

                         Ans : (a) poor conductor

48. _____ ionisation is a reaction in which two like molecules react to give ions.

  a) Self   b) Unautomatic   c) catalytic   d) none

                         Ans : (a) Self

49. _____ formed is a strong acid and the _____ ion is a strong base.

  a) hydronium ion, hydroxyl ion   b) hydroxyl ion, hydronium ion

  c) both a and b   d) none

                         Ans : (a) hydronium ion, hydroxyl ion

50. The unit of ionic product of water is _____.

  a) mol^2dm^{-6} b) mol^3dm^{-3} c) $mol^{-2}dm^{-6}$ d) $mol^{-3}dm^{-3}$

                         Ans : (a) mol^2dm^{-6}

51. pH notation was devised by the _____ in 1909.

  a) Torrenson   b) Danish biochemist sorensen

  c) Thales   d) Newton

                         Ans : (b) Danish biochemist sorensen

52. Acids have pH less than _____.

  a) 7   b) 8   c) 9   d) 10

                         Ans : (a) 7

53. Bases have pH greater than _____.

  a) 7   b) 8   c) 9   d) 10

                         Ans : (a) 7

54. A neutral solution has pH equal to _____.

  a) 7   b) 8   c) 9   d) 10

                         Ans : (a) 7

55. pH of rain water is _____.

  a) 7   b) 8   c) 9   d) 10

                         Ans : (a) 7

56. pH of blood is ranging _____ .

a) 7.35 to 7.45   b) 7.45 to 7.55   c) 7.25 to 7.35   d) none

Ans : (a) 7.35 to 7.45

57. The ideal pH for blood is _____ .

a) 7.4   b) 7.3   c) 7.5   d) 7.2

Ans : (a) 7.4

58. Rice requires _____ soil.

a) Allealine soil   b) Acidic soil   c) Neutral soil   d) None

Ans : (b) Acidic soil

59. Citrus fruits required slightly _____ soil.

a) alkaline   b) acidic   c) neutral   d) None

Ans : (a) alkaline

60. The pH of the mouth saliva falls below _____ .

a) 5.5   b) 5.6   c) 5.7   d) 5.8

Ans : (a) 5.5

61. The pH of the stomach fluid is approximately _____ .

a) 2.0   b) 2.1   c) 2.5   d) 2.4

Ans : (a) 2.0

62. In which acid is secreted in our stomach?

a) Hydrochloric acid   b) Sulphuric acid   c) Nitric acid   d) Citric acid

Ans : (a) Hydrochloric acid

63. Toothpastes are generally _____ .

a) Acidic   b) basic   c) both   d) none

Ans : (b) basic

64. The term pH means power of _____ .

a) Hydrogen   b) Hydroxyl   c) both   d) none

Ans : (a) Hydrogen

65. Pure water is a _____ electrolyte.

a) weak   b) strong   c) either a or b   d) neither a nor b

Ans : (a) weak

66. _____ gives an insoluble salt as the product.

a) decomposition   b) precipitation   c) either a or b   d) neither a nor b

Ans : (b) precipitation

Additional – Fill in the blanks

1. Plants grow by absorbing nutrients from the Earth and get their food by _____ . **Ans :** Photosynthesis
2. Oxidation of Iron causes _____ . **Ans :** Rusting
3. Bond breaking _____ energy. **Ans :** absorbs
4. Bond formation _____ energy. **Ans :** releases
5. $CH_4 + +O_2 \rightarrow$ _____ . **Ans :** $CO_2 + H_2O$
6. _____ states that matter cannot be created or destroyed. **Ans :** The law of conservation of mass
7. Symbol (S) denoted as _____ . **Ans :** Solid
8. Symbol (l) denoted as _____ . **Ans :** liquid
9. Symbol (g) denoted as _____ . **Ans :** gas

10. Symbol (aq) denoted as _____. **Ans :** aqueous solution

11. Sulphur reacts with oxygen to give _____. **Ans :** Sulphur dioxide

12. Silica is react with Calcium oxide to give _____. **Ans :** Calcium silicate

13. A _____ is decomposed into two elements. Mercury oxide → Mercury + oxygen **Ans :** compound

14. In thermal decomposition reaction, heat is supplied to break the bonds. Such reactions inwhich heat is absorbed are called _____. **Ans :** Endothermic reactions

15. A compound (NaCl) is converted into elements (Na and Chlorine) so it is a type of compound to _____ decomposition. **Ans :** element/element

16. The decompostion is caused by light, this kind of reaction is also called _____. **Ans :** Photolysis

17. When two compounds react if their ions are interchanged, then the reaction is called _____.
Ans : double displacement reaction

18. Precipitate is a _____ compound. **Ans :** insoluble

19. When lead nitrate is react with Potassium iodide to give yellow precipitate of _____ is formed.
Ans : Lead iodide

20. _____ is used for domestic cooking purposes. **Ans :** LPG

21. _____ is a mixture of hydrocarbon gases like _____, _____ and _____ etc.
Ans : LPG, Propane, Butane, Propylene

22. _____, then it is said to be exothermic reaction. **Ans :** Heat is evolved

23. _____ may be called as an exothermic oxidation. **Ans :** Combustion

24. On recharging the mobile, these chemical reactions are reserved _____. **Ans :** Reversed

25. On discharging the mobile, these chemical reactions are irreserved _____. **Ans :** Irreversed

26. The reaction that cannot be reversed is called _____. **Ans :** irreversible reaction

27. The negative sign indicates the _____ in the concentration of A with time. **Ans :** decrease

28. The positive sign indicates the _____ in the concentration of B with time. **Ans :** increase

29. Changing the amount of the reactants also _____ the reaction rate. **Ans :** increase

30. The amount of the substance present in a certain volume of the solutions is called _____.
Ans : Concentration

31. Most of the reactions go faster at _____ temperature. **Ans :** higher

32. Food kept at room temperature spoils _____ than that kept in refrigerator. **Ans :** faster

33. In the refrigerator, the temperature is _____ than the room temperature and hence the reaction rate is _____. **Ans :** lower, less

34. If the reactants are gases, _____ their pressure _____ the reaction rate.
Ans : increasing, increases

35. The substances which _____ the reaction rate, the Catalyst also increases. **Ans :** increases

36. Catalyst means to _____ the chemical reaction. **Ans :** speed up

37. Concentration of the reactants _____, the concentration of the products _____.
Ans : decreases, increases

38. In chemical equilibrium the reaction is takes place in _____. **Ans :** closed vessel

39. In physical equilibrium the reaction is takes place in _____. **Ans :** open vessel

40. _____ contain dissolved CO_2 in a pop bottle. **Ans :** Aerated soft drinks

41. Ionic product of water is denoted as _____. **Ans :** Kw

42. The value of ionic product of water is _____. **Ans :** 1.00×10^{-14}

43. The 'p' in pH stands for power of _____ion concentration. **Ans :** hydrogen

44. The pH is the negative logarithm of the _____ concentration.   **Ans :** hydrogen ion

45. pH of Milk of Magnesia is _____.   **Ans :** 10

46. The pH of a solution can be determined by using a _____.   **Ans :** Universal indicator

47. If the pH of rain water is less than 7 is called _____.   **Ans :** Acid rain

48. _____ is the negative logarithm of the hydroxyl ion concentration.   **Ans :** pOH

49. _____ is a strong base.   **Ans :** NaOH

50. Electrolytic decompostion reaction may occur in the presence of _____.   **Ans :** heat or light

51. Plants grow by absorbing nutrients from the Earth and get their food by _____.   **Ans :** Photosynthesis

52. Oxidation of iron causes _____.   **Ans :** Rusting

53. Burning of petrol , the hydrocarbons present in it are converted into _____ and _____.   **Ans :** Carbondioxide and water

54. Bond breaking _____ energy.   **Ans :** Absorbs

55. Bond formation _____ energy.   **Ans :** Releases

56. $CH_4 + O_2$ _____ $\rightarrow CO_2 +$ _____.   **Ans :** H_2O

57. The compounds or elements, which undergo reactions (reactants) are shown to the _____ an arrow and the compounds formed are shown to the _____ of the arrow.   **Ans :** Left, right

58. The arrow indicates the _____ of the reaction.   **Ans :** direction

59. _____ states that matter cannot be created or destroyed.   **Ans :** The law of conservation of mass

60. A combination reaction is otherwise called as _____.   **Ans :** composition reaction

61. Sulphur reacts with oxygen to give _____.   **Ans :** Sulphur dioxide

62. Silica reacts with calcium oxide to give _____.   **Ans :** Calcium Silicate

63. A _____ is decomposed into 2 elements.   **Ans :** Compound

64. Element + Element _____ $\rightarrow$ _____.   **Ans :** Compound

65. Compound + Element _____ $\rightarrow$ _____.   **Ans :** Compound

66. Compound + Compound _____ $\rightarrow$ _____.   **Ans :** Compound

67. _____ is the opposite of the combination reaction.   **Ans :** Decomposition

68. Breaking of bonds is the major phenomenon in a _____ reaction.   **Ans :** Decomposition

69. A solution of _____ is used for white washing walls.   **Ans :** Slaked lime

70. Calcium hydroaxide reacts slowly with the carbondioxide in air to form a thin layer of _____ on the walls.   **Ans :** calcium carbonate.

71. Chemical formula for marble is also _____.   **Ans :** Calcium Carbonate($CaCO_3$)

72. The molecule is dissociated by the absoption of heat , it is otherwise called as _____.   **Ans :** Thermolysis

73. Thermal decomposition reaction is otherwise known as _____.   **Ans :** Endothermic reaction

74. A compound NaCl is converted into elements. So it is a type of compound to _____ decomposition.   **Ans :** Element/element

75. Sodium chloride decomposes into metallic sodium and chlorine gas .This process is termed as _____.   **Ans :** Electrolysis

76. Photo decomposition reactions are otherwise known as _____.   **Ans :** Photolysis

77. _____ and _____ metals displaces hydrogen gas from hydrochloric acid.   **Ans :** silver and zinc

78. When two compounds react if their ions are interchanged, then the reaction is called _____.   **Ans :** double displacement reaction

79. Double displacement reaction is otherwise known as _____.   **Ans :** Metathesis reaction

80. Double displacement reaction takesplace one of the products must be a _____ or water.

Ans : precipitate

81. When Aqueous solutions of two compounds are mixed , if they react to form an insoluble compound and a soluble compound then it is called _____.   **Ans :** Precipitation reaction

82. Precipitate is a _____ compound.   **Ans :** insoluble

83. Whenleadnitrateis react with potassium iodide to give yellow precipitate of _____ is formed.

Ans : Lead Iodide

84. The reaction between an acid and base is known as _____ reaction.   **Ans :** Neutralisation

85. Acid + Base _____ → _____ + water.   **Ans :** Salt

86. A combustion reaction is one in which the reactant rapidly combines with oxygen to form one or more _____ and energy   **Ans :** Oxides

87. In combustion reactions, one of the reactants must be _____.   **Ans :** Oxygen

88. Combustion reactions are majorly used as _____ sources in many of our day to day activities.

Ans : Heat energy

89. _____ gas for domestic cooking purposes.   **Ans :** LPG

90. _____ is a mixture of hydrocarbon gases like propane, butane and propylene.   **Ans :** LPG

91. Heat is _____, then it is said to be exothermic reaction.   **Ans :** Evolved

92. _____ may be called as an exothermic oxidation.   **Ans :** Combustion

93. _____ is an example of combustion reaction in our body.   **Ans :** Digestion of food

94. _____ changes can be reversed easily.   **Ans :** physical

95. _____ changes cannot be reversed easily.   **Ans :** Chemical

96. On _____ the mobile these chemical reactions are reversed.   **Ans :** Recharging

97. On _____ the mobile these chemical reactions are irreversed.   **Ans :** discharging

98. The chemical reactions are grouped into two catagories like _____ and _____.

Ans : reversible , irreversible

99. The reaction that can be reversed is called _____ reaction.   **Ans :** Reversible

100. A _____ reaction is represented by a double arrow with their heads in the direction opposite to each other.   **Ans :** Reversible

101. The compound AB undergoes decomposition to form the products A and B. it is the _____ reaction.

Ans : Forward

102. As soon as the products are formed, they combined together to form AB. It is the _____ reaction

Ans : Backward

103. In reversible both the reactions are taken place _____.   **Ans :** simultaneously

104. In reversible reactions, the speed of the reaction is _____.   **Ans :** same

105. If hydrogen peroxide is poured on a wound it decomposes into _____ and _____.

Ans : water , Oxygen

106. The gaseous oxygen bubbles away as it is formed and thus prevent the formation of _____.

Ans : Hydrogenperoxide

107. The reaction that cannot be reversed is called _____ reaction.   **Ans :** irreversible

108. The irreversible reactions are _____.   **Ans :** Unidirectional

109. The irreversible reactions are takes place only in the _____ direction.   **Ans :** forward

110. The combustion of coal into carbon di oxide and _____.   **Ans :** water

111. Reversible reactions attains _____.   **Ans :** Equilibrium

112. In irreversible reactions _____ is not attained.   **Ans :** Equilibrium

113. In reversible reactions, the reactants cannot be converted completely into _____.   **Ans :** Products

114. In _____ reactions, the reactants can be converted into products.   **Ans :** Irreversible

115. Give an example of slow reaction.   **Ans :** Rusting of iron

116. Give an example of fast reaction.   **Ans :** Burning of petrol

117. The negative sign indicates the _____ in the concentration of A with time.   **Ans :** decreases

118. The positive sign indicates the _____ in the concentration of B with time.   **Ans :** Increases

119. [ ] represents the _____.   **Ans :** concentration

120. d represents the infinitesimal change in the _____.   **Ans :** concentration

121. Most of the reactions go faster at _____ temperature.   **Ans :** Higher

122. Food kept at room temperature spoils _____ than that kept in the refrigerator.   **Ans :** faster

123. In the refrigerator, the temperature is _____ than the room temperature and hence the reaction rate is _____.   **Ans :** lower, less

124. If the reactants are gases increasing their pressure _____ the reaction rate.   **Ans :** increases

125. The substance which increases the reaction rate the catalyst also.   **Ans :** increases

126. _____ means to speed up the chemical reaction.   **Ans :** Catalyst

127. Concentration of the reactants decreases the concentration of the products _____.   **Ans :** increases

128. Hydrochloric acid is a _____ acid than acetic acid and thus more reactive.   **Ans :** Stronger

129. The amount of the substance present in a certain volume of the solution is called _____.   **Ans :** concentration

130. Granulated _____ reacts faster with 2M hydrochloric acid than IM Hydrochloric acid.   **Ans :** Zinc

131. Most of the reactions go _____ at higher temperature.   **Ans :** Faster

132. Calcium carbonate reacts _____ with hydrochloric acid at room temperature.   **Ans :** slowly

133. The reaction mixture is heated the reaction rate _____.   **Ans :** Increases

134. If the reactants are gases, increasing their pressure increase the _____.   **Ans :** reaction rate

135. On increasing the pressure the reacting particles come _____ and collide frequently.   **Ans :** closer

136. A _____ is a substance which increases the reaction rate.   **Ans :** Catalyst

137. On heating potassium chlorate, it decomposes into _____ and _____ gas.   **Ans :** potassium chloride and oxygen

138. When solid reactants are involve in a reaction their _____ form react more readily.   **Ans :** powdered

139. Powdered calcium carbonate reacts more readily with hydrochloric acid than _____.   **Ans :** Marble chips

140. Powdering of the reactants increases the surface area increases as well as rate of the reaction also _____.   **Ans :** Increases

141. In chemical equilibrium the reaction is takes place in _____.   **Ans :** closed vessel

142. In physical equilibrium the reaction is takes place in _____.   **Ans :** open vessel

143. At equilibrium, The rate of forward reaction is equal to rate of _____ reaction.   **Ans :** backward

144. _____ contain dissolved carbondioxide in a pop bottle.   **Ans :** Aerated soft drinks

145. Aerated soft drinks, the gaseous carbondioxide is react with water to form _____.   **Ans :** carbonic acid

146. _____ is a non-conductor of electricity.   **Ans :** pure water

147. Self ionization or auto ionization is a reaction in which two molecules react to give _____.   **Ans :** ions

148. The _____ gets dissolved in water forming the hydronium ions.   **Ans :** proton

149. The hydronium ion formed is a _____ Acid and the _____ Is a strong base.

   Ans : Strong ; hydroxyl ion

150. The product of the concentration of the hydronium ion and the hydroxyl ion is called _____.

   Ans : Ionic product of water

151. Ionic product of water is denoted as _____.   **Ans :** Kw

152. The value of ionic product of water is _____.   **Ans :** 1.00×10^{-14}

153. Its unit is of ionic product of water _____.   **Ans :** $mol^2 dm^{-6}$

154. All the aqueous solutions may contain hydrogen and hydroxyl ions due to _____.

   Ans : ionization of water

155. The concentration of these ions decides whether the solution is acidic or _____.   **Ans :** basic

156. PH scale is a scale for measuring the _____ concentration in a solution.   **Ans :** Hydrogen ion

157. The p in PH stands for _____ in german meaning _____.   **Ans :** Potenz, power

158. PH notation was devised by the _____.   **Ans :** Danish biochemist Sorensen

159. PH scale is a set of numbers from _____ which is used to indicate whether a solution is acidic, basic or neutral.   **Ans :** 0 to 14

160. Acids have pH _____ 7.   **Ans :** less than

161. Bases have pH _____ 7.   **Ans :** Greater than

162. A neutral solution has pH _____ 7.   **Ans :** equal to

163. pH of HCl is _____.   **Ans :** 0

164. pH of Stomach acid is _____.   **Ans :** 1

165. pH of lemon juice is _____.   **Ans :** 2

166. pH of Vinegar is _____.   **Ans :** 3

167. pH of Orange is _____.   **Ans :** 3.5

168. pH of Soda and grapes _____.   **Ans :** 4

169. pH of sour milk is _____.   **Ans :** 4.5

170. pH of Fresh Milk is _____.   **Ans :** 5

171. pH of Human Saliva is _____.   **Ans :** 6-8

172. pH of Pure water is _____.   **Ans :** 7

173. pH of Tomato Juice _____.   **Ans :** 4.2

174. pH of Blood plasma _____.   **Ans :** 7.4

175. pH of Egg white _____.   **Ans :** 8

176. pH of Sea water _____.   **Ans :** 8

177. pH of Baking Soda _____.   **Ans :** 9

178. pH of Antacids _____.   **Ans :** 10

179. pH of Ammonia water _____.   **Ans :** 11

180. pH of Lime water _____.   **Ans :** 12

181. pH of Drain Cleaner _____.   **Ans :** 13

182. pH of Caustic Soda 4% (NaOH) _____.   **Ans :** 14

183. pH of Milk of Magnesia _____.   **Ans :** 10

184. pH of Coffee _____.   **Ans :** 5.6

185. pH of a solution can be determined by using a _____.   **Ans :** Universal indicator

186. pH solution contains a mixture of _____.   **Ans :** Dyes

187. A pH paper contains a mixture of _____.   **Ans :** Mixture of indicators

188. pH paper shows a specific _____ at a given pH.   **Ans :** colour

189. A colour guide is provided with the bottle of the indicator or strips of paper impregnated with it, which are called _____.   **Ans :** pH paper strips

190. The test solution is tested with a drop of _____.   **Ans :** Universal indicator

191. Our body works within the pH range at _____.   **Ans :** 7.0 to 7.8

192. pH of blood is ranging from _____.   **Ans :** 7.35 to 7.45

193. The ideal pH for blood is _____.   **Ans :** 7.4

194. Our stomach produces _____.   **Ans :** Hydrochloric Acid

195. It helps in the digestion of food without harming the _____.   **Ans :** Stomach

196. During indigestion the stomach produces too much acid and this causes _____ and irritation.   **Ans :** Pain

197. pH of the stomach fluid is approximately _____.   **Ans :** 2.0

198. pH of the saliva normally ranges between _____.   **Ans :** 6.5 to 7.5

199. White enamel coating of our teeth is _____, the hardest substance in our body.   **Ans :** Calcium Phosphate

200. When the pH of the mouth saliva falls below _____.   **Ans :** 5.5

201. _____, which are generally basic are used for cleaning the teeth that can neutralize the excess acid and prevent tooth decay.   **Ans :** toothpastes

202. In _____ the pH of the soil is very important.   **Ans :** Agriculture

203. Citrus fruits require slightly _____ soil.   **Ans :** Alkaline

204. Sugarcane requires _____ soil.   **Ans :** Neutral

205. The pH of rain water is approximately _____.   **Ans :** 7

206. pH of rain water is less than 7 then its called _____.   **Ans :** Acid rain

207. Pure water is a _____.   **Ans ::** weak electrolyte

208. pOH is the _____ logarithm of the hydroxyl ion concentration.   **Ans :** Negative

209. NaOH is a _____ base.   **Ans :** Strong

210. Electrolytic decomposition reaction may occur in the process of _____ and _____.   **Ans :** Heat and light

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Additional – Match the following

1.
   1. $2\,Na + Cl_2 \rightarrow 2\,NaCl$ (a) Compound → Element + Element.
   2. $PCl_3 + Cl_2 \rightarrow PCl_3$ (b) Element + Element → Compound
   3. $SiO_2 + CaO \rightarrow CaSiO_3$ (c) Compound + Element → Compound
   4. $HgO \rightarrow Hg + O_2$ (d) Compound + Compound → Compound

   Ans :

1	$2\,Na + Cl_2 \rightarrow 2\,NaCl$	b	Element + Element → Compound
2	$PCl_3 + Cl_2 \rightarrow PCl_3$	c	Compound + Element → Compound
3	$SiO_2 + CaO \rightarrow CaSiO_3$	d	Compound + Compound → Compound
4	$HgO \rightarrow Hg + O_2$	a	Compound → Element + Element

2.
   1. $A + B \rightarrow AB$ (a) decomposition reaction
   2. $AB \rightarrow A + B$ (b) combination reaction
   3. $A + BC \rightarrow AC + B$ (c) double displacement reaction
   4. $AB + CD \rightarrow AD + CB$ (d) displacement reaction

Ans :

1	A + B → AB	b	combination reaction
2	AB → A + B	a	decomposition reaction
3	A + BC → AC + B	d	displacement reaction
4	AB + CD → AD + CB	c	double displacement reaction

3.

1.	**Apple**	**(a)**	**Citric acid**
2.	**Lemon & orange**	**(b)**	**Tartaric acid**
3.	**Tarmarind & grapes**	**(c)**	**Oxalic acid**
4.	**Tomato**	**(d)**	**Malic acid**

Ans :

1	Apple	d	Malic acid
2	Lemon & orange	a	Citric acid
3	Tarmarind & grapes	b	Tartaric acid
4	Tomato	c	Oxalic acid

4.

1.	**Vinegar**	**(a)**	**4.2**
2.	**Oranges**	**(b)**	**4**
3.	**Grapes**	**(c)**	**3.5**
4.	**Tomato juice**	**(d)**	**3**

Ans :

1	Vinegar	d	3
2	Oranges	c	3.5
3	Grapes	b	4
4	Tomato juice	a	4.2

5.

1.	**Baking soda**	**(a)**	**12**
2.	**Egg white**	**(b)**	**9**
3.	**Blood plasma**	**(c)**	**8**
4.	**Lime water**	**(d)**	**7.4**

Ans :

1	Baking soda	b	9
2	Egg white	c	8
3	Blood plasma	d	7.4
4	Lime water	a	12

Additional – Find the odd one out

1. **Lime stone, marble, chalk powder, quick lime.**
   Ans : Quick lime is CaO, others are $CaCO_3$.
2. **Acid gives hydroiam ion, bases giveshydroxyl ion, salts gives neutralisation reaction, all alkalies are bases.**
   Ans : All alkalies are bases.
3. **Sour milk, Fresh milk, vinegar and Milk of magnesia.**
   Ans : Milk of magnesia, others are acids.
4. **Lime water, Ammonia water, Baking Soda, Oranges.**
   Ans : Oranges, others are bases.
5. **Egg white, Sea water, Antacids, Human Saliva.**
   Ans : Human saliva, others are bases.

6. **Stomach acid, Tomotojuice , Vinegar, Blood plasma.**

   Ans : Blood plasma, others are acids.

7. **Soda, sour milk, vinegar, coffee.**

   Ans : Coffee, others are below than pH value is 5.

Additional – Assertion and Reason

1. **Assertion :** Orange juice is sour in taste as it is acidic.
   Reason : All acids are sour in taste.
   a) **A is right R is wrong**
   b) **R explain A**
   c) **A is wrong R is right**
   d) **R does not explain A**

   Ans : (b) R explain A

2. **Assertion :** Rusting of iron is an example of slow chemical reaction.
   Reason : Iron is react with air and moisture to form brown colour substance.
   a) **A is right R is wrong**
   b) **R explain A**
   c) **A is wrong R is right**
   d) **R does not explain A**

   Ans : (b) R explains A

3. **Assertion :** Tooth pastes are basic in nature.
   Reason : White enamel coating of our teeth is Calcium phosphate.
   a) **A is right R is wrong**
   b) **R explain A**
   c) **A is wrong R is right**
   d) **R does not explain A**

   Ans : (b) R explains A

4. **Assertion :** The pH of the stomach fluid is 2.0.
   Reason : The pH of the mouth saliva falls is 5.5.
   a) **A is right R is wrong**
   b) **A and R are correct**
   c) **A is wrong R is right**
   d) **R explains A**

   Ans : (b) A and R are correct

5. **Assertion :** Citrus fruits require slightly alkaline soil.
   Reason : Sugarcane not requires any particular soil.
   a) **A is right R is wrong**
   b) **A and R is right**
   c) **A is wrong R is right**
   d) **R explains A**

   Ans : (a) A is right R is wrong

Additional – True or false (If false give the correct statement)

1. **Reduction of iron causes rusting.**

   Ans : False. Oxidation of iron causes rusting.

2. **Old chemical bonds between atoms are broken and new chemical bonds are not formed.**

   Ans : False. Old chemical bonds between atoms are broken and new chemical bonds are formed.

3. **Law of conservation of matter states that matter cannot be created and destroyed.**

   Ans : True.

4. **A small number of chemical reactions are taking place around us everybody.**

   Ans : False. A large number of chemical reactions are taking place around us everybody.

5. **Combination reaction is also known as Synthesis reaction.**

   Ans : True.

6. **Decomposition is the opposite of the double composition reaction.**

   Ans : False. Decomposition is the opposite of the combination reaction.

7. **The molecule is dissociated by the evolution of heat, it is otherwise called thermolysis.**

   Ans : False. The molecule is dissociated by the absorption of heat, it is otherwise called Thermolysis.

8. **The decomposition is caused by light, this kind of reaction is also called Photolysis.**

   Ans : True.

9. **Burning is an example of exothermic reaction.**

   Ans : True.

10. **Weathering of rock is an example of fast reaction.**

    Ans : False. Weathering of rock is an example of slow reaction.

Additional – Short answer questions

1. **Give example for chemical changes.**
   ✦ Digestion.
   ✦ Combustion.
   ✦ Oxidation.

2. **What happens during a chemical reaction?**
   ✦ In a chemical reaction, the atoms of the reacting molecules or elements are rearranged to for new molecules.
   ✦ Bond breaking absorbs energy whereas bond formation releases energy.

3. **Define balanced chemical equation.**
   It is the simplified representation of a chemical reaction which describes the chemical composition, physical state of the reactants and products and the reaction conditions.

4. **How to write the chemical reaction in physical state?**
   When solid Potassium reacts with liquid water, it produces hydrogen gas and Potassium hydroxide gas and Potassium hydroxide solution. All these information of the reaction is given in the chemical equation as shown below.

   $$2 K_{(s)} + 2 H_2 O_{(2)} \rightarrow 2 KOH_{aq} + H_{2(g)}$$
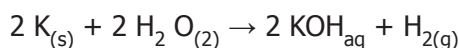
5. **A large number of chemical reactions are taking place around us everyday. Are they taking place in a similary way?**
   No. Each reaction involves different kinds of atoms and hence the way they act also differs.

6. **Write the different types of chemical reactions.**
   ✦ Combination.
   ✦ Decompostion.
   ✦ Single displacement.
   ✦ Double displacement.
   ✦ Combustion reaction.

7. **Write the different types of decomposition reaction.**
   ✦ Thermal decomposition reaction.
   ✦ Electrolytic decomposition reaction.
   ✦ Photo decomposition reaction.

8. **Why does the colour of Copper sulphate change when an iron nail is kept in it? Justify.**
   ✦ Iron is more reactive than Copper. $Fe + CuSO_4 \rightarrow FeSO_4 + Cu$.
   ✦ In this displacement reaction, Iron displaces Copper from $CuSO_4$ solution.
   ✦ Hence, blue colour of the Copper sulphate solution changes into green colour and the Iron nail acquires a brownish colour.

9. **Which of the metals displaces hydrogen gas from hydrochloric acid? Silver or Zinc.**
   Zinc. Because Zinc is more reactive than Silver. So Zinc is react with HCl to produce salt and hydrogen gas.

   $$Zn + 2HCl \rightarrow ZnCl_2 + H_2\uparrow$$
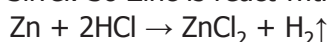
10. Differences between combination and decompositon reaction.

S.No.	Combination Reaction	Decomposition Reaction
1	One or more reactants combine to form a single product.	A single reactant is decomposed to form one or more products.
2	Energy is released.	Energy is absorbed.
3	Elements (or) compounds may be the reactants.	Single compound is the reactant.

11. Which of the following is a combustion.

✦ Digestion of food.

✦ Rusting of iron.

12. What do you mean by exothermic oxidation?

All these hydrocarbon burns with oxygen to form Carbon dioxide and water.

$$C_3 H_8 + O_2 \rightarrow CO_2 + H_2O + Heat$$

Heat is evolved. It is an exothermic reaction. As oxygen is added, it is also an oxidation. So combustion may be called as an exothermic oxidation.

13. Physical changes can be reversed easily. Can chemical changes be reversed?

It is a permanant product is obtained.

14. Can we get back the wood immediately from CO_2 and water?

We cannot. So it is a permanent change.

15. How will our mobile phones recharged and discharged? Justify.

Our mobile phone get energy from its lithium ion battery by chemical reactions. It is called discharging or recharging the mobile, these chemical reactions are reversed. Thus chemical reactions may be reversed under suitable conditions.

16. What happened when hydrogen peroxide is poured on a wound?

If hydrogen peroxide is poured on a wound it decomposes into water and oxygen. The gaseous oxygen pubbles away as it is formed and thus prevent the formation of H_2O_2.

17. Define Rate of a chemical reaction.

Rate of a chemical reaction is the change in the amount or concentration of anyone of the reactants or products per unit time.

Consider the following reaction,

$A \rightarrow B$

The rate of this reaction is given by

$$Rate = -\frac{d\,[A]}{dt} = +\frac{d\,[B]}{dt}$$

where,

[A] = Concentration of A

[B] = Concentration of B

The negative sign indicates the decreasein the concentration of A with time.

The positive sign indicates the increase in the concentration of B with time.

18. Why is reaction rate important?

Faster the reaction, more will be the amount of the product in a specified time. So the rate of the reaction is important for a chemist for designing a process to get a good yield of a product. Rate of reaction is also important for a food processor who hopes toslow down the reactions that cause food to spoil.

19. What is meantby self ionisation or auto ionisation?

Self ionisation (or) autoionisation is a reaction in which two like molecules react to give ions.

$$H_2O + H_2O \ H_3O^+ + OH^-$$

2 H₂O   H₃O   OH⁻
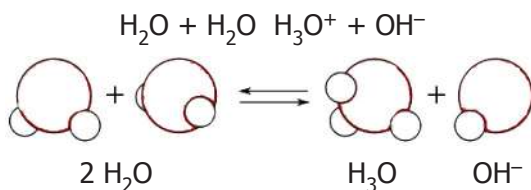
20. What is called Ionic product of water?

The product of the concentration of the hydronium ion and thehydroxyl ion is called Ionic product of water. It is denoted by Kw.

$$Kw = [H_3O^+] \, [OH^-]$$

$[H_3O^+]$ may be simply written as $[H^+]$. Thus the ionic product of water may also be expressed as,

$$Kw = [H^+] \, [OH^-]$$

It's unit is,

$mol^2 \, dm^{-6}$. At 25°C, its value is 1.00×10^{-14}.

21. Write and Tabulate the pH value of some common acids and bases.

Common Acids	pH	Common Bases	pH
HCl (4%)	0	Blood plasma	7.4
Stomach acid	1	Egg white	8
Lemon juice	2	Sea water	8
Vinegar	3	Banking soda	9
Oranges	3.5	Antacids	10
Soda, grapes	4	Ammonia water	11
Sour milk	4.5	Drain cleaner	13
Fresh milk	5	Caustic soda	14
Human saliva	6 – 8	4% NaOH	
Pure water	7	Milk of magnesia	10
Tomato juice	4.2	Coffee	5.6

22. Why is pure water has pH7 at room temperature?

In case of pure water there are always the same concentration of hydrogen ions and hydroxide ions and hence the water is still neutral.

$$pH = pOH = 7.$$

Additional – Long answer questions

1. How are chemical reactions represented?

When methane reacts with oxygen, it forms carbon dioxide and water. How can you represent this reaction? It can be written as a word equation as shown below:

Methane + Oxygen → Carbon dioxide + Water

But, this equation does not give the chemical composition of the reactants and products. So, to learn the characteristics of a chemical reaction, it is represented by a chemical equation. In the chemical equation, the chemicals of the reaction are represented by their chemical formulas.The compounds or elements, which undergo reactions (reactants) are shown to the left of an arrow and the compounds formed (products) are shown to the right of the arrow. The arrow indicates the direction of the reaction. Thus, the aforesaid reaction can be written as follows:

$$CH_4 + O_2 \rightarrow CO_2 + H_2O$$
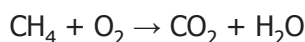
2. Explain Combination reaction.

A combination reaction is a reaction in which two or more reactants combine to form a compound. It is otherwise called 'synthesis reaction' or 'composition reaction'. When a reactant 'A' combines with 'B', it forms the product 'AB'. The generalised scheme of a combination reaction is given below:

$$\boxed{A} + \boxed{B} \longrightarrow A\!\!\!/\!\!\!B$$
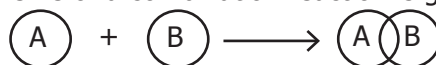
Example: Hydrogen gas combines with chlorine gas to form hydrogen chloride gas.

$$H_{2(g)} + Cl_{2(g)} \quad 2HCl_{(g)}$$
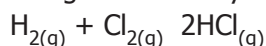
Depending on the chemical nature of the reactants, there are three classes of combination reactions:

✠ **Element + Element → Compound**

In this type of combination reaction, two elements react with one other to form a compound. The reaction may take place between a metal and a non-metal or two non-metals.

Example 1: When solid sulphur reacts with oxygen, it produces sulphur dioxide. Here both the reactants are non-metals.

$$S_{(s)} \quad + \quad O_{2(g)} \quad \rightarrow \quad SO_{2(g)}$$
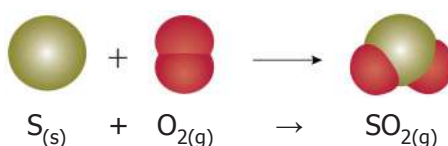
Example 2 : Sodium, a silvery-white metal, combines with chlorine, a pale yellow green gas, to form sodium chloride, an edible compound. Here one of the reactants is a metal (sodium) and the other (chlorine) is a non-metal.

$$2Na_{(s)} + Cl_{2(g)} \rightarrow 2NaCl_{(s)}$$
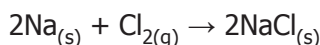
✠ **Compound + Element → Compound**

In this case, a compound reacts with an element to form a new compound. For instance, phosphorous trichloride reacts with chlorine gas and forms phosphorous pentachloride.

$$PCl_{3(l)} + Cl_{2(g)} \rightarrow PCl_{5(s)}$$
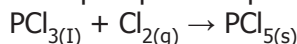
✠ **Compound + Compound → Compound**

It is a reaction between two compounds to form a new compound. In the following reaction, silicon dioxide reacts with calcium oxide to form calcium silicate.

$$SiO_{2(s)} + CaO_{(s)} \rightarrow CaSiO_{3(s)}$$
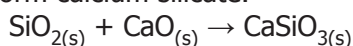
Most of the combination reactions are exothermic in nature. Because, they involve the formation of new bonds, which releases a huge amount of energy in the form of heat.

3. Explain Decomposition reactions.

In a decomposition reaction, a single compound splits into two or more simpler substances under suitable conditions. It is the opposite of the combination reaction. Th e generalised scheme of a decomposition reaction is given below:

$$\boxed{A} - \boxed{A} \longrightarrow \boxed{A} + \boxed{A}$$

Breaking of bonds is the major phenomenon in a decomposition reaction and hence it requires energy to break the bonds, depending on the nature of the energy used in the decomposition reaction.

4. Electrolytic decomposition reaction – explain.

In some of the decomposition reactions, electrical energy is used to bring about the reaction. For example, decomposition of sodium chloride occurs on passing electric current through its aqueous solution. Sodium chloride decomposes in to metallic sodium and chlorine gas. This process is termed as 'Electrolysis'.

$$2NaCl_{(aq)} \xrightarrow{\text{Electricity}} 2Na_{(s)} + Cl_{2(g)}$$

Here, a compound (NaCl) is converted into elements (Na and chlorine). So it is a type of compound to element/element decomposition.

5. Explain Photo decomposition reaction.

Light is an another form of energy, which facilitates some of the decomposition reactions. For example, when silver bromide is exposed to light, it breaks down into silver metal and bromine gas. As the decomposition is caused by light, this kind of reaction is also called 'Photolysis'.

6.   Single displacement reaction – explain.

It is a reaction between an element and a compound. When they react, one of the elements of the compound-reactant is replaced by the element-reactant to form a new compound and an element. The general schematic representation of a single displacement reaction is given as:

$$\text{(A)} + \text{(B)(C)} \longrightarrow \text{(A)(C)} + \text{(B)}$$

Element Compound   Compound Element

'A' displaces element 'B' from the compound 'BC' and hence a single displacement reaction occurs. If zinc metal is placed in hydrochloric acid, hydrogen gas is evolved. Here, hydrogen is displaced by zinc metal and zinc chloride is formed.

$$Zn_{(s)} + 2HCl_{(aq)} \rightarrow ZnCl_{2(aq)} + H_{2(g)}$$
$$Fe_{(s)} + CuSO_{4(aq)} \rightarrow FeSO_{4(aq)} + Cu_{(s)}$$

If an iron nail is placed in an aqueous solution of copper (II) sulphate as shown in above figure, the iron displaces copper from its aqueous solution and the so formed copper deposits over the iron nail.

7.   Explain Irreversible reaction.

The reaction that cannot be reversed is called irreversible reaction. Th e irreversible reactions are unidirectional, i.e., they take place only in the forward direction. Consider the combustion of coal into carbon dioxide and water.

$$C_{(s)} + O_{2(g)} \rightarrow CO_{2(g)} + Heat$$
Coal Oxygen Carbon dioxide

In this reaction, solid coal burns with oxygen and gets converted into carbon dioxide gas and water. As the product is a gas, as soon as it is formed it escapes out of the reaction container. It is extremely hard to decompose a gas into a solid. Thus, the backward reaction is not possible in this case. So, it is an irreversible reaction.

8.   Write the activity series of some elements is given below.

S.No.	To Remember	Activity Series	
1	Please	Potassium (K)	
2	Send	Sodium (Na)	Most reactive
3	Lions	Lithium (L)	
4	Cats	Calcium (Ca)	
5	Monkeys	Magnesuim (Mg)	
6	And	Aluminium (Al)	
7	Zebras	Zinc (Zn)	
8	Into	Iron (Fe)	
9	Lovely	Lead (Pb)	
10	Hot	Hydrogen (H) non–metal	
11	Countries	Copper (Cu)	
12	Signed	Silver (Ag)	
13	General	Gold (Au)	
14	Penguin	Platinum (Pt)	Least reactive

9.   Double decomposition reaction.

i)   Explain Precipitation reaction.

ii)   Explain Neutralisation reaction.

i)   When two compounds react, if their ions are interchanged, then the reaction is called double displacement reaction. The ion of one compound is replaced by the ion of the another compound. Ions of identical charges are only interchanged, i.e., a cation can be replaced by other cations. This reaction is also called

'Metathesis Reaction'. The schematic representation of a double displacement reaction is given below:
Differences between combination and decomposition reactions

Combination Reactions	Decomposition Reactions
One or more reactants combine to form a single product	A single reactant is decomposed to form one or more products
Energy is released	Energy is absorbed
Elements or compounds may be the reactants	Single compound is the reactant

When the clear aqueous solutions of potassium iodide and lead (II) nitrate are mixed, a double displacement reaction takes place between them.

$$Pb(NO_3)_{2(aq)} + 2KI_{(aq)} \rightarrow PbI_{2(s)} \downarrow + 2KNO_{3(aq)}$$
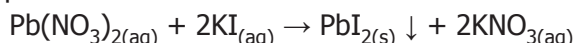
Potassium and lead displace or replace one other and form a yellow precipitate of lead (II) iodide.

ii) In your lower classes, you have learned the reaction between an acid and a base. It is another type of displacement reaction in which the acid reacts with the base to form a salt and water. It is called 'neutralization reaction' as both acid and base neutralize each other.

$$Acid + Base \rightarrow Salt + Water$$
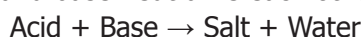
Reaction of sodium hydroxide with hydrochloric acid is a typical neutralization reaction. Here, sodium replaces hydrogen from hydrochloric acid forming sodium chloride, a neutral soluble salt.
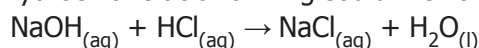
$$NaOH_{(aq)} + HCl_{(aq)} \rightarrow NaCl_{(aq)} + H_2O_{(l)}$$

Similarly, when ammonium hydroxide reacts with nitric acid, it forms ammonium nitrate and water.

$$HNO_{3(aq)} + NH_4OH_{(aq)} \rightarrow NH_4NO_{3(aq)} + H_2O_{(l)}$$
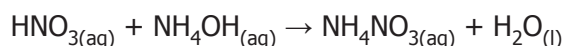
10. Explain Combustion reaction.

A combustion reaction is one in which the reactant rapidly combines with oxygen to form one or more oxides and energy (heat). So in combustion reactions, one of the reactants must be oxygen. Combustion reactions are majorly used as heat energy sources in many of our day to day activities. For instance, we use LPG gas for domestic cooking purposes. We get heat and fl ame from LPG gas by its combustion reaction of its constituent gases. LPG is a mixture of hydrocarbon gases like propane, butane, propylene, etc. All these hydrocarbons burn with oxygen to form carbon dioxide and water.

$$C_3H_{8(g)} + 5O_{2(g)} \rightarrow 3CO_{2(g)} + 4H_2O_{(g)} + Heat$$
Propane
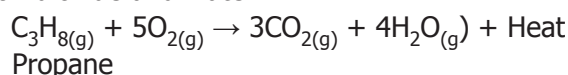
11. Explain Reversible reaction.

A reversible reaction is a reaction that can be reversed, i.e., the products can be converted back to the reactants. A reversible reaction is represented by a double arrow with their heads in the direction opposite to each other. Thus, a reversible reaction can be represented by the following equation:
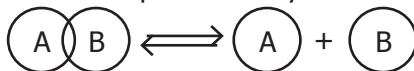
Explanation: Here, the compound 'AB' undergoes decomposition to form the products 'A' and 'B'. It is the forward reaction. As soon as the products are formed, they combine together to form 'AB'. It is the backward reaction. So, the reaction takes place in both the directions. Do you think then that no products are formed in the aforesaid reaction? If you think so, you are wrong. Because, even though the reaction takes place in both the directions, at the initial stage the rates (speed) of these reactions are not equal. Consider the following decomposition reaction of phosphorous pentachloride into phosphorous trichloride and chlorine.

$$PCl_{5(g)} \rightleftharpoons PCl_{3(g)} + Cl_{2(g)}$$

The forward reaction is the decomposition of PCl5 and the backward reaction is the combination of PCl_3 and Cl_2. Initially, the forward reaction proceeds faster than the backward reaction. Aft er sometimes, the speed of both the reactions become equal. So, PCl_5 cannot be completely converted into the products as the reaction is reversed. It is a reversible reaction. Th e actual measurements of the given reaction show that the reaction is at equilibrium, but the amount of PCl_5 is more than that of PCl_3 and Cl_2.

12. Explain the chemical equilibrium in briefly.

Explanation: Initially the rate of the forward reaction is greater than the rate of the backward reaction. However, during the course of reaction, the concentration of the reactants decreases and the concentration of the products increases. Since the rate of a reaction is directly proportional to the concentration, the rate of the forward reaction decreases with time, whereas the rate of the backward reaction increases.

At a certain stage, both the rates become equal. From this point onwards, there will be no change in the concentrations of both the reactants and the products with time. Th is state is called as equilibrium state.

Let us consider the decomposition of calcium carbonate into lime and carbon dioxide. It is a reversible reaction. The speed of each reaction can be determined by how quickly the reactant disappears. If the reaction is carried out in a closed vessel, it reaches a chemical equilibrium. At this stage,

$$CaCO_{3(s)} \rightleftharpoons CaO_{(s)} + CO_{2(g)}$$
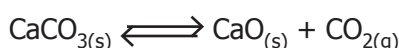
The rate of decomposition of $CaCO_3$ = The rate of combination of CaO and CO_2.

Not only chemical changes, physical changes also may attain equilibrium. When water kept in a closed vessel evaporates, it forms water vapour. No water vapour escapes out of the container as the process takes place in a closed vessel. So, it builds up the vapour pressure in the container. At one time, the water vapour condenses back into liquid water and when the rate of this condensation becomes equal to that of vapourisation, the process attains equilibrium. At this stage, the volume of the liquid and gaseous phases remain constant. Since it is a physical change, the equilibrium attained is called 'Physical Equilibrium'. Physical equilibrium is a state of a physical change at which the volume of all the phases remain unchanged.

$$H_2O_{(l)} \underset{\text{Condensation}}{\overset{\text{Evaporation}}{\rightleftharpoons}} H_2O_{(g)}$$
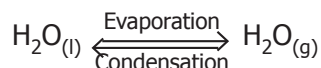
Additional – pH Calculations

1. Calculate the pH of 0.01 M HNO_3?

Solution :

$$
\begin{aligned}
[H^+] &= 0.01 \\
pH &= -\log_{10}[H^+] \\
pH &= -\log_{10}[0.01] \\
pH &= -\log_{10}[1 \times 10^{-2}] \\
pH &= (\log_{10} 1 - 2 \log_{10} 10) \\
pH &= 0 + 2 \times \log_{10} 10 \\
pH &= 0 + 2 \times 1 = 2 \\
pH &= 2.
\end{aligned}
$$

2. The hydroxyl ion concentration of a solution is 1×10^{-9} M. What is the pOH of the solution?

Solution :

$$
\begin{aligned}
pOH &= -\log_{10}[OH^-] \\
pOH &= -\log_{10}[1 \times 10^{-9}] \\
pOH &= -(\log_{10} 1.0 + \log_{10} 10^{-9}) \\
pOH &= -(0 - 9 \log_{10} 10) \\
pOH &= -(0 - 9) \\
pOH &= 9.
\end{aligned}
$$

3. A solution has a pOH of 11.76. What is the pH of this solution?

Solution :

$$
\begin{aligned}
pH &= 14 - pOH \\
pH &= 14 - 11.76 \\
&= 2.24.
\end{aligned}
$$

4.   Calculate the pH of 0.001 molar solution of HCl.

Solution : HCl is a strong acid and is completely dissociated in its solutions according to the process:

$$HCl_{(aq)} \rightarrow H^+{}_{(aq)} + Cl^-{}_{(aq)}$$
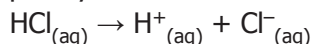
From this process it is clear that one mole of HCl would give one mole of H+ ions. Therefore, the concentration of H+ ions would be equal to that of HCl, i.e., 0.001 molar or 1.0×10^{-3} mol litre^{-1}.

$$\begin{aligned}
\text{Thus, } [H^+] &= 1 \times 10^{-3} \text{ mol litre}^{-1} \\
pH &= -\log_{10}[H^+] = -\log_{10}10^{-3} \\
&= -(-3 \times \log_{10}) = -(3 \times 1) = 3. \\
\text{Thus, pH} &= 3.
\end{aligned}$$

5.   What would be the pH of an aqueous solution of sulphuric acid which is 5×10^{-5} mol litre^{-1} in concentration.

Solution : Sulphuric acid dissociates in water as:

$$H_2SO_{4(aq)} \rightarrow 2\,H^+{}_{(aq)} + SO_4{}^{2-}{}_{(aq)}$$
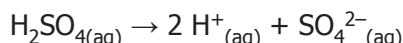
Each mole of sulphuric acid gives two mole of H+ ions in the solution. One litre of H_2SO_4 solution contains 5×10^{-5} moles of H_2SO_4 which would give $2 \times 5 \times 10^{-5} = 10 \times 10^{-5}$ or 1.0×10^{-4} moles of H$^+$ ion in one litre of the solution.

Therefore,

$$\begin{aligned}
[H^+] &= 1.0 \times 10^{-4} \text{ mol litre}^{-1} \\
pH &= -\log_{10}[H^+] \\
&= -\log_{10}10^{-4} \\
&= -(-4 \times \log_{10}10) \\
&= -(-4 \times 1) \\
&= 4.
\end{aligned}$$

6.   Calculate the pH of 1×10^{-4} molar solution of NaOH.

Solution : NaOH is a strong base and dissociates in its solution as:

$$NaOH_{(aq)} \rightarrow Na^+{}_{(aq)} + OH^-{}_{(aq)}$$
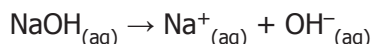
One mole of NaOH would give one mole of OH$^-$ ions. Therefore,

$$\begin{aligned}
[OH^-] &= 1 \times 10^{-4} \text{ mol litre}^{-1} \\
pOH &= -\log_{10}[OH^-] = -\log_{10} \times [10^{-4}] \\
&= -(-4 \times \log_{10}10) = -(-4) = 4 \\
\text{Since, pH} + pOH &= 14 \\
pH &= 14 - pOH = 14 - 4 \\
&= 10.
\end{aligned}$$

7.   Calculate the pH of a solution in which the concentration of the hydrogen ions is 1.0×10^{-8} mol litre^{-1}.

Solution : Here, although the solution is extremely dilute, the concentration given is not of an acid or a base but that of H$^+$ ions. Hence, the pH can be calculated from the relation:

$$\begin{aligned}
pH &= -\log_{10}[H+] \\
\text{given } [H^+] &= 1.0 \times 10^{-8} \text{ mol litre}^{-1} \\
pH &= -\log_{10}10^{-8} = -(-8 \times \log 1010) \\
&= -(-8 \times 1) = 8.
\end{aligned}$$

8.   If the pH of a solution is 4.5, what is its pOH?

Solution :

$$\begin{aligned}
pH + pOH &= 14 \\
pOH &= 14 - 4.5 = 9.5 \\
pOH &= 9.5.
\end{aligned}$$

UNIT TEST - 10

Time : 1.15 Hrs.   Marks : 50

I. Choose the best answer
(5 × 1 = 5)

1. **Photolysis is a decomposition reaction caused by _____.**
   a) heat   b) light   c) electricity   d) mechanical energy
2. **$2Mg + O_2 \rightarrow 2MgO$ is an example of _____.**
   a) combination   b) decomposition   c) displacement   d) double displacement
3. **The chemical name for marble is _____.**
   a) Calcium oxide   b) Calcium carbonate c) Calcium Hydroxide   d) Calcium sulphide
4. **Combustion reaction is otherwise called as _____.**
   a) Exothermic   b) Endothermic   c) either a or b   d) reduction
5. **P^H value of Magnesium Hydroxide is _____.**
   a) 7   b) 8   c) 10   d) 9

II. Fill in the blanks
(5 × 1 = 5)

6. Thermal decomposition reaction is otherwise known as _____.
7. Photo decomposition reactions are otherwise known as _____.
8. Sodium chloride decomposes into metallic sodium and chlorine gas. This process is termed as _____.
9. Double displacement reaction is otherwise known as _____.
10. P^H notation was devised by the _____.

III. State whether the statements are true or false. Correct the false statement
(4 × 1 = 4)

11. Reduction of iron causes rusting.
12. Old chemical bonds between atoms are broken and new chemical bonds are not formed.
13. Combination reaction is also known as Synthesis reaction.
14. The decomposition is caused by light, this kind of reaction is also called Photolysis.

IV. Match the following
(4 × 1 = 4)

15. Lemon Juice   (a)   12
16. Antacids   (b)   4.5
17. Lime water   (c)   2
18. Sour milk   (d)   10

V. Assertion and Reasoning
(3 × 1 = 3)

Direction: In each of the following questions, a statement of Assertion is given and a corresponding statement of Reason is given just below it. Of the statements given below, mark the correct answer as
a.   If both A and R are true and R is the correct explanation of A.
b.   If both A and R are true but R is not the correct explanation of A.
c.   If A is true but R is false.

d.   If both A and R are false.

19. **Assertion:**   Orange juice is sour in taste as it is acidic.
     Reason: All acids are sour in taste.

20. **Assertion:**   Rusting of iron is an example of slow chemical reaction.
     Reason: Iron is react with air and moisture to form brown colour substance.

21. **Assertion:**   The PH of the stomach fluid is 2.0.
     Reason: The PH of the mouth saliva falls is 5.5s.

VI. Write the answer for the following questions in word or sentence

(3 × 1 = 3)

22. Give an example of reversible reaction
23. Give an example of Irreversible reaction
24. Give an example of slow reaction.

VII. Find the odd one out

(3 × 1 = 3)

25. Sour milk, Fresh milk, vinegar and Milk of magnesia.
26. Lime water, Ammonia water, Baking Soda, Oranges.
27. Stomach acid, Tomotojuice , Vinegar, Blood plasma.

VIII. Correct the mistakes

(3 × 1 = 3)

28. Electrolysis is type of combination reaction.
29. Chemical volcano is an example for double displacement reaction.
30. The number of produts formed in a synthesis reaction is 2.

IX. Write the short answer for ANY 5 of the following questions.

(5 × 2 = 10)

31. Differentiate between combination and decomposition reactions.
32. Define combustion reaction.
33. Differentiate between reversible and irreversible reaction.
34. Define rate of a chemical reaction.
35. What are the factors influencing the chemical reactions?
36. Define catalyst.
37. Calculate the P^H of 0.01M HNO_3?

X. Write long answer for the following questions

(2 × 5 = 10)

38. Explain the types of chemical reaction.
        [OR]
39   Explain the various factors influencing the chemical reactions.
40. Explain the Role of P^H in everyday life.
        [OR]
41   What are the characteristics of chemical equilibrium?

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CARBON AND ITS COMPOUNDS

UNIT 11

Points to Remember

➢ A group or class of organic compounds related to each other by a general molecular formula constitutes homologous series.

➢ Th e IUPAC name of the any organic compound consist of three parts. **ROOTWORD, PREFIX and / or SUFFIX**.

➢ Functional group may be defi ned as an atom or group of atom or reactive part which is responsible for the characteristic properties of the compounds.

➢ Ethanoic acid is most commonly known as acetic acid and belongs to a group of acids called carboxylic acids.

➢ Acetic acid is present in many fruits and it renders a sour taste to those fruits.

➢ Ethanol or ethyl alcohol or simply alcohol is one of the most important members of the family of alcohols.

➢ The slow chemical change that takes place in complex organic compounds by the action of enzymes leading to the formation of simple molecules is called fermentation.

➢ Soaps are sodium or potassium salts of some long chain carboxylic acids.

➢ Detergents are sodium salts of sulphonic acids. Thus instead of –COOH group in soaps, detergents contain $-SO_3H$ group.

TEXT BOOK EVALUATION

I. Book Exercise – *Choose the best answer*

1. **The molecular formula of an open chain organic compound is C_3H_6. The class of the compound is _____.**

    a) alkane   b) alkene   c) alkyne   d) alcohol

    Ans : (b) alkene

2. **The IUPAC name of an organic compound is 3-Methyl butan-1-ol. What type compound it is?**

    a) Aldehyde   b) Carboxylic acid   c) Ketone   d) Alcohol

    Ans : (d) Alcohol

3. **The secondary suffix used in IUPAC nomenclature of an aldehyde is _____.**

    a) – ol   b) – oic acid   c) – al   d) – one

    Ans : (c) – al

4. **Which of the following pairs can be the successive members of a homologous series?**

    a) C_3H_8 and C_4H_{10} b) C_2H_2 and C_2H_4 c) CH_4 and C_3H_6 d) C_2H_5OH and C_4H_8OH

    Ans : (a) C_3H_8 and C_4H_{10}

5. **$C_2H_5OH + 3O_2 \rightarrow 2CO_2 + 3H_2O$ is a _____.**

    a) Reduction of ethanol   b) Combustion of ethanol
    c) Oxidation of ethanoic acid   d) Oxidation of ethanal

    Ans : (b) Combustion of ethanol

6. **Rectified spirit is an aqueous solution which contains about _____ of ethanol.**

    a) 95.5%   b) 75.5%   c) 55.5%   d) 45.5%

    Ans : (a) 95.5%

7. Which of the following are used as anaesthetics?

    a) Carboxylic acids   b) Ethers   c) Esters   d) Aldehydes

    Ans : (b) Ethers

8. TFM in soaps represents _____ content in soap.

    a) mineral   b) vitamin   c) fatty acid   d) carbohydrate

    Ans : (c) fatty acid

9. Which of the following statements is wrong about detergents?

    a) It is a sodium salt of long chain fatty acids   b) It is sodium salts of sulphonic acids

    c) The ionic part in a detergent is $-SO_3-Na+$ d) It is effective even in hard water.

    Ans : (a) It is a sodium salt of long chain fatty acids

II. Book Exercise – Fill in the blanks

1. An atom or a group of atoms which is responsible for chemical characteristics of an organic compound is called _____.   **Ans :** Functional group

2. The general molecular formula of alkynes is _____.   **Ans :** C_nH_{2n-2}

3. In IUPAC name, the carbon skeleton of a compound is represented by _____ (root word / prefix / suffix).   **Ans :** root word

4. (Saturated / Unsaturated) _____ compounds decolourize bromine water.   **Ans :** unsaturated

5. Dehydration of ethanol by conc. Sulphuric acid forms _____ (ethene/ ethane).   **Ans :** ethene

6. 100 % pure ethanol is called _____.   **Ans :** absolute alcohol

7. Ethanoic acid turns _____ litmus to _____.   **Ans :** blue, red

8. The alkaline hydrolysis of fatty acids is termed as _____.   **Ans :** Saponification

9. Biodegradable detergents are made of _____ (branched / straight) chain hydrocarbons. **Ans :** straight

III. Book Exercise – Match the following

    1. Functional group –OH   **(a) Benzene**
    2. Heterocyclic   **(b) Potassium stearate**
    3. Unsaturated   **(c) Alcohol**
    4. Soap   **(d) Furan**
    5. Carbocyclic   **(e) Ethene**

    Ans :

1	Functional group –OH	c	Alcohol
2	Heterocyclic	d	Furan
3	Unsaturated	e	Ethene
4	Soap	b	Potassium stearate
5	Carbocyclic	a	Benzene

IV. Book Exercise – Assertion and Reason

Answer the following questions using the data given below:

    i) A and R are correct, R explains the A.

    ii) A is correct, R is wrong.

    iii) A is wrong, R is correct.

    iv) A and R are correct, R doesn't explains A.

1. Assertion: Detergents are more effective cleansing agents than soaps in hard water.

    Reason: Calcium and magnesium salts of detergents are water soluble.

    Ans : (i) A and R are correct, R explain the A

2. **Assertion:** Alkanes are saturated hydrocarbons.
   Reason: Hydrocarbons consist of covalent bonds.

   Ans : (iv) A and R are correct, R doesn't explains A

V. Book Exercise – Short answer questions

1. **Name the simplest ketone and give its structural formula.**
   Acetone.
   Structure : $CH_3 - C - CH_3$
                            $\parallel$
                            O

2. **Classify the following compounds based on the pattern of carbon chain and give their structural formula:**
   i) **Propane.**
      $CH_3 - CH_2 - CH_3$.
      Structural formula :

      ```
           H   H   H
           |   |   |
       H – C – C – C – H          A cyclic compound
           |   |   |
           H   H   H
      ```

   ii) **Benzene.**
      $C_6 H_6$.
      Structural formula :

      Aromatic compound

   iii) **Cyclobutane.**
      $C_4 H_8$.
      Structural formula :

      ```
           H   H
           |   |
       H – C – C – H
           |   |
       H – C – C – H          Alicyclic compound
           |   |
           H   H
      ```

   iv) **Furan.**
      $C_4 H_4 O$.
      Structural formula :

      Hetrocyclic compound

3. **How is ethanoic acid prepared from ethanol? Give the chemical equation.**
   Ethanoic acid is prepared in large scale, by the oxidation of ethanol in the presence of alkaline potassium permanganate or acidified potassium dichromate.

   $$CH_3CH_2OH \xrightarrow[2(O)]{KMnO_4/OH^-} CH_3COOH + H_2O$$
   Ethanol   Ethanoic Acid

4. **How do detergents cause water pollution? Suggest remedial measures to prevent this pollution?**
   Detergents also add another problem for aquatic life by lowering the surface tension of the water. Phosphates in detergents can lead to fresh water algal blooms that releases toxins and deplete oxygen in waterways. When the algae decompose, they use up the oxygen available for aquatic life.
   Remedial Measures :
   ✦ Immediate reduction and evetual eradication of phosphates in detergents.

✦ Awareness among consumers to select washing products with the least amount of polluting ingredients.

✦ Prompt promulgation of regulations requiring appropriate labelling of detergent packages listing of the ingredients and information about use of detergents in soft and hard water.

5. Differentiate soaps and detergents.

S.No.	Soap	Detergents
1	It is a Sodium salt of long chain fatty acids.	It is sodium salts of sulphonic acids
2	The ionic part of a soap is $-COO^-Na^+$	The ionic part in a detergent $-SO_3^-Na^+$
3	It is prepared from animal fats (or) vegetable oils.	It is prepared from hydrocarbons obtained from crude oil.
4	It forms a scum in hard water.	Does not form a scum in hard water.
5	It has poor foaming capacity.	It has rich foaming capacity.
6	Soaps are biodegradable.	Most of the detergents are non–biodegradable.

VI. Book Exercise – Long answer questions

1. What is called homologous series? Give any three of its characteristics?

Homologous series : is a group or a class of organic compounds having same general formula and similar chemical properties in which the successive members differ by a - CH_2 group.

Characteristics of Homologous series :

✦ Each member of the series differs from the preceding or succeeding member by one methylene group ($-CH_2$) and hence by a molecular mass of 14 amu.

✦ All members of a homologous series contain the same elements and functional group.

✦ They are represented by a general molecular formula. e.g. Alkanes, C_nH_{2n+2}.

✦ The members in each homologous series show a regular gradation in their physical properties with respect to their increase in molecular mass.

✦ Chemical properties of the members of a homologous series are similar.

✦ All the members can be prepared by a common method.

2. Arrive at, systematically, the IUPAC name of the compound: $CH_3-CH_2-CH_2-OH$.

Step 1 : The parent chain consists of 3 carbon atoms. The root word is 'prop'.

Step 2 : There are single bonds between the carbon atoms of the chain. So the primary suffix is 'ane'.

Step 3 : Since the compound contains –OH group, it is an alcohol. The carbon chain is numbered from the end which is closest to –OH group (Rule 3), $C^3H_3 - C^2H_2 - C^1H_2 - OH$.

Step 4 : The locant number of –OH group is 1 and thus the secondary suffix is 1–ol. The name of the compound is prop+ane + (1–01) = propan–1–ol.

NOTE : Terminal 'e' of 'ane' is removed as per Rule 5.

3. How is ethanol manufactured from sugarcane?

Ethanol is manufactured in industries by the fermentation of molasses, which is a by product obtained during the manufacture of sugar from sugarcane. Molasses is a dark coloured synopy liquid left after the crystallisation of sugar from the concentrated sugarcane juice. Molasses contain about 30% of sucrose, which cannot be separated by crystallisation. It is converted into ethanol by the following steps.

i) **Dilution of Molasses :**

Molasses is first diluted with water to bring down the concentration of sugar to about 8 to 10 percent.

ii) **Addition of Nitrogen source :**

Molasses usually contains enough nitrogenous matter to act as food for yeast during the fermentation process. If the nitrogen content of the molasses is poor, it may be fortified by the addition of ammonium sulphate or ammonium phosphate.

iii) **Addition of Yeast :**

The solution obtained in step (ii) is collected in large 'fermentation tanks' and yeast is added to it. The

mixture is kept at about 303K for a few days. During this period, the enzymes invertase and zymase present in yeast, bring about the conversion of sucrose into ethanol.

$$C_{12}H_{22}O_{11} + H_2O \xrightarrow{\text{invertase}} C_6H_{12}O_6 + C_6H_{12}O_6$$

Sugar   glucose   fructose

$$C_6H_{12}O_6 \xrightarrow{\text{zymase}} 2C_2H_5OH + 2\ CO_2$$

glucose or fuctose   ethanol
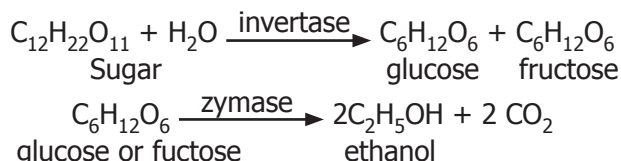
The fermented liquid is technically called wash.

iv) **Distillation of 'Wash' :**

The fermented liquid (i.e. wash), containing 15 to 18 percent alcohol, is now subjected to fractional distillation. The main fraction drawn is an aqueous solution of ethanol which contains 95.5% of ethanol and 4.5% of water. This is called rectified spirit. This mixture is then refluxed over quicklime for about 5 to 6 hours and then allowed to stand for 12 hours. On distillation of this mixture, pure alcohol (100%) is obtained. This is called absolute alcohol.

4. Give the balanced chemical equation of the following reactions:
   i) Neutralization of NaOH with ethanoic acid.

   Ethanoic acid reacts with sodium hydroxide to form sodium ethanoate and water.

$$CH_3\ COO\ \boxed{H + Na}\ OH \rightarrow CH_3\ COONa + H_2O$$
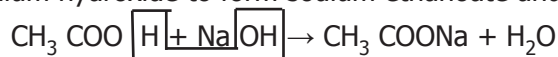
   ii) Evolution of carbon dioxide by the action of ethanoic acid with $NaHCO_3$.

   Ethanoic acid reacts with sodium bicarbonate to give salt, water and carbon dioxide gas.

$$CH_3\ COO\boxed{H + Na}\ H\boxed{CO}_3 \rightarrow CH_3\ COONa + CO_2 \uparrow + H_2O$$
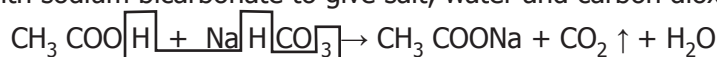
   iii) Oxidation of ethanol by acidified potassium dichromate.

   Ethanol is oxidised to ethanoic acid with alkaline $KMnO_4$ or acidified $K_2Cr_2O_7$.

$$CH_3\ CH_2\ OH \xrightarrow[2(O)]{K_2Cr_2O_7\ /\ H^+} CH_3\ COOH + H_2O$$

   Ethyl alcohol   Acetic acid
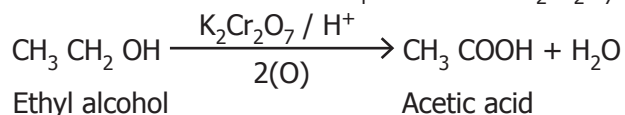
   iv) Combustion of ethanol.

   Ethanol is highly inflammable liquid. It burns with oxygen to form carbon dioxide and water.

$$C_2\ H_5\ OH + 3O_2 \rightarrow 2\ CO_2 + 3H_2O$$

   Ethanol   Carbon dioxide
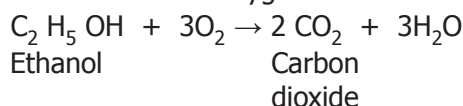
5. Explain the mechanism of cleansing action of soap.
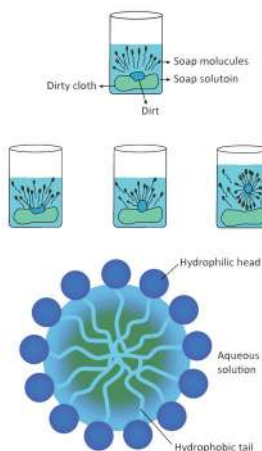
A Soap molecule contains two chemically distinct parts that interact differently with water. It has one polar end, which is a short head with a carboxylate group (–COONa) and one non–polar end having the long tail made of the hydrocarbon chain.

The polar end is hydrophilic (water loving) in nature and this end is attracted towards water. The non–polar end is hydrophobic (water hating) in nature and it is attracted towards water. Thus, the hydrophobic part of the group molecule traps the dirt and the hydrophilic part makes the entire molecule soluble in water.

When a soap (or) detergent is dissolved in water, the molecules join together as clusters called micelles. Their long hydrocarbon chains attach themselves to the oil and dirt. The dirt is thus surrounded by the non–polar end of the soap molecules as shown below. The changed carboxylate end of the soap molecules makes the micelles soluble in water. Thus. the dirt is washed away with the soap.

VII. Book Exercise – HOT question

1. **The molecular formula of an alcohol is $C_4H_{10}O$. The locant number of its –OH group is 2.**
    i)   **Draw its structural formula.**

$$
\begin{array}{cccc}
1 & 2 & 3 & 4 \\
CH_3 - CH & - CH_2 & - CH_3 \\
 & | \\
 & OH
\end{array}
$$
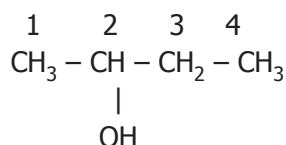
    ii)   **Give its IUPAC name.**
        2 – butanol.
    iii) **Is it saturated or unsaturated?**
        Saturated (C – C single bond).

2. **An organic compound 'A' is widely used as a preservative and has the molecular formula $C_2H_4O_2$. This compound reacts with ethanol to form a sweet smelling compound 'B'.**
    i)   **Identify the compound 'A'.**
        Ethanoic acid.
    ii)   **Write the chemical equation for its reaction with ethanol to form compound 'B'.**
        Ethyl Ethanoate.
    iii) **Name the process.**
        Esterification.

$$
\underset{\text{Ethanol}}{CH_3\,CH_2\,\boxed{OH}} + \underset{\text{Acetic acid}}{CH_3\,COO\,\boxed{H}} \xrightarrow{H^+} \underset{\text{Ethyl ethanoate}}{CH_3\,CH_2\,COOCH_3} + H_2O
$$
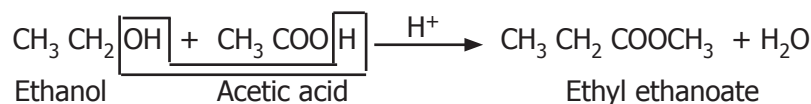
Additional – Choose the best answer

1. **All organic compounds are made up of _____ bonds.**
    a) Ionic   b) Covalent   c) Isomerism   d) None of the above
    Ans : (b) Covalent

2. **_____ are highly inflammable in nature.**
    a) Organic compounds   b) Inorganic compounds   c) metalic compounds   d) non metalic compounds
    Ans : (a) Organic compounds

3. **Organic compounds are classified into _____ types.**
    a) 2   b) 3   c) 4   d) 5
    Ans : (a) 2

4. **Carbon–carbon contain single bond means _____.**
    a) Alkane   b) Alkene   c) Alkyne   d) None
    Ans : (a) Alkane

5. **Carbon–Carbon contain double bond (or) triple bond are called _____.**
    a) Alkane   b) Alkene   c) Alkyne   d) Alkene and Alkyne
    Ans : (d) Alkene and Alkyne

6. **Organic compounds in which the chain of carbon atoms is closed or cyclic are called _____.**
    a) cyclic   b) carbocyclic   c) heterocyclic   d) none

Ans : (a) cyclic

7. **If the chain contains only carbon atoms, such compounds are called _____.**
   a) cyclic   b) carbocyclic   c) heterocyclic   d) none

   Ans : (b) carbocyclic

8. **If the chain contains carbon and other atoms like oxygen, nitrogen sulphur, etc., these compounds are called _____.**
   a) cyclic   b) carbocycli   c) heterocyclic   d) none

   Ans : (c) heterocyclic

9. **Carbocyclic compounds are further subdivided into _____.**
   a) 2   b) 3   c) 4   d) 5

   Ans : (a) 2

10. **Ethane is a example of _____.**
    a) saturated   b) unsaturated   c) carbocyclic   d) alicyclic

    Ans : (a) saturated

11. **Ethene and Ethyne are an example of _____.**
    a) saturated   b) unsaturated   c) carbocyclic   d) alicyclic

    Ans : (b) unsaturated

12. **Cyclobutane is an example of _____.**
    a) saturated   b) unsaturated   c) alicyclic   d) aromatic

    Ans : (c) alicyclic

13. **Pyridine and Furan is an example of _____.**
    a) alicyclic   b) aromatic   c) heterocyclic   d) none

    Ans : (c) heterocyclic

14. **Benzene is an example of _____.**
    a) alicyclic   b) aromatic carbocyclic   c) heterocyclic   d) none of the above

    Ans : (b) aromatic carbocyclic

15. **Hydrocarbons are divided into _____ types.**
    a) 2   b) 3   c) 4   d) 5

    Ans : (b) 3

16. **Emperical formula (or) General formula for alkane is _____.**
    a) CnH_{2n+2} b) CnH_{2n} c) CnH_{2n-2} d) CnH_{2n+1}

    Ans : (a) CnH_{2n+2}

17. **Emperical formula for alkene is _____.**
    a) CnH_{2n+2} b) CnH_{2n} c) CnH_{2n-2} d) CnH_{2n+1}

    Ans : (b) CnH_{2n}

18. **Emperical formula for alkyne is _____.**
    a) CnH_{2n+2} b) CnH_{2n} c) CnH_{2n-2} d) CnH_{2n+1}

    Ans : (c) CnH_{2n-2}

19. **Emperical formula for alkyl is _____.**
    a) CnH_{2n+2} b) CnH_{2n} c) CnH_{2n-2} d) CnH_{2n+1}

    Ans : (d) CnH_{2n+1}

20. **Alcohol is represented by _____.**

    a) R–OH   b) R–CHO   c) R–COOH   d) $R–\overset{\displaystyle O}{\overset{\displaystyle ||}{C}}–R^1$

    Ans : (a) R–OH

21. Aldehyde is represented by _____.

a) R–OH   b) R–CHO   c) R–COOH   d)
$$\underset{R-C-R^1}{\overset{\overset{\textstyle O}{||}}{}}$$
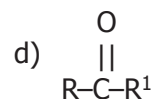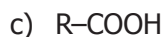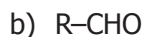
Ans : (b) R–CHO

22. Carboxylic acid is represented by _____.

a) R–OH   b) R–CHO   c) R–COOH   d)
$$\underset{R-C-R^1}{\overset{\overset{\textstyle O}{||}}{}}$$
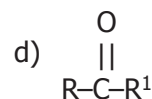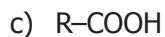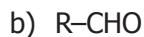
Ans : (c) R–COOH

23. Ketone is represented by _____.

a)
$$\overset{R-C-R^1}{\underset{O}{||}}$$
          b) R–COO–R^1 c) R–O–R   d) none

Ans : (a)
$$\overset{R-C-R^1}{\underset{O}{||}}$$
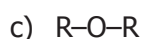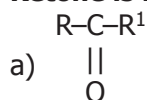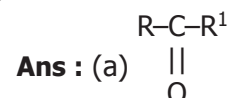
24. Ester can be represented by _____.
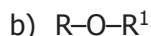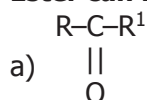
a)
$$\overset{R-C-R^1}{\underset{O}{||}}$$
          b) R–O–R^1 c) R–COOR^1 d) none

Ans : (c) R–COOR^1

25. Ether can be represented by _____.

a) R–OH   b) R–O–R^1 c) R–COOR^1 d) R–COOH
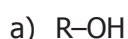
Ans : (b) R–O–R^1

26. _____ represents the nature in carbon to carbon bonding of the parent chain.

a) Prefix   b) Suffix   c) Primary suffix   d) Secondary suffix

Ans : (c) Primary suffix

27. _____ describes the functional group of the compound.

a) Prefix   b) Suffix   c) Primary suffix   d) Secondary suffix

Ans : (d) Secondary suffix

28. Ethanol is commonly known as _____.

a) Alcohol   b) Aldehyde   c) Ketone   d) Ether

Ans : (a) Alcohol

29. All alcoholic beverages are some cough syrups contain _____.

a) Alcohol   b) Aldehyde   c) Ketone   d) Ether

Ans : (a) Alcohol

30. Molasses contain about _____ of sucrose.

a) 30%   b) 40%   c) 50%   d) 60%

Ans : (a) 30%

31. The fermented liquid is technically called _____.

a) wash   b) pure alcohol   c) absolute alochol   d) solution

Ans : (a) wash

32. The fermented liquid containing _____ to _____ percent alcohol.

a) 20 to 21   b) 18 to 19   c) 15 to 18   d) none

Ans : (c) 15 to 18

33. 95.5% of ethanol and 4.5% water is called _____.

a) Rectified spirit   b) Methylated spirit   c) Denatured spirit   d) none

Ans : (a) Rectified spirit

34. **95% of ethanol and 5% of methanol is called _____.**
a) reftified spirit   b) methylated spirit   c) denatured spirit   d) none
Ans : (b) methylated spirit

35. **Ethanol mixed with Pyridine is called _____.**
a) reftified spirit   b) methylated spirit   c) denatured spirit   d) none
Ans : (c) denatured spirit

36. **Mixture of petrol and ethanol is called _____.**
a) reftified spirit   b) power alcohol   c) denatured spirit   d) none
Ans : (b) power alcohol

37. **_____ is a burning taste.**
a) Ethanol   b) Ethanal   c) Ethanoic acid   d) None
Ans : (a) Ethanol

38. **Boiling point of Alcohol is _____.**
a) 351 K   b) 350 K   c) 320 K   d) 310 K
Ans : (a) 351 K

39. **_____ compounds gives fruit smell odour.**
a) Ethanol   b) Ether   c) Ester   d) Acids
Ans : (c) Ester

40. **Ethanol is used as an _____.**
a) Anaesthetic   b) Antiseptic
c) Anaesthetic and antiseptic   d) None
Ans : (b) Antiseptic

41. **_____ is used as an antiseptic to sterilize wounds in hospitals.**
a) Ethanal   b) Ethanol   c) Aldehyde   d) Acids
Ans : (b) Ethanol

42. **The molecular formula for Acetic acid is _____.**
a) $C_2H_4O_2$ b) C_2H_6O c) C_2H_4 d) C_2H_6
Ans : (a) $C_2H_4O_2$

43. **Removal of water is known as _____.**
a) Dehydration   b) Dehydrogenation   c) Decarboxylation   d) Oxidation
Ans : (a) Dehydration

44. **Removal of Hydrogen is known as _____.**
a) Dehydration   b) Dehydrogenation   c) Decarboxylation   d) None
Ans : (b) Dehydrogenation

45. **Removal of CO_2 is known as _____.**
a) Dehydration   b) Dehydrogenation   c) Decarboxylation   d) None of the above
Ans : (c) Decarboxylation

46. **_____ is used as a food additive, a flavoring agent and a preservative.**
a) Acetic acid   b) Propionic acid   c) Bytyric acid   d) Formic acid
Ans : (a) Acetic acid (Ethanoic acid)

47. **_____ is used as a laboratory reagent.**
a) Ethanol   b) Ethanoic acid   c) Formic acid   d) Ethanal
Ans : (b) Ethanoic acid

48. **_____ are stain remover.**
a) Hydrocarbons   b) Alcohols   c) Aldehydes   d) Ketones
Ans : (d) Ketones

49. _____ are Anaesthetic agents and pain killer.

a) Alcohols   b) Aldehydes   c) Ketones   d) Ethers

Ans : (d) Ethers

50. _____ is a sodium salt of sulphonic acids.

a) Fatty acids   b) Detergent

c) Soap   d) Unsaturated compounds

Ans : (b) Detergent

Additional – Fill in the blanks

1. _____ compounds in our day to day life.   **Ans :** carbon
2. The number of carbon compounds found in _____ and _____.   **Ans :** Nature and man made
3. All these compounds are made of _____ compounds.   **Ans :** covalent
4. Organic compounds have a _____ and _____.
    ans: High molecular weight and a complex structure
5. Organic compounds are mostly _____ in water.   **Ans :** insoluble
6. Organic compounds are soluble in organic solvents like _____, _____ and _____.
    Ans : Ether, ccl_4 and toluene
7. Organic compounds are _____ reactive compared to inorganic compounds.   **Ans :** less
8. The reactions are involving organic compounds proceed to _____ rates.   **Ans :** slower
9. Mostly organic compounds form _____ bonds in nature.   **Ans :** Covalent
10. Organic compounds have _____ and _____ point when compared to inorganic compounds.
    Ans : Lower melting and boiling point
11. Organic compounds exhibit the phenomenon of _____.   **Ans :** Isomerism
12. Organic compounds _____ in nature.   **Ans :** volatile
13. _____ can be prepared in the laboratory.   **Ans :** organic compounds
14. Organic compounds is the chemistry of _____ carbon compounds.   **Ans :** catenated
15. Organic compounds are classified into _____ types.   **Ans :** 2
16. If all the carbon atoms in the chain are connected by single bonds, the compound is called as _____.
    Ans : saturated
17. If one or more double bonds or triple bonds exist between the carbon atoms then the compound is said to _____.
    Ans : Unsaturated
18. _____ is an example of saturated.   **Ans :** Propane
19. _____ is an example of Unsaturated.   **Ans :** propene
20. Saturated compounds alkanes are otherwise known as _____.   **Ans :** Paraffins
21. Unsaturated compounds like alkenes are known as _____.   **Ans :** Olifens
22. Organic compounds in which the chain of carbon atom is closed or cyclic are called _____.
    Ans : Cyclic compounds
23. If the chain contains only carbon atoms such compounds are called _____.
    Ans : Carbo cyclic compounds
24. If the chain contains carbon and other atoms like oxygen, nitrogen, Sulphur etc, these compounds are called _____.
    Ans : Heterocyclic
25. Carbocyclic compounds are further subdivided into _____ and _____. **Ans :** alicyclic , aromatic.
26. _____ compounds contain one or more carbocyclic rings which may be saturated or unsaturated.
    Ans : Alicyclic
27. Aromatic compounds contain one or more _____ ring.   **Ans :** Benzene
28. The organic compounds that are composed of only carbon and hydrogen atoms are called _____.
    Ans : Hydrocarbons

29. _____ further subdivided into three classes such as Alkanes, Alkenes and Alkynes.

    Ans : Hydrocarbons

30. _____ are hydrocarbons which contain only single bonds.   **Ans :** Alkanes

31. Alkanes are represented by the general formula _____.   **Ans :** C_nH_{2n+2}

32. The simplest alkane is _____.   **Ans :** Methane

33. The hydrocarbons, which contain one or more C=C bonds are called _____.   **Ans :** Alkenes

34. Alkenes are represented by the general formula _____.   **Ans :** C_nH_{2n}

35. The simplest alkene contains two carbon atoms and is called _____.   **Ans :** Ethylene

36. The hydrocarbon containing carbon to carbon triple bond are called _____.   **Ans :** Alkynes

37. Alkynes are represented by the general formula _____.   **Ans :** C_nH_{2n-2}

38. The simplest alkyne is _____.   **Ans :** Actylene

39. Lower hydrocarbons are _____ at room temperature.   **Ans :** Gases

40. _____ are colourless and odourless.   **Ans :** Hydrocarbons

41. The boiling point of hydrocarbons _____ with an increase in the number of atoms.   **Ans :** Increases

42. Hydrocarbons undergo _____ reaction with oxygen to form CO_2 and water.   **Ans :** Combustion

43. Alkanes are _____ reactive when compared to other classes of Hydrocarbons.   **Ans :** Least

44. Alkynes are _____ reactive due to the presence of the triple bond.   **Ans :** Most

45. Alkanes are _____ whereas _____ and _____ are unsaturated.

    Ans : Saturated, Alkenes, Alkynes

46. _____ are insoluble in water.   **Ans :** Hydrocarbons

47. _____ compounds do not decolourise bromine.   **Ans :** Saturated

48. _____ compounds will decolourise bromine water.   **Ans :** Unsaturated

49. A _____ is an atom or group of atoms in a molecule, which gives its characteristic chemical properties.   **Ans :** Functional group

50. A series of compounds containing the same functional group is called a _____.

    Ans : class of organic compounds

51. Functional group of alcohol is _____.   **Ans :** R-OH

52. Functional group of Aldehyde is _____.   **Ans :** R-CHO

53. Functional group of Ketone is _____.   **Ans :** R-CO-R′

54. Functional group of Acid is _____.   **Ans :** R–COOH

55. Functional group of Ester is _____.   **Ans :** R-COOR

56. Functional group of Ether is _____.   **Ans :** R-O-RI

57. Example of alcohol is _____.   **Ans :** Ethyl alcohol (CH_3CH_2OH)

58. Example of Aldehyde is _____.   **Ans :** Acetaldehyde (CH_3CHO)

59. Example of Ketone is _____.   **Ans :** Acetone (CH_3COCH_3)

60. Example of Acid is _____.   **Ans :** Acetic Acid (CH_3COOH)

61. Example of Ester is _____.   **Ans :** Methyl Acetate (CH_3COOCH_3)

62. Example of Ether is _____.   **Ans :** Dimethyl ether (CH_3OCH_3)

63. _____ is a group or a class of organic compounds having same general formula and similar chemical properties in which the successive members differ by a CH_2 group.   **Ans :** Homologous group

64. All members of a homologous series contain the _____ elements and _____ group.

    Ans : same, functional

65. Chemical properties of the members of homologous series are _____.   **Ans :** similar

66. The _____ acid was initially obtained by distillation of red ants.   **Ans :** Formic

67. Latin name of the red ant is _____.   **Ans :** Formica

68. IUPAC Means _____.   **Ans :** International Union Of Pure and Applied Chemistry

69. Prefix + Root word + Suffix _____ → _____.   **Ans :** IUPAC name

70. The number of carbon atom is 1 then the root word of Hydrocarbon is _____.   **Ans :** Meth-

71. The number of carbon atom is 2 then the root word of Hydrocarbon is _____.   **Ans :** Eth-

72. The number of carbon atom is 3 then the root word of Hydrocarbon is _____.   **Ans :** Prop-

73. The number of carbon atom is 4 then the root word of Hydrocarbon is _____.   **Ans :** But-

74. The number of carbon atom is 5 then the root word of Hydrocarbon is _____.   **Ans :** Pent-

75. The number of carbon atom is 6 then the root word of Hydrocarbon is _____.   **Ans :** Hex-

76. The number of carbon atom is 7 then the root word of Hydrocarbon is _____.   **Ans :** Hept-

77. The number of carbon atom is 8 then the root word of Hydrocarbon is _____.   **Ans :** Oct-

78. The number of carbon atom is 1 then the root word of Hydrocarbon is _____.   **Ans :** Non-

79. The number of carbon atom is 1 then the root word of Hydrocarbon is _____.   **Ans :** Dec-

80. The _____ forms the end of the name.   **Ans :** Suffix

81. Suffix is divided into _____ types.   **Ans :** 2

82. The _____ suffix comes after the root word.   **Ans :** Primary

83. The secondary suffix describes the _____ group.   **Ans :** Functional

84. Number the carbon atoms of the parent chain, beginning at the closest end of the substituent or functional groups. These are called _____.   **Ans :** Locant numbers

85. If both functional group and substituent are present, then the priority will be given to _____.   **Ans :** functional group

86. The name of the compound is 2-methyl+pent+ane = _____.   **Ans :** 2 methyl pentane

87. _____ is commonly known as Alcohol.   **Ans :** Ethanol

88. All alcoholic beverages and some cough syrups contain _____.   **Ans :** Alcohol

89. Molecular formula for ethanol is _____.   **Ans :** C_2H_5OH

90. Ethanol is manufactured in industries by the _____ of molasses, which is a by-product obtained during the manufacture of sugar from sugarcane.   **Ans :** Fermentation

91. _____ is a dark coloured syrupy liquid left after the crystalisation of sugar from the concentrated sugarcane juice.   **Ans :** Molasses

92. Molasses contain about _____ % of sucrose which cannot be separated by crystallization.   **Ans :** 30

93. Molasses is first diluted with water to bring down the concentration of sugar to about _____ to _____.   **Ans :** 8 to 10

94. If the nitrogen content of the molasses is poor. It may be fortified by the addition of _____ and _____.   **Ans :** Ammoiumsulphate or ammonium phosphate

95. Sugar is converted into glucose and fructose in presence of _____.   **Ans :** Invertase

96. Glucose or fructose are converted in to ethanol in presence of _____.   **Ans :** Zymase

97. The fermented liquid is techniacally called as _____.   **Ans :** Wash

98. The fermented liquid containg _____ to _____ percent alcohol is now subjected to fractional distillation.   **Ans :** 15 to 18

99. The main fraction drawn is an aqueous solution of ethanol which contains 95.5% of ethanol and 4.5% of water. This is called _____.   **Ans :** Rectified spirit

100. On distillation of this mixture, pure alcohol is obtained. This is called _____ alcohol.   **Ans :** Absolute

101. _____ are single celled micro organisms belonging to process of fungi.   **Ans :** Yeast

102. _____ is an example of fermentation.   **Ans :** Curdling of milk

103. Ethanol is a _____ liquid.   **Ans :** Colourless

104. Ethanol is having a _____ smell and a _____ taste.   **Ans :** pleasant, burning

105. Ethanol is a _____ liquid.   **Ans :** Volatile

106. Ethanol boiling point is _____.   **Ans :** 351 K

107. Ethane boiling point is _____.   **Ans :** 184 K

108. Ethanol is completely _____ with water in all proportions.   **Ans :** miscible

109. Dehydration means _____.   **Ans :** loss of water

110. Ethanol is heated with conc.H_2SO_4 at 443K it loses a water molecueie. Dehydrated to form _____.
    Ans : Ethene

111. Ethanol reacts with sodium metal to form sodium hydroxide and _____ gas.   **Ans :** Hydrogen

112. Ethanol is oxidized to _____ with alkaline $KMnO_4$ or acidified $K_2Cr_2O_7$.   **Ans :** Ethanoic Acid

113. During oxidation reaction, the orange colour of potassium dichromate changes into _____. This reaction
is used for the identification of alcohols.   **Ans :** green

114. Ethanol is react with ethanoic acid to form _____ and gives a fruit smell odour. **Ans :** Ethyl ethanoate

115. When the vapour of ethanol is passed over heated copper used as a catalyst at 573k it is hydrogenated to
_____.   **Ans :** acetaldehyde

116. Ethanol is highly inflammable liquid. It burns with oxygen to form carbondioxide and _____.
    Ans : water

117. _____ is used in medical wipes.   **Ans :** Ethanol

118. _____ is used as an antiseptic.   **Ans :** Ethanol

119. _____ is used as an anti-freeze in automobile radiators.   **Ans :** Ethanol

120. _____ is used it in many sand sanitizers.   **Ans :** Ethanol

121. _____ is used as an antiseptic to sterilize wounds in hospitals.   **Ans :** Ethanol

122. _____ is used as a solvent for drugs ,oils, fats, perfumes, dyes, etc.   **Ans :** Ethanol

123. A mixture of 95% of ethanol and 5% of Methanol is called _____.   **Ans :** Methylated spirit

124. A mixture of 95.5% of ethanol and 4.5% of water is called _____.   **Ans :** Rectified spirit

125. A mixture of petrol and ethanol is called _____.   **Ans :** power alcohol

126. Ethanol is mixed with pyridine is called as _____.   **Ans :** Denatured spirit

127. Ethanoic acid molecular formula is _____.   **Ans :** $C_2H_4O_2$

128. _____ is a colourless liquid having an unpleasant odour.   **Ans :** Ethanoic acid

129. Ethanoic acid is _____ taste.   **Ans :** Sour

130. On cooling, pure ethanoic acid is frozen to form ice like glaciers. They look like glaciers. So it is called
_____.   **Ans :** Glacial acetic acid

131. Decarboxylation is a removal of _____.   **Ans :** Carbondioxide

132. _____ is a solid mixture of 3 parts of NaOH and 1 part of CaO.   **Ans :** Sodalime

133. _____ is used in the manufacture of plastic.   **Ans :** Ethanoic Acid

134. _____ is used in making dyes, pigments and paint.   **Ans :** Ethanoic Acid

135. _____ is used in printing on fabrics.   **Ans :** Ethanoic Acid

136. _____ as a Laboratory reagent.   **Ans :** Ethanoic Acid

137. _____ is used for coagulating rubber from latex.   **Ans :** Ethanoic acid

138. _____ is used in the production of pharmaceuticals.   **Ans :** Ethanoic acid

139. _____ fuels like LPG, Petrol and kerosene.   **Ans :** Hydrcarbons

140. _____ are used for solvent and an antiseptic agent.   **Ans :** Alcohols

141. _____ as a disinfectant.   **Ans :** Formaldehyde

142. _____ as a solvent.   **Ans :** Ketones

143. _____ as a stain remover.   **Ans :** Ketones

144. _____ as aanesthetic agents.   **Ans :** Ethers

145. _____ as a pain killer.   **Ans :** Ethers

146. All the cooking oils and lipids contain _____.   **Ans :** Esters

147. _____ and _____ are materials that are used by us for cleaning purposes because pure water alone cannot remove all types of dirt or any oily substance from our body or clothes.
                    Ans : Soaps and Detergents

148. Soaps and detergents contain _____ which are compounds with molecules that line up around water to break the surface tension.   **Ans :** Surfactants

149. _____ is a cleaning agent that is composed of one or more salts of fatty acids.   **Ans :** Soap

150. _____ is a chemical compound or a mixture of chemical compounds.   **Ans :** detergents

151. _____ is used as a cleaning agent. They perform their cleaning actions in certain specific conditions.
                    Ans : Detergents

152. Soaps are _____ or _____ salts of long chain carboxylic acids called fatty acids.
                    Ans : Sodium or potassium

153. Soap requires two major raw materials namely _____ and _____.   **Ans :** Fat and Alkali

154. The _____ most commonly used in the preparation of soap is sodium hydroxide.   **Ans :** Alkali

155. _____ can also be used.   **Ans :** Potassium Hydroxide

156. A potassium – based soap creates a more water _____ product than a sodium based soap.
                    Ans : Soluble

157. Soaps, which are prepared by the Saponification of oils and fats with caustic soda are known as _____.   **Ans :** Hard soaps

158. Soaps are usually used for _____ purposes.   **Ans :** washing

159. Soaps, which are prepared by the saponification of oils and fats with potassium salts are known as _____.   **Ans :** Soft soaps

160. _____ are used for cleansing the body.   **Ans :** Soft soaps

161. _____ is the oldest method. It is still widely used in the small scale preparation of soap.   **Ans :** Kettle

162. Manufacture of soap by _____ process.   **Ans :** kettle

163. The oil gets hydrolysed after several hours of boiling . this process is called _____.
                    Ans : Saponification

164. _____ is then added to the boiling mixture.   **Ans :** Common salt

165. After several hours the soap rises to the top of the liquid as a _____.   **Ans :** curdy mass

165. Hard water contains _____ and _____ ions that limit the cleaning action of soap.
                    Ans : Calcium and Magnesium

166. When combined with soap, Hard water develops a thin layer called _____.   **Ans :** Scum

167. Ordinary soaps when treated with hard water, precipitate as salts of _____ and _____.
                    Ans : calcium and Magnesium

168. calcium and magnesim salts are appeared at the surface of the cloth as _____.
                    Ans : Sticky grey scum

169. The soaps cannot be used conveniently in _____ water.   **Ans :** Hard

170. The detergents do not form precipitates with calcium and magnesium present in _____ water.
                    Ans : Hard

171. Development of synthetic detergents is a big achievement in the field of _____   **Ans :** cleansing

172. Detergents are prepared by adding _____ to the processedhydrocarbon obtained from petroleum.
                    Ans : sulphuric acid

173. This chemical reaction result in the formation of molecules similar to the _____ in soap.
                    Ans : Fatty acid

174. An alkali is added to the mixture to produce the _____ which do not bond with the minerals present in the hard water.   **Ans :** Surfacant molecules

175. _____ which prevents the corrosion and ensure that the detergent does not damage the washing machine.   **Ans :** Sodium Silicate

176. _____ whitening agents that give a glow to the clothes.   **Ans :** Fluorescent
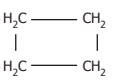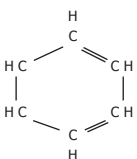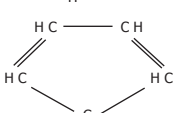
177. Oxygen bleaches such as _____ enable the removal of certain stains from the cloth.
Ans : Sodium perborate

178. _____ is added to prevent the caking of the detergent powder.   **Ans :** Sodium sulphate

179. _____ are added to break down some to break down some stains caused by biological substances like blood and vegetable juice.   **Ans :** Enzymes

180. Certain chemicals that give out a pleasant smell are also added to make the clothes fragrant after they are washed with _____.   **Ans :** Detergents

181. Soap has one _____ which is a _____ with a carboxylate group.   **Ans :** polar end, short head

182. Soap has one _____ having the _____ made of the hydrocarbon chains.
Ans : Non polar end, long tail

183. The polar end is _____ in nature and this end is attracted towards water.   **Ans :** Hydrophilic

184. The non-polar end is _____ in nature and it is attracted towards dirt or oil on the cloth, but not attracted towards water.   **Ans :** Hydrophobic

185. The Hydrophobic part of the soap molecule traps the dirt and the hydrophilic part makes the entire molecule _____ in water.   **Ans :** Soluble

186. When a soap or detergent is dissolved in water the molecules join together as clusters called _____.
Ans : Micelles

187. Long hydrocarbon chains attach themselves to the oil and _____.   **Ans :** dirt

188. The _____ is thus surrounded by the non-polar end of the soap molecules.   **Ans :** dirt

189. The charged carboxylate end of the soap molecules makes the micelles soluble in _____. **Ans :** water

190. Detergents can also be used in _____ and _____ water. Ans: Saline and acidic.

191. Detergents are active emulsifiers of motor _____.   **Ans :** grease

192. Detergents have a linear hydrocarbon chain which is _____.   **Ans :** Biodegradable

193. _____ have straight hydrocarbon chains which can be easily degraded by bacteria.
Ans : biodegradable

194. _____ have branched hydrocarbon chains which cannot be degraded by bacteria.
Ans : non-biodegradable

195. Detergents are relatively _____ expensive than soap.   **Ans :** more

196. Soaps has _____ foaming capacity.   **Ans :** poor

197. Detergents _____ foaming capacity.   **Ans :** rich

198. The ionic part of a soap is _____.   **Ans :** -coo- Na$^+$

199. The ionic part of detergent is _____.   **Ans :** -SO^3 Na$^+$

200. TFM means _____.   **Ans :** Total Fatty Matter

201. Organic compounds have a high _____ and a _____ structure. **Ans :** molecular weight, complex

202. Organic compounds are highly _____ in nature.   **Ans :** inflammable

203. Organic compounds are _____ compared to inorganic compounds.   **Ans :** less reactive

204. Organic compounds have lower _____ point when compared to inorganic compounds.
Ans : melting and boiling

205. Organic compounds exhibit the phenomenon of _____.   **Ans :** Isomerism

206. They are (organic compounds) _____ in nature.   **Ans :** volatile

207. Alkanes are otherwise known as _____.   **Ans :** Paraffins

208. Alkenes are otherwise known as _____.   **Ans :** Olefins

209. Hydrocarbons are _____ in water.   **Ans :** insoluble

210. Formic acid was initially obtained by distillation of _____.   **Ans :** Red ants

211. Latin name of the red ant is _____.   **Ans :** Formica

212. IUPAC means _____.   **Ans :** International Union of Pure and Applied Chemistry

213. Prefix + Root word + Suffix → _____.   **Ans :** IUPAC name

214. _____ are single called micro organisms, belonging to the class of fungi.   **Ans :** Yeasts

215. _____ is an example of Fermentation.   **Ans :** Curding of milk

216. Ethane boiling point is _____.   **Ans :** 184 K

217. _____ is used as a hand sanitizers.   **Ans :** Ethanol

218. _____ is a colourless liquid having an unpleasant adour.   **Ans :** Ethanoic acid

219. _____ is sour in taste.   **Ans :** Ethanoic acid

220. On cooling, pure ethanoic acid is frozen to form ice like flakes. They look like glaciers. So it is called _____.   **Ans :** Glacial acetic acid

221. Sodalime is a mixture of _____.   **Ans :** 3 parts of Sodium hydroxide (NaOH) and 1 part of Calcium oxide (CaO)

222. _____ is used in the manufacture of plastic.   **Ans :** Ethanoic acid

223. _____ is used in printing on fabrics.   **Ans :** Ethanoic acid

224. _____ is used in making dyes, pigments and paint.   **Ans :** Ethanoic acid

225. _____ is used for coagulating rubber from latex.   **Ans :** Ethanoic acid

226. _____ is used in the production of pharmaceuticals.   **Ans :** Ethanoic acid

227. _____ as a disinfectant.   **Ans :** Formaldehyde

228. _____ as a solvent.   **Ans :** Ketones

229. All the cooking oils and lipids contain _____.   **Ans :** Esters

230. _____ and the _____ are materials that are used by us for cleaning purposes.   **Ans :** Soaps, detergents

231. _____ which are compounds with molecules that line up around water to break the _____.   **Ans :** Surfacants, surface tension

232. _____ is a cleansing agent that iscomposed of one or more salts of fatty acids.   **Ans :** Soap

233. _____ is a chemical compound or a mixture of chemical compounds, which is used as a cleansing agent.   **Ans :** Detergent

234. Saponification of oils or fats with caustic soda are known as _____.   **Ans :** hard soap

235. Saponification of oils or fats with pottassium salts are known as _____.   **Ans :** soft soap

236. _____ are sodium (or) potassium salts of some long chain carboxylic acids called fatty acids.   **Ans :** Soaps

237. Manufacture of soap by _____ process.   **Ans :** Kettle

238. Soap has one _____ which is a _____ with a carboxylate group   **Ans :** Polar end, short head

239. Soap has one _____ having the _____ made of the hydrocarbon chains.   **Ans :** Non–polar end, long tail

240. The polar end is _____ (water loving).   **Ans :** hydrophilic

241. The Non–polar end is _____ (water hating).   **Ans :** hydrophobic

242. When a soap or detergent is dissolved in water, the molecules join together as clusters called _____.   **Ans :** micelles

243. Soaps are _____.   **Ans :** Biodegradable

244. Detergents are _____.   **Ans :** Non–biodegradable

245. The ionic part of a soap is _____.   **Ans :** $-COO^- Na^+$

246. The ionic part of a detergent is _____.   **Ans :** $-SO_3^- Na^+$

247. _____ form a scum in hard water.   **Ans :** Soaps

248. _____ does not form a scum in hard water.   **Ans :** Detergents

249. _____ has rich foaming capacity.   **Ans :** Detergents
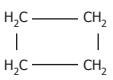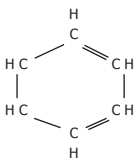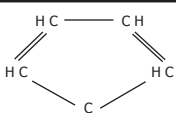
Additional – True or false (If false give the correct statement)

1. **Organic compounds are mostly soluble in water, but insoluble in organic solvents such as Ether, Carbontetra chloride, Toluene, etc.**
   Ans : False. Organic compounds are mostly insoluble in water. But soluble in organic solvents such as Ether, CCl_4 and toluene, etc.

2. **Inorganic compounds can be prepared in the laboratory.**
   Ans : False. Organic compounds can be prepared in the laboratory.

3. **Isomerism exhibits single molecular formula, but differ in their structural formula.**
   Ans : True.

4. **Propylene is the simplest alkyne.**
   Ans : False. Acetylene is the simplest alkyne.

5. **Higher hydrocarbons are gases at room temperature.**
   Ans : False. Lower hydrocarbons are gases at room temperature.

6. **The boiling point of hydrocarbons increases with an decrease in the number of carbon atoms.**
   Ans : False. The boiling point of hydrocarbons increases with an increase in the number of carbon atoms.

7. **Alkanes are saturated whereas alkenes and alkynes are unsaturated.**
   Ans : True.

8. **Saturated compounds do not decolourise bromine.**
   Ans : True.

9. **Acetone is an example of Aldehyde.**
   Ans : False. Acetone is an example of Ketone.

10. **Parent chain of hydrocarbons containing 1 to 6 carbon atoms.**
    Ans : False. Parent chain of hydrocarbons containing 1 to 10 carbon atoms.

11. **Functional group of –CHO is aldohyde.**
    Ans : True.

12. **IUPAC name of CH_3CHO is Acetaldehycle.**
    Ans : False. IUPAC name of CH_3CHO is Ethanal.

13. **The enzymes invertase and amylase present in the yeast, bring about the conversion of sucrose into ethanol.**
    Ans : False. The enzymes invertase and zymase present in the yeast, bring about the conversion of sucrose into ethanol.

14. **Fermentation is conversion of simpler organic molecules into complex molecules by the action of enzymes.**
    Ans : False. Fermentationis conversion of complex organic molecules into simpler molecules by the action of enzymes.

15. **Ethanol is completely immiscible with water in all proportions.**
    Ans : False. Ethanol is completely miscible with water in all proportions.

16. **Sodium salt of ethanoic acid is heatedwith sodalime, alkane is formed.**
    Ans : True.

17. **Potassium based soap creates a more water soluble product than a sodium–based soap.**
    Ans : True.

18. **Hard soaps are used for cleansing the body.**
    Ans : False. Soft soaps are used for cleansing the body.

19. **Kettle process is a new method.**
    Ans : False. Kettle process is a oldest method.

20. **The oil gets hydrolysed after several hours of boiling. This process is called saponification.**
    Ans : True.

Additional – Match the following

1.
1. $CH_3 CH_2 CH_3$ **(a) Cyclobutane**
2. $CH_3 CH = CH_2$ **(b) Furan**
3.   **(c) Propene**
4.   **(d) Propane**
5.   **(e) Benzen**

Ans :

1	$CH_3 CH_2 CH_3$	d	Propane
2	$CH_3 CH = CH_2$	c	Propene
3		a	Cyclobutane
4		e	Benzene
5		b	Furan

2.
1. **Methane**   **(a)** $C_4 H_{10}$
2. **Ethane**   **(b)** CH_4
3. **Propane**   **(c)** $C_2 H_6$
4. **Butane**   **(d)** $C_3 H_8$

Ans :

1	Methane	b	CH_4
2	Ethane	c	$C_2 H_6$
3	Propane	d	$C_3 H_8$
4	Butane	a	$C_4 H_{10}$

3.
1. **Ethene**   **(a)** $C_3 H_6$
2. **Propene**   **(b)** $C_2 H_4$
3. **Butene**   **(c)** $C_5 H_{10}$
4. **Pentene**   **(d)** $C_4 H_8$

Ans :

1	Ethene	b	$C_2 H_4$
2	Propene	a	$C_3 H_6$
3	Butene	d	$C_4 H_8$
4	Pentene	c	$C_5 H_{10}$

4.
1.	**Ethyne**	**(a)** C_3H_4
2.	**Propyne**	**(b)** C_2H_2
3.	**Butyne**	**(c)** C_5H_8
4.	**Pentyne**	**(d)** C_4H_6

Ans :

1	Ethyne	b	C_2H_2
2	Propyne	a	C_3H_4
3	Butyne	d	C_4H_6
4	Pentyne	c	C_5H_8

5.
1.	**Alcohol**	**(a)** **– COOH**
2.	**Aldehyde**	**(b)** $\underset{\underset{O}{\parallel}}{-C-}$
3.	**Ketone**	**(c)** **– OH**
4.	**Acid**	**(d)** $R - COO - R^1$
5.	**Ester**	**(e)** $R - O - R^1$
6.	**Ether**	**(f)** **– CHO**

Ans :

1	Alcohol	c	– OH
2	Aldehyde	f	– CHO
3	Ketone	b	$\underset{\underset{O}{\parallel}}{-C-}$
4	Acid	a	– COOH
5	Ester	d	$R - COO - R^1$
6	Ether	e	$R - O - R^1$

6.
1.	**Dehydration**	**(a)** $CO_2 + H_2O$
2.	**Oxidation**	**(b)** **Ethene**
3.	**Esterification**	**(c)** **Acetaldehyde**
4.	**Dehydrogenation**	**(d)** **Ethyl Ethanoate**
5.	**Combustion**	**(e)** **Ethanoic Acid**

Ans :

1	Dehydration	b	Ethene
2	Oxidation	e	Ethanoic Acid
3	Esterification	d	Ethyl Ethanoate
4	Dehydrogenation	c	Acetaldehyde
5	Combustion	a	$CO_2 + H_2O$

7.

1.	Hydrocarbons	(a)	Solvent
2.	Alcohols	(b)	Tyre, Plastic
3.	Ketones	(c)	LPG, Petrol
4.	Ethers	(d)	Oils and Lipids
5.	Esters	(e)	Painkiller
		(f)	Antiseptic

Ans :

1	Hydrocarbons	c	LPG, Petrol
2	Alcohols	f	Antiseptic
3	Ketones	a	Solvent
4	Ethers	e	Painkiller
5	Esters	d	Oils and Lipids

Additional – Assertion and Reason

1. **Assertion :** Organic compounds have a high molecular weight and a complex structure.
Reason : They are highly inflammable in nature.
a) **A is right R is wrong**
b) **A is wrong R is right**
c) **A and R are right**
d) **R does not explain A**

Ans : (c) A and R are right

2. **Assertion :** Hydrocarbons are considered as parent organic compounds.
Reason : Hydrocarbons are used as sources for the preparation of most of the organic derivatives .
a) **A is right R is wrong**
b) **A is wrong R is right**
c) **R explains A**
d) **R does not explain A**

Ans : (c) R explains A

3. **Assertion :** Acidified potassium di chromate is a very strong oxidizing Agent.
Reason : Potassium dichromate in acidic medium oxidizes ethanol directly to ethanoic acid.
a) **A is right R is wrong**
b) **A is wrong R is right**
c) **R explains A**
d) **R does not explain A**

Ans : (c) R explains A

4. **Assertion :** Soaps are prepared by the saponification of oils or fats with caustic soda are known as Hard soaps.
Reason : Soaps are prepared by the saponification of oils and fats with caustic potash are known as soft soap.
a) **A is right R is wrong**
b) **A is wrong R is right**
c) **R explains A**
d) **Both are different**

Ans : (d) Both are different

5. **Assertion :** When a soap or detergent is dissolved in water, the molecules join together as clusters called Micelles.
Reason : Their long hydrocarbon chains attach themselves to the oil and dirt.
a) **A is right R is wrong**
b) **A is wrong R is right**
c) **R explains A**
d) **R does not explain A**

Ans : (c) R explains A

1. **What are the unique nature of Carbon?**
   ✦ Catenation.
   ✦ Tetravalency.
   ✦ Multiple bonding.

2. **What are the other uses of organic compounds?**
   ✦ Medicines.
   ✦ Clothes.
   ✦ Domestic and automobile fuels.
   ✦ Paints.
   ✦ Cosmetics.
   ✦ Automobile parts.

3. **What is the significance of classification of organic compounds?**
   There are millions of organic compounds known and many new organic compounds are discovered every year in nature or synthesized in laboratory. This may mystify organic chemistry to a large extent. However a unique molecular structure can be assigned to each compound and it can be listed by using synthetic methods of classification and eventually named on the basis of its structural arrangement.

4. **What is called organic chemistry?**
   Organic chemistry is the chemistry of catenated carbon compounds. The carbon atoms present in organic compounds are linked with each other through covalent bonds and thus exist as chains.

5. **Acyclic (or) open chain compounds – E.**
   These are the compounds in which the carbon atoms are linked in a liner pattern to form the chain. If all the carbon atoms in the chain are connected by single bonds, the compound is called as saturated.

6. **What are called unsaturated compounds?**
   If one or more double bonds or triple bonds exist between the carbon atoms, then the compound is said to be unsaturated.

7. **What are called cyclic compounds?**
   Organic compounds in which the chain of carbon atoms is closed or cyclic are called cyclic compounds.

8. **What are called carbocyclic compounds?**
   If the chain contains only carbon atoms, such compounds are called carbocyclic compounds.

9. **What are called heterocyclic compounds?**
   If the chain contains carbon and other atoms like oxygen, nitrogen, sulphur, etc., these compounds are called heterocyclic compounds.

10. **What are called alicyclic compounds?**
   Alicyclic compounds contain one or more carbocyclic rings which may be saturated or unsaturated.

11. **What are called aromatic compounds?**
   Aromatic compounds contain one or more benzene ring (ring containing alternated double bonds between carbon atoms).

12. **Write the classes of organic compounds?**
   Other than carbon, organic compounds contain atoms like hydrogen, oxygen, nitrogen, etc., bonded to the carbon combination of these kinds of atoms with carbon gives different classes of organic compounds.

13. **Define Hydrocarbons.**
   The organic compounds that are composed of only carbon and hydrogen atoms are called hydrocarbons.

14. **What are classification of hydrocarbons?**
   Hydrocarbons are classified into two types. They are;
   ✦ Saturated hydrocarbon => Alkanes.
   ✦ Unsaturated hydrocarbon => Alkenes and Alkynes.

15. What are alkanes?

These are hydrocarbons which contain only single bond. They are represented by the general formula CnH_{2n+2}.

16. What are alkenes?

The hydrocarbons, which contain one or more C=C bonds are called Alkenes. They are represented by the general formula C_nH_{2n}.

17. What are alkynes?

The hydrocarbons which contain one or more C=C bonds are called Alkynes. They are represented by the general formula C_nH_{2n-2}.

18. Write the test to indentify saturated and unsaturated compounds.

✦   The given sample solution is taken in the test tube.
✦   Added a few drops of bromine water and observed any characteristic change in colour.
✦   If the given compoundis unsaturated it will decolourise bromine water.

19. Define functional group.

Certain substances which as so hygroscopic, when exposed to the atmospheric air at ordinary temperature, absorb enough water to get completely dissolved. Such substances are called deliquescent substances.

20. What are important characters of the deliquescent substances?

Deliquescent substances lose their crystalline shape and ultimately dissolve in the absorbed water forming a saturated solution.

21. Write the components of an IUPAC name.

The IUPAC name of the any organic compound consists of 3 parts.

✦   Root word.
✦   Prefix.
✦   Suffix.

22. Tabulate the Root words of hydrocarbon.

No. of Carbon atoms	Root word
1	Meth –
2	Eth –
3	prop –
4	But –
5	pent –
6	Hex –
7	Hept –
8	Oct –
9	Non –
10	Dec –

23. Tabulate the prefix for IUPAC name.

Substituent	Prefix used
– F	Fluoro
– cl	Chloro
– Br	Bromo
– I	Iodo
– NH_2	Amino
– CH_3	Methyl
–CH_2CH_3	Ethyl

24. Tabulate the suffix for IUPAC name.

Class of compound	Functional group	Suffix used
Alcohols	– OH	– ol
Aldehydes	– CHO	– al
Ketones	$-\overset{\displaystyle \|}{\underset{\displaystyle O}{C}}-$	– one
Carboxylic acid	– COOH	– oic acid

25. Write the structure of Ethanol.

$C_2 H_5$ OH.

Structure :
```
         H       H
         |       |
  H ──── C ───── C ──── OH
         |       |
         H
```
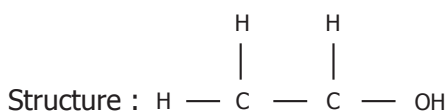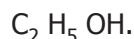
26. Define Fermentation.

Fermentation is conversion of complex organic molecules into simpler molecules by the action of enzymes. eg: curding the milk.

27. Write the physical properties of Ethanol.

✦ Ethanol is a colourless liquid having a pleasant smell and a burning taste.

✦ It is a volatile liquid. It's boiling point is 78° C (351 K) which is much higher than that of its corresponding alkane. i.e., Ethane boiling point = 184 K.

✦ It is completely miscible with water in all proportions.

28. Write the property of Dehydration of ethanol.

Dehydration : When ethanol is heated with conc. H2SO4 at 443 K it loses a water molecule. i.e., dehydrated to form ethene.

$$CH_3 CH_2 OH \xrightarrow[\text{443 K}]{\text{Conc. } H_2SO_4} CH_2 = CH_2 + H_2O$$
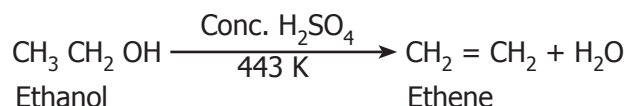
Ethanol   Ethene

29. Write the property of Reaction with sodium of ethanol.

Ethanol react with Sodium metal to form sodium ethoxide and hydrogen gas.

$$C_2 H_5 OH + 2 Na \rightarrow 2C_2 H_5 ONa + H_2\uparrow$$

Ethanol   Sodium ethoxide
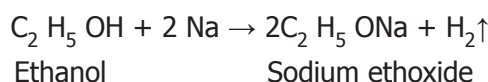
30. Write the property of oxidation of ethanol.

Ethanol is oxidised to ethanoic acidwith alkaline $KMnO_4$ or acidified $K_2Cr_2O_7$.

$$CH_3 CH_2 OH \xrightarrow[\text{KMnO}_4]{K_2Cr_2O_7} CH_3 COOH + H_2O$$

Ethanol   Ethanoic acid
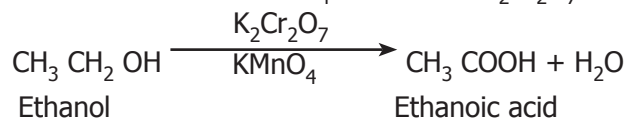
This is the test for identification of alcohol.

31. Define Esterification.

The reaction of an alcohol with a carboxylic acid gives a compound having fruity adour. This compound is called an Ester and the reaction is called Esterification. Ethanol reacts with ethanoic acid in the presence of Conc.H_2SO_4 to form ethylethanoate an ester.

$$C_2 H_5 OH + CH_3 COOH \xrightarrow{\text{Conc.}H_2SO_4} CH_3 COOC_2 H_5 + H_2O$$

Ethanol   Ethanoic acid   Ethylethanoate
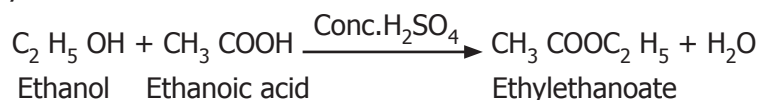
32. Write the process of dehydrogenation.

When the vapour of ethanol is passed over heated copper, used as a catalyst at 573 K it is dehydrogenated to acetaldehyde.

$$CH_3\,CH_2\,OH \xrightarrow[573\,K]{Cu} CH_3\,CHO + H_2\uparrow$$

Ethanol Ethanal
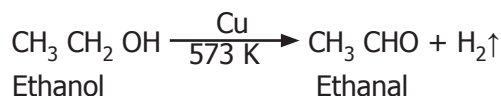
33. Write the process of combustion.

Ethanol is highly inflammable liquid. It burns with oxygen to form Carbon dioxide and water.

$$C_2\,H_5\,OH + 3O_2 \rightarrow 2CO_2 + 3H_2O$$

Ethanol Carbon dioxide
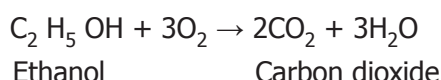
34. Write the preparation of Ethanoic acid.

Ethanoic acid or Acetic acid is prepared in large scale, by the oxidation of ethanol in the presence of alkaline potassium permanganate or acidified potassium dischromate.

$$CH_3\,CH_2\,OH \xrightarrow[2(O)]{KMnO_4\,/\,OH^-} CH_3\,COOH + H_2O$$

Ethanol Ethanoic acid
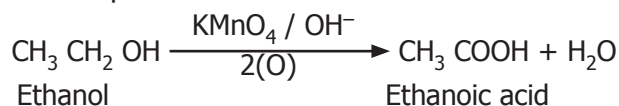
35. Write the physical properties of ethanoic acid.

✦ Ethanoic acid is a colourless liquid having unpleasant odour.

✦ It is sour in taste.

✦ It is miscible with water in all proportions.

✦ It's boiling point is higher than the corresponding alcohols, aldehydes and ketones.

✦ On cooling, pure ethanoic acid is frozen toform ice like flakes. They look glaciers. So it is called Glacial Acetic Acid.

36. Write the reaction of ethanoic acid with metal.

Ethanoic acid reacts with active metals like Zn, Na, etc., to liberate hydrogen and form Sodium ethanoate.

$$CH_3COOH + Zn \rightarrow (CH_3COO_2)\,Zn + H_2\uparrow$$
$$CH_3COOH + 2Na \rightarrow 2CH_3COONa + H_2\uparrow$$
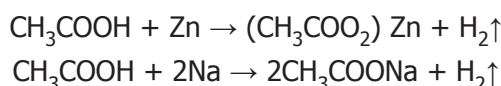
37. Explain Decarboxylation.

When a sodium salt of ethanoic acid is heated with sodalime (solid mixture of 3 parts of NaOH and 1 part of CaO), Methane gas is formed.

$$CH_3COONa \xrightarrow{NaOH\,/\,CaO} CH_4\uparrow + Na_2CO_3$$

Methane
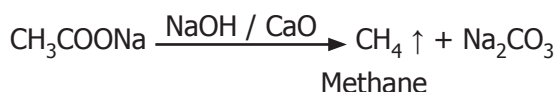
38. Write the 2 uses of ethanoic acid.

✦ in the manufacture of plastic.

✦ in making dyes, pigments and paint.

✦ in printing on fabrics.

✦ as a laboratory agent.

39. Write the uses of hydrocarbons in everyday life.

✦ Fuels like LPG, petrol, kerosene.

✦ Raw materials for various important synthetic materials.

✦ Polymeric materials like tyre, plastic containers.

40. Write the uses of Alcohol in everyday life.

✦ As a solvent and an antiseptic agent.

✦ Raw materials for various important synthetic materials.

41. Write the uses of Aldehydes in everyday life.

✦ Formaldehyde as a disinfectant.

✦ Raw materials for synthetic materials.

42. Write the uses of Ketones in everyday life.

✦ Anaesthetic agents.

✦ Painkiller.

43. Write the uses of Esters in everyday life.

All the cooking oils and lipids contain esters.

44. Define Soap.

Soaps are Sodium or Potassium salts of some long chain Carboxylic acids called fatty acids.

45. What are the raw materials required for the soap.

✦ Fat.   ✦ Alkali.

The alkali most commonly used in the preparation of soap is sodium hydroxide, potassium hydroxide can also be used.

46. Define Hard soap.

Soaps which are prepared by the saponification of oils or fats with caustic soda are known as hard soaps. They are usually used for washing purposes.

47. Define Soft soap.

Soaps which are prepared by the saponification of oils or fats with potassium salts are known as soft soaps. They are used for cleansing the body.

48. Why ordinary soap is not suitable for using with hard water?

Ordinary soaps when treated with hard water, precipitate as salts of calcium and magnesium. They appear at the surface of the cloth as sticky grey scum. Thus the soaps cannot be used conveniently in hard water.

49. Explain the process saponification.

The oil, which is used in this process, is taken in an iron tank. The alkaline solution is added into the kettle a little in excess. The mixture is boiled by passing steam through it. The oil gets hydrolysed after several hours of boiling. This process is called saponification.

50. What are called detergents?

✦ It is a sodium salts of sulphonic acids.

✦ It is effective even in hard water.

✦ It is prepared from hydrocarbons obtained from crude oil.

✦ The ionic part in a detergent is $-SO_3^- \ Na^+$.

51. What are called Biodegredable and Non–biodegradable?

Biodegradable Detergent : They have straight hydrocarbon chains which can be easily degraded by bacteria.

Non–biodegradable Detergent : They have highly branched hydrocarbon chains, which cannot be degraded by bacteria.

52. Have you noticed the term TFM in Soap.

TFM means Total Fatty Matter. It is the one of the important factors to be considered to assess the quality of soap. A soap which has higher TFM, is a good bathing soap.

53. Draw the structure of Ethanoic acid.

CH_3COOH.
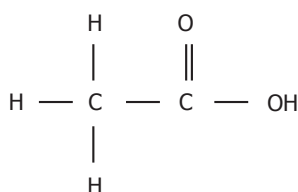
<div align="center">**Additional – Long answer questions**</div>

1. Write the characteristics of organic compounds.

i) Organic compounds have a high molecular weight and a complex structure.

ii) They are mostly insoluble in water, but soluble in organic solvents such as ether, carbontetra chloride, toluene, etc.

iii) They are highly inflammable in nature.

iv) Organic compounds are less reative compared to inorganic compounds. Hence the reactions involving organic compounds proceed at slower rates.

v) Mostly organic compounds form covalent bonds in nature.

vi) They have lower melting and boiling point when compare to inorganic compounds.

vii) They are volatile in nature.

viii) Organic compounds can be prepared in the laboratory.

ix) They exhibit the phenomenon of Isomerism, in which a single molecular formula represents several organic compounds that cliffer in their physical and chemical properties.

2. Draw the flow chart of classification of organic compounds.

```
                        ┌─────────────────────┐
                        │ Organic Compounds   │
                        └─────────────────────┘
              ┌──────────────┘       ─       └──────────────┐
              ▼                                              ▼
   ┌────────────────────┐                        ┌────────────────────┐
   │ A cyclic (or) open │                        │ Cyclic (or) closed │
   │  chain compounds   │                        │  chain compounds   │
   └────────────────────┘                        └────────────────────┘
       ┌──────┘  └──────┐                          ┌────┘      └────┐
       ▼                ▼                          ▼                ▼
 ┌──────────────┐ ┌──────────────┐      ┌─────────────┐  ┌──────────────┐
 │  Saturated   │ │  Unsaturated │      │ Carbocyclic │  │ Heterocyclic │
 │C – C Single  │ │   = (or) =   │      └─────────────┘  │  Pyridine    │
 │    bond      │ │    bonds     │                       │   Furan      │
 │ Eg.: Ethane  │ │ Ethene CH2=CH2│                      └──────────────┘
 │   C2H4       │ │ Ethyne CH = CH│
 └──────────────┘ └──────────────┘
                               ┌──────┘      └──────┐
                               ▼                    ▼
                    ┌──────────────────┐ ┌──────────────────┐
                    │    Alicyclic     │ │    Aromatic      │
                    │    compounds     │ │    compounds     │
                    │ eg: Cyclo butane │ │  eg: Benzene     │
                    └──────────────────┘ └──────────────────┘
```
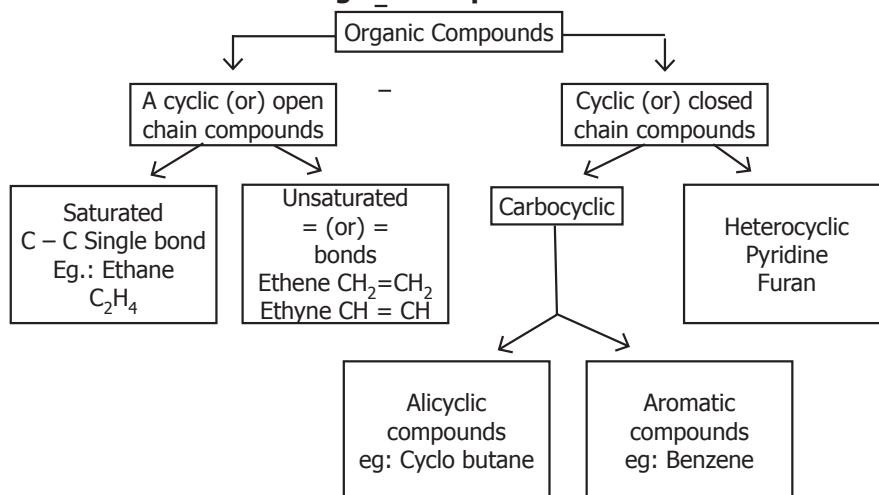
3. Fill in the blanks :

No. of Carbon atoms	Alkane	Alkene	Alkyne
1	Methane (CH_4)		
2	_____ (C_2H_6)	Ethene (C_2H_4)	_____ (C_2H_2)
3	Propane (C_3H_8)	_____ (C_3H_6)	_____ (C_3H_4)
4	Butane (C_4H_{10})	_____ (C_4H_8)	Butyne (C_4H_6)
5	_____ (C_5H_{12})	Pentene (C_5H_{10})	Pentyne (C_5H_8)

Ans :

No. of Carbon Atoms	Alkane (C_nH_{2n+2})	Alkene (C_nH_{2n})	Alkyne (C_nH_{2n-2})
1	Methane (CH_4)		
2	**Ethane** (C_2H_6)	Ethene (C_2H_4)	**Ethyne** (C_2H_2)
3	Propane (C_3H_8)	**Propene** (C_3H_6)	**Propyne** (C_3H_4)
4	Butane (C_4H_{10})	**Butene** (C_4H_8)	Butyne (C_4H_6)
5	**Pentane** (C_5H_{12})	Pentene (C_5H_{10})	Pentyne (C_5H_8)

4. **Write the characteristics of hydrocarbons.**

i) Lower hydrocarbons are gases at room temperature. Eg. Methane, Ethane and gases.

ii) They are colourless and odourless.

iii) The boiling point of hydrocarbons increases with an increase in the number of carbon atoms.

iv) They undergo combustion reaction with oxygen to form CO_2 and water.

v) Alkanes are lease reactive when compare to other classes of compounds.

vi) Alkynes are the most reactive due to the presence of the triple bond.

vii) Alkanes are saturated whereas Alkenes and Alkynes are unsaturated.

viii) They are insoluble in water.

5. **Tabulate the organic compounds based on functional group.**

Class of Compound	Functional Group	Common Formula	Examples
Alcohols	$- OH$	$R - OH$	CH_3CH_2OH Ethanol
Aldehydes	$\overset{O}{\overset{\|\|}{- C - H}}$	$R - CHO$	CH_3CHO Acetaldehyde
Ketones	$\overset{O}{\overset{\|\|}{- C -}}$	$\overset{O}{\overset{\|\|}{R - C - R^1}}$	CH_3COCH_3 Acetone
Acids	$\overset{O}{\overset{\|\|}{- C - OH}}$	$R - COOH$	CH_3COOH Acetic Acid
Ester	$\overset{O}{\overset{\|\|}{- C - OR}}$	$R - COOR^1$	CH_3COOCH_3 Methyl acetate
Ether	$- O - R$	$R - O - R^1$	CH_3-O-CH_3 Dimethyl Ether

6. **Write the IUPAC rules for naming organic compounds.**

Rule 1 : Identify the longest chain of carbon atoms to get the parent name.

Rule 2 : Number the Carbon atoms of the parent chain, beginning at the closest end of the substituent or functional group. They are called Locant numbers. If both functional group and substituent are present, then the priority will be given to the functional group.

Rule 3 : In case of alkenes and alkynes, locate the double bond or triple bond and use its locant number followed by a dash and a primary suffix.

Rule 4 : If the compound contains functional group, locate it and use its locant number followed by a dash and a secondary suffix.

Rule 5 : When the primary and secondary suffixes are joined, the terminal 'e' of the primary suffix is removed.

Rule 6 : Identify the substituent and use a number followed by a dash and a prefix to specify the location and identity.

7. **Arrive at, systematically, the IUPAC name of the compound.**

i) $CH_3 - CH_2 - CH_2 - CH_2 - CH_3$.

Step 1 : It is a five carbon chain and hence the root word is 'Pent'.

Step 2 : All the bonds between carbon atoms are single bonds and thus the suffix is 'ane'. So it name is Pent+ane = **Pentane**.

ii) CH_3
           $|$
$CH_3 - CH - CH_2 - CH_2 - CH_3$.

Step 1 :　The longest chain contains 5 carbon atoms and hence the root word is 'Pent'.

Step 2 :　There is a substituent. So the carbon chain is numbered from the left end which is closest to the substituent.

Step 3 :　All the single bonds between the carbon atoms and thus the suffix is 'ane'.

Step 4 :　The substituent is a methyl group and it is located at second carbon atom. So the locant number is 2. Thus the prefix is '2 methyl'. The name of the compound is 2–methyl+pent+ane = **2–methyl pentane**.

8.　**Arrive at systematically, the IUPAC name of the compound CH_3COOH.**

Rule 1 :　The parent chain consists of 2 carbon atoms. The root word is 'Eth'.

Rule 2 :　All are single bonds between the carbon atoms of the chain. So the primary suffix is 'ane'.

Rule 3 :　Since the compound contains the –COOH group, it is a carboxylic acid. The secondary suffix is 'oic' acid. The name of the compound is (Eth+ane+oic acid) => **Ethanoic Acid**.

9.　**Test yourself :**

i)　**CH_3CHO**

Step 1 :　The parent chain consists of 2 carbon atoms. The root word is 'Eth'.

Step 2 :　All are single bonds between the carbon atoms of the chain. So the primary suffix is 'ane'.

Step 3 :　Since the compound contains –CHO group, it is a Aldehyde. The secondary suffix is 'al'. The name of the compound is (Eth+ane+al) => **Ethanal**.

ii)　**$CH_3CH_2COCH_3$.**

Step 1 :　The parent chain consists of 4 carbon atoms. The root word is 'But'.

Step 1 :　All are single bonds between the carbon atoms ofthe chain. So the primary suffix is 'ane'.

Step 1 :　Since the compound contains $-\overset{\overset{\text{O}}{\|}}{\text{C}}-$ group, it is a Ketone. The secondary suffix is 'one'. The name of the compound is (But+ane+one) => **Butanone**.

iii)　**$Cl - CH_2 - CH_2 - CH_2 - CH_3$.**

Step 1 :　The parent chain consists of 4 carbon atoms. The root word is 'but'.

Step 2 :　All are single bonds between the carbon atoms of the chain. So the primary suffix is 'ane'.

Step 3 :　Since the compounds contain 'chloro' group, it is a halogen 1. The name of the compound is (Chloro+but+ane) => **Chloro butane**.

10.　**Write the common name and IUPAC of the following.**

i)　**CH_3OH**

ii)　**HCHO**

iii)　**HCOOH**

iv)　**$CH_3 - CH_2 - CH_2 - OH$**

v)　**$CH_3 - CH_2 - CHO$**

vi)　**$CH_3 - CO - CH_2CH_3$**

vii)　**$CH_3 - CH_2 - CH_2 - COOH$**

viii)　**$CH_3 - CO - CH_2 - CH_2 - CH_3$**

ix)　**$CH_3 - CH_2 - COOH$**

x)　**$CH_3 - CH_2 - CH_2–CH_2–COOH$**

S.No.	Molecular Formula	Common Name	IUPAC Name
1	CH_3OH	Methyl alcohol	Methanol
2	HCHO	Formaldehyde	Methanal
3	HCOOH	Formic Acid	Methanoic Acid
4	$CH_3 - CH_2 - CH_2 - OH$	Propyl Alcohol	Propanol
5	$CH_3 - CH_2 - CHO$	Propionaldehyde	Propanal
6	$CH_3 - CO - CH_2CH_3$	Ethyl Methyl Ketone	2 – butanone
7	$CH_3 - CH_2 - CH_2 - COOH$	Butyric Acid	Butanoic Acid
8	$CH_3 - CO - CH_2 - CH_2 - CH_3$	Methyl Propyl Ketone	Pentanone
9	$CH_3 - CH_2 - COOH$	Propionic Acid	Propanoic Acid
10	$CH_3 - CH_2 - CH_2–CH_2–COOH$	Pentanic Acid	Pentanoic Acid

11. Write the uses of Ethanol.

i) In medical wipes, as an antiseptic.

ii) As an anti–freeze in automobile radiators.

iii) For effectively killing micro organisms like bacteria, fungi, etc., by including it in many hand sanitizers.

iv) As an antiseptic to sterilize wounds in hospitals.

v) As an solvent for drugs, oils, fats, perfumes, dyes, etc.

vi) In the preparation of methylated spirit (mixture of 95% of ethanol and 5% of methanol) rectified spirit (mixture of 95.5% of ethanol and 4.5% of water) power alcohol (mixture of petrol and ethanol) and denatured spirit (ethanol mixed with pyridine).

vii) To enhance the flavour of food extracts, for example vannila extract, a common food flavour, which is made by processing vannila beans in a solution of ethanol and water.

12. Write the uses of ethanoic acid.

i) It is a food additive, a flavoring agent and a preservative.

ii) In the manufacture of preservative.

iii) In making dyes, pigments and paint.

iv) In printing on fabrics.

v) As a laboratory reagent.

vi) For coagulating rubber from latex.

vii) In the production of pharmaceuticals.

13. Write the manufacture of soap process.

Kettle Process : This is the oldest method. But, it is still widely used in the small scale preparation of soap. There are mainly two steps to be followed in this process.

i) **Saponification of Oil :**

The oil, which is used in this process, is taken in an iron tank (kettle). The alkaline solution (10%) is added into the little a little in excess. The mixture is boiled by passing steam through it. The oil gets hydrolysed after several hours of boiling. This process is called saponification.

ii) **Salting out of soap :**

Common salt is then added to the boiling mixture. Soap is finally precipitated in the tank. After several hours the soap rises to the top of the liquid as a 'curdy mass'. The next soap is taken off from the top. It is then allowed to cool down.

14. What are the modern detergent contains several ingredients? Explain.

i) Sodium silicate, which prevents the corrosion and ensures that the detergent does not damage the washing machine.

ii) Fluorescent whitening agents that give a glow to the clothes.

iii) Oxygen bleaches, such as Sodium perbonate enable the removal of certain stains from the cloth.

iv) Sodium sulphate is added to prevent the caking of the detergent powder.

v) Enzymes are added to break down some stains caused by biological substances like blood and vegetable juice.

vi) Certain chemicals like that give out a pleasant smell are also added to make the clothes fragrant after they washed with detergent.

15. Write the advantages of detergents over soap.

Detergents are better than soaps because they;

i) Can be used in both hard and soft water and can clean more effectively in hard water than soap.

ii) Can also be used in saline and acidic water.

iii) Do not leave any soap scum on the tub or clothes.

iv) Dissolve freely even in cool water and rinse freely in hard water.

v) Can be used for washing woolen garments where as soap cannot be used.

vi) Have a linear hydrocarbon chain, which is biodegradable.

vii) Are active emulsifiers of motor grease.

UNIT TEST - 11

Time : 1.15 Hrs.   Marks : 50

I. Choose the best answer

(5 × 1 = 5)

1. The secondary suffix used in IUPAC nomenclature of an Aldehyde is _____.
    a) −ol   b) −al   c) −one   d) −de

2. The IUPAC name of an organic compound is 3-methyl butan −1−ol. What type compound it is?
    a) Aldehyde   b) Carboxylic acid   c) Ketone   d) Alcohol

3. Rectified spirit is an aqueous solution which contains about _____.
    a) 95.5%   b) 55.5%   c) 60.2%   d) 80.5%

4. Which of the following are used as anaesthetics?
    a) Carboxylic acids   b) Ethers   c) Esters   d) Aldehydes

5. TFM in soaps represents _____ content in soap.
    a) Mineral   b) Vitamins   c) Fatty acid   d) Carbohydrates

II. Fill in the blanks

(5 × 1 = 5)

6. Mostly organic compounds form _____ bonds in nature.

7. _____ compounds contain one or more carbocyclic rings which may be saturated or unsaturated.

8. _____ compounds will decolourise bromine water.

9. Latin name of the red ant is _____.

10. _____ is used it in many sand sanitizers.

III. State whether the statements are true or false. Correct the false statement

(4 × 1 = 4)

11. Propylene is the simplest alkyne.

12. Alkanes are saturated and Alkenes and alkynes are Unsaturated.

13. IUPAC name of CH_3CHO is Acetaldehyde.

14. Kettle process is a new method.

IV. Match the following

(4 × 1 = 4)

15. Alcohol   (a) $R - O - R^1$

17. Ester   (b) $R - OH$

18. Acid   (c) $R - COO - R^1$

19. Ether   (d) $R - COOH$

V. Assertion and Reasoning

(3 × 1 = 3)

Direction: In each of the following questions, a statement of Assertion is given and a corresponding statement of Reason is given just below it. Of the statements given below, mark the correct answer as

a. If both A and R are true and R is the correct explanation of A.

b. If both A and R are true but R is not the correct explanation of A.

c. If A is true but R is false.

d. If both A and R are false.

19. **Assertion:**   Detergents are more effective cleansing agents than soaps in hard water.

    Reason: Calcium and Magnesium salts of detergents are water soluble.

20. **Assertion:** Alkanes are saturated hydrocarbons.
    Reason: Hydrocarbons consist of covalent bonds.

21. **Assertion:** Organic compounds have a high molecular weight and a complex structure.
    Reason: They are highly inflammable in nature.

VI. Write the answer for the following questions in word or sentence

(3 × 1 = 3)

22. Draw the structure of Ethanol.
23. Draw the structure of Furon.
24. Draw the structure of Acetic acid.

VII. Find the odd one out

(3 × 1 = 3)

25. Methane, Ethene, Propene, Butene.
26. Ethyne, Propyne, Butyne, Butane.
27. Methane , Ethane, Propane, Propyne.

VIII. Correct the mistakes

(3 × 1 = 3)

28. 100% of pure ethanol is called rectified spirit.
29. Ethanoic acid turns red litmus to blue.
30. The alkaline hydrolysis of fatty acids is termed as fermentation.

IX. Write the short answer for ANY 5 of the following questions.

(5 × 2 = 10)

31. How is ethanoic acid prepared from ethanol?
32. How do detergents cause water pollution?
33. Differentiate soaps and detergents.
34. Name the simplest ketone and give its structural formula.
35. What are the unique nature of carbon?
36. What are called Cyclic compounds?
37. Write the physical properties of Ethanol.

X. Write long answer for the following questions

(2 × 5 = 10)

38. Write the characteristics of Homologous Series.
    [OR]
39 Write the characteristics of Organic compounds.
40. Write the characteristics of Hydrocarbons.
    [OR]
41 Write the IUPAC rules for naming organic compounds.

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UNIT 12

PLANT ANATOMY AND PLANT PHYSIOLOGY

Points to Remember

➢ Tissue is a group of similar or dissimilar cells, having a common orgin and performing similar functions.

➢ Plants are capable of synthesizing glucose from CO_2 and H_2O in the presence of light, by the process of photosynthesis.

➢ Light reaction takes place in grana of chloroplast.

➢ Dark reaction takes place in stroma of chloroplast.

➢ Respiration involves both external and cellular respiration.

➢ Aerobic respiration takes place in the presence of oxygen.

➢ Aerobic respiration occurs in three major steps like Glycolysis, Krebs cycle and Electron transport chain.

TEXT BOOK EVALUATION

I. Book Exercise – Choose the best answer

1. **Casparian strips are present in the _____ of the root.**
   a) cortex   b) pith   c) pericycle   d) endodermis

   Ans.: d) Endodermis

2. **The endarch condition is the characteristic feature of**
   a) root   b) stem   c) leaves   d) flower

   Ans.: b) Stem

3. **The xylem and phloem arranged side by side on same radius is called _____.**
   a) radial   b) amphivasal   c) conjoint   d) None of these

   Ans.: c) Conjoint

4. **Which is formed during anaerobic respiration**
   a) Carbohydrate   b) Ethyl alcohol   c) Acetyl CoA   d) Pyruvate

   Ans.: b) Ethyl alcohol

5. **Kreb's cycle takes place in**
   a) chloroplast   b) mitochondrial matrix
   c) stomata   d) inner mitochondrial membrane

   Ans.: b) Mitochondrial matrix

6. **Oxygen is produced at what point during photosynthesis ?**
   a) when ATP is converted to ADP   b) when CO_2 is fixed
   c) when H_2O is splitted   d) All of these

   Ans.: c) When H_2O is splitted

II. Book Exercise – Fill in the blanks

1. Cortex lies between _____.   **Ans.:** Epidermis and Endodermis

2. Xylem and phloem occurring on the same radius constitute a vascular bundle called _____.

   Ans.: Conjoint bundle

3. Glycolysis takes place in _____.   **Ans.:** Cytoplasm

4. The source of O_2 liberated in photosynthesis is _____. **Ans.:** Photolysis of water

5. _____ is ATP factory of the cells. **Ans.:** Mitochondria

III. Book Exercise – State whether the following statements are true or false: If false correct the statement.

1. **Phloem tissue is involved in the transport of water in plant.**
   Ans.: False.
   Correct statement : Phloem tissue is involved in the transport of **food** in plant.

2. **The waxy protective covering of a plant is called as cuticle.**
   Ans.: True.

3. **In monocot stem cambium is present in between xylem and phloem.**
   Ans.: False.
   Correct statement : In **dicot stem** cambium is present in between xylem and phloem.

4. **Palisade parenchyma cells occur below upper epidermis in dicot root.**
   Ans.: False.
   Correct statement : Palisade parenchyma cells occur below upper epidermis in **dicot leaf**.

5. **Mesophyll contains chlorophyll.**
   Ans.: True.

6. **Anaerobic respiration produces more ATP than aerobic respiration.**
   Ans.: False.
   Correct statement : **Aerobic** respiration produces more ATP than **anaerobic** respiration.

IV. Book Exercise – Match the items in column-I to the items in column-II:

	Column I		Column II
1.	**Amphicribal**	(a)	**Dracaena**
2.	**Cambium**	(b)	**Translocation of food**
3.	**Amphivasal**	(c)	**Fern**
4.	**Xylem**	(d)	**Secondary growth**
5.	**Phloem**	(e)	**Conduction of water**

Ans :

	Column I		Column II
1	Amphicribal	c	Fern
2	Cambium	d	Secondary growth
3	Amphivasal	a	Dracaena
4	Xylem	e	Conduction of water
5	Phloem	b	Translocation of food

V. Book Exercise – Answer in a sentence

1. **What is collateral vascular bundle?**
   Vascular bundle in which xlem lies towards the centre and phloem lies towards the periphery is called as collateral vascular bundle.

2. **Where does the carbon that is used in photosynthesis come from?**
   Terrestrial plants obtain CO_2 from atmosphere and aquatic plants obtain dissolved CO_2 from water.

3. What is the common step in aerobic and anaerobic pathway?

Glycolysis is the common step in aerobic and anaerobic pathway.

4. Name the phenomenon by which carbohydrates are oxidized to release ethyl alcohol.

During **anaerobic respiration or fermentation**, carbohydrates are oxidized to release ethyl alcohol.

VI. Book Exercise – Short answer questions

1. Give an account on vascular bundle of dicot stem.
   i) Vascular bundles of dicot stem are conjoint, collateral, endarch and open.
   ii) They are arranged in the form of a ring around the pith.

2. Write a short note on mesophyll.

The tissue present between the upper and lower epidermis is called mesophyll.

It is differentiated into

   a) Palisade parenchyma : It is found just below the upper epidermis. The cells are elongated. These cells have more number of chloroplasts. The cells do not have intercellular spaces and they take part in photosynthesis.

   b) Spongy parenchyma : It is found below the palisade parenchyma tissue. Cells are almost spherical or oval and are irregularly arranged. Cells have intercellular spaces. It helps in gaseous exchange.

3. Draw and label the structure of oxysomes.
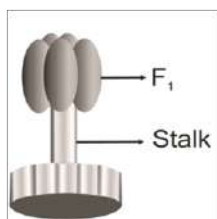
4. Name the three basic tissues system in flowering plants.

The three basic tissues system in flowering plants are
   i) Dermal or Epidermal tissue system
   ii) Ground tissue system on fundamental tissue system and
   iii) Vascular tissue system on conducting tissue system

5. What is photosynthesis and where in a cell does it occur?
   i) Photosynthesis is a process in which **carbon dioxide** combines with **water** in the presence of **sunlight** and **chlorophyll** to form **carbohydrates**. During this process **oxygen** is released as a byproduct.
   ii) It occurs in the **chloroplast** of plant cell.

6. What is respiratory quotient?

Respiratory quotient is the ratio of volume of carbon dioxide liberated and the volume of oxygen consumed during respiration. It is expressed as

$$\text{Respiratory Quotient (RQ)} = \frac{\text{Volume of CO}_2 \text{ liberated}}{\text{Volume of O}_2 \text{ consumed}}$$

7. Why should the light dependent reaction occur before the light independent reaction?

The light dependent reaction (Light reaction) should occur before light independent reaction (Dark reaction). Because light dependent reaction only have to supply organic energy molecules such as ATP and $NADPH_2$ necessary to reduce CO_2 into carbohydrate in the light independent reaction.

8. Write the reaction for photosynthesis?

$$6CO_2 + 12H_2O \xrightarrow[\text{Chlorophyll}]{\text{Light}} C_6H_{12}O_6 + 6H_2O + 6O_2\uparrow$$

Carbon dioxide + Water   Glucose + Water + Oxygen
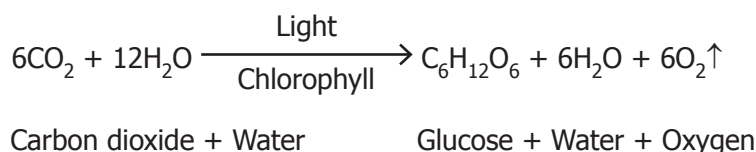
VII. Book Exercise – Long answer questions

1. Differentiate the following

a) Monocot root and Dicot root   **b) Aerobic and Anaerobic respiration.**

a) Monocot root and Dicot root

S.No.	Tissue	Dicot root	Monocot root
1.	Number of Xylem	Tetrarch	Polyarch
2.	Cambium	Present (During secondary growth only)	Absent
3.	Secondary Growth	Present	Absent
4.	Pith	Absent	Present

b) Aerobic and Anaerobic respiration

Aerobic Respiration	Anaerobic Respiration
1. It takes place in **higher plants and animals**.	1. It takes place in **lower plants.(Yeast and Bacteria)**.
2. Oxygen is **utilized** for respiration.	2. Oxygen is **not utilized** for respiration.
3. Glucose is **completely** oxidized.	3. **Incomplete** oxidation of Glucose takes place.
4. **More energy** is produced. (38 ATP)	4. **Less energy** is produced. (2 ATP)
5. The end products are **CO$_2$, H$_2$O and Energy**	5. The end products are **Ethanol or Lactic acid, CO$_2$ and Energy**.

2. Describe and name three stages of cellular respiration that aerobic organisms use to obtain energy from glucose.

Stages of Aerobic respiration

a) Glycolysis (Glucose splitting):

i)   It is the breakdown of one molecule of glucose (6 carbon) into two molecules of pyruvic acid (3 carbon).

ii) Glycolysis takes place in cytoplasm of the cell.

iii) It is the first step of both aerobic and anaerobic respiration.

b) Krebs Cycle:

i)   This cycle occurs in mitochondria matrix.

ii) At the end of glycolysis, 2 molecules of pyruvic acid enter into mitochondria.

iii) The oxidation of pyruvic acid into CO_2 and water takes place through this cycle. It is also called Tricarboxylic Acid Cycle (TCA).

c) Electron Transport Chain :

i)   This is accomplished through a system of electron carrier complex called Electron Transport Chain (ETC) located on the inner membrane of the mitochondria.

ii) $NADH_2$ and $FADH_2$ molecules formed during glycolysis and Krebs cycle are oxidised to NAD^+ and FAD^+ to release the energy via electrons.

iii) The electrons, as they move through the system, release energy which is trapped by ADP to synthesize ATP. This is called oxidative phosphorylation.

iv) In this process, O_2 the ultimate acceptor of electrons gets reduced to water.

3. **How does the light dependent reaction differ from the light independent reaction? What are the end product and reactants in each? Where does each reaction occur within the chloroplast?**

	Light dependent reaction	**Light independent reaction**
Important Differences	1. It takes place in the **presence of light**.	1. It takes place in the **absence of light**.
	2. It is also known as **Hill reaction** or **Light reaction**.	2. It is also known as **Calvin Cycle** or **Dark reaction**.
	3. It is named as Hill reaction after its discoverer **Hill**.	3. It is named Calvin Cycle after its discoverer **MelvinCalvin**.
Reactants	Light, Water, ADP and NADPH.	CO_2 , ATP and $NADPH_2$
End Product	O_2, ATP and $NADPH_2$	Carbohydrate.
Location	It takes place in the **thylakoid membranes (Grana)** of the chloroplast.	It takes place in the **stroma** of the chloroplast.

VIII. Book Exercise – Higher Order Thinking Skills (HOTS)

1. **The reactions of photosynthesis make up a biochemical pathway.**

    A) **What are the reactants and products for both light and dark reactions.**

    B) **Explain how the biochemical pathway of photosynthesis recycles many of its own reactions and identify the recycled reactants.**

       A) **The reactants and products for both light and dark reactions**

	Light reaction	**Dark reaction**
Reactants	Light, Water, ADP and NADPH.	CO_2, ATP and $NADPH_2$
End Product	O_2, ATP and $NADPH_2$	Carbohydrate.

    B)   **i)**   **The biochemical pathway of photosynthesis which recycles many of its own reactions.**
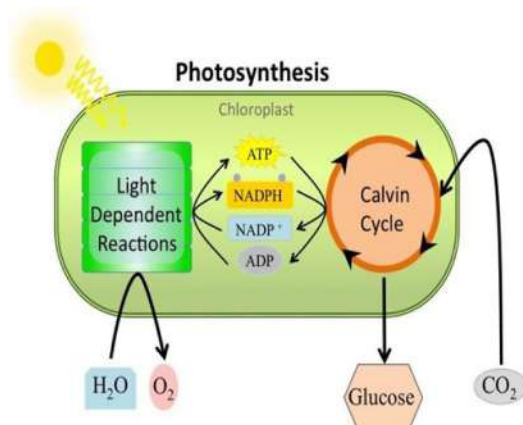
Overview of Hill and Calvin cycle

       ii)   **Name of the recycled reactants :**

       The products of light reaction, ATP and $NADPH_2$, move out from the thylokoid to the stroma. These ATP and $NADPH_2$ are utilized in Calvin cycle to reduce CO_2 to carbohydrate. The used up ATP and $NADPH_2$ are converted to ADP and $NADP^+$.

$$\text{ATP and NADPH}_2 \xrightarrow{\text{Calvin cycle}} \text{ADP and NADP}^+$$
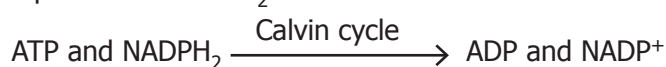
Light reaction converts these energy - depleted compounds ADP and $NADP^+$ back to the high energy forms ATP and NADPH.

$$\text{ATP and NADP+} \xrightarrow{\text{Light reaction}} \text{ATP and NADPH}_2$$

2. **Where do the light dependent reaction and the Calvin cycle occur in the chloroplast?**
T

	Light dependent reaction	Calvin cycle
Location	It takes place in the **thylakoid membranes (Grana)** of the chloroplast.	It takes place in the **stroma** of the chloroplast.

Additional – Choose the best answer

1. **The study of internal structure of plants.**
   a) Plant Physiology   b) Plant Anatomy   c) Taxonomy   d) Cytology
   Ans.: b) Plant Anatomy

2. **Vascular bundle in which xylem completely surrounds the phloem or vice versa is called _____ vascular bundle.**
   a) Collateral   b) Bicollateral   c) Concentric   d) Radial
   Ans.: c) Concentric

3. **In _____ vascular bundles, Xylem and phloem are present in different radii alternating with each other.**
   a) Collateral   b) Bicollateral   c) Concentric   d) Radial
   Ans.: d) Radial

4. **In _____ vascular bundle, the phloem is present on both outer and inner side of xylem.**
   a) Collateral   b) Bicollateral   c) Concentric   d) Radial
   Ans.: b) Bicollateral

5. **Cuticle and stomata are absent in _____.**
   a) Stem   b) Leaf   c) Root   d) None of the above
   Ans.: c) Root

6. **Conjunctive tissue in dicot root, is made up of _____.**
   a) Parenchyma   b) Collenchyma   c) Sclerenchyma   d) Xylem
   Ans.: c) Sclerenchyma

7. **The xylem is exarch and polyarch in _____.**
   a) Dicot stem   b) Dicot root   c) Monocot stem   d) Monocot root
   Ans.: d) Monocot root

8. **Conjunctive tissue in monocot root, is made up of _____.**
   a) Parenchyma   b) Collenchyma   c) Sclrenchyma   d) Xylem
   Ans.: c) Sclrenchyma

9. **Root hairs are the unicellular out growths of _____.**
   a) Epiblema   b) Rhizodermis   c) Piliferous layer   d) All the above
   Ans.: d)All the above

10. **Vascular bundles are conjoint, collateral, endarch and open in**
    a) Dicot stem   b) Dicot root   c) Monocot stem   d) Monocot root
    Ans.: a) Dicot stem

11. **_____ helps in the storage of food materials.**
    a) Epidermis   b) Chlorenchyma   c) Collenchyma   d) Pith
    Ans.: d) Pith

12. _____ cells of hypodermis provides mechanical support in Monocot Stem (Maize).

   a) Parenchyma   b) Collenchyma   c) Sclerenchyma   d) Xylem

                              Ans.: c) Sclerenchyma

13. Ground tissue is not differentiated into endodermis, cortex, pericycle and pith in _____.

   a) Dicot stem   b) Dicot root   c) Monocot stem   d) Monocot root

                              Ans.: c) Monocot stem

14. **Each vascular bundle in monocot stem (Maize) is surrounded by few layer of sclerenchyma cells called _____.**

   a) Bundle sheath   b) Endodermis   c) Pericycle   d) Cambium

                              Ans.: a)Bundle sheath

15. _____ of dicot leaf takes part in photosynthesis.

   a) Vascular bundle   b) Lower epidermis   c) Spongy Parenchyma   d) Palisade parenchyma

                              Ans.: d)Palisade parenchyma

16. **Vascular bundles are conjoint, collateral and closed in**

   a) Monocot and dicot stem   b) Monocot and dicot root

   c) Monocot and dicot leaf   d) All the above

                              Ans.: c) Monocot and dicot leaf

17. **Mesophyll is not differentiated into palisade and spongy parenchyma in _____.**

   a) Monocot leaf   b) Dicot leaf   c) Monocot and dicot leaf   d) None of the above

                              Ans.: a) Monocot leaf

18. **Yellow, red, orange coloured plastids**

   a) Leucoplast   b) Chloroplast   c) Chromoplast   d) None of the above

                              Ans. : c) Chromoplast

19. **Chloroplasts are _____ shaped organelles.**

   a) Oval   b) Rod   c) Square   d) Rectangle

                              Ans.: a) Oval

20. **Stroma contains _____ ribosomes for protein synthesis.**

   a) 20 S   b) 30 S   c) 50 S   d) 70 S

                              Ans.: d) 70 S

21. **Thylakoids forms a stack of disc like structures called _____.**

   a) Stroma   b) Matrix   c) Granum   d) Lamellae

                              Ans.: c) Granum

22. **During photosynthesis _____ is released as a byproduct.**

   a) Oxygen   b) Carbon di oxide   c) ATP   d) ADP

                              Ans.: a) Oxygen

23. **_____ is the primary photosynthetic pigment.**

   a) Chlorophyll a   b) Chlorophyll b   c) Carotenoids   d) Xanthophylls

                              Ans.: a) Chlorophyll a

24. **The entire process of photosynthesis takes place inside the _____.**

   a) Chloroplast   b) Leucoplast   c) Chromoplast   d) Mitochondria

                              Ans.: a) Chloroplast

25. **Dark reaction or biosynthetic pathway is carried out in the _____.**

   a) Stroma   b) Oxysomes   c) Grana   d) Lamellae

                              Ans. : a)Stroma

26. Light independent reaction is also called as _____.
a) Calvin cycle   b) Krebs cycle   c) Glycolysis   d) Hill reaction

Ans.: a) Calvin cycle

27. In mitochondria, _____ involve in ATP synthesis.
a) Oxysomes   b) DNA   c) Ribosomes   d) RNA

Ans.: a)Oxysomes

28. Glycolysis is the breakdown of one molecule of _____ carbon glucose into two molecules of _____ carbon pyruvic acid.
a) 3 and 6   b) 6 and 3   c) 2 and 4   d) 3 and 4

Ans.: b) 6 and 3

29. Glycolysis takes place in _____ of the cell.
a) Chloroplast   b) Mitochondria   c) Cytoplasm   d) Ribosome

Ans.: c) Cytoplasm

30. _____ is the ultimate electron acceptor in aerobic respiration.
a) Oxygen   b) Hydrogen   c) Carbon di oxide   d) Water

Ans. : a)Oxygen

Additional – Fill in the blanks

1. _____ classified tissue system in plants into three types.   **Ans.:** Sachs
2. Trichomes and root hairs are the _____ outgrowths.   **Ans.:** Epidermal
3. _____ is present on the outer wall of epidermis to check evaporation of water.   **Ans.:** Cuticle
4. _____ conducts water and minerals.   **Ans.:** Xylem
5. _____ conducts food materials to different parts of the plant.   **Ans.:** Phloem
6. The internal structure of plants was first published by English Physician _____.   **Ans.:** Nehemiah Grew
7. _____ is known as Father of Plant Anatomy.   **Ans.:** Nehemiah Grew
8. Vascular bundle without cambium is called _____.   **Ans.:** Closed
9. Cortex of dicot and monocot roots is made of thin-walled _____ cells.   **Ans. :** Parenchymatous
10. The radial and inner tangential walls of endodermis of root consists _____ strips.   **Ans. :** Casparian
11. _____ is the site of origin of lateral roots.   **Ans.:** Pericycle
12. All tissues inner to endodermis constitute _____.   **Ans. :** Stele
13. The tissue present between xylem and phloem in dicot root is called _____. **Ans.:** Conjunctive tissue
14. Casparian strips are band like thickening made of _____.   **Ans.:** Suberin
15. Pith of monocot root contains abundant amount of _____.   **Ans.:** Starch grains
16. Epidermis is made up of single layer of _____ cells.   **Ans.:** Parenchyma
17. Epidermis of stem is covered with a waxy layer _____.   **Ans.:** Cuticle
18. The large central parenchymatous zone in some stem and root is called _____.   **Ans.:** Pith
19. Multicellular hairs are absent and stomata are also less in number in epidermis of _____. **Ans.:** Maize
20. The entire mass of parenchyma cells next to hypodermis and extending to the centre in monocot stem is called _____.   **Ans.:** Ground tissue
21. In monocot stem (Maize), _____ are skull shaped and scattered in the ground tissue.   **Ans.:** Vascular bundles

22. In mature vascular bundle of monocot stem, the lower most protoxylem disintegrates and form a cavity. This is called _____.   **Ans.:** Protoxylem lacuna

23. Phloem components such as phloem parenchyma, and phloem fibers are absent in _____.
    Ans.: Monocot stem

24. Out of four components, the _____ consists only sieve tube elements and companion cells in monocot stem.   **Ans.:** Phloem

25. Chloroplasts are present in _____ of lower epidermis of dicot leaf.   **Ans.:** Guard cells

26. The tissue present between the upper and lower epidermis of leaves is called _____.   **Ans.:** Mesophyll

27. Vascular bundle of is surrounded by a sheath of parenchymatous cells called _____.
    Ans.: Bundle sheath

28. Some cells of upper epidermis in monocot leaf are large and thin walled they are known as _____.
    Ans.: Bulliform cells

29. _____ are colourless plastids.   **Ans.:** Leucoplast

30. Chloroplasts are containing green pigment called _____.   **Ans. :** Chlorophyll

31. Matrix present inside to the membrane chloroplast is called _____.   **Ans.:** Stroma

32. _____ of thylakoid is covered by thylakoid membrane.   **Ans.:** Lumen

33. Grana are interconnected to each other by membranous lamellae called _____.   **Ans.:** Fret channels

34. Chlorophyll _____ traps solar energy and converts it into electrical and chemical energy.   **Ans.:** a

35. _____ is called the reaction centre.   **Ans.:** Chlorophyll a

36. Chlorophyll b and carotenoids are called _____ pigments.   **Ans. :** Accessory

37. Accessory pigments pass on the absorbed energy to _____ molecule.   **Ans.:** Chlorophyll a

38. Reaction centres (Chl. a) and the accessory pigments (harvesting centre) together are called _____.
    Ans.: Photosystems

39. Accessory pigments are called _____ centre.   **Ans. :** Harvesting

40. Light dependent photosynthesis (Hill reaction \ Light reaction) was discovered by _____ in 1939.
    Ans . : Robin Hill

41. Light dependent photosynthesis (Hill reaction \ Light reaction) takes place in _____ of the chloroplasts.   **Ans.:** Thylakoid membranes or Grana

42. During light reaction photosynthetic pigments absorb the light energy and convert it into chemical energy _____ and _____.   **Ans.:** ATP and NADPH$_2$

43. ATP and NADPH$_2$, products of light reaction, move out from the thylakoid to the _____ of the chloroplast.   **Ans.:** Stroma

44. Light independent reactions is the _____ phase of photosynthesis.   **Ans.:** Biosynthetic

45. During Light independent reaction, CO_2 is reduced into _____ with the help of light generated ATP and NADPH$_2$.   **Ans.:** Carbohydrates

46. Calvin cycle is carried out in the absence of _____.   **Ans. :** Light

47. In respiration, the energy released from glucose is used to make _____.   **Ans.:** ATP

48. _____ discovered chemical pathway for photosynthesis.   **Ans. :** Melvin Calvin

49. _____ was awarded with Nobel Prize in the year 1961 for discovery of Dark reaction.
    Ans.: Melvin Calvin

50. The mitochondria were first discovered by _____ in 1857.   **Ans.:** Kolliker

51. _____ is the energy currency of the cell.   **Ans.:** ATP

52. The _____ is referred to as the "Power house of the cell".   **Ans.:** Mitochondria

53. Mitochondria vary in size from _____.   **Ans.:** 0.5 μm to 2.0 μm

54. Each Mitochondrial membrane is _____ thick.   **Ans.:** 60-70 A°

55. Outer mitochondrial membrane has _____ molecules which form channels for passage of molecules through it.   **Ans.:** Porin

56. Inner mitochondrial membrane is a _____ membrane and regulates the passage of materials into and out of the mitochondria.   **Ans.:** Semi permeable

57. _____ is a method for producing renewable energy by the use of sunlight.
Ans.: Artificial photosynthesis

58. Indian scientist _____ was conferred the Bharat Ratna in 2013.   **Ans.:** C.N.R. Rao

59. C.N.R. Rao is working on artificial photosynthesis to produce _____ fuel.   **Ans.:** Hydrogen

60. The inner mitochondrial membrane gives rise to finger like projections called _____.   **Ans.:** Cristae

61. _____ increase the inner surface area of the mitochondria to hold variety of enzymes necessary for respiration.   **Ans.:** Cristae

62. The inner mitochondrial membrane bear minute regularly spaced tennis racket shaped particles known as _____.   **Ans.:** Oxysomes (F_1 particle)

63. Mitochondrial _____ contains enzymes for Krebs cycle.   **Ans.:** Matrix

64. _____ helps the cells to maintain normal concentration of calcium ions.   **Ans.:** Mitochondria

65. The plants obtain oxygen from their environment and release carbon dioxide and water vapour. This exchange of gases is known as _____.   **Ans.:** External respiration

66. Biochemical process occurs within cells where the food is oxidized to obtain energy, this is known as _____.   **Ans. :** Cellular respiration

67. _____ $+ 6O_2 \longrightarrow 6CO_2 + 6H_2O + ATP$.   **Ans.:** $C_6H_{12}O_6$

68. $C_6H_{12}O_6 \longrightarrow 2CO_2 + 2$ _____ $+ ATP$.   **Ans.:** C_2H_5OH

69. $6CO_2 + 12H_2O \xrightarrow[\text{Chlorophyll}]{\text{Light}}$ _____ $+ 6H_2O + 6O_2\uparrow$ **Ans.:** $C_6H_{12}O_6$

70. _____ is the first step of both aerobic and anerobic respiration.   **Ans.:** Glycolysis

71. Krebs Cycle occurs in mitochondria _____.   **Ans.:** Matrix

72. At the end of glycolysis, 2 molecules of 3 carbon _____ enter into mitochondria.   **Ans.:** Pyruvic acid

73. The oxidation of _____ into CO_2 and water takes place in Krebs cycle.   **Ans.:** Pyruvic acid

74. Krebs cycle is also called _____.   **Ans.:** Tricarboxylic Acid Cycle (TCA).

75. Electron transport chain (ETC) located on the _____ of the mitochondria.   **Ans.:** Inner membrane

76. In Electron transport chain, energy released via electrons during the oxidation of _____ and _____ are trapped by ADP to synthesis ATP.   **Ans.:** $NADH_2$ and $FADH_2$

77. The energy released by electrons during Electron Transport Chain is trapped by ADP to synthesize ATP. This is called _____.   **Ans.:** Oxidative phosphorylation

78. In aerobic respiration, O_2, the ultimate acceptor of electrons, gets reduced to _____.   **Ans.:** Water

79. In _____ respiration, organic food is incompletely oxidized.   **Ans.:** Anaerobic

80. In anaerobic respiration, organic food is incompletely oxidized into _____.   **Ans.:** Ethanol

81. Ethanol or lactate, carbon dioxide and energy are the end products of _____ respiration.
Ans.: Anaerobic

82. Anaerobic respiration takes place without _____.   **Ans.:** Oxygen

83. During anaerobic respiration, glucose is converted into _____ in some bacteria.   **Ans.:** Lactate

84. _____ is the ratio of volume of carbon dioxide liberated and the volume of oxygen consumed during respiration.   **Ans :** Respiratory quotient

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Additional – State whether the statements are true or false. Correct the false statement

1. **In vascular bundle of root, protoxylem lies towards the centre and metaxylem lies towards the periphery.**

   Ans : False.

   Correct statement : In vascular bundle of **stem**, protoxylem lies towards the centre and metaxylem lies towards the periphery.

2. **Cortex , Endodermis, Pericycle and Pith are the parts of Vascular Tissue System.**

   Ans : False.

   Correct statement : Cortex , Endodermis, Pericycle and Pith are the parts of **Ground** Tissue System.

3. **Radial Bundles are present in roots.**

   Ans.: True.

4. **Xylem is exarch and tetrarch in dicot stem.**

   Ans : False.

   Correct statement : Xylem is exarch and tetrarch in dicot **root**.

5. **Root hairs are unicellular.**

   Ans.: True.

6. **Vascular bundles are conjoint, collateral, endarch and open in monocot stem.**

   Ans : False.

   Correct statement : Vascular bundles are conjoint, collateral, endarch and open in **dicot** stem.

7. **In Epidermis of monocot stem (Maize), Multicellular hairs are absent and stomata are also less in number.**

   Ans.: True.

8. **Ground tissue is not differentiated into endodermis, cortex, pericycle and pith in monocot stem.**

   Ans.: True.

9. **Pith is not differentiated in monocot stems.**

   Ans.: True.

10. **Upper epidermis of dicot leaf has more stomata than lower epidermis.**

    Ans : False.

    Correct statement : **Lower** epidermis of dicot leaf has more stomata than **upper** epidermis.

11. **In dicot leaf, the lower epidermis helps in the exchange of gases.**

    Ans.: True.

12. **Mesophyll is differentiated into Palisade parenchyma and Spongy parenchyma in monocot leaf.**

    Ans : False.

    Correct statement : Mesophyll is **not** differentiated into Palisade parenchyma and Spongy parenchyma in monocot leaf.

13. **Chloroplasts are green colour plastids.**

    Ans.: True.

14. **Chloroplasts having a diameter of 2-10 micrometer and a thickness of 1-2 micrometer.**

    Ans.: True.

15. **In Calvin cycle, the inputs are CO$_2$ from the atmosphere and the ATP and NADPH$_2$ produced from light reaction.**

    Ans.: True.

16. **A cell cannot get its energy directly from glucose.**

    Ans.: True.

17. **In anaerobic respiration, organic food is completely oxidized without the help of oxygen.**

    Ans. : False.

    Correct Statement : In **anaerobic** respiration, organic food is incompletely oxidized without the help of oxygen.

Additional – Match the following

Section I

1.	Bicollateral	(a)	Piliferous layer
2.	Closed Vascular bundle	(b)	Colourless
3.	Open Vascular Bundle	(c)	Dicot leaf
4.	Exarch	(d)	Monocot leaf
5.	Endarch	(e)	Casparian strips
6.	Endodermis	(f)	Protoxylem towards centre
7.	Rhizodermis	(g)	Cucurbita
8.	Dorsiventral Leaf	(h)	Dicot stem
9.	Isobilateral Leaf	(i)	Protoxylem towards periphery
10.	Leucoplast	(j)	Monocot stem

Answer :

1.	Bicollateral	g	Cucurbita
2.	Closed Vascular bundle	j	Monocot stem
3.	Open Vascular Bundle	h	Dicot stem
4.	Exarch	i	Protoxylem towards periphery
5.	Endarch	f	Protoxylem towards centre
6.	Endodermis	e	Casparian strips
7.	Rhizodermis	a	Piliferous layer
8.	Dorsiventral Leaf	c	Dicot leaf
9.	Isobilateral Leaf	d	Monocot leaf
10.	Leucoplast	b	Colourless

Section II

1.	Oxysomes	(a)	Light reaction
2.	Mitochondrial ribosome	(b)	Glucose splitting
3.	Mitochondria	(c)	Artificial photosynthesis
4.	Glycolysis	(d)	Proteins
5.	C.N.R. Rao	(e)	ATP factory
6.	Robin Hill	(f)	70 S
7.	Porin molecules	(g)	Stroma
8.	Krebs cycle	(h)	Tricarboxylic Acid Cycle
9.	Dark reaction	(i)	F1 particle

Answer :

1.	Oxysomes	i	F1 particle
2.	Mitochondrial ribosome	f	70 S
3.	Mitochondria	e	ATP factory
4.	Glycolysis	b	Glucose splitting
5.	C.N.R. Rao	c	Artificial photosynthesis
6.	Robin Hill	a	Light reaction
7.	Porin molecules	d	Proteins
8.	Krebs cycle	h	Tricarboxylic Acid Cycle
9.	Dark reaction	g	Stroma

Additional – Answer in a sentence

1. **What are the three types of tissue systems of plants?**
   i) Dermal or Epidermal tissue system.
   ii) Ground tissue system on fundamental tissue system and
   iii) Vascular tissue system on conducting tissue system

2. **What are the degrees of organization in plants?**
   Atoms $\longrightarrow$ Molecules $\longrightarrow$ Organelles $\longrightarrow$ Cells $\longrightarrow$ Tissues $\longrightarrow$ Organs $\longrightarrow$ Organ systems $\longrightarrow$ Plant.

3. **Define Tissue.**
   Tissues are the group of cells that are similar or dissimilar in structure and origin, but perform similar function.

4. **How are plant tissues classified based on their ability to divide?**
   Plant tissues can be broadly classified into two, based on their ability to divide. They are
   i) Meristamatic tissue - They able to divide.
   ii) Permanent tissue - They do not able to divide.

5. **What is protoxylem lacuna?**
   In mature vascular bundle of monocot stem, the lower most protoxylem disintegrates and form a cavity. This is called **protoxylem lacuna**.

6. **What are the functions of Chloroplast?**
   i) Photosynthesis   ii) Storage of starch   iii) Synthesis of fatty acids
   iv) Storage of lipids   v) Formation of chloroplasts.

7. **Where does photosynthesis occur?**
   Photosynthesis occurs in green parts of the plant such as leaves, stems and floral buds.

8. **What does ATP stand for?**
   ATP - Adenosine Triphosphate.

9. **What does ADP stand for?**
   ADP - Adenosine Diphosphate.

10. **What does NAD stand for?**
    NAD - Nicotinamide Adenine Dinucleotide.

11. **What does NADP stand for?**
    NADP - Nicotinamide Adenine Dinucleotide Phosphate.

12. **What are Oxysomes?**
    The inner mitochondrial membrane bear minute regularly spaced tennis racket shaped particles known as oxysomes (F1 particle). They involve in ATP synthesis.

13. Define Cellular respiration.

Biochemical process occurs within cells where the food is oxidized to obtain energy, this is known as cellular respiration.

14. What is aerobic respiration?

Aerobic respiration is the type of celluar respiration in which organic food is completely oxidized with the help of oxygen into carbon dioxide, water and energy.

15. Write the overall equation for Photosynthesis.

$$6CO_2 + 12H_2O \xrightarrow[\text{Chlorophyll}]{\text{Light}} C_6H_{12}O_6 + 6H_2O + 6O_2\uparrow$$

Carbon dioxide + Water   Glucose + Water + Oxygen
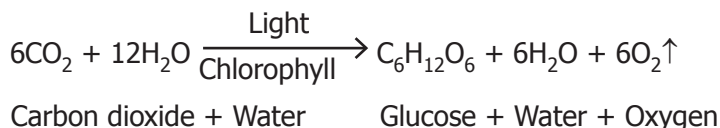
16. Write the overall equation for aerobic respiration.

$$C_6H_{12}O_6 + 6O_2 \xrightarrow{\text{Mitochondria}} 6CO_2 \ + \ 6H_2O + ATP$$

Glucose + Oxygen   Carbon dioxide + Water + Energy
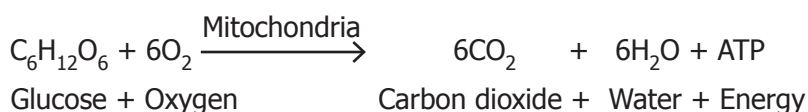
18. Define anaerobic respiration.

Anaerobic respiration is the type of celluar respiration in which organic food is incompletely oxidized without oxygen into ethanol (in plants) or lactate, carbon dioxide and energy.

19. What are the three stages of Aerobic respiration?

The three stages of Aerobic respiration are

a.   Glycolysis (Glucose splitting) or EMP Pathway
b.   Krebs Cycle or TCA Cycle or Citric Acid Cycle
c.   Electron Transport Chain.

20. What is oxidative phosphorylation?

The energy released by electrons during Electron Transport Chain is trapped by ADP to synthesize ATP. This is called oxidative **phosphorylation**.

Additional – Short answers

1. What are the functions of Dermal or Epidermal Tissue System?

i)   Epidermis protects the inner tissues.
ii)   Stomata helps in transpiration.
iii)   Root hairs help in absorption of water and minerals.

2. Differentiate endarch and exarch.

Endarch	Exarch
1. Protoxylem lies towards the centre.	1. Protoxylem lies towards the periphery.
2. Metaxylem lies towards the periphery.	2. Metaxylem lies towards the centre.
3.This is characteristic feature of stem.	3.This is characteristic feature of root.

3. What is casparian strip ? What is its function?

Band like thickenings on radial and inner tangential walls of endodermis of dicot and monocot roots are known as **casparian** strips.

Function : It helps in the movement of water and dissolved salts from cortex into xylem.

4. Give an account on vascular bundle of dicot root.

i)   It is radial.
ii)   Xylem is **exarch** and **tetrach**.
iii)   The tissue present between xylem and phloem is called conjunctive tissue.
iv)   Conjunctive tissue is made up of parenchyma.

5. **Describe regions of the cortex of dicot stem.**

Cortex of dicot stem is divided into three regions:

(i) Hypodermis : It consists of 3 - 6 layers of collenchyma cells. It gives mechanical support.

(ii) Middle cortex : It is made up of few layers of chlorenchyma cells. It is involed in photosynthesis due to the presence of chloroplast.

(iii) Inner cortex : It is made up of few layers of parenchyma cells. It helps in gaseous exchange and stores food materials. **Endodermis** is the inner most layer of cortex it consists of a single layer of barrel shaped cells, these cells contain starch grains. So it is also called **starch sheath**.

6. **What are the three types of cells present in cortex of dicot stem. Mention the their uses.**

No.	Types of cell in cortex of dicot stem	Function
1.	Collenchyma cells	They give mechanical support
2.	Chlorenchyma cells	They involve in photosynthesis
3.	Parenchyma cells	They help in gaseous exchange and stores food materials.

7. **Write the differences between of Dicot and Monocot Leaf.**

No.	Dicot Leaf	Monocot Leaf
1.	Dorsiventral leaf	Isobilateral leaf
2.	Mesophyll is differentiated into palisade and spongy parenchyma	Mesophyll is not differentiated into palisade and spongy parenchyma.

8. **Write a note on mesophyll of dicot leaf.**

The tissue present between the upper and lower epidermis is called mesophyll.

It is differentiated into Palisade parenchyma and Spongy parenchyma.

a) Palisade parenchyma :

i) It is found just below the upper epidermis with elongated cells.

ii) These cells have more number of chloroplasts.

iii) The cells do not have intercellular spaces and they take part in photosynthesis.

b) Spongy parenchyma :

i) It is found below the palisade parenchyma tissue.

ii) Cells are almost spherical or oval and are irregularly arranged.

iii) Cells have intercellular spaces. It helps in gaseous exchange.

9. **Write the differences between palisade and spongy parenchyma of dicot leaf.**

No.	Palisade Parenchyma	Spongy Parenchyma
1.	These cells have more number of chloroplasts.	These cells have less number of chloroplasts.
2.	The cells are elongated.	The cells are spherical or oval in shape.
3.	It takes part in photosynthesis.	It helps in gaseous exchange.

10. **Define dorsiventral and isobilateral leaf.**

Dorsiventral Leaf : When **leaf** structure of ventral side is different from dorsal side, it is called **dorsiventral**. In such type of **leaf**, mesophyll layer is differentiated in to palisde and spongy tissues. eg: Dicot leaves.

Isobilateral leaf : The **leaves** showing similar structure on both the surfaces are called **isobilateral**. eg: Monocot leaves.

11. **What are plastids? Name three types of plastids.**

Plastids are double membrane bound organelles found in plants and some algae. They are responsible for preparation and storage of food. There are three types of plastids.

i)   Chloroplast   -   Green coloured plastids

ii)   Chromoplast   -   Yellow, red, orange coloured plastids

iii) Leucoplast   -   Colourless plastids.

12. What are Photosynthetic pigments? What are the two types?

Pigments involved in photosynthesis are called **Photosynthetic pigments**.

Photosynthetic pigments are of two classes namely,

i)   The primary pigments and

ii)   Accessory pigments.

13. What are the factors affecting Photosynthesis?

a)   Internal Factors :

i) Pigments   ii) Leaf age   iii) Accumulation of carbohydrates   iv) Hormones

b)   External Factors :

i) Light   ii) Carbon dioxide   iii) Temperature   iv) Water   v) Mineral elements.

14. What are the components of mitochondrial matrix?

i)   It is a complex mixture of proteins and lipids.

ii)   Matrix contains enzymes for Krebs cycle, mitochondrial ribosomes (70 S), tRNAs and mitochondrial DNA.

15. What are the functions of Mitochondria?

i)   Mitochondria is the main organelle of cellular respiration. They produce a large number of ATP molecules. So they are called as **power houses of the cell or ATP factory of the cell**.

ii)   It helps the cells to maintain normal concentration of calcium ions.

iii) It regulates the metabolic activity of the cell.

Additional – Long Answers

1.   Explain the three types of tissue systems of plants.

Sachs (1875) classified tissue system in plants into three types

a)   Dermal or Epidermal tissue system

b)   Ground tissue system and

c)   Vascular tissue system.

a)   Dermal or Epidermal Tissue System :

It consists of epidermis, stomata and epidermal outgrowths. Epidermis is the outer most layer. It has many minute pores called stomata. Cuticle is present on the outer wall of epidermis to check evaporation of water. Trichomes and root hairs are the epidermal outgrowths.

Functions :

i)   Epidermis protects the inner tissues.

ii)   Stomata helps in transpiration.

iii) Root hairs help in absorption of water and minerals.

b)   Ground Tissue System on Fundamental tissue system:

It includes all the tissues of the plant body except epidermal and vascular tissues like

(i) Cortex (ii) Endodermis (iii) Pericycle (iv) Pith

c)   Vascular Tissue System on conducting tissue system:

It consists of xylem and phloem tissues. They are present in the form of bundles called vascular bundles. Xylem conducts water and minerals to different parts of the plant. Phloem conducts food materials to different parts of the plant.

There are three different types of vascular bundles namely (i) Radial (ii) Conjoint (iii) Concentric.

i)   Radial Bundles :

Xylem and phloem are present in different radii alternating with each other. e.g. roots.

ii)   Conjoint bundles :

Xylem and phloem lie on the same radius. There are two types of conjoint bundles.

a)   Collateral : Xylem lies towards the centre and phloem lies towards the periphery.

When cambium is present in collateral bundles, it is called open. e.g. dicot stem and collateral bundle without cambium is called closed. e.g. monocot stem.

b)   Bicollateral : In this type of bundle, the phloem is present on both outer and inner side of xylem. e.g. Cucurbita.

iii)   Concentric Bundles :

Vascular bundle in which xylem completely surrounds the phloem or vice versa is called concentric vascular bundle. It is of two types:

1. Amphivasal: Xylem surrounds phloem. e.g. Dracaena.

2. Amphicribral: Phloem surrounds xylem. e.g. Ferns.

2.   Tabulate the components and functions of three types of tissue system.

Tissue System	Components	Funtions
1.Dermal Tissue System	1.Epidermis and 2.Periderm (In older stems and roots)	1.Protection 2.Prevention of water loss.
2.Ground Tissue System	1.Parenchyma tissue 2.Collenchyma tissue 3.Sclerenchyma tissue	1.Photosynthesis 2.Food storage 3.Regeneration 4.Support 5.Protection
3.Vascular Tissue System	Vascular tissues 1.Xylem tissue 2.Phloem tissue	1.Transport of water and minerals 2.Transport of food

3.   Explain the internal structure of Dicot Root (Bean) with a labeled diagram.

Internal Structure of Dicot Root (Bean):

A thin transverse section of dicot root shows the following structures.

i)   Epiblema : It is the outermost layer. Cuticle and stomata are absent. Unicellular root hairs are present. It is also known as **Rhizodermis** or **Piliferous layer**.

ii)   Cortex : It is a multilayered large zone made of thin-walled parenchymatous cells with intercellular spaces. It stores food and water.

iii)   Endodermis: It is the innermost layer of cortex. The cells are barrel - shaped, closely packed, and show band like thickenings on their radial and inner tangential walls called **casparian strips**. It helps in the movement of water and dissolved salts from cortex into xylem.

iv)   Stele: All tissues inner to endodermis constitute stele. It includes pericycle and vascular bundle.

Transverse section of Dicot root

a)   Pericycle : Inner to endodermis lies a single layer of pericycle. It is the site of origin of lateral roots.

b)   Vascular bundle : It is radial. Xylem is **exarch** and **tetrach**. The tissue present between xylem and phloem is called conjunctive tissue. In dicot root, it is made up of parenchyma.

c)   Pith : Young root contains pith whereas in old root pith is absent.
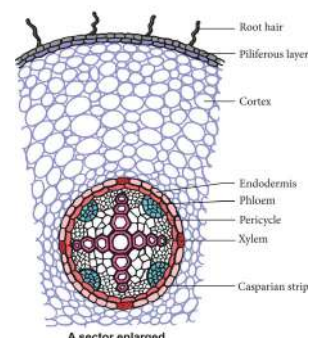
4. **Explain the internal structure of monocot root (Maize) with labeled diagram.**

   Internal Structure of Monocot Root (Maize)

   A thin transverse section of monocot root, shows the following characteristic features.

   i) **Epiblema or Rhizodermis :** It is the outermost layer of the root, and is made up of single layer of thin walled, parenchymatous cell. Stomata and cuticle are absent. The root hair helps in absorption of water and minerals from the soil. This layer also protects the inner tissues.

   ii) **Cortex :** It is multilayered large zone, composed of parenchymatous cells with intercellular spaces. It stores water and food material.

   iii) **Endodermis:** It is the innermost layer of cortex with characteristic casparian strips and passage cells. **Casparian strips** are band like thickening made of **suberin**.

   iv) **Stele :** All the tissues inner to endodermis constitute stele. It includes pericycle, vascular tissues and pith.

   a) **Pericycle :** It is a single layer of thin walled cells. The lateral roots originate from this layer.

   b) **Vascular tissues :** It consists of many patches of xylem and phloem arranged radially. The xylem is exarch and polyarch. The conjunctive tissue is made up of sclerenchyma.

   c) **Pith :** It is present at the center. It is made up of parenchyma cells with intercellular spaces. It contains abundant amount of starch grains. It stores food.

5. **Explain the internal structure of Dicot Stem (Sunflower) with labeled diagram.**

   Internal Structure of Dicot Stem (Sunflower) :

   The transverse section of a dicot stem reveals the following structures.

   i) **Epidermis :** It is the outermost layer. It is made up of single layer of parenchyma cells, its outer wall is covered with cuticle. It is protective in function.

   ii) **Cortex :** It is divided into three regions:

   i) **Hypodermis :** It consists of 3 - 6 layers of collenchyma cells. It gives mechanical support.

   ii) **Middle cortex :** It is made up of few layers of chlorenchyma cells. It is involed in photosynthesis due to the presence of chloroplast.

   iii) **Inner cortex:** It is made up of few layers of parenchyma cells. It helps in gaseous exchange and stores food materials.

   Endodermis is the inner most layer of cortex it consists of a single layer of barrel shaped cells, these cells contain starch grains. So it is also called **starch sheath**.

   iii) **Stele :** The central part of the stem inner to endodermis is known as stele. It consists of pericycle, vascular bundle and pith.

   a) **Pericycle :** It occurs between vascular bundle and endodermis. It is multilayered, parenchymatous with alternating patches of sclerenchyma.

   b) **Vascular bundle :** Vascular bundles are conjoint, collateral, endarch and open. They are arranged in the form of a ring around the pith.

   c) **Pith :** The large central parenchymatous zone with intercellular spaces is called pith. It helps in the storage of food materials.

6. **Describe the Internal Structure of Monocot Stem (Maize) with labeled**

   Internal Structure of Monocot Stem (Maize)

   A transverse section of monocot stem reveals the following structures.

   i) **Epidermis :** It is the outermost layer. It is made up of single layer of parenchyma cells. It is covered with thick cuticle. Multicellular hairs are absent and stomata are also less in number.

   ii) **Hypodermis :** It is made up of few layers of sclerenchyma cells interrupted by chlorenchyma. Sclerenchyma provides mechanical support to plant.

   iii) **Ground tissue :** The entire mass of parenchyma cells next to hypodermis and extending to the centre is called ground tissue. It is
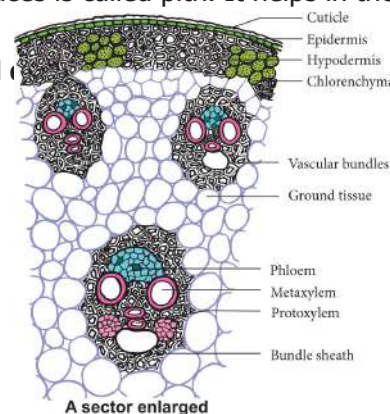
Transverse section of Monocot stem

not differentiated into endodermis, cortex, pericycle and pith.

iv) **Vascular Bundle :** Vascular bundles are skull shaped and scattered in the ground tissue. Vascular bundles are conjoint, collateral, endarch and closed. Each vascular bundle is surrounded by few layer of sclerenchyma cells called **bundle sheath**.

     a)   **Xylem:** It consists of metaxylem and protoxylem. Xylem vessels are arranged in V or Y shape. In mature vascular bundle, the lower most protoxylem disintegrates and form a cavity. This is called **protoxylem lacuna**.

     b)   **Phloem :** It consists of sieve tube elements and companion cells. Phloem parenchyma, and phloem fibers are absent.

v)   **Pith :** Pith is not differentiated in monocot stems.

7.   **Describe the Internal Structure of Dicot or Dorsiventral Leaf (Mango) with labeled diagram.**

The transverse section of leaf shows the following structures.
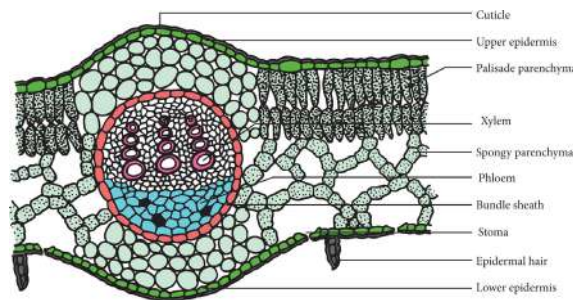
Transverse section of Dicot leaf

i)   **Upper epidermis :** This is the outermost layer made of single layered parenchymatous cells without intercellular spaces. The outer wall of the cells are cuticularized. Stomata are less in number.

ii)   **Lower epidermis :** It is a single layer of parenchymatous cells with a thin cuticle. It contains numerous stomata. Chloroplasts are present only in guard cells. The lower epidermis helps in the exchange of gases. The loss of water vapour is facilitated through this chamber.

iii)   **Mesophyll :** The tissue present between the upper and lower epidermis is called mesophyll. It is differentiated into Palisade parenchyma and Spongy parenchyma.

     a)   **Palisade parenchyma :** It is found just below the upper epidermis. The cells are elongated. These cells have more number of chloroplasts. The cells do not have intercellular spaces and they take part in photosynthesis.

     b)   **Spongy parenchyma :** It is found below the palisade parenchyma tissue. Cells are almost spherical or oval and are irregularly arranged. Cells have intercellular spaces. It helps in gaseous exchange.

iv)   **Vascular bundles :** Vascular bundle of mid-rib is larger. Vascular bundles are conjoint, collateral and closed. Each vascular bundle is surrounded by a sheath of parenchymatous cells called **bundle sheath**. Each vascular bundle consists of xylem lying towards the upper epidermis and phloem towards the lower epidermis.

8.   **Describe the internal structure of Monocot or Isobilateral Leaf with labeled diagram.**

The transverse section of a monocot leaf reveals the following structures.
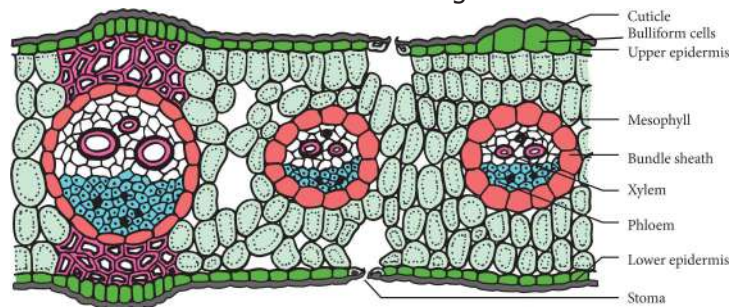
Transverse section of Monocot Leaf

i) **Epidermis :** Monocot leaf has upper and lower epidermis. Epidermis is made up of parenchyma cells. Cuticle is present on the outer wall stomata are present on both upper and lower epidermis. Some cells of upper epidermis are large and thin walled they are known as **bulliform cells**.

ii) **Mesophyll :** It is the ground tissue that is present between both epidermal layers. Mesophyll is not differentiated into palisade and spongy parenchyma. The cells are irregularly arranged with inter-cellular spaces. These cells contain chloroplasts.

iii) **Vascular bundles :** Large number of vascular bundles are present, some of which are small and some are large. Each vascular bundle is surrounded by parenchymatous bundle sheath. Vascular bundles are conjoint, collateral and closed. Xylem is present towards upper epidermis and phloem towards lower epidermis.

9. **Write the differences between Dicot and Monocot Stem.**

No.	Tissues	Dicot Stem	Monocot Stem
1.	Hypodermis	Collenchymatous	Sclerenchymatous
2.	Ground tissue	Differentiated into cortex, endodermis, pericycle and pith	Undifferentiated
3.	Vascular bundles	i) Less in number ii) Uniform in size iii) Arranged in a ring iv) Open v) Bundle sheath absent	i) Numerous ii) Smaller near periphery, bigger in the centre iii) Scattered iv) Closed v) Bundle sheath present
4.	Secondary growth	Present	Mostly absent
5.	Pith	Present	Absent
6.	Medullary rays	Present	Absent

10. **Explain aerobic respiration.**

Aerobic respiration is the type of celluar respiration in which organic food is completely oxidized with the help of oxygen into carbon dioxide, water and energy. It occurs in most plants and animals.

$$C_6H_{12}O_6 + 6O_2 \xrightarrow{\text{Mitochondria}} 6CO_2 + 6H_2O + ATP$$

Glucose + Oxygen → Carbon dioxide + Water + Energy
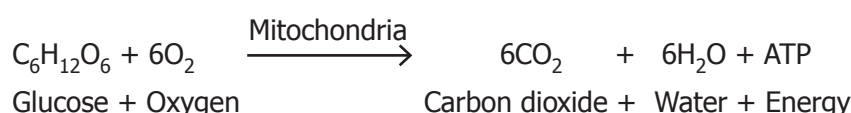
Stages of Aerobic respiration :

a) **Glycolysis (Glucose splitting):** It is the breakdown of one molecule of glucose (6 carbon) into two molecules of pyruvic acid (3 carbon). Glycolysis takes place in cytoplasm of the cell. It is the first step of both aerobic and anerobic respiration.

b) **Krebs Cycle :** This cycle occurs in mitochondria matrix. At the end of glycolysis, 2 molecules of pyruvic acid enter into mitochondria. The oxidation of pyruvic acid into CO_2 and water takes place through this cycle. It is also called Tricarboxylic Acid Cycle (TCA).

c) **Electron Transport Chain:** This is accomplished through a system of electron carrier complex called **electron transport chain** (ETC) located on the inner membrane of the mitochondria. $NADH_2$ and $FADH_2$ molecules formed during glycolysis and Krebs cycle are oxidised to NAD+ and FAD+ to release the energy via electrons. The electrons, as they move through the system, release energy which is trapped by ADP to synthesize ATP. This is called oxidative **phosphorylation**. In this process O_2, the ultimate acceptor of electrons gets reduced to water.

11. **Explain the structure of Mitochondria with labeled diagram.**

i) **Mitochondrial Membranes :** It consists two membranes called inner and outer membrane. Each membrane is 60-70 A° thick.

a. **Outer mitochondrial membrane** is smooth and freely permeable to most small molecules. It contains enzymes, proteins and lipids. It has **porin molecules** (proteins) which form channels for passage of molecules through it.

b. **Inner mitochondrial membrane** is semi permeable membrane and regulates the passage of materials into and out of the mitochondria. It is rich in enzymes and carrier proteins. It consists of 80% proteins and lipids.

ii) **Cristae :** The inner mitochondrial membrane gives rise to finger like projections called cristae. These cristae increase the inner surface area (fold in inner membrane) of the mitochondria to hold variety of enzymes.

iii) **Oxysomes :** The inner mitochondrial membrane bear minute regularly spaced tennis racket shaped particles known as oxysomes (F$_1$ particle). They involve in ATP synthesis.

Structure of Mitochondria

iv) **Mitochondrial matrix** - It is a complex mixture of proteins and lipids. Matrix contains enzymes for Krebs cycle, mitochondrial ribosomes(70 S), tRNAs and mitochondrial DNA.
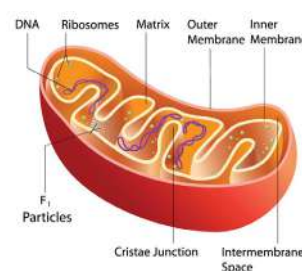
12. Explain the process of Photosynthesis.

Photosynthesis is the process in which carbondioxide combines with water in the pressure of sunlight and chlorophyle to form carbohydrates.

$$6CO_2 + 12H_2O \xrightarrow[\text{Chlorophyle}]{\text{Light}} C_6H_{12}O_6 + 6H_2O + 6O_2\uparrow$$
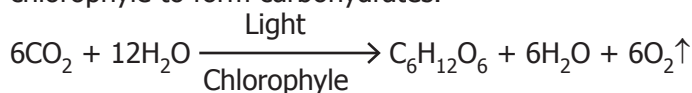
Carbondioxide + water   Glucose + water + oxygen

The entire process of photosynthesis takes place inside the chloroplast. The structure of chloroplast is such that the light dependent **(Light reaction)** and light independent **(Dark reaction)** take place at different sites in the organelle
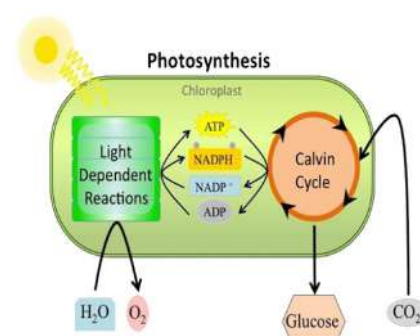
Overview of Hill and Calvin cycle

i) **Light dependent photosynthesis (Hill reaction \ Light reaction)**

This was discovered by **Robin Hill** (1939). This reaction takes place in the presence of light energy in **thylakoid membranes** (grana) of the chloroplasts. Photosynthetic pigments absorb the light energy and convert it into chemical energy ATP and NADPH$_2$. These products of light reaction move out from the thylakoid to the stroma of the chloroplast.

ii) **Light independent reactions (Biosynthetic phase)**

The second steps (dark reaction or biosynthetic pathway) is carried out in the **stroma**. During this reaction CO$_2$ is reduced into carbohydrates with the help of light generated **ATP** and **NADPH$_2$**. This is also called as **Calvin cycle** and is carried out in the absence of light.

In Calvin cycle the inputs are CO$_2$ from the atmosphere and the ATP and NADPH$_2$ produced from light reaction.

13. Explain the structure of Chloroplast with labeled diagram.

Chloroplasts are green plastids containing green pigment called chlorophyll. Chloroplasts are oval shaped organelles having a diameter of 2-10 micrometer and a thickness of 1-2 micrometer.
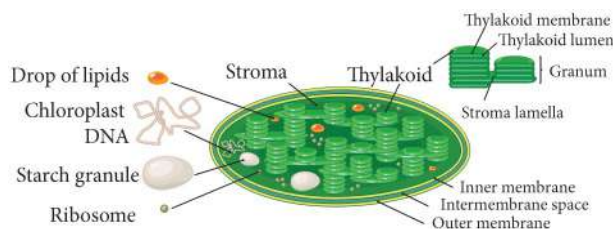
Ultrastructure of Chloroplast

i) **Envelope :** Chloroplast envelope has outer and inner membranes which is seperated by intermembrane space.

ii) **Stroma :** Matrix present inside to the membrane is called stroma. It contains DNA, 70 S ribosomes and other molecules required for protein synthesis.

iii) **Thylakoids :** It consists of thylakoid membrane that encloses thylakoid lumen. Thylakoids forms a stack of disc like structures called a grana (singular-granum).

iv) **Grana :** Some of the thylakoids are arranged in the form of discs stacked one above the other. These stacks are termed as grana, they are interconnected to each other by membranous lamellae called Fret channels.

IMPORTANT ABBREVIATIONS TO REMEMBER	
ATP	Adenosine Triphosphate
ADP	Adenosine Diphosphate
NAD	Nicotinamide Adenine Dinucleotide
NADP	Nicotinamide Adenine Dinucleotide Phosphate
$NADPH_2$	Nicotinamide Adenine Dinucleotide Hydrogen Phosphate
FAD	Flavin Adenine Dinucleotide
$FADH_2$	Flavin Adenine Dinucleotide (Reduced form)
TCA	Tricarboxylic Acid Cycle
ETC	Electron Transport Chain
tRNA	Transfer Ribonucleic Acid
RQ	Respiratory Quotient

UNIT TEST - 12

Time : 1.15 Hrs.   Marks : 50

I. Choose the best answer   (7 × 1 = 7)

1. **Casparian strips are present in the _____ of the root.**
   a) cortex   b) pith   c) pericycle   d) endodermis

2. **Oxygen is produced at what point during photosynthesis?**
   a) when ATP is converted to ADP   b) when CO_2 is fixed
   c) when H_2O is splitted   d) All of these

3. **Which is formed during anaerobic respiration**
   a) Carbohydrate   b) Ethyl alcohol   c) Acetyl CoA   d) Pyruvate

4. **Cuticle and stomata are absent in _____.**
   a) Stem   b) Leaf   c) Root   d) None of the above

5. **Light independent reaction is also called as _____.**
   a) Calvin cycle   b) Krebs cycle   c) Glycolysis   d) Hill reaction

6. **Glycolysis takes place in _____ of the cell.**
   a) Chloroplast   b) Mitochondria   c) Cytoplasm   d) Ribosome

7. **_____ is the ultimate electron acceptor in aerobic respiration.**
   a) Oxygen   b) Hydrogen   c) Carbon di oxide   d) Water

II. Fill in the blanks

(8 × 1 = 8)

8.   Cortex lies between _____.

9.   _____ discovered chemical pathway for photosynthesis.

10. _____ is ATP factory of the cells.

11. The first account of internal structure of plants was published by English Physician _____.

12. ATP and NADPH2, products of light reaction, move out from the thylakoid to the _____ of the chloroplast.

13. During anaerobic respiration, glucose is converted into _____ in some bacteria.

14. The energy released by electrons during Electron Transport Chain is trapped by ADP to synthesize ATP. This is called _____.

15. Krebs Cycle occurs in _____ of mitochondria.

III. Match the following

(5 × 1 = 5)

16. Amphicribal   (a)   Reaction centre

17. Amphivasal   (b)   Colourless

18. Phloem   (c)   Fern

19. Leucoplast   (d)   Dracaena

20. Chlorophylla   (e)   Translocation of food

IV. State whether the statements are true or false. Correct the false statement

(5 × 1 = 5)

21. Phloem tissue is involved in the transport of water in plant.

22. In monocot stem cambium is present in between xylem and phloem.

23. Anaerobic respiration produces more ATP than aerobic respiration.

24. Root hairs are unicellular.

25. Upper epidermis of dicot leaf has more stomata than lower epidermis.

V. Write the answer for the following questions in word or sentence

(5 × 1 = 5)

26. What is collateral vascular bundle?

27. Where does the carbon that is used in photosynthesis come from?

28. Name the phenomenon by which carbohydrates are oxidized to release ethyl alcohol.

29. What are the three types of tissue systems of plants?

30. What does ADP stand for?

VI. Write the short answer for ANY 5 of the following questions

(5 × 2 = 10)

31. Draw and label the structure of oxysomes.

32. What is photosynthesis and where in a cell does it occur?

33. Where do the light dependent reaction and the Calvin cycle occur in the chloroplast?

34. Differentiate Monocot root and Dicot root.

35. What is casparian strip? What is its function?

36. Write the differences between of Dicot and Monocot Leaf.

37. What are the functions of Mitochondria?

VII. Write long answer for the following questions   (2 × 5 = 10)

38. Describe and name three stages of cellular respiration that aerobic organisms use to obtain energy from glucose.

                                                        or

    Explain the structure of chloroplast with labelled diagram.

39. Describe the Internal Structure of Dicot or Dorsiventral Leaf (Mango) with labeled diagram.

                                                        or

    Differentiate the following a) Aerobic and anaerobic respriation b) Monocot stem and dicot system.

                                              ෴❖෴

UNIT
13

STRUCTURAL ORGANISATION OF ANIMALS

Points to Remember

➢ Leech is metamerically segmented and has 33 segments.

➢ It has two suckers which are used to attach to the body of the host. It is also involved in locomotion.

➢ The salivary glands of leech produce an anticoagulating substance called hirudin.

➢ Leech is a hermaphrodite.

➢ Rabbits are warm blooded vertebrates.

➢ Canine teeth are absent in rabbit.

➢ Respiration takes place through a pair of lungs in rabbit.

➢ The heart is four chambered consisting of two auricles and two ventricles

➢ Urinogenital system comprises the urinary (or) excretory system and the genital (or) reproductive system

➢ Mammary glands are modified glands of the skin and help in nourishing the young ones

TEXT BOOK EVALUATION

I. Book Exercise – Choose the best answer

1. **In leech locomotion is performed by**
   a) Anterior sucker   b) Posterior sucker   c) Setae   d) None of the above

   Ans : (d) None of the above

2. **The segments of leech are known as**
   a) Metameres (somites)   b) Proglottids   c) Strobila   d) All the above

   Ans : (a) Metameres (somites)

3. **Pharyngeal ganglion in leech is a part of**
   a) Excretory system   b) Nervous system   c) Reproductive system   d) Respiratory system

   Ans : (b) Nervous system

4. **The brain of leech lies above the**
   a) Mouth   b) Buccal Cavity   c) Pharynx   d) Crop

   Ans : (c) Pharynx

5. **The body of leech has**
   a) 23 segments   b) 33 segments   c) 38 segments   d) 30 segments

   Ans : (b) 33 segments

6. **Mammals are _____ animals.**
   a) Cold blooded   b) Warm blooded   c) Poikilothermic   d) All the above

   Ans : (b) Warm blooded

7. **The animals which give birth to young ones are**
   a) Oviparous   b) Viviparous   c) Ovoviviparous   d) All the above

   Ans : (b) Viviparous

II. Book Exercise – Fill in the blanks

1. The posterior sucker is formed by the fusion of the _____ segments. **Ans :** last seven

2. The existence of two sets of teeth in the life of an animal is called _____ dentition. **Ans :** Diphyodont

3. The anterior end of leech has a lobe-like structure called _____. **Ans :** Anterior Sucker

4. The blood sucking habit of leech is known as _____. **Ans :** Sanguivorous

5. _____ separate nitrogenous waste from the blood in rabbit. **Ans :** Kidney

6. _____ spinal nerves are present in rabbit. **Ans :** 37 pairs

Iii. Book Exercise – True or false (If false give the correct statement)

1. **An anticoagulant present in saliva of leech is called heparin.**

   Ans : False. An anticoagulant present in saliva of leech is called **hirudin**.

2. **The vas deferens serves to transport the ovum.**

   Ans : False. The vas deferens serves to transport the **sperms**.

3. **The rabbit has a third eyelid called tympanic membrane which is movable.**

   Ans : False. The rabbit has a third eyelid called **Nictitating** membrane which is movable.

4. **Diastema is a gap between premolar and molar teeth in rabbit.**

   Ans : False. Diastema is a gap between the **incisors** and **premolar** teeth in rabbit.

5. **The cerebral hemispheres of rabbit are connected by band of nerve tissue called corpora quadrigemina.**

   Ans : False. The cerebral hemispheres of rabbit are connected by band of nerve tissue called **corpus callosum**.

IV. Book Exercise – Match the following (match columns I, II, III correctly)

S.No.	ORGANS	MEMBRANOUS COVERING	LOCATION
1	Brain	Pleura	Abdominal cavity
2	Kidney	Capsule	Mediastinum
3	Heart	Meninges	Enclosed in thoracic cavity
4	Lungs	Pericardium	Cranial cavity

Ans :

S.No.	ORGANS	MEMBRANOUS COVERING	LOCATION
1	Brain	Meninges	Cranial cavity
2	Kidney	Capsule	Abdominal cavity
3	Heart	Pericardium	Mediastinum
4	Lungs	Pleura	Enclosed in thoracic cavity

V. Book Exercise – Answer in a sentence (1 mark)

1. **Give the common name of the *Hirudinaria granulosa*.**
   The common name of the *Hirudinaria granulosa* is Indian Cattle Leech.

2. **How does leech respire?**
   Leech respires through the skin.

3. **Write the dental formula of rabbit.**

   Dental formula of rabbit is, $I\frac{2}{1}$, $C\frac{0}{0}$, $PM\frac{3}{2}$, $M\frac{3}{3}$, which can be written as $\frac{2033}{1023}$.

4. How many pairs of testes are present in leech?

Eleven pairs of testes are present in leech.

5. How is diastema formed in rabbit?

The gap between incisors and premolar forms the diastema. Diastema helps in mastication and chewing of food in rabbit.

6. What organs are attached to the two bronchi?

Lungs are attached to the two bronchi.

7. Which organ acts as suction pump in leech?

Pharynx acts as suction pump in leech.

8. What does CNS stand for?

CNS stands for Central Nervous System.

9. Why is the teeth of rabbit called heterodont?

As there are three different kinds of teeth (Incisors, Premolars and Molars)` in rabbit, the dentition is called heterodont.

10. How does leech suck blood from the host?

Leech attaches itself to the body of the host by suckers. Jaws of mouth causes wound. Then the blood is sucked by pharynx.

VI. Book Exercise – Short answer question (2 mark)

1. Why are the rings of cartilages found in trachea of rabbit?

Tracheal walls are supported by rings of cartilage. Cartilage is flexible tissue. They help in the free passage of air.

2. List out the parasitic adaptations in leech.
   i)   Blood is sucked by pharynx.
   ii) Anterior and posterior suckers help the leech attacks itself to the body of the host.
   iii) The three jaws inside the mouth, causes a painless Y–shaped wound in the skin of the host.
   iv) The salivary glands produce hirudin which does not allow the blood to coagulate. Thus, a continuous supply of the blood is maintained.
   v)   Blood is stored in the crop. It gives nourishment to the leech for several months.

VII. Book Exercise – Long answer question (5 mark)

1. How is the circulatory system designed in leech to compensate the heart structure?
   i)   In leech, circulation is brought about by haemocoelic system.
   ii) There are no true blood vessels. The blood vessels are replaced by channels called haemocoelic channels or canals filled with blood like fluid.
   iii) There are four longitudinal channels. One channel lies above (dorsal) the alimentary canal, one below (vental) alimentary canal.
   iv) The other two channels lie on either (lateral) side of the alimentary canal which serve as heart and have inner values.
   v)   All four channels are connected together posteriorly in the 26th segment.

2. How does locomotion take place in leech?

Locomotion in leech takes place by (i) Looping or crawling movement and (ii) Swimming movement.
   i)   **Looping or crawling movement :** This type of movement is brought about by the contraction and relaxation of muscles. The two suckers serve for attachment during movement on a substratum.
   ii) **Swimming movement :** Leeches swim very actively and perform undulating movements in water.

3. **Explain the male reproductive system of rabbit with a labelled diagram.**

   Male Reproductive System in Rabbit : The male reproductive system of rabbit consists of,

   i) A pair of testes.
   ii) The associated ducts and
   iii) Three accessory glands.

   i) **Testes :**
      a) The testes produce sperms.
      b) Testes are located in a sac of skin called the scrotum hanging down from the abdoman.

   ii) **Ducts :**
      a) Each testis consists of a numerous fine tubules called seminiferous tubules.
      b) This network of tubules lead into a coiled tubules called epididymis, which lead into the sperm duct called vas deferens.
      c) The urethra runs backward and passes into the penis.

   iii) **Accessory glands :**

   Three accessory glands involve in reproduction. They are;
      a) Prostate gland.
      b) Cowper's gland and
      c) Perineal gland.
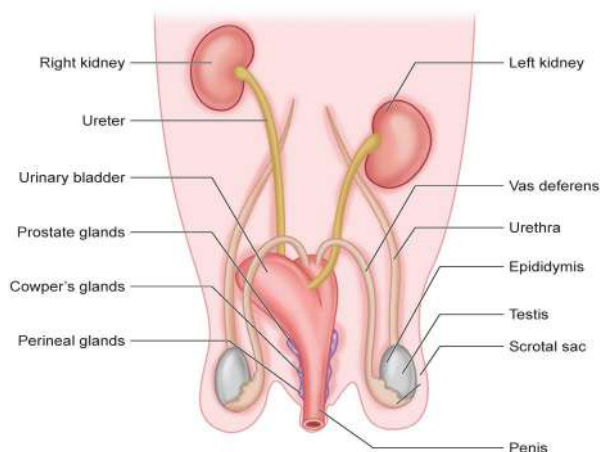
VIII. Book Exercise – Higher Order Thinking Skills (HOTS)

1. **Arjun is studying in tenth standard. He was down with fever and went to meet the doctor. As he went to the clinic he saw a patient undergoing treatment for severe leech bite. Being curious, Arjun asked the doctor why leech bite was not felt as soon as it attaches to the skin ? What would have been the reply given by the doctor?**

   Leech bite could not be felt as soon as it attaches to the skin, because leech injects a substance, which works to be a local anasthetic and the person can't feel the bite.

2. **Shylesh has some pet animals at his home. He has few rabbits too, one day while feeding them he observed something different with the teeth. He asked his grandfather, why is it so? What would have been the explanation of his grandfather?**

   Shylesh's grandfather explained about the teeth of rabbit as follows :
   i) The rabbit has two sets of teeth (Diphyodont dentition).
   ii) The two types of teeth are;
      a) Milk teeth (yound ones) and
      b) Permanent teeth (in adults).
   iii) In rabbit the teeth are of three different kinds (Heterodont). They are;
      a) Incisors.

b) Premolars and

c) Molars.

iv) Diastema is the gap between the incisors and premolar which helps in mastication and chewing of food.

IX. Book Exercise – Value based questions

1. Leeches do not have secretion of digestive juices and enzymes -Why ?

The leech feeds by sucking the blood of cattle and other domestic animals. Then the blood is stored in the crop. It gives noureshment to the leech for several months. Due to this reason there is no elaborate secretion of digestive juices and enzymes.

2. How is the digestive system of rabbit suited for herbivorous mode of feeding?

i) The digestive system of rabbit is uniquely designed to consume large amounts of plant materials.

ii) The teeth are of three types viz incisors, premolars and molars (Heterodont).

iii) Diastema, a gap between incisors and premolar, helps in mastication and chewing of food in herbivorous animals.

iv) The plants that rabbits eat are high in fibre, which is indigestible to mammalian digestive enzymes. So alimentary canal contains bacteria that helps in digestion of cellulose.

Additional – Choose the best answer

1. Metamerically segmented body is present in

a) Earthworm
b) Leech
c) Nereis
d) All of the above
Ans : (d) All of the above

2. Body is segmented in

a) Coelenterate
b) Annelida
c) Porifera
d) Mollusca
Ans : (b) Annelida

3. Botryoidal tissue is found in

a) Rabbit
b) Ascaris
c) Leech
d) Earthworm
Ans : (c) Leech

4. Leech is

a) Carnivorous
b) Sanguivorous
c) Ectoparasite
d) Both (b) and (c)
Ans : (d) Both (b) and (c)

5. The main function of clitellum is

a) Coccon formation
b) Locomotion
c) Excretion
d) Copulation.
Ans : (a) Coccon formation

6. A typical segment of leech is:

a) Triannulate
b) Biannulate
c) Quadriannulate
d) Quinquannulate
Ans : (c) Quinquannulate

7. A suctorial mouth is present in:

a) Tapeworm
b) Leech
c) Roundworm
d) Earthworm
Ans : (b) Leech

8. Suckers of leech are located at:

a) Anterior and posterior ends of the body
b) Anterior end of the body
c) Posterior end of the body
d) All over the body
Ans : (a) Anterior and posterior ends of the body

9. Which one of the following is present in saliva of leech:

a) Hirudin
b) Histammine
c) Heparin
d) Haemoglobin
Ans : (a) Hirudin

10. Leech secretes which of the following anticoagulant?

a) Hirudin   b) Heparin   c) Serotonin   d) Histamine

Ans : (a) Hirudin

11. In leech, hirudin is secreted by:

a) Crop   b) Pharynx   c) Haemocoel   d) Salivary glands

Ans : (d) Salivary glands

12. Leech obtains continuous bloodstream from its victim by poring in it:

a) Pepsin   b) Heparin   c) Insulin   d) Hirudin

Ans : (d) Hirudin

13. The botryoidal tissue of leech is a/an:

a) Epithelial tissue   b) Mesodermal tissue   c) Connective tissue   d) Mesenchymatic tissue

Ans : (c) Connective tissue

14. 'Leeches' are included in class

a) Oligochaete   b) Hirudinea   c) Polychaeta   d) Gastropoda

Ans : (b) Hirudinea

15. A trait common in Leech and Mosquito is

a) Anticoagulants   b) Abundant asexual reproduction

c) Cellular level of organization   d) Absence of sexual phase

Ans : (a) Anticoagulants

16. What is true of Hirudinaria

a) It has a cephalic sucker   b) Mouth is triradiate

c) Segments are superficially subdivided   d) All the above

Ans : (d) All the above

17. Annelids are

a) Flatworms   b) Roundworms

c) 6-legged invertebrates   d) Segmented worms

Ans : (d) Segmented worms

18. On the dorsal side of the leech there are _____ pairs of eyes on the first five segments.

a) 2   b) 3   c) 4   d) 5

Ans : (d) 5

19. Leech has _____ suckers.

a) 1   b) 2   c) 3   d) 6

Ans : (b) 2

20. The posterior sucker is formed by the fusion of the last _____ segments.

a) Four   b) Five   c) Six   d) Seven

Ans : (d) Seven

21. The anterior sucker helps in

a) Attachment   b) Locomotion   c) Feeding   d) All the above

Ans : (d) All the above

22. In leech, attachment and locomotion are performed by

a) Anterior sucker   b) Posterior sucker   c) Oral sucker   d) All the above

Ans : (d) All the above

23. The digested blood is then absorbed slowly by the _____.

a) Intestine   b) Crop   c) Stomach   d) Pharynx

Ans : (a) Intestine

24. In leech, fertilization is internal.
  a) External
  b) Internal.
  c) Absent
  d) None of the above
  Ans : (b) Internal

25. The trunk of rabbit bears two pairs of _____ limbs.
  a) Tetradactyl
  b) Pentadactyl
  c) Hexadactyl
  d) None of the above
  Ans : (b) Pentadactyl

26. _____ is used to give signals to other rabbits in the event of danger.
  a) Pinnae
  b) Limb
  c) Tail
  d) Mouth
  Ans : (c) Tail

27. _____ teeth are absent rabbit.
  a) Canines
  b) Molar
  c) Premolar
  d) Incisors
  Ans : (a) Canines

28. Indian cattle leech are
  a) Ectoparasitic
  b) Lives in fresh water
  c) Sanguivorous
  d) All of the above
  Ans : (d) All of the above

29. Leech has _____ pairs of eyes.
  a) two
  b) three
  c) four
  d) five
  Ans : (d) five

30. Male genital aperture in leech is present in _____ segment.
  a) 9th
  b) 10th
  c) 11th
  d) 12th
  Ans : (b) 10th

31. Female genital aperture in leech is present in _____ segment.
  a) 9th
  b) 10th
  c) 11th
  d) 12th
  Ans : (c) 11th

32. _____ is the largest portion of the alimentary canal in leech.
  a) Pharynx
  b) Oesophagus
  c) Crop
  d) Stomach
  Ans : (c) Crop

33. Respiration takes place through _____ in leech.
  a) skin
  b) suckers
  c) mouth
  d) pharynx   **Ans :** (a) skin

34. In leech, excretion takes place by _____.
  a) Kidney
  b) Excretory tubes
  c) Nephridia
  d) Anus
  Ans : (c) Nephridia

35. Leech has _____ pair of Nephridia.
  a) 10
  b) 12
  c) 17
  d) 20
  Ans : (c) 17

36. Leech is _____.
  a) Unisexual
  b) Dioecious
  c) Hermaphrodite
  d) None of the above
  Ans : (c) Hermaphrodite

37. There are _____ pair of testes in leech.
  a) 2
  b) 8
  c) 11
  d) 13
  Ans : (c) 11

38. _____ is the sperm vesicle to store spermatozoa or sperm in leech.
  a) Testes sac
  b) Vas efferens
  c) Genital atrium
  d) Epididymis
  Ans : (d) Epididymis

39. A short duct arising from each testes in leech is _____.
  a) Vas efferens
  b) Vas deferens
  c) Ejaculatory duet
  d) Epididymis
  Ans : (a) Vas efferens

40. Biochemical substances hirudin derived from saliva of leech can be used to trent _____.

a) Blood clots

b) Cardiovascular diseases

c) Hypertension

d) All the above

Ans : (d) All the above

41. Rabbit is a _____ animal.

a) Acoelomate

b) Pseudocoelomate

c) Coelomate

d) None of the above

Ans : (c) Coelomate

42. A thin walled sac present at the junction of small intestine and large intestine of rabbit is _____.

a) Oesophagus

b) Stomach

c) Rectum

d) Caecum

Ans : (d) Caecum

43. The _____ prevents the entry of food into trachea.

a) Glottis

b) Pharynx

c) Epiglothis

d) Larynx

Ans : (c) Epiglottis

44. The anterior part of the wind pipe is enlarged to form the _____.

a) Larynx

b) Pharynx

c) Throat

d) Glottis

Ans : (a) Larynx

45. The heat of rabbit is _____ chambered.

a) 2

b) 3

c) 3½

d) 4

Ans : (d) 4

46. _____ teeth are absent in rabbit.

a) Canine

b) Incisor

c) Premolar

d) Molar

Ans : (a) Canine

47. The common tube which is formed by the union of urinary bladder and the vagina is called _____.

a) Uterus

b) Vestibule

c) Vulva

d) Urethra

Ans : (b) Vestibule

Additional – Fill in the blanks

1. Clitellum produces _____ to store eggs. **Ans :** Cocoon

2. Scientific name of India cattle leech is _____. **Ans :** *Hirudinaria granulosa*

3. Scientific name of the common rabbit is _____. **Ans :** *Oryctolagus cuniculus*

4. Each segment of leech is superficially subdivided into _____. **Ans :** Rings (or) Annuli

5. Segmentation with serially repeated parts is known as _____. **Ans :** Metamerism

6. In leech, Nephridia open to the exterior by 17 pairs of _____. **Ans :** Nephridiopores

7. Mouth of leech has a _____ aperture situated in the middle of anterior sucker. **Ans :** Triradiate

8. In leech, salivary glands release saliva through _____. **Ans :** Papillae

9. The secretion of saliva in leech contains _____ which prevents the coagulation of blood. **Ans :** Hirudin

10. In leech, the last chamber of crop opens into _____. **Ans :** Stomach

11. Circular apertures of crop consists of _____ to regulate the movement of food. **Ans :** Sphincters

12. _____ (or) _____ of chambers of crop store large amount of blood. **Ans :** Caeca (or) diverticula

13. Crop of leech possesses blind out growths known as _____ (or) _____ to store blood. **Ans :** Caecae (or) diverticulum

14. In leech, digestion takes place in stomach by the action of _____ enzyme. **Ans :** Proteolytic

15. During respiration in leech, oxygen dissolved in water diffuses through skin into _____ fluid. **Ans :** Haemocoelic

16. In leech, circulation is brought about by _____ system.   **Ans :** Haemocoelic

17. Nephridia open out by _____ to release exereta.   **Ans :** Nephridiopores

18. In leech, after fertilization _____ is formed around the 9th, 10th and 11th segments.   **Ans :** Cocoon

19. All the digits of rabbit bear _____.   **Ans :** Claws

20. In male rabit testes are enclosed by _____.   **Ans :** Scrotal sacs

21. In rabbit, sweat glands and _____ glands regulate the body temperature.   **Ans :** Sebaceous

22. The transverse partition between thoracic cavity and abdominal caity is _____.   **Ans :** Diaphragam

23. Breathing movements are brought by the movement of a dome shaped muscles known as _____.
    Ans : Diaphragam

24. In rabbit, the digestion of cellulose is brought about by the bacteria present is sac called _____.
    Ans : Caecum

25. The outer covering of lungs of rabbit is _____.   **Ans :** Pleura

26. The opening between pharynx and wind pipe is called _____.   **Ans :** glottis

27. The double layered membranous covering of heart is _____.   **Ans :** Pericardium

28. In rabbit, the nitrogenous wastes are excreted in the form of _____.   **Ans :** urea

29. Exterior opening of female reproductive system of rabbit is _____.   **Ans :** Vulva

30. _____ is the anterior part the oviduct in rabbit.   **Ans :** Fallopian tube

31. Excretory and reproductive system of rabbit together known as _____ system.   **Ans :** Urinogenital

32. Whiskers of rabbit are otherwise known as _____.   **Ans :** Tactile hairs (or) Vibrissae

33. The sperm producing tubules of testis of rabbit are known as _____.   **Ans :** Seminiferous tubules

34. The _____ rabbit is an endangered species.   **Ans :** Pygmy

35. Kingdom _____ is divided into two groups, Invertebrates and Chordates.   **Ans :** Animalia

36. The scientific name of the Indian cattle leech is _____.   **Ans :** *Hirudinaria granulosa*

37. Hirudinaria granulose belongs to Phylum _____.   **Ans :** Annelida

38. Annelids are _____ segmented worms with well developed organ systems.   **Ans :** Metamerically

39. The scientific name of the common rabbit is _____.   **Ans :** *Oryctolagus cuniculus*

40. *Oryctolagus cuniculus* belongs to Phylum _____.   **Ans :** Chordata

41. *Oryctolagus cuniculus* belongs to Class _____.   **Ans :** Mammalia

41. _____ in females is the most striking feature of a mammal.   **Ans :** Mammary gland

42. Presence of hair and mammary gland are the most striking feature of a class _____.   **Ans :** Mammal

43. The segmentation of the body is known as _____.   **Ans :** Metamerism

44. The body of leech is metamerically divided into _____ segments.   **Ans :** 33

45. Each segment of leech is further superficially subdivided into _____.   **Ans :** Rings or annuli

46. Segments 9-11 of leech consist of a temporary _____.   **Ans :** Clitellum

47. In leech, during the breeding season cocoon is produced by _____.   **Ans :** Clitellum

48. Each segment of leech bears a number of sensory projections called _____.   **Ans :** Receptors

49. First five segments in leech are occupied by _____.   **Ans :** Anterior sucker or oral sucker

50. Mouth is located in the middle of _____ sucker.   **Ans :** Anterior

51. The aperture in 26th segment is _____.   **Ans :** Anus

52. In leech, Nephridia open to the exterior by _____ pairs of nephridiopores.   **Ans :** 17

53. In leech, the tissue lies beneath longitudinal muscles and fills the entire coelom around the gut is _____.   **Ans :** Botryoidal tissue

54. In leech, The blood is sucked by muscular _____.   **Ans :** Pharynx

55. Leech can sense vibrations through their _____.   **Ans :** Skin

56. The leech makes a _____ or Y shaped incision in the skin of the host.   **Ans :** Triradiate

57. The ingested blood is stored in _____ chambers and its diverticulum.   **Ans :** Crop
58. Leeches prevent blood clotting by secreting a protein called _____.   **Ans :** Hirudin
59. Digestion takes place in stomach by the action of _____ enzyme.   **Ans :** Proteolytic
60. Respiration takes place through the _____ in leech.   **Ans :** skin
61. Oxygen dissolved in water diffuses through the skin of leech into _____ fluid.   **Ans :** Haemocoelic
62. In leech, circulation is brought about by _____ system.   **Ans :** Haemocoelic
63. The blood vessels are replaced by channels called _____.   **Ans :** Haemocoelic channels or canals
64. The two channels lie on either (lateral) side of the alimentary canal serve as _____.   **Ans :** Heart
65. In leech, the nerve ring surrounds the _____.   **Ans :** Pharynx
66. In leech, excretion takes place by paired tubules called _____.   **Ans :** Nephridia
67. Leech is _____ because both the male and female reproductive organs are present in the same animal.   **Ans :** Hermaphrodite
68. Development of young leech takes place in _____.   **Ans :** Cocoon
69. Blood is stored in the _____ which gives nourishment to the leech for several months.   **Ans :** Crop
70. A technique of bleeding in a patient to remove toxic impurities from the body is called _____.
                                                                          Ans : Blood letting
71. In leech, blood is sucked by _____.   **Ans :** Pharynx
72. The three _____ inside the mouth, causes a painless Y-shaped wound in the skin of the host.
                                                                          Ans : Jaws
73. The salivary glands of leech produce _____ which does not allow the blood to coagulate.
                                                                          Ans : Hirudin
74. As rabbits moving in groups , they are called as _____ animals.   **Ans :** Gregarious
75. The _____ rabbit was listed as a threatened species because of decline in its population size and distribution due to habitat loss.   **Ans :** Pygmy
76. The Columbia Basin _____ Rabbit is an endangered species.   **Ans :** Pygmy
77. In rabbit, testes are enclosed by _____.   **Ans :** Scrotal sacs
78. In rabbit, hairs, claws, nails and glands like sweat glands, sebaceous glands and mammary glands are the derivatives of _____.   **Ans :** Skin
79. Mammary glands are modified glands of the _____.   **Ans :** Skin
80. The sweat glands and _____ glands embedded in the skin regulate the body temperature in rabbit.
                                                                          Ans : Sebaceous
81. In rabbit, thoracic cavity and abdominal cavity separated by transverse partition called _____.
                                                                          Ans : Diaphragm
82. The thin walled sac present at the junction of small intestine and large intestine is known as _____.
                                                                          Ans : Caecum
83. Caecum contains bacteria that helps in digestion of _____.   **Ans :** Cellulose
84. The existence of two sets of teeth in the life of an animal is called _____ dentition.
                                                                          Ans : Diphyodont
85. As there are four kinds of teeth in mammals, the dentition is called _____.   **Ans :** Heterodont
86. The gap between the incisors and premolar is called _____.   **Ans :** Diastema
87. _____ helps in mastication and chewing of food in herbivorous animals.   **Ans :** Diastema
88. Each lung is enclosed by a double membranous _____.   **Ans :** Pleura.
89. The anterior part of the wind pipe is enlarged to form the _____.   **Ans :** Larynx or voice box
90. Inside the larynx lies the _____ and its vibrations result in the production of sound.   **Ans :** Vocal cord
91. Tracheal walls are supported by rings of _____ which help in the free passage of air.   **Ans :** Cartilage
92. The _____ prevents the entry of food into the trachea through the glottis.   **Ans :** Epiglottis

93. The trachea divides into two branches called the _____.　**Ans :** Bronchi

94. Numerous fine tubules present in each testis of rabbit are called _____ tubules.　**Ans :** Seminiferous

95. The network of seminiferous tubules lead into a coiled tubule called _____.　**Ans :** Epididymis

96. Epididymis leads into the sperm duct called _____.　**Ans :** Vas deferens

97. _____ separate the nitrogenous wastes urea from blood.　**Ans :** Nephrons

98. A dome-shaped muscular partition separating the thorax from the abdomen and helps breathing movements in mammals is called _____.　**Ans :** Diaphragm

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Additional – True or false (If false give the correct statement)

1. **Mammals are cold blooded animals.**
   Ans : False. Mammals are **warm** blooded animals.

2. **Looping or crawling movement in leech is brought about by the contraction and relaxation of muscles.**
   Ans : True.

3. **Crop chambers and diverticulum (Caecae) store ingested blood in leech.**
   Ans : True.

4. **Leeches have ear.**
   Ans : False. Leeches **do not** have ear.

5. **The locomotory organs parapodia and setae are absent in leech.**
   Ans : True.

6. **Fertilization in leech is external.**
   Ans : False. Fertilization in leech is **internal**.

7. **Rabbits are homeothermic vertebrates.**
   Ans : True.

8. **Rabbits are nongregarious animals.**
   Ans : False. Rabbits are **gregarious** animals.

9. **The tail of rabbit is ued to give signals to other rabbits in the event of danger.**
   Ans : True.

10. **In rabbits, lungs and heart lie in the abdominal cavity.**
    Ans : False. In rabbits, lungs and hearts lie in the **thoracic** cavity.

11. **Canine teeth are absent in rabbits.**
    Ans : True.

12. **Precaval and postcaval veins bring oxygenated blood to right auricle.**
    Ans : False. Precaval and postcaval veins bring **deoxygenated** blood to right auricle.

13. **Each kidney of rabbit is made up of several nephridia.**
    Ans : False. Each kidney of rabbit is made up of several **nephrons**.

14. **Leeches may grow to a length of 35 cm.**
    Ans : True.

15. **Dorsal surface of leech is olive green in colour and the ventral surface is orange yellow or orange red in colour.**
    Ans : True.

16. **Female and male genital pores are situated in the 10ᵗʰ and 11ᵗʰ segments respectively.**
    Ans : False. **Male** and **female** genital pores are situated in the 10ᵗʰ and 11ᵗʰ segments respectively.

17. **Leeches sense vibrations through their ear.**
    Ans : Fales. Leeches sense vibrations through their **skin**.

18. **Leeches have 2 to 10 tiny eyes, which helps them to locate their food.**
    Ans : True.

19. **Leeches can suck blood five times more than their body weight. It may take more than a year for the complete digestion and absorption of a full meal.**
    Ans : True.

20. **True blood vessels are present in leech.**
    Ans : False. True blood vessels are **absent** in leech.

21. **Leech is hermaphrodite because both the male and female reproductive organs are present in the separate animal.**
    Ans : False. Leech is hermaphrodite because both the male and female reproductive organs are present in the **same** animal.

22. **Development is direct and young leech resembling the adult emerges.**
    Ans : True.

23. **Parapodia and setae are completely absent in leech .**
    Ans : True.

24. **Rabbit is a coelomate animal.**
    Ans : True.

25. **The presence of diaphragm is one of the characteristic features of Annelids.**
    Ans : False. The presence of diaphragm is one of the characteristic features of **mammals**.

26. **All the digits bear claws in rabbits.**
    Ans : True.

Additional – Match the following

1.
1.	**Clitellum**	**(a)**	**Segmentation**
2.	**Metamerism**	**(b)**	**Segments 1 − 5**
3.	**Crop**	**(c)**	**Brain**
4.	**Cephalic region**	**(d)**	**10 chambers**
5.	**Haemocoelic fluid**	**(e)**	**Segments 9 − 10**
6.	**Epididymis**	**(f)**	**Egg case**
7.	**Cocoon**	**(g)**	**Sensory projections**
8.	**Receptors**	**(h)**	**Sperm vesicle**
9.	**Suprapharyngeal ganglion**	**(i)**	**Anticoagulant**
10.	**Hirudin**	**(j)**	**Blood**

   Ans :

1	Clitellum	e	Segments 9 − 10
2	Metamerism	a	Segmentation
3	Crop	d	10 chambers
4	Cephalic region	b	Segments 1 − 5
5	Haemocoelic fluid	j	Blood
6	Epididymis	h	Sperm vesicle
7	Cocoon	f	Egg case
8	Receptors	g	Sensory projections
9	Suprapharyngeal ganglion	c	Brain
10	Hirudin	i	Anticoagulant

2.

1.	Lagomorpha	(a)	moving in groups
2.	Gregarious	(b)	nipples
3.	Teats	(c)	5 digits
4.	Pentadactyle	(d)	whiskers
5.	Vibrissae	(e)	order of rabbit
6.	Caecum	(f)	passive process
7.	Inspiration	(g)	voice box
8.	Expiration	(h)	olfactory lobes
9.	Larynx	(i)	urinogenital caval
10.	Midbrain	(j)	cellulose digestion
11.	Forebrain	(k)	optic lobes
12.	Vestibule	(l)	active process

Ans :

1	Lagomorpha	e	order of rabbit
2	Gregarious	a	moving in groups
3	Teats	b	nipples
4	Pentadactyle	c	5 digits
5	Vibrissae	d	whiskers
6	Caecum	j	cellulose digestion
7	Inspiration	l	active process
8	Expiration	f	passive process
9	Larynx	g	voice box
10	Midbrain	k	optice lobes
11	Forebrain	h	olfactory lobes
12	Vestibule	i	urinogenital caval

3.

1.	Sanguivorous	(a)	Egg case
2.	Mammals	(b)	Triradiate
3.	Anterior sucker	(c)	Brain of leech
4.	The Indian cattle leech	(d)	27th – 33rd segments
5.	Cephalic region	(e)	Anticoagulant
6.	Posterior sucker	(f)	*Hirudinaria granulosa*
7.	Suprapharyngeal ganglion	(g)	Oral sucker
8.	Cocoon	(h)	Blood sucking
9.	Hirudin	(i)	1st – 5th segments
10.	Mouth of leech	(j)	Warm blooded

Ans :

1	Sanguivorous	h	Blood sucking
2	Mammals	j	Warm blooded
3	Anterior sucker	g	Oral sucker
4	The Indian cattle leech	f	*Hirudinaria granulosa*
5	Cephalic region	i	1st – 5th segments
6	Posterior sucker	d	27th – 33rd segments
7	Suprapharyngeal ganglion	c	Brain of leech
8	Cocoon	a	Egg case
9	Hirudin	e	Anticoagulant
10	Mouth of leech	b	Triradiate

4.
1.	Tactile hairs of vibrissae	(a)	Pinnae
2.	Hindbrain	(b)	Nipples
3.	External ear	(c)	Prosencephalon
4.	Teats	(d)	Mesencephalon
5.	Lungs and heart	(e)	Active process
6.	Urinogenital system	(f)	Whiskers
7.	Inspiration	(g)	Thoracic cavity
8.	Expiration	(h)	Abdominal cavity
9.	Forebrain	(i)	Rhombencephalon
10.	Midbrain	(j)	Passive process

Ans :

1	Tactile hairs of vibrissae	f	Whiskers
2	Hindbrain	i	Rhombencephalon
3	External ear	a	Pinnae
4	Teats	b	Nipples
5	Lungs and heart	g	Thoracic cavity
6	Urinogenital system	h	Abdominal cavity
7	Inspiration	e	Active process
8	Expiration	j	Passive process
9	Forebrain	c	Prosencephalon
10	Midbrain	d	Mesencephalon

Additional – Answer in a sentence (1 mark)

1. What are receptors? Mention the types.
Receptors are sensory projections of leech. They are 2 types.
✦ Annular receptors and
✦ Segmental receptors.

2. What are the functions of suckers?
✦ Anterior suckers helps in feeding.
✦ Both suckes (anterior and posterior) helps in attachment and locomotion.

3. How many eyes do leaches have?
Leaches have 2 to 10 tiny eyes.

4. What is blood leting?
Blood letting is a technique of bleeding in a patient to remove toxic impurities from the body.

5. What are the two types of teeth of diphyodont dentition?
✦ **Milk teeth :** Present in young ones.
✦ **Permanent teeth :** Present in adults.

6. What does ANS stand for?
ANS stands for AUTONOMIC NERVOUS SYSTEM.

7. What does PNS stand for?
PNS stands for PERIPHERAL NERVOUS SYSTEM.

8. How many pairs of cranial and spinal nerves form PSN?
PNS is formed of,
✦ 12 pairs of cranial nerves and
✦ 37 pairs of spinal nerves.

9. Name the three membranes covering of the brain of rabbit.

✦ Duramater : Outer membrane.

✦ Piamater : Inner membrane.

✦ Arachnoid : Middle membrane.

10. Name the accessory glands of female reporductive system of rabbit.

✦ Cowper's gland and

✦ Perineal gland.

11. What are the two types of nerves of ANS?

ANS comprises,

✦ Sympathetic nerves and

✦ Parasympathetic nerves.

12. Name the band of nerve tissue which connects right and left cerebral hemisphere.

The right and left cerebral hemisphere are connected by transverse band of nerve tissue called Corpus Callosum.

13. What are advanced characteristic features of mammals?

✦ Presence of epidermal hairs and

✦ Presence of mammary glands in females.

14. What are the two parts of the central nervous system of leech?

✦ A nerve ring and

✦ A paired ventral nerve cord.

15. What are the two types of teeth in rabbit ?

The two types of teeth are

✦ Milk teeth (young ones) and

✦ Permanent teeth (in adults).

16. What are the components of Circulatory System rabbit?

The circulatory system is formed of

✦ Blood,

✦ Blood vessels and

✦ Heart.

17. What make up the peripheral nervous system (PNS)?

PNS is formed of 12 pairs of cranial nerves and 37 pairs of spinal nerves.

18. What are the two divisions of Autonomic nervous system (ANS)?

ANS comprises

✦ Sympathetic and

✦ Parasympathetic nerves.

19. What are the two parts of the central nervous system (CNS)?

The central nervous system (CNS) consists of brain and spinal cord.

20. What two systems make up the urinogenital system?

It comprises

✦ The urinary or excretory system and

✦ The genital or reproductive system.

1. Write the Taxonomic position of the Indian Cattle Leech.

✦ Phylum – Annelida.

✦ Class – Hirudinea.

✦ Order – Gnathobdellida.

✦ Genus – Hirudinaria.

✦ Species – granulosa.

2. How isthe body of leech divided?

The body of leech is divided in to six regions.

S.No.	Region	Segments
1	Cephalic region	1st to 5th
2	Pre–clitellar region	6th, 7th and 8th
3	Clitellar region	9th, 10th and 11th
4	Middle region	12th to 22nd
5	Caudal region	23rd to 26th
6	Posterior sucker	27th to 33rd

3. What are the five layers of body wall of leech?

Body wall of leech includes five layers.

✦ Cuticle : Outermost layer.

✦ Epidermis : Lies below the cuticle.

✦ Dermis : Lies below epidermis formed of connective tissue.

✦ Muscular layer : Formed of circular and longitudinal muscles.

✦ Botryoidal tissue : Lies beneath longitudinal muscles and fills the entire coelom around the gut.

4. Write the path of sperm from testes to male genital pore of leech.

```
        TESTES
          ↓
     VAS EFFERENS
          ↓
     VAS DEFERENS
          ↓
EPIDIDYMIS OR SPERM VESICLE
          ↓
    EJACULATORY DUCT
          ↓
    GENITAL ATRIUM
          ↓
        PENIS
          ↓
   MALE GENITAL PORE
```
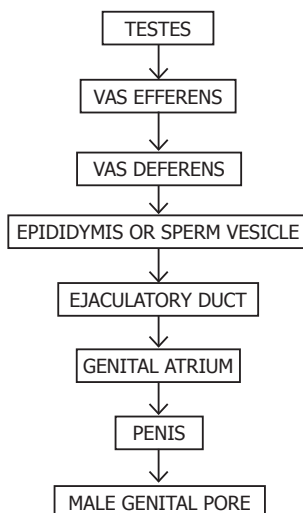
5. What are the three parts of nerve ring which surrounds the pharynx?

✦ Suprapharyngeal ganglion.

✦ Circumpharyngeal connective and

✦ Subpharyngeal ganglion.

6.　Write about the medicinal value of leech.
- ✦ Leeches are effective in increasing blood circulation and breaking up blood clots.
- ✦ They can be used to treat cardiovascular diseases.
- ✦ Biochemical substances derived from leech seliva are used forpreparation of pharmaceutical drugs that can treat hypertension.

7.　Write the taxonomic postion of rabbit.
- ✦ Phylum : Chordata.
- ✦ Sub–phylum : Vertebrate.
- ✦ Class : Mammalia.
- ✦ Order : Lagomorpha.
- ✦ Genus : Oryctolagus.
- ✦ Species : cuniculus.

8.　What is the proper sequence of air flow in rabbit respiratory system?

External Nostril
↓
Nassal Passage
↓
Pharynx
↓
Glottis
↓
Larynx or voice box
↓
Trachea or wind pipe
↓
Bronchi
↓
Lung
↓
Bronchioles
↓
Alveoli
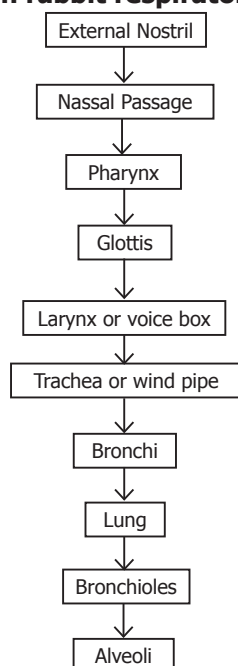
9.　What are the three divisions of brain of rabbit?
- ✦ Prosencephalon : Forebrain.
- ✦ Mesencephalon : Midbrain and
- ✦ Rhombencephalon : Hindbrain.

10.　Name the three accessory glands of male reproductive system of rabbit.

The three accessory glands of male reproductive system of rabbit are,
- ✦ Prostate gland.
- ✦ Cowper's gland and
- ✦ Perineal gland.

11.　Write about the valves present in heart of rabbit.

S.No.	Name of the valve	Location
1	Tricuspid valve	Between right auricle and right ventricle
2	Bicuspid or Mitral valve	Between left auricle and left ventricle
3	Semilunar valve	At the opening of pulmonary artery and aorta.

12. Write about the habitat of leech.

Leech lives in freshwater ponds, lakes, swamps and slow streams. They are ectoparasitic and feed on the blood of fishes, frogs, cattle and human. It is sanguivorous (blood sucking) in nature.

13. What are the two types of receptor present in leech?
✦ Annular receptors are located in each annulus and
✦ Segmental receptors are located on the first annulus of each segment.

14. Write about the development of young leech.
✦ Internal fertilization takes place. This is followed by cocoon formation. Cocoon is also known as egg case which is formed around the 9th, 10th and 11th segments.
✦ Development is direct and proceeds in cocoon which contain one to 24 embryos.
✦ Young leech resembling the adult emerges.

15. What are the three divisions of nervous system of rabbit?
The nervous system in rabbit is formed of
✦ The central nervous system (CNS),
✦ Peripheral nervous system (PNS) and
✦ Autonomic nervous system (ANS).

16. Why are the excretory and reproductive systems studied together as urinogenital system?
The Urinogenital system is comprised to two systems, the excretory system and the reproductive system. These two systems are often studied together because they share some common ducts.

<div align="center">

Additional – Long answer questions

</div>

1. Explain the structure of alimentary canal of leech.
Alimentary Canal : Alimentary canal of leech is straight tube running from the mouth to the anus.
✦ **Mouth :**
It is a triradiate a perture situated in the middle of the anterior sucker.
✦ **Buccal cavity :**
Mouth leads to buccal cavity. The wall of the buccal cavity bears three jaws with single row of minute teeth.
✦ **Pharynx :**
The buccal cavity leads into muscular pharynx. It is surrounded by salivary glands.
✦ **Oesophagus :**
A short and narrow oesophagus connects the pharynx and crop.
✦ **Crop :**
It is the largest portion of alimentary canal. It is divided into a series of 10 chambers. Each chambers consists of blind outgrowths known as Cacca or diverticula. Crop and diverticula can store large amount of blood.
✦ **Stomach :**
The last chamber of crop opens into stomach.
✦ **Intestine :**
The stomach leads into intestine which is small straight tube that opens into rectum.
✦ **Anus :**
Undigested food is egested through exterior opening anus.
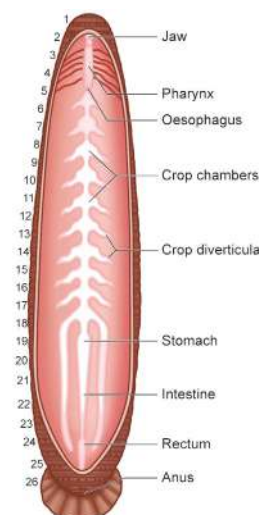
2. Explain the male reproduction system of leech with labelled diagram.
✦ There are eleven pairs of testes, one pair in each segment from 12 to 22 segments.
✦ From each testis arises a short duct called vas efferens which join with the vas deprens.
✦ The vas deferens becomes convoluted to form the epididymis or sperm vesicla, to store spermatozoa.
✦ The epididymis leads to a short duct called ejaculatory duct.

✦   The ejaculatory ducts on both sides join to form the genital atrium.

✦   The atrium consists of two regions,

   i)   Prostate glands and

   ii)   Penial sac.

✦   Penial sac consists penis.

✦   Penis opens through the male genital pore.

3.   Explain the development of young leech in cocoon.

✦   Leeches have internal fertilization.

✦   Fertilization is followed by cocoon formation.

✦   Cocoon is also known as egg case.

✦   Cocoon is formed around the 9th, 10th and 11th segments.

✦   Cocoon contains one to 24 embryos.

✦   Development of young one is direct.

✦   Young leech resembling the adult emerges.

4.   Explain the female reproductive system of rabbit with labelled diagram.
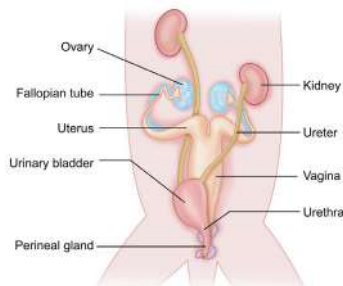
✦   The female reproductive system of rabbit consists of a pair of ovaries.

✦   Ovaries are small ovoid structure located behind the kidney in the abdominal cavity.

✦   A pair of oviducts opens into the body cavity by a funnel shaped opening from each side of the ovary.

✦   The anterior part of the oviduct is the fallopian tube.

✦   Fallopian tube leads into a wider tube called the uterus.

✦   The uterus join together to form a median tube called vagina.

✦   The common tube is formed by the union of urinary bladder and the vagina and iscalled urinogenital canal or vestibula.

✦   urinogenital canal runs backwards and opens to the exterior by a slit–like aperture called Vulva.

✦   A pair of Cowper's gland and perineal gland are the accessory glands present in the female reproductive system of rabbits.

5.   Write about the location and name of external apertures present in leech.

✦   **Mouth :** It is located in the middle of anterior sucker.

✦   **Anus :** Anus is a small aperture that opens on the mid-dorsal side of 26th segment.

✦   **Nephridiopores :** Nephridia open to the exterior by 17 pairs of nephridiopores. They lie ventrally on the last annulus of each segment from 6 to 22.

✦   **Male genital pore :** It is a mid-ventral opening, situated between second and third annuli of 10th segment.

✦   **Female genital pore :** It lies mid-ventrally between second and third annuli of 11th segment.

6.   What are the five layers of body wall of leech?

Body wall of leech includes five layers:

✦   Cuticle (outermost layer)

✦   Epidermis which lies below the cuticle

✦   Dermis which lies below the epidermis formed of connective tissue
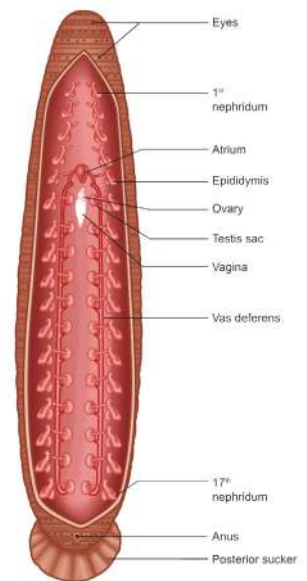
✦ Muscular layer formed of circular and longitudinal muscles and
✦ Botryoidal tissue lies beneath longitudinal muscles and fills the entire coelom around the gut.

7.   Explain the Nervous System of leech.
✦ The central nervous system of leech consists of a nerve ring and a paired ventral nerve cord.
✦ The nerve ring surrounds the pharynx.
✦ The nerve ring is formed of
   i)   Suprapharyngeal ganglion (brain),
   ii)   Circumpharyngeal connective and
   iii) Subpharyngeal ganglion
✦ The subpharyngeal ganglion lies below the pharynx and is formed by the fusion of four pairs of ganglia.

8.   Describe the female reproductive system of leech.
✦ Leech is hermaphrodite because both the male and female reproductive organs are present in the same animal.
✦ It consists of ovaries, oviducts and vagina.
✦ There is a single pair of ovary in the 11th segment on the ventral side.
✦ Each ovary is a coiled ribbon-shaped structure.
✦ The ova are budded off from the ovary.
✦ From each ovary runs a short oviduct.
✦ The oviducts of the two sides joins together, to form a common oviduct.
✦ The common oviduct opens into a pear-shaped vagina which lies mid-ventrally in the posterior part of the 11th segment.

9.   Describe the digestive system of rabbit.
The digestive system includes
i)   The alimentary canal and
ii)   The associated digestive glands.

i)   **The alimentary canal :** The alimentary canal consists of mouth, buccal cavity, pharynx, oesophagus, stomach, small intestine, caecum, large intestine and anus.
   ✦ Mouth is a transverse slit bounded by upper and lower lips. It leads into the buccal cavity.
   ✦ The floor of the buccal cavity is occupied by a muscular tongue. Jaws bear teeth.
   ✦ The buccal cavity leads into the oesophagus through the pharynx.
   ✦ Oesophagus opens into the stomach followed by small intestine.
   ✦ Caecum is a thin walled sac present at the junction of small intestine and large intestine. It contains bacteria that helps in digestion of cellulose.
   ✦ The small intestine opens into the large intestine which has colon and rectum.
   ✦ The rectum finally opens outside by the anus.

ii)   **Digestive glands :** The digestive glands are salivary glands, gastric glands, liver, pancreas and intestinal glands. The secretions of digestive glands help in digestion of food in the alimentary canal.

10.   Describe the structure of heart of rabbit.
✦ The heart is pear shaped and lies in the thoracic cavity in between the lungs.
✦ It is enclosed by pericardium, a double layered membrane.
✦ The heart is four chambered with two auricles and two ventricles.
✦ The right and left auricles are separated by interauricular septum, similarly right and left ventricles are separated by interventricular septum.
✦ The right auricle opens into the right ventricle by right auriculoventricular aperture, guarded by a tricuspid valve. The left auricle opens into the left ventricle by left auriculoventricular aperture guarded by a bicuspid valve or mitral valve.
✦ The opening of the pulmonary artery and aorta are guarded by three semilunar valves.
✦ The right auricle receives deoxygenated blood through two precaval (superior vena cava) and one postcaval (inferior vena cava) veins from all parts of the body.
✦ The left auricle receives oxygenated blood from the pulmonary veins from the lungs.

✦ From the right ventricle arises pulmonary trunk which carries the deoxygenated blood to the lungs and from the left ventricle arises the systemic arch (aorta) which supplies oxygenated blood to all parts of the body.

11. Describe the structure of the brain of rabbit.

Brain is situated in the cranial cavity and covered by three membranes called,

i)   Outer duramater,
ii) Inner piamater and
iii) Middle arachnoid membrane.

The brain is divided into forebrain (prosencephalon), midbrain (mesencephalon) and hindbrain (rhombencephalon).

✦ **Forebrain :** Forebrain consists of a pair of olfactory lobes, cerebral hemispheres and diencephalon. The right and left cerebral hemispheres are connected by transverse band of nerve tissue called corpus callosum.

✦ **Midbrain :** The midbrain includes the optic lobes.

✦ **Hindbrain :** The hindbrain consists of the cerebellum, pons varolii and medulla oblongata.

Additional – Draw and label the diagrams

1. External morphology of Leech.
    a) Dorsal view and   **b) Vental view.**
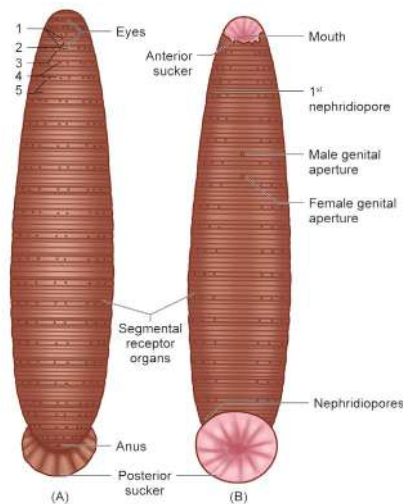
2. Digestive system of Leech.
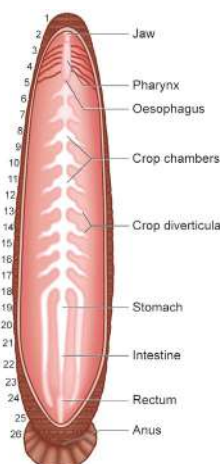
3. **Nervous system of Leech.**
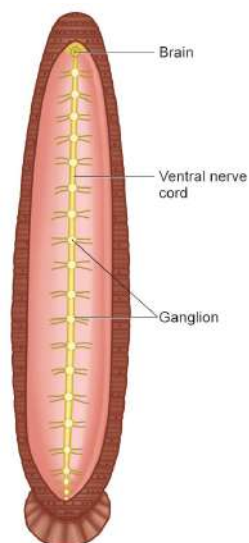
4. **Reproductive system of Leech.**
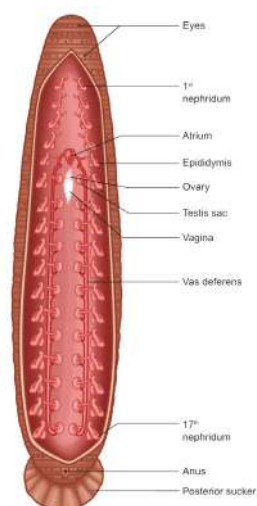
5. **Digestive system of Rabbit.**
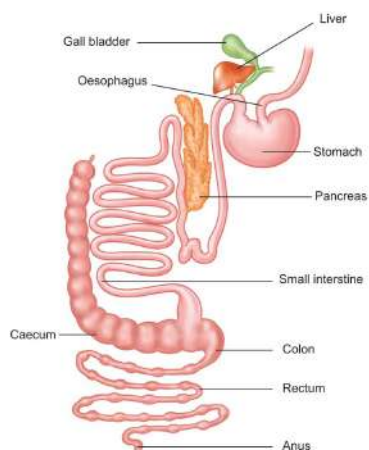
6. **Lungs of Rabbit.**
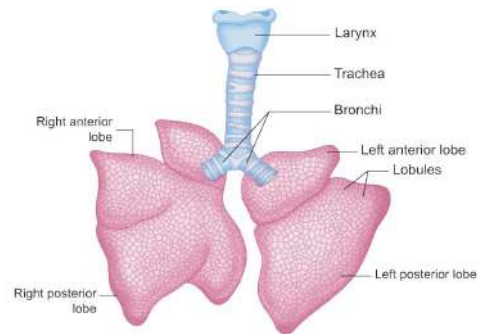
7. **Heart of Rabbit.**
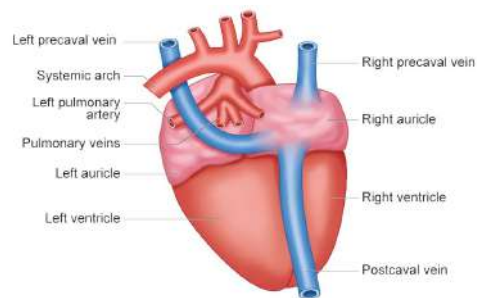
8. **Brain of Rabbit.**
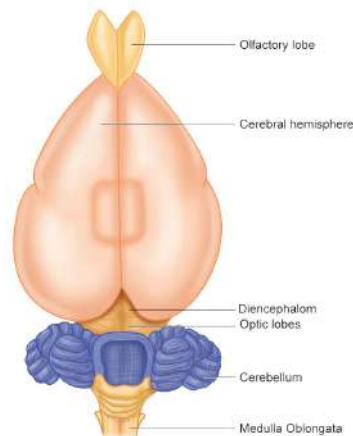
9. **Male reproductive system of Rabbit.**

10. Female reproductive system of Rabbit.

Ovary
Fallopian tube
Uterus
Urinary bladder
Perineal gland
Kidney
Ureter
Vagina
Urethra
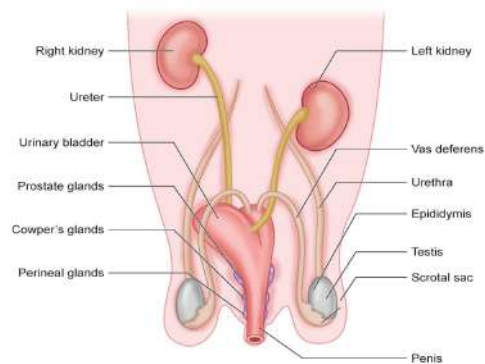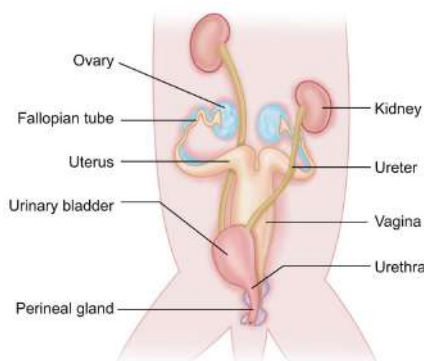
Additional – Assertion and Reasoning

Direction : In each of the following questions a statement of Assertion (A) is given and a corresponding statement of Reason (R)is given just below it. Mark the correct statement as

    i) If both A and R are true and R is correct explanation of A.
    ii) If both A and R true but R does not the correct explanation of A.
    iii) A is true but R is false.
    iv) Both A and R are false.

1. **Assertion:** Leach is sanguivorous in nature.

    Reason: Leeches feeds on blood.

                                  Ans : (i) Both A and R are true and R is correct explanation of A

2. **Assertion:** In leech, circulation is brought about by haemocoelic system.

    Reason: The blood vessels are replaced by channels called haemocoelic channels.

                                  Ans : (i) Both A and R are true and R is correct explanation of A

3. **Assertion:** Leech is hermaphrodite.

    Reason: In leech, male and female reproductive organs are present in different animal.

                                  Ans : (iii) A is true but R is false

4. **Assertion:** Rabbits limbs are hexadactyl.

    Reason: Each limb has six digits.

                                  Ans : (iv) Both A and R are false

5. **Assertion:** The dentition in rabbit is called heterodont.

    Reason: The rabbit has two sets of teeth.

                Ans : (ii) Both A and R are true and R does not the correct explanation of A

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UNIT TEST - 13

Time : 1.15 Hrs.   **Marks : 50**

I. Choose the best answer

                                                        (5 × 1 = 5)

1. **The segments of leech are known as _____.**

    a) Metameres (somites)   b) Proglottids   c) Strobila   d) All the above

2. **Mammals are _____ animals**

    a) Cold blooded   b) Warm blooded   c) Poikilothermic   d) All the above

3. **The animals which give birth to young ones are _____.**
   a) Oviparous
   b) Viviparous
   c) Ovoviviparous
   d) All the above

4. **'Leeches' are included in class _____.**
   a) Oligochaete
   b) Hirudinea
   c) Polychaeta
   d) Gastropoda

5. **_____ teeth are absent rabbit.**
   a) Canines
   b) Molar
   c) Premolar
   d) Gastropoda

II. Fill in the blanks
(5 × 1 = 5)

6. The posterior sucker is formed by the fusion of the _____ segments.

7. The blood sucking habit of leech is known as _____.

8. _____ spinal nerves are present in rabbit.

9. The scientific name of the common rabbit is _____.

10. Each segment of leech is further superficially subdivided into _____.

III. State whether the statements are true or false. Correct the false statement
(5 × 1 = 5)

11. An anticoagulant present in saliva of leech is called heparin.

12. The rabbit has a third eyelid called tympanic membrane which is movable.

13. The cerebral hemispheres of rabbit are connected by band of nerve tissue called corpora quadrigemina.

14. Leeches have one pair of ear.

15. Rabbit is a coelomate animal.

IV. Match the following
(5 × 1 = 5)

16. Brain   (a) Pleura
17. Kidney   (b) Egg case
18. Heart   (c) Meninges
19. Lungs   (d) Pericardium
20. Cocoon   (e) Capsule

V. Write the answer for the following questions in word or sentence
(8 × 1 = 8)

21. Give the common name of the Hirudinaria granulosa.

22. Write the dental formula of rabbit.

23. How many pairs of testes are present in leech?

24. Which organ acts as suction pump in leech?

25. What does CNS stand for?

26. What are the two parts of the central nervous system of leech?

27. What are the two types of teeth in rabbit?

28. What are the two parts of the central nervous system (CNS)?

VI. Write the short answer for ANY 6 of the following questions
(6 × 2 = 12)

29. Why are the rings of cartilages found in trachea of rabbit?

30. List out the parasitic adaptations in leech.

31. Leeches do not have secretion of digestive juices and enzymes -Why?

32. How is the digestive system of rabbit suited for herbivorous mode of feeding?

33. Arjun is studying in tenth standard. He was down with fever and went to meet the doctor. As he went to the clinic he saw a patient undergoing treatment for severe leech bite. Being curious, Arjun asked the doctor why leech bite was not felt as soon as it attaches to the skin ? What would have been the reply given by the doctor?

34. Write the taxonomic position of leech.

35. Name the three accessory glands present in the male reproductive system of rabbit.

36. Why are the excretory and reproductive systems studied together as urinogenital system?

VII. Write long answer for the following questions

(2 × 5 = 10)

37. How does locomotion take place in leech?

or

How is the circulatory system designed in leech to compensate the heart structure.

38. Describe the structure of the brain of rabbit with labelled diagram.

or

Describe the digestive system of rabbit.

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UNIT 14

TRANSPORTATION IN PLANTS AND CIRCULATION IN ANIMALS

Points to Remember

➢ The movement of molecules from a region of higher concentration to a region of their lower concentration without the utilization of energy is called diffusion.

➢ Osmosis is the movement of solvent or water molecules from the region of higher concentration to the region of lower concentration through a semi-permeable membrane.

➢ Transpiration is the evaporation of water in plants through stomata in the leaves.

➢ The circulatory system consists of the circulating fluids, the blood and lymph and the heart and its blood vessels.

➢ The blood consists of two main components. The fluid plasma and the formed elements (blood cells) which are found suspended in the plasma.

➢ A muscular pumping organ that pumps out the blood into the blood vessels is called heart.

➢ The blood circulates in our body as oxygenated and deoxygenated blood.

➢ The supply of blood to the heart muscles (cardiac muscles) is called as coronary circulation.

➢ One complete contraction (systole) and relaxation (diastole) of atrium and ventricles of heart is called a heartbeat.

➢ The sequence of events which occur during the beginning and completion of one heart beat is called cardiac cycle.

➢ Blood pressure is usually expressed as systolic pressure and diastolic pressure (120mm / 80 mm Hg)

➢ An individual has one of the four blood groups A, B, AB and O.

➢ Rh factor was discovered by Landsteiner and Wiener in 1940.

➢ Lymph is a colourless fluid formed when plasma, proteins and blood cells escape into intercellular spaces in the tissues through the pores present in the walls of capillaries.

TEXT BOOK EVALUATION

I. Book Exercise – Choose the best answer

1. Active transport involves
   a) Movement of molecules from lower to higher concentration
   b) Expenditure of energy
   c) It is an uphill task
   d) All of the above

                                     Ans : d) All of the above

2. Water which is absorbed by roots is transported to aerial parts of the plant through
   a) Cortex   b) Epidermis   c) Phloem   d) Xylem

                                       Ans : d) Xylem

3. During transpiration there is loss of
   a) Carbon di oxide   b) Oxygen   c) Water   d) None of the above

                                       Ans : c) Water

4. Root hairs are
   a) Cortical cell   b) Projection of epidermal cell
   c) Unicellular   d) Both b and c

                                       Ans : d) Both b and c

5. Which of the following process requires energy?

a) Active transport   b) Diffusion   c) Osmosis   d) All of them

Ans : a) Active transport

6. The wall of human heart is made up of

a) Endocardium   b) Epicardium   c) Myocardium   d) All of the above

Ans : d) All of the above

7. Which is the sequence of correct blood flow

a) Ventricle – atrium – vein – arteries

b) Atrium – ventricle – veins – arteries

c) Atrium – ventricle – arteries – veins

d) Ventricles – vein – atrium - arteries

Ans : c) Atrium – Ventricle – Arteries - Vein

8. A patient with blood group O was injured in an accident and has blood loss. Which blood group the doctor should effectively use for transfusion in this condition?

a) O group   b) AB group   c) A or B group   d) All blood group

Ans : a) O group

9. 'Heart of heart' is called

a) SA node   b) AV node   c) Purkinje fibres   d) Bundle of His

Ans : a) SA node

10. Which one of the following regarding blood composition is correct

a) Plasma – Blood + Lymphocytes

b) Serum – Blood + Fibrinogen

c) Lymph – Plasma + RBC + WBC

d) Blood – Plasma + RBC + WBC + Platelets

Ans : d) Blood – Plasma + RBC + WBC + Platelets

II. Book Exercise – Fill in the blanks

1. _____ involves evaporative loss of water from aerial parts.   **Ans :**Transpiration

2. Water enters the root cell through a _____ plasma membrane.   **Ans :** Semi-permeable

3. Structures in roots that help to absorb water are _____.   **Ans :** Root hairs

4. Normal blood pressure is _____.   **Ans :** 120 mm / 80 mm Hg

5. The normal human heartbeat rate is about _____ time per minute.   **Ans :** 72 - 75

III. Book Exercise – Match the following

Section I

1. **Symplastic pathway**   (a) **Leaf**
2. **Transpiration**   (b) **Plasmodesmata**
3. **Osmosis**   (c) **Pressure in xylem**
4. **Root pressure**   (d) **Pressure gradient**

Ans :

Column I		Column II	
1	Symplastic pathway	b	Plasmodesmata
2	Transpiration	a	Leaf
3	Osmosis	d	Pressure gradient
4	Root pressure	c	Pressure in xylem

Section II

1. **Leukemia**   (a) **Thrombocytes**
2. **Platelets**   (b) **Phagocyte**

3.   **Monocytes**
4.   **Leucopenia**
5.   **AB blood group**
6.   **O blood group**
7.   **Eosinophil**
8.   **Neutrophils**

(c)   **Decrease in leucocytes**
(d)   **Blood cancer**
(e)   **Allergic condition**
(f)   **Inflammation**
(g)   **Absence of antigen**
(h)   **Absence of antibody**

Ans :

Column I		Column II	
1	Leukemia	d	Blood cancer
2	Platelets	a	Thrombocytes
3	Monocytes	b	Phagocyte
4	Leucopenia	c	Decrease in leucocytes
5	AB blood group	g	Absence of antibody
6	O blood group	g	Absence of antigen
7	Eosinophil	e	Allergic condition
8	Neutrophils	f	Inflammation

IV. Book Exercise – State whether the following statements are true or false: If false correct the statement.

1.   **The phloem is responsible for the translocation of food.**
     Ans : True.

2.   **Plants lose water by the process of transpiration.**
     Ans : True.

3.   **The form of sugar transported through the phloem is glucose.**
     Ans : False.
     Corrected statement : The form of sugar transported through the phloem is **Sucrose**.

4.   **In apoplastic movement the water travels through the cells membrane and enter the cell.**
     Ans : False.
     Corrected statement : In **symplastic** movement the water travels through the cell membrane and enter the cell.

5.   **When guard cells lose water the stoma opens.**
     Ans : False.
     Corrected statement : When the guard cells lose water the stoma **closes**.

6.   **Initiation and stimulation of heart beat take place by nerves.**
     Ans : False.
     Corrected statement : Initiation and stimulation of heart beat takes place by Sino – atrial (SA) node.

7.   **All veins carry deoxygenated blood.**
     Ans : False.
     Corrected statement : All veins, **except pulmonary vein**, carry deoxygenated blood.

8.   **WBC defend the body from bacterial and viral infection.**
     Ans : True.

9.   **The closure of mitral and tricuspid valves at the start of the ventricular systole produces the first sound ' LUBB'.**
     Ans : True.

V. Book Exercise – Answer in a word or sentence [1 Mark]

1. **Name two layered protective covering of human heart.**
   Two layered protective covering of human heart is **Pericardium**.

2. **What is the shape of RBC in human blood?**
   RBCs of human blood are **biconcave** or **disc-shaped**.

3. **Why is the colour of the blood red?**
   The blood is red because of the presence of red coloured respiratory pigment **haemoglobin**.

4. **Which kind of cells are found in the lymph?**
   White Blood cells (WBC) are found in the lymph.

5. **Name the heart valve associated with the major arteries leaving the ventricles.**
   Semilunar valves are associated with the major arteries (Pulmonary artery and aorta) leaving the ventricles.

6. **Mention the artery which supplies blood to the heart muscle.**
   Coronary artery supplies blood to the heart muscles.

VI. Book Exercise – Short answer questions [2 Marks]

1. **What causes the opening and closing of guard cells of stomata during transpiration?**
   The opening and closing of the stomata is due to the **change in turgidity** of the **guard cells**.
   a) When **turgidity increases** within the two guard cells **stoma opens**.
   b) When the guard cells lose water, it becomes **flaccid** and the **stoma closes**.

2. **What is cohesion?**
   The **force of attraction between molecules of water** is called cohesion.

3. **Trace the pathway followed by water molecules from the time it enters a plant root to the time it escapes into the atmosphere from a leaf.**
   a) Once the water enters the root hairs, the concentration of water molecules in the root hair cells become more than that of the cortex.
   b) Thus water from the root hair moves to the cortical cells by osmosis and then reaches the xylem.
   c) From there the water is transported to the stem and leaves and then to atmosphere by transpiration.

   ROOT HAIR ⟶ CORTICAL CELLS ⟶ XYLEM ⟶ STEM ⟶ LEAVES ⟶ ATMOSPHERE

4. **What would happen to the leaves of a plant that transpires more water than its absorption in the roots?**
   When transpiration exceeds water absorption by the roots, the plant **dehydrates**. Dehydration **affects growth, photosynthesis** etc. which can result in **wilting** and **dying** of the plant.

5. **Describe the structure and working of the human heart.**
   i) The heart is enclosed in a double walled sac called **pericardium**.
   ii) The human heart is **four chambered**.
   iii) The two **upper thin walled** chambers of the heart are called **auricle or atria**.
   iv) The two **lower thick walled** chambers are called **ventricles**.
   v) The **right atrium receives deoxygenated blood** from different parts of the body through main veins **superior vena cava, inferior vena cava and coronary sinus**.
   vi) **Pulmonary veins** bring **oxygenated blood** to the left atrium from the **lungs**.
   vii) The right and left auricles pump blood into the right and left ventricles respectively.
   viii) **From the right ventricle** arises the pulmonary trunk which bifurcates to form right and left **pulmonary arteries**.
   ix) The right and left **pulmonary arteries** supply **deoxygenated** to the **lungs** of the respective side.

x)   The **left ventricle** gives rise to **aorta**.

xi)   The **oxygenated blood** is supplied by the **aorta** to various organs of the body.

xii) The **coronary arteries** supply blood to the **heart**.

6.   Why is the circulation in man referred to as double circulation?

When the **blood circulates twice** through the heart in one complete cycle, it is called double circulation.

7.   What are heart sounds? How are they produced?

The rhythmic closure and opening of the valves cause the sound of the heart.

a)   The first sound **LUBB** is of longer duration and is produced by the closure of the **tricuspid and bicuspid valves** after the **beginning of ventricular systole**.

b)   The second sound **DUPP** is of a shorter duration and produced by the closure of **semilunar valves** at the **end of ventricular systole**.

8.   What is the importance of valves in the heart?

Valves **regulate the flow of blood** in a single direction and prevent back flow of blood.

9.   Who discovered Rh factor? Why was it named so?

1.   Rh factor was discovered by **Landsteiner** and **Wiener** in 1940.

2.   The Rh factor is named after the **Rhesus monkey**, which is the animal where it was first identified.

10. How are arteries and veins structurally different from one another?

No.	Arteries	No.	Veins
1.	Wall of artery is **strong, thick and elastic**.	1.	Wall of vein is **weak, thin and non – elastic**.
2.	Internal valves are **absent**.	2.	Internal valves are **present**.

11. Why is the Sinoatrial node called the pacemaker of heart?

Sino-atrial (SA) node acts as the '**pacemaker**' of the heart because it is capable of initiating impulse which can stimulate the heart muscles to contract.

12. Differentiate between systemic circulation and pulmonary circulation.

No.	Systemic circulation	No.	Pulmonary circulation
1.	It occurs **between** the **heart** and the **entire body**.	1.	It occurs **between** the **heart** and the **lungs**.
2.	It carries **oxygenated blood** from the heart around the body then carries the **deoxygenated blood** from the body back to the heart.	2.	It carries **deoxygenated blood** from the heart to the lungs and **oxygenated blood** from lungs to the heart.

13. The complete events of cardiac cycle last for 0.8 sec. What is the timing for each event?

Each cardiac cycle, or heartbeat, takes about 0.8 seconds to complete the cycle.

The events during a single cardiac cycle involves

a)   **Strial systole :** Contraction of auricles : 0.1 sec.

b)   **Ventricular systole :** Contraction of ventricles : 0.3 sec.

c)   **Ventricular diastole :** Relaxation of ventricles : 0.4 sec.

VII. Book Exercise – Give reasons for the following statements   *[2 Marks]*

1.   Minerals cannot be passively absorbed by the roots.

Minerals cannot be passively absorbed by the roots because

a)   Minerals are present in the soil as **charged particles** which cannot move across the cell membranes.

b)   The **concentration of minerals** in the soil is usually **lower** than the concentration of minerals in the root.

c)   Most of the minerals enter the root by **active absorption**.

2. **Guard cells are responsible for opening and closing of stomata.**

   The opening and closing of the stomata is due to the **change in turgidity** of the **guard cells**.

   a)   When **turgidity increases** within the two guard cells **stoma opens**.

   b)   When the guard cells lose water, it becomes **flaccid** and the **stoma closes**.

3. **The movement of substances in the phloem can be in any direction.**

   a)   During the growth of a plant, its leaves act as the **source of food** as they carry out **photosynthesis**.

   b)   The phloem conducts the food from the source to the sink (the part of the plant requiring or storing food).

   c)   **During spring**, this process is reversed as the food stored in the sink is transported toward the growing buds of the plant, through the phloem.

   d)   Thus, the movement of food in the phloem is **bidirectional** (i.e., upward and downward).

4. **Minerals in the plants are not lost when the leaf falls.**

   In deciduous plants, minerals like phosphorus, suphur, nitrogen and potassium are remobilized from older dying leaves to younger leaves. So minerals in the plants are not lost when the older leaf falls.

5. **The walls of the right ventricle are thicker than the right auricles.**

   Usually walls of the ventricles are thicker than auricles because the ventricles have to pump out **blood with force** away from the heart.

6. **Mature RBC in mammals do not have cell organelles.**

   a)   The lack of cell organelles and nucleus in mature RBC is an **adaptation** to be better equipped for its task.

   b)   The lack of cell organelles and nucleus **accommodates more haemoglobin** and **allows** it to **carry more oxygen**.

VIII. Book Exercise – Long answer questions   [5 Marks]

1. **How do plants absorb water? Explain.**

   1.   Water is absorbed along with minerals, by the root hairs, purely by **diffusion**.

   2.   Root hairs are thin walled, **slender extension** of **epidermal cell** that increase the surface area of absorption.

   3.   Once the water enters the root hairs, the **concentration** of water molecules in the root hair cells become **more than** that of the **cortex**.

   4.   Thus water from the root hair moves to the **cortical cells** by **osmosis** and then reaches the xylem. From there the water is **transported** to the **stem and leaves**.

   5.   Once water is absorbed by the root hairs, it can move deeper into root layers by two distinct pathways:

        a)   **Apoplast Pathway :** The **apoplastic** movement of water occurs exclusively **through the intercellular spaces** and the walls of the cells. Apoplastic movement does not involve crossing the cell membrane. This movement is dependent on the gradient.

        b)   **Symplast Pathway :** In **symplastic** movement, the water travels through the cells i.e. their cytoplasm; intercellular movement is through the **plasmodesmata**. Water enters the cells through the cell membrane. Movement is again down a potential gradient.

2. **What is transpiration? Give the importance of transpiration.**

   Transpiration is the **evaporation of water** in plants through stomata in the leaves.

   Importance of Transpiration

   1.   Creates transpirational pull for **transport of water.**

   2.   Supplies water for photosynthesis.

   3.   **Transports minerals** from soil to all parts of the plant.

   4.   **Cools** the surface of the leaves by evaporation.

   5.   Keeps the **cells turgid**; hence, maintains their **shape**.

3. **Why are leucocytes classified as granulocytes and agranulocytes? Name each cell and mention its functions.**

   Based on the presence or absence of granules , leucocytes are classified into two types.

i) **Granulocytes :** They contain granules in their cytoplasm.

ii) **Agranulocytes :** Granules are not found in the cytoplasm of these cells.

I. Types of Granulocytes and their functions :

Name of Granulocyte Cells	Functions
1.Neutrophils	Their numbers are increased during **infection** and **inflammation**.
2.Eosinophils	Their number increases during conditions of **allergy** and **parasitic infections**. It brings about detoxification of toxins.
3.Basophils	They release chemicals during the process of **inflammation**.

II. Types of Agranulocytes and their functions :

Name of Agranulocyte Cells	Functions
1.Lymphocytes	They produce **antibodies** during bacterial and viral infections.
2.Monocytes	They are the largest of the leucocytes and are amoeboid in shape. They are **phagocytic** and can **engulf bacteria**.

4. Differentiate between systole and diastole. Explain the conduction of heart beat.

I. Differences between Systole and Diastole.

Systole	Diastole
1. It is the **contraction** of atrium and ventricles.	1. It is the **relaxation** of atrium and ventricles.
2. Due to systole, the auricles and ventricles **push** the blood out of heart.	2. Due to diastole, the auricles are **filled** with blood.
3. **Atrial systole** lasts about **0.1 seconds**. **Ventricular systole** lasts about **0.3 seconds**.	3. **Ventricular diastole** lasts about **0.4 seconds**.

II. The conduction of heart beat

i)   **Sino-atrial node** acts as the **'pacemaker'** of the heart because it is capable of initiating impulse which can stimulate the heart muscles to contract.

ii) The impulse from the sinoatrial node spreads as a wave of contraction over the right and left atrial wall pushing the blood through the **atrioventricular** valves into the ventricles.

iii) The wave of contraction from SA node reaches the **atrioventricular** (AV) **node** which is stimulated to emit an impulse of contraction spreading to the ventricular muscle via the **atrioventricular bundle** and **the Purkinje fibres**.

5. Enumerate the functions of blood.

Functions of blood

i)   Transport of respiratory gases (Oxygen and CO_2).

ii) Transport of digested food materials to the different body cells.

iii) Transport of hormones.

iv) Transport of nitrogenous excretory products like ammonia, urea and uric acid.

v)   It is involved in protection of the body and defense against diseases.

vi) It acts as buffer and also helps in regulation of pH and body temperature.

vii) It maintains proper water balance in the body.

IX. Book Exercise – Assertion and Reasoning   **[2 Marks]**

Direction: In each of the following questions, a statement of Assertion is given and a corresponding statement of Reason is given just below it. Of the statements given below, mark the correct answer as

a)   **If both A and R are true and R is the correct explanation of A.**

b)   **If both A and R are true but R is not the correct explanation of A.**

c)   **If A is true but R is false.**

d) If both A and R are false.

1. **Assertion:** RBC plays an important role in the transport of respiratory gases.
   Reason: RBC do not have cell organelles and nucleus.

   Ans : a. Both A and R are true and R is the correct explanation of A.

2. **Assertion:** Persons with AB blood group are called an universal recipients, because they can receive blood from all groups.
   Reason: Antibodies are absent in persons with AB blood group.

   Ans : a. Both A and R are true and R is the correct explanation of A.

X. Book Exercise – High Order Thinking Skills (HOTS).

1. **When any dry plant material is kept in water, they swell up. Name and define the phenomenon involved in this change.**

   Ans :

   a) Any dry plant material kept in water absorbs water and swells up. This phenomenon is known as **imbibition**.

   b) **Imbibition** is defined as the **uptake of water** by substances that do not dissolve in water, so that the process results in swelling of the substance.

2. **Why are the walls of the left ventricle thicker than the other chambers of the heart?**

   Ans : The **left ventricle** has a **thicker** muscular **wall** than the other chambers. This is due to the **higher pressure** needed to **pump oxygenated blood** through the **aorta** towards all the parts of the body.

3. **Doctors use stethoscope to hear the sound of the heart. Why?**

   Ans :

   a) The stethoscope is an instrument used by doctors to listen the sound of the heart.

   b) The heart sound is heard by placing the stethoscope on the chest.

   c) It is useful diagnostic tool to identify and localize health problems and diagnose disease.

4. **How does the pulmonary artery and pulmonary vein differ in their function when compared to a normal artery and vein?**

   Ans :

   a) Differences between pulmonary artery and normal artery.

No.	Pulmonary Artery	No.	Normal Artery
1.	It carries blood from **heart to lungs**.	1.	It carries blood from **heart to other parts of the body**.
2.	It carries **deoxygenated** blood.	2.	It carries **oxygenated** blood.

   b) Differences between pulmonary vein and normal vein.

No.	Pulmonary Vein	No.	Normal Vein
1.	It carries blood from **lungs to heart**.	1.	It carries blood **other parts of the body to the heart**.
2.	It carries **oxygenated** blood.	2.	It carries **deoxygenated** blood.

5. **Transpiration is a necessary evil in plants. Explain.**

   Ans :

   a) The **loss of excess water** in the form of **vapour** from the aerial parts of the plant is known as transpiration.

   b) Transpiration is essential for the **movement of water** and **minerals** from the root **to the healthy parts** of the plant.

   c) But **excess transpiration** may result in **drying up** of the leaves or **wilting** and **loss of soil water**. Hence it is termed as a necessary evil.

Additional – Choose the best answer

1. The bulk movement of substances through the vascular tissue is called _____.

a) Translocation   b) Imbibition   c) Diffusion   d) Osmosis

Ans.: a) Translocation

2. In larger organisms transport of nutrients, salts, oxygen, hormones and waste products around the body are performed by the _____ system.

a) Excretory   b) Circulatory   c) Digestive   d) Respiratory

Ans.: b) Circulatory

3. Active transport is carried out by membrane bound _____.

a) Carbohydrates   b) Fats   c) Vitamins   d) Proteins

Ans.: d) Proteins

4. Root hairs are extension of _____.

a) Epidermal cell   b) Cortical cell   c) Endodermal cell   d) Vascular bundle

Ans.: a) Epidermal cell

5. The opening and closing of the stomata depends upon the change in turgidity of the _____ cells.

a) Mesophyll   b) Epidermal   c) Guard   d) Parenchyma

Ans.: c) Guard

6. The direction of movement in the _____ can be upwards or downwards, i.e., bidirectional.

a) Xylem   b) Vessels   c) Tracheids   d) Phloem

Ans.: d) Phloem

7. RBC's are formed in the _____.

a) Liver   b) Bone marrow   c) Spleen   d) Thymus

Ans.: b) Bone marrow

8. Life span of RBCs is about _____.

a) 100 days   b) 120 days   c) 150 days   d) 200 days

Ans.: b) 120 days

9. _____ are phagocytic and can engulf bacteria.

a) Lymphocytes   b) Basophils   c) Eosinophils   d) Monocytes

Ans.: d) Monocytes

10. Capillaries are about _____ in diameter.

a) 8 mm   b) 8 μm   c) 80 μm   d) 80 mm

Ans.: b) 8 μm

11. Which blood cells of mammals are concerned with immunity?

a) Young Erythrocytes   b) Leucocytes   c) Thrombocytes   d) Matured Erythrocytes

Ans.: b) Leucocytes

12. Mitral valve is found between _____.

a) Right auricle and right ventricle   b) Left auricle and left ventricle

c) Right ventricle and pulmonary artery   d) Left ventricle and aorta

Ans.: b) Left auricle and left ventricle

13. Animal possesses four chambered heart.

a) Fish   b) Frog   c) Crocodile   d) Octopus

Ans.: c) Crocodile

14. **In myogenic heart beat contraction is initiated by a specialized portion of the heart muscle known as _____.**

     a) Sino-atrial (SA) node   b) Atrioventricular (AV) node

     c) Purkinje fibres   d) Atrioventricular bundle

                                                        Ans.: a) Sino-atrial (SA) node

15. **The second sound DUPP is produced by the closure of _____.**

     a) Bicuspid valve   b) Tricuspid   c) Semilunar valves   d) Mitral valve

                                                        Ans.: c) Semilunar valves

16. **In an healthy adult during normal resting condition systolic and diastolic blood pressure is expressed as**

     a) 80 mm / 120 mm Hg   b) 120 mm / 80 mm Hg

     c) 100 mm / 60 mm Hg   d) 160mm / 120 mm Hg

                                     Ans.: b)   120 mm / 80 mm Hg

17. **Blood groups A, B and O were identified by _____.**

     a) Decastello   b) Steini   c) Willium Harvey   d) Karl Landsteiner

                                       Ans. : d) Karl Landsteiner

18. **Blood group _____ was recognized by Decastello and Steini in 1902.**

     a) A   b) B   c) AB   d) O

                                       Ans.: c) AB

19. **Antigens are found on the membrane surface of _____.**

     a) WBC   b) Platelets   c) RBC   d) WBC and RBC

                                       Ans.: c) RBC

20. **Diffusion is a _____ process.**

     a) Active   b) Passive   c) Energy requiring   d) ATP utilizing

                                       Ans.: b) Passive

21. **_____ transport utilizes energy to pump molecules against a concentration gradient.**

     a) Active   b) Passive   c) 'Downhill'   d) None of the above

                                       Ans.: a) Active

22. **The membrane bound proteins (pumps) can transport substances from a low concentration to a high concentration. This is called _____.**

     a) Downhill transport   b) Passive transport   c) Uphill transport   d) None of the above

                                       Ans.: c) Uphill transport

23. **Absorption of water by seeds and dry grapes is an example for _____.**

     a) Imbibition   b) Plasmolysis   c) Ascent of sap   d) Exosmosis

                                       Ans.: a) Imbibition

24. **Symplast movement of water is relatively slower than Apoplastic movement.**

     a) Slower   b) Faster   c) Rapid   d) Quicker

                                       Ans.: a) Slower

25. **One of the following is NOT use of Transpiration.**

     a) Supplies water for photosynthesis

     b) Transports minerals from soil to all parts of the plant

     c) Helps in the translocation of food

     d) Creates transpirational pull for transport of water

                                       Ans.: c) Helps in the translocation of food

26. **The food synthesised by the leaves are transported by the _____ either to the area of requirement or stored.**
    a) Xylem   b) Tracheids   c) Phloem   d) Vessels

    Ans.: c) Phloem

27. **Glucose prepared by photosynthesis is converted to _____.**
    a) Sucrose   b) Malate   c) Fructose   d) Starch

    Ans.: a) Sucrose

28. **Water is able to rise to great heights even in the tallest plants, because of**
    a) Root pressure   b) Capillary action   c) Transpiration pull   d) Cohesion

    Ans.: c) Transpiration pull

29. **It is slightly alkaline, non-living intercellular substance which constitutes about 55% of the blood.**
    a) Formed elements   b) Plasma   c) Lymph   d) Blood cells

    Ans.: b) Plasma

30. **Red blood corpuscles (RBCs) are otherwise known as _____.**
    a) Leucocytes   b) Erythrocytes   c) Thrombocytes   d) Granulocytes

    Ans.: b) Erythrocytes

31. **White blood corpuscles (WBC) are otherwise known as _____.**
    a) Leucocytes   b) Erythrocytes   c) Thrombocytes   d) Granulocytes

    Ans.: a) Leucocytes

32. **Blood platelets are otherwise known as _____.**
    a) Leucocytes   b) Erythrocytes   c) Thrombocytes   d) Granulocytes

    Ans.: c) Thrombocytes

33. **_____ are by far the most abundant type of cell in the human body, accounting for over 80 % of all cells.**
    a) Red blood cells   b) White blood cells   c) Blood platelets   d) Plasma

    Ans.: a) Red blood cells

34. **Red blood cells are _____ and disc-shaped.**
    a) Amoeboid   b) Biconvex   c) Biconcave   d) Convex

    Ans.: c) Biconcave

35. **_____ is involved in the transport of oxygen from lungs to tissues.**
    a) White blood cells   b) Red blood cells   c) Blood platelets   d) Plasma

    Ans.: b) Red blood cells

37. **Loss of _____ allows more flexibility for RBC to move through the narrow capillaries.**
    a) Endoplasmic reticulum   b) Mitochondria
    c) Ribosome   d) Golgi bodies

    Ans. : a) Endoplasmic reticulum

38. **_____ form 60% - 65% of the total leucocytes.**
    a) Neutrophils   b) Eosinophils   c) Basophils   d) All the above

    Ans.: a) Neutrophils

39. **_____ have a beneficial role in host defence against parasitic infections and promoting allergic reactions.**
    a) Neutrophils   b) Eosinophils   c) Basophils   d) All the above

    Ans.: b) Eosinophils

40. **Lymphocytes produce _____ during bacterial and viral infections.**
    a) Antigens   b) Toxins   c) Antibodies   d) Hormones

    Ans.: c) Antibodies

41. _____are the largest of the leucocytes and are amoeboid in shape.

a) Neutrophils   b) Eosinophils   c) Basophils   d) Monocytes

Ans.: d) Monocytes

42. The number of blood platelets or thrombocytes per cubic mm of blood is _____.

a) 25,000 − 40,000   b) 50,000 − 1,00,000   c) 2,50,000 − 4,00,000   d) 5,00,000 to 7,00,000

Ans.: c) 2,50,000 − 4,00,000

43. Life span of platelets is only _____ days.

a) 2-3   b) 15 − 20   c) 40   d) 60

Ans.: a) 2-3

44. _____ play an important role in clotting of blood and prevent blood loss.

a) White blood cells   b) Red blood cells   c) Blood platelets   d) Plasma

Ans.: c) Blood platelets

45. The condition of decrease in number of erythrocytes or RBCs is known as _____.

a) Leucocytosis   b) Anemia   c) Leucopenia   d) Thrombocytopenia

Ans.: b) Anemia

46. The condition of decrease in number of leukocytes is known as _____.

a) Leucocytosis   b) Anemia   c) Leucopenia   d) Thrombocytopenia

Ans.: c) Leucopenia

47. Open type circulatory system is found in _____.

a) Arthropods   b) Molluscs   c) Ascidians   d) All the above

Ans.: d) All the above

48. Closed type of circulatory system is found in _____.

a) Arthropods   b) Molluscs   c) Vertebrates   d) Ascidians

Ans.: c) Vertebrates

49. _____ bring oxygenated blood to the left atrium from the lungs.

a) Coronary sinus   b) Pulmonary veins   c) Pulmonary artery   d) Vena cava

Ans.: b) Pulmonary veins

50. The valve which is located between the right auricle and right ventricle is _____ .

a) Tricuspid valve   b) Bicuspid valve or Mitral valve

c) Pulmonary semilunar valve   d) Aortic semilunar valve

Ans.: a) Tricuspid valve

51. The valve which is located between the left auricle and left ventricle is _____ .

a) Tricuspid valve   b) Bicuspid valve or Mitral valve

c) Pulmonary semilunar valve   d) Aortic semilunar valve

Ans.: b) Bicuspid valve or Mitral valve

52. The valve which is located at the base of aorta is _____ .

a) Tricuspid valve   b) Bicuspid valve or Mitral valve

c) Pulmonary semilunar valve   d) Aortic semilunar valve

Ans.: d) Aortic semilunar valve

53. The valve which is located at the base of pulmonary artery is _____ .

a) Tricuspid valve   b) Bicuspid valve or Mitral valve

c) Pulmonary semilunar valve   d) Aortic semilunar valve

Ans.: c) Pulmonary semilunar valve

54. The number heart chambers in fish is _____.

a) Two   b) Three   c) Incomplete four   d) Four

Ans.: a) Two

55. The number heart chambers in Amphibians is _____.

    a) Two   b) Three   c) Incomplete four   d) Four

                                                                                   Ans.: b) Three

56. The number heart chambers in most of the reptiles is _____.

    a) Two   b) Three   c) Incomplete four   d) Four

                                                         Ans.: c) Incomplete four

57. The number heart chambers in Aves and Mammals is _____.

    a) Two   b) Three   c) Incomplete four   d) Four

                                                                Ans.: d) Four

58. The number heart chambers in Crocodiles (Reptile) is _____.

    a) Two   b) Three   c) Incomplete four   d) Four

                                                                Ans.: d) Four

59. Normal pulse rate ranges from _____.

    a) 40 – 60   b) 70 – 90   c) 80 - 120   d) 100 – 140

                                                                Ans.: b) 70 – 90

60. If Antigen A is present on the surface of RBC and antibody b (anti-b) is present in the plasma, the blood group present in the person is _____.

    a) A   b) B   c) AB   d) O

                                                                Ans.: a) A

61. If Antigen B is present on the surface of RBC and antibody a (anti - a) is present in the plasma , the blood group present in the person is _____.

    a) A   b) B   c) AB   d) O

                                                                Ans.: b) B

62. If Antigens A and B are present on the surface of RBC and antibodies are absent in the plasma , the blood group present in the person is _____.

    a) A   b) B   c) AB   d) O

                                                                Ans.: c) AB

63. If Antigen A or B are absent on the surface of RBC. However, the plasma contains both antibodies a and b (anti a and b), the blood group present in the person is _____.

    a) A   b) B   c) AB   d) O

                                                                Ans.: d) O

64. Persons with '_____' blood group are called 'Universal Recipient'.

    a) A   b) B   c) AB   d) O

                                                                Ans.: c) AB

65. Persons with '_____' blood group are called 'Universal Donor'.

    a) A   b) B   c) AB   d) O

                                                                Ans.: d) O

Additional – Fill in the blanks

1. Proteins that carry substances across the cell membrane are often referred to as _____.

                                                                                   Ans.: Pumps

2. Osmosis is the _____ movement of water or any other solvent molecules.   **Ans.:** Passive

3. The _____ movement of water occurs exclusively through the intercellular spaces and the walls of the cells.   **Ans. :** Apoplastic

4. Movement of water through plasmodesmata, cell membrane and cytoplasm of the cells is known as _____ movement.   **Ans.:** Symplastic

5. Transpiration is the evaporation of water in plants through _____ in the leaves.   **Ans.:** Stomata

6. Movement of minerals by active absorption needs energy in the form of _____.   **Ans.:** ATP

7. _____ strands pass through the pores in the sieve plates of phloem.   **Ans.:** Cytoplasmic

8. The food synthesised by the leaves are transported by the _____ either to the area of requirement or stored.   **Ans.:** Phloem

9. The direction movement is always unidirectional in _____.   **Ans.:** Xylem

10. Guttation takes place through specialized cells called _____.   **Ans.:** Hydathodes

11. _____ is the main circulatory medium in the human body.   **Ans.:** Blood

12. Decrease in the number of thrombocytes is known as _____.   **Ans.:** Thrombocytopenia

13. Increase in the number of leukocytes is known as _____.   **Ans.:** Leucocytosis

12. Capillaries are formed of single layer of _____ cells.   **Ans.:** Endothelial

13. Closed circulatory system was discovered by _____.   **Ans.:** William Harvey (1628)

14. _____ reduces friction during heart beat and protects heart from mechanical injuries.

    Ans.: Pericardial fluid

15. The heart normally beats _____ times per minute.   **Ans.:** 72 – 75

16. Sino-atrial (SA) node is situated in the wall of the right atrium near the opening of the _____.

    Ans.: Superior vena cava

17. Decrease in blood pressure is termed _____.   **Ans. :** Hypotension (Low blood pressure)

18. The concept of blood grouping was developed by _____ in 1900.   **Ans.:** Karl Landsteiner

19. When an individual receives a mismatched blood group from the donor, _____ of blood occurs in the body.   **Ans. :** Agglutination (clumping)

20. Rh factor was discovered by _____ and _____ in 1940.   **Ans.:** Landsteiner and Wiener

21. The lymphatic capillaries unite to form large lymphatic _____.   **Ans.:** Vessels

22. Lymph from the intercellular spaces drains into lymphatic _____.   **Ans.:** Capillaries

23. Food is the only source of energy and every cell gets its energy by the breakdown of _____.

    Ans.: Glucose

24. Water and mineral salts absorbed by the roots reach all parts of the plant through the _____.

    Ans.: Xylem

25. The food synthesised by the leaves are translocated to all parts of the plant through the _____.

    Ans.: Phloem

26. The movement of molecules in liquid and solids from a region of higher concentration to a region of their lower concentration without the utilization of energy is called _____.   **Ans.:** Diffusion

27. The movement of solvent or water molecules from the region of higher concentration to the region of lower concentration through a semi-permeable membrane is known as _____.   **Ans.:** Osmosis

28. Osmosis process is carried out till an _____ is reached.   **Ans.:** Equilibrium

29. The process in which water moves out of the cell and resulting in the shrinkage of cell membrane away from the cell wall is known as _____.   **Ans.:** Plasmolysis

30. _____ is a type of diffusion in which a solid absorbs water and gets swelled up.   **Ans.:** Imbibition

31. Water is absorbed along with minerals, by the root hairs, purely by _____.   **Ans.:** Diffusion

32. _____ movement of water does not involve crossing the cell membrane.   **Ans.:** Apoplastic

33. In Symplast Pathway, water enters the cells through the _____.   **Ans.:** Cell membrane

34. Stomata are open in the _____ and closed at _____.   **Ans.:** Day / Night

35. When _____ increases within the two guard cells the stoma open.   **Ans.:** Turgidity

36. When the guard cells lose water, it becomes _____ and the stoma closes.   **Ans.:** Flaccid

37. As water is lost from the leaves, pressure is created at the top to pull more water from the xylem to the mesophyll cells, this process is called _____.   **Ans.:** Transpiration pull

38. As ion from the soil are actively transported into the vascular tissue of the root, water moves along and increases the pressure inside the xylem. This pressure is called _____.   **Ans.:** Root pressure

39. The active absorption of minerals needs energy in the form of _____.   **Ans.:** ATP

40. Minerals are remobilised from older dying leaves to younger leaves. This phenomenon can be seen in _____ plants.   **Ans.:** Deciduous

41. The sieve tubes of phloem tissue consists of _____.   **Ans.:** Sieve plates

42. Phloem transports food in the form of _____ from a source to a sink.   **Ans.:** Sucrose

43. The _____ Hypothesis is the best-supported theory to explain the translocation of sugars through the phloem.   **Ans.:** Pressure Flow

44. After photosynthesis, sucrose moves into the companion cells, then into the living phloem _____ cells by active transport.   **Ans.:** Sieve tube

45. The upward movement of water and minerals from roots to different plant parts is called _____.   **Ans.:** Ascent of sap

46. _____ is responsible for movement of water up to the base of the stem.   **Ans.:** Root Pressure

47. Water or any liquid rises in a capillary tube because of physical forces, this phenomenon is called _____.   **Ans.:** Capillary action

48. The force of attraction between molecules of water is called _____.   **Ans.:** Cohesion

49. The force of attraction between molecules of different substances is called _____.   **Ans.:** Adhesion

50. Water molecules stick to a xylem because of force of _____.   **Ans.:** Adhesion

51. Transpiration through stomata creates vacuum which creates a suction force called _____.   **Ans.:** Transpiration pull

52. The fluid part of blood is _____.   **Ans.:** Plasma

53. Dews are water droplets on the leaves of grass seen in the early mornings, when the climate is humid and excess of water in the soil. This is due to root pressure and this phenomenon is called _____.   **Ans.:** Guttation

54. The RBC's impart red colour to the blood due to presence of respiratory pigment _____.   **Ans.:** Haemoglobin

55. Matured mammalian RBC's do not have cell organelles and _____.   **Ans.:** Nucleus

56. White blood corpuscles (Leucocytes) are capable of _____ movement.   **Ans.:** Amoeboid

57. The number of _____ increases during conditions of allergy and parasitic infections.   **Ans.:** Eosinophils

58. _____ brings about detoxification of toxins in the blood.   **Ans.:** Eosinophils

59. _____ acts as buffer and also helps in regulation of pH and body temperature.   **Ans.:** Blood

60. _____ are thick and elastic vessels that carry blood away from the heart to various organs of the body.   **Ans.:** Arteries

61. All arteries carry oxygenated blood except the _____ artery which carry deoxygenated blood to the lungs.   **Ans.:** Pulmonary

62. _____ are thin and non-elastic vessels that transport blood to the heart from the different organs.

Ans.: Veins

63. All veins carry _____ blood except the pulmonary vein. **Ans.:** Deoxygenated

64. Pulmonary vein carry _____ blood from the lungs to the heart. **Ans.:** Oxygenated

65. Arteries are _____ in colour. **Ans.:** Pink

66. Veins are _____ in colour. **Ans.:** Red

67. In open type circulatory system, the blood is pumped by heart into blood vessels that open into blood spaces called as _____. **Ans.:** Sinuses

68. The sinuses are the body cavities which are known as _____. **Ans.:** Haemocoel

69. Capillary system is absent in _____ type circulatory system. **Ans.:** Open

70. In Arthropods, Molluscs and Ascidians, _____ type circulatory system is found. **Ans.:** Open

71. In closed type of circulatory system, the blood flows from arteries to veins through small blood vessels called _____. **Ans.:** Capillaries

72. The heart is made of specialized type of muscle called the _____. **Ans.:** Cardiac muscle

73. The human heart is _____ chambered. **Ans.:** Four

74. The two upper thin walled chambers of the heart are called _____. **Ans.:** Auricle or atria

75. The two lower thick walled chambers are called _____. **Ans.:** Ventricles

76. Auricles and ventricles are separated by partition called _____. **Ans.:** Septum

77. The two auricles are separated from each other by _____ septum. **Ans.:** Interatrial

78. The right atrium receives _____ blood from different parts of the body through vena cava and coronary sinus. **Ans.:** Deoxygenated

79. The two ventricles are separated from each other by an _____ septum. **Ans.:** Interventricular

80. The _____ have thick walls because they have to pump out blood with force away from the heart.

Ans.: Ventricles

81. The left ventricle gives rise to _____which supplies oxygenated blood to various organs of the body.

Ans.: Aorta

82. The _____ arteries supply blood to the heart. **Ans.:** Coronary

83. The _____ are the muscular flaps that regulate the flow of blood in a single direction and prevent back flow of blood. **Ans.:** Valves

84. The apices of the flaps of tricuspid valve are held in position by _____. **Ans.:** Chordae tendinae

85. Chordae tendinae arising from the muscular projection of the ventricle wall known as _____.

Ans.: Papillary muscles

86. Circulation of oxygenated blood from the left ventricle of the heart to various organs of the body and return of deoxygenated blood to the right atrium is called as _____ circulation . **Ans.:** Systemic

87. Circulation of deoxygenated blood from the right ventricle of the heart to lungs and return of oxygenated blood to the ventricle is called as _____ circulation. **Ans.:** Pulmonary

88. The supply of blood to the heart muscles (cardiac muscles) is called as _____ circulation.

Ans.: Coronary

89. Cardiac muscles receive oxygenated blood from _____ arteries that originate from the aortic arch.

Ans.: Coronary

90. When the blood circulates twice through the heart in one complete cycle, it is called _____ circulation.

Ans.: Double

91. When the oxygenated and deoxygenated blood are mixed and pass through the heart only once, it is called _____ circulation.   **Ans.:** Single

92. One complete contraction (systole) and relaxation (diastole) of the atrium and ventricles of the heart constitute _____.   **Ans.:** Heartbeat

93. _____ heart beat is initiated by a nerve impulse caused from a nerve ganglion situated near the heart as in Annelids, most arthropods.   **Ans.:** Neurogenic

94. _____ heart beat is initiated by a specialized group of modified heart muscle fibres as in Mollusca and Vertebrates.   **Ans.:** Myogenic

95. The human heart is _____ in nature.   **Ans.:** Myogenic

96. Sino-atrial node acts as the '_____' of the heart because it is capable of initiating impulse which can stimulate the heart muscles to contract.   **Ans.:** Pacemaker

97. Atrioventricular bundle was discovered by _____ in 1893.   **Ans.:** His

98. Atrioventricular bundle is also called as _____.   **Ans.:** Bundle of His

99. When the heart beats the blood is forced into the arteries. The expansion of the artery every time the blood is forced into it is called_____.   **Ans.:** Pulse

100. The sequence of events occurring from the beginning to the completion of one heart beat is called _____.   **Ans.:** Cardiac cycle

101. Each cardiac cycle lasts about _____ second.   **Ans.:** 0.8

102. Atrial systole or contraction of auricles lasts about _____ sec.   **Ans.:** 0.1

103. Ventricular systole or contraction of ventricles lasts about _____ sec.   **Ans.:** 0.3

104. Ventricular diastole or relaxation of ventricles lats about _____ sec.   **Ans.:** 0.4

105. The force exerted during the flow of blood against the lateral walls of arteries is called _____.
                                                                              Ans.: Blood pressure

106. During ventricular systole, the left ventricle contracts and forces blood into the aorta. The pressure rises to a peak which is referred as _____.   **Ans.:** Systolic pressure

107. During diastole, the ventricles relax and the pressure falls to the lowest value which is referred as _____.
                                                                           Ans.: Diastolic pressure

108. A prolonged or constant elevation of blood pressure is a condition known as _____.
                                                                Ans.: Hypertension (High blood pressure)

109. Decrease in blood pressure is termed _____.   **Ans.:** Hypotension (Low blood pressure).

110. The device which is used to detect the sound produced by the internal organs of human body is called _____.   **Ans.:** Stethoscope

111. The clinical instrument used to measure blood pressure is called _____.   **Ans.:** Sphygmomanometer

112. The antigenic substances present in blood cells which stimulates the formation of an agglutinins (Antibodies) in blood serum is called _____ .   **Ans.:** Agglutinogens

113. _____ are the antibodies in the plasma that react to foreign Agglutinogens or antigens.
                                                                              Ans.: Agglutinins

114. Rh factor was first discovered in _____ monkey.   **Ans.:** Rhesus

115. The lymphatic capillaries of intestinal _____ absorb digested fats.   **Ans.:** Villi (lacteals)

116. _____ present in the lymph defend the body from infections.   **Ans.:** Lymphocytes

Additional – Match the following

Section I

1.	Diffusion	(a)	Rhesus monkey
2.	Root hairs	(b)	Colourless fluid
3.	Apoplastic movement	(c)	Passive process
4.	Flaccid guard cells	(d)	Water absorption
5.	Phloem	(e)	Intercellular space
6.	Guttation	(f)	Close stoma
7.	Blood	(g)	Sieve tubes
8.	Atrioventricular bundle	(h)	Hydathodes
9.	Landsteiner and Wiener	(i)	Connective tissue
10.	Lymph	(j)	His

Ans :

1	Diffusion	c	Passive process
2	Root hairs	d	Water absorption
3	Apoplastic movement	e	Intercellular space
4	Flaccid guard cells	f	Close stoma
5	Phloem	g	Sieve tubes
6	Guttation	h	Hydathodes
7	Blood	i	Connective tissue
8	Atrioventricular bundle	j	His
9	Landsteiner and Wiener	a	Rhesus monkey
10	Lymph	b	Colourless fluid

Section II

1.	Anemia	(a)	Antibodies
2.	Blood spaces	(b)	Antigens
3.	Two chambered heart	(c)	Pacemaker
4.	Three chambered heart	(d)	Neurogenic heart
5.	Incomplete 4 chambered heart	(e)	Amphibians
6.	Annelids	(f)	Reptiles
7.	Mollusca	(g)	Sinuses
8.	Sino-atrial node	(h)	Myogenic heart
9.	Agglutinogens	(i)	Fishes
10.	Agglutinins	(j)	Decrease in erythrocytes

Ans :

1	Anemia	j	Decrease in erythrocytes
2	Blood spaces	g	Sinuses
3	Two chambered heart	i	Fishes
4	Three chambered heart	e	Amphibians
5	Incomplete 4 chambered heart	f	Reptiles
6	Annelids	d	Neurogenic heart
7	Mollusca	h	Myogenic heart
8	Sino-atrial node	c	Pacemaker

| 9 | Agglutinogens | b | Antigens |
| 10 | Agglutinins | a | Antibodies |

Additional – True or false

1. **Passive transport utilizes energy to pump molecules against a concentration gradient.**

   Ans.: False.

   Correct statement: Active transport utilizes energy to pump molecules against a concentration gradient.

2. **Transport of substances from a low concentration to a high concentration across the cell membrane by pumps is an 'uphill' transport.**

   Ans.: True.

3. **Water from the root hair moves to the cortical cells by osmosis and then reaches the phloem.**

   Ans.: False.

   Correct statement: Water from the root hair moves to the cortical cells by osmosis and then reaches the **xylem**.

4. **Symplastic movement of water is slower than apoplastic movement.**

   Ans.: True.

5. **When turgidity increases within the two guard cells the stoma open.**

   Ans.: True.

6. **Stomata are closed in the day and open at night.**

   Ans.: False.

   Correct statement: Stomata are **open** in the day and **closed** at night.

7. **The upward movement of water and minerals from roots to different plant parts is called ascent of sap.**

   Ans.: True.

8. **60% - 65% of white blood cells are Eosinophils.**

   Ans.: False.

   Correct statement: 60% - 65% of white blood cells are **Neutrophils**.

9. **Capillaries unite to form the venules and veins.**

   Ans.: True.

10. **Vertebrates possess open type of circulatory system.**

    Ans.: False.

    Correct statement: Vertebrates possess **closed** type of circulatory system.

11. **Aves and Reptiles possess four chambered heart.**

    Ans.: True.

12. **The human heart is neurogenic in nature.**

    Ans.: False.

    Correct statement: The human heart is **myogenic** in nature.

13. **The first sound LUBB is of longer duration and is produced by the closure of the tricuspid and bicuspid valves.**

    Ans.: True.

14. **In blood group AB, Antigen A or B are absent where as in blood group O, antibodies are absent.**

    Ans.: False.

Correct statement: In blood group **O**, Antigens A or B are absent where as in blood group **AB**, antibodies are absent.

15. **Antibodies are present in blood plasma.**

    Ans.: True.

16. **Persons with 'O' blood group are called '<u>Universal Donor</u>' as they can <u>donate blood</u> to persons with any blood group.**

    Ans.: True.

Additional – Answer in a word or sentence   (1 Mark)

1. **What is plasmolysis?**

   Contraction of the protoplast and the shrinkage of cell membrane of a plant cell as a result of loss of water from the cell is known as plasmolysis.

2. **Where are the White Blood Cells or Leucocytes produced?**

   White Blood Cells or Leucocytes are produced in **bone marrow, spleen, thymus and lymph nodes**.

3. **What are the two types of circulatory system?**

   Two types of circulatory system are

   i) **Open type** - Blood is pumped from heart to body cavity called haemocoel.

   ii) **Closed type** - Blood is pumped by heart through vessels to all the parts of body.

4. **Who is the Father of Modern Physiology?**

   William Harvey (1628) is the Father of Modern Physiology.

5. **What is single circulation?**

   In fishes, amphibians and certain reptiles, the oxygenated and deoxygenated blood are mixed and pass through the heart only once. This type of circulation is called **single circulation**.

6. **Define cardiac cycle.**

   The sequence of events occurring from the **beginning** to the **completion of one heart beat** is called cardiac cycle.

7. **Define blood pressure.**

   Blood pressure is the **force exerted** during the flow of blood against the **lateral walls of arteries**.

8. **What are Rh antibodies?**

   Antibodies developed against Rh antigen are called **Rh antibodies**.

Additional – Short answer question   (2 Marks)

1. **Define diffusion.**

   The movement of molecules in liquid and solids from a region of **higher concentration** to a region of their **lower concentration** without the utilization of energy is called **diffusion**.

2. **Define Osmosis.**

   Osmosis is the **movement of solvent** or water molecules from the **region of higher concentration** to the **region of lower concentration** through a **semi-permeable membrane** till an **equilibrium** is reached. Osmosis is the passive movement of water or any other solvent molecules.

3. **What are the factors affecting the transpiration?**

   Transpiration is affected by the following factors.

   I. **External factors :**

      a) Temperature

      b) Light

    c) Humidity and

    d) Wind speed.

II. Internal factors :

    a) Number and distribution of stomata

    b) Percentage of open stomata

    c) Water status of the plant and

    d) Canopy structure.

4. What is root pressure? What is the use of the root pressure in plant?

As ion from the soil are actively transported into the vascular tissue of the root, water moves along and increases the pressure inside the xylem. This pressure is called root pressure.

Use of root pressure: When soil moisture level is high either at night or when transpiration is low during day, root pressure can push water to smaller height of the stem.

5. What is guttation?

Dews are water droplets on the leaves of grass seen in the early mornings, when the climate is humid and excess of water in the soil. This is due to root pressure and this phenomenon is called **Guttation**. It takes place through specialized cells called **Hydathodes**.

6. Differentiate Transpiration and Guttation.

Transpiration	Guttation
1. Water is lost from the aerial parts of the plants, in the form of **vapours**.	1. Water is lost in the form of **liquid** from the uninjured margins of leaves.
2. It takes place through **stomata** of leaves.	2. It takes place through specialized cells called **Hydathodes**.

7. Why does mammalian RBC lack cell organelles and nucleus?

Mammalian RBC lack nucleus and makes the cells biconcave and increase surface area for oxygen binding, loss of mitochondria allows the RBC to transport all the oxygen to tissues, and loss of endoplasmic reticulum allows more flexibility for RBC to move through the narrow capillaries.

8. Write about the components of blood.

The blood consists of two main components.

A. Plasma: It is slightly alkaline, non-living intercellular substance which constitutes about 55% of the blood. Organic substances like proteins, glucose, urea, enzymes, hormones, vitamins and minerals are present in the plasma.

B. Formed Elements of Blood: Blood corpuscles are of three types

    a) Red blood corpuscles (RBC) or Erythrocytes

    b) White blood corpuscles (WBC) or Leucocytes

    c) Blood platelets or Thrombocytes.

9. Mention the various valves and their location in the human heart.

Name of the valve	Location
1. Tricuspid valve	It is found in the right auricu¬lo-ventricular aperture.
2. Bicuspid valve or mitral valve	It is found in the left auriculo ventricular aperture.
3. Semilunar valve	It is found at the base of the pulmonary artery.
4. Aortic valve	It is found at the base of Aorta

10. Define double circulation.

When the blood circulates twice through the heart in one complete cycle it is called **double circulation**. In double circulation the oxygenated blood do not mix with the deoxygenated blood.

11. Differentiate the heart beat and pulse.

Heart beat	Pulse
1. One complete **contraction (systole)** and **relaxation (diastole)** of the atrium and ventricles of the heart constitute heartbeat.	1. When the heart beats the blood is forced into the arteries. The **expansion of the artery** every time the blood is forced into it is called pulse.
2. The heart normally beats **72 − 75** times per minute.	2. Normal pulse rate ranges from **70 − 90** times per minute.

12. Write the differences between Neurogenic and Myogenic Heart Beat.

Neurogenic Heart Beat	Myogenic Heart Beat
1. It is initiated by a nerve impulse caused from a **nerve ganglion** situated near the heart.	1. It is initiated by a specialized group of **modified heart muscle fibres**.
2. It occurs in **Annelids and most arthropods**.	2. It occurs in **Mollusca and Vertebrates**.

13. Write the differences between Systolic Pressure and Diastolic Pressure.

Systolic Pressure	Diastolic Pressure
1. It is the pressure exerted on arteries during **ventricular systole** (Contraction of ventricles).	1. It is the pressure exerted on arteries during **ventricular diastole** (Relaxation of ventricles).
2. Normal range is **120 mm Hg**.	2. Normal range is **80 mm Hg**

14. What would happen if you have high blood pressure?

A prolonged or constant elevation of blood pressure is a condition known as **hypertension (High blood pressure)** which can increase the risk of heart attack and stroke.

15. What are the uses of Stethoscope?
a)   A stethoscope is used to detect the sound produced by the internal organs of human body.
b)   The heart sound is heard by placing the stethoscope on the chest.
c)   It is a useful diagnostic tool to identify and localize health problems and diagnose disease.

16. What is Sphygmomanometer ? What are the uses of Sphygmomanometer?

Sphygmomanometer is a clinical instrument used to measure blood pressure when a person is in a relaxed and resting condition. The pressure of the brachial artery is measured.
a)   It helps to estimate the state of blood circulation and the working of the heart.
b)   It helps to diagnose conditions such as increased or decreased blood pressure.

17. Compare and contrast the blood groups A, B, AB and O.

OR

Tabulate the distribution of Antigen (RBC) and Antibody (Plasma) in different Blood Groups.

Blood Group	Antigens on RBC	Antibodies in Plasma	Can donate to	Can receive from
A	Antigen A	Antibody - b	A and AB	A and O
B	Antigen B	Antibody - a	B and AB	B and O
AB	Antigen A and B	No antibody	AB	A, B, AB and O (Universal Recipient)
O	No Antigen	Both anti a and b	A, B, AB and O (Universal Donor)	O

18. Write a notes on Rh factor.
a)   Rh factor was discovered by **Landsteiner** and **Wiener** in 1940 in **Rhesus monkey**.
b)   The surface of RBC contains the antigen for Rh factor.
c)   **Rh+** (positive) persons have Rh antigen on the surface of RBC.
d)   **Rh−** (negative) persons do not have Rh antigen on the surface of RBC.

e) Antibodies developed against this Rh antigen is called **Rh antibodies**.

19. What are the parts of Lymphatic system?

The lymphatic system comprises of

a) Lymphatic capillaries

b) Lymphatic vessels

c) Lymph nodes and

d) Lymphatic ducts

Additional – Give reasons for the following statements (2 Marks)

1. Transpiration pull is responsible for ascent of sap (Upward movement of water from root).

Transpiration through stomata creates vacuum which creates a suction called transpiration pull. The transpiration pull sucks the water column from the xylem tubes and thus water is able to rise to great heights (Ascent of sap) even in the tallest plants.

2. All minerals cannot be passively absorbed by the roots.

All minerals cannot be passively absorbed by the roots. Because

(i) Minerals are present in the soil as charged particles (ions) that cannot move across cell membranes and

(ii) The concentration of minerals in the soil is usually lower than the concentration of minerals in the root.

3. Arthropods, Molluscs and Ascidians possess open type of circulatory system.

In animals belong to Arthropods, Molluscs and Ascidians, the blood is pumped by heart into blood vessels that open into blood spaces called as **sinuses**. These sinuses are the body cavities which are called **haemocoel**. Capillary system is absent. This is known as open type of circulatory system.

4. Atrioventricular bundle is otherwise known as Bundle of His.

As Atrioventricular bundle is discovered by **His** (1893) , Atrioventricular bundle is otherwise known as Bundle of His.

5. Receiving mismatched blood will lead to death.

When an individual receives a mismatched blood group from the donor **agglutination (clumping)** of blood occurs in the body which leads to death.

Additional – Long Answer Questions (5 Marks)

1. How does translocation of food take place in plants?

i) The mechanism of translocation of sugars from source to sink is through pressure flow hypothesis.

ii) Glucose prepared at source (by photosynthesis) is converted to sucrose.

iii) Sucrose moves into the companion cells, then into the living phloem sieve tube cells by active transport.

iv) This process produces a hypertonic condition in the phloem.

v) Water in the adjacent xylem moves into the phloem by osmosis.

vi) As osmotic pressure builds up, the phloem sap moves to areas of lower pressure.

vii) By active transport sucrose moves into the cells where it is utilised or stored.

viii) As sugars are removed, the osmotic pressure decreases and water moves out of the phloem.

2. Explain the factors which play a role in ascent of sap.

A number of factors play a role in ascent of sap and it takes places in following steps.

i) Root Pressure: Water from soil enters the root hairs due to osmosis. Root pressure is responsible for movement of water up to the base of the stem.

ii) Capillary Action: Water or any liquid rises in a capillary tube because of physical forces, this phenomenon is called capillary action. In the same way, in stem water rises up to certain height because of capillary action.

iii) **Adhesion-cohesion of Water Molecules:** Water molecules form a continuous column in the xylem because of forces of adhesion and cohesion among the molecules.

iv) **Cohesion:** The force of attraction between molecules of water is called cohesion.

v) **Adhesion:** The force of attraction between molecules of different substances is called adhesion.Water molecules stick to a xylem because of force of adhesion.

3. Write the differences between Artery and Vein.

S.No.	Artery	S.No.	Vein
1.	Distributing vessel	1.	Collecting vessel
2.	Pink in colour	2.	Red in colour
3.	Deep location	3.	Superficial in location
4.	Blood flow with high pressure	4.	Blood flow with low pressure
5.	Wall of artery is strong, thick and elastic	5.	Wall of vein is weak, thin and non-elastic
6.	All arteries carry oxygenated blood except pulmonary arteries	6.	All veins carry deoxygenated blood except pulmonary veins

4. Compare and contrast Red Blood cells, White Blood Cells and Platelets.

Red blood cells (Erythroctes)	White blood cells (Leucocytes)	Blood Platelets (Thrombocytes)
1. They **transport of oxygen** from lungs to tissues.	1. They help to **fight infections**.	1. They play an important role in **clotting of blood**.
2. They contain respiratory pigment **haemoglobin**.	2. They do not have Haemoglobin.	2. They do not have Haemoglobin.
3. They are formed in the **bone marrow**.	3. They are formed in the **bone marrow, spleen, thymus and lymph nodes**.	3. They are formed in the **bone marrow**.
4. They **do not have nucleus**.	4. They **have nucleus**.	4. They **do not have nucleus**.
5. Their life span is about **120 days**.	5. Life span is only **13-20 days**.	5. Life span is only **2–3 days**.
6. They are **red in colour**.	6. They are **colourless**.	6. They are **colourless**.
7. They are **biconcave and disc-shaped**.	7. They are **irregular (Amoeboid) in shape**.	7. They are **plate** shaped.
8. **Only one type** of RBCs exists.	8. **Five different types** exist such as neutrophils, lymphocytes, monocytes, basophils and eosinophils.	8. **Only one type** of RBCs exists.
9. They are about **5 million** RBCs / cubic mm of blood.	9. They are about **7000–8000** WBC s / cubic mm of blood.	9. There are about **2,50,000 – 4,00,000** platelets / cubic mm of blood.
10. Low count of RBCs results in **Anaemia**.	10. Low count of WBC'S results in **Leukopenia**.	10. Low count of platelets results **thrombocytopenia**.

5. **Explain the structure of heart with labeled diagram.**

Structure of Human Heart

i) The heart is made of specialized type of muscle called the **cardiac muscle**.

ii) The heart is enclosed in a double walled sac called **pericardium**. It contains lubricating **pericardial fluid** which reduces **friction** during heart beat and protects it from mechanical injuries.

iii) The human heart is four chambered. The two upper **thin** walled chambers of the heart are called auricle or **atria** (sing: atrium) and two lower **thick** walled chambers are called **ventricles**.

iv) The right atrium receives deoxygenated blood from different parts of the body through the main veins **superior vena cava, inferior vena cava** and **coronary sinus**.

v) From the left atrium arises **Pulmonary vein** which brings oxygenated blood from the lungs to heart.

vi) From the **right ventricle** arises the **pulmonary artery** which takes deoxygenated blood from heart to lungs.

vii) The **left ventricle** gives rise to **aorta**.

viii) The heart contains three types of valves.

    a) **Tricuspid valve** is located between the right auricle and right ventricle.

    b) **Bicuspid** or **mitral valve** is located between the left auricle and left ventricle.

    c) **Semilunar valves** are located at the base of pulmonary artery and aorta.
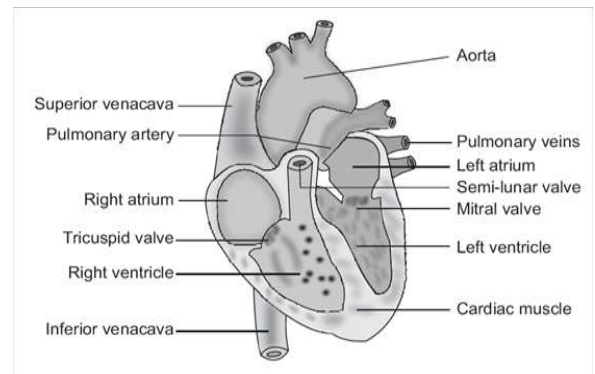
6. **Explain the three types of blood circulation found in human being.**

Types of Blood Circulation :

The blood circulates in our body as oxygenated and deoxygenated blood. The types of circulation are:

i) **Systemic circulation :** Circulation of oxygenated blood from the left ventricle of the heart to various organs of the body and return of deoxygenated blood to the right atrium. Aorta carries oxygenated blood to all the organs of the body.

ii) **Pulmonary circulation :** The path of pulmonary circulation starts in the right ventricle. Pulmonary artery arises from the right ventricle and reaches the lungs with deoxygenated blood. Pulmonary veins collect the oxygenated blood from the lungs and supplies it to the left atrium of the heart.

iii) **Coronary circulation :** The supply of blood to the heart muscles (cardiac muscles) is called as **coronary circulation**. Cardiac muscles receive oxygenated blood from **coronary arteries** that originate from the **aortic arch**. Deoxygenated blood from the cardiac muscles drains into the right atrium by the **coronary sinuses**.
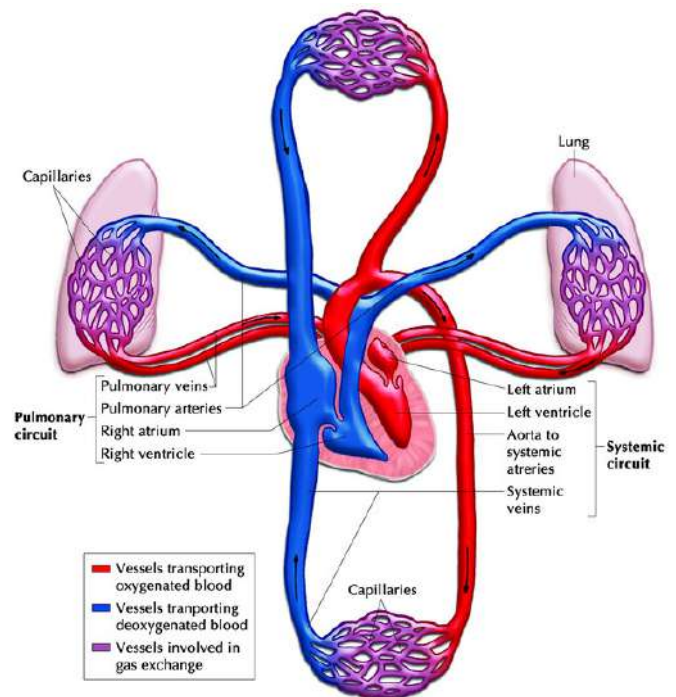
7. **What is lymph? What are the functions of Lymph?**

Lymph :

i) Lymph is a colourless fluid formed when plasma, proteins and blood cells escape into intercellular spaces in the tissues through the pores present in the walls of capillaries.

ii) It is similar to blood plasma, but is colourless and contains less proteins.

iii) The lymph contains very small amount of nutrients, oxygen, CO_2, water and WBC.

Functions of Lymph :

i) Supplies nutrition and oxygen to those parts where blood cannot reach.

ii) It drains away excess tissue fluid and metabolites and returns proteins to the blood from tissue spaces.

iii) The lymph also carries absorbed fats from small intestine to the blood.

iv) The lymphatic capillaries of intestinal villi (lacteals) absorb digested fats.

v) Lymphocytes in the lymph defend the body from infections.

Additional – Assertion and Reason (2 Marks)

Direction: In each of the following questions, a statement of Assertion is given and a corresponding statement of Reason is given just below it. Of the statements given below, mark the correct answer as

a) If both A and R are true and R is the correct explanation of A.

b) If both A and R are true but R is not the correct explanation of A.

c) If A is true but R is false.

d) If both A and R are false.

1. **Assertion (A) :** Pericardium contains lubricating pericardial fluid.

   Reason (R) : Pericardial fluid reduces friction during heart beat and protects it from mechanical injuries.

   Ans : a) Both A and R are true and R is the correct explanation of A

2. **Assertion (A) :** Mammalian heart is called myogenic heart.

   Reason (B) : Heartbeat is regulated by a specialized muscle bundle (pacemaker) in mammals.

   Ans : a) Both A and R are true and R is the correct explanation of A

3. **Assertion (A) :** Persons with '**AB**' blood group are called '**Universal Recipient**'

   Reason (R) : Persons with '**AB**' blood group can donate blood to persons with any blood group.

   Ans : c) A is true but R is false.

Additional – Draw and label the following diagrams. (2 Marks)

1. **Plasmolysis.**

Plasmolysis
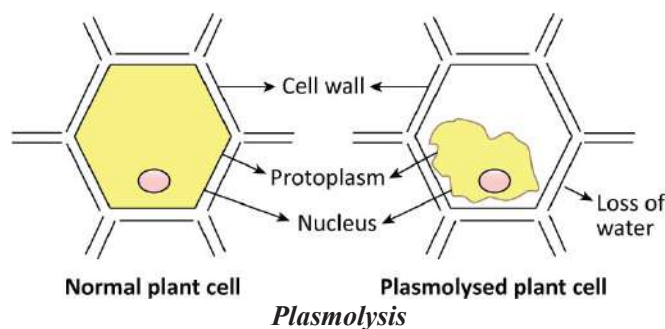
2.   Root Tip with Root Hairs.
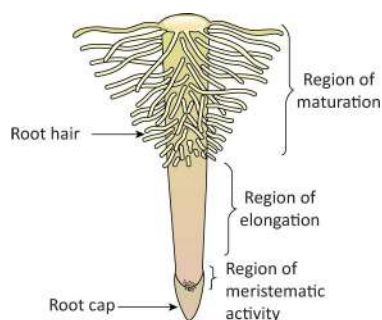
Root Tip with Root Hairs

3.   Symplastic and Apoplastic pathways of Water.
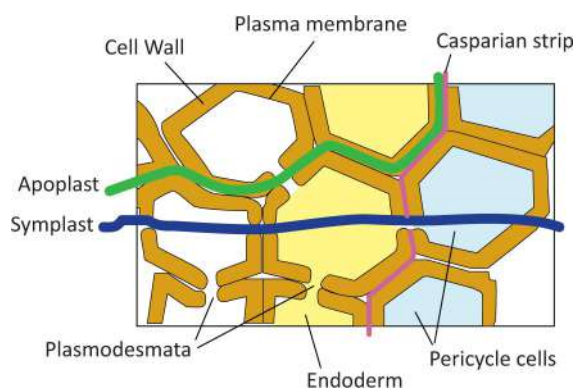
Symplastic and Apoplastic pathways of Water

4.   T. S. of the root showing movement of water from soil to xylem.
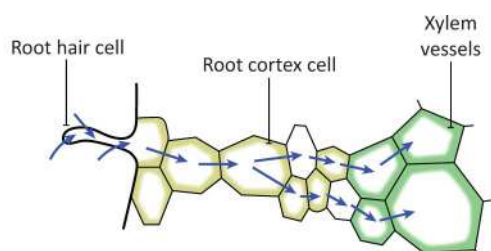
T. S. of the root showing movement of water from soil to xylem

5.   Guard cell in turgid and flaccid condition.
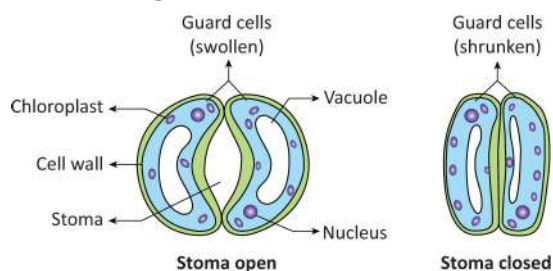
Guard cell in turgid and flaccid condition

6.   Types of Leucocytes.
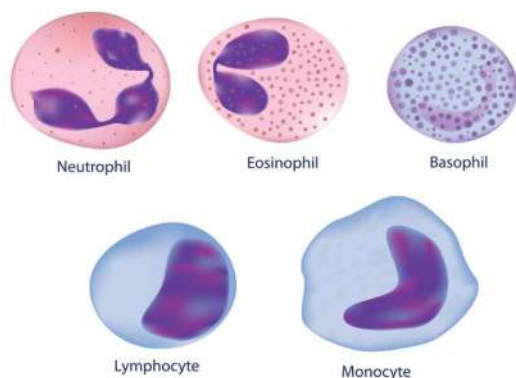
Leucocytes

7.   Structure of blood vessel.
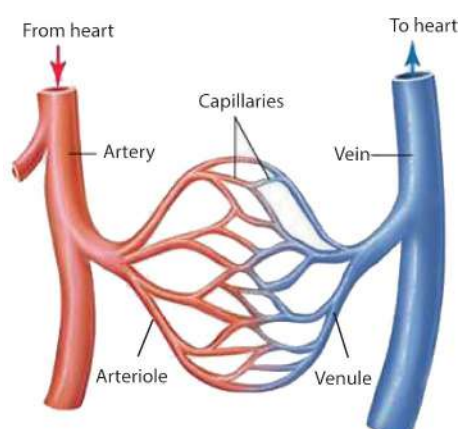
Structure of blood vessel

8.   Internal structure of human heart (L.S).
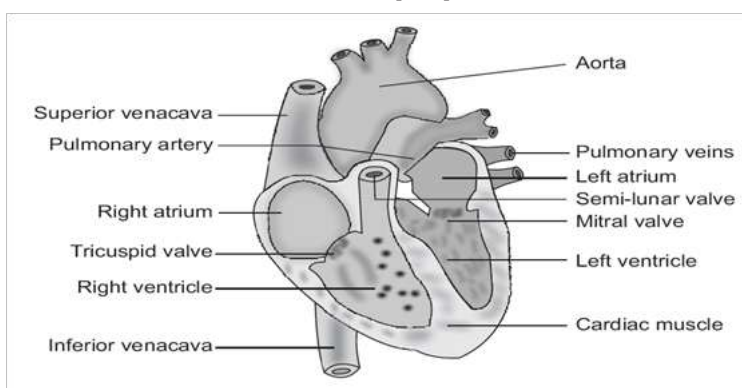
UNIT TEST - 14

Time : 1.15 Hrs. Marks : 50

I. Choose the best answer

(5 × 1 = 5)

1. **Active transport involves.**
   a) Movement of molecules from lower to higher concentration
   b) Expenditure of energy
   c) It is an uphill task
   d) All of the above

2. **'Heart of heart' is called**
   a) SA node
   b) AV node
   c) Purkinje fibres
   d) Bundle of His

3. **During transpiration there is loss of**
   a) Carbond di oxide
   b) Oxygen
   c) Water
   d) None of the above

4. **The bulk movement of substances through the vascular tissue is called _____.**
   a) Translocation
   b) Imbibition
   c) Diffusion
   d) Osmosis

5. **RBC's are formed in the _____.**
   a) Liver
   b) Bone marrow
   c) Spleen
   d) Thymus

II. Fill in the blanks

(5 × 1 = 5)

6. _____ involves evaporative loss of water from aerial parts.

7. The normal human heartbeat rate is about _____ time per minute.

8. Structures in roots that help to absorb water are _____.

9. Movement of minerals by active absorption needs energy in the form of _____.

10. Guttation takes place through specialized cells called _____.

III. State whether the statements are true or false. Correct the false statement

(5 × 1 = 5)

11. The phloem is responsible for the translocation of food.

12. The form of sugar transported through the phloem is glucose.

13. All veins carry deoxygenated blood.

14. Water from the root hair moves to the cortical cells by osmosis and then reaches the phloem.

15. The upward movement of water and minerals from roots to different plant parts is called ascent of sap.

IV. Match the following

(5 × 1 = 5)

16. Symolastic pathway   (a) Leaf
17. Transpiration   (b) Allergic condition
18. Osmosis   (c) Pressure in xylem
19. Root pressure   (d) Pressure gradient
20. Eosinophil   (e) Plasmodesmata

V. Assertion and Reasoning

(5 × 1 = 5)

Direction: In each of the following questions, a statement of Assertion is given and a corresponding statement of Reason is given just below it. Of the statements given below, mark the correct answer as

a. If both A and R are true and R is the correct explanation of A.

b. If both A and R are true but R is not the correct explanation of A.
c. If A is true but R is false.
d. If both A and R are false.

21. **Assertion:** Persons with AB blood group are called an universal recipients, because they can receive blood from all groups.
    Reason: Antibodies are absent in persons with AB blood group.

22. **Assertion:** RBC plays an important role in the transport of respiratory gases.
    Reason: RBC do not have cell organelles and nucleus.

23. **Assertion:** Persons with 'AB' blood group are called 'Universal Recipient'.
    Reason: Persons with 'AB' blood group can donate blood to persons with any blood group.

24. **Assertion:** Mammalian heart is called myogenic heart.
   **Reason:** Heartbeat is regulated by a specialized muscle bundle (pacemaker) in mammals.

25. **Assertion:** Pericardium contains lubricating pericardial fluid.
    Reason: Pericardial fluid reduces friction during heart beat and protects it from mechanical injuries.

VI. Write the answer for the following questions in word or sentence
(5 × 1 = 5)

26. Name two layered protective covering of human heart.
27. Why is the colour of the blood red?
28. Mention the artery which supplies blood to the heart muscles.
29. What is plasmolysis?
30. What are Rh antibodies?

VII. Write the short answer for ANY 5 of the following questions
(6 × 2 = 12)

31. What causes the opening and closing of guard cells of stomata during transpiration?
32. What is cohesion?
33. Why is the circulation in man referred to as double circulation?
34. The movement of substances in the phloem can be in any direction. Give reason.
35. When any dry plant material is kept in water, they swell up. Name and define the phenomenon involved in this change.
36. What are the factors affecting the transpiration?
37. Why does mammalian RBC lack cell organelles and nucleus?

VIII. Write long answer for the following questions
(2 × 5 = 10)

38. Enumerate the functions of blood.

<div align="center">or</div>

Explain the structure of heart with labelled diagram.

39. What is Transpiration? Give the importance of transpiration.

<div align="center">or</div>

How do plants absorb water? Explain.

<div align="center">ఇ❖ఇ</div>

NERVOUS SYSTEM

Points to Remember

➢ Nervous system controls and coordinates the activities of our body.

➢ Neuron is the structural and functional unit of the cell and has three parts- cyton, dendrites and axon.

➢ A receptor is a cell or group of cells that receives the stimuli.

➢ An effector is a part of the body which can respond to a stimulus according to the instructions from the brain or the spinal cord.

➢ CNS is formed of brain and spinal cord.

➢ PNS consists of all nerves which connect brain and spinal cord to all parts of the body.

➢ ANS operates automatically and formed of sympathetic and parasympathetic nerves.

➢ A reflex action is a rapid, automatic response to a stimulus which is not under the voluntary control of the brain.

TEXT BOOK EVALUATION

I. Book Exercise – Choose the best answer

1. Bipolar neurons are found in
   a) retina of eye   b) cerebral cortex   c) embryo   d) respiratory epithelium

   Ans.: a) Retina of eye

2. Site for processing of vision, hearing, memory, speech, intelligence and thought is
   a) kidney   b) ear   c) brain   d) lungs

   Ans.: c) Brain

3. In reflex action, the reflex arc is formed by
   a) brain, spinal cord, muscle
   c) muscle, receptor, brain
   b) receptor, muscle, spinal cord
   d) receptor, spinal cord, muscle

   Ans.: d) Receptor, spinal cord, muscle

4. Dendrites transmit impulse cell body and axon transmit impulse cell body.
   a) away from, away from
   c) towards, towards
   b) towards, away from
   d) away from, towards

   Ans.: b) Towards, away from

5. The outer most of the three cranial meninges is
   a) arachnoid membrane   b) piamater   c) duramater   d) myelin sheath

   Ans.: c) Duramater

6. There are pairs of cranial nerves and pairs of spinal nerves.
   a) 12, 31   b) 31, 12   c) 12, 13   d) 12, 21

   Ans.: a) 12, 31

7. The neurons which carries impulse from the central nervous system to the muscle fibre.
   a) afferent neurons   b) association neuron   c) efferent neuron   d) unipolar neuron

   Ans.: c) Efferent neuron

8. **Which nervous band connects the twocerebral hemispheres of brain?**

a) thalamus   b) hypothalamus   c) corpus callosum   d) pons

Ans.: c) Corpus callosum

9. **Node of Ranvier is found in**

a) muscles   b) axons   c) dendrites   d) cyton

Ans.: b) Axons

10. **Vomiting centre is located in**

a) medulla oblongata   b) stomach   c) cerebrum   d) hypothalamus

Ans.: a) Medulla oblongata

11. **Nerve cells do not possess**

a) neurilemma   b) sarcolemma   c) axon   d) dendrites

Ans.: b) Sarcolemma

12. **A person who met with an accident lost control of body temperature, water balance, and hunger. Which of the following part of brain is supposed to be damaged?**

a) Medulla oblongata   b) cerebrum   c) pons   d) hypothalamus

Ans.: d) Hypothalamus

II. Book Exercise – Fill in the blanks

1. _____ is the longest cell in our body.   **Ans.:** Neuron / Nerve cell

2. Impulses travels rapidly in _____ neurons.   **Ans.:** Myelinated

3. A change in the environment that causes an animal to react is called _____.   **Ans.:** Stimulus

4. _____ carries the impulse towards the cell body.   **Ans.:** Dendrite

5. The two antagonistic component of autonomic nervous system are _____ and _____.

Ans.: Sympathetic / Parasympathetic

6. A neuron contains all cell organelles except _____.   **Ans.:** Centriole

7. _____ maintains the constant pressure inside the cranium.   **Ans.:** Cerebrospinal fluid

8. _____ and _____ increases the surface area of cerebrum.   **Ans.:** Gyri and Sulci

9. The part of human brain which acts as relay center is _____.   **Ans.:** Thalamus

III. Book Exercise – State whether the following statements are true or false: If false correct the statement.

1. **Dendrons are the longest fibres that conducts impulses away from the cell body.**
Ans.: False.
Correct statement : <u>Axon</u> is the longest fibres that conducts impulses away from the cell body.

2. **Sympathetic nervous system is a part of central nervous system.**
Ans.: False.
Correct statement : Sympathetic nervous system is a part of **<u>Autonomic</u>** nervous system.

3. **Hypothalamus is the thermoregulatory centre of human body.**
Ans.: True.

4. **Cerebrum controls the voluntary actions of our body.**
Ans.: False.
Correct statement : <u>Cerebellum</u> controls the voluntary actions of our body.

5. **In the central nervous system myelinated fibres form the white matter.**
Ans.: True.

6. **All the nerves in the body are covered and protected by meninges.**

   Ans.: False.

   Correct statement : All the nerves in the body are covered and protected by **Epineurium**.

7. **Cerebrospinal fluid provides nutrition to brain.**

   Ans.: True.

8. **Reflex arc allows the rapid response of the body to a stimulus.**

   Ans.: True.

9. **Pons helps in regulating respiration.**

   Ans.: True.

IV. Book Exercise – Match the items in column-I to the items in column-II:

	Column I		Column II
1.	Nissil's granules	(a)	Forebrain
2.	Hypothalamus	(b)	Peripheral Nervous system
3.	Cerebellum	(c)	Cyton
4.	Schwann cell	(d)	Hindbrain

Ans :

	Column I		Column II
1	Nissil's granules	c	Cyton
2	Hypothalamus	a	Forebrain
3	Cerebellum	d	Hindbrain
4	Schwann cell	b	Peripheral Nervous system

V. Book Exercise – Understand the assertion statement. Justify the reason given and choose the correct choice.

a) **Assertion is correct and reason is wrong.**

b) **Reason is correct and the assertion is wrong.**

c) **Both assertion and reason are correct.**

d) **Both assertion and reason are wrong.**

1. **Assertion:** Cerebrospinal fluid is present throughout the central nervous system.

   Reason: Cerebrospinal fluid has no such functions.

   Ans : a) Assertion is correct and reason is wrong

2. **Assertion:** Corpus callosum is present in space between the duramater and piamater.

   Reason: It serves to maintain the constant intracranial pressure.

   Ans : d) Both assertion and reason are wrong

VI. Book Exercise – Short answer question.

1. **Define stimulus.**

   'Stimulus' refers to the changes in the environmental condition, that are detected by receptors present in the body.

2. **Name the parts of the hind brain.**

   Hindbrain is formed of three parts

   a) Cerebellum,

   b) Pons and

   c) Medulla oblongata.

3.   **What are the structures involved in the protection of brain?**

The structures involved in the protection of brain are

a)   Skull

b)   Three membranes of meninges

    i)   Duramater

    ii)   Arachnoid membrane and

    iii)   Piamater

c)   Cerebrospinal fluid.

4.   **Give an example for conditioned reflexes.**

Playing harmonium by striking a particular key on seeing a music note is an example of conditioned reflexes which required conscious training effort.

5.   **Which acts as a link between the nervous system and endocrine system?**

Hypothalamus acts as a link between the nervous system and endocrine system.

6.   **Define reflex arc.**

A reflex action is any response that occurs automatically without consciouness. The pathway taken by nerve impulse to accomplish reflex action is called reflex arc.

VII. Book Exercise – Differentiate between.

1.   **Voluntary and involuntary actions.**

Voluntary action		Involuntary action	
i)	The Voluntary actions are **under the control of our will**. e.g Eating,Locomotion etc.	i)	Involuntary action are **not under our control**. e.g Breathing,Heart beat etc.
ii)	It is controlled by the **brain**.	ii)	It is controlled by the **spinal cord**.
iii)	All voluntary actions result in a **muscular action**.	iii)	Involuntary actions result in a **muscular action or secretion from some gland**.

2.   **Medullated and non-medullated nerve fibre.**

Medullated nerve fibre		Non-medullated nerve fibre	
i)	The axon is **covered with myelin sheath**.	i)	The axon is **not covered by myelin sheath**.
ii)	They form the **white matter** of the brain.	ii)	They form the **grey matter** of the brain.
iii)	They also known as **Myelinated** nerve fibre.	iii)	They also known as **Non-myelinated** nerve fibre.

VIII. Book Exercise – Long answer question :

1.   **With a neat labelled diagram explain the structure of a neuron.**

A neuron typically consists of three basic parts: Cyton, Dendrites and Axon.

i)   **Cyton :**   1.   Cyton is also called cell body or perikaryon.

                2.   It has a central nucleus with abundant cytoplasm called **neuroplasm**.

                3.   The cytoplasm has large granular body called **Nissl's granules** and the other cell organelles like mitochondria, ribosomes, lysosomes, and endoplasmic recticulum.

                4.   Neurons do not have the ability to divide.

                5.   Several neurofibrils are present in the cytoplasm that help in transmission of nerve impulses to and from the cell body.

ii)   **Dendrites**:   1.   These are the numerous branched cytoplasmic processes that project from the surface of the cell body. They conduct nerve impulses towards the cyton.

                2.   The branched projections increase the surface area for receiving the signals from other nerve cells.

iii) **Axon:**
1. The axon is a single, elongated, slender projection.
2. The end of axon terminates as fine branches which terminate into knob like swellings called **synaptic knob**.
3. The plasma membrane of axon is called **axolemma**, while the cytoplasm is called **axoplasm**. It carries impulses away from the cyton.
4. The axons may be covered by a protective sheath called **myelin sheath** which is further covered by a layer of **Schwann cells** called **neurilemma**.
5. Myelin sheath breaks at intervals by depressions called **Nodes of Ranvier**.
6. The region between the nodes is called as **internode**.
7. Myelin sheath acts as insulator and ensures rapid transmission of nerve impulses.

2. Illustrate the structure and functions of brain.

Structure	Functions
I. Fore brain	
1. **Cerebrum** is the largest portion forming nearly two-third of the brain. The cerebrum is longitudinally divided into two halves as right and left **cerebral hemispheres**. The **outer** portion of each cerebral hemisphere is formed of **grey matter** and is called **cerebral cortex**. The **inner or deeper** part is formed of **white** matter and is called **cerebral medulla**.	The cerebrum is responsible for the thinking, intelligence, consciousness, memory, imagination, reasoning and willpower.
2. **Thalamus** present in cerebral medulla	Acts as relay station.
3. **Hypothalamus** lies at the base of the thalamus.	Temperature control, thirst, hunger, urination, important link between nervous system and endocrine glands
II. Mid brain	
4. **Corpora quadrigemina** is the dorsal portion of the mid brain consists of four rounded bodies.	It controls visual and auditory (hearing) reflexes.

III. Hind brain	
5.	**Cerebellum** is second largest part of the brain formed of two large sized hemispheres and middle vermis.	It coordinates voluntary movements and also maintains body balance.
6.	**Pons** is a bridge of nerve fibre that connects the lobes of cerebellum.	It relay signals between the cerebellum, spinal cord, midbrain and cerebrum. It controls respiration and sleep cycle.
7.	**Medulla oblongata** is the posterior most part of the brain that connects spinal cord and various parts of brain.	It has cardiac centres, respiratory centres, vasomotor centres to control heart beat, respiration and contractions of blood vessels respectively. It also regulates vomiting and salivation.

3.   What will you do if someone pricks your hand with a needle? Elucidate the pathway of response with a neat labelled diagram.

i)   When a needle pricks our hand, we withdraw our hand away from the source of pain, the needle. This stimulus (pain) in turn triggers an impulse in sensory neuron.

ii)   The **sensory neuron** transmits or conveys the message to the spinal cord.

iii)   **Spinal cord** interprets the stimulus and the impulse is passed on to the relay neuron which in turn transmits it to a motor neuron.

iv)   **Motor neurons** carry command from spinal cord to our arm.

v)   Muscle in our arm contracts and we withdraw our hand immediately from the source of pain, the needle.
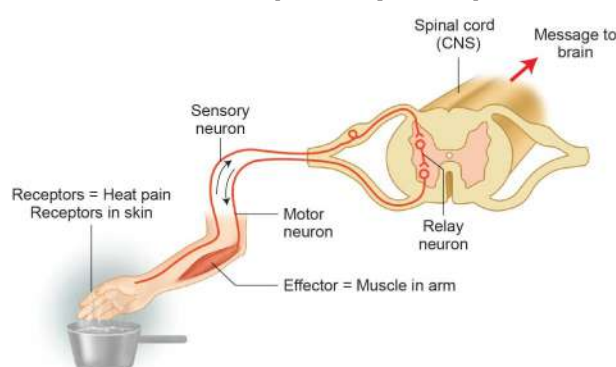
Reflex action and its pathway

4.   Describe the structure of spinal cord.

i)   Spinal cord is a cylindrical structure lying in the neural canal of the vertebral column.

ii)   It is covered by meninges.

iii)   It extends from the lower end of medulla oblongata to the first lumbar vertebra.

iv)   The posterior most region of spinal cord tapers into a thin fibrous thread like structure called **filum terminale**.

v)   Internally, the spinal cord contains a cerebrospinal fluid filled cavity known as the **central canal**.

Structure of spinal cord

vi)   The grey matter of spinal cord is 'H' shaped. The upper end of letter 'H" forms **posterior horns** and lower end forms **anterior horns**.

vii)   A bundle of fibres pass into the posterior horn forming **dorsal** or **afferent root**. Fibres pass outward from the anterior horn forming **ventral** or **efferent root**.

viii)   These two roots joins to form **spinal nerves**.

ix)   The white matter is external and have bundle of nerve tracts.

x)   Spinal cord conducts sensory and motor impulses to and from the brain. It controls reflex actions of the body.
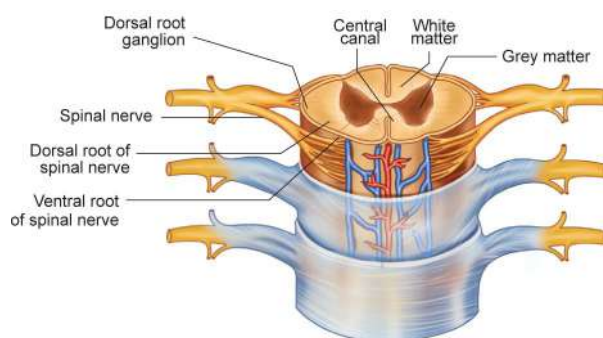
5.　How nerve impulses are transferred from one neuron to next neuron?

i)　All the information from the environment are detected by the receptors located in our sense organs such as the eyes, the nose, the skin etc.

ii)　Information from the receptors is transmitted as **electrical impulse** and is received by the dendritic tips of the neuron.

iii)　This impulse travels from the dendrite to the cell body and then along the axon to its terminal end.

iv)　On reaching the axonal end, it causes the nerve endings to release a chemical called **neurotransmitter** which diffuses across a synapse and starts a similar electrical impulse in the dendrites of the next neuron, then to their cell body to be carried along the axon.

v)　In this way, the electrical signal reaches the brain or spinal cord.

vi)　The response from brain (or spinal cord) is similarly passed on to the effector organs such as the muscle or gland cell, that undergoes the desired response.

vii)　The flow of nerve impulses from axonal end of one neuron to dendrite of another neuron through a **synapse** is called **synaptic transmission**.
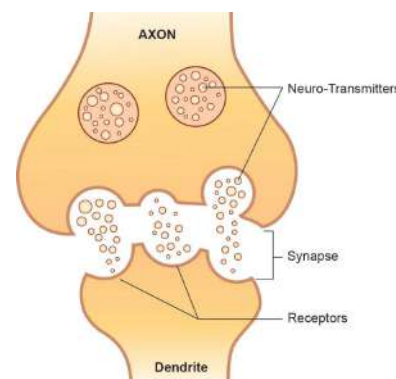
Nerve impulse transmission

6.　Classify neurons based on its structure.

Based on structure the neurons classified as follows:

i)　**Unipolar neurons:** Only **one nerve process** arises from the cyton which acts as both axon and dendron. They found in **early embryos** but not in adult.

ii)　**Bipolar neurons:** The cyton gives rise to **two nerve processes** of which one acts as an axon while another as a dendron. They found in **retina of eye** and **olfactory epithelium** of nasal chambers.

iii)　**Multipolar neurons:** The cyton gives rise to **many dendrons** and an **axon**. They found in **cerebral cortex** of brain.
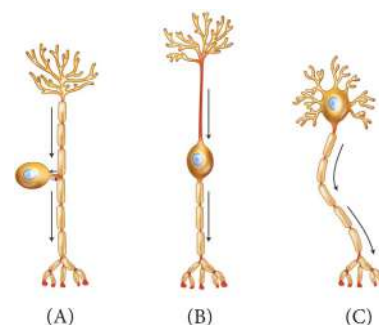
Unipolar (A), Bipolar (B) and multipolar (C) neurons

IX. Book Exercise – Higher Order Thinking Skills (HOTS)

1.　'A' is a cylindrical structure that begins from the lower end of medulla and extend downwards. It is enclosed in bony cage 'B' and covered by membranes 'C'. As many as 'D' pairs of nerves arise from the structure 'A'.

i)　What is A?

ii)　Name (a) bony cage 'B' and (b) membranes 'C'.

iii)　How much is D?

i)　A is **Spinal cord**.

ii)　(a) Bony cage 'B' is **Vertebral column**.

　　(b) Membranes 'C' are **Duramater, Arachnoid membrane** and **Piamater of Meninges**.

iii)　D – **31 Pairs** of nerves.

2.　Our body contains a large number of cells 'L' which are the longest cells in the body. L has long and short branch called as 'M' and 'N' respectively. There is a gap 'O' between two 'L' cells, through which nerve impulse transfer by release of chemical substance 'P'.

i)　Name the cells L.

ii)　What are M and N?

iii)　What is the gap O?

iv)　Name the chemical substance P.

i)　L – **Neurons or Nerve cells.**

ii)　M – **Axon** and N - **Dendron.**

iii) **Synapse** is the gap O.

iv) The chemical substance P is Neurotransmitters (Acetylcholine).

Additional – Choose the best answer

1. Axon and dendrites are departing from _____.

a) Cyton   b) Cell body   c) Perikaryon   d) All the above

Ans.: d) All the above

2. Cytoplasm of neuron is called _____.

a) Neuroplasm   b) Nucleoplasm   c) Axoplasm   d) Non of the above

Ans.: a) Neuroplasm

3. The numerous branched cytoplasmic processes that project from the surface of the cell body.

a) Nervefibres   b) Axon   c) Dendrites   d) Nerves

Ans.: c) Dendrites

4. Single, elongated, slender projection of neuron.

a) Nervefibres   b) Axon   c) Dendrites   d) Nerves

Ans.: b) Axon

5. The plasma membrane of axon is called _____.

a) Axoplasm   b) Neurilemma   c) Myelin sheath   d) Axolemma

Ans.: d)Axolemma

6. _____ acts as insulator and ensures rapid transmission of nerve impulses.

a) Myelin sheath   b) Neurilemma   c) Nodes of Ranvier   d) Schwann cell

Ans.: a) Myelin sheath

7. Chemicals produced by synaptic knob to transmits information from one neuron to another neuron through synapse or synaptic junction are known as _____.

a) Axoplasm   b) Neurilemma   c) Neurotransmitters   d) Axolemma

Ans.: c) Neurotransmitters

8. _____ are found in early embryos but not in adult.

a) Unipolar Neurons   b) Bipolar Neurons   c) Multipolar Neurons   d) None of the above

Ans.: a) Unipolar Neurons

9. _____ carry impulses from the central nervous system to effector organ such as the muscle fibre or the gland.

a) Sensory neurons   b) Afferent neurons   c) Efferent neurons   d) All the above

Ans.: c) Efferent neurons

10. Involuntary functions like hunger, thirst, sleep, sweating, sexual desire, anger, fear, water balance, blood pressure etc. are controlled by _____.

a) Thalamus   b) Pons   c) Hypothalamus   d) Medulla Oblongata

Ans.: c) Hypothalamus

11. _____ controls the secretion of hormones from anterior pituitary gland.

a) Thalamus   b) Pons   c) Hypothalamus   d) Medulla Oblongata

Ans.: c) Hypothalamus

12. Midbrain is located between _____ and hind brain.

a) Thalamus   b) Cerebellum   c) Pons   d) Medulla Oblongata

Ans.: a) Thalamus

13. Cerebellum, pons and medulla oblongata are the parts of _____.

a) Fore brain   b) Mid brain   c) Hind brain   d) Cerebrum

Ans.: c) Hind brain

14. _____ **coordinates voluntary movements and also maintains body balance.**

  a) Cerebrum   b) Pons   c) Cerebellum   d) Spinal cord

                                                     Ans.: c) Cerebellum

15. The posterior most part of the brain.

  a) Medulla oblongata   b) Pons   c) Cerebellum   d) Spinal cord

      Ans.: a) Medulla oblongata

16. The _____ **nervous system is formed of sympathetic and parasympathetic nerves.**

  a) Central   b) Peripheral   c) Autonomic   d) None of the above

      Ans. : c) Autonomic

17. The fattest organ in our body is _____.

  a) Liver   b) Kidney   c) Brain   d) Stomach

      Ans.: c) Brain

18. The grey matter of spinal cord is _____ **shaped.**

  a) 'H'   b) 'V'   c) 'L'   d) 'C'

      Ans.: a) 'H'

19. Reflex actions of the body is controlled by _____.

  a) Medulla oblongata   b) Pons   c) Cerebellum   d) Spinal cord

      Ans.: d) Spinal Cord

20. The nerves arising from the brain and the spinal cord constitute _____ **nervous system.**

  a) Central   b) Peripheral   c) Autonomic   d) None of the above

      Ans.: b) Peripheral

Additional – Fill in the blanks

1. The changes in the environmental condition, that are detected by receptors present in the body is termed as _____.   **Ans.:** Stimulus

2. Relevant changes in the activities of organisms to a particular _____ are called their reactions or responses.   **Ans.:** Stimuli

3. The working together of various organs in a systematic, controlled and efficient way to produce proper response to various stimuli is called _____.   **Ans.:** Coordination

4. The coordination between the various cells and organs to maintain physiological balance is called _____.

    Ans.: Homeostasis

5. _____ is the structural and functional unit of the nervous system.   **Ans. :** Neuron or nerve cell

6. _____ is the longest cell of the human body with a length of over 100mm.   **Ans.:** Neuron

7. _____ are the highly specialized cells to detect, receive and transmit different kinds of stimuli.

    Ans.: Neurons

8. Information is conducted through neurons in the form of _____ impulses from one part of the body to another.   **Ans.:** Electrical

9. Neuroglia are also called as _____ cells.   **Ans.:** Glial

10. A number of _____ are bundled up together to form nerves.   **Ans.:** Nerve fibres

11. _____ is also called cell body or perikaryon.   **Ans.:** Cyton

12. The cytoplasm of neuron has large granular body called _____ granules.   **Ans.:** Nissl's

13. _____ of the cytoplasm help in transmission of nerve impulses to and from the cell body.

Ans.: Neurofibrils

14. Dendrites conduct nerve impulses towards the _____ . **Ans.:** Cyton

15. The end of axon terminates as fine branches which terminate into knob like swellings called _____ .

Ans.: Synaptic knob

16. The cytoplasm of axon is called _____ . **Ans.:** Axoplasm

17. _____ carries impulses away from the cyton. **Ans.:** Axon

18. The axons of some neurons are covered by a protective sheath called _____ . **Ans.:** Myelin sheath

19. Myelin sheath is covered by a layer of Schwann cells called _____ . **Ans.:** Neurilemma

20. Myelin sheath breaks at intervals by depressions called _____. **Ans.:** Nodes of Ranvier

21. The region between the Nodes of Ranvier is called as _____. **Ans.:** Internode

22. A junction between synaptic knob of axon of one neuron and dendron of next neuron is called _____.

Ans.: Synapse or synaptic junction

23. _____ neurons are found in retina of eye and olfactory epithelium of nasal chambers.

Ans.: Bipolar

24. _____ neurons conduct impulses between sensory and motor neurons. **Ans.:** Association

25. Myelinated nerve fibres form the _____ matter of the brain. **Ans.:** White

26. Non-myelinated nerve fibres form the _____ matter of the brain. **Ans.:** Grey

27. Information from the receptors is transmitted as electrical impulse and is received by the _____ tips of the neuron. **Ans.:** Dendritic

28. _____ released by nerve endings diffuses across a synapse and pass electrical impulse to the dendrites of the next neuron. **Ans.:** Neurotransmitter

29. The flow of nerve impulses from axonal end of one neuron to dendrite of another neuron through a _____ is called synaptic transmission. **Ans.:** Synapse

30. The important neurotransmitter released by neurons is called _____. **Ans.:** Acetylcholine

31. The _____ Nervous System acts as centre for information processing and control. **Ans.:** Central

32. The Central Nervous System (CNS) consists of the _____ and _____.

Ans.: Brain and the spinal cord

33. The Peripheral nervous system (PNS) is made up of the _____ which connect the brain and spinal cord to all parts of the body. **Ans.:** Nerves

34. The brain is protected by the bony structure called _____ . **Ans.:** The skull

35. Spinal cord is protected by _____ of vertebral column. **Ans.:** Vertebrae

36. Brain is covered by three layered connective tissue membrane known as _____. **Ans.:** Meninges

37. The middle layer of meninges, _____ provides web like cushion for the brain.

Ans. Arachnoid membrane

38. _____ is the innermost layer of meninges. **Ans.:** Piamater

39. _____ is an inflammation of the meninges surrounding our brain and spinal cord.

Ans.: Meningitis

40. Meningitis is caused due to the infection by virus or bacteria in the fluid surrounding the _____ .

Ans.: Meninges

41. The forebrain is formed of _____ and _____. **Ans.:** Cerebrum and diencephalon

42. _____ of fore brain consists of dorsal thalamus and ventral hypothalamus. **Ans.:** Diencephalon

43. _____ is the largest portion forming nearly two-third of the brain.   **Ans.:** Cerebrum

44. _____ divides cerebrum longitudinally into right and left cerebral hemispheres.   **Ans.:** Median cleft

45. _____ and _____ increase surface area of cerebral cortex.   **Ans.:** Gyri and sulci

46. Elevations found in cerebral cortex is termed as _____ .   **Ans.:** Gyri

47. Depressions found between gyrus is termed as _____ .   **Ans.:** Sulci

48. _____ present in cerebral medulla is a major conducting centre for sensory and motor signalling.
                    Ans.: Thalamus

49. _____ acts as a thermoregulatory (temperature control) center of the body.   **Ans.:** Hypothalamus

50. Four rounded bodies present on the dorsal portion of the mid brain is called _____ .
                    Ans.: Corpora quadrigemina.

51. _____ control visual and auditory (hearing) reflexes.   **Ans.:** Corpora quadrigemina

52. _____ is a bridge of nerve fibre that connects the lobes of cerebellum.   **Ans.:** Pons

53. Respiration and sleep cycle are controlled by _____ .   **Ans.:** Pons

54. _____ connects spinal cord and various parts of brain.   **Ans. :** Medulla oblongata

55. The most crucial molecules that determine our brain's integrity and the ability are _____ .
                    Ans.: Essential Fatty Acids (EFAs)

56. Spinal cord is a cylindrical structure lying in the _____ of the vertebral column.   **Ans.:** Neural canal

57. The posterior most region of spinal cord tapers into a thin fibrous thread like structure called _____ .
                    Ans.: Filum terminale

58. Internally, the spinal cord contains a cerebrospinal fluid filled cavity known as the _____ .
                    Ans.: Central canal

59. The brain is suspended in a special fluid environment called _____ .   **Ans.:** Cerebrospinal fluid (CSF)

60. _____ is responsible for maintaining a constant pressure inside the cranium.
                    Ans.: Cerebrospinal fluid

61. A _____ is any response that occurs automatically without consciouess.   **Ans.:** Reflex

62. Winking of eyes when any dust particles enters, sneezing, coughing, yawning, etc. are examples for
    _____reflexes.   **Ans.:** Simple or basic

63. _____ reflexes are inbuilt and unlearned responses.   **Ans.:** Simple or basic

64. Most of the reflex actions are monitored and controlled by the spinal cord, hence also known as
    _____.   **Ans.:** Spinal reflexes

65. The pathway taken by nerve impulse to accomplish reflex action is called _____.   **Ans.:** Reflex arc

66. The nerves arising from the brain are called _____.   **Ans.:** Cranial nerves

67. Optic nerves which innervates the eye are an example for _____ nerves.   **Ans.:** Cranial

68. In man, there are _____ pairs of cranial nerves.   **Ans.:** 12

69. Autonomic Nervous System controls the involuntary functions of the _____ organs.   **Ans.:** visceral

70. Autonomic nervous system (ANS) is also called as _____ nervous system.   **Ans.:** Visceral

71. Two cerebral hemispheres are interconnected by thick band of nerve fibres called _____.
                    Ans.: Corpus callosum

72. The outer portion of cerebral hemisphere is formed of grey matter called _____.
                    Ans.: Cerebral cortex

73. _____ supplies nutrients to the brain.   **Ans.:** Cerebrospinal fluid

74. In man there are _____ pairs of spinal nerves.   **Ans.:** 31

Additional – True or false

1. **Neuroglia initiate or conduct nerve impulses.**
   Ans.: False.
   Correct statement : Neuroglia **do not** initiate or conduct nerve impulses.

2. **The nerve fibres are the long slender processes of neurons.**
   Ans.: True.

3. **Efferent neurons carry impulses from the sense organ to the central nervous system.**
   Ans. : False.
   Correct statement: **Afferent** neurons carry impulses from the sense organ to the central nervous system.

4. **Each neuron can transmit 1,000 nerve impulses per minute.**
   Ans.: False.
   Correct statement : Each neuron can transmit 1,000 nerve impulses per second.

5. **Duramater is the outermost thick fibrous membrane of meninges.**
   Ans.: True.

6. **Arachnoid membrane of meninges is a thin delicate membrane and richly supplied with blood.**
   Ans.: False.
   Correct statement : **Piamater** of meninges is a thin delicate membrane and richly supplied with blood.

7. **The inner or deeper part of cerebral hemisphere is formed of white matter called cerebral cortex.**
   Ans.: False.
   Correct statement : The inner or deeper part of cerebral hemisphere is formed of white matter called **cerebral medulla**.

8. **Thalamus acts as a relay centre.**
   Ans.: True.

9. **Hypothalamus is an important link between nervous system and endocrine system.**
   Ans.: True.

10. **Hypothalamus lies at the base of the thalamus.**
    Ans.: True.

11. **Spinal cord regulates vomiting and salivation.**
    Ans.: False.
    Correct statement : **Medulla Oblongata** regulates vomiting and salivation.

12. **EFAs cannot be synthesised and must be obtained from food.**
    Ans. : True.

13. **The central canal of the spinal cord is filled with Cerebrospinal fluid.**
    Ans.: True.

14. **Nerves arising from spinal cord are called cranial nerves.**
    Ans.: False.
    Correct statement: Nerves arising from spinal cord are called **spinal nerves**.

15. **Neurons do not have the ability to divide.**
    Ans.: True.

Additional – Match the following

1.	Pons	(a)	Afferent neurons
2.	Forebrain	(b)	Efferent neurons
3.	Mid brain	(c)	Glial cells
4.	Hind brain	(d)	Corpora quadrigemina
5.	Neuroglia	(e)	Cerebellum
6.	Cyton	(f)	Relay centre
7.	Schwann cells	(g)	Diencephalon
8.	Sensory	(h)	Neurilemma
9.	Motor	(i)	Bridge
10.	Thalamus	(j)	Perikaryon

Ans :

1.	Pons	(i)	Bridge
2.	Forebrain	(g)	Diencephalon
3.	Mid brain	(d)	Corpora quadrigemina
4.	Hind brain	(e)	Cerebellum
5.	Neuroglia	(c)	Glial cells
6.	Cyton	(j)	Perikaryon
7.	Schwann cells	(h)	Neurilemma
8.	Sensory	(a)	Afferent neurons
9.	Motor	(b)	Efferent neurons
10.	Thalamus	(f)	Relay centre

Additional – Assertion and Reason

a) **Both A and R are true and R is the correct explanation of A.**
b) **Both A and R are true but R is not the correct explanation of A.**
c) **A is true but R is false.**
d) **Both A and R are false.**

1. **Assertion:** All spinal nerves are mixed nerves.
   Reason: Each spinal nerve has a sensory root and a motor root.

   Ans : a) Both A and R are true and R is the correct explanation of A

2. **Assertion:** A reflex action is a rapid, automatic response to a stimulus.
   Reason: Reflex action is under the voluntary control of the brain.

   Ans : c) A is true but R is false

3. **Assertion:** Efferent neurons carry impulses from the central nervous system to effector organ such as the muscle fibre or the gland.
   Reason: Association neurons conduct impulses betweeen sensory and motor neurons.

   Ans : b) Both A and R are true but R is not the correct explanation of A

4. **Assertion:** Neurons have the ability to divide.
   Reason: Neurotransmitters are produced by cyton.

   Ans : d) Both A and R are false

Additional – Short answers

1.   What are the three components of nervous system?

The components of the nervous system are

a) Neurons   b) Neuroglia and   c) Nerve fibres.

2.   What are neurotransmitters?

Chemicals produced by synaptic knob to transmits information from one neuron to another neuron through synapse or synaptic junction are known as neurotransmitters.

3.   Classify neurons based on their functions.

a)   **Sensory or afferent neurons** carry impulses from the sense organ to the central nervous system.

b)   **Motor or efferent neurons** carry impulses from the central nervous system to effector organ such as the muscle fibre or the gland.

c)   **Association neurons** conduct impulses betweeen sensory and motor neurons.

4.   Classify the Nerve Fibres based on the presence or absence of myelin sheath.

Nerve fibres are of two types based on the presence or absence of myelin sheath.

i)   **Myelinated nerve fibre:** The axon is covered with myelin sheath.

ii)   **Non-myelinated nerve fibre:** The axon is not covered by myelin sheath.

5.   What is the correct pathway of an impulse through a neuron?

Stimulus $\longrightarrow$ Receptor $\longrightarrow$ Dendrite $\longrightarrow$ Cyton $\longrightarrow$ Axon $\longrightarrow$ Synaptic knobs $\longrightarrow$ Neurotransmitters $\longrightarrow$ Another Dendrite.

6.   What are Neurotransmitters?

Neurotransmitters are the chemicals which allow the transmission of nerve impulse from the axon terminal of one neuron to the dendron of another neuron or to an **effector organ**. The important neurotransmitter released by neurons is called **Acetylcholine**.

7.   Give the expansions for the following?

a) CNS b) PNS   c) ANS   d) EFA   e) CSF   f) EEG

a)   CNS - Central nervous system

b)   PNS - Peripheral nervous system

c)   ANS - Autonomic nervous system

d)   EFA – Essential Fatty Acid

e)   CSF - Cerebrospinal fluid

f)   EEG - Electroencephalogram.

8.   What are the three divisions of Human nervous system?

a)   Central nervous system (CNS),

b)   Peripheral nervous system (PNS) and

c)   Autonomic nervous system (ANS).

9.   What are the three layers of meninges from outermost to innermost?

i)   **Duramater** is the outermost thick fibrous membrane.

ii)   **Arachnoid membrane** is the middle, thin vascular membrane providing web like cushion.

iii)   **Piamater** is the innermost, thin delicate membrane richly supplied with blood.

10. What is meningitis?

a)   Meningitis is an inflammation of the membranes (meninges) surrounding our brain and spinal cord.

b)   It can occur when fluid surrounding the meninges becomes infected.

c)   The most common causes of meningitis are viral and bacterial infections.

11. What are the parts of forebrain?

The forebrain is formed of

a)   **Cerebrum** and

b) **Diencephalon**

Diencephalon consists of

i) Dorsal **thalamus** and

ii) Ventral **hypothalamus**.

12. What are four lobes of cerebral hemisphere?

Cerebral hemisphere is divisible into four lobes such as

a) Frontal lobe.

b) Parietal lobe.

c) Temporal lobe and

d) Occipital lobe.

13. What are the functions of cerebrum?

The cerebrum is responsible for the thinking, intelligence, consciousness, memory, imagination, reasoning and willpower.

14. What are the functions of Hypothalamus?

i) Hypothalamus controls involuntary functions like hunger, thirst, sleep, sweating, sexual desire, anger, fear, water balance, blood pressure etc.

ii) It acts as a thermoregulatory (temperature control) center of the body.

iii) It controls the secretion of hormones from anterior pituitary gland and

iv) It is an important link between nervous system and endocrine system.

15. What is corpora quadrigemina?

Four rounded bodies present on the dorsal portion of the mid brain is called corpora quadrigemina.

Corpora quadrigemina control visual and auditory (hearing) reflexes.

16. Write the location and functions of Pons.

Location: The pons is a portion of the brain stem, located above the medulla oblongata.

Functions: i. Pons is a bridge of nerve fibre that connects the lobes of cerebellum.

ii. It relay signals between the cerebellum, spinal cord, midbrain and cerebrum.

iii. It controls respiration and sleep cycle.

17. Write the location and functions of Medulla Oblongata.

i) Medulla oblongata is the posterior most part of the brain.

ii) It connects spinal cord and various parts of brain.

iii) It has cardiac centres, respiratory centres, vasomotor centres to control heart beat, respiration and contractions of blood vessels respectively.

iv) It also regulates vomiting and salivation.

18. What is the fattest part of our body?

Brain is the fattest organ in our body. As the brain constitutes nearly 60 percent of fat, it is considered as the fattest organ in our body.

19. Write a note on Autonomic nervous system (ANS).

Autonomic nervous system (ANS) is also called as visceral nervous system as it regulates the function of internal visceral organs (Heart, Lungs, Liver, Pancreas etc.) of our body through its two antagonistic (opposite) components **sympathetic** and **parasympathetic systems**.

20. What is EEG? What are the uses of EEG?

Electroencephalogram (EEG) is an instrument which records the electrical impulses of brain.

Uses : An EEG can detect abnormalities in the brain waves and help in diagnoses of seizures, epilepsy, brain tumors, head injuries,etc.

1. **Describe the structure of cerebrum. Write a note on its functions.**

   I. Structure of Cerebrum :

   i)   Cerebrum is the largest portion forming nearly two-third of the brain.

   ii) The cerebrum is longitudinally divided into two halves as right and left **cerebral hemispheres** by a deep cleft called **median cleft**.

   iii) Two cerebral hemispheres are interconnected by thick band of nerve fibres called **corpus callosum**.

   iv) The outer portion of each cerebral hemisphere is formed of grey matter and is called **cerebral cortex**.

   v)   The inner or deeper part is formed of white matter and is called **cerebral medulla**.

   vi) The cortex is extremely folded forming elevations called **gyri** with depressions between them termed as **sulci** that increase its surface area.

   vii) Each cerebral hemisphere is divisble into a frontal lobe, a parietal lobe, a temporal lobe and an occipital lobe. These lobes are also known as **cerebral lobes** and are associated with specific functions.

   II. Functions of cerebrum :

   The cerebrum is responsible for the thinking, intelligence, consciousness, memory, imagination, reasoning and willpower.

Draw and label the following diagrams.

1. **Structure of neuron.**
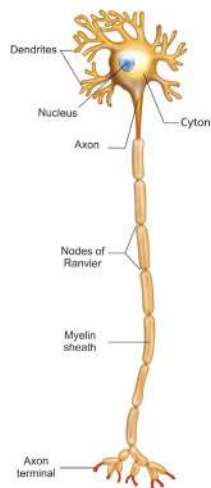
2. **Types of neuron.**
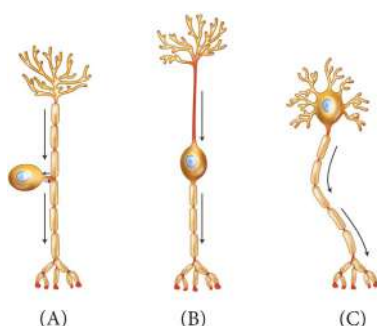
Unipolar (A), Bipolar (B) and multipolar (C) neurons

3. **Nerve impulse transmission.**
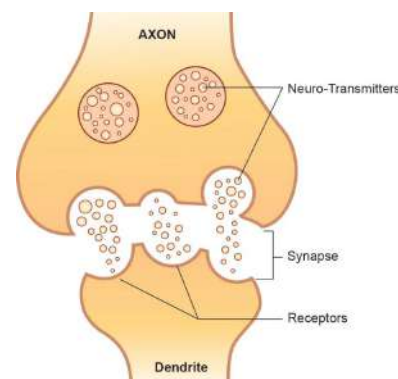
4. **Structure of brain.**
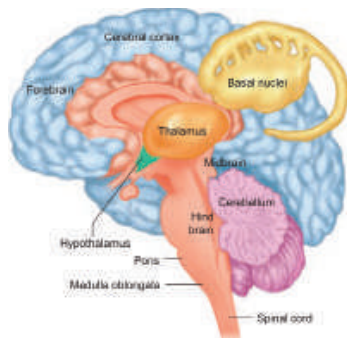
5. **Reflex action and its pathway.**
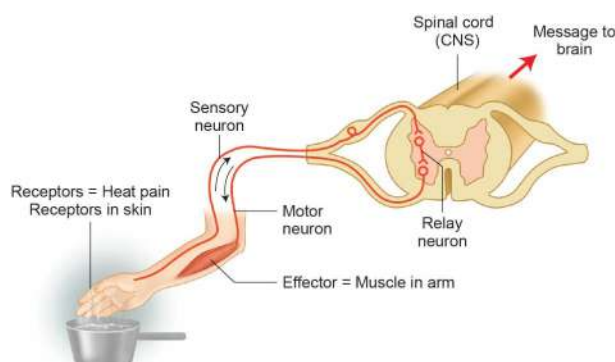
1.	CNS	Central Nervous System
2.	PNS	Peripheral Nervous System
3.	ANS	Autonomic Nervous System
4.	EEG	Electroencephalogram
5.	EFAs	Essential Fatty Acids
6.	CSF	Cerebro Spinal Fluid

Important Abbreviations to remember

UNIT TEST - 15

Time : 1.15 Hrs.   Marks : 50

I. Choose the best answer   (5 × 1 = 5)

1. **Bipolar neurons are found in**
    a) retina of eye   b) cerebral cortex   c) embryo   d) respiratory epithelium

2. **In reflex action, the reflex arc is formed by**
    a) brain, spinal cord, muscle   b) receptor, muscle, spinal cord
    c) muscle, receptor, brain   d) receptor, spinal cord, muscle

3. **Vomiting centre is located in**
    a) medulla oblongata   b) stomach   c) cerebrum   d) hypothalamus

4. **_____ coordinates voluntary movements and also maintains body balance.**
    a) Cerebrum   b) Pons   c) Cerebellum   d) Spinal cord

5. **The fattest organ in our body is _____.**
    a) Liver   b) Kidney   c) Brain   d) Stomach

II. Fill in the blanks   (5 × 1 = 5)

6. _____ is the longest cell in our body.

7. _____ maintains the constant pressure inside the cranium.

8. The part of human brain which acts as relay center is _____.

9. _____ released by nerve endings diffuses across a synapse and pass electrical impulse to the dendrites of the next neuron.

10. The middle layer of meninges, _____ provides web like cushion for the brain.

III. State whether the statements are true or false. Correct the false statement   (5 × 1 = 5)

11. Sympathetic nervous system is a part of central nervous system.

12. In the central nervous system myelinated fibres form the white matter.

13. Reflex arc allows the rapid response of the body to a stimulus.

14. Nerves arising from spinal cord are called cranial nerves.

15. The central canal of the spinal cord is filled with cerebrospinal fluid.

IV. Match the following
(5 × 1 = 5)

16. Nissil's granules   (a)   Forebrain
17. Hypothalamus   (b)   Efferent neurons
18. Cerebellum   (c)   Cyton
19. Schwann cell   (d)   Hindbrain
20. Motor   (e)   Peripheral Nervous system

V. Assertion and Reasoning
(5 × 1 = 5)

Direction: In each of the following questions, a statement of Assertion is given and a corresponding statement of Reason is given just below it. Of the statements given below, mark the correct answer as

a. If both A and R are true and R is the correct explanation of A.
b. If both A and R are true but R is not the correct explanation of A.
c. If A is true but R is false.   d. If both A and R are false.

21. **Assertion:** Corpus callosum is present in space between the duramater and piamater.
    Reason: It serves to maintain the constant intracranial pressure.

22. **Assertion:** Cerebrospinal fluid is present throughout the central nervous system.
    Reason: Cerebrospinal fluid has no such functions.

23. **Assertion:** All spinal nerves are mixed nerves.
    Reason: Each spinal nerve has a sensory root and a motor root.

24. **Assertion:** A reflex action is a rapid, automatic response to a stimulus.
    Reason: Reflex action is under the voluntary control of the brain.

25. **Assertion:** Neurons have the ability to divide.
    Reason: Neurotransmitters are produced by cyton.

VI. Write the answer for the following questions in word or sentence
(5 × 1 = 5)

26. Define stimulus.
27. Name the parts of the hind brain.
28. What are the three components of nervous system?
29. Which acts as a link between the nervous system and endocrine system?
30. What is corpora quadrigemina?

VII. Write the short answer for ANY 5 of the following questions
(6 × 2 = 12)

31. Differentiate between voluntary and involuntary actions.
32. Give an example for conditioned reflexes.
33. What are the structures involved in the protection of brain?
34. 'A' is a cylindrical structure that begins from the lower end of medulla and extend downwards. It is enclosed in bony cage 'B' and covered by membranes 'C'. As many as 'D' pairs of nerves arise from the structure 'A'.
i) What is A?   ii) Name (a) bony cage 'B' and (b) membranes 'C'.   iii) How much is D?
35. What is EEG? What are the uses of EEG?
36. What are Neurotransmitters?
37. What are the three layers of meninges from outermost to innermost?

VIII. Write long answer for the following questions
(2 × 5 = 10)

38. With a neat labelled diagram explain the structure of a neuron.
<div align="center">or</div>

39 Illustrate the structure and functions of brain.
40. How nerve impulses are transferred from one neuron to next neuron?
<div align="center">or</div>

41 Describe the structure of cerebrum. Write a note on its functions.

PLANT AND ANIMAL HORMONES

Points to Remember

➢ Auxins are produced at the tip of stems and roots from where they migrate to the zone of elongation.

➢ Cytokinins are the plant hormones that promote cell division or cytokinesis in plant cells.

➢ Gibberellins induce the formation of seedless fruit and parthenocarpic fruits.

➢ Abscisic acid is a growth inhibitor which regulates abscission and dormancy. It increases tolerance of plants to various kinds of stress.

➢ The pituitary gland regulates and controls other endocrine glands and so is called as the "Master gland".

➢ The hormones secreted by the thyroid gland are triiodothyronine (T_3), and tetraiodothyronine or thyroxine (T_4).

➢ The parathormone act on bone, kidney and intestine to maintain blood calcium levels.

➢ Pancreas secretes insulin and glucagon. They maintain blood glucose level.

➢ Adrenal cortex secrete coritsol and aldosterone and adrenal medulla secretes epinephrine and norepinephrine.

➢ The sex glands are of two types the testes and the ovaries which secrete testosterone and estrogens respectively.

TEXT BOOK EVALUATION

I. Book Exercise – Choose the best answer

1. **Gibberellins cause:**
   a) Shortening of genetically tall plants
   b) Elongation of dwarf plants
   c) Promotion of rooting
   d) Yellowing of young leaves

   Ans : (b) Elongation of dwarf plants

2. **The hormone which has positive effect on apical dominance is:**
   a) Cytokinin
   b) Auxin
   c) Gibberellin
   d) Ethylene

   Ans : (b) Auxin

3. **Which one of the following hormones is naturally not found in plants:**
   a) 2, 4–D
   b) G A 3
   c) Gibberellin
   d) IAA

   Ans : (a) 2, 4–D

4. **Avena coleoptiles est was conducted by**
   a) Darwin
   b) N. Smit
   c) Paal
   d) F.W. Went

   Ans : (d) F.W. Went

5. **To increase the sugar production in sugarcanes they are sprayed with _____**
   a) Auxin
   b) Cytokinin
   c) Gibberellins
   d) Ethylene

   Ans : (d) Ethylene

6. **LH is secreted by**
   a) Adrenal gland   b) Thyroid gland   c) Anterior pituitary   d) Hypothalamus

   Ans : (c) Anterior pituitary

7. **Identify the exocrine gland**
   a) Pituitary gland   b) Adrenal gland   c) Salivary gland   d) Thyroid gland

   Ans : (c) Salivary gland

8. **Which organ acts as both exocrine gland as well as endocrine gland**
   a) Pancreas   b) Kidney   c) Liver   d) Lungs

   Ans : (a) Pancreas

9. **Which one is referred as "Master Gland"?**
   a) Pineal galnd   b) Pituitary gland   c) Thyroid gland   d) Adrenal gland

   Ans : (b) Pituitary gland

II. Book Exercise – Fill in the blanks

1. _____ causes cell elongation, apical dominance and prevents abscission.   **Ans :** Auxin
2. _____ is a gaseous hormone involved in abscission of organs and acceleration of fruit ripening.

   Ans : Ethylene
3. _____ causes stomatal closure.   **Ans :** Abscisic acid
4. Gibberellins induce stem elongation in _____ plants.   **Ans :** Rosette
5. The hormone which has negative effect on apical dominance is _____.   **Ans :** Cytokinin
6. Calcium metabolism of the body is controlled by _____.   **Ans :** Parathormone
7. In the islets of Langerhans, beta cells secrete _____.   **Ans :** Insulin
8. The growth and functions of thyroid gland is controlled by _____.

   Ans : Thyroid Stimulating Hormone (TSH)
9. Decreased secretion of thyroid hormones in the children leads to _____.   **Ans :** Cretinisms

III. Book Exercise – Match the following

A) Match Column I with II and III

COLUMN–I
Auxin
Ethylene
Abscisic acid
Cytokinin
Gibberellins

COLUMN–II
Gibberella fujikuroi
Coconut milk
Coleoptile tip
Chloroplast
Fruits

COLUMN–III
Abscission
Internodal elongation
Apical dominance
Ripening
Cell division

Ans :

Column I	Column II	Column III
Auxin	Coleoptile tip	Apical dominance
Ethylene	Fruits	Ripening
Abscisic acid	Chloroplast	Abscission
Cytokinin	Coconut milk	Cell division
Gibberellins	Gibberella fujikuroi	Internodal elongation

B) **Match the following hormones with their deficiency states**

	Hormones		Disorders
	Hormones		**Disorders**
1.	**Thyroxine**	**(a)**	**Acromegaly**
2.	**Insulin**	**(b)**	**Tetany**
3.	**Parathormone**	**(c)**	**Simple goitre**
4.	**Growth hormone**	**(d)**	**Diabetes insipidus**
5.	**ADH**	**(e)**	**Diabetes mellitus**

Ans :

S.No.	Hormones		Disorders
1	Thyroxine	c	Simple goitre
2	Insulin	e	Diabetes mellitus
3	Parathormone	b	Tetany
4	Growth hormone	a	Acromegaly
5	ADH	e	Diabetes insipidus

IV. Book Exercise – True or false (If false give the correct statement)

1. **A plant hormone concerned with stimulation of cell division and promotion of nutrient mobilization is cytokinin.**
   Ans : True.

2. **Gibberellins cause parthenocarpy in tomato.**
   Ans : True.

3. **Ethylene retards senescence of leaves, flowers and fruits.**
   Ans : False. Ethylene <u>**hastens**</u> senescence of leaves, flowers and fruits.

4. **Exopthalmic goiter is due to the over secretion of throxine.**
   Ans : True.

5. **Pituitary gland is divided into four lobes.**
   Ans : False. Pituitary gland is divided into <u>**two**</u> lobes.

6. **Estrogen is secreted by corpus luteum.**
   Ans : False. Estrogen is secreted by <u>**Graafian follicles**</u>.

V. Book Exercise – Assertion and Reason

Direction: In each of the following questions, a statement of Assertion is given and a corresponding statement of Reason is given just below it. Of the statements given below, mark the correct answer as

    a) If both A and R are true and R is the correct explanation of A.
    b) If both A and R are true but R is not the correct explanation of A.
    c) If A is true but R is false.
    d) If both A and R are false.

1. **Assertion :** Application of cytokinin to marked vegetables can keep them fresh for several days.
   Reason : Cytokinins delay senescence of leaves and other organs by mobilisation of nutrients.
                            Ans : (a) Both A and R ture and R is correct explanation of A

2. **Assertion (A) :** Pituitary gland is referred as "Master gland".
   Reason (R) : It controls the functioning of other endocrine glands.
                            Ans : (a) Both A and R are true and R is correct explanation of A

3. **Assertion (A) :-** Diabetes mellitus increases the blood sugar levels.
   Reason (R) :- Insulin decreases the blood sugar levels.
                            Ans : (b) Both A and R are true but R is not the correct explanation of A

VI. Book Exercise – Answer in a sentence (1 mark)

1. **Which hormone promotes the production of male flowers in Cucurbits?**
Gibberellins hormone promotes the production of male flower in Cucurbits.

2. **Write the name of a synthetic auxin.**
2,4 D – (2,4 Dichlorophenoxy Acetic Acid) is a synthetic auxin.

3. **Which hormone induces parthenocarpy in tomatoes?**
Gibberellins hormone induces parthenocarpy in tomatoes.

4. **What is the hormone responsible for the secretion of milk in female after child birth?**
Prolactin (PRL) or Lactogenic Hormone is responsible for the secretion of milk in female after child birth.

5. **Name the hormones which regulates water and mineral metabolism in man.**
Aldosterone regulates water and mineral metabolism in man.

6. **Which hormone is secreted during emergency situation in man?**
Adrenaline is secreted during emergency situation in man.

7. **Which gland secretes digestive enzymes and hormones?**
Pancreas is a duel gland. It secretes both digestive enzymes and hormones.

8. **Name the endocrine glands associated with kidneys.**
The endocrine glands associated with kidneys is Adrenal Gland.

VII. Book Exercise – Short answer question (2 mark)

1. **What are synthetic auxins? Give examples.**
- ❖ Artificially synthesized auxins that have properties like auxins are called as synthetic auxins.
- ❖ Example: 2, 4 D (2,4 Dichlorophenoxy Acetic Acid).

2. **What is bolting? How can it be induced artificially?**
- ❖ **Bolting :** Treatment of rosette plants with gibberellin induces sudden shoot elongation followed by flowering. This is called bolting.
- ❖ It is induced by artificial treatment with plant hormone gibberellin. It causes stem elongation in plants under normal condition.

3. **Bring out any two physiological activities of abscisic acid.**
- ❖ ABA promotes the process of abscission (separation of leaves, flowers and fruits from the branch).
- ❖ ABA promotes senescence in leaves by causing loss of chlorophyll.

4. **What will you do to prevent leaf fall and fruit drop in plants? Support your answer with reason.**
We can spray auxins to prevent leaf fall and fruit drop in plants. Auxins prevent the formation of abscission layer thus delay the abscission of leaves and fruits. So leaf and fruit can remain attached to the stem long time.

5. **What are chemical messengers?**
Hormones are powerful messengers that control and coordinate essential processes such as growth, metabolism and fertility by carrying messges from endocrine glands to target cells and tissues.

6. **Write the differences between endocrine and exocrine gland.**

S.No.	Endocrine gland	Exocrine gland
1	They secrete hormones	They secrete enzymes, saliva and milk
2	They are ductless gland	They may have or may not have ducts
3	They are transported through blood stream	They are transported through ducts or tubes
4	They control long term activities	They control short term activities
5	Ex: Piyuitary, Thyroid, Adrenal, etc.	Ex: Salivary, Gastric and Sweat glands

7. **What is the role of parathormone?**
Role of parathormone
- ❖ The parathormone regulates calcium and phosphorus metabolism in the body.

❖ They act on bone, kidney and intestine to maintain blood calcium levels

8. What are the hormones secreted by posterior lobe of the pituitary land? Mention the tissues on which they exert their effect.

S.No.	Hormones secreted by posterior lobe of the pituitary gland	Hormones excert effect on
1	Vasopressin or Antidiuretic hormone	Tissues of kidney tubules
2	Oxytocin	Tissues of uterus and mammary gland

9. Why are thyroid hormones refered as personality hormone?

As thyroid hormones (Triiodothyronine (T3) and Tetraiodothyronine (T4) or Thyroxine) are essential for normal physical, mental and personality development, they are also known as personality hormone.

10. Which hormone requires iodine for its formation? What will happen if intake of iodine in our diet is low?

❖ Thyroid hormones, Triiodothyronine (T3) and Tetraiodothyronine or Thyroxine (T4) require iodine for its formation.

❖ The inadequate supply of iodine in our diet leads to the enlargement of thyroid gland which protrudes as a marked swelling in the neck and is called as goitre.

VII. Book Exercise – Long answer question (5 mark)

1. a) Name the gaseous plant hormone. Describe its three different actions in plants.
Physiological effects of ethylene :
✦ Ethylene promotes the ripening of fruits eg: Tomato, Apple, Mango, Banana, etc.
✦ Ethylene inhibits the elongation of stem and root in dicots.
✦ Ethylene hastens the senescence of leaves and flowers.
✦ Ethylene stimulates formation of abscission zone in leaves, flowers and fruits.
    This leads to premature shedding.
✦ Ethylene breaks the dormancy of buds, seeds and storage organs.

b) Which hormone is known as stress hormone in plants? Why?
Abscisic acid (ABA) is the stress hormone. Because it increases tolerance of plants to various kinds of stress. So, it is called as stress hormone.

2. Describe an experiment which demonstrates that growth stimulating hormone is produced at the tip of coleoptile.

A. Germination of an oat seed
B. Decapitate tip of coleoptile and place on agar block.
C. Agar block is placed on top of the decapitated tip of the seedling.
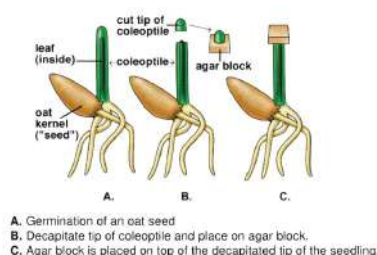
Went's Experiment

✦ Frits Warmolt Went (1903–1990), a Dutch biologist demonstrated the existence and effect of auxin in plants.
✦ He did a series of experiments in Avena coleoptiles.
✦ In his first experiment he removed the tips of Avena coleoptiles.
✦ The cut tips did not grow indicating that the tips produced something essential for growth. In his second experiment he placed the agar blocks on the decapitated coleoptile tips.
✦ The coleoptile tips did not show any response. In his next experiment he placed the detached coleoptile tips on agar blocks.
✦ After an hour, he discarded the tips and placed this agar block on the decapitated coleoptile.

- ✦ It grew straight up indicating that some chemical had diffused from the cut coleoptile tips into the agar block which stimulated the growth.
- ✦ From his experiments Went concluded that a chemical diffusing from the tip of coleoptiles was responsible for growth, and he named it as "Auxin" meaning 'to grow'.

3. Write the physiological effects of gibberellins.

Physiological effects of Gibberellins:

- ✦ Application of gibberellins on plants stimulate extraordinary elongation of internode. eg: Corn and Pea.
- ✦ Treatment of rosette plants with gibberellin induces sudden shoot elongation followed by flowering. This is called bolting.
- ✦ Gibberellins promote the production of male flowers in monoecious plants (Cucurbits).
- ✦ Gibberellins break dormancy of potato tubers.
- ✦ Gibberellins are efficient than auxins in inducing the formation of seedless fruit - Parthenocarpic fruits (Development of fruits without fertilization) eg: Tomato.

4. Where are estrogens produced? What is the role of estrogens in the human body?

Estrogens are produced by the Graafian follicles of the ovary.

Functions of estrogens :

- ✦ It brings about the changes that occur during puberty.
- ✦ It initiates the process of cogenesis.
- ✦ It stimulates the maturation of ovarian follicles in the ovary.
- ✦ It promotes the development of secondary sexual characters (breast development, high pitched voice etc).

5. What are the conditions which occur due to lack of ADH and insulin? How are the conditions different form one another?

i) **The conditions occur due to lack of ADH and insulin**
- ✦ Deficiency of ADH causes Diabetes insipidus.
- ✦ The deficiency of insulin causes Diabetes mellitus.

ii) **Differences between Diabetes insipidus and Diabetes mellitus**

S.No.	Diabetes insipidus	Diabetes mellitus
1	It reduces reabsorption water in kidney tubules	It increases blood sugar level (Hyperglycemia)
2	Sympoms : i) Frequenty and excessive urination (polyuria) ii) Dehydration iii) Increased thirst (Polydipsia)	Symptoms : i) Excretion of excess glucose in the urine (Clycosuria) ii) Frequenty urination (Polyuria) iii) Increased thirst (Polydipsia) iv) Increase in appetite (Polyphagia)

VIII. Book Exercise – Higher Order Thinking Skills (HOTS)

2. What would be expected to happen if :

a. **Gibberellin is applied to rice seedlings.**

If Gibberellins is applied to rice seedlings, then the rice seedlings will exhibit internode-elongation and increase in height.

b. **A rotten fruit gets mixed with unripe fruits.**

If rotten fruits get mixed with unripe fruits, then the Ethylene produced from the rotten fruits will hastens the ripening of the unripe fruits.

c. **When cytokinin is not added to culture medium.**

When cytokinin is not added to culture medium, it slows down the cell division and there by prevent the

fomation of new organs from the callus (Organogenesis) in the tissue culture.

3. **A plant hormone was first discovered in Japan when rice plants were suffering from Bakanae disease caused by Gibberella fujikoroi. Based on this information answer the following questions:**

a. **Identify the hormone involved in this process.**

The hormone involved in this process is Gibberellins.

b. **Which property of this hormone causes the disease?**

Gibberellins has the property of stimulating the extraordinary elongation of internode.

c. **Give two functions of this hormone.**

✦   Gibberellins promote the production of male flowers in monoecious plants (Cucurbits).

✦   Gibberellins break dormancy of potato tubers.

4. **Senthil has high blood pressure, protruded eyeball and an increased body temperature. Name the endocrine gland involved and hormone secretion responsible for this condition.**

High blood pressure, protruded eyeball and an increased body temperature are the symptoms of Grave's disease. It is caused due to the excess secretion (Hyperthyroidism) of the thyroid hormones.

a)   The endocrine gland involved for this condition is Thyroid gland.

b)   Hormones responsible for this condition are Thyroid hormones such as

✦   Triiodothyronine (T3).

✦   Tetraiodothyronine or Thyroxine (T4).

5. **Sanjay is sitting in the exam hall. Before the start of the exam , he sweats a lot, with increased rate of heart beat. Why does this condition occur?**

In stressful situations, such as before and during an exam, the body releases "Emergency hormones" called Epinephrine (Adrenaline) and Norepinephrine (Noradrenaline). Secretion of these hormones leads to conditions such as more sweating and increased rate of heart beat.

6. **Susan's father feels very tired and frequently urinates. After clinical diagnosis he was advised to take an injection daily to maintain his blood glucose level. What would be the possible cause for this? Suggest preventive measures.**

Feeling very tired and frequent urination are the symptoms of Diabetes mellitus. It is caused due to deficiency of insulin.

Prevention of Diabetes mellitus

✦   Performing physical activity on a regular basis may help prevent diabetes.

✦   Lose excess body fat - Being overweight is a big risk factor for diabetes.

✦   Follow a plant-based, low-calorie diet.

✦   Foods to avoid are those rich in trans fats (also called hydrogenated fat), saturated fat, and sugar.

✦   Stress less : The stress response triggers the release of several hormones that increase blood sugar.

✦   Sleep well : Chronic sleep deprivation and poor quality sleep increase the risk for diabetes and obesity.

Additional – Choose the best answer

1. **Growth regulators, which control plant growth and development are called _____.**

a) Secondary metabolites   b) Macro element

c) Non-essential elements   d) Phytohormone

                                                         Ans.: d) Phytohormone

2. **Name the plant in which auxin was first discovered?**

a) Mustard   b) Pea   c) Oats   d) Rice

                                                                 Ans.: c) Oats

3. **Mark the one, which is NOT a physiological effect of auxin?**

a) Cell elongation   b) Stem elongation   c) Cell differentiation   d) Rooting

                                                               Ans.: b) Stem elongation

4.   **Name the site of Gibberellins synthesis**
     a) Endosperm   b) Coleoptile tip   c) Young leaves   d) Scutellum
                                                                        Ans. : a) Endosperm

5.   **What is bolting?**
     a) Internode elongation   b) Rooting
     c) Shooting   d) Shoot apical meristem
                                                            Ans.: a) Internode elongation

6.   **Which of the following plant hormone is responsible for seed germination?**
     a) Auxin   b) Gibberellin   c) Ethylene   d) Abscisic acid
                                                                        Ans.: b) Gibberellin

7.   **Name the first naturally occurring cytokines.**
     a) Neoxanthin   b) Xanthoxin   c) Zeatin   d) Isopentenyl adenine
                                                                        Ans.: c) Zeatin

8.   **Which of the following plant hormone causes a delay in leaf senescence?**
     a) Abscisic acid   b) Ethylene   c) Auxin   d) Cytokines
                                                                        Ans. : d) Cytokines

9.   **Name the stress hormone of the plant.**
     a) Brassinosteroid   b) Abscisic acid   c) Cytokines   d) Ethylene
                                                                        Ans.: b) Abscisic acid

10. **Chemical messengers secreted by ductless glands are called _____.**
     a) Lymph   b) Platelets   c) Plasma   d) Hormones
                                                                        Ans. : d) Hormones

11. **Which of the following is NOT an endocrine gland?**
     a) Hypothalamus   b) Pituitary   c) Parathyroid   d) Pancreas
                                                                        Ans. : a) Hypothalamus

12. **The hormone _____ acts on bone, kidney and intestine to maintain blood calcium levels.**
     a) Thyroxine   b) Parathormone   c) Oxytocin   d) vasopressin
                                                                        Ans.: b) Parathormone

13. **_____ were the first plant hormones discovered.**
     a) Auxins   b) Cytokinins   c) Gibberellins   d) Abscisic Acid
                                                                        Ans.: a) Auxins

14. **_____ are the plant hormones that promote cell division or cytokinesis in plant cells.**
     a) Cytokinins   b) Auxins   c) Gibberellins   d) Abscisic Acid
                                                                        Ans.: a) Cytokinins

15. **_____ promote the growth of lateral buds even in the presence of apical bud.**
     a) Cytokinins   b) Auxins   c) Gibberellins   d) Abscisic Acid
                                                                        Ans.: a) Cytokinins

16. **_____ are the most abundantly found plant hormones.**
     a) Cytokinins   b) Auxins   c) Gibberellins   d) Abscisic Acid
                                                                        Ans.: c) Gibberellins

17. **_____ is a growth inhibitor which regulates abscission and dormancy.**
     a) Cytokinins   b) Auxins   c) Gibberellins   d) Abscisic Acid
                                                                        Ans.: d) Abscisic Acid

18. **Decreased secretion of growth hormone in children leads to _____.**
     a) Gigantism   b) Acromegaly   c) Dwarfism   d) Goitre
                                                                        Ans.: c) Dwarfism

19. **_____ is responsible for production of female sex hormones estrogen and progesterone.**
     a) Luteinizing hormone (LH)   b) Follicle stimulating hormone (FSH)
     c) Prolactin (PRL)   d) Vasopressin
                                                            Ans.: a) Luteinizing hormone (LH)

20. _____ helps in the contraction of the smooth muscles of uterus at the time of child birth.

a) Vasopressin

b) Oxytocin

c) Luteinizing hormone

d) Follicle stimulating hormone

Ans.: b) Oxytocin

21. An amino acid tyrosine and _____ are involved in the formation of thyroid hormone.

a) Calcium   b) Iron   c) Iodine   d) Nitrogen

Ans.: c) Iodine

22. Thyroid gland requires _____ µg of iodine everyday for the production of thyroxine.

a) 20   b) 60   c) 80   d) 120

Ans.: d) 120

23. Melatonin is a hormone produced by the _____ gland.

a) Thyroid   b) Pituitary   c) Pineal   d) Thymus

Ans.: c) Pineal

24. _____ is caused due to the inadequate supply of iodine in our diet.

a) Goitre   b) Grave's disease   c) Diabetes   d) Hyperglycemia

Ans.: a) Goitre

25. Insulin helps in the conversion of glucose into glycogen which is stored in _____.

a) Liver   b) Stomach   c) Spleen   d) Pancreas

Ans.: a) Liver

26. Human insulin was first discovered in 1921 by

a) Fredrick Banting   b) Charles Best   c) MacLeod   d) All the above

Ans.: d) All the above

27. Testes are composed of

a) Seminiferous tubules

b) Leydig cells

c) Sertoli cells

d) All the above

Ans.: d) All the above

28. The maturation of ovarian follicles in the ovary is stimulated by _____.

a) Estrogen   b) Progesterone   c) Thymosin   d) Coritsol

Ans.: a) Estrogen

29. _____ promotes the development of secondary sexual characters such as breast development, high pitched voice etc.

a) Estrogen   b) Progesterone   c) Thymosin   d) Coritsol

Ans.: a) Estrogen

30. The hormone essential for the formation of placenta is _____ .

a) Adrenaline   b) Noradrenalin   c) Estrogen   d) Progesterone

Ans.: d) Progesterone

31. _____ has a stimulatory effect on the immune function.

a) Cortisol   b) Thymosin   c) Oxytocin   d) Adrenaline

Ans.: b) Thymosin

32. The endocrine gland located in the upper part of the chest covering the lower end of trachea.

a) Adrenal   b) Thymus   c) Pineal   d) Spleen

Ans.: b) Thymus

33. Thymosin stimulates the production and differentiation of _____.

a) Lymphocytes   b) RBCs   c) Thrombocytes   d) Haemoglobin

Ans.: a) Lymphocytes

Additional – Fill in the blanks

1. The function of control and coordination in plants is performed by chemical substances produced by the plants called _____.   **Ans.:** Plant hormones.

2. Endocrine glands co-ordinate physiological and metabolic functions by _____ integration.
    Ans.: Chemical

3. he endocrine system acts through chemical messengers known as _____.   **Ans.:** Hormones

4. Auxins, cytokinins and gibberellins are growth _____.   **Ans.:** Promotors

5. Abscisic acid and ethylene are growth _____.   **Ans.:** Inhibitors

6. The term auxin was introduced by _____ and _____ in 1931.   **Ans.:** Kogl and Haagen- Smith

7. _____ are produced at the tip of stems and roots from where they migrate to the zone of elongation.
    Ans.: Auxins

8. In 1880, _____ observed unilateral growth and curvature of canary grass (Phalaris canariensis) coleoptiles.   **Ans.:** Charles Darwin

9. _____ is the first person who demonstrated the existence and effect of auxin in plants.
    Ans.: Frits Warmolt Went

10. Frits Warmolt Went did a series of experiments to prove the effect of auxins in coleoptiles of _____.
    Ans.: Avena

11. Cytokinins was first isolated from _____ fish sperm.   **Ans.:** Herring

12. The cytokinin isolated from Zea mays is _____.   **Ans.:** Zeatin

13. Cytokinin is found abundantly in _____ milk.   **Ans.:** Coconut

14. Cytokinin induces cell division (cytokinesis) in the presence of _____.   **Ans.:** Auxins

15. _____ and _____ are essential for the formation of new organs (Morphogenesis) from the callus in tissue culture.   **Ans.:** Auxins and cytokinins

16. In 1926, _____ observed Bakanae disease or foolish seedling disease in rice crops.   **Ans.:** Kurosawa

17. _____ produced by fungus Gibberella fujikuroi causes internodal elongation in rice plant.
    Ans.: Gibberellic acid

18. Application of _____ stimulate extraordinary elongation of internode in Corn and Pea.
    Ans.: Gibberellins

19. _____ promote the production of male flowers in monoecious plants such as Cucurbits.
    Ans.: Gibberellins

20. Development of fruits without fertilization is known as _____.   **Ans.:** Parthenocarpy

21. _____ are efficient than auxins in inducing the formation of seedless fruit - Parthenocarpic fruits.
    Ans.: Gibberellins

22. As _____ increases tolerance of plants to various kinds of stress, it is also called as stress hormone.
    Ans.: Abscisic acid (ABA).

23. Abscisic acid (ABA) is found in the _____ of plants.   **Ans.:** Chloroplast

24. Separation of leaves, flowers and fruits from the branch is known as _____.   **Ans.:** Abscisson

25. ABA promotes _____ in leaves by causing loss of chlorophyll.   **Ans.:** Senescence

26. _____ induces bud dormancy towards the approach of winter in trees like birch.
    Ans.: Abscisic acid (ABA)

27. Ethylene is a growth _____.   **Ans.:** Inhibitor

28. The hormone concerned with maturation and ripening of fruits is _____.   **Ans.:** Ethylene

29. _____ inhibits the elongation of stem and root in dicots.   **Ans.:** Ethylene

30. Ethylene hastens the _____ of leaves and flowers.   **Ans.:** Senescence

31. Ethylene stimulates formation of _____ zone in leaves, flowers and fruits which leads to premature shedding.   **Ans.:** Abscission

32. The secretions of endocrine glands are called _____.   **Ans.:** Hormones

33. Hormones act on specific organs which are referred as _____ organs.   **Ans.:** Target

34. _____ glands have specific ducts to carry their secretions.   **Ans.:** Exocrine

35. Salivary glands, Mammary glands and Sweat glands are examples for _____ glands.   **Ans.:** Exocrine

36. Pituitary Gland located at the base of the midbrain attached to the _____ by a pituitary stalk.
                                                                                                          Ans.: Hypothalamus

37. Over secretion of growth hormone leads to _____ in children.   **Ans.:** Gigantism

38. Excess secretion of growth hormone in adults leads to _____.   **Ans.:** Acromegaly

39. In male, _____ stimulates the germinal epithelium of testes for formation of sperms.
                                                                                        Ans.: Follicle stimulating hormone (FSH)

40. In male, Luteinizing hormone (LH) promotes the Leydig cells of the testes to secrete _____.
                                                                                                          Ans.: Testosterone

41. The hormone is responsible for the development of corpus luteum is _____.
                                                                                        Ans.: Luteinizing hormone (LH)

42. The hormone is responsible for milk ejection from the mammary gland after child birth is _____.
                                                                                                          Ans.: Oxytocin

43. A narrow band of tissue which connects two lobes of thyroid gland is known as _____.
                                                                                                          Ans.: Isthmus

44. Amino acid involved in formation of thyroid hormone is _____.   **Ans.:** Tyrosine

45. Thyroid gland is composed of glandular follicles and lined by _____ epithelium.   **Ans.:** Cuboidal

46. The follicles of thyroid gland are filled with colloid material called _____.   **Ans.:** Thyroglobulin

47. Thyroxine hormone was first crystallised by _____ in 1914.   **Ans.:** Edward C. Kendal

48. Charles Harrington and George Barger identified the molecular structure of _____ in 1927.
                                                                                                          Ans.: Thyroxine

49. _____ is caused due to the inadequate supply of iodine in our diet.   **Ans.:** Goitre

50. Sustained contraction of muscles in face, larynx, hands and feet caused due to less secretion of parathormone is known as _____.   **Ans.:** Tetany

51. Parathyroid Gland secretes the hormone _____.   **Ans.:** Parathormone.

52. Removal of thyroid glands is known as _____.   **Ans.:** Thyroidectomy

53. The exocrine part of pancreas secretes _____ which plays a role in digestion.   **Ans.:** Pancreatic juice

54. The endocrine portion of pancreas is made up of _____.   **Ans.:** Islets of Langerhans

55. The alpha cells of Islets of Langerhans secrete _____.   **Ans.:** Glucagon

56. The Beta cells of Islets of Langerhans secrete _____.   **Ans.:** Insulin

57. A balance between insulin and glucagon production is necessary to maintain blood _____ concentration.   **Ans.:** Glucose

58. _____ helps in the breakdown of glycogen to glucose in the liver.   **Ans.:** Glucagon

59. The deficiency of insulin causes _____.   **Ans.:** Diabetes mellitus

60. Increase in blood sugar level is known as _____.   **Ans.:** Hyperglycemia

61. Excretion of excess glucose in the urine is known as _____.   **Ans.:** Glycosuria

62. Frequent urination is termed as _____.   **Ans.:** Polyuria

63. The condition of increased thirst is known as _____.   **Ans.:** Polydipsia

64. Increase in appetite is termed as _____.   **Ans.:** Polyphagia

65. The _____ glands are located above each kidney.   **Ans.:** Adrenal

66. As adrenal glands are located on the top of each kidney, they are also called as _____.
    Ans.: Supra renal glands

67. The hormones secreted by the adrenal cortex are called _____.   **Ans.:** Corticosteroids

68. Glucocorticoids and Mineralocorticoids are secreted by _____ region of adrenal gland.
    Ans.: Cortex

69. The glucocorticoids secreted by the zona fasciculata are _____ and _____.
    Ans.: Cortisol and corticosterone

70. _____ hormone is an anti-inflammatory and anti-allergic agent.   **Ans.:** Cortisol

71. The mineralocorticoids secreted by zona glomerulosa is _____.   **Ans.:** Aldosterone

72. _____ causes increased excretion of potassium ions.   **Ans.:** Aldosterone

73. Electrolyte balance, body fluid volume, osmotic pressure and blood pressure are regulated by the hormone _____.   **Ans.:** Aldosterone

74. _____ is known as the life-saving hormone.   **Ans.:** Cortisol

75. The adrenal medulla is composed of _____ cells.   **Ans.:** Ahromaffin

76. Epinephrine (Adrenaline) and Norepinephrine (Noradrenaline) are secreted by _____ part of Adrenal gland.   **Ans.:** Medulla

77. _____ is known as "emergency hormone" or "flight, fright and fight hormone".   **Ans.:** Adrenaline

78. _____ form the endocrine part of the testes.   **Ans.:** Leydig cells

79. Leydig cells secrete hormone called _____.   **Ans.:** Testosterone

80. _____ is responsible for the development of secondary sexual characters such as distribution of hair on body and face, deep voice pattern, etc.   **Ans.:** Testosterone

81. The ovaries are the female gonads located in the _____ cavity of the abdomen.   **Ans.:** Pelvic

82. Estrogen and Progesterone are secreted by _____.   **Ans.:** Ovary

83. Estrogen is produced by the _____ of the ovary.   **Ans.:** Graafian follicles

84. Progesterone is produced by _____ that is formed in the ovary from the ruptured follicle during ovulation.   **Ans.:** Corpus luteum

85. _____ brings about the changes that occur during puberty.   **Ans.:** Estrogens

86. _____ initiates the process of oogenesis.   **Ans.:** Estrogens

87. _____ is responsible for the premenstrual changes of the uterus and it maintains pregnancy.
    Ans.: Progesterone

88. _____ gland is partly an endocrine gland and partly a lymphoid gland.   **Ans.:** Thymus

89. The hormone secreted by thymus is _____.   **Ans.:** Thymosin

90. Insulin was first used in treatment of diabetes on 11th January _____.   **Ans.:** 1922

Additional – Match the following

Section I

1.	Went	(d)	Synthetic auxins
2.	Cytokinin	(j)	Gibberella fujikuro
3.	Phenyl Acetic Acid	(i)	Parthenocarpic fruits
4.	Indole-3- Propionic Acid	(b)	Zeatin
5.	Plant hormones	(h)	Gaseous hormone
6.	Gibberellins	(c)	Natural auxins
7.	Abscisic acid (ABA)	(e)	Organic molecules
8.	Ethylene	(g)	Stress hormone
9.	Grass	(a)	Avena coleoptiles
10.	Fungus	(i)	Phalaris canariensis

Ans. :

1.	Went	(a)	Avena coleoptiles
2.	Cytokinin	(b)	Zeatin
3.	Phenyl Acetic Acid	(c)	Natural auxins
4.	Indole-3- Propionic Acid	(d)	Synthetic auxins
5.	Plant hormones	(e)	Organic molecules
6.	Gibberellins	(f)	Parthenocarpic fruits
7.	Abscisic acid (ABA)	(g)	Stress hormone
8.	Ethylene	(h)	Gaseous hormone
9.	Grass	(i)	Phalaris canariensis
10.	Fungus	(j)	Gibberella fujikuroi

Section II

1.	Exocrine Gland	(a)	Lactogenic hormone
2.	Pituitary gland	(b)	Polyuria
3.	Luteinizing hormone (LH)	(c)	Adrenaline
4.	Prolactin (PRL)	(d)	Salivary gland
5.	Vasopressin	(e)	Hypophysis
6.	Increased urine output	(f)	Tetany
7.	Melatonin	(g)	Ovulation
8.	Muscle spasm	(h)	Pancreas
9.	Duel gland	(i)	Antidiuretic hormone
10.	Epinephrine	(j)	Time messenger

Ans. :

1.	Exocrine Gland	(d)	Salivary gland
2.	Pituitary gland	(e)	Hypophysis
3.	Luteinizing hormone (LH)	(g)	Ovulation
4.	Prolactin (PRL)	(a)	Lactogenic hormone
5.	Vasopressin	(i)	Antidiuretic hormone
6.	Increased urine output	(b)	Polyuria
7.	Melatonin	(j)	Time messenger
8.	Muscle spasm	(f)	Tetany
9.	Duel gland	(h)	Pancreas
10.	Epinephrine	(c)	Adrenaline

Additional – True or false

1. **Endocrine glands secret products into the ducts and transfer it into body cavities.**
   Ans. : False.
   Correct statement : Endocrine glands secret products into the **blood** and transfer it into **target organs**.

2. **Auxins, cytokinins and gibberellins are growth inhibitors.**
   Ans.: False.
   Correct statement : Auxins, cytokinins and gibberellins are growth **promotors**.

3. **Gibberellins break dormancy of potato tubers.**
   Ans.: True.

4. **ABA inhibits the process of abscission.**
   Ans.: False.
   Correct statement : ABA **promotes** the process of abscission.

5. **ABA is a powerful inhibitor of lateral bud growth in tomato.**
   Ans.: True.

6. **Maximum synthesis of ethylene occurs during ripening of fruits.**
   Ans.: True.

7. **The secretions of endocrine glands are called enzymes.**
   Ans.: False.
   Correct statement : The secretions of endocrine glands are called **hormones**.

8. **Deficiency of ADH reduces reabsorption of water in kidney tubules and causes <u>Diabetes insipidus</u>.**
   Ans.: True.

9. **The alpha cells secrete insulin and beta cells secrete glucagon.**
   Ans.: False.
   Correct statement : The alpha cells secrete **glucagon** and beta cells secrete **insulin**.

10. **Testosterone influences the process of spermatogenesis.**
    Ans.: True.

11. **Insulin was first used in treatment of diabetes on 11th January 1922.**
    Ans.: True.

Additional – Assertion and Reason

Direction: In each of the following questions a statement of assertion (A) is given and a corresponding statement of reason (R) is given just below it. Mark the correct statement as.

    a)   If both A and R are true and R is correct explanation of A

    b)   If both A and R are true but R is not the correct explanation of A

    c)   A is true but R is false

    d)   Both A and R are false.

1. **Assertion:**   During water stress and drought conditions ABA causes stomatal closure.

   Reason: Abscisic acid induces various responses in plants against stress conditions.

   Ans : a) Both A and R are true and R is correct explanation of A

2. **Assertion:**   Ethylene is a growth inhibitor.

   Reason: Ethylene is mainly concerned with maturation and ripening of fruits.

   Ans : b) Both A and R are true but R is not the correct explanation of A

3. **Assertion:** Endocrine glands are called ductless glands.
   Reason: The hormones diffuse into the blood stream and are carried to the distant parts of the body.
   Ans : a) Both A and R are true and R is correct explanation of A

4. **Assertion:** The Islets of Langerhans consists of two types of cells namely alpha cells and beta cells.
   Reason: The alpha cells secrete insulin and beta cells secrete glucagon.
   Ans : c) A is true but R is false

5. **Assertion:** Estrogen is responsible for secondary sexual characters in male.
   Reason: Estrogen is produced by Leydig cells.
   Ans : d) Both A and R are false

Additional – Answer in a word or sentence

1. **What is Richmond Lang effect?**
   Application of cytokinin delays the process of ageing in plants. This is called **Richmond Lang effect**.

2. **What is bolting?**
   Sudden shoot elongation followed by flowering is called **bolting**. Treatment of rosette plants with gibberellin induces bolting.

3. **Why is pituitary gland called as a master gland?**
   The pituitary gland regulates and controls the secretion of hormones from the other endocrine glands and so is called as the **"Master gland"** of endocrine system.

4. **What are the two hormones secreted by the posterior lobe (Neurohypophysis) of pituitary?**
   The hormones secreted by the posterior pituitary are
   a) Vasopressin or Antidiuretic hormone.
   b) Oxytocin.

5. **Why is Vasopressin called as Antidiuretic hormone (ADH)?**
   In kidney tubules Vasopressin increases reabsorption of water. It reduces loss of water through urine and hence the name antidiuretic hormone.

6. **What is isthmus?**
   A narrow band of tissue which connects two lobes of thyroid gland is known as the **isthmus**.

7. **Why is Goitre commonly prevalent in Himalayan regions?**
   Goitre is caused due to the inadequate supply of iodine in our diet. This is commonly prevalent in Himalayan regions due to low level of iodine content in the soil.

8. **What are the functions of Glucagon?**
   i) Glucagon helps in the breakdown of glycogen to glucose in the liver.
   ii) It increases blood glucose levels.

9. **Name the hormones secreted by Adrenal Medulla.**
   It secretes two hormones namely
   a) Epinephrine (Adrenaline)
   b) Norepinephrine (Noradrenaline).

10. **Name the two hormones secreted by ovary.**
    a) Estrogen.
    b) Progesterone.

Additional – Short answers

1. **What are five major classes of plant hormones?**
   i) Auxins
   ii) Cytokinins
   iii) Gibberellins
   iv) Abscisic Acid (ABA) and
   v) Ethylene.

2. **What are growth promoters? Give examples.**

The plant hormones which promote cell division, cell enlargement, flowering, fruiting and seed formation are called as growth promotors. Examples are auxins, gibberellins and cytokinins.

3. **What are growth inhibitors? Give examples.**

The plant hormones which inhibit growth and promote dormancy and abscission in plants are called growth inhibitors.

Examples are Abscisic acid and Ethylene.

4. **What are the two types of auxins? Give examples.**

Auxins are classified into two types, namely natural auxins and synthetic auxins.

i) **Natural Auxins:** Auxins produced by the plants are called natural auxins.

Example: IAA (Indole – 3 - Acetic Acid).

ii) **Synthetic Auxins:** Artificially synthesized auxins that have properties like auxins are called as synthetic auxins.

Example: 2, 4 D (2,4 Dichlorophenoxy Acetic Acid).

5. **Write the differences between hormones and enzymes.**

	Hormones	Enzymes
1.	They are produced by endocrine glands	They are produced by exocrine glands
2.	They control long term activities	They control short term activities
3.	They act as messengers, controlling and co-ordinating activities throughout the body	They act as catalysts
eg:	Growth hormone, Adrenaline etc.,	Amylase, Maltase, Tripsin etc.,

6. **Write the examples for natural auxins.**

i) Phenyl Acetic Acid (PAA)

ii) Indole – 3 - Acetic Acid (IAA) and

iii) Indole 3 Acetonitrile (IAN).

7. **Write the examples for synthetic auxins.**

i) 2,4 Dichlorophenoxy Acetic Acid (2,4 D)

ii) Indole 3 Butyric Acid (IBA),

iii) Indole-3- Propionic Acid (IPA),

iv) α-Naphthalene Acetic Acid (NAA)

v) 2, 4, 5-T (2,4,5 Trichlorophenoxy Acetic Acid).

8. **What is Bakanae disease or foolish seedling disease?**

Bakanae disease or foolish seedling disease is a disease that infects the rice plant. The metabolism of the fungus Gibberella fujikuroi produces a surplus of Gibberellic acid which is responsible for intermodal elongation in rice plant.

9. **Which hormone is known as stress hormone in plants and why?**

Abscisic acid is **called stress hormones** as it induces various responses in plants against **stress** conditions. For example, it induces the closure of the stomata during water **stress**.

10. **What are the two lobes of pituitary gland?**

The pituitary gland is composed of two lobes.

i) The anterior lobe (**adenohypophysis**) and

ii) The posterior lobe (**neurohypophysis**).

11. **Name the two hormones secreted by thyroid gland.**

The hormones secreted by the thyroid gland are

a) Triiodothyronine (T3)

b) Tetraiodothyronine or Thyroxine (T4).

12. What are the functions of insulin ?

i) Insulin helps in the conversion of glucose into glycogen which is stored in liver and skeletal muscles.

ii) It promotes the transport of glucose into the cells.

iii) It decreases the concentration of glucose in blood.

13. What are the symptoms of Diabetes mellitus?

i) Increase in blood sugar level (Hyperglycemia).

ii) Excretion of excess glucose in the urine (Glycosuria).

iii) Frequent urination (Polyuria).

iv) Increased thirst (Polydipsia).

v) Increase in appetite (Polyphagia).

14. What are the three layers of adrenal Cortex?

The adrenal cortex consists of three layers of cells. They are

i) Zona glomerulosa,

ii) Zona fasciculata and

iii) Zona reticularis.

15. Name the hormones secreted by Adrenal Cortex.

The hormones secreted by the adrenal cortex are corticosteroids. They are classified into

a) Glucocorticoids.

b) Mineralocorticoids.

16. Why is adrenaline and noradrenaline called as "emergency hormone" or "flight, fright and fight hormone"?

During emergency situations, adrenal gland releases adrenaline and noradrenaline hormones which help in quick actions to deal with the emergency situation. It induces 'flight, fright and fight' by the body, thereby helping to deal with the emergency situation. This causes faster heart beat, more oxygen to muscles. Hence they are referred as **"emergency hormone"** or "flight, fright and fight hormone".

17. What are the functions of testosterone?

i) It influences the process of spermatogenesis.

ii) It stimulates protein synthesis and controls muscular growth.

iii) It is responsible for the development of secondary sexual characters (distribution of hair on body and face, deep voice pattern, etc).

18. What are the functions of progesterone ?

i) It is responsible for the premenstrual changes of the uterus.

ii) It prepares the uterus for the implantation of the embryo.

iii) It maintains pregnancy.

iv) It is essential for the formation of placenta.

19. What are the functions of Thymosin?

i) It has a stimulatory effect on the immune function.

ii) It stimulates the production and differentiation of lymphocytes.

20. Why is cortisol called life saving hormone?

The cortisol hormones of adrenal cortex serves to maintain the body in living condition and recover it from the severe effects of stress reactions. Thus an increased output of cortisol is "life saving" in "shock conditions". Hence it is known as life-saving hormone.

Additional – Long Answers

1. What are the physiological effects of Auxins?

Auxins bring about a variety of physiological effects in different parts of the plant body.

i) Auxins promote the **elongation of stems** and **coleoptiles** which makes them to grow.

ii)   Auxins **induce root formation** at low concentration and inhibit it at higher concentration.

iii) The auxins produced by the apical buds suppress growth of lateral buds. This is called **apical dominance**.

iv)   Seedless fruits without fertilization are induced by the external application of auxins. (**Parthenocarpy**). Examples: Watermelon, Grapes, Lime etc.

v)   Auxins **prevent** the formation of **abscission layer**.

2.   What are the physiological effects of Cytokinins?

i)   Cytokinin induces **cell division** (cytokinesis) in the presence of auxins.

ii)   Cytokinin also causes **cell enlargement**.

iii) Both auxins and cytokinins are essential for the formation of new organs from the callus in tissue culture **(Morphogenesis)**.

iv)   Cytokinins promote the growth of **lateral buds** even in the presence of apical bud.

v)   Application of cytokinin delays the process of ageing in plants. This is called **Richmond Lang effect**.

3.   What are the physiological effects of Abscisic acid (ABA)?

i)   ABA promotes the process of **abscission** (separation of leaves, flowers and fruits from the branch).

ii)   During water stress and drought conditions ABA **causes stomatal closure**.

iii) ABA **promotes senescence** in leaves by causing loss of chlorophyll.

iv)   ABA **induces bud dormancy** towards the approach of winter in trees like birch.

v)   ABA is a powerful **inhibitor of lateral bud growth** in tomato.

4.   Write the name and location of the endocrine glands present in human and other vertebrates.

	Name of the endocrine glands	Location
a.	Pituitary gland	It is attached to the hypothalamus of the brain
b.	Thyroid gland	It is located on the either side of larynx.
c.	Parathyroid gland	In the neck behind the thyroid
d.	Pancreas (Islets of Langerhans)	In the abdomen, below the stomach.
e.	Adrenal gland (Adrenal cortex and Adrenal medulla)	It is present on top of each kidney.
f.	Testes	They are contained in scrotal sac.
g.	Ovary	They are present on either side of uterus.
h.	Thymus gland	It is a lymphoid mass, present above the heart.

5.   Write about the hormones secreted by pituitary gland and their functions.

No.	Hormones of pituitary gland	Functions
	Hormones secreted by the anterior lobe (Adenohypophysis)	
1.	Growth hormone (GH)	1. GH promotes the development and enlargement of all tissues of the body. 2. It stimulates the growth of muscles, cartilage and long bones. 3. It controls the cell metabolism.
2.	Thyroid stimulating hormone (TSH)	1. TSH controls the growth of thyroid gland, coordinates its activities and hormone secretion.
3.	Adrenocorticotropic hormone (ACTH)	1. ACTH stimulates adrenal cortex of the adrenal gland for the production of its hormones. 2. It also influences protein synthesis in the adrenal cortex.
4.	Gonadotropic hormones (GTH)	

	i) Follicle stimulating hormone (FSH)	1. In male, it stimulates the germinal epithelium of testes for formation of sperms. 2. In female it initiates the growth of ovarian follicles and its development in ovary.
	ii) Luteinizing hormone (LH)	1. In male, it promotes the Leydig cells of the testes to secrete male sex hormone testosterone. 2. In female, it causes ovulation (rupture of mature graafian follicle), responsible for the development of corpus luteum and production of female sex hormones estrogen and progesterone.
5.	Prolactin (PRL)	1. PRL is also called **lactogenic hormone**. This hormone initiates development of mammary glands during pregnancy and stimulates the production of milk after child birth.
	**Hormones secreted by the posterior lobe (Neurohypophysis)**	
6.	Vasopressin or Antidiuretic hormone (ADH)	1.In kidney tubules it increases reabsorption of water. 2.It reduces loss of water through urine and hence the name antidiuretic hormone.
7.	Oxytocin	1.It helps in the contraction of the smooth muscles of uterus at the time of child birth and milk ejection from the mammary gland after child birth.

6. What are the disorders caused due to improper secretion of growth hormone?

The improper secretion of this hormone leads to the following conditions.

i) **Dwarfism:** It is caused by decreased secretion of growth hormone in children. The characteristic features are stunted growth, delayed skeletal formation and mental disability.

ii) **Gigantism:** Over secretion of growth hormone leads to gigantism in children. It is characterised by overgrowth of all body tissues and organs. Individuals attain abnormal increase in height.

iii) **Acromegaly:** Excess secretion of growth hormone in adults may lead to abnormal enlargement of head, face, hands and feet.

7. What are the functions of thyroid hormones?

The functions of thyroid hormones are

i) Increases oxygen consumption in tissues.

ii) Prodution of energy by maintaining the **Basal Metabolic Rate** (BMR) of the body.

iii) Helps to maintain normal body temperature.

iv) Influences the activity of central nervous system.

v) Controls growth of the body, bone formation and development of gonads.

vi) Essential for normal physical, mental and personality development. It is also known as personality hormone. 8.Regulates carbohydrate, protein and fat metabolism.

8. What are the disorders caused due to improper secretion of thyroid hormones?

i) **Cretinism :** It is caused due to decreased secretion of the thyroid hormones in children. The conditions are stunted growth, mental defect, lack of skeletal development and deformed bones. They are called as cretins.

ii) **Myxoedema :** It is caused by deficiency of thyroid hormones in adults. They are mentally sluggish, increase in body weight, puffiness of the face and hand, oedematous appearance.

iii) **Hyperthyroidism :** It is caused due to the excess secretion of the thyroid hormones which leads to Grave's disease. The symptoms are protrusion of the eyeballs (Exopthalmia), increased metabolic rate, high body temperature, profuse sweating, loss of body weight and nervousness.

9. **Give the functions of adrenocortical hormones.**

    The hormones secreted by the adrenal cortex are corticosteroids. They are classified into

    a) Glucocorticoids   b) Mineralocorticoids

    a)   Glucocorticoids :

    1)   The glucocorticoids secreted by the zona fasciculata are **cortisol** and **corticosterone**.

    2)   They regulate carbohydrate, protein and fat metabolism.

    3)   It stimulates the formation of glucose from glycogen in the liver.

    4)   It is an anti-inflammatory and anti-allergic agent.

    b)   Mineralocorticoids

    1)   The mineralocorticoids secreted by zona glomerulosa is **aldosterone**.

    2)   It helps to reabsorb sodium ions from the renal tubules.

    3)   It causes increased excretion of potassium ions.

    4)   It regulates electrolyte balance, body fluid volume, osmotic pressure and blood pressure.

10. **What are the functions of hormones secreted by adrenal cortex?**

    Adrenal cortex secretes two hormones namely

   a) Epinephrine (Adrenaline)   b) Norepinephrine (Noradrenaline)

    a)   Epinephrine (Adrenaline) :

    i)   It promotes the conversion of glycogen to glucose in liver and muscles.

    ii)   It increases heart beat and blood pressure.

    iii) It increases the rate of respiration by dilation of bronchi and trachea.

    iv) It causes dilation of the pupil in eye.

    v)   It decreases blood flow through the skin.

    b)   Norepinephrine (Noradrenalin) : Its actions are similar to those of epinephrine.

Additional – Draw and label

Draw and label the following diagrams.
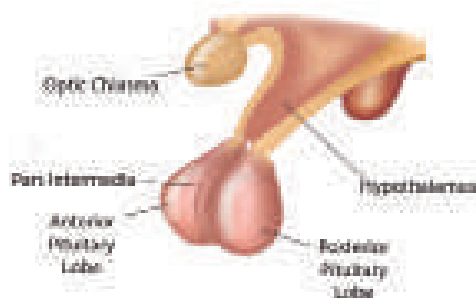
1. **Pituitary gland**   **2.Thyroid gland**
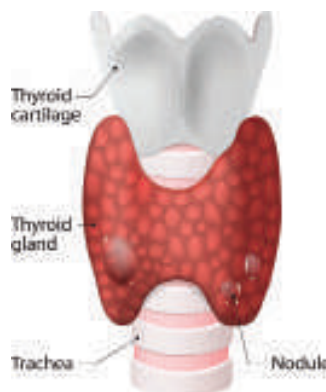
3. **Parathyroid gland**
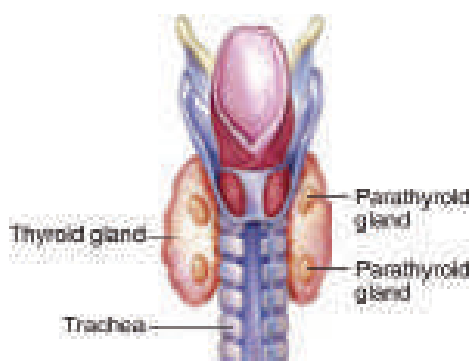
4. Pancreas
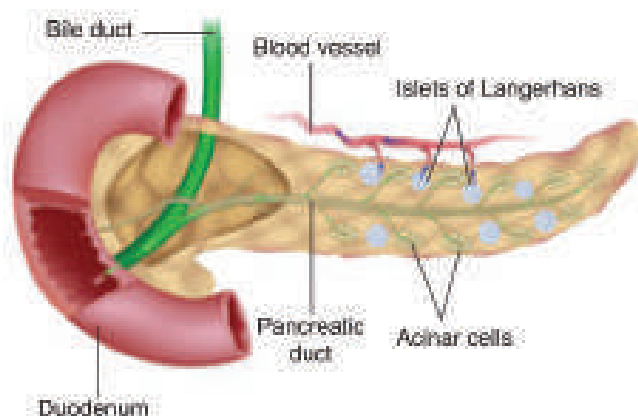
5. Adrenal gland
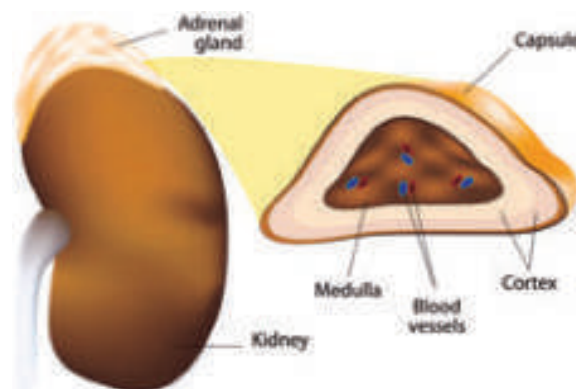
Additional – Long Answers

	Abbreviation	Expansion
i)	IAA	Indole – 3 - Acetic Acid
ii)	2, 4 D	2,4 Dichlorophenoxy Acetic Acid
iii)	PAA	Phenyl Acetic Acid
iv)	IBA	Indole 3 Butyric Acid
v)	IPA	Indole-3- Propionic Acid
vi)	NAA	α-Naphthalene Acetic Acid
vii)	2, 4, 5-T	2,4,5 Trichlorophenoxy Acetic Acid
viii)	IAA	Indole – 3 - Acetic Acid
ix)	ABA	Abscisic acid
x)	GA	Gibberrellic Acid
xi)	IAN	Indole 3 Acetonitrile
xii)	GH	Growth Hormone
xiii)	TSH	Thyroid Stimulating Hormone
xiv)	ACTH	Adrenocorticotropic Hormone
xv)	GTH	Gonadotropic Hormone
xvi)	FSH	Follicle Stimulating Hormone
xvii)	LH	Luteinizing Hormone
xviii)	PRL	Prolactin
xix)	BMR	Basal Metabolic Rate
xx)	T_3	Tri-iodothyronine
xxi)	T_4	Tetra-iodothyronine or Thyroxine

UNIT TEST - 16

Time : 1.15 Hrs.   Marks : 50

I. Choose the best answer
(5 × 1 = 5)

1. **Gibberellins cause:**
   a) Shortening of genetically tall plants   b) Elongation of dwarf plants
   c) Promotion of rooting   d) Yellowing of young leaves

2. **Avena coleoptile test was conducted by**
   a) Darwin   b) N. Smit   c) Paal   d) F.W. Went

3. **Identify the exocrine gland**
   a) Pituitary glang   b) Adrenal gland   c) Salivary gland   d) Thyroid gland

4. **Name the site of Gibberellins synthesis**
   a) Endosperm   b) Coleoptile tip   c) Young leaves   d) Scutelllum

5. **_____ helps in the contraction of the smooth muscles of uterus at the time of child birth.**
   a) Vasopressin   b) Oxytocin
   c) Luteinizing hormone   d) Follicle stimulating hormone

II. Fill in the blanks
(5 × 1 = 5)

6. _____ causes cell elongation, apical dominance and prevents abscission.
7. Decreased secretion of thyroid hormones in the children leads to _____.
8. Calcium metabolism of the body is controlled by _____.
9. The hormone concerned with maturation and ripening of fruits is _____.
10. Removal of thyroid glands is known as _____.

III. State whether the statements are true or false. Correct the false statement
(5 × 1 = 5)

11. Gibberellins cause parthenocarpy in tomato.
12. Ethylene retards senescence of leaves, flowers and fruits.
13. Estrogen is secreted by corpus luteum.
14. Auxins, cytokinins and gibberellins are growth inhibitors.
15. Testosterone influences the process of spermatogenesis.

IV. Match the following
(5 × 1 = 5)

16. Thyroxine   (a)   Acromegaly
17. Insulin   (b)   Tetany
18. Parathormone   (c)   Simple goitre
19. Growth hormone   (d)   Diabetes insipidus
20. ADH   (e)   Diabetes mellitus

V. Assertion and Reasoning
(5 × 1 = 5)

Direction: In each of the following questions, a statement of Assertion is given and a corresponding statement of Reason is given just below it. Of the statements given below, mark the correct answer as

a. If both A and R are true and R is the correct explanation of A.
b. If both A and R are true but R is not the correct explanation of A.
c. If A is true but R is false.
d. If both A and R are false.

21. **Assertion:** Application of cytokinin to marketed vegetables can keep them fresh for several days.
    Reason: Cytokinins delay senescence of leaves and other organs by mobilisation of nutrients.

22. **Assertion:** Diabetes mellitus increases the blood sugar levels.
    Reason: Insulin decreases the blood sugar levels.

23. **Assertion:** Pituitary gland is referred as "Master gland".
    Reason: It controls the functioning of other endocrine glands.

24. **Assertion:** The Islets of Langerhans consists of two types of cells namely alpha cells and beta cells.
    Reason: The alpha cells secrete insulin and beta cells secrete glucagon.

25. **Assertion:** Ethylene is a growth inhibitor.
    Reason: Ethylene is mainly concerned with maturation and ripening of fruits.

VI. Write the answer for the following questions in word or sentence

(5 × 1 = 5)

26. Write the name of a synthetic auxin.
27. Name the endocrine glands associated with kidneys.
28. Name the hormones which regulates water and mineral metabolism in man.
29. What is Richmond Lang effect?
30. Why is pituitary gland called as a master gland?

VII. Write the short answer for ANY 5 of the following questions

(6 × 2 = 12)

31. What is bolting? How can it be induced artificially?
32. Bring out any two physiological activities of abscisic acid.
33. What are chemical messengers?
34. What are the hormones secreted by posterior lobe of the pituitary gland? Mention the tissues on which they exert their effect.
35. What are five major classes of plant hormones?
36. What are the functions of progesterone ?
37. Write the examples for natural auxins.

VIII. Write long answer for the following questions

(2 × 5 = 10)

38. Describe an experiment which demonstrates that growth stimulating hormone is produced at the tip of coleoptile.

or

Name the gaseous plant hormone. Describe its three different actions in plants.

39. Where are estrogens produced? What is the role of estrogens in the human body?

or

Write about the hormones secreted by pituitary gland and their funtions.

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UNIT 17 — REPRODUCTION IN PLANTS AND ANIMALS

Points to Remember

➤ Many bacteria and protozoa simply divide into two or more daughter cells by fission.

➤ Organisms such as hydra can regenerate if they are broken into pieces. They can also give out buds which mature into new individuals.

➤ Reproduction in flowering plants involves transfer of pollen grains from the anther to the stigma which is referred to as pollination. This is followed by fertilization.

➤ Sexual reproduction involves the fusion of two haploid gametes (male and the female gametes) to form a diploid individual (zygote).

➤ The formation of the sperm in male and the ovum in female is called gametogenesis. It involves spermatogenesis (formation of spermatozoa) and oogenesis (the formation of ova).

➤ The cyclic events that take place in a rhythmic manner during the reproductive period of a woman's life is called menstrual cycle.

➤ The process of attachment of the blastocyst to the uterine wall (endometrium) is called implantation.

➤ The placenta is a temporary association between the developing embryo and maternal tissues.

➤ Parturition is the expulsion of young one from the mother's uterus.

➤ Contraception is one of the best birth control measures. The devices used for contraception are called contraceptive devices.

TEXT BOOK EVALUATION

I. Book Exercise – Choose the best answer

1. **The plant which propagates with the help of its leaves is _____.**
   a) Onion   b) Neem   c) Ginger   d) Bryophyllum
   Ans : (d) Bryophyllum

2. **Asexual reproduction takes place through budding in _____.**
   a) Amoeba   b) Yeast   c) Plasmodium   d) Bacteria
   Ans : (b) Yeast

3. **Syngamy results in the formation of _____.**
   a) Zoospores   b) Conidia   c) Zygote   d) Chlamydospores
   Ans : (c) Zygote

4. **The essential parts of a flower are _____.**
   a) Calyx and Corolla   b) Calyx and Androecium
   c) Corolla and Gynoecium   d) Androecium and Gynoecium
   Ans : (d) Androecium and Gynoecium

5. **Anemophilous flowers have _____.**
   a) Sessile stigma   b) Small smooth stigma   c) Colored flower   d) Large feathery stigma
   Ans : (d) Large feathery stigma

6. **Male gametes in angiosperms are formed by the division of _____.**
   a) Generative cell   b) Vegetative cell   c) Microspore mother cell   d) Microspore
   Ans : (a) Generative cell

7. **What is true of gametes?**

   a) They are diploid

   b) They give rise to gonads

   c) They produce hormones

   d) They are formed from gonads

   Ans : (d) They are formed from gonads

8. **A single highly coiled tube where sperms are stored, get concentrated and mature is known as**

   a) Epididymis   b) Vasa efferentia   c) Vas deferens   d) Seminiferous tubules

   Ans : (a) Epididymis

9. **The large elongated cells that provide nutrition to developing sperms are**

   a) Primary germ cells   b) Sertoli cells   c) Leydig cells   d) Spermatogonia

   Ans : (b) Sertoli cells

10. **Estrogen is secreted by**

    a) Anterior pituitary   b) Primary follicle   c) Graffian follicle   d) Corpus luteum

    Ans : (c) Graffian follicle

11. **Which one of the following is an IUCD?**

    a) Copper – T   b) Oral pills   c) Diaphragm   d) Tubectomy

    Ans : (a) Copper – T

II. Book Exercise – Fill in the blanks

1. The embryo sac in a typical dicot at the time of fertilization is _____.   **Ans :** 7 Celled
2. After fertilization the ovary develops into _____.   **Ans :** Fruit
3. Planaria reproduces asexually by _____.   **Ans :** Regeneration
4. Fertilization is _____ in humans.   **Ans :** Internal
5. The implantation of the embryo occurs at about _____ days of fertilization.   **Ans :** 6 – 7 days
6. _____ is the first secretion from the mammary gland after child birth.   **Ans :** Colostrum
7. Prolactin is a hormone produced by _____.   **Ans :** Pituitary gland

III. Book Exercise – Match the following

A) Match Column I with II

COLUMN–I	COLUMN–II
Fission	Spirogyra
Budding	Amoeba
Fragmentation	Yeast

Ans :

Column I	Column II
Fission	Amoeba
Budding	Yeast
Fragmentation	Spirogyra

B) Match the following terms with their respective meanings

1.	Parturition	(a)	Duration between pregnancy and birth
2.	Gestation	(b)	Attachment of zygote to endometrium
3.	Ovulation	(c)	Delivery of baby from uterus
4.	Implantation	(d)	Release of egg from Graafian follicle

Ans :

1	Parturition	c	Delivery of baby from uterus
2	Gestation	a	Duration between pregnancy and birth
3	Ovulation	d	Release of egg from Graafian follicle
4	Implantation	b	Attachment of zygote to endometrium

IV. Book Exercise – True or false (If false give the correct statement)

1. **Stalk of the ovule is called pedicle.**
   Ans : False. Stalk of the ovule is called **funiculus**.

2. **Seeds are the product of asexual reproduction.**
   Ans : False. Seeds are the product of **sexual** reproduction.

3. **Yeast reproduces asexually by means of multiple fission.**
   Ans : False. Yeast reproduces asexually by means of **budding**.

4. **The part of the pistil which serves as a receptive structure for the pollen is called as style.**
   Ans : False. The part of the pistil which serves as a receptive structure for the pollen is called as **stigma**.

5. **Insect pollinated flowers are characterized by dry and smooth pollen.**
   Ans : False. **Wind** pollinated flowers are characterized by dry and smooth pollen.

6. **Sex organs produce gametes which are diploid.**
   Ans : False. Sex organs produce gametes which are **haploid**.

7. **LH is secreted by the posterior pituitary.**
   Ans : False. LH is secreted by the **anterior** pituitary.

8. **Menstrual cycle ceases during pregnancy.**
   Ans : True.

9. **Surgical methods of contraception prevent gamete formation.**
   Ans : False. Surgical methods of contraception prevent gametes **transportation**.

10. **The increased level of estrogen and progesterone is responsible for menstruation.**
    Ans : False. The **decreased** level of estrogen and progesterone is responsible for menstruation.

V. Book Exercise – Answer in a sentence (1 mark)

1. **If one pollen grain produces two male gametes, how many pollen grains are needed to fertilize 10 ovules?**
   Ten pollen grains are needed to fertilize 10 ovules. Because two sperms of each pollen grain are needed to fertilize each ovule during the process of double fertilization.

2. **In which part of the flower germination of pollen grains takes place?**
   Germination of pollen grains takes place on the stigmatic surface of the flower.

3. **Name two organisms which reproduces through budding.**
   Budding takes place in
   ❖ Yeast
   ❖ Bryophyllum

4. **Mention the function of endosperm.**
   Endosperm is the nutritive tissue. It provides food to the developing embryo.

5. **Name the hormone responsible for the vigorous contractions of the uterine muscles.**
   Oxytocin from the posterior pituitary stimulates the uterine contractions and provides force to expel the baby from the uterus, causing birth.

6. **What is the enzyme present in acrosome of sperm?**
   Acrosome contains hyaluronidase, an enzyme that helps the sperm to enter the ovum during fertilization.

7. **When is World Menstrual Hygiene Day observed?**
   Every year May 28 is observed World Menstrual Hygiene Day.

8. **What is the need for contraception ?**
   Contraception is one of the best birth control measures. Contraception is needed to follow the small family norms, which improve economic status, living status and the quality of life.

9. **Name the part of the human female reproductive system where the following occurs.**

a. **Fertilization.**

Fertilization : Fertilization occurs in the oviduct particularly in ampulla of fallopian tube.

b. **Implantation.**

Implantation : Fertilized egg gets implanted in the uterus.

VII. Book Exercise – Short answer question (2 mark)

1. **What will happen if you cut planaria into small fragments?**

If we cut a Planaria into small fragments, over time each piece will regenerate into a complete worm by the process regeneration.

2. **Why is vegetative propagation practiced for growing some type of plants?**

Vegetative propagation is practiced for growing some type of plants, becuse

- ❖ Some plants have reduced power of sexual reproduction.
- ❖ Seeds of some plants have long dormant period or poor viability.
- ❖ It is a rapid and easier method.
- ❖ Good characters can be preserved.

3. **How does binary fission differ from multiple fission?**

S.No.	Binary fission	Multiple fission
1	A single parent cell divides into two daughter cells	A single parent cell divides into many daughter cells
2	It occurs during favourable conditions eg: Amoeba	It occurs during unfavourable conditions eg: Plasmodium

4. **Define triple fusion.**

The fusion of second sperm (n) with secondary nucleus (2n) is known as triple fusion. As the result of triple fusion endosperm nucleus is formed.

Second sperm (n) + Secondary nucleus (2n) = Endosperm nucleus (3n).

5. **Write the characteristics of insect pollinated flowers.**

The characteristics of insect pollinated flowers or Entamophilous flower.

- ❖ To attract insects these flowers are brightly coloured, have smell and nectar.
- ❖ The pollen grains are larger in size, the exine is pitted, spiny etc., so they can be adhered firmly on the sticky stigma.

6. **Name the secondary sex organs in male.**

The secondary sex organs in male are;

- ❖ Epididymis.
- ❖ Vas deferens.
- ❖ Seminal vesicles.
- ❖ Sperm duct.
- ❖ Prostate gland.
- ❖ Cowper's gland.
- ❖ Urethra and
- ❖ Penis.

7. **What is colostrum? How is milk production hormonally regulated ?**

- ❖ The first fluid which is released from the mammary gland after child birth is called as colostrum.
- ❖ Milk production from alveoli of mammary glands is stimulated by prolactin secreted from the anterior pituitary. The ejection of milk is stimulated by posterior pituitary hormone oxytocin.

8. **How can menstrual hygiene be maintained during menstrual days?**

Maintaining menstrual hygiene is important for the overall health of women. The basic menstrual hygiene ways are;

- ❖ Sanitary pads should be changed regularly, to avoid infections due to microbes from vagina and sweat from genitals.

❖ Use of warm water to clean genitals helps to get rid of menstrual cramps.
❖ Wearing loose clothing rather than tight fitting clothes will ensure the airflow around the genitals and prevent sweating.

9. How does developing embryo gets its nourishment inside the mother's body?

❖ After fertilization, the lining of uterus thickens and is richly supplied with blood to nourish the growing embryo.
❖ The embryo gets nutrition from the mother's blood with the help of special tissue called placenta.
❖ Umbilical cord connects the placenta and foetus.

10. Identify the parts A, B, C and D
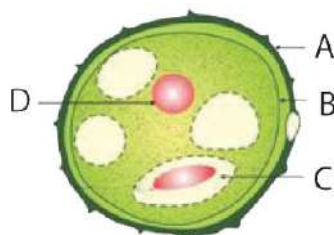
A : Exine.
B : Intine.
C : Generative cell.
D : Vegetative nucleus.

11. Write the events involved in the sexual reproduction of a flowering plant.

a. Discuss the first event and write the types.

i) **Process of sexual reproduction in flowering plants. It involves :**
    ❖ Pollination.
    ❖ Fertilization.

ii) **Pollination :** The transfer of pollen grains from anther to stigma of a flower is called as pollination.

Types of Pollination :

❖ **Self-pollination (Autogamy) :** The transfer of pollen grains from the anther to the stigma of same flower or another flower borne on the same plant is known as self-pollination.

❖ **Cross pollination (Allogamy) :** Cross-pollination is the transfer of pollen from the anthers of a flower to the stigma of a flower on another plant of the same species**.**

b. Mention the advantages and the disadvantages of that event.

Advantages of self-pollination

❖ Self-pollination is possible in certain bisexual flowers.
❖ Flowers do not depend on agents for pollination.
❖ There is no wastage of pollen grains.

Disadvantages of self-pollination

❖ The seeds are less in numbers.
❖ The endosperm is minute. Therefore, the seeds produce weak plants.
❖ New varieties of plants cannot be produced

Advantages of cross pollination

❖ The seeds produced as a result of cross pollination, develop and germinate properly and grow into better plants, i.e. cross pollination leads to the production of new varieties.
❖ More viable seeds are produced.

Disadvantages of cross-pollination

❖ Pollination may fail due to distance barrier.
❖ More wastage of pollen grains.
❖ It may introduce some unwanted characters.
❖ Flowers depend on the external agencies for pollination**.**

12. Why are the human testes located outside the abdominal cavity? Name the pouch in which they are present.

Human testes responsible for formation of sperms (Spermatogenesis) need slightly lower temperature than the normal body temperature for this function. So human testes are located outside the abdominal cavity in sac-like structure called scrotum.

13. Luteal phase of the menstrual cycle is also called the secretory phase. Give reason.

The luteal phase is the second half of the menstrual cycle, in which fertilisation and implantation may occur. Female hormones like estrogen and progesterone secreted in peak level because ovulation have to occur and they provide conditions for implantation. For this reason, Luteal phase of the menstrual cycle is called the secretory phase.

14. Why are family planning methods not adopted by all the people of our country?

❖ Due to lack of awareness about family planning.
❖ Myths and misconceptions about family planning.
❖ Long distance to Health facility.
❖ Unavailability of preferred contraceptive methods.
❖ high cost of managing side effects.
❖ Desire for big family size.

VII. Book Exercise – Long answer question (5 mark)

1. With a neat labelled diagram describe the parts of a typical angiospermic ovule.
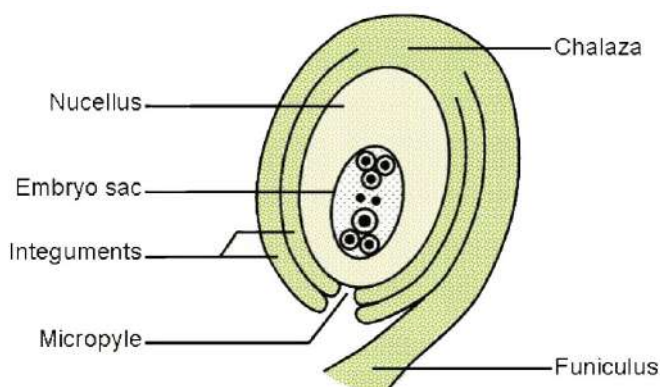
❖ The main part of the ovule is the nucellus which is enclosed by two integuments leaving an opening called as micropyle.
❖ The ovule is attached to the ovary wall by a stalk known as funiculus.
❖ Chalaza is the basal part.
❖ The embryo sac contains seven cells and the eighth nuclei located within the nucellus.
❖ Three cells at the micropylar end form the egg apparatus and the three cells at the chalaza end are the antipodal cells.
❖ The remaining two nuclei are called polar nuclei found in the centre.
❖ In the egg apparatus one is the egg cell (female gamete) and the remaining two cells are the synergids.

2. What are the phases of menstrual cycle? Indicate the changes in the ovary and uterus.

S.No.	Phase	Days	Changes in Ovary	Changes in Uterus
1	Menstrual phase	4–5 days	Development of primary follicles	Breakdown of uterine endometrial lining leads to bleeding
2	Follicular phase	6th – 13th day	Primary follicles grow to become a fully mature Graafian follicle	endometrium regenerates through proliferation

S.No.	Phase	Days	Changes in Ovary	Changes in Uterus
3	Ovulatory phase	14th day	The Graafian follicle ruptures and releases the ovum (egg)	Increase in endometrial thickness
4	Luteal phase	15th – 28th day	Emptied Graafian follicle develops into corpus luteum	Endometrium is prepared for implantation if fertilization of egg takes place, if fertilization does not occur corpus luteum degenerates, uterine wall ruptures, bleeding starts and unfertilized egg is expelled

VIII. Book Exercise – Higher Order Thinking Skills (HOTS)

1. In angiosperms the pollen germinates to produce pollen tube that carries two gametes. What is the purpose of carrying two gametes when single gamete can fertilize the egg?

Double fertilization requires two sperm cells; one to fertilize the egg cell and thereby to form the zygote, while the other sperm to fuse with the secondary nucleus to form the endosperm. That's why two sperms are needed for the process of sexual reproduction in angiosperm.

2. Why menstrual cycle does not take place before puberty and during pregnancy ?

❖ When a baby girl is born, her ovaries contain hundreds of thousands of eggs, which remain inactive until puberty begins. Only at the time of puberty (age of 11-13 years), the pituitary gland starts making hormones (LH and FSH) that stimulate the ovaries to produce female sex hormones, including estrogen and progesterone. These hormones are responsible for first menstruation (Menarche). That's why menstrual cycle does not take place before puberty.

❖ Lack of menstruation generally indicates pregnancy. If fertilization takes place the corpus luteum persists, continues to secrete progesterone maintains the thickened state of uterine wall and prevents maturation of another follicle till the end of pregnancy. That's why menstrual cycle does not take place during pregnancy.

3. Read the following passage and answer the questions that follow Rahini and her parents were watching a television programme. An advertisement flashed on the screen which was promoting use of sanitary napkins. Rahini's parents suddenly changed the channel, but she objected to her parents and explained the need and importance of such advertisement.

a) What is first menstruation called? When does it occur ?

b) List out the napkin hygiene measures taken during menstruation ?

c) Do you think that Rahini's objection towards her parents was correct? If so, Why?

a) First menstruation is called menarche. The first menstruation occurs at the age of 11-13 years.

b) Girls should be educated about napkin hygiene in the following ways

    ❖ The sanitary pad and tampons should be wrapped properly and discarded because they can spread infections.

    ❖ Sanitary pad or tampon should not be flushed down the toilet.

    ❖. Napkin incinerators are to be used properly for disposal of used napkins.

c) Yes. Rahini's objection towards her parents was correct. Rahini's parents should not change channel, instead they must explain about the use of napkins and their proper disposal.

Additional – Choose the best answer

1. The cell division takes place during vegetative reproduction is _____.

   a) Amitosis   b) Mitosis   c) Meiosis   d) Non of the above

                                                Ans : (b) Mitosis

2. In Sweet potato, vegetative propagation takes place by

   a) Root   b) Buds   c) Flower   d) Leaf

                                                Ans : (a) Root

3. In this type of reproduction, the parent cell divides into two daughter cells and each cell develops into a new adult organism.

   a) Budding   b) Bulbils   c) Regeneration   d) Fission

                                                Ans : (d) Fission

4. The method which is common for Hydra and Planaria is

   a) Fission   b) Budding   c) Regeneration   d) None of the above

                                                Ans : (c) Regeneration

5. Asexual reproduction mostly occurs by _____ formation.

   a) Spore   b) Egg   c) Sperm   d) Zygote

                                                Ans : (a) Spore

6. Asexual reproduction is common in

   a) Fungi   b) Algae   c) Bacteria   d) All the above

                                                Ans : (d) All the above

7. A mature _____ contains two cells, the vegetative and the generative cell.

   a) Ovule   b) Pollen grain   c) Ovary   d) Anther

                                                Ans : (b) Pollen grain

8. One of the following is not the part of carpel.

   a) Ovary   b) Anther   c) Style   d) Stigma

                                                Ans : (b) Anther

9. _____ is the basal part of the ovule.

   a) Integument   b) Funiculus   c) Chalaza   d) Micropyle

                                                Ans : (c) Chalaza

10. The embryo sac contains _____ cells.

   a) 4   b) 5   c) 6   d) 7

                                                Ans : (d) 7

11. The first event of sexual reproduction in plant is _____.

   a) Fertilization   b) Pollination   c) Zygote formation   d) Pollen germination

                                                Ans : (b) Pollination

12. The stigmas are comparatively large , protruding and sometimes hairy to trap the pollen grains in _____ flowers.

   a) Hydrophilous   b) Entamophilous   c) Zoophilous   d) Anemophilous

                                                Ans : (d) Anemophilous

13. Find the anemophilous

   a) Hibiscus   b) Hydrilla   c) Grass   d) Canna

                                                Ans : (c) Grass

14. _____ flowers are brightly coloured, have smell and nectar.

   a) Hydrophilous   b) Entamophilous   c) Zoophilous   d) Anemophilous

                                                Ans : (b) Entamophilous

15. **The pollen grains of _____ flowers are larger in size, the exine is pitted, spiny etc., so they can be adhered firmly on the sticky stigma.**

    a) Hydrophilous   b) Entamophilous   c) Zoophilous   d) Anemophilous

                                          Ans : (b) Entamophilous

16. **Approximately, 80% of the pollination done by the insects is carried by _____.**

    a) Grasshopper   b) Honey bees   c) Housefly   d) Dragonfly

                                          Ans : (b) Honey bees

17. **Endosperm nucleus is triploid in nature.**

    a) Haploid   b) Diploid   c) Triploid   d) Tetraploid

                                          Ans : (c) Triploid

18. **In angiosperms, the fusion of second sperm with secondary nucleus is known as _____.**

    a) Fertilization   b) Double fertilization   c) Triple fusion   d) All the above

                                          Ans : (c) Triple fusion

19. **Since two types of fusion, syngamy and triple fusion take place in an embryo sac the process is termed as**

    a) Fertilization   b) Double fertilization   c) Triple fusion   d) All the above

                                      Ans : (b) Double fertilization

20. **Sperm production begins in the**

    a) Seminiferous tubules   b) Epididymis   c) Vas deferens   d) Ejaculatory duct

                                  Ans : (a) Seminiferous tubules

21. **The cell produced by fertilization is called**

    a) gamete   b) embryo   c) fetus   d) zygote

                                            Ans : (d) zygote

22. **The primary sex organ is known as _____**

    a) Penis   b) Urethra   c) Fallopian tube   d) Gonads

                                            Ans : (d) Gonads

23. **Which of the following produces the male sex hormone?**

    a) Rete testis   b) Seminiferous tubule   c) Leydig cell   d) Scrotum

                                          Ans : (c) Leydig cell

24. **Out of the following, which hormone does not secret from corpus luteum?**

    a) Estrogen   b) Progesterone   c) Relaxin   d) Testosterone

                                          Ans : (d) Testosterone

25. **Name the hormone which is at peak during ovulation.**

    a) Progesterone   b) Estrogen   c) FSH   d) LH View Answer

                                               Ans : (c) FSH

26. **Name the site of sperm maturation?**

    a) Epididymis   b) Ductus deferens   c) Spermatic cord   d) Urethra

                                          Ans : (a) Epididymis

27. **Which of the following gland is seen in male reproductive system ?**

    a) Seminal vesicle   b) Prostate gland   c) Bulbourethral gland   d) All of these

                                          Ans : (d) All of these

28. Where seminiferous tubules of each lobe empty sperms ?

a) Vas deference   b) Vasa efferentia   c) Epididymus   d) Seminal vesicles

Ans : (b) Vasa efferentia

29. Function of epididymis is _____

a) A temporary storage site

b) For the immature sperms complete their maturation process

c) Gain the ability of swimming (motility)

d) All of these

Ans : (d) All of these

30. Gametes with _____ cells are produced through gametogenesis.

a) Haploid   b) Diploid   c) Triploid   d) None of the above

Ans : (a) Haploid

31. Stroma of ovary is lined by the _____ epithelium.

a) Squamous   b) Germinal   c) Columnar   d) Glandular

Ans : (b) Germinal

32. The number of primordial follicles in new born female child ranges over _____.

a) 7000   b) 70000   c) 7 Lakhs   d) 7 million

Ans : (d) 7 million

33. In human females the menstrual cycle starts at the age of _____ years.

a) 11–13   b) 15–16   c) 18–20   d) 21–23

Ans : (a) 11–13

34. The phase of menstrual cycle in which, the Graafian follicle ruptures, and releases the ovum(egg) is

a) Menstrual or Destructive Phase   b) Follicular or Proliferative Phase

c) Ovulatory Phase   d) Luteal or Secretory Phase

Ans : (c) Ovulatory Phase

35. The phase of menstrual cycle in which, development of primary follicles takes place

a) Menstrual or Destructive Phase   b) Follicular or Proliferative Phase

c) Ovulatory Phase   d) Luteal or Secretory Phase

Ans : (a) Menstrual or Destructive Phase

36. The phase of menstrual cycle in which, primary follicles grow to become a fully mature Graafian follicle is

a) Menstrual or Destructive Phase   b) Follicular or Proliferative Phase

c) Ovulatory Phase   d) Luteal or Secretory Phase

Ans : (b) Follicular or Proliferative Phase

37. The phase of menstrual cycle in which, emptied Graafian follicle develops into corpus luteum is

a) Menstrual or Destructive Phase   b) Follicular or Proliferative Phase

c) Ovulatory Phase   d) Luteal or Secretory Phase

Ans : (d) Luteal or Secretory Phase

38. The first cleavage in zygote takes place about _____ hours after fertilization.

a) 2   b) 10   c) 30   d) 90

Ans : (c) 30

39. The blastocyst gets implanted in the _____.

a) Ovary   b) Fallopian tube   c) Uterus   d) Vagina

Ans : (c) Uterus

40. _____ is the expulsion of young one from the mother's uterus at the end of gestation.

   a) Gestation   b) Parturition   c) Implantation   d) Ovulation

                                      Ans : (b) Parturition (Child Birth)

41. Milk production from alveoli of mammary glands is stimulated by _____ secreted from the anterior pituitary.

   a) Prolactin   b) Oxytocin   c) Estrogen   d) Progesterone

                                      Ans : (a) Prolactin

42. The ejection of milk is stimulated by posterior pituitary hormone _____.

   a) Prolactin   b) Oxytocin   c) Estrogen   d) Progesterone

                                      Ans : (b) Oxytocin

43. India launched the nation wide family planning programme in the year _____.

   a) 1945   b) 1947   c) 1952   d) 1966

                                      Ans : (c) 1952

Additional – Fill in the blanks

1. Reproduction is to preserve individual species and it is called as _____.   **Ans :** Self-perpetuation

2. During spore formation in fungi, a structure called _____ develops from the hypha. **Ans :** Sporangium

3. A _____ is a modified shoot with limited growth to carry out sexual reproduction.   **Ans :** Flower

4. All the four whorls of the flower borne on a _____.   **Ans :** Thalamus

5. A group of sepals forms _____.   **Ans :** Calyx

6. A group of petals forms _____.   **Ans :** Corolla

7. The male part of flower is _____.   **Ans :** Androecium

8. Androecium is composed of _____.   **Ans :** Stamens

9. In Agave, the flower bud modifies into globose bulb which are called as _____.   **Ans :** Bulbils

10. The process of breaking of the filamentous algae Spirogyra into many pieces is called _____.   **Ans :** Fragmentation

11. The ability of the lost body parts of an individual organism to give rise to an whole new organism is called _____.   **Ans :** Regeneration

12. Offspring produced by _____ reproduction are not only identical to parents but are also exact copies of their parent.   **Ans :** Asexual

13. The pollination with the help of water is called _____.   **Ans :** Hydrophily

14. The female part of the flower is _____.   **Ans :** Gynoecium

15. Gynoecium or pistil is composed of _____.   **Ans :** Carpels

16. The outermost whorl of the flower is _____.   **Ans :** Calyx

17. Androecium and gynoecium are known as the _____ whorls, because both take part directly in reproduction.   **Ans :** Essential

18. Stalk of the stamen is called the _____.   **Ans :** Filament

19. Pollen grains bearing small bag like structure of stamen is called _____.   **Ans :** Anther

20. The pollen grains are produced in the anther within the _____.   **Ans :** Pollen sac

21. The hard-outer layer of pollen grain is known as _____.   **Ans :** Exine

22. Exine of pollen has prominent apertures called _____.   **Ans :** Germpore

23. The inner thin layer of pollen grain is known as _____.   **Ans :** Intine

24. The _____ cell of pollen grain divides mitotically to form two male gametes or sperms.   **Ans :** Generative

25. The stalk of the ovule is _____.   **Ans :** Funiculus

26. The opening present in the ovule is _____. **Ans :** Micropyle

27. The nucellus of the ovule is enclosed by two _____. **Ans :** Integuments

28. The eighth nuclei of the ovule is located within the _____. **Ans :** Nucellus

29. Three cells at the micropylar end of ovule form the _____. **Ans :** Egg apparatus

30. The three cells at the chalaza end of the ovule are known as the _____. **Ans :** Antipodal cells

31. The two nuclei found in the centre of the embryo sac are _____. **Ans :** Polar nuclei

32. The two haploid polar nuclei fuse to form the diploid _____ nucleus. **Ans :** Secondary

33. In the egg apparatus one is the egg cell (female gamete) and the remaining two cells are the _____.
Ans : Synergids

34. The transfer of pollen grains from anther to stigma of a flower is called as _____. **Ans :** Pollination

35. New varieties of plants are formed through new combination of genes in case of _____ pollination.
Ans : Cross

36. Self-pollination is certain in _____ flowers. **Ans :** Bisexual

37. As the _____ is minute in self pollinated seeds, they produce weak plants. **Ans :** Endosperm

38. _____ pollination leads to the production of new varieties. **Ans :** Cross

39. The pollination with the help of wind is called _____. **Ans :** Anemophily

40. Pollination in grasses and some cacti is carried out by _____. **Ans :** Wind

41. Pollination with the help of insects like honey bees, flies are called _____. **Ans :** Entomophily

42. In Hydrilla and Vallisneria flowers are pollinated by _____. **Ans :** Water

43. When pollination takes place with the help of animals, it is called _____. **Ans :** Zoophily

44. Flowers of Canna and Gladioli are pollinated by _____. **Ans :** Sun bird

45. Flowers of silk cotton tree are pollinated by _____. **Ans :** Squirrels

46. During the germination of pollen grain, a pollen tube emerges through the _____. **Ans :** Germ pore

47. After fertilization, the ovule develops into a _____. **Ans :** Seed

48. After fertilization, the integuments of the ovule develop into the _____. **Ans :** Seed coat

49. After fertilization, the _____ enlarges and develops into a fruit. **Ans :** Ovary

50. Pollen tube grows through stylar tissue and finally reaches the ovule through the opening called _____.
Ans : Micropyle

51. As the result of fusion of first sperm and the egg (syngamy) a diploid _____ is formed. **Ans :** Zygote

52. As the result of triple fusion, _____ is formed. **Ans :** Endosperm nucleus

53. As the result of _____, zygote and endosperm nucleus are formed. **Ans :** Double fertilization

54. In angiosperm, _____ provides food to the developing embryo. **Ans :** Endosperm

55. Primary reproductive organs of male are _____. **Ans :** Testes

56. Primary reproductive organs of female are _____. **Ans :** Ovaries

57. Vas deferens, epididymis, seminal vesicle, prostate gland and penis are the _____ sex organs of male.
Ans : Accessory / Secondary

58. Fallopian tubes, uterus, cervix and vagina are the _____ sex organs of female.
Ans : Accessory / Secondary

59. Testes lie outside the abdominal cavity of a man in a sac like structure called _____. **Ans :** Scrotum

60. Each testes is covered with a layer of fibrous tissue called _____. **Ans :** Tunica albuginea

61. The process of spermatogenesis takes place in the _____ of the testes. **Ans :** Seminiferous tubules

62. The _____ cells provide nutrients to the developing sperms. **Ans :** Sertoli

63. The _____ cells lie between the seminiferous tubules secrete testosterone. **Ans :** Leydig

64. The hormone _____ produced by the Leydig cells initiates the process of spermatogenesis.
Ans : Testosterone

65. The cortex of ovary is composed of a network of connective tissue called as _____. **Ans :** Stroma

66. The epithelial cells called the _____ cells surround each ovum in the ovary together forming the primary follicle. **Ans :** Granulosa

67. A nest of cells in the ovary that develops into a fluid-filled cyst containing a maturing egg (ovum) is known as _____. **Ans :** Graafian follicle

68. A woman ovulates only _____ to _____ eggs during her lifetime. **Ans :** 300 to 400

69. Men produce over _____ billion sperms in their lifetime. **Ans :** 500

70. The formation of the sperm in male and the ovum in female is called _____. **Ans :** Gametogenesis

71. Formation of spermatozoa is known as _____. **Ans :** Spermatogenesis

72. The formation of ova is known as _____. **Ans :** Oogenesis

73. A cap structure at the anterior portion of sperm is called as _____. **Ans :** Acrosome

74. Acrosome contains the enzyme _____. **Ans :** Hyaluronidase

75. The enzyme which helps the sperm to enter the ovum during fertilization is _____. **Ans :** Hyaluronidase

76. Middle piece of the sperm is made up of _____. **Ans :** Centrioles

77. The middle piece contains the _____ which provides energy for the movement of tail. **Ans :** Mitochondria

78. The membrane that surrounds the outer surface of the plasma membrane of an ovum is _____. **Ans :** Vitelline membrane

79. The membrane that surrounds a fertilized ovum and prevents the entry of other spermatozoa is _____. **Ans :** Vitelline membrane

80. The plasma membrane of ovum is surrounded by a thin glycoprotein layer layer known as _____. **Ans :** Zona pellucid

81. Outer thick layer of ovum, _____ is formed of follicle cells. **Ans :** Corona radiata

82. The fluid-filled space between zona pellucida and the surface of the egg is called _____. **Ans :** Perivitelline space

83. The period during which adolescents reach sexual maturity and become capable of reproduction is known as _____. **Ans :** Puberty

84. In male, the onset of puberty is triggered by the secretion of the hormone _____. **Ans :** Testosterone

85. In female, the onset of puberty is triggered by the secretion of _____ and _____. **Ans :** Estrogens and progesterone

86. The cyclic events that take place in a rhythmic fashion during the reproductive period of a woman's life is called _____. **Ans :** Menstrual cycle

87. The onset of puberty is called _____. **Ans :** Menarche

88. The ceasing of menstruation is known as _____. **Ans :** Menopause

89. The ceasing of menstruation or menopause occurs around _____ years. **Ans :** 48–50

90. Menstruation will happen if the released _____ is not fertilized by the sperm. **Ans :** Ovum

91. Lack of menstruation between the age 11 to 48 generally indicates _____. **Ans :** Pregnancy

92. The rupture of the follicle to release the egg or ovum is known as _____. **Ans :** Ovulation

93. The uterine lining becomes thick and spongy for _____ of the fertilized egg. **Ans :** Implantation

94. Fertilization in human is _____ as it occurs in the oviduct of the female genital tract. **Ans :** Internal

95. Fertilization takes place usually in the _____ of the fallopian tube. **Ans :** Ampulla

96. An oocyte is alive for about _____ hours after it is released from the follicle. **Ans :** 24

97. Series of rapid mitotic divisions (Cleavage) of the zygote leads to form many celled _____.

Ans : Blastula (Blastocyst)

98. The process of attachment of the blastocyst to the uterine wall (endometrium) is called _____.

Ans : Implantation

99. The transformation of blastula into gastrula and the formation of primary germ layers (ectoderm, mesoderm and endoderm) by rearrangement of the cells is called _____. **Ans :** Gastrulation

100. Formation of the various organs of the foetus from ectoderm, mesoderm and endoderm is termed as _____. **Ans :** Organogenesis

101. The _____ is a temporary association between the developing embryo and maternal tissues.

Ans : Placenta

102. _____ allows the exchange of food materials, diffusion of oxygen, excretion of nitrogenous wastes and elimination of carbon dioxide between the developing embryo and maternal tissues. **Ans :** Placenta

103. A cord containing blood vessels that connects the placenta with the foetus is called the _____.

Ans : Umbilical cord

104. The time period during which the embryo attains its development in the uterus is known as _____.

Ans : Pregnancy or Gestation

105. Normally gestation period of human last for about _____ days. **Ans :** 280

106. _____ from the posterior pituitary stimulates the uterine contractions and provides force to expel the baby from the uterus, causing birth. **Ans :** Oxytocin

107. The process of milk production after child birth from mammary glands of the mother is called _____.

Ans : Lactation

108. The first fluid which is released from the mammary gland after child birth is called as _____.

Ans : Colostrum

109. _____ twins develop when a single egg is fertilised and then divides into two foetus. **Ans :** Identical

110. The milk produced from the breast during the first 2 to 3 days after child birth is called _____ which contains immune substances and provides immunity to the new born. **Ans :** Colostrum

111. _____ is inserted into the vagina and fits snugly over the cervix to prevent the entry of sperms into the uterus. **Ans :** Diaphragm (Cervical cap)

112. Cystitis or Bladder infection is caused by _____. **Ans :** Bacteria

113. Two synthetic intrauterine devices (IUD) commonly used in India are _____ and _____.

Ans : Lippe's Loop and Copper-T

114. _____ reduces the sperm fertilizing capacity and prevents implantation. **Ans :** Copper-T

115. Surgical contraception method in male is known as _____. **Ans :** Vasectomy (ligation of vas deferens)

116. Surgical contraception or sterilization technique in females is known as _____.

Ans : Tubectomy (ligation of fallopian tube)

Additional – Match the following

1. Reproduction in plants :

1.	Bryophyllum	(a)	Ornithophily
2.	Strawberry	(b)	Bulbils
3.	Asparagus	(c)	Entomophily
4.	Agave	(d)	Allogamy
5.	Planaria	(e)	Stem propagation
6.	Self – pollination	(f)	Buds
7.	Cross pollination	(g)	Regeneration
8.	Wind pollination	(h)	Root propagation
9.	Pollination by insects	(i)	Anemophily

10. Pollination by birds   (j)   Autogamy

Ans :

1	Bryophyllum	f	Buds
2	Strawberry	e	Stem propagation
3	Asparagus	h	Root propagation
4	Agave	b	Bulbils
5	Planaria	g	Regeneration
6	Self–pollination	j	Autogamy
7	Cross pollination	d	Allogamy
8	Wind pollination	i	Anemophily
9	Pollination by insects	c	Entomophily
10	Pollination by birds	a	Ornithophily

2. Sexual Reproduction in Human :

1.	Acrosome	(a)	Oogenesis
2.	Sperm formation	(b)	identical twins
3.	Egg formation	(c)	Fraternal twins
4.	Onset of puberty	(d)	Endometrium
5.	Ceasing of menstruation	(e)	Gestation
6.	Uterine wall	(f)	Menopause
7.	Pregnancy	(g)	Menarche
8.	Colostrums	(h)	Hyaluronidase
9.	One sperm two eggs	(i)	Spermatogenesis
10.	One sperm one egg	(j)	Mammary gland

Ans :

1	Acrosome	h	Hyaluronidase
2	Sperm formation	i	Spermatogenesis
3	Egg formation	a	Oogenesis
4	Onset of puberty	g	Menarche
5	Ceasing of menstruation	f	Menopause
6	Uterine wall	d	Endometrium
7	Pregnancy	e	Gestation
8	Colostrums	j	Mammary gland
9	One sperm two eggs	c	Fraternal twins
10	One sperm one egg	b	Identical twins

Additional – True or false. If it is false give correct statement

1. **In vegetative reproduction, young plants are genetically similar to the parent plant.**
Ans : True.

2. **Production of an offspring by a single parent without the formation and fusion of gametes is called sexual reproduction.**
Ans : False. Production of an offspring by a single parent without the formation and fusion of gametes is called **asexual** reproduction.

3. **Asexual reproduction involves only mitotic cell divisions and meiosis does not occur.**
Ans : True.

4. **The ovary contains the ovules and ovules contain sperm.**
Ans : False. The ovary contains the ovules and ovules contain **egg**.

5. **The energy for sperm motility is supplied by ATP produced by mitochondria.**
   Ans : True.

6. **During reproductive period (at puberty) the number of primordial follicles in female is around 60,000 to 70,000.**
   Ans : True.

7. **The human ovum is almost free of yolk.**
   Ans : True.

8. **Generally boys attain puberty between the age of 13 to 14 years, while girls reach puberty between 11 to 13 years.**
   Ans : True.

9. **The secretion of both male and female sex hormones are controlled by LH and FSH.**
   Ans : True.

10. **Menstruation is a periodical phenomenon that continues from puberty to menarche.**
    Ans : False. Menstruation is a periodical phenomenon that continues from puberty to **menopause**.

11. **During pregnancy the uterus expands upto 500 times of its normal size.**
    Ans : True.

12. **Sometimes ovaries releases two eggs and each is fertilised by a different sperm, resulting in Identical Twins.**
    Ans : False. Sometimes ovaries releases two eggs and each is fertilised by a different sperm, resulting in **Non-Identical Twins**.

13. **Vasectomy and tubectomy are methods of permanent birth control methods.**
    Ans : True.

Additional – Assertion and Reason (2 Marks)

Direction: In each of the following questions, a statement of Assertion is given and a corresponding statement of Reason is given just below it. Of the statements given below, mark the correct answer as

   a) Assertion are true and the reason is a correct explanation of the assertion.

   b) Assertion are true and the reason is not a correct explanation of the assertion.

   c) The assertion is true but the reason is false.

   d) The assertion is false but the reason is true.

1. **Assertion :** Calyx and corolla are non–essential or accessory whorls of the flower.
   Reason : Calyx and corolla do not directly take part in the reproduction.
   Ans : (a) Assertion are true and the reason is a correct explanation of the assertion.

2. **Assertion :** Scrotal sac is located outside of the body.
   Reason : Testes need to be cooler than the temperature inside the body.
   Ans : (a) Assertion are true and the reason is a correct explanation of the assertion.

3. **Assertion :** Sertoli cells produces sperms.
   Reason : Leydigs cells secretes the male sex hormone testosterone.
   Ans : (d) The assertion is false but the reason is true.

4. **Assertion :** The epididymis is a highly coiled tube about 6 meteres long.
   Reason : It provides a temporary storage site for the immature sperms.
   Ans : (a) Assertion are true and the reason is a correct explanation of the assertion.

5. **Assertion :** Fertilization in human is internal.
   Reason : Fertilization occurs in the oviduct of the female genital tract.
   Ans : (a) Assertion are true and the reason is a correct explanation of the assertion.

Additional – Answer in a sentence (1 mark)

1. Define asexual reproduction.

Production of an offspring by a single parent without the formation and fusion of gametes is called asexual reproduction.

2. Define pollination.

The transfer of pollen grains from anther to stigma of a flower is called as pollination.

3. Define reproduction.

The ability of all living organisms to produce more of its own kind to ensure continuity and survival of the species is called reproduction.

4. What is Diaphragm (cervical cap)?

The Diaphragm (cervical cap) is a small, bowl-shaped latex or silicone cup. It is inserted into the vagina and fits snugly over the cervix. This prevents the entry of sperms into the uterus.

5. What Parturition?

Parturition is the expulsion of young one from the mother's uterus at the end of gestation.

6. What is Lactation?

The process of milk production after child birth from mammary glands of the mother is called lactation.

7. What is umbilical cord?

A cord containing blood vessels that connects the placenta with the foetus is called the umbilical cord.

8. What are the primary and secondary (accessory) sex organs of male?
   ✦ **Primary organ :** Testes.
   ✦ **Secondary (accessory) organ :** Vas deferens, epididymis, seminal vesicle, prostate gland and penis.

9. What are the primary and secondary (accessory) sex organs of female?
   ✦ **Primary organ :** Ovaries.
   ✦ **Secondary (accessory) organ :** Fallopian tubes, uterus, cervix and vagina.

10. What is cleavage?

Cleavage is a series of rapid mitotic divisions of the zygote to form many celled blastula (Blastocyst).

11. Define regeneration. Give examples.

The ability of the lost body parts of an individual organism to give rise to an whole new organism is called regeneration. Eg. Hydra and Planaria

Additional – Short answer questions (2 mark)

1. With the help of a neat labelled diagram of the female reproductive system, depict the following sites:
   a) **Production of gamete.**
   b) **Site of fertilization.**
   c) **Site of implantation.**
   d) **Birth canal.**
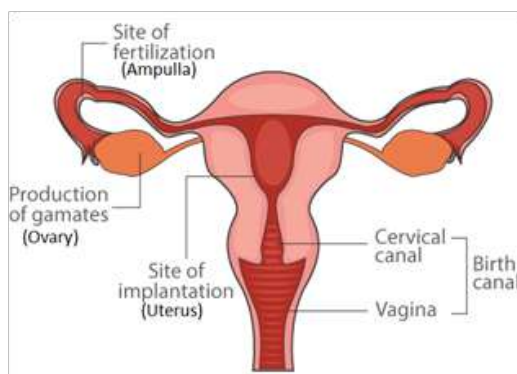
2. Differentiate Oogenesis and spermatogenesis.

S.No.	Oogenesis	Spermatogenesis
1	Production of eggs from Oogonia	Production of sperm from Spermatogonia
2	Takes place inside the ovary in females	Takes place inside the testes in males
3	Generates non–motile gametes	Produces motile gametes

3. List the following events observed in human reproduction in chronological order.
Fertilization, gametogenesis, insemination, gestation, parturition, implantation.
Following is the sequence of events occurring in the process of human reproduction:
✦   Gametogenesis.
✦   Insemination.
✦   Fertilization.
✦   Implantation.
✦   Gestation.
✦   Parturition.

4. What are the three types of reproduction in plants?
There are three types of reproduction in plants namely;
✦   Vegetative,
✦   Asexual and
✦   Sexual reproduction**.**

5. What are bulbils?
Bulbils is the modification of vegetative or floral bud. It is swollen due to storage of food. It can function as an organ of vegetative propagation. These bulbils fall on the ground and grow into new plants. eg: Agave.

6. What are the importance of Pollination?
✦   It results in fertilization which leads to the formation of fruits and seed.
✦   New varieties of plants are formed through new combination of genes in case of cross pollination.

7. What are the four whorls of a flower?
These whorls are from outside.
✦   Calyx – consisting of sepals.
✦   Corolla – consisting of petals.
✦   Androecium – consisting of stamens.
✦   Gynoecium or pistil – consisting of carpels.

8. What are the essential and non-essential parts of a flower?
✦   **Non-essential parts :** The two outermost whorls calyx and corolla are non–essential or accessory whorls as they do not directly take part in the reproduction.
✦   **Essential parts :** The other two whorls androecium and gynoecium are known as the essential whorls, because both take part directly in reproduction.

9. Describe the characteristic features flowers pollinated water (Hydrophilous) flower.
✦   Pollen grains are produced in large numbers.
✦   Pollen grains float on surface of water till they land on the stigma of female flowers e.g. Hydrilla, Vallisneria.

10. Describe the characteristic features of flowers pollinated by insects (Entamophilous).
To attract insects these flowers are brightly coloured, have smell and nectar. The pollen grains are larger in size, the exine is pitted, spiny etc., so they can be adhered firmly on the sticky stigma. Approximately, 80% of the pollination done by the insects is carried by honey bees.

11. Describe the characteristic features of wind-pollinated (Anemophilous) flower

✦ The anemophilous flowers produce enormous amount of pollen grains.

✦ The pollen grains are small, smooth, dry and light in weight.

✦ The stigmas are comparatively large, protruding and sometimes hairy to trap the pollen grains. eg: Grasses and some cacti.

12. What are significance of Fertilization in flowering plants?

✦ It stimulates the ovary to develop into fruit.

✦ It helps in development of new characters from two different individuals.

13. Write the post fertilization changes take place in flower.

✦ The ovule develops into a seed.

✦ The integuments of the ovule develop into the seed coat.

✦ The ovary enlarges and develops into a fruit.

14. What are the four phases of menstrual cycle?

The menstrual cycle consists of 4 phases;

✦ Menstrual or Destructive Phase.

✦ Follicular or Proliferative Phase.

✦ Ovulatory Phase.

✦ Luteal or Secretory Phase.

15. Describe the events leading to when fertilization occurs and does not occur.

✦ **If fertilization takes place :** The corpus luteum persists, continues to secrete progesterone maintains the thickened state of uterine wall and prevents maturation of another follicle till the end of pregnancy.

✦ **If fertilization does not occur :** Corpus luteum degenerates, the egg disintegrates and the uterine lining slowly breaks, discharged as blood and mucus leading to menstrual events.

16. Define implantation.

The blastocyst (fertilized egg) reaches the uterus and gets implanted in the uterus. The process of attachment of the blastocyst to the uterine wall (endometrium) is called implantation.

17. What is blastula?

The human embryo at the early stage of development when it is a hollow ball of cells is known as blastula. It is formed as the result of a series of rapid mitotic divisions of the zygote. It comprises an outer layer of smaller cells and inner mass of larger cells.

18. Define Gastrulation.

The transformation of blastula into gastrula and the formation of primary germ layers (ectoderm, mesoderm and endoderm) by rearrangement of the cells is called gastrulation.

19. What is organogenesis?

Organogenesis is the process by which the three germ tissue layers of the embryo, which are the ectoderm, endoderm, and mesoderm, develop into the internal organs of the organism.

20. What is placenta? Mention its function.

The placenta is a disc shaped structure attached to the uterine wall and is a temporary association between the developing embryo and maternal tissues. It allows the exchange of food materials, diffusion of oxygen, excretion of nitrogenous wastes and elimination of carbon dioxide.

21. How are the identical and non-identical twins formed?

✦ **Non-identical twins :** Sometimes ovaries releases two eggs and each is fertilised by a different sperm, resulting in Non-Identical Twins (Fraternal Twins).

✦ **Identical twins :** If single egg is fertilised and then divides into two foetus, Identical Twins develop.

22. What are the common contraceptive methods used to prevent pregnancy?

✦ Barrier methods.

✦ Hormonal methods.

✦ Intra-Uterine Devices (IUDs).

✦ Surgical methods**.**

23. What are Intra-Uterine Devices (IUDs)?

The intrauterine device (IUD) are contraceptive devices inserted into the uterus. There are two synthetic devices commonly used in India are Lippe's Loop and Copper-T made of copper and plastic (non irritant). This can remain for a period of 3 years. This reduces the sperm fertilizing capacity and prevents implantation.

24. Write the measures which can ensure toilet hygiene.

✦ The floors of the toilet should be maintained clean and dry. This helps to reduce the bad odour and also infection.

✦ Toilet flush handles, door knobs, faucets, paper towel dispensers, light switches and walls should be cleaned with disinfectants to kill harmful germs and bacteria.

✦ Hands should be washed thoroughly with soap before and after toilet use.

25. What is gametogenesis?

The formation of the sperm (Spermatogenesis) in male and the ovum (Oogenesis) in female is called gametogenesis.

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Additional – Long answer questions

</div>

1. Explain the vegetative reproduction takes place in plants.

In vegetative reproduction, new plantlets are formed from vegetative (somatic) cells, buds or organs (root, stem, leaf or bud) of plant. It has only mitotic division, no gametic fusion and daughter plants are genetically similar to the parent plant.

Vegetative reproduction may take place through;

I. **By vegetative parts**

✦ **Leaves :** In Bryophyllum small plants grow at the leaf notches

✦ **Stems :** In strawberry aerial weak stems touch the ground and give off adventitious roots and buds. When the connections with the parent plant is broken, the offspring beomes independent.

✦ **Root :** Tuberous roots (Asparagus and Sweet potato) can be used for vegetative propagation.

✦ **Bulbils :** In some plants the flower bud modifies into globose bulb which are called as bulbils, when these falls on the ground they grow into new plants. e.g. Agave.

II. **Fragmentation :** In filamentous algae, breaking of the filament into many fragments is called fragmentation. Each fragment having atleast one cell, may give rise to a new filament of the algae by cell division e.g. Spirogyra.

III. **Fission** : In this type the parent cell divides into two daughter cells and each cell develops into a new adult organism e.g. Amoeba.

IV. **Budding**: Formation of a daughter individual from a small projection, the bud, arising on the parent body is called budding. e.g. Yeast.

V. **Regeneration :** The ability of the lost body parts of an individual organism to give rise to an whole new organism is called regeneration. It takes place by specialized mass of cells e.g Hydra and Planaria.

2. With labelled diagram describe the structure of pollen grain.
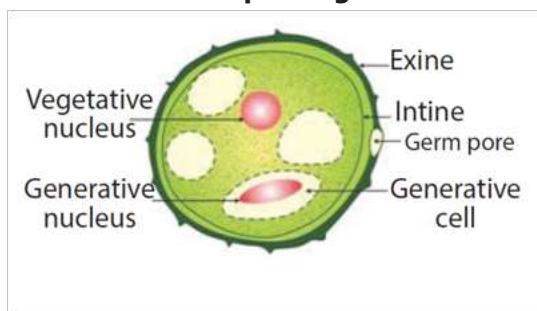
✦ Pollen grains are usually spherical in shape.
✦ It has two layered wall.
✦ **Exine :** The hard-outer layer is known as exine. It has prominent apertures called germpore.
✦ **Intine :** The inner thin layer is known as intine. It is a thin and continuous layer made up of cellulose and pectin.
✦ Mature pollen grains contain two cells, the vegetative and the generative cell.
✦ Vegetative cell contains a large nucleus.
✦ The generative cell divides mitotically to form two male gametes.

3. What is self-pollination or autogamy? What are the advantages and disadvantages of self pollination?

The transfer of pollen grains from the anther to the stigma of same flower or another flower borne on the same plant is known as self-pollination or autogamy. e.g. Hibiscus.

Advantages of self-pollination

✦ Self-pollination is possible in certain bisexual flowers.
✦ Flowers do not depend on agents for pollination.
✦ There is no wastage of pollen grains.

Disadvantages of self-pollination

✦ The seeds are less in numbers.
✦ The endosperm is minute. Therefore, the seeds produce weak plants.
✦ New varieties of plants cannot be produced.

4. What is Cross pollination or allogamy? What are the advantages and disadvantages of cross pollination?

Cross-pollination is the transfer of pollen from the anthers of a flower to the stigma of a flower on another plant of the same species. E.g. apples, grapes, plum, etc.

Advantages of cross pollination

✦ The seeds produced as a result of cross pollination, develop and germinate properly and grow into better plants, i.e. cross pollination leads to the production of new varieties.
✦ More viable seeds are produced.

Disadvantages of cross-pollination

✦ Pollination may fail due to distance barrier.
✦ More wastage of pollen grains
✦ It may introduce some unwanted characters
✦ Flowers depend on the external agencies for pollination

5. Explain the agents of Cross Pollination.

This takes place through the agency of animals, insects, wind and water.

✦ **Pollination by wind :** The pollination with the help of wind is called anemophily. e.g. Grasses and some cacti.
✦ **Pollination by insects :** Pollination with the help of insects like honey bees, flies are called entomophily.

✦ **Pollination by water :** The pollination with the help of water is called hydrophily.This takes place in aquatic plants. e.g. Hydrilla, Vallisneria.

✦ **Pollination by Animals :** When pollination takes place with the help of animals, it is called Zoophily.e.g. sun bird pollinates flowers of Canna, Gladioli etc., Squirrels pollinate flowers of silk cotton tree.

6.   Explain the process of fertilization of angiospermic plants.
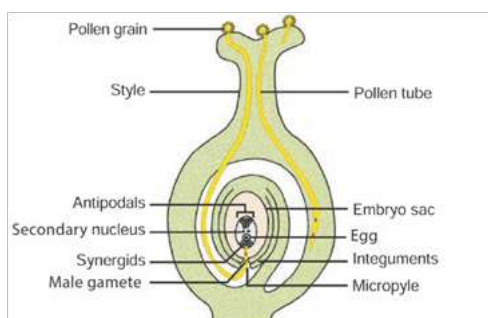
✦ Pollen grains reach the right stigma and begin to germinate.

✦ Pollen grain forms a small tube-like structure called pollen tube which emerges through the germ pore. The contents of the pollen grain move into the tube.

✦ Pollen tube grows through the tissues of the stigma and style and finally reaches the ovule through the micropyle.

✦ Vegetative cell degenerates and the generative cell divides to form two sperms (or male gametes).

✦ Tip of pollen tube bursts and the two sperms enter the embryo sac.

✦ One sperm fuses with the egg (syngamy) and forms a diploid zygote. Sperm (n) + Egg (n) = Zygote (2n)

✦ The other sperm fuses with the secondary nucleus (Triple fusion) to form the primary endosperm nucleus which is triploid in nature. Second sperm (n) + Secondary nucleus (2n) = Endosperm nucleus (3n)

✦ Since two types of fusion, syngamy and triple fusion take place in an embryo sac the process is termed as double fertilization.

✦ After triple fusion, primary endosperm nucleus develops into an endosperm. Endosperm provides food to the developing embryo.

✦ Later the synergids and antipodal cells degenerate.

7.   Describe the structure of testes with labelled diagram.
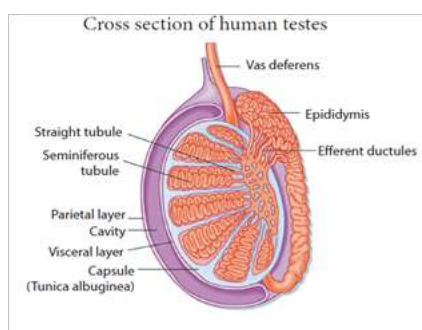
✦ Testes are the reproductive glands of the male that are oval shaped organs which lie outside the abdominal cavity of a man in a sac like structure called scrotum.

✦ Each testes is covered with a layer of fibrous tissue called tunica albuginea.

✦ Many septa from this layer divide the testes into pyramidal lobules, in which lie seminiferous tubules, cells of Sertoli, and the Leydig cells (interstitial cells).

✦ The process of spermatogenesis takes place in the seminiferous tubules.

✦ The Sertoli cells are the supporting cells and provide nutrients to the developing sperms.

✦ The Leydig cells are polyhedral in shape and lie between the seminiferous tubules and secrete testosterone. It initiates the process of spermatogenesis.

8. Describe the structure of Human Sperm with labelled diagram.
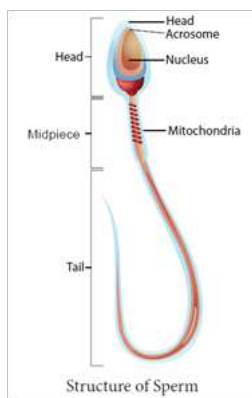
Structure of Sperm

✦ The spermatozoan consists of head, a middle piece and tail.
✦ The sperm head is elongated and formed by the condensation of nucleus.
✦ The anterior portion has a cap structure called acrosome.
✦ Acrosome contains hyaluronidase an enzyme that helps the sperm to enter the ovum during fertilization.
✦ A short neck connects the head and middle piece which comprises the centrioles.
✦ The middle piece contains the mitochondria which provides energy for the movement of tail. It brings about sperm motility which is essential for fertilization.

9. Describe the structure of Ovum with labelled diagram.

Structure of Ovum

i)   The mature ovum or egg is spherical in shape.
ii)   The ovum is almost free of yolk. It contains abundant cytoplasm and the nucleus.
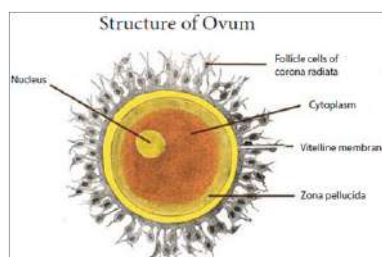iii) The plasma membrane of ovum is surrounded by three membranes.
     ✦ Inner thin zona pellucida.
     ✦ Vitelline membrane forms the surface layer of the ovum.
     ✦ An outer thick corona radiata. The corona radiata is formed of follicle cells.
iv)   The fluid-filled space between zona pellucida and the surface of the egg is called perivitelline space.

10. Describe different events of human reproduction from fertilization to foetal development.

✦ **Fertilization :** Fertilization in human is internal and occurs in the oviduct of the female genital tract. The sperm enters into the ovum and fuses with it, resulting in the formation of a 'zygote'. This process is called fertilization. The zygote is a fertilized ovum.
✦ **Cleavage and Formation of Blastula :** The first cleavage takes place about 30 hours after fertilization. Cleavage is a series of rapid mitotic divisions of the zygote to form many celled blastula (Blastocyst) which comprises an outer layer of smaller cells and inner mass of larger cells.
✦ **Implantation :** The blastocyst (fertilized egg) reaches the uterus and gets implanted in the uterus. The process of attachment of the blastocyst to the uterine wall (endometrium) is called implantation. The fertilized egg becomes implanted in about 6 to 7 days after fertilization.
✦ **Gastrulation :** The transformation of blastula into gastrula and the formation of primary germ layers

(ectoderm, mesoderm and endoderm) by rearrangement of the cells is called gastrulation. This takes place after the process of implantation.

✦ **Organogenesis :** The establishment of the germ layers namely ectoderm, mesoderm and endoderm initiates the final phase of embryonic development. During organogenesis the various organs of the foetus are established from the different germ layers attaining a functional state.

✦ **Formation of Placenta :** The placenta is a disc shaped structure attached to the uterine wall and is a temporary association between the developing embryo and maternal tissues. It allows the exchange of food materials, diffusion of oxygen, excretion of nitrogenous wastes and elimination of carbon dioxide. A cord containing blood vessels that connects the placenta with the foetus is called the umbilical cord.

✦ **Pregnancy (Gestation) :** It is the time period during which the embryo attains its development in the uterus. Normally gestation period of human last for about 280 days. During pregnancy the uterus expands upto 500 times of its normal size.

✦ **Parturition (Child Birth) :** Parturition is the expulsion of young one from the mother's uterus at the end of gestation. Oxytocin from the posterior pituitary stimulates the uterine contractions and provides force to expel the baby from the uterus, causing birth.

11. What is UTI ? Explain its types.

A urinary tract infection (UTI) is an infection in any part of our urinary system — our kidneys, ureters, bladder and urethra. Woman are susceptible to UTI from the bacteria that are present on skin, rectum or vagina.

The types of UTI are:

✦ **Cystitis or Bladder infection :** Bacteria lodged in the urinary bladder thrive and multiply leading to inflammation. It is most common in the age group of 20 to 50.

✦ **Kidney Infection :** The bacteria can travel from the urinary bladder and upward to ureter and affect one or both the kidneys. It also infects the blood stream and leads to serious life-threatening complications.

✦ **Asymptomatic Bacteriuria :** The bacteria present in the urinary bladder which may not show any symptoms.

Important Abbreviations to remember

LH	Luteinizing Hormone
FSH	Follicle Stimulating Hormone
RCH	Reproductive and Child Health Care
STD	Sexually Transmitted Diseases
IUD	Intra–Uterine Infection
UNICEF	United Nations International Children's Emergency Fund
WHO	World Health Organisation

UNIT TEST - 17

Time : 1.15 Hrs. Marks : 50

I. Choose the best answer

(5 × 1 = 5)

1. **Anemophilous flowers have _____.**
   a) Sessile stigma   b) Small smooth stigma   c) Colored flower   d) Large feathery stigma

2. **The plant which propagates with the help of its leaves is _____.**
   a) Onion   b) Neem   c) Ginger   d) Bryophyllum

3. **A single highly coiled tube where sperms are stored, get concentrated and mature is known as**
   a) Epididymis   b) Vasa efferentia   c) Vas deferens   d) Seminiferous tubules

4. **The cell division takes place during vegetative reproduction is _____.**
   a) Amitosis   b) Mitosis   c) Meiosis   d) None of the above

5. **Which of the following produces the male sex hormone?**
   a) Rete testis   b) Seminiferous tubule   c) Leydig cell   d) Scrotum

II. Fill in the blanks
(5 × 1 = 5)

6. Planaria reproduces asexually by _____.

7. Prolactin is a hormone produced by _____.

8. The implantation of the embryo occurs at about _____ day of fertilization.

9. In Agave, the flower bud modifies into globose bulb which are called as _____.

10. Each testes is covered with a layer of fibrous tissue called _____.

III. State whether the statements are true or false. Correct the false statement
(5 × 1 = 5)

11. Stalk of the ovule is called pedicle.

12. Menstrual cycle ceases during pregnancy.

13. The increased level of estrogen and progesterone is responsible for menstruation.

14. Sometimes ovaries releases two eggs and each is fertilised by a different sperm, resulting in identical twins.

15. Production of an offspring by a single parent without the formation and fusion of gametes is called sexual reproduction.

IV. Match the following
(5 × 1 = 5)

16. Fission   (a)   Spirogyra
17. Budding   (b)   Planaria
18. Fragmentation   (c)   Yeast
19. Agave   (d)   Bulbils
20. Regeneration   (e)   Amoeba

V. Assertion and Reasoning
(5 × 1 = 5)

Direction: In each of the following questions, a statement of Assertion is given and a corresponding statement of Reason is given just below it. Of the statements given below, mark the correct answer as

a. If both A and R are true and R is the correct explanation of A.

b. If both A and R are true but R is not the correct explanation of A.

c. If A is true but R is false.

d. If both A and R are false.

21. **Assertion:** Calyx and corolla are non–essential or accessory whorls of the flower.

    Reason: Calyx and corolla do not directly take part in the reproduction.

22. **Assertion:** Scrotal sac is located outside of the body.

    Reason: Testes need to be cooler than the temperature inside the body.

23. **Assertion:** Sertoli cells produces sperms.

    Reason: Leydigs cells secretes the male sex hormone testosterone.

24. **Assertion:** The epididymis is a highly coiled tube about 6 meteres long.

    Reason: It provides a temporary storage site for the immature sperms.

25. **Assertion:** Fertilization in human is internal.

    Reason: Fertilization occurs in the oviduct of the female genital tract.

VI. Write the answer for the following questions in word or sentence

(5 × 1 = 5)

26. In which part of the flower germination of pollen grains takes place?

27. What is the enzyme present in acrosome of sperm?
28. When is World Menstrual Hygiene Day observed?
29. What is the need for contraception?
30. Mention the function of endosperm.

VII. Write the short answer for ANY 5 of the following questions

(6 × 2 = 12)

31. How does binary fission differ from multiple fission?
32. Why is vegetative propagation practiced for growing some type of plants?
33. Why are the human testes located outside the abdominal cavity? Name the pouch in which they are present.
34. How does developing embryo gets its nourishment inside the mother's body?
35. Name the secondary sex organs in male.
36. What is colostrum? How is milk production hormonally regulated?
37. Differentiate Oogenesis and spermatogenesis.

VIII. Write long answer for the following questions

(2 × 5 = 10)

38. a) Write the events involved in the sexual reproduction of a flowering plant.
    b) Discuss the first event and write the types.
    c) Mention the advantages and the disadvantages of that event.

                                    or

    With neat labelled diagram describe the parts of typical angiospermic ovule.

39. What are the phases of menstrual cycle? Indicate the changes in the ovary and uterus.

                                    or

    Describe the structure of human sperm with labelled diagram.

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UNIT
18

HEREDITY

Points to Remember

➢ Variations are quite apparent among closely related groups of organisms.

➢ Mendel had choosen seven pairs of distinguishing traits: flower colour, position, seed colour, shape, pod colour, pod shape, stem length.

➢ Every pea plant has two 'factors' which are responsible for producing a particular character or trait is called allele.

➢ The process of acquiring characters or traits from parents is called 'Heredity'.

➢ Each human cell contains 23 pairs of chromosomes. Out of these 22 pairs are called autosomes and one pair is called allosomes.

➢ A chromosome consists of the regions: primary constriction, centromere, secondary constriction, telomere and satellite.

➢ Based on the position of the centromere, the chromosomes are classified as telocentric, acrocentric, sub metacentric and metacentric chromosomes.

➢ Each nucleotide of DNA consists of a deoxyribose sugar, a nitrogenous base and a phosphate group. Pairing is always between a purine and a pyrimidine.

➢ The sperm, produced by the father, determines the sex of the child. The mother is not responsible in determining the sex of the child.

➢ Mutation is an inheritable change in the genetic material of an organism.

TEXT BOOK EVALUATION

I. Book Exercise – Choose the best answer

1. **According to Mendel alleles have the following character**
   a) Pair of genes
   b) Responsible for character
   c) Production of gametes
   d) Recessive factors

   Ans : (b) Responsible for character

2. **9 : 3 : 3 : 1 ratio is due to**
   a) Segregation
   b) Crossing over
   c) Independent assortment
   d) Recessiveness

   Ans : (c) Independent assortment

3. **The region of the chromosome where the spindle fibres get attached during cell division**
   a) Chromomere   b) Centrosome   c) Centromere   d) Chromonema

   Ans : (c) Centromere

4. **The centromere is found at the centre of the _____ chromosome.**
   a) Telocentric   b) Metacentric   c) Sub-metacentric   d) Acrocentric

   Ans : (b) Metacentric

5. **The _____ units form the backbone of the DNA.**
   a) 5 carbon sugar   b) Phosphate   c) Nitrogenous bases   d) Sugar phosphate

   Ans : (d) Sugar phosphate

6. **Okasaki fragments are joined together by _____.**
   a) Helicase   b) DNA polymerase   c) RNA primer   d) DNA ligase

   Ans : (d) DNA ligase

7. **The number of chromosomes found in human beings are _____.**
   a) 22 pairs of autosomes and 1 pair of allosomes   b) 22 autosomes and 1 allosome
   c) 46 autosomes   d) 46 pairs autosomes and 1 pair of allosomes
                 Ans : (a) 22 pairs of autosomes and 1 pair of allosomes.

8. **The loss of one or more chromosome in a ploidy is called _____.**
   a) Tetraploidy   b) Aneuploidy   c) Euploidy   d) polyploidy
                 Ans : (b) Aneuploidy

II. Book Exercise – Fill in the blanks

1. The pairs of contrasting character (traits) of Mendel are called _____.   **Ans :** Allele
2. Physical expression of a gene is called _____   **Ans :** Phenotype
3. The thin thread like structures found in the nucleus of each cell are called _____.
              Ans : Chromosomes
4. DNA consists of two _____ chains.   **Ans :** Polynucleotide
5. An inheritable change in the amount or the structure of a gene or a chromosome is called _____.
              Ans : Mutation

III. Book Exercise – True or false (If false give the correct statement)

1. **A typical Mendelian dihybrid ratio of F2 generation is 3:1.**
   Ans : False. A typical Mendelian dihybrid ratio of F2 generation is **9 : 3: 3 : 1**.

2. **A recessive factor is altered by the presence of a dominant factor.**
   Ans : False. A recessive factor is **masked** by the presence of a dominant factor.

3. **Each gamete has only one allele of a gene.**
   Ans : True.

4. **Hybrid is an offspring from a cross between genetically different parent.**
   Ans : True.

5. **Some of the chromosomes have an elongated knob-like appendages known as telomere.**
   Ans : False. Some of the chromosomes have an elongated knob-like appendages known as **Satellite** .

6. **New nucleotides are added and new complementary strand of DNA is formed with the help of enzyme DNA polymerase.**
   Ans : True

7. **Down's syndrome is the genetic condition with 45 chromosomes.**
   Ans : False. Down's syndrome is the genetic condition with **47** chromosomes.

IV. Book Exercise – Match the following

1. **Match Column I with II**
   1. **Autosomes**   (a) **Trisomy 21**
   2. **Diploid condition**   (b) **9:3:3:1**
   3. **Allosome**   (c) **22 pair of chromosome**
   4. **Down's syndrome**   (d) **2n**
   5. **Dihybrid ratio**   (e) **23rd paif of chromosome**

   Ans :

1	Autosomes	c	22 pair of chromosome
2	Diploid condition	d	2n
3	Allosome	e	23rd pair of chromosome
4	Down's syndrome	a	Trisomy 21
5	Dihybrid ratio	b	9:3:3:1

V. Book Exercise – Answer in a sentence (1 mark)

1. What is a cross in which inheritance of two pairs of contrasting characters are studied?

A cross in which inheritance of two pairs of contrasting characters are studied is called Dihybrid cross.

2. Name the conditions when both the alleles are identical?

The conditions when both the alleles are identical (TT or tt) is known as Homozygous.

3. A garden pea plant produces axial white flowers. Another of the same species produced terminal violet flowers. Identify the dominant trait?

The dominant trait is axial white flower.

4. What is the name given to the segments of DNA, which are responsible for the inheritance of a particular character?

The segments of DNA, which are responsible for the inheritance of a particular character is gene.

5. Name the bond which binds the nucleotides in a DNA.

Hydrogen bond binds the nucleotides in a DNA.

VII. Book Exercise – Short answer question (2 mark)

1. Why did Mendel select pea plant for his experiments?
   ❖ It is naturally self–pollinating and is very easy to raise pure breeding individuals.
   ❖ It has a short life span so it is an annual and so it was possible to follow several generations.
   ❖ It is easy to cross–pollinate.
   ❖ It has deeply defined contrasting characters.
   ❖ The flowers are bisexual.

2. What do you understand by the term phenotype and genotype?
   ❖ **Phenotype :** External expression of of a particular trait.
   ❖ **Genotype :** Genetic expression of an organism.

3. What are allosomes?

Allosomes are chromosomes which are responsible for determining the sex of an individual. They are also called as sex chromosomes or hetero-chromosomes.

There are two types of sex chromosomes, X and Y- chromosomes.
   ❖ A male has XY chromosomes
   ❖ A female has XX Chromosomes

4. What are Okazaki fragments?

Okazaki fragments are short sequences of DNA nucleotides which are synthesized discontinuously and later linked together by enzyme DNA ligase to create the lagging strand during DNA replication.

5. Why is euploidy considered to be advantageous to both plants and animals?

Organisms with multiples of the basic chromosome set are called euploid.
   ❖ Plants with euploidy condition have increased fruit and flower size.
   ❖ Plants and animals with euploidy condition are typically sterile.

6. A pure tall plant (TT) is crossed with pure dwarf plant (tt), what would be the F1 and F2 generations? Explain.

Mendel selected tall (TT) and dwarf (tt) garden pea plants, Pisum sativum, for the Monohybrid cross.

When a pure breeding tall plant (TT) was crossed with a pure breeding dwarf plant(tt), all plants were tall in the first filial generation (F1)

When such an F1 tall plant (Tt) was allowed to self-pollination, both the tall and dwarf plants appeared in second filial generation (F2) in the ratio of 3:1.

Monohybrid Cross
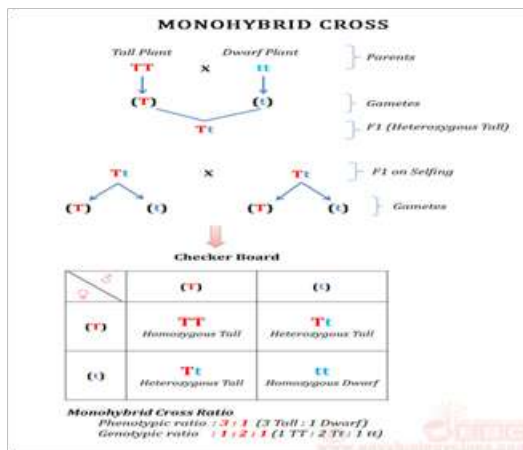
7. Explain the structure of a chromosome.

❖ The chromosomes are thin, long and thread like structures consisting of two identical strands called sister chromatids.

❖ They are held together by the centromere.

❖ Each chromatid is made up of spirally coiled thin structure called chromonema.

❖ The chromonema has number of bead-like structures along its length which are called chromomeres.

❖ The chromosomes are made up of DNA, RNA, chromosomal proteins (Histones and non–histones) and certain metallic ions.

❖ These proteins provide structural support to the chromosome.

❖ Some of the chromosomes have an elongated knob-like appendage at one end of the chromosome known as satellite.

❖ The chromosomes with satellites are called as the sat-chromosomes.
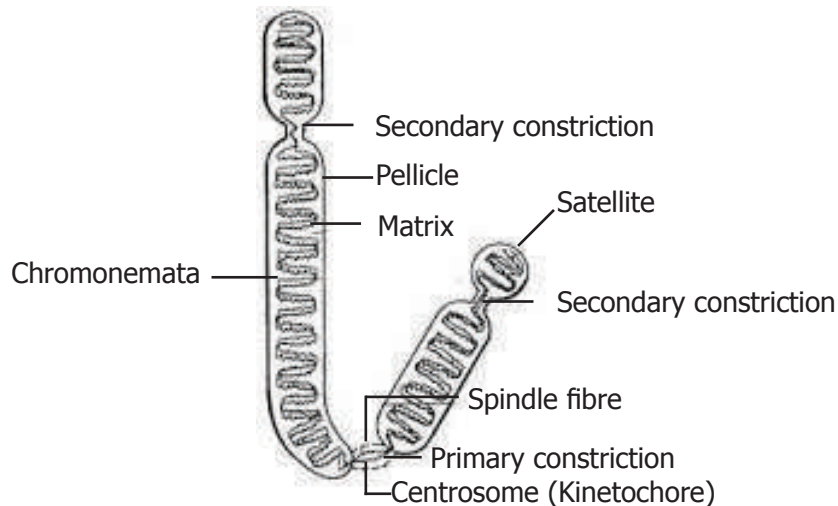
8. Label the parts of the DNA in the diagram given below. Explain the structure briefly.
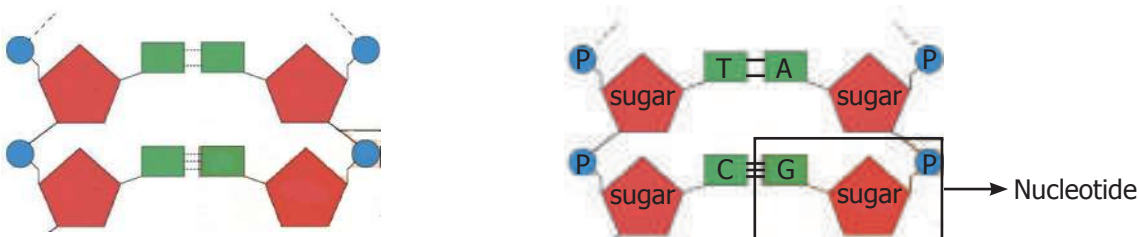
DNA is a large molecule consisting of millions of nucleotides. Each nucleotide consists of three components.

i)   A sugar molecules – Deoxyribose sugar.

ii) A nitrogenous base. There are two types of nitrogenous bases in DNA. They are;
  ❖ Purines (Adenine and Guanine).
  ❖ Pyrimidines (Cytosine and Thymine).
iii) A phosphate group.

VII. Book Exercise – Long answer question (5 mark)

1. **Explain with an example the inheritance of dihybrid cross. How is it different from monohybrid cross?**
  ❖ Dihybrid cross involves the inheritance of two pairs of contrasting characteristics (or contrasting traits) at the same time.
  ❖ Mendel first crossed pure breeding pea plants having round-yellow (RRYY) seeds with pure breeding pea plants having wrinkled-green (rryy) seeds and found that only round-yellow (RrYy) seeds were produced in the first generation (F1).
  ❖ When the hybrids of F1 generation pea plants having round-yellow (RrYy) seeds were cross-bred by self pollination, then four types of seeds having different combinations of shape and color were obtained in second generation or F2 generation. They were round yellow, round-green, wrinkled yellow and wrinkled-green seeds.
  ❖ The ratio of each phenotype (or appearance) of seeds in the F2 generation is 9:3:3:1. This is known as the Dihybrid ratio.
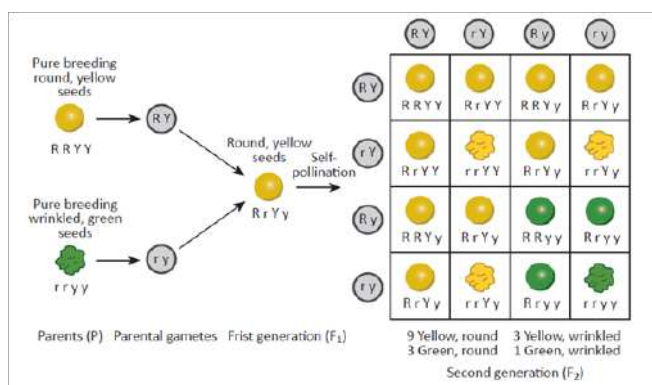
Differences between Monohybrid and Dihybrid cross.

S.No.	Monohybrid cross	Dihybrid cross
1	The inheritance of one pair of contrasting characteristics	The inheritance of two pairs of contrasting characteristics
2	The phenotypic ratio is 3:1	The phenotypic ratio is 9:3:3:1

2. **How is the structure of DNA organised? What is the biological significance of DNA?**
  The structure of DNA
  ❖ DNA molecule consists of two polynucleotide chains.
  ❖ These chains form a double helix structure with two strands which run anti-parallel to one another.
  ❖ Nitrogenous bases in the centre is linked by sugar-phosphate units which form the backbone of the DNA.
  ❖ Pairing between the nitrogenous bases is very specific and is always between purine and pyrimidine linked by hydrogen bonds.
    i) Adenine (A) links Thymine (T) with two hydrogen bonds (A = T).
    ii) Cytosine (C) links Guanine (G) with three hydrogen bonds(C ≡ G).
    This is called complementary base pairing.
  ❖ Hydrogen bonds between the nitrogenous bases make the DNA molecule stable.
  ❖ Each turn of the double helix is 34 A° (3.4 nm). There are ten base pairs in a complete turn.
  ❖ The nucleotides in a helix are joined together by phosphodiester bonds.

Biological significance of DNA

❖ It is responsible for the transmission of hereditary information from one generation to next generation.

❖ It contains information required for the formation of proteins.

❖ It controls the developmental process and life activities of an organism.

3. **The sex of the new born child is a matter of chance and neither of the parents may be considered responsible for it. What would be the possible fusion of gametes to determine the sex of the child?**

The sex of the new born child is a chance of probability as to which category of sperm fuses with the egg.

If the egg (X) is fused by the X-bearing sperm an XX individual (female) is produced.

Egg (22+X)   +   Sperm (22+X) = Female child (44+XX)

If the egg (X) is fused by the Y-bearing sperm an XY individual (male) is produced.

Egg (22+X)   +   Sperm (22+Y) = Male child (44+XY)

Thus the sperm, produced by the father, determines the sex of the child.

The mother is not responsible in determining the sex of the child.
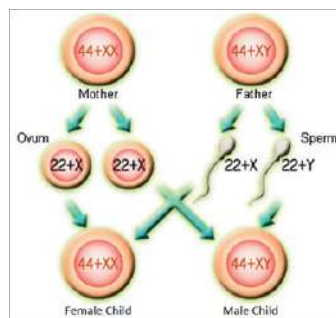
VIII. Book Exercise – Higher Order Thinking Skills (HOTS)

1. **Flowers of the garden pea are bisexual and self-pollinated. Therefore, it is difficult to perform hybridization experiment by crossing a particular pistil with the specific pollen grains. How Mendel made it possible in his monohybrid and dihybrid crosses?**

In pea plants, cross pollination can be easily achieved by emasculation in which the stamen of the flower is removed without affecting the pistil. The emasculated flower is immediately enclosed in a bag to prevent pollination by unwanted pollen. Then, the specific , mature and viable pollen grains are collected from the male parent, the bag is opened and the pollen grains are dusted on the stigma.

2. **Pure-bred tall pea plants are first crossed with pure-bred dwarf pea plants. The pea plants obtained in F1 generation are then cross-bred to produce F2 generation of pea plants.**

a. **What do the plants of F1 generation look like?**

All the plants of F1 generation are tall (Tt).

b. **What is the ratio of tall plants to dwarf plants in F2 generation?**

The ratio of tall plants to dwarf plants in F2 generation is 3:1.

c. **Which type of plants were missing in F1 generation but reappeared in F2 generation?**

The trait dwarf is missing in F1 generation but reappeared in F2 generation.

3. **Kavitha gave birth to a female baby. Her family members say that she can give birth to only female babies because of her family history. Is the statement given by her family members true. Justify your answer.**

The statement given by her family members is not true. Because, the sex of the new born child is a chance of probability as to which category of sperm fuses with the egg.

If the egg (X) is fused by the X-bearing sperm an XX individual (female) is produced.

Egg (22+X)   +   Sperm (22+X)   = Female child (44+XX)

If the egg (X) is fused by the Y-bearing sperm an XY individual (male) is produced.

Egg (22+X)   +   Sperm (22+Y)   = Male child (44+XY)

Thus the sperm, produced by the father, determines the sex of the child. The mother or her family history is not responsible in determining the sex of the child.

VIII. Book Exercise – Higher Order Thinking Skills (HOTS)

1. **Under which conditions does the law of independent assortment hold good and why?**
   - ❖ The factors for each character or trait remain independent and maintain their identity in the gametes.
   - ❖ The factors are independent to each other and pass to the offspring (through gametes).
   - ❖ If the law of independent assortment did not happen, all the genes have been locked with each other and not a single gene can be able to express independently.
   - ❖ Independent assortment of genes is important to produce new genetic combinations that increase genetic variations within a population.

Additional – Choose the best answer

1. **_____ is the common genetic material for all organisms except some viruses.**
   a) Mitochondria   b) RNA   c) DNA   d) Ribosome

   Ans.: c) DNA

2. **One of the following characters of pea plant is NOT CORRECT. Find out it.**
   a) The flowers are unisexual   b) It is an annual
   c) It is easy to cross-pollinate   d) It has deeply defined contrasting characters

   Ans.: a) The flowers are unisexual

3. **The actual number of tall and dwarf plants obtained in F2 generation by Mendel in Monohybrid cross were 787 tall and _____ dwarf.**
   a) 354   b) 787   c) 177   d) 277

   Ans.: d) 277

4. **Phenotypic ratio of Mendel's Monohybrid cross is**
   a) 3:1   b) 1: 3   c) 1:2:1   d) 2:1:2

   Ans.: a) 3:1

5. **A dihybrid cross produced _____ types of F2 offsprings.**
   a) Two   b) Three   c) Four   d) Six

   Ans.: c) Four

6. **If the centromere is found on the proximal end of chromosome, it is called as _____.**
   a) Telocentric   b) Acrocentric   c) Submetacentric   d) Meta centric

   Ans.: a) Telocentric

7. **If the centromere is found at the one end with a short arm and a long arm, the chromosome is called as _____.**
   a) Telocentric   b) Acrocentric   c) Submetacentric   d) Meta centric

   Ans.: b) Acrocentric

8. **If the centromere is found near the centre of the chromosome and form two unequal arms, the chromosome is called as_____.**
   a) Telocentric   b) Acrocentric   c) Submetacentric   d) Meta centric

   Ans.: c) Submetacentric

9. **If the centromere occurs in the centre of the chromosome and form two equal arms. The chromosome is called_____.**
   a) Telocentric   b) Acrocentric   c) Submetacentric   d) Meta centric

   Ans.: d) Meta centric

10. **_____ contain genes that determine the somatic (body) characters.**
    a) Allosomes   b) Autosomes   c) Sex chromosomes   d) Hetero-chromosomes

    Ans.: b) Autosomes

11. _____ are chromosomes which are responsible for determining the sex of an individual.
   - a) Allosomes
   - b) Sex chromosomes
   - c) Hetero-chromosomes
   - d) All the above

   Ans.: d) All the above

12. **Adenine (A) links Thymine (T) with _____ hydrogen bonds.**
   - a) One
   - b) Two
   - c) Three
   - d) Four

   Ans.: b) Two

13. **Cytosine (C) links Guanine (G) with _____ hydrogen bonds.**
   - a) One
   - b) Two
   - c) Three
   - d) Four

   Ans.: c) Three

14. **The length of the complete turns of the double helix is _____.**
   - a) $34A°$ or 3.4 nm
   - b) $38A°$ or 3.8 nm
   - c) $0.34A°$ or $0.003.4$ nm
   - d) 3.4 Å or 0.34 nm

   Ans.: a) $34A°$ or 3.4 nm

15. **The distance between two base pair in a DNA is _____.**
   - a) $34A°$ or 3.4 nm
   - b) $38A°$ or 3.8 nm
   - c) $0.34A°$ or $0.003.4$ nm
   - d) 3.4 Å or 0.34 nm

   Ans.: d) 3.4 Å or 0.34 nm

16. **Each complete turn of the double helix of DNA consists of _____ base pairs.**
   - a) Five
   - b) Eight
   - c) Ten
   - d) Twenty

   Ans.: c) Ten

17. **The specific points on the DNA, where the replication begins, is the _____ of replication.**
   - a) Terminus
   - b) Site of origin
   - c) Replication fork
   - d) None of the above

   Ans.: b) Site of origin

19. **A new complementary strand of DNA is formed from each of the parent strand by the enzyme _____.**
   - a) Topoisomerase
   - b) DNA helicases
   - c) DNA polymerase
   - d) DNA Ligases

   Ans.: c) DNA polymerase

20. **Human beings have _____ pairs of autosomes.**
   - a) 22
   - b) 23
   - c) 44
   - d) 46

   Ans.: a) 22

21. **The chromosome type in female gametes or the eggs is**
   - a) 22 + XY
   - b) 22 + Y
   - c) 22 + XX
   - d) 22+X

   Ans.: d) 22 + X

22. **The chromosome type in male gametes or the sperms is**
   - a) 22 + X
   - b) 22 + Y
   - c) 22 + XY
   - d) Both a) and b)

   Ans.: d) Both a) and b)

23. **The _____ determines the sex of the child.**
   - a) Zygote
   - b) Egg
   - c) Sperm
   - d) Ova

   Ans.: c) Sperm

24. **Triploid plants and animals are typically _____.**
   - a) Sterile
   - b) Fertile
   - c) Bisexual
   - d) Unisexual

   Ans.: a) Sterile

25. **The condition of having a diploid chromosome complement in which one chromosome lacks its homologous partner (2n − 1) is _____.**

    a) Monosomy   b) Trisomy   c) Nullisomy   d) None of the above

                                                     Ans.: a) Monosomy

26. **The condition in which an extra copy of a chromosome (2n + 1) is present in the cell nuclei is known as _____.**

    a) Monosomy   b) Trisomy   c) Nullisomy   d) None of the above

                                                     Ans.: b) Trisomy

27. **_____ is a condition where a pair of homologous chromosomes that would normally be present is missing (2n − 2).**

    a) Monosomy   b) Trisomy   c) Nullisomy   d) None of the above

                                                     Ans.: c) Nullisomy

28. **Down's syndrome is an example for**

    a) Monosmy   b) Triosomy   c) Nullisomy   d) None of the above

                                                     Ans. : b) Triosomy

29. **Sickle cell anaemia is an example for _____.**

    a) Gene mutation   b) Chromosomal mutation

    c) Euploidy   d) Aneuploidy

                                                     Ans.: a) Gene mutation

30. **Due to the Alteration in the protein molecule caused by gene mutation, the red blood cell (RBC) that carries the haemoglobin is _____ shaped.**

    a) Spherical   b) Oval   c) Disc   d) Sickle

                                                     Ans.: d) Sickle

31. **In tobacco, if the diploid number of chromosomes is 48, how many chromosomes will be found in a pollen grain?**

    a) 96   b) 48   c) 24   d) 12

                                                     Ans.: c) 24

32. **Mitotic cell division results in two cells that have:**

    a) n chromosomes and are genetically identical   b) n chromosomes and are genetically different

    c) 2n chromosomes and are genetically identical   d) 2n chromosomes and are genetically different

                                 Ans.: c) 2n chromosomes and are genetically identical

33. **The four cells produced in meiosis will have a:**

    a) 2n number of chromosomes and will differ genetically from each other

    b) 2n number of chromosomes and will be genetically identical to each other

    c) n number of chromosomes and will be genetically identical to each other

    d) n number of chromosomes and will differ genetically from each other

                 Ans.: d) n number of chromosomes and will differ genetically from each other

34. **An example of alleles is:**

    a) AB and Tt   b) TT and Tt   c) T and t   d) X and Y

                                                     Ans.: c) T and t

35. **If two white sheep produce a black offspring, the parent's genotypes for colour must be :**

    a) Heterozygous   b) Homozygous white   c) Homozygous black   d) None of the above

                                                     Ans.: a) Heterozygous

36. **Which of the following factors could lead to variations in the offspring of asexually reproducing organisms?**

    a) Crossing over   b) Fertilization

    c) Mutations   d) Independent assortment

                                                    Ans.: c) Mutations

37. Normal human eggs have:
   a) 22 autosomes and an X chromosome
   b) 22 autosomes and a Y chromosome
   c) 23 autosomes
   d) 46 chromosomes

   Ans.: a) 22 autosomes and an X chromosome

38. Mendel was born in the year
   a) 1822   b) 1847   c) 1865   d) 1900

   Ans.: a) 1822

39. Botanical name of pea plant is
   a) Pisum sativum   b) Lathyrus odoratus   c) Mirabilis jalapa   d) Antirrhinum

   Ans.: a) Pisum sativum

40. Genotype means:
   a) The genetic constitution of an organism
   b) The appearance of an organism
   c) The gametes produced by male parent
   d) The gametes received by female parent

   Ans.: a) The genetic constitution of an organism

Additional – Fill in the blanks

1. The branch of biology that deals with the genes, genetic variation and heredity of living organisms is called _____.   **Ans.:** Genetics

2. Transmission of characters, from one generation to the next generation is called _____.   **Ans.:** Heredity

3. The differences shown by the individuals of the same species and also by the offspring of the same parents is called _____.   **Ans.:** Variation

4. _____ discovered the basic principles of heredity through his experiments.

   Ans.: Gregor Johann Mendel

5. Mendel's experiments are the foundation for modern _____.   **Ans.:** Genetics

6. Mendel was born in 1822 to a family of farmers in Silesian of _____.   **Ans.:** Czechoslovakia

7. Crosses involving inheritance of only one pair of contrasting characters are called _____.

   Ans.: Monohybrid crosses

8. External expression of a particular trait is known as _____.   **Ans.:** Phenotype

9. The genotypic ratio of Mendel's Monohybrid cross is _____.   **Ans.:** 1:2:1

10. The genetic expression of an organism is known as _____.   **Ans.:** Genotype

11. The condition in which a gene possesses a pair of the same alleles (TT or tt) for a single characteristic is known as _____.   **Ans.:** Homozygous

12. The condition in which a gene possesses a pair of different alleles (Tt) for a single characteristic is called _____.   **Ans.:** Heterozygous

13. Two factors making up a pair of contrasting characters are called _____.   **Ans.:** Alleles or allelomorphs

14. The character which is expressed when two factors for alternative expression of a trait are brought together by fertilization is known as _____ character.   **Ans.:** Dominant

15. The character which is masked when two factors for alternative expression of a trait are brought together by fertilization is called _____ character.   **Ans.:** Recessive

16. Involving the inheritance of two pairs of contrasting characteristics at the same time is known as _____ cross.   **Ans.:** Dihybrid

17. When Mendel crossed plants producing round-yellow seeds and wrinkled-green seeds he obtained plants with _____ seeds in F1 generation.   **Ans.:** Round-yellow

18. The phenotypic ratio dihybrid cross is _____.   **Ans.:** 9:3:3:1

19. _____ was awarded Nobel Prize in 1993 for determining the role of chromosomes in heredity.

        Ans.: T.H. Morgan

20. Based on his experiments of monohybrid and dihybrid cross, Mendel proposed three important laws known as Mendel's Laws of _____.   **Ans.:** Heredity

21. The term 'chromosomes' was first named by _____ in 1888.   **Ans.:** Waldeyer

22. _____ are segments of DNA, which are responsible for the inheritance of a particular phenotypic character.   **Ans.:** Genes

23. A _____ is a spot on a chromosome at which a gene for a particular trait is located.   **Ans.:** Locus

24. One copy of a newly copied chromosome which is still joined to the original chromosome by a single centromere is called _____.

        Ans.: Chromatid

25. _____ are the two identical halves of a single replicated chromosome which are joined at the centromere.   **Ans.:** Sister chromatids

26. The spirally coiled central thread like structure of chromatid is called _____.   **Ans.:** Chromonema

27. The chromonema has number of bead-like structures along its length which are called _____.

        Ans.: Chromomeres

28. The two arms of a chromosome meet at a point called _____.   **Ans.:** Primary constriction or centromere

29. The _____ is the region where spindle fibres attach to the chromosomes during cell division.

        Ans.: Centromere

30. _____ constrictions of the chromosome are known as the nuclear zone or nucleolar organizer.

        Ans.: Secondary

31. The end of the chromosome is called _____.   **Ans.:** Telomere

32. _____ maintains and provides stability to the chromosomes.   **Ans.:** Telomere

33. An elongated knob-like appendage at one end of the chromosome is known as _____.   **Ans.:** Satellite

34. The chromosomes with satellites are called as the _____.   **Ans.:** Sat-chromosomes

35. Telocentric and Acrocentric chromosomes are _____ shaped.   **Ans.:** Rod

36. Metacentric chromosomes are _____ shaped.   **Ans.:** V

37. _____ chromosomes are J shaped or L shaped chromosomes.   **Ans.:** Submetacentric

38. In human, each somatic or body cell normally contains _____ pairs of chromosomes.   **Ans.:** 23

39. If a cell contains a single set (n) of chromosomes it is said to be _____.   **Ans.:** Haploid

40. If a cell contains a double set (2n) of chromosomes, it is said to be _____.   **Ans.:** Diploid

41. _____ is the number, size and shape of chromosomes in the cell nucleus of an organism.

        Ans.: Karyotype

42. The diagrammatic representation of karyotype of a species is known as _____.   **Ans.:** Idiogram

43. Double helical structure of DNA was discovered by _____ and _____ in 1962.

        Ans.: James Watson and Francis Crick

44. Watson, Crick, Franklin and Wilkins co-discovered the _____ model of DNA on the basis of X-ray diffraction studies of DNA.   **Ans.:** Three-dimensional

45. In appreciation of their discoveries on the molecular structure of nucleic acids Watson, Crick and Wilkins were awarded Nobel prize for Medicine in the year _____.   **Ans.:** 1962

46. As DNA is consisting of millions of nucleotides. it is also called a _____.   **Ans.:** Polynucleotide

47. Purines and pyrimidines are the two types of _____ bases in DNA.   **Ans.:** Nitrogenous

48. Nitrogenous bases in the centre is linked by _____ units which form the backbone of the DNA.

                                                                                            Ans.: Sugar-phosphate

49. Purine and pyrimidine are linked by _____bonds.   **Ans.:** Hydrogen

50. _____ is the complementary base of cytosine in DNA.   **Ans.:** Guanine

51. _____ is the complementary base of thymine in DNA.   **Ans.:** Adenine

52. _____ bonds between the nitrogenous bases make the DNA molecule stable.   **Ans.:** Hydrogen

53. The adjacent nucleotides in a helix are joined together by _____ bonds.   **Ans.:** Phosphodiester

54. DNA molecule produces exact copies of its own structure during _____ process.   **Ans.:** Replication

55. The enzyme _____ cause the two parent DNA strands to unwind and separate from one another at the origin of replication.   **Ans.:** DNA helicases

56. "Y-shaped" _____ is formed at the point where the two strands open and separate during DNA replication.   **Ans.:** Replication fork

57. The enzyme called _____ separates the double helix above the replication fork and removes the twists formed during the unwinding process.   **Ans.:** Topoisomerase

58. A _____ is a short single strand of RNA or DNA that serves as a starting point for DNA synthesis.

                                                                                            Ans.: RNA primer

59. The enzyme which makes DNA from nucleotides is _____.   **Ans.:** DNA polymerase

60. The daughter strand which is synthesized as a continuous strand during DNA replication is called _____.

                                                                                            Ans.: Leading strand

61. The daughter strand in which short segments of DNA are synthesized is called _____.

                                                                                            Ans.: Lagging strand

62. The short segments of DNA are called _____fragments.   **Ans.:** Okazaki

63. The Okazaki fragments are joined together by the enzyme called _____.   **Ans.:** DNA ligase

64. The replication of DNA stops at a site called _____.   **Ans.:** Terminus

65. Opposite point to origin of replication site is called _____.   **Ans.:** Terminus

66. If the egg (X) is fused by the X- chromosome bearing sperm a _____ child is produced.   **Ans.:** Female

67. If the egg (X) is fused by the Y- chromosome bearing sperm a_____ child is produced.   **Ans.:** Male

68. Fertilization of the egg (22 + X) with a sperm (22 + X) will produce a _____ child.   **Ans.:** Female

69. Fertilization of the egg (22 + X) with a sperm (22 + Y) will give rise to a _____ child.   **Ans.:** Male

70. The term mutation was introduced by _____in 1901.   **Ans.:** Hugo De Vries

71. The plant in which Hugo De Vries first observed phenotypic changes (Mutation) is _____.

                                                    Ans.: The evening primrose / Oenothera lamarckiana.

72. _____is an inheritable sudden change in the genetic material (DNA) of an organism.

                                                                                            Ans.: Mutation

73. The sudden change in the structure or number of chromosomes is called _____mutation.

                                                                                            Ans.: Chromosomal

74. Changes in the number of chromosomes involve addition or deletion in the number of chromosomes present in a cell is called _____.   **Ans.:** Ploidy

75. _____ is the condition in which the individual bears more than the usual number of diploid (2n) chromosomes. **Ans.:** Euploidy

76. If an individual has three haploid (3n) sets of chromosomes, the condition is called_____.

Ans.: Triploidy

77. If an organism has four haploid (4n) sets of chromosomes, the condition is called _____.

Ans.: Tetraploidy

78. _____ plants are advantageous as they often result in increased fruit and flower size.

Ans.: Tetraploid

79. The loss or gain of one or more chromosomes in a set is called as _____. **Ans.:** Aneuploidy

80. Down's syndrome is one of the commonly known _____condition. **Ans.:** Aneuploidy

81. Down's syndrome condition was first identified by a doctor named _____ in1866.

Ans.: Langdon Down

82. _____ is a genetic disorder in which there is an extra copy of chromosome 21 (Trisomy 21).

Ans.: Down's syndrome

83. _____ mutation is the changes occurring in nucleotide sequence of a gene.

Ans.: Gene

84. Gene mutation involves substitution, deletion, insertion or inversion of a single or more than one _____ base.

Ans.: Nitrogenous

85. Gene alteration results in abnormal _____ formation in an organism. **Ans.:** Protein

86. _____ is a graphical representation to calculate the probability of all possible genotype of offsprings.

Ans.: Punnett square

Additional – True or false (If false give the correct statement)

1. **Two new combinations of traits with round green and wrinkled yellow had appeared in the F2 of dihybrid cross.**
   Ans.: True.

2. **Male and female have different number of autosomes.**
   Ans.: False.
   Correct statement : Male and female have **equal** number of autosomes.

3. **Out of 23 pairs of chromosomes, 22 pairs are autosomes and the 23rd pair is the allosome or sex chromosome.**
   Ans.: True.

4. **Polynucleotide chains form a double helix structure with two strands which run parallel to one another.**
   Ans.: False.
   Correct statement : Polynucleotide chains form a double helix structure with two strands which run **anti-parallel** to one another.

5. **In DNA, the proportion of adenine and guanine is always equal to that of thymine and cytosine respectively.**
   Ans.: True.

6. **The 23rd pair in human is called the sex chromosomes.**
   Ans.: True.

7. **Sperm bearing (22 + X) chromosomes and sperm bearing (22 + Y) chromosomes are produced in unequal proportions.**

    Ans.: False.

    Correct statement : Sperm bearing (22 + X) chromosomes and sperm bearing (22 + Y) chromosomes are produced in **equal** proportions.

8. **The mother is not responsible in determining the sex of the child.**

    Ans.: True.

Additional – Match the following

Section I

1.	Gregor Johann Mendel	(a)	Double helix DNA
2.	Monohybrid Cross	(b)	Cytosine and Thymine
3.	Law of Segregation	(c)	Inheritance of One Gene
4.	Chromosomal protein	(d)	Aging clock
5.	Primary constriction	(e)	Sex chromosomes
6.	Telomeres	(f)	Adenine and Guanine
7.	Allosomes	(g)	Histones
8.	Purines	(h)	Centromere
9.	Pyrimidines	(i)	Law of purity of gametes
10.	Watson and Crick	(j)	Father of Genetics

Ans :

1	Gregor Johann Mendel	j	Father of Genetics
2	Monohybrid Cross	c	Inheritance of One Gene
3	Law of Segregation	i	Law of purity of gametes
4	Chromosomal protein	g	Histones
5	Primary constriction	h	Centromere
6	Telomeres	d	Aging clock
7	Allosomes	e	Sex chromosomes
8	Purines	f	Adenine and Guanine
9	Pyrimidines	b	Cytosine and Thymine
10	Watson and Crick	a	Double helix DNA

Section II

1.	Nucleoside	(a)	DNA base pairing
2.	Nucleotide	(b)	Heterogametic
3.	Unwinding enzymes	(c)	homogametic
4.	Chargaff rule	(d)	Nucleoside + Phosphate
5.	Human females	(e)	Triosomy 21
6.	Human males	(f)	Nitrogen base + Sugar
7.	Evening primrose	(g)	DNA helicases
8.	Down's syndrome	(h)	3D of DNA
9.	Pea plant	(i)	Oenothera lamarckiana
10.	Franklin and Wilkins	(j)	Pisum sativum

Ans :

1	Nucleoside	f	Nitrogen base + Sugar
2	Nucleotide	d	Nucleoside + Phosphate
3	Unwinding enzymes	g	DNA helicases
4	Chargaff rule	a	DNA base pairing
5	Human females	c	Homogametic
6	Human males	b	Heterogametic
7	Evening primrose	i	Oenothera lamarckiana
8	Down's syndrome	e	Triosomy 21
9	Pea plant	j	Pisum sativum
10	Franklin and Wilkins	h	3D of DNA

Additional – Answer in a Word or Sentences

1. Define Genetics.

The branch of biology that deals with the genes, genetic variation and heredity of living organisms is called genetics.

2. Define heredity.

Heredity is transmission of characters, from one generation to the next generation.

3. Define variation.

Variation refers to the differences shown by the individuals of the same species and also by the offspring of the same parents.

4. What are phenotype and genotype?

Phenotype : It is the observable physical appearance of an organism.

Genotype : It is the genetic make-up of an individual organism.

5. Give the phenotypic and genotypic ratio of monohybrid cross.

In monohybrid cross

      1.Phenotypic ratio is 3 : 1   2.Genotypic ratio is 1 : 2 : 1

6. Give the phenotypic ratio of dihybrid cross.

The phenotypic ratio of dihybrid cross is **9 : 3 : 3 : 1**

7. What are genes?

Genes are segments of DNA, which are responsible for the inheritance of a particular phenotypic character.

8. Define karyotype.

Karyotype is the number, size and shape of chromosomes in the cell nucleus of an organism.

9. What is mutation ?

Mutation is an inheritable sudden change in the genetic material (DNA) of an organism.

10. State the Chargaff rule of DNA base pairing.

Erwin Chargaff states that in DNA, the proportion of adenine is always equal to that of thymine. and the proportion of guanine always equal to that of cytosine.

11. What is Chromonema?

The spirally coiled central thread like structure of chromatid is called **Chromonema**.

12. What is chromatid?

One copy of a newly copied chromosome which is still joined to the original chromosome by a single centromere is called **Chromatid**.

<div style="text-align:center">**Additional – Short answers**</div>

1. What is monohybrid cross?

Crosses involving inheritance of only one pair of contrasting characters are called monohybrid crosses. For example a cross between single pair of contrasting trait such as tall and dwarf plant.

2. What are homozygous and heterozygous?

i) **Homozygous :** It is a condition in which a gene possesses a pair of the same alleles (TT or tt) for a single characteristic.

ii) **Heterozygous :** It is a condition in which a gene possesses a pair of different alleles (Tt) for a single characteristic.

3. Define allele or allelomorph.

Two factors making up a pair of contrasting characters are called **alleles** or **allelomorphs**.

Each allele controls a single trait. The dominant allele 'T' controls the trait tallness. The recessive allele 't' controls the trait dwarfness.

4. Differentiate dominant and recessive condition.

Dominant condition	Recessive condition
1. The character which expresses itself is called dominant condition.	1. The character which is masked is called recessive condition.
2. It will be expressed in both homozygous (TT) condition and heterozygous (Tt).	2. It will be expressed only in homozygous (tt) condition.

5. Define dihybrid cross.

Dihybrid cross involves the inheritance of two pairs of contrasting characteristics (or contrasting traits) at the same time.

For example the cross between round-yellow (RRYY) seeds and wrinkled-green seeds (rryy).

6. What is the chemical composition of chromosome?

The chromosomes are made up of

i) **Nucleic acids :** DNA, RNA,

ii) **Chromosomal proteins :** Histones and non-histones and

iii) Certain metallic ions.

7. What is telomere ? What are the functions of telomere in chromosome?

The end of the chromosome is called telomere.

Functions :

i) It maintains and provides stability to the chromosomes.

ii) Telomeres act as aging clock in every cell.

8. What is Satellite?

An elongated **knob-like appendage present** at one end of the some chromosomes is known as satellite. The chromosomes with satellites are called as the **sat-chromosomes**.

9. Differentiate haploid and diploid.

Haploid	Diploid
1. Haploid describes a cell that contains a single set (n) of chromosomes.	1. Diploid describes a cell that contains a double set (2n) of chromosomes.
2. Gametes are haploid (n) cells that contain 23 chromosomes in human.	2. Body cells are diploid (2n) that contain 46 or 23 set of chromosomes in human.
3. Haploid cells are produced by meiotic cell division.	3. Diploid cells are produced by mitotic cell division.

10. What is idiogram?

Idiogram is the diagrammatic representation of karyotype of a species. It consists of all the metaphasic chromosomes arranged in homologous pairs according to decreasing length, thickness, position of centromere, shape etc., with the sex chromosomes placed at the end.
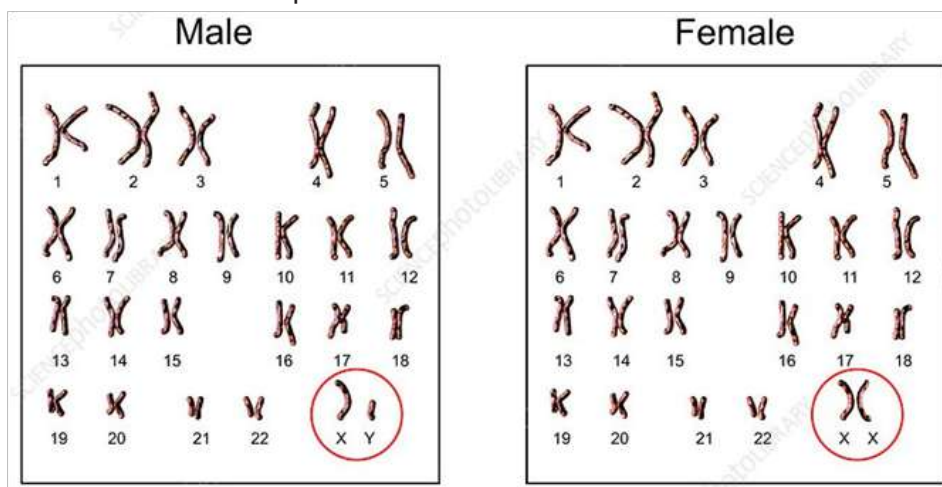
11. What is the chemical composition of DNA molecule.

DNA is a large molecule consisting of millions of nucleotides. Hence, it is also called a **polynucleotide**. Each nucleotide consists of three components.

i)   A sugar molecules : Deoxyribose sugar.

ii)   A nitrogenous base : There are two types of nitrogenous bases in DNA. They are

       a) Purines (Adenine and Guanine)

       b) Pyrimidines (Cytosine and Thymine)

iii) A phosphate group.

12. What is DNA Replication?

DNA replication is one of the basic process that occurs within a cell. DNA molecule produces exact copies of its own structure during replication process. The two strands of a DNA molecule have complementary base pairs, the nucleotides of each strand provide the information needed to produce its new strand. The two resulting daughter cells contain exactly the same genetic information as the parent cell.

13. What is Down's Syndrome ? What are the symptoms of Down's syndrome?

Down's syndrome: Down's syndrome (DS or DNS), also known as trisomy 21, is a genetic disorder caused by the presence of all or part of a third copy of chromosome 21. This condition was first identified by a doctor named Langdon Down in1866.

Symptoms: It is associated with mental retardation, delayed development, behavioural problems, weak muscle tone, vision and hearing disability are some of the conditions seen in these children.

14. Classify the chromosomes based on function.

The eukaryotic chromosomes are classified into **autosomes** and **allosomes**.

i)   **Autosomes**   They contain genes that determine the somatic (body) characters. Male and female have equal number of autosomes.

ii)   **Allosomes** They are chromosomes which are responsible for determining the sex of an individual. They are also called as **sex chromosomes** or **hetero-chromosomes**.

   eg: X and Y- chromosomes. Human male have XY chromosome and female have XX.

Additional – Long answers

1. State the three Mendel's Laws of Heredity.

i)   **Law of Dominance :** "When two homozygous individuals with one or more sets of contrasting characters are crossed, the characters that appear in the F1 hybrid are dominant and those that do not appear in F1 are recessive characters".

ii) **Law of Segregation or Law of purity of gametes :** "When a pair of contrasting factors or genes or allelomorphs are brought together in a heterozygote or hybrid, the two members of the allelic pair remain together without mixing and when gametes are formed, the two separate out, so that only one enters each gamete."

iii) **Law of independent assortment :** "In case of inheritance of two or more pairs of characters simultaneously, the factors or genes of one pair assort out independently of the other pair."

2.   **Classify the chromosomes based on the position of centromere?**

Based on the position of centromere, the chromosomes are classified as **Telocentric, Acrocentric, Submetacentric** and **Metacentric**

Telocentric   *Acrocentric*   *Sub-metacentric*   *Metacentric*
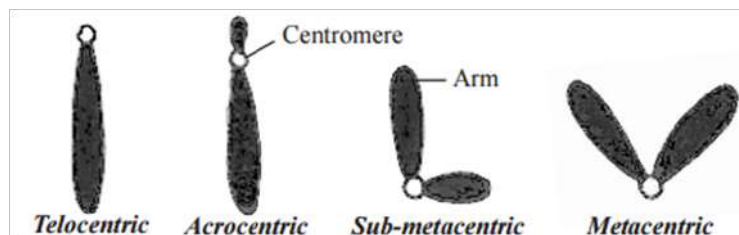
i) **Telocentric** – The centromere is found on the proximal end. They are rod shaped chromosomes.

ii) **Acrocentric** – The centromere is found at the one end with a short arm and a long arm. They are also rod-shaped chromosomes.

iii) **Submetacentric** – The centromere is found near the centre of the chromosome. Thus forming two unequal arms. They are J shaped or L shaped chromosomes.

iv) **Metacentric** – The centromere occurs in the centre of the chromosome and form two equal arms. They are V shaped chromosomes

4.   **Explain the Watson and Crick model of DNA structure with diagram.**

i) DNA molecule consists of two **polynucleotide** chains.

ii) These chains form a **double helix** structure with two strands which run **anti-parallel** to one another.

iii) **Nitrogenous bases** in the centre is linked by **sugar-phosphate** units which form the backbone of the DNA.

iv) Pairing between the nitrogenous bases is very specific and is always between purine and pyrimidine linked by hydrogen bonds.

* Adenine (A) links Thymine (T) with two hydrogen bonds (A = T)

* Cytosine (C) links Guanine (G) with three hydrogen bonds(C ≡ G)

This is called **complementary base pairing**.

v) Hydrogen bonds between the nitrogenous bases make the DNA molecule stable.

vi) Each turn of the double helix is 34 A° (3.4 nm). There are ten base pairs in a complete turn.

vii) The nucleotides in a helix are joined together by phosphodiester bonds.

5.   **Give an account on the classification of mutation.**

Mutations are classified into two main types, namely chromosomal mutation and gene mutation.

A.   **Chromosomal mutation**

The **sudden change** in the **structure** or **number of chromosomes** is called chromosomal mutation. This may result in

i) **Changes in the structure of chromosomes :** Structural changes in the chromosomes usually occurs due to errors in cell division. Changes in the number and arrangement of genes takes place as a result of deletion, duplication, inversion and translocation in chromosomes.

ii) **Changes in the number of chromosomes :** They involve addition or deletion in the number of chromosomes present in a cell. This is called **ploidy**.

There are two types of ploidy   a) Euploidy   and   b) Aneuploidy.

a) **Euploidy:** It is the condition in which the individual bears **more than the usual number** of diploid (2n) chromosomes.

1. If an individual has three haploid sets of chromosomes, the condition is called **triploidy** (3n). Triploid plants and animals are typically sterile.

2. If it has four haploid sets of chromosomes, the condition is called **tetraploidy** (4n). Tetraploid plants are advantageous as they often result in increased fruit and flower size.

b) **Aneuploidy:** It is the loss or gain of one or more chromosomes in a set. It is of three types.

    1. **Monosomy** (2n-1),

    2. **Trisomy** (2n+1) and

    3. **Nullisomy** (2n-2).

In man, Down's syndrome is one of the commonly known aneuploid condition. It is a genetic condition in which there is an extra copy of **chromosome 21 (Trisomy 21)**.

B. Gene or point mutation

Gene mutation is the **changes** occurring in **nucleotide sequence of a gene**. It involves substitution, deletion, insertion or inversion of a single or more than one nitrogenous base. Gene alteration results in abnormal protein formation in an organism.

Important Scientists to remember

1	Gregoz Johan Mendel	Father of Genetics
2	R.C.Punnett	Introduced punnett square
3	T.H.Morgan	Awarded Nobel Prize in 1993 for determining the role of chromosomes in heredity
4	Waldeyer	Coined the term chromosome in 1885
5	James Watson and Francis Crick	Double helical structure of DNA / 3D model of DNA. Awarded Nobel Prize for Medicine in 1962
6	Rosalind Franklin and Maurice Wilkins	They obtained 3D model of DNA
7	Erwin Chargaff	Proposed Rule of DNA base pairing
8	Langdon Down	Identified Down's Syndrome in 1866

Important Abbreviations to remember

1	DNA	Deoxyribonucleic Acid
2	RNA	Ribonucleic Acid
3	F_1 and F_2	Filial-1 and Filial-2

UNIT TEST - 18

Time : 1.15 Hrs.   Marks : 50

I. Choose the best answer
(5 × 1 = 5)

1. **9 : 3 : 3 : 1 ratio is due to;**
   a) Segregation   b) Crossing over
   c) Independent assortment   d) Recessiveness

2. **Okasaki fragments are joined together by _____.**
   a) Helicase   b) DNA polymerase   c) RNA primer   d) DNA ligase

3. **The loss of one or more chromosome in a ploidy is called _____.**
   a) Tetraploidy   b) Aneuploidy   c) Euploidy   d) polyploidy

4. **_____ is the common genetic material for all organisms except some viruses.**
   a) Mitochondria   b) RNA   c) DNA   d) Ribosome

5. **A dihybrid cross produced _____ types of F2 offsprings.**
   a) Two   b) Three   c) Four   d) Six

II. Fill in the blanks
(5 × 1 = 5)

6. DNA consists of two _____ chains .
7. Physical expression of a gene is called _____.
8. An inheritable change in the amount or the structure of a gene or a chromosome is called _____.
9. The condition in which a gene possesses a pair of different alleles (Tt) for a single characteristic is called _____.
10. The branch of biology that deals with the genes, genetic variation and heredity of living organisms is called _____.

III. State whether the statements are true or false. Correct the false statement
(5 × 1 = 5)

11. A typical Mendelian dihybrid ratio of F2 generation is 3:1.
12. Each gamete has only one allele of a gene.
13. Down's syndrome is the genetic condition with 45 chromosomes.
14. Male and female have different number of autosomes.
15. The mother is not responsible in determining the sex of the child.

IV. Match the following
(5 × 1 = 5)

16. Autosomes   (a)   Trisomy 21
17. Diploid condition   (b)   9:3:3:1
18. Allosome   (c)   22 pair of chromosome
19. Down's syndrome   (d)   2n
20. Dihybrid ratio   (e)   23rd pair of chromosome

V. Write the answer for the following questions in word or sentence
(8 × 1 = 8)

21. What is Chromonema?
22. What are genes?
23. Define Genetics.
24. Name the conditions when sboth the alleles are identical?
25. What is the name given to the segments of DNA, which are responsible for the inheritance of a particular character?

26. What is a cross in which inheritance of two pairs of contrasting characters are studied?
27. Define karyotype.
28. What is mutation ?

VI. Write the short answer for ANY 6 of the following questions

(6 × 2 = 12)

29. Why did Mendel select pea plant for his experiments?
30. What are allosomes?
31. What are Okazaki fragments?
32. Why is euploidy considered to be advantageous to both plants and animals?
33. What do you understand by the term phenotype and genotype?
34. Differentiate dominant and recessive condition.
35. What is Satellite?
36. What is telomere ? What are the functions of telomere in chromosome?

VII. Write long answer for the following questions

(2 × 5 = 10)

37. Explain with an example the inheritance of dihybrid cross. How is it different from monohybrid cross?

or

State the three Mendel's Laws of Heredity.

38. Explain the structure of chromosome with labelled diagram.

or

Explain the Watson and Crick model of DNA structure with diagram.

☙❖☙

ORIGIN AND EVOLUTION OF LIFE

> **Points to Remember**

➢ Lamarck proposed that the acquired characters are passed on to the offsprings in the next generation.

➢ Internal vital force, environment and new needs, use and disuse theory and inheritance of acquired characters are the main principles of Lamarckism.

➢ Each species tends to produce large number of offsprings, but only the fittest can survive.

➢ Homologous, analogous organs and embryological evidences explain evolutionary relationships.

➢ Some traits in organisms would be similar because they are inherited from a common ancestor.

➢ Fossils are evidences of ancient life forms or ancient habitats which have been preserved by natural processes.

➢ Ethnobotanical importance of various types of plants are know through traditional knowledge.

➢ Astrobiology/exobiology is the science which looks for the presence of extra terrestrial life in the universe.

> **TEXT BOOK EVALUATION**

I. Book Exercise – Choose the best answer

1. **Biogenetic law states that _____**
   a) Ontogeny and phylogeny go together
   b) Ontogeny recapitulates phylogeny
   c) Phylogeny recapitulates ontogeny
   d) There is no relationship between phylogeny and ontogeny
   Ans : (b) Ontogeny recapitulates phylogeny

2. **The 'use and disuse theory' was proposed by _____.**
   a) Charles Darwin
   b) Ernst Haeckel
   c) Jean Baptiste Lamarck
   d) Gregor Mendel
   Ans : (c) Jean Baptiste Lamarck

3. **Palaeontologist deal with**
   a) Embryological evidences
   b) Fossil evidences
   c) Vestigial organ evidences
   d) All the above
   Ans : (b) Fossil evidences

4. **The best way of direct dating fossils of recent origin is by**
   a) Radio–carbon method
   b) Uranium lead method
   c) Potassium–argon method
   d) Both (a) and (c)
   Ans : (a) Radio–carbon method

5. **The term Ethnobotany was coined by**
   a) Khorana
   b. J.W. Harsbberger
   c) Ronald Ross
   d. Hugo de Vries
   Ans : (b) J.W. Harsbberger

II. Book Exercise – Fill in the blanks

1. The characters developed by the animals during their life time, in response to the environmental changes are called _____. **Ans.:** Adaptation

2. The degenerated and non-functional organs found in an organism are called _____. **Ans.:** Vestigial

3. The forelimb of bat and human are examples of _____ organs. **Ans.:** Homologous

4. The theory of natural selection for evolution was proposed by _____. **Ans.:** Charles Darwin

III. Book Exercise – True or false (If false give the correct statement)

1. **The use and disuse theory of organs' was postulated by Charles Darwin.**
   Ans : False. The use and disuse theory of organs' was postulated by **Jean Baptiste Lamarck**.

2. **The homologous organs look similar and perform similar functions but they have different origin and developmental pattern.**
   Ans : False. The **analogous** organs look similar and perform similar functions but they have different origin and developmental pattern.

3. **Birds have evolved from reptiles.**
   Ans : True.

IV. Book Exercise – Match the following

1. **Match Column A with B**

	Column A		Column B
1.	Atavism	(a)	Caudal vertebrae and vermiform appendix
2.	Vestigial	(b)	A forelimb of a cat and a organs bat's wing
3.	Analogous	(c)	Rudimentary tail and organs thick hair on the body
4.	Homologous	(d)	A wing of a bat and organs a wing of an insect
5.	Wood park	(e)	Radiocarbon dating
6.	W.F. Libby	(f)	Thiruvakkarai

   Ans :

S.No.	Column A		Column B
1	Atavism	c	Rudimentary tail and organs thick hair on the body
2	Vestigial	a	Caudal vertebrae and vermiform appendix
3	Analogous	d	A wing of a bat and organs a wing of an insect
4	Homologous	b	A forelimb of a cat and a organs bat's wing
5	Wood park	f	Thiruvakkarai
6	W.F. Libby	e	Radiocarbon dating

V. Book Exercise – Answer in a sentence (1 mark)

1. **A human hand, a front leg of a cat, a front flipper of a whale and a bat's wing look dissimilar and adapted for different functions. What is the name given to these organs?**
   Homologous organs.

2. **Which organism is considered to be the fossil bird?**
   Archaeopteryx is considered to be the fossil bird.

3. **What is the study of fossils called?**
   The study of fossils is called Palaeontology.

VI. Book Exercise – Short answer question (2 mark)

1. **The degenerated wing of a kiwi is an acquired character. Why is it an acquired character?**
   The kiwi was flying bird in New Zealand. At the time there were no enemies on the land in the New Zealand. Hence, they did not attempt to fly. This happened generation after generation resulting degeneration of wings and loss flight. This character is acquired due to environmental changes. The acquired characters are transmitted to off springs. So the degenerated wing of a kiwi is an acquired character.

2. **Why is Archaeopteryx considered to be a connecting link?**
   Archaeopteryx is the oldest known fossil bird. It was an early bird-like form found in the Jurassic period. It had wings with feathers, like a bird. It had long tail, clawed digits and conical teeth, like a reptile. So it is considered to be a connecting link between reptiles and birds.

3.   Define Ethnobotany and write its importance.

Ethnobotany is the study of a region's plants and their practical uses through the traditional knowledge of the local culture of people.

Importance of Ethnobotany

❖   It provides traditional uses of plant.

❖   It gives information about certain unknown and known useful plants.

❖   The ethnomedicinal data will serve as a useful source of information for the chemists, pharmacologists and practitioners of herbal medicine.

❖   Tribal communities utilize ethnomedicinal plant parts like bark, stem, roots, leaves, flower bud, flowers, fruits, seeds, oils, resins, dyes, gum for the treatment of diseases like diarrhoea, fever, headache, diabetes, jaundice, snakebites, leprosy, etc.

4.   How can you determine the age of the fossils?

The age of fossils is determined by radioactive elements present in it. They may be carbon, uranium, lead or potassium.

Radioactive carbon (C^{14}) dating method : This method was discovered by W.F. Libby (1956). Carbon consumption of animals and plants stops after death and since then, only the decaying process of C^{14} occurs continuously. The time passed since death of a plant or animal can be calculated by measuring the amount of C^{14}. present in their body.

VII. Book Exercise – Long answer question (5 mark)

1.   Natural selection is a driving force for evolution-How?

Natural selection is a driving force for evolution. Origin of new species takes place through the following steps.

❖   **Overproduction :** Living beings have the ability to reproduce more individuals and form their own progeny. This will increase reproductive potential leading to overproduction.

❖   **Struggle for existence :** Overproduction creates an intense competition among the organisms for food and space leading to struggle.

❖   **Variation :** Small variations are important for evolution. According to Darwin favourable variations are useful to the organism. These variations are inherited by offspring from their parents.

❖   **Survival of the fittest or Natural selection :** During the struggle for existence, the organisms which can overcome the challenging situation, survive and adapt to the surrounding environment. Organisms which are unable to face the challenges, are unfit to survive and disappear. The process of selection of organisms with favourable variation is called as natural selection.

❖   Origin of species According to Darwin, new species originates by the gradual accumulation of favourable variations for a number of generations.
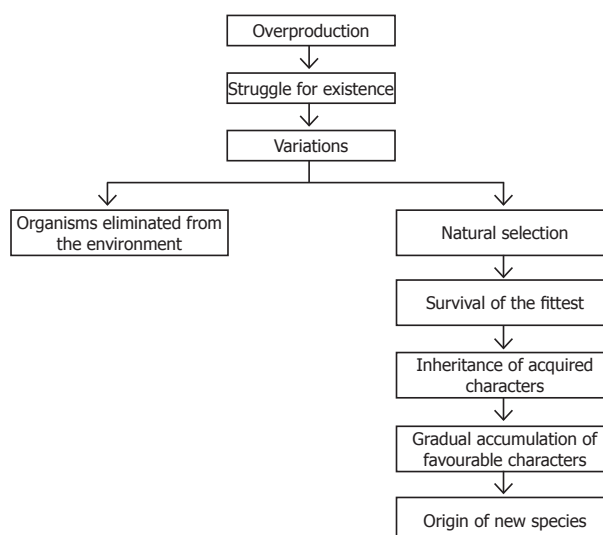
2.   How do you differentiate homologous organs from analogous organs?

S.No.	Homologous organs	Analogous organs
1	They have inherited from common ancestors with similar developmental pattern in embryos	They have different origin with different development pattern
2	Homologous organs look dissimilar and adapted for different functions	The analogous organs look similar and perform similar functions
3	Example 1: Forelimb of a frog and man seem to be built from the same basic design of bones but they perform different functions	Example 1 : Wings of birds and bats look similar. But in birds wings are covered by feathers all along the arm but the wings of bats is skin folds stretched between elongated fingers
4	Example 2 : A human hand, a front leg of a cat, flipper of a whate and a bat's wing look dissimilar and adapted for different functions	Example 2 : Penguins and fish both have fin–like structures to swim aquatic environments. These locomotory organs have different origin but look similar and perform similar function

3.   How does fossilization occur in plants?

The process of formation of fossil in the rocks is called fossilization. Common methods of fossilization includes petrifaction, molds and cast, carbonization, preservation, compression and infiltration.

❖   **Petrifaction :** Minerals like silica slowly penetrate in and replace the original organic tissue and forms a rock like fossil. This method of fossilization can preserve hard and soft parts. Most bones and wood fossils are petrified.

❖   **Mold and Cast :** A replica of a plant or animal is preserved in sedimentary rocks. When the organism gets buried in sediment it is dissolved by underground water leaving a hollow depression called a mold. It shows the original shape but does not reveal the internal structure. Minerals or sediment fill the hollow depression and forms a cast.

❖   **Preservation :** Original remains can be preserved in ice or amber (tree sap). They protect the organisms from decay. The entire plant or animal is preserved.

❖   **Compression :** When an organism dies, the hard parts of their bodies settle at the bottom of the sea bed and are covered by sediment. The process of sedimentation goes on continuously and fossils are formed.

❖   **Infiltration or Replacement :** The precipitation of minerals takes place which later on infiltrate the cell wall. The process is brought about by several mineral elements such as silica, calcium carbonate and magnesium carbonate. Hard parts are dissolved and replaced by these minerals.

VIII. Book Exercise – Higher Order Thinking Skills (HOTS)

1.   Arun was playing in the garden. Suddenly he saw a dragon fly sitting on a plant. He observed the wings of it. He thought it looked similar to a wing of a crow. Is he correct? Give reason for your answer.

No, He is not correct.

The wing of crow and the wing of dragon fly have different developmental origin and structural design but perform similar function. They are known as analogous organs.

2.   Imprints of fossils tell us about evolution- How?

❖   The study of fossils helps us to understand the line of evolution of many invertebrates and vertebrates.

❖   Fossil records show that the evolution has taken a gradual process from simple to complex organisms.

❖   The origin of modern birds is supported by the evidences from palaeontology.

❖   Fossils provide solid evidence that organisms from the past are not the same as those found today.

❖   By comparing the morphological, or anatomical, record of both modern species and fossils, palaeontologists can infer the ancestors of those species.

3. **Octopus, cockroach and frog all have eyes. Can we group these animals together to establish a common evolutionary origin? Justify your answer.**

No, they can't be grouped together.

The eye of Octopus is similar in their anatomy and abilities to eyes of vertebrates, but they have photoreceptor cells not just in their eyes, but also in their skin, insects have compound eyes and vertebrates have highly specialised eyes; however, all of them perform the same function that is a vision.

But the eyes of Octopus, cockroach and frog have different origin. So they can't be grouped together to establish a common evolutionary origin.

Additional – Choose the best answer

1. **The Big Bang theory explains the**
   a) Origin of Universe   b) Origin of bacteria   c) Origin of plants   d) Origin of human being
   Ans.: a) Origin of Universe

2. **Earth was supposed to have been formed about _____ years back.**
   a) 4.5 million   b) 4.5 billion   c) 45 million   d) 45 billion
   Ans.: b) 4.5 billion

3. **Life appeared _____ years after the formation of earth.**
   a) 50 billion   b) 50 million   c) 500 billion   d) 500 million
   Ans.: d) 500 million

4. **Biogenesis theory was proposed by**
   a) Charles Darwin   b) Jean Baptiste Lamarck   c) Louis Pasteur   d) Oparin
   Ans.: c) Louis Pasteur

5. **According to Spontaneous generation (Abiogenesis) theory life originated spontaneously from _____.**
   a) Living organisms   b) Lifeless matter   c) Bacteria   d) Pre-existing life
   Ans.: b) Lifeless matter

6. **According to Biogenesis theory, life originated from _____.**
   a) Organic chemicals   b) Lifeless matter   c) Fire   d) Pre-existing life
   Ans.: d) Pre-existing life

7. **Oparin (1922) and Haldane (1929) proposed**
   a) Chemical Evolution of Life   b) Cosmic origin of life or Theory of Extraterrestrial
   c) Spontaneous generation (Abiogenesis) theory   d) Biogenesis theory
   Ans.: a) Chemical Evolution of Life

8. **Most accepted theory of origin of life is**
   a) Chemical Evolution of Life   b) Cosmic origin of life or Theory of Extraterrestrial
   c) Spontaneous generation (Abiogenesis) theory   d) Biogenesis theory
   Ans.: a) Chemical Evolution of Life

9. **Inorganic molecules $\longrightarrow$ Organic molecules $\longrightarrow$ Colloid system $\longrightarrow$ Life. This is the concept of**
   a) Chemical Evolution of Life   b) Cosmic origin of life or Theory of Extraterrestrial
   c) Spontaneous generation (Abiogenesis) theory   d) Biogenesis theory
   Ans.: a) Chemical Evolution of Life

10. **Organs which have inherited from common ancestors, look dissimilar and adapted for different functions are known as _____ organs .**
    a) Homologous   b) Analogous   c) Vestigial   d) None of the above
    Ans.: a) Homologous

11. **The fore limbs of mammals such as human hand, front leg of a cat, flipper of a whale and bat's wing are examples for _____ organs.**
    a) Homologous   b) Analogous   c) Vestigial   d) None of the above
    Ans.: a) Homologous

12. **Organs which look similar and perform similar functions but they have different origin are known as _____.**
    a) Homologous   b) Analogous   c) Vestigial   d) None of the above
    Ans.: b) Analogous

13. **The wings of a bat, the wings of a bird and wings of an insect seem to be similar and perform similar function but they have different origin. They are examples for _____ organs.**
    a) Homologous   b) Analogous   c) Vestigial   d) None of the above
    Ans.: b) Analogous

14. **The degenerated and non-functional organs of animals are called _____ organs.**
    a) Homologous   b) Analogous   c) Vestigial   d) None of the above
    Ans.: c) Vestigial

15. **Vermiform appendix, nictitating membrane, caudal vertebra, coccyx are examples for _____ organs.**
    a) Homologous   b) Analogous   c) Vestigial   d) None of the above
    Ans.: c) Vestigial

16. **Presence of rudimentary tail in new born babies, presence of thick hair on the human body are examples for _____.**
    a) Homologous organs   b) Analogous organs   c) Vestigial organs   d) Atavism
    Ans.: d) Atavism

17. **Biogenetic law or Recapitulation theory was given by**
    a) Charles Darwin   b) Jean Baptiste Lamarck   c) Louis Pasteur   d) Ernst Haeckel
    Ans.: d) Ernst Haeckel

18. **_____ is called the Father of Palaeontology.**
    a) Charles Darwin   b) Leonardo da Vinci
    c) Jean Baptiste Lamarck   d) Louis Pasteur
    Ans.: b) Leonardo da Vinci

19. **Archaeopteryx is the oldest known fossil _____.**
    a) Amphibian   b) Reptile   c) Bird   d) Mammal
    Ans.: c) Bird

20. **Wings with feathers, like a bird and had long tail, clawed digits and conical teeth, like a reptile is the characteristics feature of _____ .**
    a) Bat   b) Penguin   c) Archaeopteryx   d) Ostrich
    Ans.: c) Archaeopteryx

21. **'Theory of inheritance of Acquired Characters" was proposed by**
    a) Charles Darwin   b) Leonardo da Vinci
    c) Jean Baptiste Lamarck   d) Louis Pasteur
    Ans.: c) Jean Baptiste Lamarck

22. **If an organ is used constantly, the organ develops well and gets strengthened and when an organ is not used for a long time, it gradually degenerates. This is concept of**
    a) Theory of Natural Selection   b) Use and disuse theory
    c) Spontaneous generation theory   d) Biogenesis theory
    Ans.: b) Use and disuse theory

23. Charles Darwin was one of the great naturalist and philosopher of _____ century.
 a) 15th   b) 16th   c) 17th   d) 18th

         Ans.: d) 18th

24. Charles Darwin was born in _____ in 1809.
 a) America   b) Italy   c) France   d) England

         Ans.: d) England

25. Competition among the individuals of same species is known as _____ struggle .
 a) Environmental   b) Intraspecific   c) Interspecific   d) Intergeneric

         Ans.: b) Intraspecific

26. Competition between the organisms of different species living together is known as _____ struggle.
 a) Environmental   b) Intraspecific   c) Interspecific   d) Intergeneric

         Ans.: c) Interspecific

27. Struggle of an organism against the natural conditions like extreme heat or cold, drought and floods is known as _____ struggle.
 a) Environmental   b) Intraspecific   c) Interspecific   d) Intergeneric

         Ans.: a) Environmental

28. Sexual reproduction, which involves _____ helps in recombination of genes during gametic fusion.
 a) Amitosis   b) Mitosis   c) Meiosis   d) Fission

         Ans.: c) Meiosis

29. Mutation theory was proposed by _____.
 a) Charles Darwin   b) Leonardo da Vinci
 c) Jean Baptiste Lamarck   d) Hugo de Vries

         Ans.: d) Hugo de Vries

30. Mutation occurs due to
 a) Errors occurring in DNA   b) Exposure to UV rays
 c) Exposure to chemicals   d) All of the avove

         Ans.: d)All of the above

31. "Father of Paleobotany" is
 a) Charles Darwin   b) Leonardo da Vinci
 c) Kaspar Maria Von Sternberg   d) Hugo de Vries

         Ans.: c) Kaspar Maria Von Sternberg

32. Bohemian National Museum in Prague, consists the collections related to Paleobotany, was established by _____.
 a) Charles Darwin   b) Leonardo da Vinci
 c) Kaspar Maria Von Sternberg   d) Hugo de Vries

         Ans.: c) Kaspar Maria Von Sternberg

33. _____ is the "Father of Indian Paleobotany".
 a) Birbal Sahani   b) Leonardo da Vinci
 c) Kaspar Maria Von Sternberg   d) Hugo de Vries

         Ans.: a) Birbal Sahani

34. The study of a region's plants and their practical uses through the traditional knowledge of the local culture of people is called as _____.
 a) Ethnobotany   b) Paleobotany   c) Ecology   d) Phytosociology

         Ans.: a) Ethnobotany

35. The term Ethnobotany was coined by _____ .
 a) J.W. Harshberger   b) W.F. Libby   c) Birbal Sahani   d) Von Sternberg

         Ans.: a) J.W. Harshberger

36. The science which looks for the presence of extra terrestrial life in the universe is _____.
 a) Astrobiology   b) Exobiology   c) Astrology   d) Options a) and b)

         Ans.: d) Options a) and b)

Additional – Fill in the blanks

1. According to _____ theory, the universe had an explosive beginning and originated 15 billion years ago.   **Ans.:** Big Bang

2. Theory of Extraterrestrial or Cosmic origin states that the life came from outer space in the form of small units called _____.   **Ans.:** Panspermia (Spore)

3. The reappearance of ancestral characters in some individuals is called _____.   **Ans.:** Atavism

4. Ontogeny recapitulates Phylogeny is the concept of _____ law.   **Ans.:** Biogenetic

5. The study of fossils is known as _____.   **Ans.:** Palaeontology

6. Archaeopteryx was an early bird-like form found in the _____ period.   **Ans.:** Jurassic

7. _____ is considered to be a connecting link between reptiles and birds.   **Ans.:** Archaeopteryx

8. Formation of new species due to changes in specific characters over several generations as response to natural selection, is called _____.   **Ans.:** Evolution

9. Lamarck's theory of evolution was published in the book '_____' in the year 1809.   **Ans.:** Philosophic Zoologique

10. The classic example used to explain the concept of use and disuse is the elongated neck of _____.   **Ans.:** Giraffe.

11. The degenerated wing of _____ is an example for organ of disuse.   **Ans.:** Kiwi

12. The characters developed by the animals during their life time, in response to the environmental changes are called _____.   **Ans.:** Acquired characters

13. According to Lamarck, the acquired characters are transmitted to the offspring by the process of _____.   **Ans.:** Inheritance

14. Name of the ship used for Voyage of exploration is _____.   **Ans.:** H.M.S. Beagle

15. Darwin published his observations and conclusions under the name '_____' in 1859.   **Ans.:** Origin of species

16. The book _____ elaborates on the Darwin's Theory of Natural selection for evolutionary transformation.   **Ans.:** Origin of species

17. The process of selection of organisms with favourable variation is called as _____.   **Ans.:** Natural selection

18. According to Darwin, new species originates by the gradual accumulation of _____ variations for a number of generations.   **Ans.:** Favourable

19. _____ of genes during gametic fusion leads to differences in the phenotype of the offspring from its parents.   **Ans.:** Recombination

20. The difference found among individuals of the same species and the offspring of the same parent is known as _____.   **Ans.:** Variation

21. _____ is the raw material which plays an important role in evolution.   **Ans.:** Variation

22. _____ variations affect the body cells of the organisms and they are not heritable.   **Ans.:** Somatic

23. _____ variations are produced in germ cells of an organism and they are inherited.   **Ans.:** Germinal

24. Small variations which occur among individuals of a population are known as _____ variations.   **Ans.:** Continuous

25. The skin colour, height, weight of an individual and colour of eye are examples for _____ variation.   **Ans.:** Continuous

26. Sudden changes which occur in an organism due to mutations such as short legged Ancon sheep and six or more digits (fingers) in human, are known as _____ variations.   **Ans.:** Discontinuous

27. _____ variations occur in an organism due to mutations are not useful for evolution.

Ans.: Discontinuous

28. The branch of paleontology that deals with recovery and identification of plant remains of geological past is known as _____ . **Ans.:** Paleobotany

29. The process of formation of fossil in the rocks is called _____. **Ans.:** Fossilization

30. The method of fossilization in which minerals like silica slowly penetrate in and replace the original organic tissue and forms a rock like fossil is known as _____. **Ans.:** Petrifaction

31. _____ fossils show the original shape but does not reveal the internal structure. **Ans.:** Mold

32. A replica of a plant or animal preserved in sedimentary rocks is known as _____. **Ans.:** Mold

33. _____ are living organisms that are similar in appearance to their fossilized distant ancestors and usually have no extinct close features. **Ans.:** Living Fossils

34. Radioactive carbon (C^{14}) dating method was discovered by _____. **Ans.:** W.F. Libby

35. Carbon consumption of animals and plants stops after death and since then, only the decaying process of _____ occurs continuously. **Ans.:** C^{14}

36. The time passed since death of a plant or animal can be calculated by measuring the amount of _____ present in their body. **Ans. :** C^{14}

37. The "calendar" for events that have occurred during Earth's history is called as _____ .

Ans.: The geologic time scale

38. _____ deals with the origin, evolution and distribution of life in the universe and to investigate the possibility of life in other world. **Ans.:** Astrobiology

39. The major concept in astrobiology is the _____ zone. **Ans.:** Habitable

40. If the distance between planet and star (Sun) is not too hot or not too cold, the planet is often referred as _____ for life. **Ans.:** Goldilock Zone

41. In our solar system _____ is the only planet in the goldilock zone. **Ans.:** Earth

42. The organisms which live in extreme environmental conditions on earth are called _____.

Ans.: Extremophiles.

Additional – True or False

1. **The embryos from fish to mammals are different in their early stages of development.**

   Ans.: False.

   Correct statement : The embryos from fish to mammals are **similar** in their early stages of development.

2. **The evolution is the sudden development of complex organisms from pre-existing simpler forms.**

   Ans.: False.

   Correct statement : The evolution is the **gradual** development of complex organisms from pre-existing simpler forms.

3. **During his five years (1831–1835) "Voyage of exploration", Darwin visited a number of islands around South Africa including the Galapagos island and Pacific island.**

   Ans.: False.

   Correct statement : During his five years (1831–1835) "Voyage of exploration", Darwin visited a number of islands around South **America** including the Galapagos island and Pacific island.

4. **According to Darwin favourable variations are useful to the organism and unfavourable variations are harmful or useless to the organism.**

   Ans.: True.

5. **Organisms which are unable to face the challenges, are unfit to survive and disappear.**

   Ans.: True.

6. **Evolution would not be possible without variation.**

   Ans.: True.

Additional – Match the following

Section - I

1. **Cosmic origin**	(a) **Louis Pasteur**
2. **Chemical Evolution of Life**	(b) **Leonardo da Vinci**
3. **Father of Palaeontology**	(c) **Panspermia**
4. **Biogenesis**	(d) **Ernst Haeckel**
5. **Biogenetic law**	(e) **Oparin and Haldane**

Ans :

	Column I		Column II
1	Cosmic origin	c	Panspermia
2.	Chemical Evolution of Life	e	Oparin and Haldane
3.	Father of Palaeontology	b	Leonardo da Vinci
4.	Biogenesis	a	Louis Pasteur
5.	Biogenetic law	d	Ernst Haeckel

Section - II

1. **Use and Disuse theory**	(a) **H.M.S. Beagle**
2. **Voyage of exploration**	(b) **Ginko biloba**
3. **Continuous variation**	(c) **J.W. Harshberger**
4. **Living Fossil**	(d) **Fluctuating variation**
5. **Ethnobotany**	(e) **Lamarckism**

Ans :

	Column I		Column II
1	Use and Disuse theory	e	Lamarckism
2.	Voyage of exploration	a	H.M.S. Beagle
3.	Continuous variation	d	Fluctuating variation
4.	Living Fossil	b	Ginko biloba
5.	Ethnobotany	c	J.W. Harshberger

Additional – Answer in a Word or Sentence

1. **What does the Big Bang Theory state?**

   Earth was supposed to have been formed about 4.5 billion years back.

2. **When did life appear on earth?**

   Life appeared 500 million years after the formation of earth.

3. **What is Palaeontology?**

   Palaeontology deals with the **study of fossils**.

4. **Who is called as Father of Palaeotology?**

   Leonardo da Vinci is called the **Father of Palaeontology**.

5. **Define Darwin's Origin of species.**

According to Darwin, **new species originates by the gradual accumulation of favourable variations** for a number of generations.

6. **What is Paleobotany ?**

It is the branch of paleontology that deals with **recovery and identification of plant remains of geological past**.

7. **What is fossilization?**

The process of formation of fossil in the rocks is called fossilization.

8. **Define Living Fossils.**

Living Fossils are living organisms that are similar in appearance to their fossilized distant ancestors and usually have no extinct close features. eg: *Ginko biloba*.

9. **Define Ethnobotany.**

Ethnobotany is the **study of a region's plants** and their **practical uses** through the **traditional knowledge** of the local culture of people.

10. **What is Goldilocks Zone?**

The Goldilocks Zone refers to the habitable zone around a star where the temperature is just right - not too hot and not too cold - for liquid water to exist on an planet.

11. **What are extremophiles?**

The organisms which live in extreme environmental conditions on earth are called **extremophiles**.

12. **Define Astrobiology/Exobiology.**

Astrobiology deals with the origin, **evolution** and **distribution of life in the universe** and to investigate the possibility of life in other world.

13. **Who proposed Biogenesis theory?**

The Biogenesis theory was proposed by Louis Pasteur.

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Additional – Short Answer Questions

1. **Define evolution of life.**

The history of life comprises of two aspects, one is the origin of life on earth and the other is mechanism involved in the gradual changes and adaptations of living organisms through time which is known as the evolution of life.

2. **What are homologous organs? Give example.**

The homologous organs are those which have inherited from common ancestors with similar developmental pattern and adapted for different functions.

Example : A human hand, a front leg of a cat, flipper of a whale and a bat's wing have similar basic structure but different functions.

3. **What are analogous organs? Give example.**

The analogous organs **look similar** and **perform similar functions** but they have different origin and developmental pattern.

Example : The function of the wings of a bat, the wings of a bird and wings of an insect are similar, but their basic structures are different.

4. **What are Vestigial organs? Give example.**

The degenerated and non-functional organs of animals are called vestigial organs.

Example : Some of the vestigial organs in man are vermiform appendix, nictitating membrane, caudal vertebra, coccyx etc.

5. **What is atavism? Give example.**

The **reappearance of ancestral characters** in some individuals is called atavism.

Example: Presence of rudimentary tail in new born babies, presence of thick hair on the human body.

6. How does Embryology support evolution?

i) The study of comparative embryology of different animals, supports the concept of evolution.

ii) The embryos from fish to mammals are similar in their early stages of development.

iii) The differentiation of their special characters appear in the later stages of development.

iv) Studying these early stages in multiple animals can help us learn about how different species may have evolved through time.

7. What does Biogenetic law or Recapitulation theory state?

Biogenetic law or **Recapitulation theory** was given by **Ernst Haeckel.**

i) According to this theory, **Ontogeny recapitulates Phylogeny**.

ii) The stages of development of the individual animal repeats the evolutionary history of the entire race of the animal.

8. How does Archaeopteryx support the theory of evolution?

Archaeopteryx is the oldest known **fossil bird**. It was an early bird-like form found in the Jurassic period.It is considered to be a **connecting link** between reptiles and birds. It had wings with feathers, like a bird. It had long tail, clawed digits and conical teeth, like a reptile.

9. How can fossils used as evidence for evolution?

i) Fossils are the preserved remains or traces of animals, plants, and other organisms from the past.

ii) Fossils are important evidence for evolution because they show that life on earth was once different from life found on earth today.

iii) Fossil records show that the evolution has taken a gradual process from simple to complex organisms.

10. Define Evolution.

Evolution is the gradual change occurring in living organisms over a period of time. Formation of new species due to changes in specific characters over several generations as response to natural selection, is called evolution.

11. What is variation ? What are the types of variation?

Variation is the difference found among individuals of the same species and the offspring of the same parent. **Variation** is the **raw material** which plays an important **role in evolution**.

Types of variations

i) **Somatic variation:** These are the variations which affect the body (somatic) cells of the organisms. They are not heritable. They occur due to environmental factors.

ii) **Germinal variation:** These variations are produced in germ cells of an organism. They are **inherited**.

12. What are the importance of fossils ?

i) They throw light on phylogeny and evolution of plants.

ii) Fossil plants give a historical approach to plant kingdom.

iii) Fossils are useful in classification of plants.

iv) Fossil plants can be used in the field of descriptive and comparative anatomy.

13. What is petrifaction?

The method of fossilization in which minerals like silica slowly penetrate in and replace the original organic tissue and forms a rock like fossil is known as petrifaction. This method of fossilization can **preserve hard and soft parts**. Most bones and wood fossils are petrified.

14. How is carbon 14 used in carbon dating?

This method was discovered by **W.F. Libby** (1956). Carbon consumption of animals and plants stops after death and since then, only the decaying process of C^{14} occurs continuously. The time passed since death of a plant or animal can be calculated by measuring the amount of C^{14} present in their body.

15. What is the Geologic Time Scale?

The geological time scale is a system of chronological dating that relates geological rock strata to time, and is used by geologists, paleontologists, and other Earth scientists to describe the timing and relationships of events that have occurred during Earth's history.

16. What are the two important criteria needed to support the existence of life in the universe?

i) It must have a right mass to retain an atmosphere.

ii) It must have an orbit at just the right distance from its star (Sun) that it allows liquid water to exist.

17. Write the differences between mutation and variation.

	Mutation	Variation
1.	Mutation arises due to errors occurring in DNA during replication or exposure to UV rays or chemicals.	Variation is the difference found among individuals of the same species and the offspring of the same parent.
2.	Mutation leads to variation.	Variation is the raw material for evolution.
3.	It brings about changes in a single individual.	Variations are seen in groups or populations of an individual.

18. What is mold and cast fossil?

Mold: If an organism completely dissolves in sedimentary rock, it can leave an impression of its exterior in the rock, called an external mold.

Cast : If that mold gets filled with other minerals, it becomes a cast.

Additional – Long Answer Questions

1. Explain the different theories of Origin of Life.

Many theories have been postulated to explain the origin of life. The views on the origin of life has been put forth as

i) **Special creation :** This idea embodies that life on Earth is a divine creation and also attributes to **supernatural event** at a particular time in the past. It also emphasizes that life has not changed ever since its origin.

ii) **Spontaneous generation**

a) **Abiogenesis:** According to this theory **life originated** spontaneously from **lifeless matter**. It was believed that fishes originated from mud, frogs from moist soil and insects from decaying matter.

b) **Biogenesis:** It was speculated by **Louis Pasteur** (1862) that **life originates from pre-existing life**. He showed that pre-sterilised flasks kept closed airtight, with killed yeast, did not give rise to any life form, while in another flask kept open to air living organisms arose from killed yeast.

iii) **Extraterresterial or Cosmic origin:** Some scientists still believe that life came from outer space. This states that units of life called **spores (Panspermia)** were transferred to different planets including earth. This is still an idea of some astronomers.

iv) **Chemical Evolution of Life:** This idea was developed by **Oparin (1922)** and **Haldane (1929)**. They proposed that with the conditions prevailing on earth, life arose by a series of sequential **chemical reactions**. The first form of life could have come from pre-existing **non-living inorganic molecules** which gave rise to formation of diverse organic molecules which are transformed into **colloid system** to produce life. The modern concept on chemical evolution regarding origin of life was accepted.

2. Explain the Morphological and Anatomical evidences of evolution.

The comparative study of morphology and anatomy of animals, reveal that they possess common set of characteristics.

i) **Homologous organs:** The homologous organs are those which have inherited from common ancestors with similar developmental pattern in embryos. The fore limbs of mammals are homologous structures. A human hand, a front leg of a cat, flipper of a whale and a bat's wing **look dissimilar and adapted for different functions**. Their mode of development and basic structure of bone are similar.

ii) **Analogous organs:** The analogous organs **look similar** and **perform similar functions** but they have different origin and developmental pattern. The function of the wings of a bat, the wings of a bird and wings of an insect are similar, but their basic structures are different.

iii) **Vestigial organs:** The **degenerated** and **non-functional organs** of animals are called vestigial organs. The same organs are found to be well-developed and functional, in some of the related forms. Some of the vestigial organs in man are vermiform appendix, nictitating membrane, caudal vertebra, coccyx etc.

iv) **Atavism:** The **reappearance of ancestral characters** in some individuals is called atavism. e.g. Presence of rudimentary tail in new born babies, presence of thick hair on the human body.

3.   **Describe the principles of Lamarckism.**

i) **Internal vital force :** Living organisms or their component parts tend to increase in size continuously. This increase in size is due to the inherent ability of the organisms.

ii) **Environment and new needs :** A change in the environment brings about changes in the need of the organisms. In response to the changing environment, the organisms develop certain adaptive characters. The adaptations of the organisms may be in the form of development of new parts of the body.

iii) **Use and disuse theory :** Lamarck's **use and disuse theory** states that if an organ is used constantly, the organ develops well and gets strengthened. When an organ is not used for a long time, it gradually degenerates.

The ancestors of giraffe were provided with short neck and short forelimbs. Due to shortage of grass, they were forced to feed on leaves from trees. The continuous stretching of their neck and forelimbs resulted in the development of long neck and long forelimbs which is an example for constant use of an organ. The degenerated wing of Kiwi is an example for organ of disuse.

iv) **Theory of Inheritance of acquired characters :** When there is a change in the environment, the animals respond to the change. They develop adaptive structures. The characters developed by the animals during their life time, in response to the environmental changes are called acquired characters. According to Lamarck, the **acquired characters** are transmitted to the offspring by the process of inheritance.

4.   **Write a note on Thiruvakkarai fossil wood park.**

i) Thiruvakkarai fossil wood park is located in Villupuram district of Tamil Nadu.

ii) The park contains petrified wood fossils.

iii) 20 million years ago tree trunks that got buried along the river, incourse of time the organic matter was replaced by silica and was fossilized.

iv) They retained their color, shape and texture and was converted into solid rocks.

v) The annular rings, the texture, colors of the layers, nodes and every properties of plants are still visible.

5.   **What are the importance of Ethnobotany?**

i) It provides traditional uses of plant.

ii) It gives information about certain unknown and known useful plants.

iii) The ethnomedicinal data will serve as a useful source of information for the chemists, pharmacologists and practitioners of herbal medicine.

iv) Tribal communities utilize ethnomedicinal plant parts like bark, stem, roots, leaves, flower bud, flowers, fruits, seeds, oils, resins, dyes, gum for the treatment of diseases like diarrhoea, fever, headache, diabetes, jaundice, snakebites, leprosy, etc.

	Important Scientists to remember	
1	Louis Pasteur	Proposed Biogenesis Theory in 1862
2	Oparin and Haldane	Proposed Chemical Evolution of Life Theory
3	Ernst Haeckel	Biogenetic Law or Recapitulations Theory
4	Leonardo da Vinci	Father of Palaeontology
5	Jean Baptiste Lamarck	Theory of Inheritance of Acquired Characters or Use and Disuse Theory
6	Charles Darwin	Theory of Natural Selection / Origin of Species (1859)
7	De Vries	Mutation Therory
8	Kaspar Maria Von Sternberg	Father of Paleobotany
9	Birbal Sahani	Father of Indian Paleobotany
10	W.F.Libby	Discovered Radioactive Carbon (C^{14}) dating method
11	J.W.Harshberger	Coined the term Ethnobotany

UNIT TEST - 19

Time : 1.15 Hrs.   Marks : 50

I. Choose the best answer   (5 × 1 = 5)

1. **Biogenetic law states that _____.**
    a) Ontongeny and phylogeny go together
    b) Ontogeny recapitulates phylogeny
    c) Phylogeny recapitulates ontogeny
    d) There is no relationship between phylogeny and ontogeny

2. **Palaeontologist deal with**
    a) Embryological evidences   b) Fossil evidences
    c) Vestigial organ evidences   d) All the above

3. **The best way of direct dating fossils of recent origin is by**
    a) Radio–carbon method   b) Uranium–lead method
    c) Potassium–argon method   d) Both (a) and (c)

4. **The Big Bang theory explains the**
    a) Origin of Universe   b) Origin of bacteria
    c) Origin of plants   d) Origin of human being

5. **'Theory of inheritance of Acquired Characters" was proposed by**
    a) Charles Darwin   b) Leonardo da Vinci
    c) Jean Baptiste Lamarck   d) Louis Pasteur

II. Fill in the blanks   (5 × 1 = 5)

6. The theory of natural selection for evolution was proposed by _____.
7. The forelimb of bat and human are examples of _____ organs.
8. The degenerated and non-functional organs found in an organism are called _____.
9. Darwin published his observations and conclusions under the name '_____' in 1859.
10. _____ are living organisms that are similar in appearance to their fossilized distant ancestors and usually have no extinct close features.

III. State whether the statements are true or false. Correct the false statement
(5 × 1 = 5)

11. The use and disuse theory of organs' was postulated by Charles Darwin.
12. Birds have evolved from reptiles.
13. The homologous organs look similar and perform similar functions but they have different origin and developmental pattern.
14. The embryos from fish to mammals are different in their early stages of development.
15. Organisms which are unable to face the challenges, are unfit to survive and disappear.

IV. Match the following
(5 × 1 = 5)

16. Atavism   (a)   A forelimb of a cat and a organs bat's wing
17. Analogous   (b)   Rudimentary tail and organs thick hair on the body
18. Homologous   (c)   A wing of a bat and organs a wing of an insect
19. Wood park   (d)   Radiocarbon dating
20. W.F. Libby   (e)   Thiruvakkarai

V. Write the answer for the following questions in word or sentence
(8 × 1 = 8)

21. What is the study of fossils called?
22. Which organism is considered to be the fossil bird?
23. A human hand, a front leg of a cat, a front flipper of a whale and a bat's wing look dissimilar and adapted for different functions. What is the name given to these organs?
24. What is Palaeontology?
25. Define Ethnobotany.
26. What are extremophiles?
27. What is fossilization?
28. Who is called as Father of Palaeotology?

VI. Write the short answer for ANY 6 of the following questions
(6 × 2 = 12)

29. The degenerated wing of a kiwi is an acquired character. Why is it an acquired character?
30. Why is Archaeopteryx considered to be a connecting link?
31. Define Ethnobotany and write its importance.
32. How can you determine the age of the fossils?
33. Arun was playing in the garden. Suddenly he saw a dragon fly sitting on a plant. He observed the wings of it. He thought it looked similar to a wing of a crow. Is he correct? Give reason for your answer.
34. What are Vestigial organs? Give example.
35. How does Archaeopteryx support the theory of evolution?
36. What is the Geologic Time Scale?

VII. Write long answer for the following questions
(2 × 5 = 10)

37. How do you differentiate homologous organs from analogous organs?

<div align="center">or</div>

Natural selection is a driving force for evolution-How?

38. How does fossilization occur in plants?

<div align="center">or</div>

Explain the different theories of origin of life.

<div align="center">ೞ❖ೞ</div>

UNIT 20 — BREEDING AND BIOTECHNOLOGY

Points to Remember

➢ Crop improvement is the development of improved crop varieties possesing higher yield, better quality, resistance to diseases and shorter duration.

➢ When breeding takes place between animals of the same breed, it is called inbreeding. The cross between different breeds is called outbreeding.

➢ The superiority of the hybrid obtained by cross breeding is called as heterosis or hybrid vigour.

➢ Genetic engineering is the manipulation and transfer of genes from one organism to another organism.

➢ Stem cells are undifferentiated or unspecialised mass of cells and can be used for the treatment known as stem cell therapy.

TEXT BOOK EVALUATION

I. Book Exercise – Choose the best answer

1. **Which method of crop improvement can be practised by a farmer if he is inexperienced?**
   a) clonal selection   b) mass selection   c) pureline selection   d) hybridisation

   Ans : (b) Mass selection

2. **Pusa Komal is a disease resistant variety of _____.**
   a) sugarcane   b) rice   c) cow pea   d) maize

   Ans : (c) Cow pea

3. **Himgiri developed by hybridisation and selection for disease resistance against rust pathogens is a variety of _____.**
   a) chilli   b) maize   c) sugarcane   d) wheat

   Ans : (d) Wheat

4. **The miracle rice which saved millions of lives and celebrated its 50th birthday is _____.**
   a) IR 8   b) IR 24   c) Atomita 2   d) Ponni

   Ans : (a) IR 8

5. **Which of the following is used to produce products useful to humans by biotechnology techniques?**
   a) enzyme from organism   b) live organism
   c) vitamins   d) both (a) and (b)

   Ans : (d) both (a) and (b)

6. **We can cut the DNA with the help of**
   a) scissors   b) restriction endonucleases
   c) knife   d) RNAase

   Ans : (b) Restriction endonucleases

7. **rDNA is a**
   a) vector DNA   b) circular DNA
   c) recombinant of vector DNA and desired DNA   d) satellite DNA

   Ans : (c) Recombinant of vector DNA and desired DNA

8. **DNA fingerprinting is based on the principle of identifying _____ sequences of DNA**
   a) single stranded   b) mutated   c) polymorphic   d) repititive

   Ans : (d) Repititive

9. **Organisms with modified endogenous gene or a foregin gene are also known as**
    a) transgenic organsims b) genetically modified c) mutated d) both a and b

    Ans : (d) Both a and b

10. **In a hexaploid wheat (2n = 6 x = 42) the haploid (n) and the basic(x) number of chromosomes are**
    a) n = 7 and x = 21 b) n = 21 and x = 21 c) n = 7 and x = 7 d) n = 21 and x = 7

    Ans : (d) n = 21 and x = 7

II. Book Exercise – Fill in the blanks

1. Economically important crop plants with superior quality are raised by_____. **Ans :** Plant breding

2. A protein rich wheat variety is _____. **Ans :** Atlas 66

3. _____is the chemical used for doubling the chromosomes. **Ans :** Colchicine

4. The scientific process which produces crop plants enriched with desirable nutrients are called _____.

    Ans : Biofortification

5. Rice normally grows well in alluvial soil, but _____ is a rice variety produced by mutation breeding that grows well in saline soil. **Ans :** Atomita 2

6. _____ technique made it possible to genetically engineer living organism. **Ans :** Genetic Engineering

7. Restriction endonucleases cut the DNA molecule at specific positions known as _____.

    Ans : Restriction sites

8. Similar DNA fingerprinting is obtained for _____. **Ans :** Paternity testing

9. _____ cells are undifferentiated mass of cells. **Ans :** Stem

10. In gene cloning the DNA of interest is integrated in a _____. **Ans :** Vector DNA

III. Book Exercise – True or false (If false give the correct statement)

1. **Raphanobrassica is a tetraploid man–made genus produced by colchicine treatment.**
    Ans.: True.

2. **The process of producing an organism with more than two sets of chromosome is called mutation.**
    Ans.: False**.** The process of producing an organism with more than two sets of chromosome is called Polyploidy breeding.

3. **A group of plants produced from a single plant through vegetative or asexual reproduction are called a pureline.**
    Ans.: False. A group of plants produced from a single plant through vegetative or asexual reproduction are called **Clones**.

4. **Iron fortified rice variety determines the protein quality of the cultivated plant.**
    Ans.: False**. Amino acid** fortified rice variety determines the protein quality of the cultivated plant.

5. **Golden rice is a hybrid.**
    Ans.: False. Golden rice is a **Genetically modified crop**.

6. **Bt gene from bacteria can kill insects.**
    Ans.: True.

7. **In vitro fertilisation means the fertilisation done inside the body.**
    Ans.: False. In vitro fertilisation means the fertilisation done **outside** the body.

8. **DNA fingerprinting technique was developed by Alec Jeffrey.**
    Ans.: True.

9. **Molecular scissors refers to DNA ligases.**
    Ans.: False. Molecular scissors refers to **Restriction Endonucleases**.

IV. Book Exercise – Match the following

1. Match Column A with B

	Column A		Column B
1.	Sonalika	(a)	Phaseolus mungo
2.	IR 8	(b)	Surgarcane
3.	Saccharum	(c)	Semi–dwarf wheat
4.	Mung No. 1	(d)	Ground nut
5.	TMU – 2	(e)	Semi–dwarf Rice
6.	Insulin	(f)	Bacillus thuringienesis
7.	Bt toxin	(g)	Beta carotene
8.	Golden rice	(h)	First hormone produced using rDNA technique

Ans :

S.No.	Column A		Column B
1	Sonalika	c	Semi–dwarf wheat
2	IR 8	e	Semi–dwarf rice
3	Saccharum	b	Sugarcane
4	Mung No. 1	a	Phaseolus mungo
5	TMU – 2	d	Ground nut
6	Insulin	h	First hormone produced using rDNA technique
7	Bt toxin	f	Bacillus thuringienesis
8	Golden rice	g	Beta carotene

V. Book Exercise – Assertion and Reason

a) Assertion is correct and reason is wrong
b) Reason is correct and the assertion is wrong
c) Both assertion and reason is correct
d) Both assertion and reason is wrong

1. **Assertion :**   Hybrid is superior than either of its parents.
   Reason :   Hybrid vigour is lost upon inbreeding.

   Ans : (c) Both assertion and reason is correct

2. **Assertion :**   Colchicine reduces the chromosome number.
   Reason :   It promotes the movement of sister chromatids to the opposite poles.

   Ans : (b) Reason is correct and the assertion is wrong

3. **Assertion :**   rDNA is superior over hybridisation techniques.
   Reason :   Desired genes are inserted without introducing the undesriable genes in target organisms.

   Ans : (c) Both assertion and reason is correct

V. Book Exercise – Answer in a sentence (1 mark)

1. Give the name of wheat variety having higher dietary fibre and protein.

Atlas 66 is the wheat variety having higher dietary fibre and protein.

2. Semi-dwarf varieties were introduced in rice. This was made possible by the presence of dwarfing gene in rice. Name this dwarfing gene.

Name of the dwarfing gene is sd1.

3. Define genetic engineering.

Genetic engineering is the manipulation and transfer of genes from one organism to another organisms to create a new DNA called as recombinant DNA (rDNA). Genetic engineering is also called as recombinant DNA technology.

4. **Name the types of stem cells.**
   ❖ **Embryonic stem cells:** They can be extracted and cultured from the early embryos.
   ❖ **Adult stem cells or somatic stem cells:** They are found in the neonatal (new born) and adults.
5. **What are transgenic organisms?**
   Plants or animals expressing a modified endogenous gene or a foreign gene are known as transgenic organisms.
6. **State the importance of Biofortification .**
   Biofortification is used to develop the crop plants enriched with high levels of desirable nutrients like vitamins, proteins and minerals.

VI. Book Exercise – Short answer question (2 mark)

1. **Discuss the method of breeding for disease resistance.**
   Plant diseases are caused by pathogens like viruses, bacteria and fungi. This affects crop yield. Hence, it is important to develop disease resistant varieties of crops, that would increase the yield and reduce the use of fungicides and bactericides.

2. **Name three improved characteristics of wheat that helped India to achieve high productivity.**
   ❖ Higher yield with better quality. eg: Protein Rich Atlas 66
   ❖ Resistance to diseases. eg: Himgiri
   ❖ Shorter duration / Semidwarf. eg: Sonalika and Kalyan Sona

3. **Name two maize hybrids rich in amino acid lysine**
   Lysine (Amino acid) rich maize hybrids are;
   ❖ Protina,
   ❖ Shakti and
   ❖ Rathna

4. **Distinguish between**
   a. Somatic gene therapy and germ line gene therapy
   b. Undifferentiated cells and differentiated cells
   a) Differences between Somatic gene therapy and Germ line gene therapy.

S.No.	Somatic Gene Therapy	Germline Gene Therapy
1	It is the replacement of defective gene in somatic cell.	It is the replacement of defective gene in germ cell (sperm and egg).
2	Correction of genetic defects is beneficial to patient. It may not be carried to next generation.	It may not be carried to next generation and will be beneficial to next generation.

   b) Differences between Undifferentiated cells and Differentiated cells.

S.No.	Undifferentiated cells	Differentiated cells
1	They are unspecialized mass of cells. So these cells could still become any kind of cell that the body needs.	They become specialized cells for doing certain jobs.
2	Example: Cells in early embryos are undifferentiated. The cells are multiplying, but they haven't started become specific types of cells.	Example: These cells become a liver cell, a blood cell, or a neuron, muscle cells, skin cells, etc.

5. **State the applications of DNA fingerprinting technique.**
   Applications of DNA Fingerprinting
   ❖ DNA fingerprinting technique is widely used in forensic applications like crime investigation such as identifying the culprit. It is also used for paternity testing in case of disputes.
   ❖ It also helps in the study of genetic diversity of population, evolution and speciation.

6. **How are stem cells useful in regenerative process?**
   ❖ Sometimes cells, tissues and organs in the body may be permanently damaged or lost due to genetic

condition or disease or injury.
- ❖ In such situations stem cells are used for the treatment of diseases which is called stem-cell therapy.
- ❖ In treating neurodegenerative disorders like Parkinson's disease and Alzheimer's disease neuronal stem cells can be used to replace the damaged or lost neurons.

7. Differentiate between outbreeding and inbreeding.

S.No.	Outbreeding	Inbreeding
1	It is the breeding of unrelated animals.	It refers to the mating of closely related animals with the same breed.
2	The hybrids are stronger and vigorous than their parents.	It helps in the accumulation of superior genes and elimination of genes which are undesirable.
3	Cross between two different species with desirable features of economic value are mated. Male donkey + Female Horse = Mule.	Superior males and superior females of the same breed and identified and mated in pairs. Bikaneri (Magra) ewes + Australian Marino rams sheep = Hissardale Sheep.

VII. Book Exercise – Long answer question (5 mark)

1. What are the effects of hybrid vigour in animals.

The superiority of the hybrid obtained by cross breeding is called as heterosis or hybrid vigour.

Effects of hybrid vigour in animal breeding
- ❖ Increased production of milk by cattle
- ❖ Increased production of egg by poultry
- ❖ High quality of meat is produced
- ❖ Increased growth rate in domesticated animals

Example 1: Cross breed of fowls:

     White Leghorn X Plymouth Rock
            ↓
     Hybrid fowl - yield more eggs

Example 2: Cross breed of cows:

     Developed by mating the bulls of exotic breeds and cows of indigenous breeds.
     Brown Swiss X Sahiwal
            ↓
     Karan Swiss - yield 2-3 times more milk than indigenous cows.

2. Describe mutation breeding with an example.

Mutation is defined as the sudden heritable change in the nucleotide sequence of DNA in an organism. It is a process by which genetic variations are created which in turn brings about changes in the organism. The organism which undergoes mutation is called a mutant. The factors which induce mutations are known as mutagens or mutagenic agents. Mutagens are of two types namely physical mutagens and chemical mutagens.

- i) **Physical mutagens :** Radiations like X-rays, α, β and γ-rays, UV rays, temperature etc. which induce mutations are called physical mutagens
- ii) **Chemical mutagens :** Chemical substances that induce mutations are called chemical mutagens. e.g. Mustard gas and nitrous acid. The utilisation of induced mutation in crop improvement is called mutation breeding.

Achievements of mutation breeding : Some achievements of mutation breeding are

- ❖ Sharbati Sonora wheat produced from Sonora-64 by using gamma rays.
- ❖ Atomita 2 rice with saline tolerance and pest resistance.
- ❖ Groundnuts with thick shells**.**

3. Biofortification may help in removing hidden hunger. How?

Hidden hunger (Micronutrient deficiencies) may occur when one or more vitamins and minerals important for human health are consistently inadequate in a person's diet. Diets based mostly on staple crops, such as maize, wheat and rice, which provide large amounts of energy but relatively low amounts of essential bioavailable vitamins and minerals, frequently result in hidden hunger.

Biofortification may help in removing hidden hunger.

i) Biofortification is the scientific process of developing crop plants enriched with high levels of desirable nutrients like vitamins, proteins and minerals.

ii) Biofortification is a complementary intervention to supplementation and fortification.

iii) Biofortified staple foods can help close the intake gap of targeted micronutrient deficiencies in most other cases and increase the daily intake of micronutrients throughout a person's life cycle.

iv) Some examples of crop varieties developed as a result of biofortifi cation are given below :

     a) Protina, Shakti and Rathna are lysine rich maize hybrids (developed in India).

     b) Atlas 66, a protein rich wheat variety.

     c) Iron rich fortifi ed rice variety.

   d) Vitamin A enriched carrots, pumpkin and spinach.

4. With a neat labelled diagram explain the techniques involved in gene cloning.

The carbon copy of an individual is oft en called a clone. However, more appropriately, a clone means to make a genetically exact copy of an organism.

In gene cloning, a gene or a piece of DNA fragment is inserted into a bacterial cell where DNA will be multiplied (copied) as the cell divides.

A brief outline of the basic steps involved in gene cloning are :

❖ Isolation of desired DNA fragment by using restriction enzymes

❖ Insertion of the DNA fragment into a suitable vector (Plasmid) to make rDNA

❖ Transfer of rDNA into bacterial host cell (Transformation)

❖ Selection and multiplication of recombinant host cell to get a clone v. Expression of cloned gene in host cell.
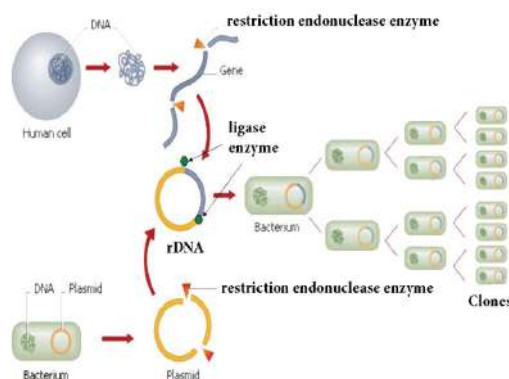
5. Discuss the importance of biotechnology in the field of medicine.

Using genetic engineering techniques medicinally important valuable proteins or polypeptides that form the potential pharmaceutical products for treatment of various diseases have been developed on a commercial scale.

Pharmaceutical products developed by rDNA technique :

❖ Insulin used in the treatment of diabetes.

❖ Human growth hormone used for treating children with growth deficiencies.

❖ Blood clotting factors are developed to treat haemophilia.

❖ Tissue plasminogen activator is used to dissolve blood clots and prevent heart attack.

❖ Development of vaccines against various diseases like Hepatitis B and rabies.

VIII. Book Exercise – Higher Order Thinking Skills (HOTS)

1. **A breeder wishes to incorporate desirable characters into the crop plants. Prepare a list of characters he will incorporate.**

   The desirable characters into the crop plants :
   i) Higher yield.
   ii) Resistance to diseases.
   iii) Insects/Pests Resistance.
   iv) Drought resistant.
   v) Shorter duration.
   vi) Frtilizer responsive.
   vii) The nutritional quality with respect to its
   ❖ Protein content and quality of protein,
   ❖ Oil content and
   ❖ Mineral content**.**

2. **Organic farming is better than Green Revolution. Give reasons.**
   i) When we hear about organic farming we think of clean, unadulterated food, while when people hear about the green revolution labs with genetically mutated seeds and plants come to mind.
   ii) The basic idea of the green revolution is to improve the yield of crops by using:
   ❖ Chemical fertilizers,
   ❖ Pesticides and
   ❖ Genetically altered seeds/plants.
   iii) Pesticides are not only bad for plants, but also for humans. If we spray too many pesticides on our plants they too, like the chemical fertilizers, get washed into the local water sources and can be consumed if the spraying happened close to the harvest of the crops.
   iv) Because of tremendous benefits on environmental, social and health front, organic agriculture seems to be emerging as an alternative to 'green revolution technology'.

3. **Polyploids are characterised by gigantism. Justify your answer.**
   An organism having more than two sets of chromosomes is called polyploidy.
   Quantitative changes in the mass of chromosomes and genes must have played a very important part in the development of plants towards greater variability including the size of the organisms and with it more appropriate adaptations to the demands of their environment. Mostly gigantism is usual consequence in plants. It seems as though doubling the number of chromosomes will increase the size of the organism also.

4. **'P' is a gene required for the synthesis of vitamin A. It is integrated with genome of 'Q' to produce genetically modified plant 'R'.**
   i. **What is P, Q and R?**
   ii. **State the importance of 'R' in India.**
   i) P = Beta Carotene Gene
   Q = Plasmid of vector
   R = Transgenic Organism
   ii) **The importance of 'R' (Transgenic Organism) in India :** The transgenic plants are much stable, with improved nutritional quality, resistant to diseases and tolerant to various environment conditions. Similarly transgenic animals are used to produce proteins of medicinal importance at low cost and improve livestock quality. In India, transgenic organism provide an opportunity to increase food and feed production efficiently by generating plants with higher yields and greater nutritional benefits in reasonably short times.

Additional – Choose the best answer

1. **For his contributions to the world food supply, Dr. Norman E. Borlaug was awarded the Nobel Peace Prize in the year _____.**
   a) 1960   b) 1970   c) 1972   d) 1975

   Ans : (b) 1970

2. **Sonalika, Kalyan Sona are semi-dwarf varieties of _____ .**

    a) Paddy   b) Maize   c) Groundnut   d) Wheat

    Ans : (d) Wheat

3. **The wheat variety which has resistance against the diseases leaf and stipe rust, hill bunt is _____ .**

    a) Himgiri   b) Pusa Shubhra   c) Pusa Komal   d) Pusa Snowball

    Ans : (a) Himgiri

4. **Pusa Shubhra and Pusa Snowball are the varieties of _____ having resistance against black rot disease.**

    a) Rice   b) Cauliflower   c) Wheat   d) Cow pea

    Ans : (b) Cauliflower

5. **The cowpea variety which has resistance against the disease bacterial blight is _____ .**

    a) Himgiri   b) Pusa Shubhra   c) Pusa Komal   d) Pusa Snowball

    Ans : (c) Pusa Komal

6. **Indian scientist known for his leading role in India's Green Revolution.**

    a) Dr. G. Nammalvar   b) Dr. M. S. Swaminathan
    c) Dr. Norman E. Borlaug   d) Dr. Ian Wilmut

    Ans : (b) Dr. M. S. Swaminathan

7. **Pusa Sem 2 and Pusa Sem 3 are the varieties of _____ .**

    a) Brassica   b) Cauliflower   c) Flat Bean   d) Lady's finger

    Ans : (c) Flat Bean

8. **Pusa Sawani and Pusa A4 are the varieties of _____ .**

    a) Brassica   b) Cauliflower   c) Flat Bean   d) Lady's finger

    Ans : (d) Lady's finger

9. **Pusa Gaurav is the variety of _____ .**

    a) Brassica   b) Cauliflower   c) Flat Bean   d) Lady's finger

    Ans : (a) Brassica

10. **The nutritional quality of crops may be improved with respect to its**

    a) Protein content b) Oil content   c) Mineral content   d) All the above

    Ans : (d) All the above

11. **Protina, Shakti and Rathna are lysine rich _____ hybrids developed in India.**

    a) Maize   b) Wheat   c) Rice   d) Lady's finger

    Ans : (a) Maize

12. **Atlas 66 is a protein rich _____ variety.**

    a) Maize   b) Wheat   c) Rice   d) Lady's finger

    Ans : (b) Wheat

13. **Phaseolus mungo (Black Gram) is an exotic species introduced from _____ .**

    a) China   b) Mexico   c) Philippines   d) Japan

    Ans : (a) China

14. **The plant breeding method in which progeny of a single individual obtained by self breeding is known as _____ .**

    a) Pureline selection   b) Clonal selection   c) Polyploidy Breeding   d) Mass selection

    Ans : (a) Pureline selection

15. Selection of desirable clones from the mixed population of vegetatively propagated crop is called _____.

  a) Pureline selection   b) Clonal selection   c) Polyploidy Breeding   d) Mass selection

                  Ans : (b) clonal selection

16. Sexually reproducing organisms have two complete set of chromosomes in their somatic cells. This is called _____.

  a) Haploid (n)   b) Diploid (2n)   c) Triploid (3n)   d) Ployploid

                  Ans : (b) Diploid (2n)

17. The gametic cells have only one set of chromosome. This is called _____.

  a) Haploid (n)   b) Diploid (2n)   c) Triploid (3n)   d) Ployploid

                  Ans : (a) Haploid (n)

18. An organism having more than two sets of chromosomes is called _____.

  a) Haploid (n)   b) Diploid (2n)   c) Triploid (3n)   d) Ployploid

                  Ans : (d) Polyploid

19. The hybrid of wheat and rye is _____.

  a) Phaseolus mungo   b) Raphano brassica   c) Triticale   d) TMV–2

                  Ans : (c) Triticale

20. _____ is an allotetraploid poruduced by colchicine treatment.

  a) Phaseolus mungo   b) Raphano brassica   c) Triticale   d) TMV–2

                  Ans : (b) Raphano brassica

21. Mustard gas and nitrous acid are examples for _____.

  a) Physical mutagens   b) Chemical mutagens   c) Biological mutagens   d) None of the above

                  Ans : (b) Chemical mutagens

22. The utilisation of induced mutation in crop improvement is called _____.

  a) Hybridization   b) Mutation breeding   c) Polyploidy breeding   d) Mass selection

                  Ans : (b) Mutation breeding

23. Some achievements of mutation breeding are _____ is wheat variety produced by using gamma rays.

  a) Sharbati Sonora   b) Atomita 2   c) Triticale   d) Raphano brassica

                  Ans : (a) Sharbati Sonora

24. _____ is a rice variety with saline tolerance and pest resistance produced by mutation breeding.

  a) Sharbati Sonora   b) Atomita 2   c) Triticale   d) Raphano brassica

                  Ans : (b) Atomita 2

25. Triticale is obtained by crossing

  a) Wheat and rice   b) Rice and black gram   c) Rice and Rye   d) Wheat and Rye

                  Ans : (d) Wheat and Rye

26. The diploid number (2n) of chromosome in wheat (Triticum durum) is _____.

  a) 14   b) 21   c) 28   d) 42

                  Ans : (c) 28

27. The diploid number (2n) of chromosome in rye (Secale cereal) is _____.

  a) 14   b) 21   c) 28   d) 42

                  Ans : (a) 14

28. The diploid number (2n) of chromosom in Triticale is _____.

  a) 14   b) 21   c) 28   d) 42

                  Ans : (d) 42

29. **When breeding takes place between animals of the same breed, it is called _____.**
a) Outbreeding   b) Inbreeding   c) Cross breeding   d) Test breeding

Ans : (b) Inbreeding

30. **The cross between different breeds is called _____.**
a) Outbreeding   b) Inbreeding   c) Cross breeding   d) Test breeding

Ans : (a) Outbreeding

31. **The enzymes which can cleave or split the phosphodiester bond within DNA is _____.**
a) Restriction Enzymes   b) DNA Ligases   c) Polymerase   d) None of the above

Ans : (a) Restriction Enzymes

32. **The enzymes which help in ligating (joining) the broken DNA fragments are _____.**
a) Restriction Enzymes   b) DNA Ligases   c) Polymerase   d) None of the above

Ans : (b) DNA Ligases

33. **Find out correct sequence of the basic steps involved in gene cloning**
  i. **Selection and multiplication of recombinant host cell to get a clone**
  ii. **Transfer of rDNA into bacterial host cell (Transformation)**
  iii. **Insertion of the DNA fragment into a suitable vector (Plasmid) to make rDNA**
  iv. **Expression of cloned gene in host cell.**
  v. **Isolation of desired DNA fragment by using restriction enzymes**
a) i – ii – iii – iv – v   b) ii – iii – v – i – iv   c) v – iii – ii – i – iv   d) v – iv – ii – iii – i

Ans : (c) v – iii – ii – i – iv

35. **Dolly was born to her surrogate mother on**
a) 5th July 1996   b) 5th June 1996   c) 5th July 2006   d) 5th July 1966

Ans : (a) 5th July 1996

36. **Dr. Ian Wilmut and his colleagues developed Dolly at the Roslin Institute situated in _____.**
a) Italy   b) Russia   c) Scotland   d) Germany

Ans : (c) Scotland

37. **Dolly was created by somatic cell _____ technique.**
a) Hybridization   b) Nuclear transfer   c) Polyploidy Breeding   d) Selection

Ans : (b) Nuclear transfer

38. **Dolly lived for 6.5 years and died in _____ because of lung disease.**
a) 2000   b) 2003   c) 2006   d) 2012

Ans : (b) 2003

39. **First commercial production of human insulin by using rDNA technology was started in 1979 by the pharmaceutical company _____.**
a) Pfizer Inc   b) Eli Lilly   c) Johnson & Johnson   d) Roche

Ans : (b) Eli Lilly

40. **Correction of genetic defects in _____ is not inheritable.**
a) Germ cells   b) Egg   c) Sperm   d) Somatic cells

Ans : (d) Somatic cells

41. **Correction of genetic defects in _____ is inheritable.**
a) Germ cells   b) Body cells   c) Brain cells   d) Somatic cells

Ans : (a) Germ cells

43. In humans, _____ carotene is required for the synthesis of Vitamin A.

   a) Alpha   b) Beta   c) Gamma   d) None of the above

                                            Ans : (b) Beta

Additional – Fill in the blanks

1. Improving the genotypes of animals to make them more useful to the welfare of mankind is the main aim of _____.   **Ans :** Animal husbandry

2. Developing improved crop varieties possessing higher yield, better quality, resistance to diseases and shorter duration is the main aim of _____.   **Ans :** Crop improvement

3. The process of increasing food production through high yielding crop varieties and modern agricultural techniques in underdeveloped and developing nations is known as _____.   **Ans :** Green Revolution

4. _____ is called as the "Father of the Green Revolution".   **Ans :** Dr. Norman E. Borlaug

5. The miracle rice, _____ is a high-yielding semi-dwarf rice variety developed by International Rice Research Institute (IRRI),Philippines.   **Ans :** IR-8

6. Nammalvar Ecological Foundation for Farm Research and Global Food Security Trust (NEFFFRGFST-Vanagam) was founded by _____ to create public awareness about the benefits of organic farming.   **Ans :** Dr. G. Nammalvar

7. _____ is called as Father of Indian Green Revolution.   **Ans :** Dr. M. S. Swaminathan

8. In India Dr. M. S. Swaminathan joined with Dr.Borlaug in bringing Green Revolution by introducing _____ wheat varieties.   **Ans :** Mexican

9. The scientific process of developing crop plants enriched with high levels of desirable nutrients like vitamins, proteins and minerals is known as _____.   **Ans :** Biofortification

10. A group of plants produced from a single plant through vegetative or asexual reproduction are called _____.   **Ans :** Clones

11. Polyploidy can be induced by chemical agents like _____.   **Ans :** Colchicine

12. The sudden heritable change in the nucleotide sequence of DNA in an organism is known as _____.   **Ans :** Mutation

13. The organism which undergoes mutation is called a _____.   **Ans :** Mutant

14. The factors which induce mutations are known as _____.   **Ans :** Mutagens or mutagenic agents

15. _____ is a concept popularised after World War II for the peaceful use of atomic energy for crop improvement.   **Ans :** Gamma garden or Atomic garden

16. _____ is a type of induced mutation breeding where radioactive sources particularly gamma rays from Cobalt-60 or Caesium-137 are used to induce desirable mutations in crop plants.   **Ans :** Gamma garden or Atomic garden

17. Radiations like X-rays, α, β and γ-rays, UV rays, temperature etc. which induce mutations are called _____.   **Ans :** Physical mutagens

18. Chemical substances that induce mutations are called _____.   **Ans :** Chemical mutagens

19. Sharbati Sonora is wheat variety produced from _____ by using gamma rays.   **Ans :** Sonora-64

20. The process of crossing two or more types of plants for bringing their desired characters together into one progeny is called _____.   **Ans :** Hybridization

21. _____ is a progeny of plant or animal that has been produced from two different types of plant or animal, especially to get desired characters.   **Ans :** Hybrid

22. _____ is the first man- made cereal hybrid.   **Ans :** Triticale

23. A new hybrid obtained by crossing Triticum durum and Secale cereal is _____.   **Ans :** Triticale

24. The condition of having 6 copies of each chromosome is known as _____.   **Ans :** Hexaploid

25. The chromosome number of Triticale is doubled by using _____.   **Ans :** Colchicines

26. Two main aspects of hybridization are to combine the characters of two plants in one plant and to utilize _____. **Ans :** Hybrid vigour

27. A _____ is a group of animals that has certain distinguishing characters that are not found in other members of the same species like general appearance and others striking features. **Ans :** Breed

28. The process which involves mating parents of different varieties each having some desired trait which are passed onto the offspring is known as _____. **Ans :** Breeding

29. Mating or breeding of closely related animals within the same is called _____. **Ans :** Inbreeding

30. The cross between different breeds is called _____. **Ans :** Outbreeding

31. _____ is a new breed of sheep developed by crossing Bikaneri (Magra) ewes and Australian Marino rams. **Ans :** Hissardale

32. _____ is a hybrid produced as the result of cross between male donkey and female horse. **Ans :** Mule

33. Hybrid fowl produced as the result of cross between White Leghorn and Plymouth Rock yield more _____. **Ans :** Eggs

34. _____ is a cross breed of cow developed by mating the bulls of exotic breed Brown Swiss and indigenous cow Sahiwal. **Ans :** Karan Swiss

35. Brown Swiss X Sahiwal = _____. **Ans :** Karan Swiss

36. The superiority of the hybrid obtained by cross breeding is called as _____. **Ans :** Heterosis or hybrid vigour.

37. The manipulation and transfer of genes from one organism to another organisms to create a new DNA is called _____. **Ans :** Genetic Engineering or Recombinant DNA technology.

38. The new DNA produced as the result of Genetic Engineering is known as _____. **Ans :** Recombinant DNA or rDNA

39. The small circular double stranded DNA molecule found in the cytoplasm of bacterial cell is known as _____. **Ans :** Plasmid

40. _____ is called as molecular scissors. **Ans :** Restriction Enzyme

41. The enzyme used to cut or break DNA at specific sites is _____. **Ans :** Restriction enzymes

42. _____ is the first cloned sheep. **Ans :** Dolly

43. The genetically exact copy of an organism or carbon copy of an individual is called a _____. **Ans :** Clone

44. The first cloned female sheep Dolly, was developed by _____. **Ans :** Dr. Ian Wilmut

45. Blood clotting factors can be developed by rDNA technique to treat _____. **Ans :** Haemophilia

46. Tissue plasminogen activator is used to dissolve _____ and prevent heart attack. **Ans :** Blood clots

47. First commercial production of human insulin by using rDNA technology was started in the year _____. **Ans :** 1979

48. The replacement of defective gene by the direct transfer of functional genes into humans to treat genetic disease or disorder is known as _____. **Ans :** Gene therapy

49. _____ gene therapy is the replacement of defective gene in body cells. **Ans :** Somatic

50. The replacement of defective gene in germ cell (egg and sperm) is known as _____ gene therapy. **Ans :** Germ line

51. Undifferentiated or unspecialised mass of cells are known as _____. **Ans :** Stem

52. The unspecialised mass of cells with ability to give rise to specialised cells with specific functions by the process of differentiation are known as _____. **Ans :** Stem cells

53. Embryonic stem cells can be extracted and cultured from the inner cell mass of _____ of early embryo. **Ans :** Blastocyst

54. Amniotic fluid, umbilical cord and bone marrow are the sources for _____ stem cells. **Ans :** Adult or somatic

55. Treating the permanently damaged or lost cells, tissues and organs of the body with stem cells is called _____. **Ans :** Stem-cell therapy

56. In treating neurodegenerative disorders like Parkinson's disease and Alzheimer's disease _____ stem cells can be used to replace the damaged or lost neurons. **Ans :** Neuronal

57. DNA fingerprinting technique was developed by _____. **Ans :** Alec Jeffrey

58. The human _____ has 3 billion base pairs. **Ans :** Genome

59. Each person's DNA sequence is unique due to the small difference in the _____ pairs. **Ans :** Base

60. The _____ technique analyses each individual's unique DNA sequences and provides distinctive characteristics of individual which helps in identification. **Ans :** DNA fingerprinting

61. _____ serve as molecular markers for identification.
Ans : Variable number of tandem repeat sequences (VNTRs)

62. In human beings, 99 % of the DNA base sequences are the same and this is called as _____.
Ans : Bulk genomic DNA

63. The 1 % of the DNA base sequence is present as small stretch of repeated sequences which is known as _____. **Ans :** Satellite DNA

64. DNA fingerprinting technique is widely used in _____ applications. **Ans :** Forensic

65. _____ technique is used for paternity testing in case of disputes. **Ans :** DNA fingerprinting

66. The organism produced by the alteration or manipulation of genes in the organisms using rDNA techniques in order to produce the desired characteristics is known as _____.
Ans : Genetically Modified Organisms (GMOs)

67. The DNA fragment inserted in the organism by using rDNA techniques is called _____.
Ans : Transgene

68. Plants or animals expressing a modified endogenous gene or a foregin gene are also known as _____. **Ans :** Transgenic organisms

69. Genetically modified rice which can produce beta carotene and can prevent Vitamin A deficiency is _____. **Ans :** Golden Rice

70. The plants with _____ genes of bacteria Bacillus thuringiensis can produce the toxin protein that kills the insects which attack them. **Ans :** Bt

71. Salmon or Rainbow trout or Tilapia are examples for _____ fish. **Ans :** Transgenic

72. Transgenic sheep contain genes responsible for synthesis of _____ amino acid. **Ans :** Cysteine

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Additional – True or false (If false give the correct statement)

1. **Raphano brassica or Rabbage is a cross between the radish (Raphanus) and cabbage (Brassica).**
Ans.: True.

2. **Hybrid is superior in one or more characters to both parents.**
Ans.: True.

3. **Breeding of related animals is known as Outbreeding.**
Ans.: False. Breeding of **unrelated** animals is known as Outbreeding.

4. **The hybrids produced by breeding are stronger and vigorous than their parents.**
Ans.: True.

5. **The hybrid mule is a sterile.**
Ans.: True.

6. **Mule is a hybrid produced as the result of cross between male giraffe and female horse.**
Ans.: False. Mule is a hybrid produced as the result of cross between male **donkey** and female horse.

7. **DNA Ligases are cut enzymes and Restriction Enzymes are paste enzymes.**
Ans.: False. **Restriction Enzymes** are cut enzymes and **DNA Ligases** are paste enzymes.

8. **Dolly sheep is the first mammal to be cloned from an adult cell.**
Ans.: True.

9. **The DNA pattern of two individuals cannot be same except for identical twins.**
   Ans.: True.

10. **Rainbow trout and Tilapia are transgenic sheep.**
    Ans.: False. Rainbow trout and Tilapia are transgenic **fish**.

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Additional – Match the following

1. Section – I :

1.	Kalyan Sona	(a)	Protein rich wheat
2.	IR–8	(b)	Phaseolus mungo
3.	Rice variety peta	(c)	Miracle rice
4.	Dee–geo–woo–gen	(d)	Semi–dwart wheat
5.	Dr. G. Nammalvar	(e)	Pusa Gaurav
6.	Brassica	(f)	Indonesia
7.	Lady's finger	(g)	Dwart rice variety
8.	Flat Bean	(h)	Pusa A4
9.	Atlas 66	(i)	Pusa Sem 2 & 3
10.	Exotic species	(j)	Organic farming

Ans :

1	Kalyan Sona	d	Semi–dwart wheat
2	IR – 8	c	Miracle rice
3	Rice variety Peta	f	Indonesia
4	Dee–geo–woo–gen	g	Dwart rice variety
5	Dr. G. Nammalvar	j	Organic farming
6	Brassica	e	Pusa Gaurav
7	Lady's finger	h	Pusa A4
8	Flat Bean	i	Pusa Sem 2 & 3
9	Atlas 66	a	Protein rich wheat
10	Exotic species	b	Phaseolus mungo

2. Section – II :

1.	Groundnut	(a)	Sahiwal
2.	Triploid variety of tea	(b)	Secale cereale
3.	Allotetraploid	(c)	Restriction enzymes
4.	Chemical mutagens	(d)	TV–29
5.	Triticale	(e)	Mustard gas and nitrous acid
6.	Wheat	(f)	First man–made cereal
7.	Rye	(g)	Raphano brassica
8.	Exotic bull	(h)	Triticum durum
9.	Indigenous cow	(i)	Brown Swiss
10.	Molecular scissors	(j)	TMV–2 and AK–10

Ans :

1	Groundnut	j	TMV–2 and AK–10
2	Triploid variety of tea	d	TV–29
3	Allotetraploid	g	Raphano brassica
4	Chemical mutagens	e	Mustard gas and Nitrous acid
5	Triticale	f	First man–made cereal
6	Wheat	h	Triticum durum

7	Rye	b	Secale cereale
8	Exotic bull	i	Brown Swiss
9	Indigenous cow	a	Sahiwal
10	Molecular scissors	c	Restriction enzymes

Additional – Assertion and Reason (2 Marks)

Direction: In each of the following questions, a statement of Assertion is given and a corresponding statement of Reason is given just below it. Of the statements given below, mark the correct answer as

a) Assertion is correct and reason is wrong
b) Reason is correct and the assertion is wrong
c) Both assertion and reason is correct
d) Both assertion and reason is wrong

1. **Assertion :** Genetic Engineering can overcome the drawbacks of traditional hybridization.
   Reason : Genetic Engineering can create desired DNA sequences to meet the specific requirements.
   Ans : (c) Both assertion and reason is correct

2. **Assertion :** Plasmids are extra chromosomal DNA.
   Reason : Plasmids are found in bacteria and are useful in genetic engineering.
   Ans : (c) Both assertion and reason is correct

3. **Assertion :** Genetic variations due to mutation will not bring about changes in the organism.
   Reason : Mutation is the sudden heritable change in the nucleotide sequence of DNA in an organism.
   Ans : (b) Reason is correct and the assertion is wrong

4. **Assertion :** Inbreeding helps in the accumulation of superior genes and elimination of genes which are undesirable.
   Reason : Inbreeding refers to the mating of unrelated animals.
   Ans : (a) Assertion is correct and reason is wrong

5. **Assertion :** Somatic gene therapy is the replacement of defective gene in gametes.
   Reason : Correction of genetic defects in germ cells may not be carried to the next generation.
   Ans : (d) Both assertion and reason is wrong

Additional – Answer in a sentence (1 mark)

1. Define plant breeding.

Plant breeding is the art of developing economically important plants with superior quality.

2. What is the aim of crop improvement?

The aim of crop improvement is to develop improved crop varieties possessing higher yield, better quality, resistance to diseases and shorter duration.

3. What is Green Revolution?

Green Revolution is the process of increasing food production through high yielding crop varieties and modern agricultural techniques in underdeveloped and developing nations.

4. Who is known as Father of the Green Revolution"?

Dr. Norman E. Borlaug, an American agronomist is known as the "Father of the Green Revolution".

5. What is Biofortification ?

Biofortification is the scientific process of developing crop plants enriched with high levels of desirable nutrients like vitamins, proteins and minerals.

6. Give examples for Physical mutagens.

Radiations like X-rays, α, β and γ-rays, UV rays, temperature etc. are examples for physical mutagens.

7. What are chemical mutagens? Give examples.

Chemical substances that induce mutations are called chemical mutagens.

Examples : 1. Mustard gas and

           2. Nitrous acid.

8. Give an example for cross breed of fowls.

White Leghorn X Plymouth Rock = Hybrid fowl (Yield more eggs).

9. Give an example for cross breed of cows.

Developed by mating the bulls of exotic breeds and cows of indigenous breeds. Brown Swiss X Sahiwal = Karan Swiss (Yield 2-3 times more milk than indigenous cows).

10. What is Heterosis ?

The superiority of the hybrid obtained by cross breeding is called as heterosis or hybrid vigour.

11. What is plasmid?

Plasmid is the small circular double stranded DNA molecule found in the cytoplasm of bacterial cell and separated from chromosomal DNA. It can replicate independently.

12. Define clone.

The carbon copy of an individual or genetically exact copy of an organism is often called a clone.

13. Name the US company which produced insulin first by rDNA Technology.

Eli Lilly and Company, United States, in 1979 first started commercial production of human insulin by using rDNA technology.

14. Name the diseases that can be treated by gene therapy.

Neuronal stem cells can be used to replace the damaged or lost neurons while treating neurodegenerative disorders like Parkinson's disease and Alzheimer's diseases.

Additional – Short answer questions (2 mark)

1. What is animal husbandry?

Animal husbandry is the branch of agriculture concerned with animals that are raised for meat, fibre, milk, eggs, or other products. It includes day-to-day care, selective breeding and the raising of livestock. It aims at improving the genotypes of animals to make them more useful to the welfare of mankind.

2. What are the modern Agricultural Practices?

Modern agricultural practices are activities carried out to improve cultivation of plants. It includes

✦ Preparation of soil,

✦ Sowing,

✦ Application of manures and fertilizers,

✦ Proper irrigation,

✦ Protection from weeds and pests,

✦ Harvesting and threshing and

✦ Storage.

3. Name Semi-Dwarf varieties in Wheat and Rice.

i) Semi-dwarf varieties of wheat

✦ Sonalika

✦ Kalyan Sona

ii) Semi-dwarf varieties of rice

✦ IR - 8

4. What are the nutritional quality of the feed crops?

The nutritional quality of crops depends on

✦ Protein content and quality of protein

✦ Oil content and

✦ Mineral content

5. Name crop varieties developed as a result of biofortification.

Some examples of crop varieties developed as a result of biofortification are given below:

✦ Protina, Shakti and Rathna are lysine rich maize hybrids (developed in India),

✦ Atlas 66, a protein rich wheat variety,

✦ Iron rich fortified rice variety and

✦ Vitamin A enriched carrots, pumpkin and spinach.

6. What is Gamma Garden?

Gamma garden or Atomic garden is a concept popularised after World War II for the peaceful use of atomic energy for crop improvement. This is a type of induced mutation breeding where radioactive sources particularly gamma rays from Cobalt-60 or Caesium-137 are used to induce desirable mutations in crop plants.

7. Define Hybridization.

Hybridization may be defined as the process of crossing two or more types of plants for bringing their desired characters together into one progeny called hybrid. Hybrid is superior in one or more characters to both parents. Hybridization is the common method of creating genetic variation to get improved varieties.

8. Define Polyploidy Breeding. Give examples for crop plants produced by polyploidy.

An organism having more than two sets of chromosomes is called polyploid. Such condition is called Polyploidy. It can be induced by physical agents such as heat or cold treatment, X-rays and chemical agents like colchicine.

Examples :

✦ Seedless watermelons (3n) and bananas (3n).

✦ TV-29 (triploid variety of tea) with larger shoots and drought tolerance

✦ Triticale (6n) is a hybrid of wheat and rye. It has higher dietary fibre and protein.

✦ Raphanobrassica is an allotetraploid by colchicine treatment.

9. What is Mutation Breeding? What are the achievements of mutation breeding in crop improvement?

Mutation is defined as the sudden heritable change in the nucleotide sequence of DNA in an organism. The utilisation of induced mutation in crop improvement is called mutation breeding. Some achievements of mutation breeding are

✦ Sharbati Sonora wheat produced from Sonora-64 by using gamma rays.

✦ Atomita 2 rice with saline tolerance and pest resistance

✦ Groundnuts with thick shells

10. Which is the first man-made cereal by hybridization method? How is it obtained?

Triticale is the first man- made cereal hybrid. It is obtained by crossing wheat (Triticum durum, 2n = 28) and rye (Secale cereal, 2n = 14). The F1 hybrid is sterile (2n = 21). Then the chromosome number is doubled using colchicine and it becomes a hexaploid Triticale (2n = 42).

11. What is Breed?

A breed is a group of animals of common origin within a species that has certain distinguishing characters that are not found in other members of the same species like general appearance and others striking features such as increased yield of milk, egg and meat.

12. What are the objectives of Animal Breeding?

Objectives of Animal Breeding includes

✦ To improve the genotypes of domesticated animals to increase their yield

✦ To improve the desirable qualities to produce milk, egg and meat.

13. What is inbreeding? Give an example.

Inbreeding refers to the mating of closely related animals within the same breed.

Example : Hissardale is a new breed of sheep developed in Punjab by crossing Bikaneri (Magra) ewes and Australian Marino rams.

14. What is outbreeding? Give an example.

The cross between different breeds is called outbreeding. It is the breeding of unrelated animals.

Example : The animal produced by crossing a male donkey and a female horse is called a mule.

Male Donkey X Female Horse = Mule.

Mule is superior to horse in strength, intelligence, ability to work and resistance to diseases but they are sterile.

15. Define Genetic Engineering or Recombinant DNA technology.

Genetic engineering is the manipulation and transfer of genes from one organism to another organisms to create a new DNA called as recombinant DNA(rDNA). The term recombinant is used because DNA from two different sources can be joined together. Hence, genetic engineering is also called as recombinant DNA technology.

16. What are the basic requirements for techniques of Genetic Engineering?

Important discoveries that led to the stepping stone of rDNA technology were

✦ Presence of plasmid in bacteria that can undergo replication independently along with chromosomal DNA.

✦ Restriction enzymes cuts or break DNA at specific sites and are also called as molecular scissors.

✦ DNA ligases are the enzymes which help in ligating (joining) the broken DNA fragments.

17. Write a note on Dolly.

✦ Dolly was the first cloned female sheep, developed by Dr. Ian Wilmut and his colleagues at the Roslin Institute, Scotland in July 1996.

✦ She was created by somatic cell nuclear transfer technique.

✦ She lived for 6.5 years and died in 2003 because of lung disease.

18. Define Gene Therapy. What are the two types of Gene Therapy?

Gene therapy refers to the replacement of defective gene by the direct transfer of functional genes into humans to treat genetic disease or disorder .

Two types of Gene therapy are;

✦ Somatic gene therapy : It is the replacement of defective gene in somatic cells. It is not inheritable.

✦ Germ line gene therapy: Germ line gene therapy replacement of defective gene in germ cell (egg and sperm). It is inheritable.

19. What are Stem Cells? What are the properties of stem cells?

Stem cells are undifferentiated or unspecialised mass of cells.

The two important properties of stem cells that are:

✦ They have ability to divide and give rise to more stem cells by self-renewal

✦ They have ability to give rise to specialised cells with specific functions by the process of differentiation.

20. What is Stem-cell therapy?

Sometimes cells, tissues and organs in the body may be permanently damaged or lost due to genetic condition or disease or injury. In such situations stem cells are used for the treatment of diseases which is called stem-cell therapy.

21. What are Genetically Modified Organisms (GMOs) or Transgenic organisms?

Genetic modification refers to the alteration or manipulation of genes in the organisms using rDNA techniques in order to produce the desired characteristics. The DNA fragment inserted is called transgene. Plants or animals expressing a modified endogenous gene or a foreign gene are also known as transgenic organisms.

22. What are the improved characteristic features of Genetically Modified Organisms (GMOs) or Transgenic organisms?

Transgenic plants : They are much stable, with improved nutritional quality, resistant to diseases and tolerant to various environment conditions.

Transgenic animals : They are used to produce proteins of medicinal importance at low cost and improve livestock quality.

1. **Name different methods of Plant Breeding for Crop Improvement.**

   Methods of plant breeding to develop high yielding varieties are;

   i)   Introduction of new varieties of plants.

   ii) Selection.

   iii) Polyploidy breeding.

   iv) Mutation breeding.

   v)   Hybridization.

   Different methods of Plant Breeding for Crop Improvement

   i)   **Introduction of New Varieties of Plants :** It is a process of introducing high yielding varieties of plants from one place to another. Such plants are called as exotic species. Example: Phaseolus mungo was introduced from China.

   ii) **Selection :** Individual plants or groups of plants are sorted out from a mixed population based on the morphological characters. There are three methods of selection. They are

   ✦ Mass selection : Seeds of best plants showing desired characters are collected from a mixed population. Th e collected seeds are allowed to raise the second generation. Examples for mass selection are groundnut varieties like TMV–2 and AK–10.

   ✦ Pureline selection : Pureline is "the progeny of a single individual obtained by self breeding". This is also called as individual plant selection.

   ✦ Clonal selection A group of plants produced from a single plant through vegetative or asexual reproduction are called clones. Selection of desirable clones from the mixed population of vegetatively propagated crop is called clonal selection.

   iii) **Polyploidy Breeding :** An organism having more than two sets of chromosomes is called polyploid. Such condition is called Polyploidy. It can be induced by physical agents such as heat or cold treatment, X-rays and chemical agents like colchicine.

   Examples : ✦ Seedless watermelons (3n) and bananas (3n).

   ✦ TV-29 (triploid variety of tea) with larger shoots and drought tolerance

   ✦ Triticale (6n) is a hybrid of wheat and rye. It has higher dietary fibre and protein.

   ✦ Raphanobrassica is an allotetraploid by colchicine treatment.

   iv) **Mutation Breeding :** Mutation is defined as the sudden heritable change in the nucleotide sequence of DNA in an organism. It is a process by which genetic variations are created which in turn brings about changes in the organism. The organism which undergoes mutation is called a mutant. The utilisation of induced mutation in crop improvement is called mutation breeding. Some achievements of mutation breeding are

   ✦ Sharbati Sonora wheat produced from Sonora-64 by using gamma rays.

   ✦ Atomita 2 rice with saline tolerance and pest resistance

   ✦ Groundnuts with thick shells

   v)   **Hybridization :** Hybridization may be defined as the process of crossing two or more types of plants for bringing their desired characters together into one progeny called hybrid. Hybrid is superior in one or more characters to both parents.

Important Abbreviations to Remember

IRRI	International Rice Research Institute
NEFFFRGFST	Nammalvar Ecological Foundation for Farm Research and Global Food Security Trust
DGWG	Dee–geo–woo–gen
DNA	Deoxyribonucleic Acid
rDNA	Recombinant DNA
VNTRs	Variable Number of Tandem Repeat Sequences
GMO	Genetically Modified Organisms

	Important Scientists to remember	
1	Dr. Norman E. Borlaug	Father of Green Revolution / Received Nobel Prize in 1970
2	Dr. M.S.Swaminathan	Father of Indian Green Revolution
3	Dr. G.Nammalvar	Founder of Nammalvar Ecological Foundation for Farm Reserch and Global Food Security Trust (NEFFRGFST)
4	Dr. Ian Wilmut	Development of Dolly - 5th July 1996
5	Alec Jeffrey	Developed DNA fingerprinting Technique

UNIT TEST - 20

Time : 1.15 Hrs.   Marks : 50

I. Choose the best answer
(5 × 1 = 5)

1. **Which method of crop improvement can be practised by a farmer if he is inexperienced?**
   a) clonal selection   b) mass selection   c) pureline selection   d) hybridisation

2. **The miracle rice which saved millions of lives and celebrated its 50th birthday is _____.**
   a) IR 8   b) IR 24   c) Atomita   d) Ponni

3. **We can cut the DNA with the help of**
   a) scissors   b) restriction endonucleases
   c) knife   d) RNAase

4. **For his contributions to the world food supply, Dr. Norman E. Borlaug was awarded the Nobel Peace Prize in the year _____.**
   a) 1960   b) 1970   c) 1972   d) 1975

5. **Protina, Shakti and Rathna are lysine rich _____ hybrids developed in India.**
   a) Maize   b) Wheat   c) Rice   d) Lady's finger

II. Fill in the blanks
(5 × 1 = 5)

6. Economically important crop plants with superior quality are raised by _____.

7. The scientific process which produces crop plants enriched with desirable nutrients are called _____.

8. _____ cells are undifferentiated mass of cells.

9. _____ is called as the "Father of the Green Revolution".

10. Polyploidy can be induced by chemical agents like _____.

III. State whether the statements are true or false. Correct the false statement
(5 × 1 = 5)

11. Raphanobrassica is a tetraploid man-made genus produced by colchicine treatment.

12. The process of producing an organism with more than two sets of chromosome is called mutation.

13. Golden rice is a hybrid.

14. DNA fingerprinting technique was developed by Alec Jeffrey.

15. Breeding of related animals is known as Outbreeding.

IV. Match the following
(5 × 1 = 5)

16. Sonalika   (a) Ground nut
17. Saccharum   (b) Semi–dwarf wheat
18. Mung No.1   (c) Beta carotene
19. TMU – 2   (d) Sugarcane
20. Golden rice   (e) Phaseolus mungo

V. Assertin and Reasoning

(5 × 1 = 5)

Direction: In each of the following questions, a statement of Assertion is given and a corresponding statement of Reason is given just below it. Of the statements given below, mark the correct answer as

a. If both A and R are true and R is the correct explanation of A.
b. If both A and R are true but R is not the correct explanation of A.
c. If A is true but R is false.
d. If both A and R are false.

21. **Assertion:** Hybrid is superior than either of its parents.
    Reason: Hybrid vigour is lost upon inbreeding.

22. **Assertion:** rDNA is superior over hybridisation techniques.
    Reason: Desired genes are inserted without introducing the undesriable genes in target organisms.

23. **Assertion:** Colchicine reduces the chromosome number.
    Reason: It promotes the movement of sister chromatids to the opposite poles.

24. **Assertion:** Genetic Engineering can overcome the drawbacks of traditional hybridization.
    Reason: Genetic Engineering can create desired DNA sequences to meet the specific requirements.

25. **Assertion:** Plasmids are extra chromosomal DNA.
    Reason: Plasmids are found in bacteria and are useful in genetic engineering.

VI. Write the answer for the following questions in word or sentence

(5 × 1 = 5)

26. State the importance of Biofortification.
27. Name the types of stem cells.
28. What are transgenic organisms?
29. What is Heterosis?
30. What is plasmid?

VII. Write the short answer for ANY 5 of the following questions

(5 × 2 = 10)

31. Name three improved characteristics of wheat that helped India to achieve high productivity.
32. Distinguish between somatic gene therapy and germ line gene therapy.
33. Differentiate between outbreeding and inbreeding.
34. State the applications of DNA fingerprinting technique.
35. What is Gamma Garden?
36. Name crop varieties developed as a result of biofortification.
37. What is inbreeding? Give an example.

VIII. Write long answer for the following questions

(2 × 5 = 10)

38. Discuss the importance of biotechnology in the field of medicine.

<div align="center">or</div>

39 With a neat labelled diagram explain the techniques involved in gene cloning.
40 Name different methods of Plant Breeding for Crop Improvement.

<div align="center">or</div>

41 Biofortication may help in removing hidden hunger. How?

UNIT 21

HEALTH AND DISEASES

Points to Remember

➢ Use of certain drugs by an individual as a regular habit. This is called drug addiction or drug abuse.

➢ Tobacco is used for smoking, chewing and snuffing. Inhaling tobacco smoke is called smoking.

➢ The dependence of alcohol is called alcoholism and the addict is termed as alcoholic.

➢ Prolonged use of alcohol depresses the nervous system, by acting as a sedative and analgesic substance and causes fatty liver (cirrhosis).

➢ Diabetes mellitus is a chronic metabolic disorder. It is characterised by increased blood glucose level due to insufficient, deficient or failure of insulin secretion and insulin resistance.

➢ Obesity is the state in which there is an accumulation of excess body fat with an abnormal increase in body weight.

➢ Coronary heart disease is the most common form and is caused by deposition of cholesterol in the blood vessels.

➢ Cancer is an abnormal and uncontrolled division of cells that invade and destroy surrounding tissue forming a tumor or neoplasm.

➢ AIDS is caused by Human immunodeficiency virus.

TEXT BOOK EVALUATION

I. Book Exercise – Choose the best answer

1. **Tobacco consumption is known to stimulate secretion of adrenaline. The component causing this could be**
   a) Nicotine   b) Tannic acid   c) Curcumin   d) heptin

   Ans.: a) Nicotine

2. **World 'No Tobacco Day' is observed on**
   a) May 31   b) June 6   c) April 22   d) October 2

   Ans.: a) May 31

3. **Cancer cells are more easily damaged by radiations than normal cells because they are**
   a) Different in structure   b) Non dividing
   c) Starved mutation   d) Undergoing rapid division

   Ans.: d) Undergoing rapid division

4. **Which type of cancer affects lymph nodes and spleen?**
   a) Carcinoma   b) Sarcoma   c) Leukemia   d) Lymphoma

   Ans.: d) Lymphoma

5. **Excessive consumption of alcohol leads to**
   a) Loss of memory   b) Cirrhosis of liver
   c) State of hallucination   d) Supression of brain

   Ans.: b) Cirrhosis of liver

6. **Coronary heart disease is due to**
   a) Streptococci bacteria   b) Inflammation of pericardium
   c) Weakening of heart valves   d) Insufficient blood supply to heart muscles

   Ans.: d) Insufficient blood supply to heart muscles

7. **Cancer of the epithelial cells is called**
   a) Leukemia   b) Sarcoma   c) Carcinoma   d) Lipoma

   Ans.: c) Carcinoma

8. **Metastasis isassociated with**
   a) Malignant tumour   b) Benign tumour   c) Both (a) and (b)   d) Crown gall tumour

   Ans.: a) Malignant tumour

9. **Polyphagia is a condition seen in**
   a) Obesity   b) Diabetes mellitus   c) Diabetes insipidus   d) AIDS

   Ans.: b) Diabetes mellitus

10. **Where does alcohol effect immediately after drinking?**
    a) Eyes   b) Auditory region   c) Liver   d) Central nervous system

    Ans.: d) Central nervous system

II. Book Exercise – State whether the following statements are true or false: If false correct the statement.

1. **AIDS is an epidemic disease.**
   Ans.: True.

2. **Cancer causing genes are called Oncogenes**
   Ans.: True.

3. **Obesity is characterized by tumour formation.**
   Ans.: False.
   Correct statement : <u>Cancer</u> is characterized by tumour formation.

4. **In leukemia both WBC's and RBC's increase in number.**
   Ans.: False.
   Correct statement : In leukemia <u>WBC's</u> increase in number.

5. **Study of cause of disease is called etiology.**
   Ans.: True.

6. **AIDS is not transmitted by contact with a patient's clothes.**
   Ans.: True.

7. **Type 2 diabetes mellitus results due to insulin deficiency.**
   Ans.: False.
   Correct statement : <u>Type 1</u> diabetes mellitus results due to insulin deficiency.

8. **Carcinogens are cancer causing agents.**
   Ans.: True.

9. **Nicotine is narcotic drug.**
   Ans.: True.

10. **Cirrhosis is associated with brain disorder.**
    Ans.: False.
    Correct statement : Cirrhosis is associated with <u>liver</u> disorder.

III. Book Exercise – Expand the following abbreviations

     1. IDDM   2. HIV   3. BMI   4. AIDS   5. CHD   6. NIDDM

     Ans.:
     1.   IDDM   -   Type-1 Insulin Dependent Diabetes Mellitus
     2.   HIV   -   Human Immunodeficiency Virus

3.   BMI   -   Body mass index
4.   AIDS   -   Acquired Immunedeficiency Syndrome
5.   CHD   -   Coronary heart disease
6.   NIDDM   -   Type-2 Non-Insulin Dependent Diabetes Mellitus

IV. Book Exercise – Match the following

1.	**Sarcoma**	**(a)**	**Stomach cancer**
2.	**Carcinoma**	**(b)**	**Excessive thirst**
3.	**Polydipsia**	**(c)**	**Excessive hunger**
4.	**Polyphagia**	**(d)**	**Lack of blood flow to heart muscle**
5.	**Myocardial Infarction**	**(e)**	**Connective tissue cancer**

Ans :

Column I		Column II	
1	Sarcoma	e	Connective tissue cancer
2	Carcinoma	a	Stomach cancer
3	Polydipsia	b	Excessive thirst
4	Polyphagia	c	Excessive hunger
5	Myocardial Infarction	d	Lack of blood flow to heart muscle

V. Book Exercise – Fill in the blanks

1.   Cirrhosis is caused in liver due to excessive use of _____.   **Ans.:** Alcohol
2.   A highly poisonous chemicals derived from tobacco is _____.   **Ans.:** Nicotine
3.   Blood cancer is called _____.   **Ans.:** Leukaemia
4.   Less response of a drug to a specific dose with repeated use is called _____.   **Ans.:** Drug tolerance
5.   Insulin resistance is a condition in _____ diabetes mellitus.   **Ans.:** Type 2

VI. Book Exercise – Analogy type questions. Identify the first words and their relationship and suggest a suitable word for the fourth blank

a.   **Communicable: AIDS: Non communicable: _____.**
     Ans : Diabetes.

b.   **Chemotherapy: Chemicals: Radiation therapy: _____.**
     Ans : Radiation.

c.   **Hypertension: Hypercholesterolomia: Glycosuria: _____.**
     Ans : Hyperglycemia.

VII. Book Exercise – Answer in a sentence

1.   **What are psychotropic drugs?**
     The drugs which act on the brain and alter the behaviour, consciousness, power of thinking and perception are called **Psychotropic drugs**. They are also referred as **mood altering drugs**.

2.   **Mention the diseases caused by tobacco smoke.**
     1.Lung cancer 2.Bronchitis 3.Pulmonary tuberculosis 4.Emphysema 5.Hypoxia and 6.Oral cancer

3.   **What are the contributing factors for Obesity?**
     Obesity is due to genetic factors, physical inactivity, eating habits (overeating) and endocrine factors.

4.   **What is adult onset diabetes?**
     Type-2 Non-Insulin Dependent Diabetes Mellitus (NIDDM) is called as adult onset diabetes.

5. What is metastasis?

The cancerous cells migrate to distant parts of the body and affect new tissues. This process is called **metastasis**.

6. How does insulin deficiency occur?

Insulin deficiency occurs due **destruction of β-cells of the pancreas**.

VIII. Book Exercise – Short answer questions

1. What are the various routes by which transmission of human immuno deficiency virus takes place ?

HIV is transmitted generally by

i)   Sexual contact with infected person

ii)   Use of contaminated needles or syringes especially in case of intravenous drug abusers

iii) By transfusion of contaminated / infected blood or blood products

iv)   From infected mother to her child through placenta.

2. How is a cancer cell different from a normal cell ?

	Cancer cell	Normal cell
1.	These cells divide in an unregulated / uncontrolled manner.	These cells divide in a regulated manner.
2.	Their life span is not definite.	They have a definite life span.
3.	They remain immature and undifferentiated.	They mature into specialized cells.

3. Differentiate between Type-1 and Type-2 diabetes mellitus.

Factors	Type-1 Insulin dependent diabetes mellitus (IDDM)	Type-2 Non-insulin dependent diabetes mellitus (NIDDM)
Prevalence	10-20%	80-90%
Age of onset	Juvenile onset (< 20 years)	Maturity onset (>30 years)
Body weight	Normal or Underweight	Obese
Defect	Insulin deficiency due to destruction of β-cells	Target cells do respond to insulin
Treatment	Insulin administration is necessary	Can be controlled by diet, exercise and medicine

4. Why is a dietary restriction recommended for an obese individual ?

Calorie restriction for weight reduction is safe and most effective.

Low calorie, normal protein, vitamins and mineral, restricted carbohydrate and fat, high fiber diet can prevent overweight.

5. What precautions can be taken for preventing heart diseases ?

    i) Diet management :

       a) **Food to avoid or reduce :** High calories, low saturated fat and cholesterol rich food, low carbohydrates and common salt.

       b) **Food to take :** Diet rich in polyunsaturated fatty acids (PUFA), fibre diet, fruits and vegetables, protein, minerals and vitamin.

    ii) **Physical activity:** Regular exercise, walking and yoga are essential for body weight maintenance.

    iii) **Addictive substance avoidance:** Alcohol consumption and smoking are to be avoided.

IX. Book Exercise – Long answer questions

1. Suggest measures to overcome the problems of an alcoholic.

    i) **Education and counselling:** Education and proper counselling will help the alcoholics to overcome their problems and stress, to accept failures in their life.

ii) **Physical activity:** Individuals undergoing rehabilitation should be channelized into healthy activities like reading, music, sports, yoga and meditation.

iii) **Seeking help from parents and peer groups:** When a problematic situation occurs, the affected individuals should seek help and guidance from parents and peers. This would help them to share their feeling of anxiety, wrong doing and get rid of the habit.

iv) **Medical assistance:** Individual should seek help from psychologists and psychiatrists to get relieved from this condition and to lead a relaxed and peaceful life.

Alcohol de-addiction and rehabilitation programmes are helpful to the individual so that they could get rid of the problem completely and can lead a normal and healthy life.

2. Changes in lifestyle is a risk factor for occurrence of cardiovascular diseases. Can it be modified ? If yes, suggest measures for prevention.

Yes, it can be modified. Our lifestyle is not only our best defense against heart diseases, it's also our responsibility. A heart-healthy lifestyle includes the ideas listed below. By following these simple steps we can reduce all of the modifiable risk factors for heart diseases.

i) Diet management:

a) **Food to avoid or reduce :** High calories, low saturated fat and cholesterol rich food, low carbohydrates and common salt.

b) **Food to take :** Diet rich in polyunsaturated fatty acids (PUFA), fibre diet, fruits and vegetables, protein, minerals and vitamin.

ii) **Physical activity:** Regular exercise, walking and yoga are essential for body weight maintenance.

iii) **Addictive substance avoidance:** Alcohol consumption and smoking are to be avoided.

iv) **Aim for a healthy weight :** Good nutrition, controlling calorie intake and physical activity are the only way to maintain a healthy weight. Obesity places you at risk for high cholesterol — the very factors that heighten our risk of cardiovascular disease.

v) **Reduce stress :** There is a relationship between coronary heart disease risk and stress in a person's life that may affect the risk factors for heart diseases.

X. Book Exercise – Higher Order Thinking Skills (HOTS)

1. What is the role of fat in the cause of atherosclerosis?

Deposition of cholesterol in the blood vessels usually develops slowly over many years beginning from childhood, they may form a fatty streak to a fibrous complicated **plaque**. It leads to the narrowing of blood vessels leading to **atherosclerosis** in the large and medium sized arteries that supply the heart muscle with oxygen.

2. Eating junk food and consuming soft drinks results in health problems like obesity, still children prefer. What are the suggestions you would give to avoid children eating junk food/ consumption of soft drinks?

i) **Start with a Balanced Breakfast :** have a protein-rich breakfast item to keep hunger levels sustained until a midmorning snack or lunchtime.

ii) **Keep Junk Food Away :** The statement "Out of sight, out of mind," holds so much truth when it comes to how to get rid of and fight junk food cravings! Instead of packaged pastries and chips located in the comfort of home, avoid their purchase altogether.

iii) **Purchase Healthier Foods:** Fill the diet with more whole grains, lean proteins, healthful fats, and fresh fruits and veggies.

iv) **Find Distractions :** If truly having temptation to eat junk food , try to find some sort of distraction. A quick walk or piece of gum can not only fight junk food cravings, but save on hundreds of unwanted calories!

v) **Drink Plenty of Water :** Thirst is often mistaken for hunger. So instead of reaching for that snack, pour up a glass of water! Staying hydrated further aids in digestion and promotes a healthy metabolism.

3. **Regular physical exercise is advisable for normal functioning of human body. What are the advantages of practising exercise in daily life?**

    i)   Exercising regularly can improve your mood and reduce feelings of anxiety and depression.

    ii) Exercise is crucial to supporting a fast metabolism and burning more calories per day. It also helps you maintain your muscle mass and weight loss.

    iii) Physical activity helps you build muscles and strong bones. It may also help prevent osteoporosis.

    iv) Engaging in regular physical activity can increase your energy levels. This is true even in people with persistent fatigue and those suffering from serious illnesses.

    v)   Daily physical activity is essential to maintaining a healthy weight and reducing the risk of chronic disease.

    vi) Moderate exercise can provide antioxidant protection and promote blood flow, which can protect your skin and delay signs of aging.

    vii) Regular exercise improves blood flow to the brain and helps brain health and memory. Among older adults, it can help protect mental function.

4. **A leading weekly magazine has recently published a survey analysis which says that number of AIDS patient in the country is increasing day by day. The report says that the awareness among the people about AIDS is still very poor. You are discussing the magazine report in your class and a team of your class decides to help people to fight against the dreadful disease.**

    a) **What problem you face when trying to educate the people in your village near by your school?**

    b) **How do you overcome the problem?**

    Problem we face while educate village people about HIV.

    i)   Illiteracy among village people.

    ii) Lack of scientific knowledge about HIV and AIDS.

    iii) Social and religious restrictions.

    iv) Lack of knowledge about effects or consequences of AIDS.

    Steps to be taken to overcome the problem.

    i)   Using locally available educated people for campaign.

    ii) Using health workers to impart knowledge about causative agent HIV and its prevention.

    iii) Using news and social medias to create awareness

    iv) Using school and college students to impart knowledge about effects or consequences of AIDS through cultural programmes.

XI. Book Exercise – Value based questions

1. **Once a person starts taking drugs or alcohol it is difficult to get rid of the habit. Why?**

    Drug and alcohol consumption has an inherent addictive nature associated with euphoria and a temporary feeling of well-being. Repeated intake of drugs increases the tolerance level of the body's receptors, leading to more consumption of drugs.

2. **Men addicted to tobacco lead to oxygen deficiency in their body. What could be the possible reason?**

    1. Carbon monoxide of tobacco smoke binds to haemoglobin of RBC and decreases its oxygen carrying capacity and it takes the place of oxygen in the blood causing hypoxia in body tissues.

    2. Smoking causes inflammation of lung's alveoli and decreases the surface area for O_2 diffusion into blood. Thus men, addicted to tobacco, have oxygen deficiency in their body.

3. **Name any three foods that are to be avoided and included in the diet of a diabetic patient. Why should it be followed?**

    Food to be avoided in diet

    i)   Refined sugar

    ii) Saturated fat and

    iii) White bread, pasta and rice.

Food to be included in diet
i)   Millets
ii) Green leafy vegetables and
iii) Wheat.

4. How can informational efforts change people's HIV knowledge and behaviour?

AIDS related health programmes, health education and campaigns which aim to influence people's behaviour. Informational efforts have changed people's HIV knowledge and behaviour regarding HIV, including

i)   Screening of blood for HIV before transfusion
ii) Use of disposable needles and syringes in hospitals and clinics.
iii) Safe sex and advantages of using condoms and
v)   Attitude towards people infected with HIV.

XII. Book Exercise – Assertion and reason

In each of the following questions, a statement of Assertion is given and a corresponding statement of Reason is given just below it. Of statements given below mark the correct answer as

   a) **If both Assertion and Reason are true and Reason is the correct explanation of Assertion**
   b) **If both Assertion and Reason are true that Reason is not the correct explanation of Asssertion**
   c) **Assertion is true but Reason is false**
   d) **Both Assertion and Reason are false.**

1. Assertion: All drugs act on the brain.
   Reason: Drugs disturb the functioning of the body and mind.
   Ans.: a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion

2. Assertion: Excretion of excess glucose in urine is observed in a person with diabetes mellitus.
   Reason: Pancreas is unable to produce sufficient quantity of insulin.
   Ans.: a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion

Additional – Choose the best answer

1. POCSO - Protection of Children from Sexual Offences Act came into force in the year _____.
   a) 1985   b) 2000   c) 2002   d) 2012
   Ans.: d) 2012

2. International Day against Drug Abuse and Illicit Trafficking is observed on _____.
   a) June 26   b) 4th February   c) 7th November   d) May 31
   Ans.: a) June 26

3. Narcotic Drugs and Psychotropic Substances Act was introduced in the year _____.
   a) 1985   b) 2000   c) 2002   d) 2012
   Ans.: a) 1985

4. One of the following is not the behaviour of drug users.
   a) Lack of interest in personal hygiene, isolation, depression, fatigue and aggressive behaviour.
   b) Deteriorating relationship with family and friends.
   c) Excellent in academic performance.
   d) Change in food and sleeping habits.
   Ans.: c) Excellent in academic performance.

5. Smoking causes inflammation of lung alveoli, decrease surface area for gas exchange and lead to the disease known as _____.
   a) Hypoxia   b) Emphysema   c) Bronchitis   d) Cancer
   Ans.: b) Emphysema

6. Carbon monoxide of tobacco smoke binds to haemoglobin of RBC and decreases its oxygen carrying

capacity causing _____ in body tissues.

a) Hypoxia   b) Emphysema   c) Bronchitis   d) Cancer

Ans.: a) Hypoxia

7. **The statutory warning found in all cigarette advertisements and packs is**

a) Quit smoking today to get happiness tomorrow.   b) Smoking is injurious to Health.

c) We need to burn calories daily, not tobacco.   d) Tobacco is killing us, don't let it kill you.

Ans.: b) Smoking is injurious to Health.

8. **Anti Tobacco Act was passed on May 1st _____.**

a) 1985   b) 2000   c) 2004   d) 2012

Ans.: c) 2004

9. **No Tobacco Day or World Anti-Tobacco Day is observed on _____.**

a) June 26   b) 4th February   c) 7th November   d) May 31

Ans.: d) May 31

10. **Diabetes Mellitus is characterised by increased blood _____ level.**

a) Glucose   b) Fat   c) Protein   d) Calcium

Ans.: a) Glucose

11. **Diabetes Mellitus is due to insufficient, deficient or failure of _____ secretion.**

a) Glucagon   b) Prolactin   c) Luteinising hormone   d) Insulin

Ans.: d) Insulin

12. **Type-1 Insulin Dependent Diabetes Mellitus (IDDM) is caused due to the destruction of _____ of the pancreas.**

a) Ducts tissue   b) Acinar Cells   c) α – Cells   d) β - Cells

Ans.: d) β- Cells

13. **Type-1 Insulin Dependent Diabetes Mellitus (IDDM) is characterized by abnormally elevated blood glucose levels called_____.**

a) Polyuria   b) Polydipsia   c) Glycosuria   d) Hyperglycemia

Ans.: d) Hyperglycemia

14. **The condition of Increased urine output which leads to dehydration is known as _____.**

a) Polyuria   b) Polydipsia   c) Glycosuria   d) Hyperglycemia

Ans.: a) Polyuria

15. **The condition of loss of water leads to thirst resulting in increased fluid intake is known as _____.**

a) Polyuria   b) Polydipsia   c) Glycosuria   d) Hyperglycemia

Ans.: b) Polydipsia

16. **The condition of excessive glucose excretion in urine is known as _____.**

a) Polyuria   b) Polydipsia   c) Glycosuria   d) Hyperglycemia

Ans.: c) Glycosuria

17. **The condition of excess hunger due to loss of glucose in urine is known as _____.**

a) Polyphagia   b) Polydipsia   c) Glycosuria   d) Hyperglycemia

Ans.: a) Polyphagia

18. **Type-2 Non-Insulin Dependent Diabetes Mellitus (NIDDM) is characterised by**

a) Normal insulin production but action is impaired   b) Cells do not respond to insulin

c) No movement of glucose into cells   d) All the above

Ans.: d) All the above

19. **According to WHO recommendation, what are the two diagnostic criteria to confirm Diabetes**

mellitus?

i) In fasting level, if blood glucose is greater than 140 mg/dl
ii) In random level, if blood glucose is greater than 200 mg /dl
iii) In fasting level, if blood glucose is less than 100 mg/dl
iv) In random level, if blood glucose is between 80 and 120 mg /dl

a) i and ii   b) i and iv   c) iii and iv   d) ii and iii

Ans. : a) i and ii

20. **Every 7 calories of excess consumption leads to 1 gm fat deposit and increase in body weight.**

a) 7   b) 14   c) 21   d) 28

Ans.: a) 7

21. **Obesity is caused due to**

a) Genetic factors   b) Overeating and physical inactivity
c) Endocrine factors   d) All the above

Ans.: d) All the above

22. **Obesity is a positive risk factor in development of**

a) Hypertension   b) Diabetes
c) Coronary heart disease   d) All the above

Ans.: d) All the above

23. **Coronary heart disease (CHD) is the most common form and is caused by deposition of _____ in the blood vessels.**

a) Sodium chloride   b) Iron   c) Cholesterol   d) Calcium

Ans.: c) Cholesterol

24. **Desirable level for blood cholesterol should be _____ for Indians.**

a) less than 200 g/dl   b) less than 200 mg/dl
c) between 200 and 239 mg/dl   d) 240 mg/dl and above

Ans. b) less than 200 mg/dl

25. **The risk of coronary heart disease increases slowly as blood cholesterol levels increases from _____ mg/dl.**

a) 20 to 99   b) 100 to 149   c) 150 to 199   d) 200 to 300

Ans.: d) 200 to 300

26. **World Cancer Day is observed on _____.**

a) June 26   b) 4th February   c) 7th November   d) May 31

Ans.: b) 4th February

27. **National Cancer Awareness Day is observed on _____.**

a) June 26   b) 4th February   c) 7th November   d) May 31

Ans.: c) 7th November

28. **Immunotherapy is treatment that uses Biological response modifiers like _____ to activate the immune system and help in destroying the tumors.**

a) Nicotine   b) Antigens   c) Interferons   d) X – rays

Ans.: c) Interferons

29. **First Indian AIDS patient was identified in _____.**

a) Chennai   b) Mumbai   d) Delhi   d) Kolkata

Ans.: a) Chennai

30. **Every year _____ is observed as the "World AIDS Day".**

a) June 26   b) 4th February   c) 7th November   d) 1st December

Ans.: d) 1st December

31. AIDS is caused by HIV. Among the following, which one is not a mode of transmission of HIV?

a) Transfusion of contaminated blood

b) Shaking hands with infected persons

c) Sexual contact with infected persons

c) Sharing the infected needle

Ans.: b) Shaking hands with infected persons

Additional – Fill in the blanks

1. Cruel, violent, harmful or injurious treatment of another human being is known as _____.

    Ans.: Abuse

2. India's first toll free children helpline number is _____.   **Ans.:** 1098

3. The physical and mental dependency on alcohol, smoking and drugs is called _____.   **Ans.:** Addiction

4. The addictive potential of these substances pulls an individual into a _____ leading to regular abuse and dependency.   **Ans.:** Vicious cycle

5. The substances used for the treatment of disease on advice of a physician and withdrawn after recovery is known as _____.   **Ans.:** Drugs

6. A person who is habituated to a drug due to its prolonged use is called _____.   **Ans.:** Drug addict.

7. The existence of both psychological dependence and physical dependence on at least one drug is known as _____.   **Ans.:** Drug addiction or drug abuse

8. A drug that modifies the physical, biological, psychological or social behaviour of a person by stimulating, depressing or disturbing the functions of the body and the mind is called _____drug.   **Ans.:** Addictive

9. The drugs which acts on the brain and alter the behaviour, consciousness, power of thinking and perception. They are referred as _____.   **Ans.:** Psychotropic drugs or mood altering drugs.

10. Persons who consume Psychotropic drugs become fully dependent on them, they cannot live without drugs. This condition is referred as _____.   **Ans.:** Drug Dependence

11. World Health Organization (WHO) suggested the use of the term _____ in place of drug addiction or drug abuse.   **Ans.:** Drug dependence

12. _____ is obtained from Nicotiana tobaccum and Nicotiana rustica.   **Ans.:** Tobacco

13. The important alkaloid present in tobacco is _____.   **Ans.:** Nicotine

14. The drug _____ present in tobacco is a stimulant, highly harmful and poisonous substance.

    Ans.: Nicotine

15. Inhaling tobacco smoke from cigars, cigarettes, bidis, pipes, hukka is called _____.   **Ans.:**Smoking.

16. When powdered tobacco is taken through nose, it is called _____.   **Ans.:** Snuffing.

17. _____ and polycyclic hydrocarbons present in tobacco smoke is carcinogenic causing lung cancer.

    Ans.: Benzopyrene

18. Smoking causes inflammation of throat and bronchi leading to conditions like _____and pulmonary tuberculosis.   **Ans.:** Bronchitis

19. The dependence of alcohol is called _____.   **Ans.:** Alcoholism

20. The person who is addict to alcohol is termed as _____.   **Ans.:** Alcoholic.

21. Alcohol abuse causes liver damage resulting in fatty liver which leads to the disease _____.

    Ans.: Cirrhosis

22. Diabetes Mellitus is due to insufficient, deficient or failure of _____ secretion.   **Ans.:** Insulin

23. Type 1 Diabetes in children and teens is known as _____.   **Ans.:** Juvenile diabetes

24. The condition of increased blood glucose level in blood is known as _____.   **Ans.:** Hyperglycemia

25. Excretion of excessive glucose in urine is known as _____.   **Ans.:** Glycosuria

26. Type-2 Non-Insulin Dependent Diabetes Mellitus (NIDDM) is also called as _____.

           Ans.: Adult onset diabetes

27. The state in which there is an accumulation of excess body fat with an abnormal increase in body weight is known as _____.   **Ans.:** Obesity

28. _____ is a measurement of a person's weight with respect to his or her height.

           Ans.: Body Mass Index (BMI)

29. The formula used to estimate the body fat and health risk by Body mass index (BMI) is _____.

           Ans.: BMI = Weight (kg) / Height (m)2

30. An adult weighing 10% more than the standard weight is _____ and 20% more is_____.

           Ans.: OVERWEIGHT and OBESE

31. Cardiovascular disease (CVD) is associated with diseases of the heart and _____.   **Ans.:** Blood vessels

32. The fibrous and thick layer of cholesterol which deposits in the inner wall of arteries is known as _____.

           Ans.: Plaque

33. _____ is a disease of the narrowing of arteries due to plaque build up on the artery walls.

           Ans.: Atherosclerosis

34. Deficient blood supply to heart muscle is called as _____.   **Ans.:** Ischemia

35. Death of the heart muscle tissue is termed as _____.   **Ans.:** Myocardial infarction

36. The good cholesterol known as _____ lowers risk of heart disease.

           Ans.: HDL (High Density Lipoprotein)

37. The "bad" cholesterol known as _____ increases risk of heart disease.

           Ans.: LDL (Low Density Lipoprotein)

38. The study of cancer is called _____.   **Ans.:** Oncology

39. _____ is an abnormal and uncontrolled division of cells that invade and destroy surrounding tissue forming a tumor.   **Ans.:** Cancer

40. Cancer cells destroy surrounding tissue forming a tumor called _____.   **Ans. :** Neoplasm

41. Tumor or neoplasm is a _____ group of cells that do not respond to the normal cell division.

           Ans.: Heterogenous (Consists both both normal cells and neoplastic cells)

42. The process of migration of cancerous cells to distant parts of the body and affect new tissues is called as _____.   **Ans.:** Metastasis.

43. The type of cancer formed in epithelial and glandular tissues of skin, lung, stomach and brain is known as _____.   **Ans.:** Carcinomas

44. The type of cancer that occurs in the connective and muscular tissue such as bones, cartilage, tendons, adipose tissue and muscles is known as _____ .   **Ans.:** Sarcomas

45. The type of cancer characterized by an increase in the formation of white blood cells in the bone marrow and lymph nodes is _____.   **Ans.:** Leukaemia or blood cancers

46. The scientific term for blood cancers is _____ .   **Ans.:** Leukaemia

47. Most common type of cancer which also affects children below 15 years of age is _____.

           Ans.: Leukaemia or blood cancers

48. The tumors which remain confined in the organ affected and do not spread to other parts of the body is known as _____.   **Ans.:** Benign tumours or Non malignant tumours

49. Mass of proliferating cells which grow very rapidly invading and damaging the surrounding normal tissues is known as _____.   **Ans.:** Malignant tumours

50. Cancer causing agents are called _____.　　　**Ans.:** Carcinogens.

51. Heavy smoking, Betel and tobacco chewing and excessive exposure to sunlight are the _____ irritant which may cause cancer.　　　**Ans.:** Physical

52. Nicotine, caffeine, pesticides, asbestos, nickel, certain dyes and artificial sweetners are _____ agents to induce cancer.　　　**Ans.:** Chemical

53. X-rays, Gamma- rays and UV- rays cause damage in the _____ leading to cancer.　　　**Ans.:** DNA

54. Cancer causing viruses are called _____ viruses.　　　**Ans.:** Oncogenic

55. The treatment that uses Biological response modifiers like interferons to activate the immune system and help in destroying the tumors is called _____ .　　　**Ans.:** Immunotherapy

56. AIDS stands for_____.　　　**Ans.:** Acquired Immune Deficiency Syndrome

57. AIDS is a severe viral disease and caused by _____.　　　**Ans.:** Human Immunodeficiency Virus (HIV)

58. HIVs attack the _____ and suppress the body's disease fighting mechanism.　　　**Ans.:** Lymphocytes

59. _____ and her team was the first to document evidence of HIV infection in India in 1985.　　　**Ans.:** Dr. Suniti Solomon

60. HIV may be transmitted from infected mother to her child through _____.　　　**Ans.:** Placenta

61. The presence of _____ virus can be confirmed by Western Blot or Enzyme Linked Immunosorbent Assay (ELISA)　　　**Ans.:** HIV

62. Anti-retroviral drugs and _____ therapy can prolong the life of the HIV infected person.　　　**Ans.:** Immunestimulative

63. NACO stands for _____.　　　**Ans.:** National AIDS Control Organization

Additional – True or false

1. **By 2030 tobacco is expected to be single biggest cause of death worldwide accounting for 10 million deaths per year.**
   Ans.: True.

2. **Drinking of alcohol improves one's physical, physiological and psychological functions.**
   Ans.: False.
   Correct statement: Drinking of alcohol **impairs** one's physical, physiological and psychological functions.

3. **Diabetes Mellitus is the most common pituitary endocrine disorder.**
   Ans.: False.
   Correct statement: Diabetes Mellitus is the most common **pancreatic** endocrine disorder.

4. **The condition of Increased urine output which leads to dehydration is known as Polydipsia.**
   Ans.: False.
   Correct statement: The condition of Increased urine output which leads to dehydration is known as **Polyuria**.

5. **LDL lowers risk of heart disease while HDL increases risk of heart disease.**
   Ans.: False.
   Correct statement: HDL lowers risk of heart disease while **LDL** increases risk of heart disease.

6. **About 85% of the tumours are carcinomas and only 1% tumours are sarcomas.**
   Ans.: True.

7. **Nicotine, caffeine, pesticides, asbestos, nickel, certain dyes and artificial sweeteners are physical agents to induce cancer.**
   Ans.: False.

Correct statement : Nicotine, caffeine, pesticides, asbestos, nickel, certain dyes and artificial sweetners are <u>**chemical**</u> agents to induce cancer.

8. HIV/AIDS is not transmitted by touch or any physical contact.

Ans.: True.

Additional – Match the following

Section – I

1.	Tobacco	(a) Hypertension
2.	Nicotine	(b) Excessive glucose in urine
3.	Emphysema	(c) Nicotiana rustica
4.	Hypoxia	(d) Alkaloid
5.	Diabetes mellitus	(e) Alveoli damage
6.	Hyperglycemia	(f) Inadequate o2 to tissue
7.	Polyuria	(g) Metabolic disorder
8.	Glycosuria	(h) High blood glucose
9.	Hypercholesterolemia	(i) Increased urine output
10.	High blood pressure	(j) High blood cholesterol

Ans :

1.	Tobacco	c	Nicotiana rustica
2.	Nicotine	d	Alkaloid
3.	Emphysema	e	Alveoli damage
4.	Hypoxia	f	Inadequate o_2 to tissue
5.	Diabetes mellitus	g	Metabolic disorder
6.	Hyperglycemia	h	High blood glucose
7.	Polyuria	i	Increased urine output
8.	Glycosuria	b	Excessive glucose in urine
9.	Hypercholesterolemia	j	High blood cholesterol
10.	High blood pressure	a	Hypertension

Section – II

1.	IDDM	(a) HIV Confirmation
2.	NIDDM	(b) Blood cancers
3.	HDL	(c) Adult onset diabetes
4.	LDL	(d) Tumor
5.	ELISA	(e) Bad cholesterol
6.	Neoplasm	(f) Good cholesterol
7.	Leukaemia	(g) Juvenile diabetes
8.	1st December	(h) No Tobacco Day
9.	4th February	(i) World AIDS Day
10.	May 31	(j) World Cancer Day

Ans :

1.	IDDM	g	Juvenile diabetes
2.	NIDDM	c	Adult onset diabetes
3.	HDL	f	Good cholesterol
4.	LDL	e	Bad cholesterol
5.	ELISA	a	HIV Confirmation

6.	Neoplasm	d	Tumor
7.	Leukaemia	b	Blood cancers
8.	1st December	i	World AIDS Day
9.	4th February	j	World Cancer Day
10.	May 31	h	No Tobacco Day

Additional – Analogy type questions. Identify the first words and their relationship and suggest a suitable word for the fourth blank

1. **Sarcomas : Bone**
   Leukaemia : _____
   Ans : Blood.

2. **IDDM : Maturity onset**
   NIDDM : _____
   Ans : Juvenile onset

3. **Emphysema : Alveoli**
   Atherosclerosis : _____
   Ans : Artery.

4. **α Cells : Glucagon**
   β-cells : _____
   Ans : Insulin.

5. **Polydipsia : Excess thirst**
   Polyphagia : _____
   Ans : Excess hunger.

Additional – Assertion and Reason

In each of the following questions, a statement of Assertion is given and a corresponding statement of Reason is given just below it. Of statements given below mark the correct answer as

     a) **Both Assertion and Reason are true and Reason is the correct explanation of Assertion**

     b) **Both Assertion and Reason are true that Reason is not the correct explanation of Asssertion**

     c) **Assertion is true but Reason is false**

     d) **Both Assertion and Reason are false**

1. **Assertion:** Prolonged use of alcohol depresses the nervous system.
   Reason: Alcohol acts as a sedative and analgesic substance.

        Ans : a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion

2. **Assertion:** Benign tumors are called neoplastic cells.
   Reason: Malignant tumors remain in place to form a compact mass by a process known as metastasis.

        Ans : d) Both Assertion and Reason are false

3. **Assertion:** Tobacco contains a large number of alkaloids including nicotine.
   Reason: Nicotine stimulates adrenal glands which decrease blood pressure and increase heart rate.

        Ans : c) Assertion is true but Reason is false

4. **Assertion:** Aids spreads by contact between the blood of an infected person and a healthy person.
   Reason: Aids manifests as tumours or as pathogen infection.

        Ans : c) Assertion is true but Reason is false

5. **Assertion:** In alcoholic drink, the alcohol is converted into glucose in liver.

Reason: Liver cells are able to produce glucose from alcohol by back fermentation.

Ans : d) Both Assertion and Reason are false

Additional – Answer in a sentence

1.   Define Child Abuse.

Child abuse constitutes all forms of physical or emotional ill treatment, sexual abuse, **exploitation** resulting in child's ill health, survival and development.

2.   Define Physical abuse of a child.

Physical abuse of a child is defined as those acts that cause physical harm such as threatening, beating, kicking and hitting the child.

3.   Define sexual Abuse.

Sexual harassment is a form of power and dominance of one person over another, which can result in harmful consequence to the victim. It refers to inappropriate or forced sexual contact.

4.   What does POCSO stand for?

POCSO - Protection of Children from Sexual Offences Act, 2012.

5.   When did POCSO Act come into force?

The Protection of Children from Sexual Offences Act (POCSO), Act 2012, came into force on 14.11.2012.

6.   Define addiction.

The physical and mental dependency on alcohol, smoking and drugs is called addiction.

7.   Define drug.

A substance used in the diagnosis, treatment, or prevention of a disease on advice of a physician and withdrawn after recovery is called drug.

8.   Define drug addict.

A person who is habituated to a drug due to its prolonged use is called **drug addict**.

9.   When do we observe International Day against Drug Abuse and Illicit Trafficking?

International Day against Drug Abuse and Illicit Trafficking is observed every year on June 26.

10.   When was Narcotic Drugs and Psychotropic Substances Act introduced?

Narcotic Drugs and Psychotropic Substances Act was introduced in 1985.

11.   From which species of tobacco plant is tobacco is obtained?

Tobacco is obtained from the two different species of tobacco plant
i)   Nicotiana tobaccum and
ii)   Nicotiana rustica.

12.   Name the principal alkaloid present in tobacco.

The principal alkaloid present in tobacco is 'Nicotine'.

13.   What are the characteristics of Nicotine?

Nicotine is a **stimulant**, highly harmful and poisonous substance.

14.   Write the statutory warning given in cigarette advertisements and packs.

The statutory warning given in cigarette advertisements and packs is **"Smoking is injurious to Health"**.

15.   When was Anti Tobacco Act passed?

Anti Tobacco Act was passed on May 1st 2004.

16.   When do we observe No Tobacco Day (World Anti-Tobacco Day)?

Ans : No Tobacco Day (World Anti-Tobacco Day) is observed on May 31 every year.

17.   Define obesity.

Ans : Obesity is the state in which there is an accumulation of excess body fat with an abnormal increase in body weight.

18. **What is ischemia?**
    Ans : Deficient blood supply to heart muscle is called as ischemia.

19. **What is oncology?**
    Ans : The study of cancer is called Oncology.

20. **When is World Cancer day observed?**
    Ans : World Cancer Day is observed on 4th February every year.

21. **When is National Cancer Awareness Day observed?**
    Ans : National Cancer Awareness Day is observed on 7th November.

22. **When do we observe "World AIDS Day"?**
    Ans : "World AIDS Day" is observed every year on December 1.

Additional – Short answers

1. **What are the risk factors responsible for illness and early death?**
   i) Smoking cigarettes
   ii) Alcohol addiction
   iii) Use of drugs
   iv) Eating high fat and cholesterol rich diets
   v) Excessive intake of junk foods and
   vi) Reduced physical activity are some of the risk factors for illness and early death.

2. **What are the lifestyles we can adopt to promote wellness and protect our health?**
   i) By taking nutritious diet
   ii) Regular exercise and
   iii) By avoiding drugs, alcohol and smoking.

3. **Define abuse. What are the different types of abuses?**
   Cruel, violent, harmful or injurious treatment of another human being is known as abuse.
   It includes
   i) Physical abuses
   ii) Emotional or psychological abuses
   iii) Verbal abuses
   iv) Child abuses and
   v) Sexual abuses.

4. **What are the symptoms found in sexually abused children?**
   The symptoms found in sexually abused children are
   i) Genital injury
   ii) Abdominal pain
   iii) Frequent urinary infection and
   iv) Behavioural problems.

5. **What are the Objectives of the POCSO Act, 2012?**
   i) To protect children from the offences of
      a) Sexual assault
      b) Sexual harassment
      c) Pornography
   ii) To establish Special Courts for speedy trial of such offences.

6. **Define Drug Abuse or Drug addiction.**
   A person who is habituated to a drug due to its prolonged use is called **drug addict**. The existence of both psychological dependence and physical dependence on at least one drug is called **drug addiction** or **drug abuse**.

7. **What is addictive drug?**
   A drug that modifies the physical, biological, psychological or social behaviour of a person by stimulating, depressing or disturbing the functions of the body and the mind is called **addictive drug**.

8. What are the effects of addictive drugs?

i) Addictive drugs interact with the central nervous system and affect the individual physically and mentally.

ii) They modify the physical, biological, psychological or social behaviour of a person by stimulating, depressing or disturbing the functions of the body and the mind.

9. What are mood altering drugs?

There are certain drugs called **psychotropic drugs** which acts on the brain and alter the behaviour, consciousness, power of thinking and perception. They are referred as **mood altering drugs**.

10. What is drug dependence ? What are the two types of drug dependence?

Persons who consume these drugs become fully dependent on them, they cannot live without drugs. This condition is referred as drug dependence. There are two types of drug dependence

i) **Physical and mental dependence :** Dependence on the drug for normal condition of well being and to maintain physiological state.

ii) **Psychological dependence :** It is a feel that drugs help them to reduce stress.

11. What is diabetes mellitus?

Diabetes mellitus is a chronic metabolic disorder. It is characterised by increased blood glucose level due to insufficient, deficient or failure of insulin secretion. This is the most common pancreatic endocrine disorder.

12. What are the causes for Type-1 Insulin Dependent Diabetes Mellitus (IDDM) ?

i) IDDM is caused by the **destruction of β-cells of the pancreas**. It is characterized by abnormally elevated blood glucose levels **(hyperglycemia)** resulting from **inadequate insulin secretion**.

ii) Genetic inheritance and environmental factors (infections due to virus, acute stress) are the cause for this condition.

13. What are the causes for Type-2 Non - Insulin Dependent Diabetes Mellitus (NIDDM)?

i) Insulin production by the pancreas is normal but its action is impaired.

ii) The target cells do not respond to insulin. It does not allow the movement of glucose into cells.

iii) The causes are multifactorial which include increasing age (affecting middle aged and older people), obesity, sedentary life style, overeating and physically inactive.

14. What is the diagnostic criteria to confirm Diabetes mellitus?

According to WHO recommendation, the diagnostic criteria to confirm Diabetes mellitus are

i) In fasting level, if blood glucose is greater than 140 mg/dl

ii) In random level, if blood glucose is greater than 200 mg /ml.

15. What is BMI?

Body mass index (BMI) is an estimate of body fat and health risk. It is a measurement of a person's weight with respect to his or her height.

$$\text{BMI} = \frac{\text{Weight (kg)}}{\text{Height (m)}^2}$$

16. What are the causes and risk factors of obesity?

Causes of obesity : Obesity is due to

i) Genetic factors

ii) Physical inactivity

iii) Eating habits (overeating) and

iv) Endocrine factors

Risk factors of obesity : Obesity is a positive risk factor in development of

i) Hypertension

ii) Diabetes

iii) Gall bladder disease

iv) Coronary heart disease and

v) Arthritis.

17. How can we prevent and control Obesity ?

i) Diet Management :

a) Low calorie, normal protein, vitamins and mineral, restricted carbohydrate and fat, high fiber diet can prevent overweight.

b) Calorie restriction for weight reduction is safe and most effective.

ii) Physical exercise:

a) A low calorie diet accompanied by moderate exercise will be effective in causing weight loss.

b) Meditation, yoga and physical activity can also reduce stress related to overeating.

18. What is plaque?

Plaque is a thick layer formed inside our arteries which is made up of fat, cholesterol, calcium, and other substances found in the blood. Plaque hardens and narrows our arteries.

19. What is Atherosclerosis?

Atherosclerosis is a disease of arteries in which plaque (Thick layer of cholesterol) builds up inside our arteries. Plaque hardens and narrows our arteries and prevents supply of oxygen-rich blood to your heart and other parts of your body.

20. What do you mean by myocardial infarction?

Myocardial infarction (MI) is commonly known as a heart attack. MI occurs when blood flow stops to a part of the heart causing death of the heart muscle.

21. What are the causes of heart diseases?

Causes: 1. Heredity (family history) 2. Diet rich in saturated fat and cholesterol 3. Obesity 4. Increasing age 5. Cigarette smoking 6. Emotional stress 7.Sedentary lifestyle 8. Excessive alcohol consumption and 9. Physical inactivity.

22. What are the symptoms of Cronary Heart Disease (CHD)?

The symptoms of Cronary Heart Disease (CHD) are

i) Shortness of breath

ii) Headache

iii) Tiredness

iv) Dizziness

v) Chest pain

vi) Swelling of leg and

vii) Gastrointestinal disturbances.

23. What are HDL and LDL? In what way they are related to heart diseases?

i) **HDL :** HDL stands for High Density Lipoproteins. It is also called as "good" cholesterol. HDL lowers risk of heart disease.

ii) **LDL :** LDL stands Low Density Lipoprotein. It is also called as "bad" cholesterol. LDL increases risk of heart disease.

24. What is the desirable blood cholesterol level for Indians?

Desirable level for blood cholesterol should be less than 200 mg/dl for Indians. The risk of coronary heart disease increases slowly as blood cholesterol levels increases from 200 to 300 mg/dl.

25. Define cancer.

Cancer is an abnormal and uncontrolled division of cells that invade and destroy surrounding tissue forming a tumor or **neoplasm** (new growth). It is a heterogenous group of cells that do not respond to the normal cell division.

26. What is matastasis?

The cancerous cells migrate to distant parts of the body and affect new tissues. This process is called **metastasis**. The frequent sites of metastasis are lungs, bones, liver, skin and brain.

27. What are the two types of tumours ?

i) **Benign tumours or Non malignant tumours:** Remain confined in the organ affected and do not spread to other parts of the body.

ii)   **Malignant tumours:** Mass of proliferating cells which grow very rapidly invading and damaging the surrounding normal tissues.

28.   What are the preventive measures for Cancer?

i)   Tobacco smoking is to be avoided.

ii)   Protective measures to be taken against exposure to toxic pollutants of industries.

iii)   Excessive exposure to radiation is to be avoided to prevent skin cancer.

29.   What is AIDS ?

Acquired immune deficiency syndrome (AIDS) is a syndrome caused by a virus called Human Immunodeficiency Virus (HIV).

It is a condition in which immune system fails and suppress the body's disease fighting mechanism. They attack the lymphocytes and the affected individual is prone to infectious diseases.

30.   How is HIV diagnosed?

The presence of HIV virus can be confirmed by

i)   Western Blot analysis or

ii)   Enzyme Linked Immunosorbent Assay (ELISA).

31.   What are the treatments given for the AIDS patient?

The following treatments are given to prolong the life of the infected person.

i)   Anti-retroviral drugs and

ii)   Immunostimulative therapy.

32.   What is Immunotherapy?

Immunotherapy is the treatment that uses Biological response modifiers like interferons to activate the immune system and help in destroying the tumors.

Additional – Long Answers

1.   What are the measures adopted for monitoring and assessment of abused child?

i)   **Child Helpline:** The Child Helpline provides a social worker who can assist the child by providing food, shelter and protection.

ii)   **Counselling the child:** Psychologists and social workers should provide guidance, counselling and continous support to a victimized child.

iii)   **Family support:** The victimized child should be supported by the family members. They should be provided with proper care and attention to overcome their sufferings.

iv)   **Medical care:** A child victim of sexual offences should receive medical care and treatment from health care professionals to overcome mental stress and depression.

v)   **Legal Counsel:** The family or the guardian of the child victim shall be entitled to free assistance of a legal counsel for such offence.

vi)   **Rehabilitation:** Enrolling in schools and resuming their education is an important step towards rehabilitation of the child. It is essential that the child's life is gradually returned to normal aft er the incidence of abuse.

vii)   **Community based efforts:** Conducting awareness campaign on child abuse and its prevention.

2.   What are the instructions to be given by parents and teachers to the child regarding the prevention of sexual abuse?

i)   Do not talk to any suspected person or strangers and to maintain a distance.

ii)   Not to be alone with unknown person.

iii)   To be careful while travelling alone in public or private transport.

iv)   Not to receive money, toys, gifts or chocolates from known or unknown person to them without the knowledge of their parents.

v)   Not to allow known or unknown person to touch them.

3. What are the behavioural changes of drug users ? or What are the adverse effects of drug use among adolescents?

Adverse effects of drug use among adolescents are

i) Drop in academic performance, absence from school or college.

ii) Lack of interest in personal hygiene, isolation, depression, fatigue and aggressive behaviour.

iii) Deteriorating relationship with family and friends.

iv) Change in food and sleeping habits.

v) Fluctuation in body weight and appetite

vi) Always looking out for an easy way to get money for obtaining drugs.

vii) Prone to infections like AIDS and Hepatitis-B.

4. What are the different phases of drug de-addiction?

Management of de-addiction is a complicated and difficult task. The path to recovery of drug addicts is long and often slow. Family members, friends and society on the whole have a very important role to play.

i) **Detoxification:** The first phase of treatment is detoxification. The drug is stopped gradually and the addict is helped to **overcome the withdrawal symptoms**. The addict undergoes severe physical and emotional disturbance. This is taken care by specific medication.

ii) **Psychotherapy:** Individual and group counselling is given by psychologists and counsellors. The treatment includes efforts to reduce the addict's stress, taught new ways to solve everyday's problems, adequate diet, rest and relaxation.

iii) **Counselling to family members:** Social workers counsell family members in order to change the **attitude of rejection** so that the addict is accepted by the family and the society.

iv) **Rehabilitation:** They are given proper **vocational training** so that they can lead a healthy life and become useful members of the society.

5. What are the harmful effects of smoking? Or Describe the smoking hazards and effects of tobacco.

When smoke is inhaled, the chemicals get absorbed by the tissues and cause the following harmful effects

i) **Benzopyrene** and **polycyclic hydrocarbons** present in tobacco smoke is carcinogenic causing lung cancer.

ii) Causes inflammation of throat and bronchi leading to conditions like **bronchitis** and **pulmonary tuberculosis**.

iii) Inflammation of lung alveoli, decrease surface area for gas exchange and cause **emphysema**.

iv) **Carbon monoxide** of tobacco smoke binds to haemoglobin of RBC and decreases its oxygen carrying capacity causing **hypoxia** in body tissues.

v) **Increased blood pressure** caused by smoking leads to increased risk of heart disease.

vi) Causes **increased gastric secretion** which leads to gastric and duodenal ulcers.

vii) Tobacco chewing causes **oral cancer** (mouth cancer).

6. What are the harmful effects of alcohol to health?

Prolonged use of alcohol depresses the nervous system, by acting as a sedative and analgesic substance. Some of the harmful effects are

i) Nerve cell damage resulting in various mental and physical disturbances

ii) Lack of co-ordination of body organs

iii) Blurred or reduced vision, results in road accidents

iv) Dilation of blood vessels which may affect functioning of the heart

v) Liver damage resulting in fatty liver which leads to cirrhosis and formation of fibrous tissues

vi) Body loses its control and consciousness eventually leading to health complications and ultimately to death.

7. What are the symptoms of Diabetes mellitus?

Diabetes mellitus is associated with several metabolic alterations. The most important symptoms are

i) Increased blood glucose level **(Hyperglycemia)**

ii) Increased urine output **(Polyuria)** leading to dehydration

iii) Loss of water leads to thirst **(Polydipsia)** resulting in increased fluid intake

iv) Excessive glucose excreted in urine **(Glycosuria)**

v) Excess hunger **(Polyphagia)** due to loss of glucose in urine.

vi) Fatigue and loss of weight

8. How can we prevention and control of heart disease ?

i) **Diet management:** Reduction in the intake of calories, low saturated fat and cholesterol rich food, low carbohydrates and common salt are some of the dietary modifications. Diet rich in polyunsaturated fatty acids (PUFA) is essential. Increase in the intake of fibre diet, fruits and vegetables, protein, minerals and vitamin are required.

ii) **Physical activity:** Regular exercise, walking and yoga are essential for body weight maintenance

iii) **Addictive substance avoidance:** Alcohol consumption and smoking are to be avoided.

9. How can we prevent and control diabetes?

Prevention and control of diabetes.

i) Dietary management :

a) Low carbohydrate and fibre rich diets are more appropriate.

b) Refined sugars (sucrose and glucose) should be avoided.

c) Diet comprising whole grains, millets (jowar, bajra, ragi), green leafy vegetables, wheat and unpolished rice should be included in diet regularly.

d) Saturated fat intake should be reduced. Polyunsaturated fatty acid content should be higher.

ii) Management with insulin: Commercially available insulin preparations (short and long acting) are also used to maintain blood glucose levels.

iii) Physical activity: Exercise plays an important role in facilitating a good control of diabetes, in addition to strengthening and toning up the muscles.

iv) Education and Awareness: People with diabetics should be educated on the nature of disease they have and the possibility of complications of the disease, if blood sugar is not kept under control. Instructions regarding diet, exercise and drugs should be explained.

10. Classify cancers based on their origin.

Cancers are classified into three types based the tissues from which they are formed.

i) **Carcinomas** arise from **epithelial** and **glandular tissues**. They include cancers of skin, lung, stomach and brain. About 85% of the tumours are carcinomas

ii) **Sarcomas** are occur in the **connective** and **muscular tissue**. They include the cancer of bones, cartilage, tendons, adipose tissue and muscles. These form 1% of all tumours.

iii) **Leukaemia** are characterized by an increase in the formation of white blood cells in the bone marrow and lymph nodes. Leukaemia are called **blood cancers**. Most common type of cancer which also affect children below 15 years of age.

11. Describe different types of cancer causing agents (Carcinogenic Agents).

Cancer causing agents are called **carcinogens**. They are physical, chemical agents, ionizing radiations and biological agents.

i) Physical Irritant: Heavy smoking causes lung cancer and cancers of oral cavity, pharynx (throat) and larynx. Betel and tobacco chewing causes oral cancer. Excessive exposure to sunlight may cause skin cancer.

ii) Chemical agents: Nicotine, caffeine, products of combustion of coal and oil, pesticides, asbestos, nickel, certain dyes and artificial sweetners induce cancer.

iii) Radiations: Ionizing radiations like X-rays, gamma- rays, radioactive substances and non-ionising radiations like UV rays cause DNA damage leading to cancer.

iv) Biological agents: Cancer causing viruses are called oncogenic viruses.

12. Describe different methods of treatment of Cancer.

The treatment of cancer involves the following methods:

i) Surgery: Tumours are removed by surgery to prevent further spread of cancer cells.

ii) Radiation therapy: Tumour cells are irradiated by lethal doses of radiation while protecting the surrounding normal cells.

iii) Chemotherapy: It involves administration of anticancerous drugs which prevent cell division and are used to kill cancer cells.

iv) Immunotherapy: Biological response modifiers like interferons are used to activate the immune system and help in destroying the tumors.

13. a) How is HIV transmitted?   b) What are the symptoms of AIDS?

a) HIV is transmitted generally by

    i)   Sexual contact with infected person

    ii)   Use of contaminated needles or syringes especially in case of intravenous drug abusers

    iii) By transfusion of contaminated / infected blood or blood products

    iv) From infected mother to her child through placenta.

b) Symptoms of AIDS

    i)   Infected individuals become immunodeficient.

    ii)   The person becomes more susceptible to viral, bacterial, protozoan and fungal infections.

    iii) Swelling of lymph nodes, damage to brain, loss of memory, lack of appetite and weight loss, fever, chronic diarrhoea, cough, lethargy, pharyngitis, nausea and headache are the symptoms of AIDS.

14. How can we prevent and control of AIDS ?

The following steps may help in controlling and prevent the spreading of HIV infection

    i)   Screening of blood from blood banks for HIV before transfusion.

    ii)   Ensuring the use of disposable needles and syringes in hospitals and clinics.

    iii) Advocating safe sex and advantages of using condoms.

    iv) Creating awareness campaign and educating people on the consequences of AIDS.

    v)   Persons with HIV/AIDS should not be isolated from the family and society.

IMPORTANT DAYS TO REMEMBER	
World Cancer Day	February 4
World Anti-Tobacco Day	May 31
No Tobacco Day	May 31
International Day against Drug Abuse and Illicit Trafficking	June 26
National Cancer Awareness Day	November 7
World AIDS Day	December 1

IMPORTANT YEARS TO REMEMBER	
POCSO - Protection of Children from Sexual Offences Act	2012
Narcotic Drugs and Psychotropic Substances Act	1985
Anti Tobacco Act	2004 (May 1st)
First Indian AIDS patient in Chennai	1985
World Health Organization (WHO) suggested the use of the term drug	1984

IMPORTANT ABBREVIATIONS TO REMEMBER	
POCSO	Protection of Children from Sexual Offences Act, 2012.
NCPCR	The National Commission for Protection of Child Rights
CPCR	Commissions for Protection of Child Rights
WHO	World Health Organization
IDDM	Insulin Dependent Diabetes Mellitus (Type-1)
NIDDM	Non-Insulin Dependent Diabetes Mellitus (Type-2)
BMI	Body Mass Index
HDL	High Density Lipoprotein
LDL	Low Density Lipoprotein
CVD	Cardiovascular Disease
CHD	Coronary Heart Disease
PUFA	PolyUnsaturated Fatty Acids
AIDS	Acquired Immunedeficiency Syndrome
HIV	Human Immunodeficiency Virus
ELISA	Enzyme Linked Immunosorbent Assay
NACO	National AIDS Control Organization
NGO's	Non- Governmental Organizations

UNIT TEST - 21

Time : 1.15 Hrs.   Marks : 50

I. Choose the best answer   (5 × 1 = 5)

1. **Tobacco consumption is known to stimulate secretion of adrenaline. The component causing this could be**
   a) Nicotine   b) Tannic acid   c) Curcumin   d) heptin

2. **Coronary heart disease is due to**
   a) Streptococci bacteria   b) Inflammation of pericardium
   c) Weakening of heart valves   d) Insufficient blood supply to heart muscles

3. **Polyphagia is a condition seen in**
   a) Obesity   b) Diabetes mellitus   c) Diabetes insipidus   d) AIDS

4. **POCSO - Protection of Children from Sexual Offences Act came into force in the year _____.**
   a) 1985   b) 2000   c) 2002   d) 2012

5. **One of the following is NOT the behaviour of drug users.**
   a) Lack of interest in personal hygiene, isolation, depression, fatigueand aggressive behaviour
   b) Deteriorating relationship with family and friends
   c) Excellent in academic performance
   d) Change in food and sleeping habits

II. Fill in the blanks   (5 × 1 = 5)

6. Cirrhosis is caused in liver due to excessive use of _____.
7. Insulin resistance is a condition in _____ diabetes mellitus.

8. Less response of a drug to a specific dose with repeated use is called _____.
9. The formula used to estimate the body fat and health risk by Body mass index (BMI) is _____.
10. Death of the heart muscle tissue is termed as _____.

III. State whether the statements are true or false. Correct the false statement

(5 × 1 = 5)

11. AIDS is an epidemic disease.
12. Carcinogens are cancer causing agents.
13. In leukemia both WBC's and RBC's increase in number.
14. Diabetes Mellitus is the most common pituitary endocrine disorder.
15. About 85% of the tumours are carcinomas and only 1% tumours are sarcomas.

IV. Match the following

(5 × 1 = 5)

16. Sarcorna   (a)   Stomach cancer
17. Carcinoma   (b)   Alveoli damage
18. Emphysema   (c)   Inadequate O2 to tissue
19. Hypoxia   (d)   Lack of blood flow to heart muscle
20. Myocardial Infarction   (e)   Connective tissue cancer

V. Assertin and Reasoning

(2 × 1 = 2)

Direction: In each of the following questions, a statement of Assertion is given and a corresponding statement of Reason is given just below it. Of the statements given below, mark the correct answer as

a. If both A and R are true and R is the correct explanation of A.
b. If both A and R are true but R is not the correct explanation of A.
c. If A is true but R is false.
d. If both A and R are false.

21. **Assertion:** Excretion of excess glucose in urine is observed in a person with diabetes mellitus.
    Reason: Pancreas is unable to produce sufficient quantity of insulin.

22. **Assertion:** All drugs act on the brain.
    Reason: Drugs disturb the functioning of the body and mind.

VI. Analogy type question.

(3 × 1 = 3)

23. Communicable: AIDS
    Non communicable: _____.

24. Chemotherapy: Chemicals
    Radiation therapy: _____.

25. Hypertension: Hypercholesterolomia
    Glycosuria: _____.

VI. Write the answer for the following questions in word or sentence

(5 × 1 = 5)

26. What are psychotropic drugs?
27. How does insulin deficiency occur?
28. What is metastasis?
29. What are the contributing factors for Obesity?
30. Define obesity.

VII. Write the short answer for ANY 5 of the following questions

(5 × 2 = 10)

31. What are the various routes by which transmission of human immuno deficiency virus takes place?
32. How is a cancer cell different from a normal cell?

33. Why is a dietary restriction recommended for an obese individual?
34. What precautions can be taken for preventing heart diseases?
35. What is the role of fat in the cause of atherosclerosis?
36. What are the objectives of the POCSO Act, 2012?
37. What is the diagnostic criteria to confirm Diabetes mellitus?

VIII. Write long answer for the following questions   (2 × 5 = 10)

38. Changes in lifestyle is a risk factor for occurrence of cardiovascular diseases. Can it be modified?

or

What are the symptoms of Diabetes mellitus?

39. a) How is HIV transmitted?
    b) What are the symptoms of AIDS?

or

Suggest measures to overcome the problems of an alcoholic.

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UNIT 22

ENVIRONMENTAL MANAGEMENT

Points to Remember

➤ Conservation is a process which is concerned with the use, preservation and proper management of natural resources from destructive activities of human being.

➤ Conservation of natural resources contributes to the social and economic development of the country.

➤ Forests of a country constitute a major asset for the people of the country.

➤ National park is a reserved area for the conservation of entire wildlife including plants and animals.

➤ Sanctuary is a place reserved exclusively for the use of animals.

➤ Solar cell is a device that absorbs sunlight and converts it into electric energy.

➤ Solar water heater does not require electricity, they heat up water directly from sunlight.

➤ Biogas is produced by the anaerobic decomposition of cow dung.

➤ The technique of collecting and storing rain water for future purpose is known as rainwater harvesting.

➤ Unwanted, non-working and outdated electronic products become e-waste.

TEXT BOOK EVALUATION

I. Book Exercise – Fill in the blanks

1. Deforestation leads to _____ in rainfall.   **Ans.:** Decrease

2. Removal of soil particles from the land is called _____.   **Ans.:** Soil erosion

3. Chipko movement is initiated against _____.   **Ans.:** Cutting trees / Deforestation

4. _____ is a biosphere reserve in Tamilnadu.   **Ans.:** Nilgiris

5. Tidal energy is _____ type of energy.   **Ans.:** Non-conventional / Renewable

6. Coal, petroleum and natural gas are called _____ fuels.   **Ans.:** Fossil

7. _____ is the most commonly used fuel for the production of electricity.   **Ans.:** Coal

II. Book Exercise – State whether the following statements are true or false: If false correct the statement.

1. **Biogas is a fossil fuel.**
   Ans.: False.
   Correct statement : Biogas is a **Bio-fuel**.

2. **Planting trees increases the groundwater level.**
   Ans.: True.

3. **Habitat destruction cause loss of wild life.**
   Ans.: True.

4. **Nuclear energy is a renewable energy.**
   Ans.: False.
   Correct statement : Nuclear energy is a **non-renewable** energy.

5. Overgrazing prevents soil erosion.

Ans.: False.

Correct statement : Overgrazing **increases** soil erosion.

6. Poaching of wild animals is a legal act.

Ans.: False.

Correct statement : Poaching of wild animals is a **illegal** act.

7. National park is a protected park.

Ans.: True.

8. Wild life protection act was established in 1972.

Ans.: True.

IV. Book Exercise – Match the items in column-I to the items in column-II:

1. **Soil erosion**   **(a) energy saving**
2. **Bio gas**   **(b) acid rain**
3. **Natural gas**   **(c) removal of vegetation**
4. **Green house gas**   **(d) renewable energy**
5. **CFL bulbs**   **(e) CO_2**
6. **Wind**   **(f) non-renewable energy**
7. **Solid waste**   **(g) lead and heavy metals**

Ans :

Column I		Column II	
1	Soil erosion	c	Removal of vegetation
2	Bio gas	d	Renewable energy
3	Natural gas	f	Non-renewable energy
4	Green house gas	e	CO_2
5	CFL bulbs	a	Energy saving
6	Wind	b	Acid rain
7	Solid waste	g	Lead and heavy metals

IV. Book Exercise – Choose the best answer

1. Which of the following is / are a fossil fuel? i. Tar   ii. Coal   iii. Petroleum

     a) i only   b) i and ii   c) ii and iii   d) i, ii and iii

                                                         Ans.: d) i, ii and iii

2. What are the steps will you adopt for better waste management?

     a) reduce the amount of waste formed   b) reuse the waste

     c) recycle the waste   d) all of the above

                                                  Ans.: d) All of the above

3. The gas released from vehicles exhaust are

     i. cCarbon monoxide   ii. Sulphur dioxide   iii. Oxides of nitrogen

     a) i and ii   b) i and iii   c) ii and iii   d) i, ii and iii

                                                  Ans.: d) i, ii and iii

4. Soil erosion can be prevented by

     a) deforestation   b) afforestation   c) over grazing   d) removal of vegetation

                                                  Ans.: b) Afforestation

5. **A renewable source of energy is**
   a) petroleum   b) coal   c) nuclear fuel   d) trees

   Ans.: d) trees

6. **Soil erosion is more where there is**
   a) no rain fall   b) low rainfall   c) rain fall is high   d) none of these

   Ans.: c) rain fall is high

7. **An inexhaustible resources is**
   a) wind power   b) soil fertility   c) wild life   d) all of the above

   Ans.: a) wind power

8. **Common energy source in village is**
   a) electricity   b) coal   c) biogas   d) wood and animal dung

   Ans.: d) wood and animal dung

9. **Green house effect refers to**
   a) cooling of earth   b) trapping of UV rays   c) cultivation of plants   d) warming of earth

   Ans.: d) warming of earth

10. **A cheap, conventional, commercial and inexhaustible source of energy is**
    a) hydropower   b) solar energy   c) wind energy   d) thermal energy

    Ans.: a) hydropower

11. **Global warming will cause**
    a) raise in level of oceans b) melting of glaciers   c) sinking of islands   d) all of these

    Ans.: d) all of these

12. **Which of the following statement is wrong with respect to wind energy**
    a) wind energy is a renewable energy
    b) the blades of wind mill are operated with the help of electric motor
    c) production of wind energy is pollution free
    d) usage of wind energy can reduce the consumption of fossil fuels.

    Ans.: b) the blades of wind mill are operated with the help of electric motor

V. Book Exercise – Answer in a sentence

1. **What will happen if trees are cut down?**
   Effect of cutting trees
   i) Ecological problems like floods and drought
   ii) Soil erosion
   iii) Loss of wild life
   iv) Extinction of species
   v) Imbalance of biogeochemical cycles
   vi) Alteration of climatic conditions and
   vii) Desertification.

2. **What would happen if the habitat of wild animals is disturbed?**
   The habitat provides food, shelter and protection to the animals. If the habitat is disturbed then the animals become unprotected and may decline in numbers and become endangered.

3. **What are the agents of soil erosion?**
   Agents of soil erosion are
   i) High velocity of wind,
   ii) Air currents,
   iii) Flowing water,

iv)   Landslide,

v)   Human activities (deforestation, farming and mining) and

vi)   Overgrazing by cattle.

4.   Why fossil fuels are to be conserved?

Conservation of fuels is essential due to following reasons:

i)   They are limited. Once they are exhausted there will be none.

ii)   There are no ideal alternative for fossil fuels.

iii) We have to use in a control way to control global warming.

5.   Solar energy is a renewable energy. How?

Solar energy is the energy obtained from the sun. It is a renewable free source of energy that is sustainable and totally inexhaustible, unlike fossil fuels which are finite.

6.   How are e-wastes generated?

E-wastes are generally called as electronic wastes. They are generated from the spoiled, outdated, non-repairable electrical and electronic devices.

VI. Book Exercise – Short answer questions.

1.   What is the importance of rainwater harvesting?

Rainwater harvesting helps to

i)   Overcome the rapid depletion of ground water levels.

ii)   To Meet the increase demand of water.

iii) Reduces flood and soil erosion

iv)   Water stored in ground is not contaminated by human and animal wastes and hence can be used for drinking purpose.

2.   What are the advantages of using biogas?

Advantages of biogas

i)   It burns without smoke and therefore causes less pollution.

ii)   An excellent way to get rid of organic wastes like bio-waste and sewage material.

iii) Left over slurry is a good manure rich in nitrogen and phosphorus

iv)   It is safe and convenient to use

v)   It can reduce the amount of greenhouse gases emitted.

3.   What are the environmental effect caused by sewage?

Careless disposal of sewage water leads to creation of a chain of problems like spreading of diseases, eutrophication, increase in Biological Oxygen Demand (BOD), etc.

i)   Detergents released in water contain phosphates and they allow the growth of algae and water hyacinths.

ii)   Pathogens present in sewage water are responsible for spreading different kinds diseases. Stagnant water fosters the growth of mosquitoes, which in turn causes diseases like malaria.

iii) Toxins released in rivers through sewage water are consumed by fish and other aquatic organisms; thus, the possibility of toxins entering the food chain increases manifold.

iv)   The sewage water dumped in oceans can affect the coral reefs to a great extent. The toxins present in polluted water inhibit the growth of corals.

v)   Water bodies in their natural form contain small amounts of chemical compounds like bicarbonates, nitrates, chlorides, sulphates, etc. So water becomes unsuitable for drinking and irrigation.

4.   What are the consequences of deforestation?

Consequences of Deforestation – Deforestation gives rise to ecological problems like floods, drought, soil erosion, loss of wild life, extinction of species, imbalance of biogeochemical cycles, alteration of climatic conditions and desertification.

VII. Book Exercise – Long answer questions

1. How does rainwater harvesting structures recharge ground water?

Rainwater harvesting is a technique of **collecting and storing rainwater** for future use. It is a traditional method of storing rain water in underground tanks, ponds, lakes, check dams and used in future. The main purpose of rainwater harvesting is to make the rainwater percolate under the ground so as to recharge **'groundwater level'**.

Methods of rainwater harvesting :

i) **Roof top rainwater harvesting:** Roof-tops are excellent **rain catchers**. The rain water that falls on the roof of the houses, apartments, commercial buildings etc. is collected and stored in the surface tank and can be used for domestic purpose.

ii) **Recharge pit:** In this method, the rainwater is first collected from the roof tops or open spaces and is directed into the **percolation pits** through pipes for filtration. After filtration the rainwater enters the **recharge pits** or **ground wells**.

2. How will you prevent soil erosion?

i) Retain vegetation cover, so that soil is not exposed.

ii) Cattle grazing should be controlled.

iii) Crop rotation and soil management improve soil organic matter.

iv) Runoff water should be stored in the catchment.

v) Reforestation, terracing and contour ploughing.

vi) Wind speed can be controlled by planting trees in form of a shelter belt.

3. What are the sources of solid wastes? How are solid wastes managed?

Sources of solid waste : i) Municipal wastes   ii) Hospital wastes   iii) Industrial wastes and iv) e-wastes

Solid-waste management It involves the collection, treatment and proper disposing of solid material that is discarded from the household and industrial activities.

i) **Segregation:** It is the separation of different type of waste materials like biodegradable and non biodegradable wastes.

ii) **Sanitary landfill :** Solid wastes are dumped into low lying areas. The layers are compacted by trucks to allow settlement. The waste materials get stabilised in about 2-12 months. The organic matter undergoes decomposition.

iii) **Incineration :** It is the burning of non-biodegradable solid wastes (medical wastes) in properly constructed furnace at high temperature.

iv) **Composting :** Biodegradable matter of solid wastes is digested by microbial action or earthworms and converted into humus.

v) **Recycling of wastes :**

    a) Papers from old books, magazines and newspapers are recycled to produce papers in paper mills.

    b) Agricultural wastes like coconut shells, jute cotton stalk, bagasse of sugarcane can be used to make paper and hard board. Paddy husk can be used as livestock fodder.

    c) Cow dung and other organic wastes can be used in gobar gas plant to provide biogas and manure for fields.

4. Enumerate the importance of forest.

Importance of forest.

✦ Forests are an important component of our environment.

✦ Forests consist of economically and medicinally valuable microorganisms, flowering plants, shrubs, climbers and dense trees.

✦ Forests provide a vast habitat for wild animals.

✦ Forests also contribute to the economic development of our country.

✦ Forests are important source for a wide range of renewable natural resource.

✦ They provide wood, food, fodder, fibre and medicine.

✦ Forests act as carbon sink, regulate climatic conditions, increase rainfall, reduce global warming, prevent natural hazards like flood and landslides, protect wildlife and also act as catchments for water conservation.

✦ They also play a vital role in maintaining the ecological balance.

5. What are the consequences of soil erosion?

Removal of **upper layer of soil** by wind and water is called soil erosion. Soil erosion causes a significant loss of humus, nutrients and decrease the fertility of soil.

i) **Fertility loss and land degradation:** The direct and primary effect of soil erosion is soil loss and nutrient leaching resulting in reduction of land productivity.

ii) **Air Pollution :** Wind erosion picks up dust particles of the soil and throws them into the air, causing air pollution.

iii) **Destruction of Infrastructure :** Soil erosion can affect infrastructural projects such as dams and drainages. The accumulation of soil sediments in dams and drainages can reduce their operational lifetime and efficiency.

iv) **Desertification :** Soil erosion is a major driver of desertification. It gradually transforms a habitable land into deserts.

v) **Water Pollution:** Soils eroded from agricultural lands carry pesticides, heavy metals, and fertilizers which are washed into streams and major water ways. This leads to water pollution and damage to marine and freshwater habitats.

vi) **Clogging of Waterways :** Accumulated sediments can also cause clogging of water ways and raises the water level leading to flooding.

6. Why is the management of forest and wildlife resource considered as a challenging task?

i) People living in and around forests are dependent on forest ie plants and animals products for various aspects of their life such as livelihood.

ii) The forest department of the government who judicially allowed for owning the land and controlling the resources from forests.

iii) The industrialists who use forest products such as timber, leaves, latex and raw materials for their industries.

iv) Global warming and climate change results in water scarcity and changes in rainfall pattern in forest area.

v) Lack of proper law enforcement and lack of sufficient number of guards lead to indiscriminate illegal poaching affects wildlife populations and the environment.

VIII. Book Exercise – Assertion and reason type questions:

Direction : In each of the following question a statement of assertion(A) is given and a corresponding statement of reason (R). Of the four statements given below mark the correct answer.

a) Both assertion and reason are true and reason is correct explanation of assertion.

b) Both assertion and reason are true but reason is not the correct explanation of assertion.

c) Assertion is true but reason is false.

d) Both assertion and reason are false.

1. Assertion: Rainwater harvesting is to collect and store rain water.

   Reason: Rainwater can be directed to recharge the underground water source.

   Ans : a) Both assertion and reason are true and reason is correct explanation of assertion

2. Assertion: Energy efficient bulbs like CFL must be used to save electric energy.

   Reason: CFL bulbs are costlier than ordinary bulbs, hence using ordinary bulbs can save our money.

   Ans : c) Assertion is true but reason is false

IX. Book Exercise – Higher Order Thinking Skills (HOTS)

1. Although coal and petroleum are produced by degradation of biomass, yet we need to conserve them. Why?

The formation of coal and petroleum is a very slow process and takes very long period of time for renewal. The coal and petroleum reserves can get exhausted if we continue using them at a rapid rate. So it is necessary to conserve or save coal and petroleum resources for the future use, which can be done by reducing their consumption.

2. What are the objectives for replacing non-conventional energy resources from conventional energy resources?

The objective in using non-conventional (Renewable) resources is to reduce the pessimistic environmental effects associated with conventional (Non-renewable) resources such as coal, petroleum and natural gas. Reusable or non-conventional energy is greener and keeps our planet clean. We need to make sure our future generation need not have to walk around with an oxygen mask on their face.

3. Why is the Government imposing ban on the use of polythene bags and plastics? Suggest alternatives. How is this ban likely to improve the environment?

Government is imposing ban on polythene bags and plastics, because they are non-biodegradable substances and harmful to the environment .

Alternatives to Polythene bags and plastics : Instead of polythene bag, "Paper Bags" and "cloth bags " and instead of non-biodegradable plastics, bio-plastics can be used as they are biodegradable and will get decomposed and they will not pollute the environment.

This ban will improve the environment in the following ways :-

i) It will help to prevent land and water pollution .

ii) It will lead to less productions of polythenes , which help in reduction of harmful gases from factories.

X. Book Exercise – Value based questions

1. Why is it not possible to use solar cells to meet our energy needs? State three reason to support to your answer.

Solar cells are not used in our daily routine because :

i) Solar cells work on the basis of solar energy which is not provided at night. Moreover in the winter season sunlight is minimal.

ii) They take lot of time in completing any work depending on the intensity of light.

For Eg : solar cookers take much time in cooking food in low intensity of light.

iii) The installing cost of solar cell panel is high as the silicon wafer is very expensive also same for the silver which is used in connecting solar cells.

iv) Only DC electricity is produced by SPV (Solar Photovoltaic system).To operate any AC device, this dc has to be converted in as by using inverters.

v) The efficiency of energy conversion is low as compared to other means of generating electricity.

2. How would you dispose the following wastes?

a. Domestic wastes like vegetable peels

b. Industrial wastes like metallic cans

Can the disposal protect the environment? How?

a) Disposal of vegetable peels and metallic cans

i) Peels and scrapings from fruit and vegetables can be composted along with other degradable matter.

ii) Industrial waste like metallic cans can be recycled as they are non - biodegradable.

b) Disposal can protect environment :

i) Biodegradable matter of solid wastes such as Peels and scrapings from fruit are digested by microbial action or earthworms and converted into humus.

ii) Recycling of industrial waste like metallic cans helps to reduce air pollution, water pollution, greenhouse gas emissions and often a conservation of global resources.

3. List any three activities based on 3R approach to conserve natural resources.

First 'R' - Reuse : Bring cloth bags to the store with you instead of asking shopkeeper for new paper or polythene bags. You can use cloth bags again and again. You can save some trees and can prevent pollution caused by polythene bags.

Second 'R' – Reduce : When we reduce the use of electric power, we reduce the amount of toxic fumes released by power plants, conserve the earth's natural resources and protect ecosystems from destruction.

Third 'R' – Recycle : Many of the things we use every day, like paper bags, soda cans, and milk cartons, are made out of materials that can be recycled. Recycled items are put through a process that makes it possible to create new products out of the materials from the old ones.

Additional – Choose the best answer

1. The use of natural resources in excess and unplanned way leads to _____ in the environment.

a) Equilibrium   b) Steadiness   c) Balance   d) Imbalance

Ans.: d) Imbalance

2. _____ provides a vast natural habitat for wild animals.

a) Garden   b) Forest   c) Zoo   d) Museum

Ans.: b) Forest

3. _____ is a threat to the economy, quality of life and future of the environment.

a) Deforestation   b) Afforestation   c) Reforestation   d) Social forestry

Ans.: a) Deforestation

4. The Chipko movement was started in the year _____

a) 1970   b) 1973   c) 1980   d) 1983

Ans.: b) 1973

5. The Chipko movement originated in the _____ district of Uttar Pradesh (now Uttarakhand).

a) Dehradun   b) Haridwar   c) Uttarkashi   d) Chamoli

Ans.: d) Chamoli

6. One of the following is NOT the effect of deforestation.

a) Desertification   b) Soil erosion   c) Flourish of wild life   d) Extinction of species

Ans.: c) Flourish of wild life

7. Alteration of climatic conditions is one of the effects of

a) Afforestation   b) Deforestation   c) Reforestation   d) Social forestry

Ans.: b) Deforestation

8. Van Mahotsav is an annual tree planting movement in India began in _____.

a) 1945   b) 1947   c) 1950   d) 1960

Ans.: c) 1950

9. When was the National Forest Policy established?

a) 1950   b) 1952   c) 1980   d) 1988

Ans.: b) 1952

10. Forest Conservation Act came into force in the year _____.

a) 1950   b) 1952   c) 1980   d) 1988

Ans.: c) 1980

11. Exploitation of wildlife resources has decreased global wildlife population by _____ % between 1970 and 2014.

a) 5   b) 10   c) 32   d) 52

Ans.: d) 52

12. The Wildlife protection Act was established in _____.

a) 1950   b) 1952   c) 1972   d) 1988

Ans.: c) 1972

13. Jim Corbett National Park (India's first National Park) is established in _____.

a) 1936   b) 1952   c) 1972   d) 1988

Ans.: a) 1936

14. Jim Corbett National Park (India's first National Park) is located in _____.

a) West Bengal   b) Assam   c) Uttarakhand   d) Uttar Pradesh

Ans.: c) Uttarakhand

15. Total number of biosphere reserves in India is _____.

a) 8   b) 10   c) 12   d) 15

Ans.: d) 15

16. Human activities responsible for soil erosion is

a) Deforestation   b) Farming   c) Mining   d) All the above

Ans.: d) All the above

17. One of the following is NOT the preventive way of soil erosion.

a) Retaining the vegetation cover   b) Overgrazing by cattle
c) Storage of runoff water   d) Contour ploughing

Ans.: b) Overgrazing by cattle

18. One of the following can prevent soil erosion.

a) Deforestation   b) High velocity of wind   c) Vegetation cover   d) Runoff water

Ans.: c) Vegetation cover

19. Example for non – renewable energy resource.

a) Biofuel   b) Nuclear power
c) Hydroelectric energy   d) Geothermal energy

Ans.: b) Nuclear power

20. Example for non-conventional energy resource

a) Coal   b) Bio-fuel   c) Natural gas   d) Nuclear power

Ans.: b) Bio-fuel

21. Bio-fuel, biomass energy, geothermal energy, water energy (hydroelectric energy and tidal energy), solar energy, wave energy and wind energy are examples for _____ energy resources.

a) Renewable   b) Inexhaustible   c) Non – conventional   d) All the above

Ans.: d) All the above

22. India is the third largest consumer of crude oil in the world.

a) Second   b) Third   c) Fourth   d) Fifth

Ans.: b) Third

23. The main component of Biogas _____.

a) Hydrogen   b) Methane   c) Carbon dioxide   d) Hydrogen sulphide

Ans.: b) Methane

24. _____ is produced by the anaerobic decomposition of animal wastes (cow dung) and plant wastes.

a) Natural Gas   b) LPG   c) Biogas   d) Shale gas

Ans.: c) Biogas

25. The world's largest and tallest wind turbine is situated in _____.

a) Kanyakumari   b) California   c) Hawaii   d) Muppanthal

Ans.: c) Hawaii

26. It is available in abundance in our country and is free of cost.

a) Nuclear power   b) Solar energy   c) Tidal energy   d) Wind energy

Ans.: b) Solar energy

27. One of the following is NOT an energy efficient appliance

a) CFL   b) LED   c) Solar water heater   d) Tungsten bulb

Ans.: d) Tungsten bulb

28. _____ present in E-Wastes causes asthmatic bronchitis.

a) Mercury   b) Cadmium   c) Chromium   d) Lead

Ans.: c) Chromium

29. _____ present in E-Wastes causes damages to central and peripheral nervous system and affects brain development in children.

a) Mercury   b) Cadmium   c) Chromium   d) Lead

Ans.: d) Lead

30. Unwanted, non-working and outdated electronic products become _____.

a) Bio-waste   b) Solid Waste   c) E-waste   d) Metal waste

Ans.: c) E-waste

Additional – Fill in the blanks

1. Proper utilization and management of nature and its resources is termed as _____.

   Ans.: Conservation.

2. The destruction of large area of forests is known as _____ .   **Ans.:** Deforestation

3. _____ is a an annual tree planting festival and is usually celebrated between 1st July and 7th July.

   Ans.: Van Mahotsav

4. India has an area of _____ lakh hectare reserved forests.   **Ans.:** 752.3

5. India has an area of _____ lakh hectare protected forests.   **Ans.:** 215.1

6. Utilization of common land to produce firewood, fodder and timber for the benefit of the rural community is known as _____.   **Ans.:** Social forestry

7. _____ programme relieves pressure on existing forests and to safeguard future of tribals.

   Ans.: Social forestry

8. The undomesticated animals living in their natural habitats are referred as _____.   **Ans.:** Wild life

9. India's first National Park is _____.   **Ans.:** Jim Corbett National Park

10. The _____ is a biosphere reserve in Tamil Nadu.   **Ans.:** Nilgiris

11. WWF stand for_____.   **Ans.:** World Wildlife Fund

12. WPSI stands for _____.   **Ans.:** Wildlife Protection Society of India

13. The first Indian woman to strike an International reputation as wildlife photographer is _____.

   Ans.: Rathika Ramasamy

14. A photo-book of Rathika Ramasamy on wildlife titled "_____" was published in November 2014.

           Ans.: The best of wildlife moments

15. Project Tiger was launched in the year _____.   **Ans.:** 1973

16. Project Elephant was launched in the year _____.   **Ans.:** 1992

17. Crocodile Conservation Project was launched in _____.   **Ans.:** 1976

18. Sea Turtle Conservation Project was launched in _____.   **Ans.:** 1999

19. Removal of upper layer of soil by wind and water is called _____.   **Ans.:** Soil erosion

20. Soil erosion causes a significant loss of humus, nutrients and decrease the _____ of soil.

           Ans.: Fertility

21. High velocity of wind, air currents, flowing water, landslide and overgrazing by cattle are agents of _____.   **Ans.:** Soil erosion

22. The expansion of possible _____ resources is directly related with the pace of agricultural and industrial development.   **Ans.:** Energy

23. Energy obtained from sources that cannot renew themselves over a short period of time is known as _____.   **Ans.:** Non-renewable energy

24. The _____ energy resources are available in unlimited amount in nature.   **Ans.:** Renewable

25. When the accumulating sediment layers produce heat and pressure, the remains of the organisms are gradually transformed into_____ .   **Ans.:** Hydrocarbons

26. Fossil fuels are formed from the degradation of _____ buried deep under the earth millions of years ago.

           Ans.: Biomass

27. Mostly _____ is used for generation of electricity at Thermal power plants.   **Ans.:** Coal

28. Petroleum also known as _____which is processed in oil refineries to produce petrol and diesel.

           Ans.: Crude oil

29. Kerosene and LPG are referred as _____ fuel.   **Ans.:** Domestic

30. Sulphur and nitrogen oxides produced by _____oil refinery have changed white marbles of Taj Mahal into yellow.   **Ans.:** Mathura

31. Solar cells or Photovoltaic devices is made up of _____.   **Ans.:** Silicon

32. _____ made up of silicon that converts sunlight directly into electricity.

           Ans.: Solar cells or Photovoltaic devices

33. Solar cell produces _____ without polluting the environment.   **Ans.:** Electricity

34. Arrangement of many solar cells side by side connected to each other is called _____.

           Ans. : Solar panel

35. Methane, Hydrogen sulphide, Carbon dioxide and hydrogen are the components of _____.

           Ans.: Biogas

36. Biogas is also commonly called as '_____ ' since the starting material used is cow dung.

           Ans.: Gobar gas

37. The soft finely stratified sedimentary rock is called _____.   **Ans.:** Shale

38. Natural gas that is trapped within soft finely stratified sedimentary rock is called as _____.

           Ans.: Shale gas

39. Shale gas is extracted by a technique called _____.   **Ans.:** Hydraulic fracturing

40. _____ technique to extract shale gas could affect groundwater reserves, drinking water resources and the fertility of the soil.   **Ans.:** Hydraulic fracturing

41. Million gallons of water is needed to break and release the _____ gas. **Ans.:** Shale

42. One wind turbine can produce electricity for _____ homes. **Ans.:** 300

43. _____ is a machine that converts the energy of wind into rotational energy by broad blade attached to the rotating axis. **Ans.:** Windmill

44. _____ plants converts the kinetic energy of flowing water into electricity. **Ans.:** Hydropower

45. The energy obtained from the movement of water due to ocean tides is known a s_____.
Ans.: Tidal energy

46. The technique of collecting and storing rainwater for future use is called _____.
Ans.: Rainwater harvesting

47. CFL stands for _____. **Ans.:** Compact Fluorescent Lamps

48. LED stands for _____. **Ans.:** Light Emiting Diode

49. Electronic wastes are commonly called as _____. **Ans.:** E-Wastes

50. _____ is the fourth oldest dam in the world. **Ans.:** Kallanai Dam or Grand Anicut

51. Kallanai Dam or Grand Anicut was constructed by King _____ in the 2nd century A.D.
Ans.: Karikala Chola

52. In today's electronic era 66 % of E-wastes consists _____ components . **Ans.:** Computer

53. The particles that settle out from the suspension is known as _____. **Ans.:** Sludge

54. Burning of PVC produces _____ which can cause developmental and reproductive problems, damages the immune system. **Ans.:** Dioxin

55. The burning of non-biodegradable solid wastes (medical wastes) is known as _____. **Ans.:** Incineration

56. The _____ approach such as Reduce, Reuse and Recycle may be followed for effective waste management. **Ans.:** 3R

57. The use, preservation and proper management of natural resources from destructive activities of human being is called _____. **Ans.:** Conservation

58. _____ is a reserved area for the conservation of entire wildlife including plants and animals.
Ans.: National park

59. _____ is a place reserved exclusively for the use of animals. **Ans.:** Sanctuary

60. _____ is a device that absorbs sunlight and converts it into electric energy. **Ans.:** Solar cell

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Additional – True or false (If false give the correct statement)

1. **Conservation of natural resources makes important contributions to the social and economic development of the country.**
   Ans.: True.

2. **A judicious balance should be maintained between exploitation of resources and its replenishment.**
   Ans.: True.

3. **India is losing about 1.5 million hectares of forest cover every day.**
   Ans.: False.
   Correct statement : India is losing about 1.5 million hectares of forest cover every **year**.

4. **The name of the movement 'Chipko' comes from the word 'embrace', as the villagers hugged the trees and encircled them to prevent them from being cut.**
   Ans.: True.

5. **Jim Corbett National Park (India's first National Park) is located in Uttar Pradesh.**
   Ans.: False.
   Correct statement : Jim Corbett National Park (India's first National Park) is located in **Uttarakhand**.

6. **Energy is an important input for development.**
   Ans.: True.

7. **The expansion of possible energy resources is directly related with the pace of agricultural and industrial development.**
   Ans.: True.

8. **Non – renewable energy resources are available in unlimited amount in nature.**
   Ans.: False.
   Correct statement : Non – renewable energy resources are available in **limited** amount in nature.

9. **Coal, petroleum, natural gas and nuclear power are the conventional energy resources.**
   Ans.: True.

10. **Fossil fuels are formed by natural process, such as aerobic decomposition of buried dead organisms.**
    Ans.: False.
    Correct statement : Fossil fuels are formed by natural process, such as **anaerobic** decomposition of buried dead organisms.

11. **India is the third largest consumer of crude oil in the world, after the United States and China.**
    Ans.: True.

12. **The formation of fossil fuels is a very rapid process and takes very short period of time for renewal.**
    Ans.: False.
    Correct statement : The formation of fossil fuels is a very **slow** process and takes very long period of time for renewal.

13. **If electricity is saved, it will in turn reduce the use of coal.**
    Ans.: True.

14. **Nearly 75 % of biogas is composed of hydrogen.**
    Ans.: False.
    Correct statement : Nearly 75 % of biogas is composed of **methane**.

15. **Chlorination and ultraviolet (UV) radiation treatment any remove any microorganism contamination in water.**
    Ans.: True.

16. **Biogas is produced by the aerobic decomposition of cow dung.**
    Ans.: False.
    Correct statement : Biogas is produced by the **anaerobic** decomposition of cow dung.

Additional – Match the following

Section – I :

1.	Chipko	(a)	Wildlife photography
2.	Deforestation	(b)	Photovoltaic devices
3.	Afforestation	(c)	Exhaustible
4.	Jim Corbett	(d)	Domestic fuel
5.	Nilgiris	(e)	First National Park
6.	Rathika Ramasamy	(f)	Embrace
7.	Renewable	(g)	Desertification
8.	Non-renewable	(h)	Van Mahotsav
9.	Solar cells	(i)	Inexhaustible
10.	LPG	(j)	Biosphere reserve

Ans :

1	Chipko	f	Embrace
2	Deforestation	g	Desertification
3	Afforestation	h	Van Mahotsav

4	Jim Corbett	e	First National Park
5	Nilgiris	j	Biosphere reserve
6	Rathika Ramasamy	a	Wildlife photography
7	Renewable	i	Inexhaustible
8	Non-renewable	c	Exhaustible
9	Solar cells	b	Photovoltaic devices
10	LPG	d	Domestic fuel

Section – II :

1.	Biogas	(a)	Medical wastes
2.	Fossils	(b)	Hydraulic fracturing
3.	Solar Cells	(c)	Remove microorganism
4.	Shale gas	(d)	Dioxin
5.	Kallanai Dam	(e)	Silicon
6.	E-Waste	(f)	Asthmatic bronchitis
7.	Chlorination	(g)	Earth's crust
8.	Chromium	(h)	Computer parts
9.	PVC	(i)	Grand Anicut
10.	Incineration	(j)	Methane

Ans :

1	Biogas	j	Methane
2	Fossils	g	Earth's crust
3	Solar Cells	e	Silicon
4	Shale gas	b	Hydraulic fracturing
5	Kallanai Dam	i	Grand Anicut
6	E-Waste	h	Computer parts
7	Chlorination	c	Remove microorganism
8	Chromium	f	Asthmatic bronchitis
9	PVC	d	Dioxin
10	Incineration	a	Medical wastes

Additional – Assertion and Reason (2 Marks)

Direction : In each of the following question a statement of assertion(A) is given and a corresponding statement of reason (R). Of the four statements given below mark the correct answer.

a) Both assertion and reason are true and reason is correct explanation of assertion.

b) Both assertion and reason are true but reason is not the correct explanation of assertion.

c) Assertion is true but reason is false.

d) Both assertion and reason are false.

1. **Assertion :** Removal of upper layer of humus and minerals rich soil by wind and water is called soil erosion.

   Reason : Soil erosion causes loss of humus, nutrients and increase the fertility of soil.

   Ans : (c) Assertion is true but reason is false.

2. **Assertion :** Forests contribute to the economic development of our country.

   Reason : They provide wood, food, fodder, fibre and medicine.

   Ans : (a) Both assertion and reason are true and reason is correct explanation of assertion.

3. **Assertion :** The energy resources which cannot renew themselves over a short period of time is known as renewable energy.

    Reason : Renewable energy resources are available in limited amount in nature.

    Ans : (d) Both assertion and reason are false.

4. **Assertion :** Fossil fuels are formed by anaerobic decomposition of buried dead organisms, over millions of years.

    Reason : Heat and pressure produced by sediment layers transform the remains of the organisms into hydrocarbons.

    Ans : (a) Both assertion and reason are true and reason is correct explanation of assertion.

5. **Assertion :** If electricity is saved, it will in turn reduce the use of coal.

    Reason : Solar cells convert sunlight directly into electricity.

    Ans : (b) Both assertion and reason are true but reason is not the correct explanation of assertion.

6. **Assertion :** The coal and petroleum reserves can get exhausted if we continue using them at a rapid rate.

    Reason : The formation of these fossil fuels is a very slow process and takes very long period of time for renewal.

    Ans : (a) Both assertion and reason are true and reason is correct explanation of assertion.

7. **Assertion :** Deforestation is the destruction of large area of forests.

    Reason : Social forestry relieves pressure on existing forests and to safeguard future of tribals.

    Ans : (b) Both assertion and reason are true but reason is not the correct explanation of assertion.

8. **Assertion :** Wild life refers to the undomesticated animals living in their natural habitats.

    Reason : Conservation of forest and wildlife are not interrelated with each other.

    Ans : (c) Assertion is true but reason is false.

9. **Assertion :** Forests are major factor of environmental concern.

    Reason : Forests regulate climatic conditions, increase rainfall and reduce global warming.

    Ans : (a) Both assertion and reason are true and reason is correct explanation of assertion.

10. **Assertion :** Coal and Petroleum are bio-fuels.

    Reason : Coal and Petroleum are formed by the decomposition of animal wastes (cow dung) and plant wastes.

    Ans : (d) Both assertion and reason are false.

Additional – Answer in a sentence (1 mark)

1. **What is Environmental management?**

    Environmental management deals with the different aspects of environment, its structure, function, its quality and its maintenance including conservation of its living and non-living components.

2. **What is meant by conservation of nature?**

    Conservation is a process which is concerned with the use, preservation and proper management of natural resources from destructive activities of human being.

3. **Define wild life.**

    Wild life refers to the undomesticated animals living in their natural habitats (forests, grasslands and deserts) an area without human habitation.

4. **Which is the first National Park established India?**

    Jim Corbett National Park was the first to be established in 1936 in Uttarakhand, India.

5. **Define Soil Erosion.**

    Removal of The top layers of soil contain humus and mineral salts, which are vital for the growth of plants. Removal of this top soil by wind and water is called soil erosion.

6. How is Taj Mahal affected by pollution?

The Mathura oil refinery owned by Indian Oil Corporation present around Agra produce sulphur and nitrogen oxides. The white marble became yellow due to air pollution.

7. What materials are used on solar panels to allow them to produce electricity?

Solar cells (Photovoltaic devices) are made up of silicon that converts sunlight directly into electricity.

8. What is the chemicalcomposition of biogas?

Biogas is the mixture of methane (nearly 75 %), hydrogen sulphide, carbon dioxide and hydrogen.

9. What do Solar thermal power plant do?

In solar thermal power plants, many solar panels are used to concentrate sun rays, to heat up water into steam. The steam is used to run the turbines to produce electricity.

10. How is biogas produced from biomass?

Biogas is produced by the decomposition of animal wastes (cow dung) and plant wastes in the absence of oxygen.

11. What is shale gas?

Shale gas refers to natural gas that is trapped within shale formations. Shales are fine-grained sedimentary rocks. These rocks contain fossil fuels like oil and gas in their pores.

12. How is shale gas extracted?

The fuel is extracted by a technique called hydraulic fracturing i.e drilling or well boring of sedimentary rocks layers to reach productive reservoir layers.

13. What is tidal energy ?

Tidal energy is the energy obtained from the movement of water due to ocean tides.

14. What are E-Wastes?

E-wastes are generally called as electronic wastes, which includes the spoiled, outdated, non-repairable electrical and electronic devices.

Additional – Short answer question (2 mark)

1. What is Deforestation? Why does it happen?

✦ Deforestation is the destruction of large area of forests.

✦ Deforestation happens for many reasons like intensive agriculture, urbanization, construction of dams, roads, buildings and industries, hydroelectric projects, forest fires, construction of mountain and forest roads.

2. Write a note on Chipko movement.

✦ The Chipko movement was a non-violent agitation in 1973 that was aimed at protection and conservation of trees.

✦ The name of the movement 'Chipko' comes from the word 'embrace', as the villagers hugged the trees and encircled them to prevent them from being cut.

✦ The movement originated in the Chamoli district of Uttar Pradesh (now Uttarakhand).

3. Why do we need to conserve wild life?

✦ Wildlife plays an important role in balancing the environment and provides stability to different natural processes of nature.

✦ They are needed for maintaining biological diversity.

✦ They help in promoting economic activities that generates revenue through tourism.

✦ They provide substances used in both the pharmaceutical industry and traditional medicine.

4. What are non-renewable or exhaustible energy resources? Give examples.

Energy obtained from sources that cannot renew themselves over a short period of time is known as non-renewable energy. These are available in limited amount in nature.

Examples :

✦ Coal,

✦ Petroleum,
✦ Natural gas and
✦ Nuclear power.

5. What are conventional energy resources?

Conventional energy means the energy source which is obtained from fixed reserves in nature like coal, petroleum and natural gas. In other words conventional energy is also termed as non-renewable energy sources, or fossil fuels.

6. What are renewable or inexhaustible energy resources ? Give examples.

These energy resources are available in unlimited amount in nature and they can be renewed over a short period of time, inexpensive and can be harvested continuously.

Examples :

✦ Biofuel,
✦ Biomass energy,
✦ Geothermal energy,
✦ Water energy (hydroelectric energy and tidal energy),
✦ Solar energy,
✦ Wave energy and
✦ Wind energy.

7. What are the uses of Petroleum?

✦ Petroleum also known as crude oil is processed in oil refineries to produce petrol and diesel which are used to run automobiles, trucks, trains, ships and airplanes etc.
✦ Kerosene and LPG (Liquefied Petroleum Gas) obtained from petroleum is used as domestic fuel for cooking food.

8. What are the uses of solar cells?

✦ It can be used for street lighting, traffi c signals, water pumping, battery charging system etc.
✦ It is used in artifi cial satellites and space probes
✦ It provides radio and TV transmission to remote areas
✦ It is used in calculators, electronic toys and watches.

9. What are the uses of biogas?

✦ It is used as fuel for cooking .
✦ It is used to run motors and pump sets.
✦ It is used to generate electricity.

10. What are Environmental concerns of shale gas?

✦ Shale drilling could affect groundwater reserves, which can contaminate the drinking water resources and also affect the fertility of the soil.
✦ Million gallons of water is needed to break and release the shale gas, which inturn can affect the water table.

11. What are the advantages of wind energy?

✦ Wind energy is free, eco-friendly, renewable source of energy.
✦ It does not cause pollution.
✦ Expenses on periodic maintenance is low when compared to the other power sources

12. What are the advantages of tidal energy?

✦ Tidal energy does not produce any pollution.
✦ It does not use any fuel and does not produce any waste.
✦ Tides are predictable, so tidal energy can be produced at any time.
✦ Water is denser than air and therefore can generate electricity at lower speeds than wind turbines.

13. What are the sources of e-wastes?

✦ Electronic devices: Computers, laptops, mobile phones, printers, monitors, televisions, DVD players, calculators, toys, sport equipments, etc.

✦ Household electrical appliances: Refrigerators, washing machine, microwave oven, mixer, grinder, water heater, etc.

✦ Accessories: Printing cartridges, batteries and chargers.

14. What are the environmental impact of e-wastes?

✦ Disposal of any kind of electrical and electronic devices without knowledge can become the landfill and water pollutants.

✦ Electronic equipments contain many hazardous heavy metals such as lead, cadmium that can cause severe soil and groundwater pollution.

✦ E-waste dumping yards and the places nearby are polluted and cause severe health hazard.

15. What are the sources of sewage/wastewater?

✦ Domestic purpose or household activities

✦ Dye and textile industries

✦ Leather industries

✦ Sugar and breweries industries

✦ Paper and pulp industries

16. Give some examples for recycling of wastes.

✦ Papers from old books, magazines and newspapers are recycled to produce papers in paper mills.

✦ Agricultural wastes like coconut shells, jute cotton stalk, bagasse of sugarcane can be used to make paper and hard board. Paddy husk can be used as livestock fodder.

✦ Cowdung and other organic wastes can be used in gobar gas plant to provide biogas and manure for fields.

17. Why does Mathura oil refinery pose problems to the Taj Mahal?

Mathura oil refinery releases many air pollutants such as sulphur dioxide in and around Agra. Sulphur dioxide (SO2) reacts with water in the atmosphere to forms sulphuric acid (H2 SO4). This acid destroy the marble quality and the colour of Taj Mahal.

18. Name six basins identified as areas for shale gas exploration in India.

i) Cambay (Gujarat)

ii) Assam-Arakan (North East)

iii) Gondwana (Central India)

iv) Krishna Godavari onshore (East Coast)

v) Cauvery onshore and

vi) Indo-Gangetic basins.

Additional – Long answer question (5 mark)

1. Describe the important measures taken for conservation of forests.

The important measures taken for conservation of forests are as follows

✦ **Afforestation :** Activities for afforestation programme (Van Mahotsav) includes planting and protecting trees with multiple uses which help in restoration of green cover. Destruction of trees should be curtailed.

✦ **Social forestry programme :** It should be undertaken on a large scale with active participation of the public and utilization of common land to produce firewood, fodder and timber for the benefit of the rural community. This relieves pressure on existing forests and to safeguard future of tribals.

✦ **Forest Conservation through Laws :** Adopting stringent laws and policies to conserve and protect forests are through National Forest Policy, (1952 and 1988) and Forest Conservation Act, 1980.

2. What are the main aims of wildlife management?

The main aim of wildlife conservation are:

✦ To control and limit exploitation of species.

✦ To preserve the plants and animals from extinction.

✦ Maintenance of threatened species and protect species which are on the verge of extinction.

✦ Preserve the endangered species.

✦ To study the ecological relationship of the plants and animals in natural habitat.

✦ Hunting and poaching should be prohibited.

✦ Establishment of National parks, Wildlife sanctuaries, protected areas and Biosphere reserves.

3. What are the objectives or provisions of the Wildlife Protection Act 1972?

✦ Prohibit killing and hunting of specified animals.

✦ Constitute sanctuaries, national parks, and closed areas for wildlife conservation.

✦ Special schemes for preservation of endangered species.

✦ Constitute Central Zoo Authority and recognition of zoos.

✦ Restrict, regulate or prohibit trade in wild animals and products obtained from them.

4. What are the differences between conventional and non-conventional energy resources?

S.No.	Conventional Energy Resources	Non–conventional Energy Resources
1	They are obtained from fixed reserves in nature.	They are available in unlimited amount in nature.
2	They are non-renewable i.e. they cannot renew themselves over a short period of time.	They are renewable i.e. renewed over a short period of time.
3	They are exhaustible.	They are inexhaustible.
4	They cause pollution.	They are pollution free.
5	They are expensive to be maintained, stored and transmitted.	They are less expensive.
6	Examples : ✦ Coal ✦ Petroleum ✦ Natural gas and ✦ Nuclear power.	Examples : ✦ Biofuel ✦ Biomass energy ✦ Geothermal energy ✦ Water energy (hydroelectric energy and tidal energy) ✦ Solar energy ✦ Wave energy and ✦ Wind energy.

5. a) What are Fossil Fuels ?

Fossil fuels are natural fuel such as petroleum, coal and natural gas, formed in the geological past from the remains of living organisms.

b) How are fossil fuels formed in the earth?

Fossil fuels, found inside the earth's crust, are formed by natural process, such as anaerobic decomposition of buried dead organisms.

c) How long does fossil fuel take to form?

The formation of fossil takes over millions of years.

d) What conditions helped fossil fuels to form?

Heat and pressure produced by the accumulating sediment layers gradually transform the remains of the organisms into hydrocarbons. e.g. Petroleum, Coal and Natural gas.

6. Describe the steps to be taken to conserve coal and petroleum resources.

It is necessary to conserve or save coal and petroleum resources for the future use, which can be done by reducing their consumption.

✦ If electricity is saved, it will in turn reduce the use of coal.

✦ Using bicycle for covering short distances instead of using cars, scooters or motorcycles.

✦ Using pressure cooker can reduce the consumption of kerosene and LPG while cooking food. Solar cooker and solar heaters can be used wherever possible.

✦ Motor vehicles should be designed with fuel efficient engines to increase efficiency and also reduce air pollution.

7. What are the advantages of solar energy sources?
- ✦ It is available in abundance in our country and is free of cost.
- ✦ It is a renewable source of energy.
- ✦ It can be used for generating electricity or heat.
- ✦ It does not cause pollution.
- ✦ Solar panels can be installed in remote and inaccessible areas (forests and hilly regions).

8. What are measures can be taken even at home and school to save electricity?
- ✦ Use energy efficient appliances to save electricity like Compact Fluorescent Lamps (CFL), Light Emiting Diode (LED) bulbs and other electric equipments.
- ✦ Switch off the lights and fans, television and other electrical appliances when not in use.
- ✦ Switch of the mobile phone chargers when not in use.
- ✦ Maximise the use of solar radiation. Solar water heating system can be used instead of electric geysers.
- ✦ Minimise the use of air conditioners.

9. Describe the sewage/wastewater treatment method.
The conventional wastewater treatment methods involve the following steps.
- ✦ **Pre-screening :** Wastewater generated from domestic and industrial activities is screened to remove soil and solid particulates.
- ✦ **Aeration :** Screened wastewater is then pumped to an aeration tank. Here the microbial contaminants are removed by the biological degradation that occurs in the presence of air.
- ✦ **Sludge Management :**
  - i) **Sedimentation process :** In this process, the solid particles in suspension form are allowed to settle. The particles that settle out from the suspension is known as sludge.
  - ii) **Sludge removal :** The sludge generated by the degradation process is transferred periodically from the tank for safe disposal.
- ✦ **Disinfection :** Chlorination and ultraviolet (UV) radiation of treated water is required to remove any microorganism contamination.
- ✦ **Water recycling :** The water will then be supplied for domestic or industrial purposes.

10. What are the health effects of E- Wastes?
- ✦ **Lead :** Damages central and peripheral nervous system; affect brain development in children.
- ✦ **Chromium :** Asthmatic bronchitis.
- ✦ **Cadmium :** Accumulates in kidney and liver; neural damage.
- ✦ **Mercury :** Chronic damage to brain and respiratory system.
- ✦ **Plastics including Polyvinyl Chloride (PVC) :** Burning produces dioxin which can cause developmental and reproductive problems, damages the immune system.

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Important abbreviations to remember

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IBWL	Indian Board for Wild Life
WWF	World Wildlife Fund
WCN	World Conservation Union
IUCN	International Union for Conservation of Nature and Natural Resources
CITES	Convention of International Trade in Endangered Species
LPG	Liquified Petroleum Gas
PVC	Polyvinyl Chloride
E–wastes	Electronic wastes
CFL	Compact Fluorescent Lamps
LED	Light Emiting Diode
WPSI	Wildlife Protection Society of India

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Important years to remember

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Wildlife Protection Act	1972
Launch of Project Tiger	1973
Launch of Project Elephant	1992
Launch of Crocodile Conservation Project	1976
Launch of Sea Turtle Conservation Project	1999
National Forest Policy	1952 and 1988
Forest Conservation Act	1980
Chipko Movement	1973

UNIT TEST - 22

Time : 1.15 Hrs.   Marks : 50

I. Choose the best answer
(5 × 1 = 5)

1. **The gas released from vehicles exhaust are**
   i) Carbon monoxide   ii) Sulphur dioxide   iii) Oxides of nitrogen
   a) (i) and (ii)   b) (i) and (iii)   c) (ii) and (iii)   d) (i), (ii) and (iii)

2. **Soil erosion is more where there is**
   a) no rainfall   b) low rainfall   c) rainfall is high   d) none of these

3. **Global warming will cause**
   a) raise in level in oceans   b) melting of glaciers   c) sinking of islands   d) all of these

4. **The Chipko movement was started in the year _____.**
   a) 1970   b) 1973   c) 1980   d) 1983

5. **Jim Corbett National Park (India's first National Park) is located in _____.**
   a) West Bengal   b) Assam   c) Uttarakhand   d) Uttar Pradesh

II. Fill in the blanks
(5 × 1 = 5)

6. Deforestation leads to _____ in rainfall.
7. _____ is the most commonly used fuel for the production of electricity.
8. _____ is a biosphere reserve in Tamilnadu.
9. The destruction of large area of forests is known as _____.
10. WPSI stands for _____.

III. State whether the statements are true or false. Correct the false statement
(5 × 1 = 5)

11. Biogas is a fossil fuel.
12. Habitat destruction cause loss of wild life.
13. Wild life protection act was established in 1972.
14. Non – renewable energy resources are available in unlimited amount in nature.
15. India is the third largest consumer of crude oil in the world, after the United States and China.

IV. Match the following
(5 × 1 = 5)

16. Bio gas   (a)   Energy saving
17. Solid waste   (b)   Non–renewable energy
18. Natural gas   (c)   Lead and heavy metals
19. Green house gas   (d)   Renewable energy

20. CFL bulbs   (e) CO_2

V. Assertin and Reasoning

(5 × 1 = 5)

Direction: In each of the following questions, a statement of Assertion is given and a corresponding statement of Reason is given just below it. Of the statements given below, mark the correct answer as

a.   If both A and R are true and R is the correct explanation of A.
b.   If both A and R are true but R is not the correct explanation of A.
c.   If A is true but R is false.
d.   If both A and R are false.

21. **Assertion:** Energy efficient bulbs like CFL must be used to save electric energy.
     Reason: CFL bulbs are costlier than ordinary bulbs, hence using ordinary bulbs can save our money.

22. **Assertion:** Rainwater harvesting is to collect and store rain water.
     Reason: Rainwater can be directed to recharge the underground water source.

23. **Assertion:** Forests contribute to the economic development of our country.
     Reason: They provide wood, food, fodder, fibre and medicine.

24. **Assertion:** Fossil fuels are formed by anaerobic decomposition of buried dead organisms, over millions of years.
     Reason: Heat and pressure produced by sediment layers transform the remains of the organisms into hydrocarbons.

25. **Assertion:** Coal and Petroleum are bio-fuels.
     Reason: Coal and Petroleum are formed by the decomposition of animal wastes (cow dung) and plant wastes.

VI. Write the answer for the following questions in word or sentence

(5 × 1 = 5)

26. What are the agents of soil erosion?
27. How are e–wastes generated?
28. What would happen if the habitat of wild animals is disturbed?
29. Define Soil Erosion.
30. What is shale gas?

VII. Write the short answer for ANY 5 of the following questions

(5 × 2 = 10)

31. What is the importance of rainwater harvesting?
32. What are the consequences of deforestation?
33. What are the advantages of using biogas?
34. What is Deforestation? Why does it happen?
35. Write a note on Chipko movement.
36. What are the uses of Petroleum?
37. What are the uses of biogas?

VIII. Write long answer for the following questions

(2 × 5 = 10)

38. How will you prevent soil erosion?

or

Enumerate the importance of forest.

39. How does rain water harvesting structure recharge ground water?

or

What are the differences between conventional and non-conventional energy resources?

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UNIT
23

VISUAL COMMUNICATION

TEXT BOOK EVALUATION

I. Book Exercise – Choose the best answer

1.   Which software is used to create animation ?
a) Paint   b) PDF   c) MS Word   d) Scratch

Ans : (d) Scratch

2.   All files are stored in the _____.
a) Folder   b) box   c) Pai   d) scanner

Ans : (a) Folder

3.   Which is used to build scripts?
a) Script area   b) Block palette   c) stage   d) sprite

Ans : (a) Script area

4.   Which is used to edit programs?
a) Inkscape   b) script editor   c) stage   d) sprite

Ans : (b) Script editor

5.   Where you will create category of blocks?
a) Block palette   b) Block menu   c) Script area   d) sprite

Ans : (b) Block menu

II. Book Exercise – Match the following

1.   Match Column A with B

Column A		Column B
1. Script area	(a)	Type notes
2. Folder	(b)	Animation software
3. Scratch	(c)	Edit programs
4. Costume editor	(d)	Store files
5. Notepad	(e)	Build scripts

Ans :

S.No.	Column A		Column B
1	Script area	e	Build scripts
2	Folder	d	Store files
3	Scratch	b	Animation software
4	Constume editor	c	Edit programs
5	Notepad	a	Type notes

III. Book Exercise – Answer in a sentence (1 mark)

1.   What is Scratch?
'Scratch' is a software used to create animations, cartoons and games easily. Scratch, on the other hand, is a visual programming language.

2.   Write a short note on editor and its types?
The Scratch editor has three main parts:
❖   **Stage :** Stage is the background appearing when we open the scratch window.

❖ **Sprite :** The characters on the background of a Scratch window are known as Sprite.

❖ **Script editor / costume editor :** Where you edit your programs or your sprite's pictures. It has three main parts:

a) **Script area :** Where you build scripts.

b) **Block menu :** Where you choose the category of blocks (programming statements) to use.

c) **Block palette :** Where you choose the block to use.

3. What is Stage?

Stage is the background appearing when we open the scratch window. The background will most often be white. You can change the background colour as you like.

4. What is Sprite?

The characters on the background of a Scratch window are known as Sprite. Usually a cat appears as a sprite when the Scratch window is opened. The software provides facilities to make alternations in sprite.

Additional – Fill in the blanks

1. _____ is a storage space that contains multiple files.   **Ans :** Folder

2. Windows and LINUX are examples for the _____.   **Ans :** Operating systems

3. The application to type notes is _____.   **Ans :** Notepad

4. Animation and sprite's pictures are edited by _____ editor.   **Ans :** Script or costume

5. _____ is used to build scripts.   **Ans :** Script area

6. _____ is used to choose the category of blocks (programming statements).   **Ans :** Block menu

7. _____ used to choose the block to use.   **Ans :** Block palette

8. The characters on the background of a Scratch window are known as _____.   **Ans :** Sprite

9. The background appearing when we open the scratch window is known as _____.   **Ans :** Stage

10. Scratch is a visual programming _____.   **Ans :** Language

Additional – True or false (If false give the correct statement)

1. The application for the specific purposes determines the nature of the file.
Ans.: True.

2. Windows and LINUX are examples for application.
Ans.: False. Windown and LINUX are examples for **operating systems**.

3. Paint is a software used to create animations, cartoons and games easily.
Ans.: False. **Scratch** is a software used to create animations, cartoons and games easily.

4. Scratch is a visual programming language.
Ans.: True.

5. Cinema is a good example for 'Visual Communication Device'.
Ans.: True.

Additional – Match the following

1.	**Folder**	(a)	**Background**
2.	**JPG**	(b)	**Microsoft**
3.	**Windows**	(c)	**Software for animation**
4.	**Typing**	(d)	**Block to use**
5.	**Stage**	(e)	**Audio File Format**
6.	**Block menu**	(f)	**Notepad**
7.	**Block palette**	(g)	**App to draw picture**
8.	**WAV**	(h)	**Multiple files**
9.	**Paint**	(i)	**Category of blocks**

10.	**Scratch**	(j)	**Photograph**

Ans :

1	Folder	h	Multiple files
2	JPG	j	Photograph
3	Windows	b	Microsoft
4	Typing	f	Notepad
5	Stage	a	Background
6	Block menu	i	Category of blocks
7	Block palette	d	Block to use
8	WAV	e	Audio File Format
9	Paint	g	App to draw picture
10	Scratch	c	Software for animation

Additional – Choose the best answer

1. **They accommodate multiple files or a single file.**
   a) Sprite   b) Inbox   c) Folders   d) Scratch

   Ans : (c) Folders

2. **The output we get from any application is commonly referred as _____.**
   a) Document   b) Folder   c) PDF   d) File

   Ans : (d) File

3. **The application to type notes is _____.**
   a) Scratch   b) Paint   c) PDF   d) Notepad

   Ans : (d) Notepad

4. **The application to draw and edit pictures is_____.**
   a) PPT   b) Paint   c) PDF   d) Notepad

   Ans : (b) Paint

5. **The file format for capturing and sending electronic documents in exactly the intended format.**
   a) PPT   b) Word   c) PDF   d) Page maker

   Ans : (c) PDF

6. **The software used to create animations, cartoons and games easily is _____.**
   a) PPT   b) Paint   c) Scratch   d) Notepad

   Ans : (c) Scratch

7. **Usually a cat appears as a sprite when the Scratch window is opened.**
   a) Cursor   b) Cat   c) Arrow   d) Pointer

   Ans : (b) Cat

8. **'Scratch' was developed in the _____ Institute of Technology (MIT) Media Lab.**
   a) Microsoft   b) Massachusetts   c) Maxwell   d) Madras

   Ans : (b) Massachusetts

9. **The device which helps in explaining the concepts easily through pictures is known as '_____ Communication Device'.**
   a) Art   b) Tele   c) Mobile   d) Visual

   Ans : (d) Visual

10. **Stage, Sprite and Script editor are the parts of _____.**

    a) Paint   b) Notepad   c) Scratch   d) MS Word

Ans : (c) Scratch

Additional – Answer the following questions

1. **What is file?**

The output we get from any application is commonly referred as 'file'.

2. **What is folder?**

A folder is a storage space that contains multiple files.

3. **How can we create a folder?**

   ✦ When we right click on the mouse, the popup menu appears on the screen with multiple options.

   ✦ Select 'NEW' option and a secondary menu comes up with another set of options.

   ✦ Select 'Folder' option in the menu.

   ✦ You can now save your file(s) in the newly created folder.

4. **What are the two operating systems used many people?**

Many people are using Windows and LINUX operating systems in their computers.

5. **What is LINUX?**

The Linux open source operating system that can be installed on PCs, laptops, netbooks, mobile and tablet devices, video game consoles, servers, supercomputer.

6. **What is 'Windows'?**

'Windows' is an operating system designed and produced by Microsoft Corporation. Windows makes a computer system user-friendly by providing a graphical display and organizing information so that it can be easily accessed.

7. **What is 'Visual Communication Device'? Give examples.**

The device which helps in explaining the concepts easily through pictures is known as 'Visual Communication Device'.

For example photos, audio -visuals, drawings, animations all these can be created easily with the help of computer. Cinema is a good example for 'Visual Communication Device'.

8. **Who developed 'Scratch' software?**

'Scratch' software was developed by the Massachusetts Institute of Technology (MIT) Media Lab.

9. **What are the main parts of Scratch editor?**

The Scratch editor has three main parts: They are;

   ✦ Stage,

   ✦ Sprite and

   ✦ Script editor.

10. **What are the three main parts script editor?**

   ✦ Script area.

   ✦ Block menu.

   ✦ Block palette.

IMPORTANT ABBREVIATIONS TO REMEMBER	
CPU	Central Processing Unit
CSS	Cascading Style Sheets
DLL	Dynamic Link Library

EPS	Encapsulated Post Script
HTM	Hyper Text Markup
HTML	Hypertext Markup Language
JPG./JPEG	Joint Photographic Experts Group
MIT	Massachusetts Institute of Technology (Media Lab)
MP3	MPEG Audio Layer-3
PDF	Portable Document Format
PNG	Portable Network Graphics
PPT	Power Point
PSD	Photoshop Data
WAV	Waveform Audio File Format
Windows OS	Windows Operating System
XLS	eXceL (MS Excel)

UNIT TEST - 23

Time : 1.15 Hrs.   Marks : 50

I. Choose the best answer   (10 × 1 = 10)

1. **They accommodate multiple files or a single file.**
   a) Sprite   b) Inbox   c) Folders   d) Scratch

2. **The output we get from any application is commonly referred as _____.**
   a) Document   b) Folder   c) PDF   d) File

3. **The application to type notes is _____.**
   a) Scratch   b) Paint   c) PDF   d) Notepad

4. **The application to draw and edit pictures is _____.**
   a) PPT   b) Paint   c) PDF   d) Notepad

5. **The file format for capturing and sending electronic documents in exactly the intended format.**
   a) PPT   b) Word   c) PDF   d) Pagemaker

6. **The software used to create animations, cartoons and games easily is _____.**
   a) PPT   b) Paint   c) Scratch   d) Notepad

7. **Usually a cat appears as a sprite when the Scratch window is opened.**
   a) Cursor   b) Cat   c) Arrow   d) Pointer

8. **'Scratch' was developed in the _____ Institute of Technology (MIT) Media Lab.**
   a) Microsoft   b) Massachusetts   c) Maxwell   d) Madras

9. **The device which helps in explaining the concepts easily through pictures is known as '_____ Communication Device'.**
   a) Art   b) Tele   c) Mobile   d) Visual

10. **Stage, Sprite and Script editor are the parts of _____.**
    a) Paint   b) Notepad   c) Scratch   d) MS Word

II. Fill in the blanks

(6 × 1 = 6)

11. _____ is a storage space that contains multiple files.
12. Scratch is a visual programming _____.
13. The characters on the background of a Scratch window are known as _____.
14. PDF stands for _____.
15. MP3 stands for _____.
16. PSD stands for _____.

III. State whether the statements are true or false. Correct the false statement

(5 × 1 = 5)

17. Windows and LINUX are examples for application.
18. Cinema is a good example for 'Visual Communication Device'.
19. Paint is a software used to create animations, cartoons and games easily.
20. The application for the specific purposes determines the nature of the file.
21. 'Scratch' is a software used to create animations, cartoons and games easily.

IV. Match the following

(10 × 1 = 10)

22.	Folder	(a)	Background
23.	JPG	(b)	Microsoft
24.	Windows	(c)	Sofware for animation
25.	Typing	(d)	Block to use
26.	Stage	(e)	Audio File Format
27.	Block menu	(f)	Notepad
28.	Block palette	(g)	App to draw picture
29.	WAV	(h)	Multiple files
30.	Paint	(i)	Category of blocks
31.	Scratch	(j)	Photograph

V. Write the answer for the following questions in word or sentence

(5 × 1 = 5)

32. What is file?
33. What is folder?
34. What are the two operating systems used many people?
35. Who developed 'Scratch' software?
36. What are the three main parts script editor?

VII. Write the short answer for ANY 7 of the following questions

(7 × 2 = 14)

37. How can we create a folder?
38. What is LINUX?
39. What is 'Windows'?
40. What is 'Visual Communication Device'? Give examples.
41. What are the main parts of Scratch editor?
42. What is Stage?
43. Write a short note on editor and its types?
44. What is Scratch?
45. What is Sprite?

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