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- Public Exam April 2024 Question Paper is given with answers.

SURA PUBLICATIONS
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Syllabus

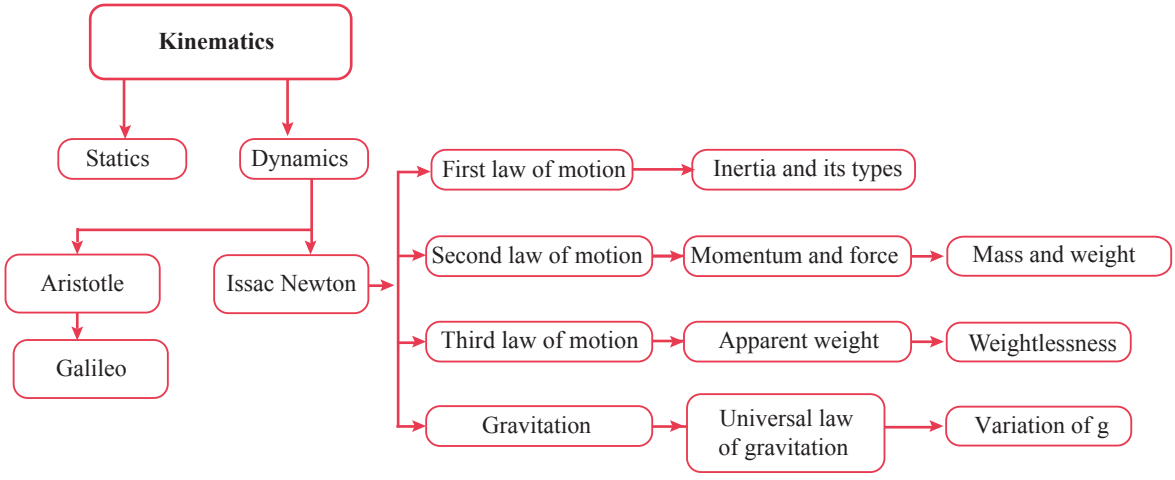
MONTH	PHYSICS	CHEMISTRY	BIOLOGY	PRACTICAL	TOTAL UNITS
June	1	7	12, 13	1, 4, 8	4
July	2	8	14, 15	2, 5, 12	4
I MID TERM TEST (8 UNITS)					
August	3	9	16, 17	6, 9, 10, 13	4
September	4	0	18	3	2
QUARTERLY EXAM (14 UNITS)					
October	5	10	19, 20	7, 11, 14	4
November	6	11	21, 22	0	4
II MID TERM TEST (8 UNITS)					
December	0	0	23	0	
HALF YEARLY EXAM (FULL PORTION)					
January	**FIRST REVISION TEST**				
February	**SECOND REVISION TEST**				
March	**THIRD REVISION TEST**				

PHYSICS

UNIT 1

LAWS OF MOTION

CONCEPT MAP



MUST KNOW DEFINITIONS

Linear momentum	:	The product of mass and velocity of a moving body gives the magnitude of its linear momentum. It acts in the direction of the velocity of the body.
Like parallel forces	:	Two or more forces of equal or unequal magnitude acting along the same direction parallel to each other.
Unlike parallel forces	:	Two or more equal forces or unequal forces act along opposite directions parallel to each other.
Resultant Force	:	When several forces act simultaneously on the same body, then the combined effect of multiple forces can be represented by a single force, as resultant.
Moment of the couple	:	It is measured by the product of any one of the forces and the perpendicular distance between the line of action of two forces.

Impulse	:	When a force F acts on a body for a period of time t, then the product of force and time.
Weight	:	Weight is equal to gravitational force. Also weight (W) = mass × acceleration due to gravity. i.e W = *mg*
Mass	:	The quantity of matter contained in the body. Its SI unit is kilogram (*kg*).
Inertial mass	:	If mass is defined in association with force and inertia, it is termed as "inertial mass".
Gravitational mass	:	When the mass of a body is defined in association with the gravitational field, it is termed as "gravitational mass".
Apparent weight	:	Apparent weight is the weight of the body acquired due to the action of gravity and other external forces on the body.
Weightlessness	:	Whenever a body or a person falls freely under the action of Earth's gravitational force alone, it appears to have zero weight.

FORMULAE

1.	Linear Momentum	$p = mv$
2.	Parallel forces are acting in the same direction	$F_{net} = F_1 + F_2$
3.	Parallel unequal forces are acting in the opposite direction	$F_{net} = F_1 - F_2$ (if $F_1 > F_2$) $F_{net} = F_2 - F_1$ (if $F_2 > F_1$)
4.	Torque	$\tau = F \times d$
5.	Principle of moments	$F_1 \times d_1 = F_2 \times d_2$
6.	Moment of Couple	$M = F \times S$
7.	Force	$F = m \times a$
8.	Impulse	$J = \Delta P$
9.	Law of conservation of linear momentum	$m_1v_1 + m_2v_2 = m_1u_1 + m_2u_2$
10.	Newton's Universal law of gravitation	$F = \frac{GMm}{R^2}$ $[G = 6.674 \times 10^{-11}\ Nm^2\ kg^{-2}]$
11.	Acceleration due to gravity	$g = \frac{GM}{R^2}$
12.	Weight	$W = mg$
13.	Mass of the Earth	$M = \frac{gR^2}{G}$
14.	Acceleration	$a = \frac{v - u}{t}$

TEXTBOOK EVALUATION

I. CHOOSE THE CORRECT ANSWER :

1. Inertia of a body depends on ⊛ *[April-'24]*
(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 equals to *[PTA-1]*
(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 & b
(d) only for bodies with equal masses
[Ans. (c) both a & b]

4. Plotting a graph for momentum on the Y-axis and time on X-axis. Slope of momentum-time graph gives
(a) Impulsive force (b) Acceleration
(c) Force (d) Rate of force
[Ans. (c) Force]

5. In which of the following sport the turning of effect of force used? ⊛ *[QY-2019]*
(a) swimming (b) tennis
(c) cycling (d) hockey **[Ans. (c) cycling]**

6. The unit of 'g' is ms^{-2}. It can be also expressed as *[QY-'23]*
(a) cms^{-1} (b) Nkg^{-1}
(c) Nm^2kg^{-1} (d) cm^2s^{-2} **[Ans. (b) Nkg^{-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) 98×10^4dyne]

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) 2 M
(c) M/4 (d) M **[Ans. (d) M]**

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 *[HY-'23]*
(a) decrease by 50% (b) increase by 50%
(c) decrease by 25% (d) increase by 300%
[Ans. (d) increase by 300%]

10. To project the rockets which of the following principle(s) is /(are) required?
[GMQP-2019; Sep-2021; FRT & Aug.-'22; July-'23]
(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. FILL IN THE BLANKS :

1. To produce a displacement _____ is required.
[Ans. force/unbalanced force] *[FRT-'22]*

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. Gear or Torque]

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

III. STATE WHETHER THE FOLLOWING STATEMENTS ARE TRUE OR FALSE CORRECT THE STATEMENT IF IT IS FALSE:

1. The linear momentum of a system of particles is always conserved.
Ans. False.
Correct Statement : In the absence of external force, the linear momentum of a system of particle is always conserved.

2. Apparent weight of a person is always equal to his actual weight
Ans. False.
Correct Statement : Apparent weight of a person **is not equal** to his actual weight.

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

Ans. False.

Correct Statement : Weight of the body is **less** at equator, **more** at polar region.

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

Ans. False.

Correct Statement : Turning a nut with a spanner having a **long handle** is so 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.

Correct Statement : When space station and astronauts have equal acceleration, they are under free fall condition, so both astronaut and space station are in the state of weightlessness.

IV. MATCH THE FOLLOWING : *[PTA-1]*

	Column I		Column II
(a)	Newton's I law	-	propulsion of a rocket
(b)	Newton's II law	-	Stable equilibrium of a body
(c)	Newton's III law	-	Law of force
(d)	Law of conservation of linear momentum	-	Flying nature of bird

Ans.

	Column I		Column II
(a)	Newton's law	-	Stable equilibrium of a body
(b)	Newton's II law	-	Law of force
(c)	Newton's III law	-	Flying nature of bird
(d)	Law of conservation of linear momentum	-	propulsion of a rocket

V. ASSERTION AND REASONING :

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 moments.

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

[Ans. (b) If 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]**

Hint: 'g' depends on the geometric radius of the Earth.

VI. ANSWER BRIEFLY :

1. Define inertia. Give its classification.

[Aug.-'22; April-'23]

Ans. 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'.**

Classification:

(i) Inertia of rest

(ii) Inertia of motion

(iii) Inertial of direction

2. Classify the types of force based on their application. ***[FRT & Aug.-'22]***

Ans. (i) **Like parallel forces:** Two or more forces of equal or unequal magnitude acting along the same direction, parallel to each other are called like parallel forces.

(ii) **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.

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

Ans.

$F_1 = 5$ N

$F_2 = 15$ N

Resultant force $= F_2 - F_1$ (if $F_2 > F_1$)

$= 15 - 5 = 10$

Resultant force = 10 N

Resultant force of 10 N is acting in the direction of F_2. (i.e.) greater force.

4. Differentiate mass and weight. ⊛ *[May-'22]*

Ans.

S.No	Mass	Weight
(i)	It is the quantity of matter contained in the body	It is the gravitational force exerted on a body due to the gravity.
(ii)	It is a scalar quantity	It is a vector quantity
(iii)	SI unit is kg (kilogram)	SI unit is N (newton)
(iv)	Mass of a body remains the same at any point on the Earth	Weight of a body varies from one place to another place on the Earth
(v)	Measured using a physical balance	Measured using a spring balance

5. Define moment of a couple.

Ans. (i) Rotating effect of a couple is known as **moment of a couple.**

(ii) It is measured by the product of any one of the forces and the perpendicular distance between the line of action of two forces.

(iii) Moment of a couple
= Force × perpendicular distance between the line of action of forces, M = F × S

6. State the principle of moments. *[QY-'19 & '23]*

Ans. (i) When a number of like or unlike parallel forces act on a rigid body and the body is in equilibrium then the algebraic sum of moments in clockwise direction is equals to the algebraic sum of moments in anticlockwise direction.

(ii) Moment in clockwise direction
= Moment in anticlockwise direction,
$F_1 \times d_1 = F_2 \times d_2$

7. State Newton's second law. ⊛
[GMQP-2019; May-'22]

Ans. (i) According to 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".

(ii) F = m × a
Force = mass × acceleration

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

Ans. (i) The turning effect of a body depends upon the distance of the line of action of the applied force from the axis of rotation.

(ii) Larger the perpendicular distance, lesser is the force required to turn the body. So spanner with long handle is preferred.

9. While catching a cricket ball the fielder lowers his hands backwards. Why? *[FRT-'24]*

Ans. When the fielder pulls back his hands he experiences a smaller force for a longer interval of time leading to less damage to his hands.

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

Ans. Astronauts are not floating but falling freely around the Earth due to their huge oribital velocity. Since space station and astronauts have equal acceleration, they are under free fall condition. (R = 0 refer case 4 in Table 1.2). Hence, both the astronauts and the spacestation are in the state of weightlessness.

VII. 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.

Given

Mass ratio of two bodies is 3 : 4

So let's assume

Mass of smaller body = $m_1 = 3$ kg

Mass of bigger body = $m_2 = 4$ kg

Acceleration due to force applied by bigger body = $a_2 = 12\ ms^{-2}$

To find : Acceleration due to the same force on the smaller body = a_1 = ?

Solution

According to Newton's second law of motion.

$F = m \times a$

$F_1 = m_1 a_1$ $\qquad F_2 = m_2 a_2$

$F_1 = 3a_1$ $\qquad F_2 = 4 \times 12 = 48$ N

As the force is the equal

$F_1 = -F_2$

$3a_1 = -48$

$\therefore\ a_1 = -\frac{48}{3} = -16\ ms^{-2}$

So acceleration due to the same force on the smaller body a_1 = **16 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.

Given

Mass, m = 1 kg
Initial velocity, u = 10 ms^{-1}
Final velocity, v = −10ms^{-1}

To find : Change in linear momentum
$= m(v-u) = mv - mu$

Solution

Momentum before collision = $mu = (1\times10)$
= 10 kg ms^{-1}
Momentum after collision = mv
= $-(1\times10)$
= −10 kg ms^{-1}
Change in momentum(Δp) = $mv - mu$
Δp = −10 − 10
= **−20 kg ms^{-1}**

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?

Given

Force F_1 = 140 N
Length L_1 = 40 cm = 40×10^{-2} m
Force, F_2 = 40 N
Length, L_2 = ?

To find : $F_1\times L_1 = F_2\times L_2$

Length of the spanner,

$$L_2 = \frac{F_1\times L_1}{F_2}$$

Solution

$$L_2 = \frac{140\times \cancel{40}\times10^{-2}}{\cancel{40}}$$
$$= 140\times10^{-2}\text{ m}$$

Length, L_2 = 1.4 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.

Given

The ratio of masses of two bodies is $m_1 : m_2$
i.e 2 : 3
Mass of the smaller body, m_1 = 2 kg
Mass of the bigger body m_2 = 3 kg
Radius of the smaller body, R_1 = 4 km
Radius of the bigger body, R_2 = 7 km
i.e $r_1 : r_2$ = 4 : 7

To find : $g_1 : g_2 = ?$

Solution

We know that

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

$$g_1 = \frac{GM_1}{R_1^2}\ ;\ g_2 = \frac{GM_2}{R_2^2}$$

$$\frac{g_1}{g_2} = \frac{\frac{\cancel{G}M_1}{R_1^2}}{\frac{\cancel{G}M_2}{R_2^2}} = \frac{M_1}{R_1^2}\times\frac{R_2^2}{M_2}$$

$$\frac{g_1}{g_2} = \left(\frac{M_1}{M_2}\right)\left(\frac{R_2}{R_1}\right)^2 = \left(\frac{2}{3}\right)\left(\frac{7}{4}\right)^2$$

$$\frac{g_1}{g_2} = \frac{\overset{1}{\cancel{2}}}{3}\times\frac{7\times7}{\underset{2}{\cancel{4}}\times4} = \frac{49}{24}$$

The ratio is, $g_1 : g_2 = 49 : 24$

VIII. Answer in detail.

1. What are the types of inertia? Give an example for each type. *[PTA-3; Aug.-'22; April-'24]*

(OR)

Explain the different types of inertia with an example for each type. *[FRT-'22]*

Ans. Inertia is of three types

(i) Inertia of rest
(ii) Inertia of motion
(iii) Inertia of direction

(i) **Inertia of rest :** The resistance of a body to change its state of rest is called **inertia of rest.**
Eg: When you vigorously shake the branches of a tree some of the leaves and fruit are detached and they fall down.

(ii) **Inertia of motion** : The resistance of a body to change its state of motion is called **inertia of motion.**
Eg : An athlete runs some distance before jumping. Because, this will help him jump longer and higher.

USE THE ANALOGY TO FILL IN THE BLANK

1. Unit of linear force : N :: Unit of torque : ___

Ans. Nm

2. Unit of force in CGS is 1 dyne = 1 g cm s^{-2} :: Unit of force in SI is 1 N =_____

Ans. 10^5 dyne

3. Inertia : Moment of inertia :: _____ : Moment of force

Ans. Force

4. Natural motion : Force independent :: Violent motion : _____

Ans. Force dependent

5. Opening a pen cap : _____ :: Opening the door : moment of force

Ans. Moment of couple

6. Clockwise moment : negative, :: Anti - clockwise moment : _____

Ans. Positive

7. R = m(g – a) : R < W :: _____ : R = W

Ans. R = mg

8. Statics : rest :: Dynamics : _____

Ans. motion

9. Law of inertia : Newton's 1 law :: Law of force : _____

Ans. Newton's II law

10. Upward motion : R > W :: Downward motion : _____

Ans. R < W

ARRANGE THE FOLLOWING IN CORRECT SEQUENCE

1. Arrange the scientists according to their periods and achievements.
Galileo, Einstein, Newton, Nicolaus Copernicus

Ans. Nicolaus Copernicus, Galileo, Newton, Einstein.

VERY SHORT ANSWERS 2 MARKS

1. Bodies of larger mass need greater effort to put them in motion. Why?

Ans. According to Newton's II law, F = *ma*.
For given acceleration *a*, if *m* is large, F should be more i.e., greater force.

2. A constant force F acts on a truck over a distance *s* and for a time *t*. What is the momentum gained by the truck?

Ans. Momentum gained by the truck = Force × time.
i.e., impulse = F × t.

3. A force of 1 N acts on a body of mass 1 g, Calculate the acceleration produced in the body. Given : F = 1 N; *m* = 1 g = 10^{-3} kg.

Ans. $F = ma \Rightarrow a = \frac{F}{m} = \frac{1}{10^{-3}} = 10^3\ ms^{-2}$.

4. If a force is acting on a moving body perpendicular to the direction of motion, then what will be its effect on the speed of the body?

Ans. There is no change in speed. E.g. Forces acting on a body in circular motion.

5. If the net force acting on a body be zero, then will the body remain necessarily in rest position?

Ans. No, the body may be in uniform motion along a straight line.

6. A lift is accelerated upward. What is apparent weight of a person inside the lift?

Ans. The opposite weight will increase.

7. When will be the force exerted by the floor of an elevator on the foot of a person standing there is more than the weight of the person?

Ans. If the elevator is
(i) going up and slowing down and
(ii) going up and speeding up.

8. Action and reaction forces do not balance each other. Why?

Ans. This is because forces of action & reaction act always on the different bodies.

9. When a ball of 0.5 kg mass moving with a speed of 20 ms^{-1} rebounds after striking normally a perfectly elastic wall. Find the change in momentum.

Ans. Change in linear momentum = $m(v - u)$

$\Delta P = -mv - mv = -2mv$
$= 2 \times 0.5 \times 20 = 20 \times 1$
$= 20\ kg\ ms^{-1}$

10. Thief jumps from roof of a house with a box of weight W on his head. What will be the weight of the box as experienced by the thief during jump?

Ans. Weight of the box during jump W= $m(g - a)$.
$= m(g - g) = 0$.

11. Why does a gun recoil when a bullet is fired?

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

12. A brinjal vendor sells his brinjal using a beam balance in an elevator. Will he gain more if the elevator is accelerating up?

Ans.
- Yes. Apparent weight = $m(g + a)$.
- Apparent weight increases in elevator while accelerating upward.

13. Which law is used in geotropism?

Ans. Newton's law of gravitation.

14. A boy puts a heavy box of mass M on his head and jumps down from the top of a multistoried building to the ground. How much is the force exerted by the box on his head during his force fall? Does the force of gravity increase during the fall?

Ans. F = mg'. No, the force of gravity does not increase.

15. What is meant by natural motion?

Ans. According to Aristotle, A moving body naturally comes to rest without any external influence or force. Such motions are termed as "**natural motion**".

16. What is equilibrant?

Ans. A system can be brought to equilibrium by applying another force, which is equal to the resultant force in magnitude, but opposite in direction.

17. What is Torque? (or) moment of force?

Ans. The rotating or turning effect of a force about a fixed point or fixed axis is called moment of the force about that point or torque (τ).

18. Write the convention rule of couple.

Ans.
(i) By convention, direction of moment of a force or couple is taken as positive if the object is rotated in anti-clockwise direction.
(ii) It is negative if it rotates the object in clock wise direction.

19. What is the use of Steering Wheel?

Ans. A small steering wheel helps to manoeuore car easily by transferring a torque to the wheels with less effort.

20. Define 1 N.

Ans. The amount of force required for a body of mass 1 kg produces an acceleration of **1 m s^{-2} ; 1 N = 1 kg m s^{-2}.**

21. Define 1 dyne.

Ans. The amount of force required for a body of mass 1 gram produces an acceleration of **1 cms^{-2} 1 dyne = 1 g cms^{-2}**; also **1 N = 10^5 dyne**.

22. What is Unit force?

Ans. The amount of force required to produce an acceleration of 1 ms^{-2} on in a body of mass 1 kg is called **"unit force"**.

23. What is Impulsive force?

Ans. Large force acting for very short interval of time is called as **"Impulsive force"**.

24. Define impulse.

Ans. 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. It is represented by 'J'.

SHORT ANSWERS — 4 MARKS

1. An athlete runs a certain distance before taking a long jump. Why?

Ans.
(i) This is due to inertia of motion.
(ii) This is because velocity acquired by running is added to the velocity of the athlete at the time of jump.
(iii) Hence he can jump over a longer distance.

2. What is Mechanics? Explain its branches.

Ans. **Mechanics:** Branch of physics that deals with the effect of force on bodies.

Branches : It is divided into two branches, namely, statics and dynamics.

(i) **Statics :** It deals with the bodies which are at rest under the action of forces.

(ii) **Dynamics:** It is the study of moving bodies under the action of forces. Dynamics is further divided as follows:

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

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

3. When is a body said to be in rest and motion?

Ans.
(i) When an object does not change its state during period of time, then it is said to be in the state of "rest".
(ii) When an object changes its state during a period of time, then it is said to be in the state of "motion".

4. What is resultant force?

Ans. (i) When several forces act simultaneously on the same object, then the combined effect of multiple forces can be represented by a single force, which is termed as **resultant force**.

(ii) It is equal to vector sum (adding the magnitude of the forces with their direction) of all the forces.

5. How can you measure torque?

Ans. It is measured by the product of any one of the forces (F) and the perpendicular distance between the fixed point or the fixed axis and the line of action of the force. $\tau = F \times d$.

6. Define Linear Momentum.

Ans. ✦ 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

$p = mv$

7. Distinguish between balanced and unbalanced force.

Ans.

	Balanced Force	Unbalanced force
(i)	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.	If the resultant force is not equal to zero, then it causes the motion of the body due to unbalanced forces.
(ii)	Eg : Force applied with a crow bar	Eg : Action of a lever.

8. Handle in a door is always placed at the edge of door. Why?

Ans. The door can be easily opened or closed if we apply the force at a point far away from the fixed edge.

(i) In this case, the effect of the force we apply is to rotate the door about the fixed edge.

(ii) This rotational effect of the applied force is more about the 'axis of rotation' when the distance between the fixed edge and the point of application of force is more.

9. What is Gravitational unit of force?

Ans. 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 g f.

✦ 1 kgf = 1 kg × 9.8 m s^{-2} = 9.8 N;

✦ 1 gf = 1 g × 980 cm s^{-2} = 980 dyne

10. Take two eggs and drop them from a certain height one by one. Drop one egg onto a concrete floor and another one onto a cushion pillow. What changes do you notice?

When the egg is dropped onto a concrete floor, it breaks. But, the egg dropped onto the cushion pillow does not break. Can you explain why?

Ans. (i) **Egg dropped on concrete :** A large force acting for a short period of time and a smaller force acting for a longer period time.

Egg dropped on cushion pillow : A smaller force acting for a longer period.

(ii) In this activity for the egg dropped to a cushion pillow, the time of interaction of force is large and makes the magnitude of force small.

(iii) So, it does not break. When the same egg is dropped onto a concrete floor, the time of interaction is very short and hence the force becomes large, which breaks the egg.

(iv) Such a force is known as "impulsive force".

11. What is meant by Weightlessness?

Ans. ✦ When the person in a lift moves down with an acceleration (a) equal to the acceleration due to gravity (g), i.e., when a = g, this motion is called as 'free fall'.

✦ Here, the apparent weight (R = m (g – g) = 0) of the person is zero.

12. Give more examples for the cases in which the time of action of force is made large to have less force?

Ans. (i) Fragile items like glass crockery etc., are wrapped in straw or paper strips in boxes for shipment to avoid breakage.

(ii) Chalks are packed with husks in between to reduce impact forces while transportation.

(iii) Automobiles are fitted with springs and shock absorbers to reduce jerk while moving in uneven roads.

13. Give examples for the cases in which the time of action of force is very short to have a large force?

Ans.
(i) Striking a hammer on a nail.
(ii) Hitting cricket ball with the bat.
(iii) We get hurt more while we slip down on a concrete floor than on a mud floor.
(iv) Both the floors experience same amount of change in momentum. But in concrete floor the large amount of force acts in shorter interval of time. So it hurts more.
(v) When the fielder pulls back his hands he experiences a smaller force for a longer interval of time leading to less damage to his hands.

14. If 25 N of force is used to compress a spring, then how much reactive force exerted by spring?

Ans. Reactive force by spring = – 25 N.
When a 25 N of forces is used to compress a spring, then same amount of force will be exerted by the spring in the opposite direction. This is according to Newton's III law of motion. i.e., For every action there is an equal and opposite reaction.

15. Is it possible to open a cap of pen with one hand? If not give reason.

Ans.
(i) Yes, it is possible. Two equal & opposite forces are required to produce required amount of torque. Two fingers can be used.
(ii) Rotational motion produced by a single finger is less than two fingers producing equal & opposite forces.

16. What happens to the weight of a person while he goes from polar region to equator?

Ans.
(i) The value of g is maximum in polar region and minimum at the equator region.
(ii) Since weight W = mg, as g varies, the weight of the person is more at poles than at the equator region.

17. Classify the following things into like parallel and unlike parallel forces (Dragging water from well, force applied to crow bar, weight balance, turning pen cap)

Ans.

Dragging water from well	- Like parallel forces
Force applied to crow bar	- Unlike parallel forces
Weight balance	- Like parallel forces
Turning pen cap	- Unlike parallel forces

NUMERICAL PROBLEMS

1. Weight of a person inside the lift while at rest is 50 N. What is the weight he feels when lift moves up with an acceleration of 9.8 ms^{-2}.

Ans. R = $m(g + a)$ (R → Apparent weight)

mg = 50 N

ma = 50 N

R = $mg + ma$ = 50 + 50

R = 100 N

Here Apparent weight (R) is greater than the actual weight mg (=W)

2. A 20g bullet moving at 300 m/s stops after penetrating 2 cm of bone. Calculate the average force exerted by the bullet.

Given

Mass of the bullet, m = 20×10^{-3} kg
Initial velocity, u = 300 m/s
Final velocity, v = 0
Distance, s = 2 cm = 2×10^{-2} m

To find : Force exerted by the bullet, f = ?

Solution

Using equations of motion,

$v^2 = u^2 + 2as$

$0 = (300)^2 + 2(a) \times 2 \times 10^{-2}$

$$a = -\frac{(300)^2}{4\times10^{-2}} = -\frac{9\times10^4}{4\times10^{-2}}$$

$a = -2.25 \times 10^6$ m/s^2

$a = 2.25 \times 10^6$ m/s^2

Average force,

$F = ma$

$= 20 \times 10^{-3} \times 2.25 \times 10^6$

$F = 45 \times 10^3 = 4.5 \times 10^4$ N

3. A bullet of mass 50 g moving with a speed of 300 ms^{-1} is brought to rest in 1s. Find the impulse and the force.

Given

Mass of the bullet, $m = 50 \times 10^{-3}$ kg
Initial speed of the bullet, $u = 300$ m/s
Final speed, $v = 0$
time, $t = 1$ s

To find : (i) Impulse (of a force), J =?
(ii) Force, F = ?

Solution

(i) Impulse, J = Change in momentum
$= m(v - u)$
$= 50 \times 10^{-3} [0 - 300]$
$= -15$ Ns

(ii) Impulse $= F \times t$
$-15 = F \times 1$s
$F = \frac{-15}{1} = -15$ N

4. A cricket ball of mass 25 g moving with a speed of 12 ms^{-1} is hit by a bat so that the ball is turned back with a velocity of 20 ms^{-1}. Calculate the impulse received by the ball?

Given

Mass of the ball, $m = 25$ g
$m = 25 \times 10^{-3}$ kg
Initial speed of the ball, $u = 12$ ms^{-1}
Final speed of the ball, $v = -20$ ms^{-1}
[–ve sign indicates backward direction]

To find : Impulse, J = ?

Solution

Impulse = Change in linear momentum
$J = m(v - u)$
$= 25 (-20 - 12)$
$= 25 (-32)$
$= -800 \times 10^{-3}$
$J = 0.8$ Ns

5. Calculate the mass of a body weighing 100 dyne. g = 10 m/s^2

Given

Weight, W = 100 dyne
Acceleration due to gravity, $g = 10$ m/s^2
$g = 1000$ cm/s^2

To find : Mass of the body, m = ?

Solution

$W = mg$; $m = \frac{W}{g}$

$m = \frac{100 \text{ dyne}}{1000 \text{ cm/s}^2} = \frac{1}{10} g$

Mass, $m = 0.1\ g$

6. A cricket ball of mass 100 g moving with a speed of 20 ms^{-1} is brought to rest by a player. Find the change in momentum of ball.

Ans.

Mass = $100\ g = 0.1$ kg ;
Initial speed $u = 20$ ms^{-1}
Final velocity $v = 0$
Change in momentum = ?
$mv - mu = (0.1 \times 0) - (0.1 \times 20)$
Change in momentum = – 2 kg ms^{-1}

7. A sphere of mass 20 kg moving with a velocity 40 ms^{-1} collides with another sphere of mass 15 kg which is at rest. After collision they move with the same velocity. Find that velocity.

Given

Mass of the first body, $m_1 = 20$ kg
Mass of the second body, $m_2 = 15$ kg
Initial velocity of first body, $u_1 = 40$ ms^{-1}
Initial velocity of second body, $u_2 = 0$
(Second body is at rest initially)
Final velocity of the first body,
v_1 = Final velocity of the second body, v_2
i.e., $v_1 = v_2 = v$

To find : v = ?

Solution

According to law of conservation of momentum,
$m_1u_1 + m_2u_2 = m_1v_1 + m_2v_2$
$m_1u_1 + m_2u_2 = (m_1 + m_2)\ v$
$20 \times 40 + 15 \times 0 = (20 + 15)\ v$
$800 = 35\ v$
Velocity, $v = \frac{800}{35} = 22.85$ ms^{-1}

8. A force of 200 dyne acts on a body of mass 10 g for 5 s. What will be the velocity of the body if it starts from rest? Express in SI unit.

Ans.

Force, F = 200 dyne
Mass $m = 10$ g
$t = 5$ s
Acceleration, $a = \frac{F}{m} \Rightarrow a = \frac{200}{10} = 20$ cm /s^2

Velocity $v = at \Rightarrow v = 20 \times 5 = 100$ cm /s

In SI unit $v = 100 \times 10^{-2}$ ms^{-1} (or) 1 ms^{-1}

$v =$ **1 ms^{-1}**

9. A force of 60 N acts on a body for 10 s. What is the change in momentum?

Ans.

Impulse = Change in momentum

F = 60 N ; t = 10 s

Change in momentum = Force × time

= 60×10

Change in momentum = 600 Ns

10. A body of mass 2 kg moving with uniform velocity of 40 ms^{-1} collides with another body at rest. If two bodies move together with a velocity of 20 ms^{-1}. Find the mass of the other body.

Given

Mass of first body, m_1 = 2 kg

Initial velocity of first body, u_1 = 40 ms^{-1}

Initial velocity of second body, u_2 = 0

Final velocity of first body,

v_1 z = Final velocity of the second body, v_2

i.e., $v_1 = v_2 = 20$ ms^{-1}

To find : Mass of second body, m_2 = ?

Solution

According to law of conservation of momentum,

$$m_1u_1 + m_2u_2 = m_1v_1 + m_2v_2$$

$$m_1u_1 + m_2u_2 = v_1 m_1 + m_2v_2$$

$$2 \times 40 + m_2 \times 0 = 20 \times 2 + 20 \times m_2$$

$$80 = 40 + 20\, m_2$$

$$20\, m_2 = 40 \Rightarrow$$

$$m_2 = \frac{40}{20} = 2 \text{ kg}$$

Mass of second body, m_2 = **2 kg**

11. A force of 10 kg weight acting on an object of mass for 2 *s* gives to it a velocity of 10 ms^{-1}. What is the mass of an object in kg? [g = 9.8 ms^{-1}]

Given

Force, F = 10 kg wt = 10 × 9.8 = 98 N

Time, t = 2 *s*; Velocity, v = 10 ms^{-1}

To find : Mass m = ?

F = ma ; $a = \frac{v}{t}$

Solution

$$a = \frac{10}{2} = 5 \text{ ms}^{-2}$$

$$\therefore m = \frac{F}{a} = \frac{98}{5} = 19.6 \text{ kg}$$

m = **19.6 kg**

12. A 2000 kg car traveling at 20 ms^{-1} hits concrete wall and stops in 0.05 s. What magnitude of impulse did the wall exert on the car?

Given

Mass of the car m = 2000 kg

Speed of the car v = 20 ms^{-1}

Time t = 0.05 s

To find : Impulse = ?

Impulse = F × t; Force = $m \times a$

Solution

$$a = \frac{v}{t} = \frac{20}{0.05} = 400 \text{ ms}^{-2}$$

$$F = ma \Rightarrow 2000 \times 400$$

$$= 8 \times 10^5 \text{ N}$$

Impulse = F × t $\Rightarrow 8 \times 10^5 \times 0.05$

$= 4 \times 10^4$ N s

The magnitude of impulse exerted by the wall on the car = **4×10^4 Ns**

13. The masses of two planets are in the ratio 1 : 2 their radii are in the ratio 1 : 2. Find the ratio of the acceleration due to gravity on the planets.

Given

Ratio of mass of two planets = $M_1 : M_2 = 1 : 2$

Ratio of radius of the planets = $R_1 : R_2 = 1 : 2$

To find : Acceleration due two planets

$= g_1 : g_2$ = ?

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

Constituent G = 6.674×10^{-11} Nm^2 kg^{-2}

Solution

$$g_1 = \frac{GM_1}{R_1^2}; g_2 = \frac{GM_1}{2R_1^2}$$

$$\frac{g_1}{g_2} = \frac{GM_1}{R_1^2} \times \frac{2R_1^2}{GM_1} = \frac{2}{1}$$

$$= \frac{1}{4} = 1 : 4 \text{ (or) } 1 : 2$$

$g_1 : g_2$ = **1 : 2**

14. A pistol fired a bullet of mass 50 g triggered with a speed 250 ms^{-1} penetrated into a wooden plank comes to rest at 1 ms. Find the impulse and average force offered by the planks.

Given

Mass, m = 50 g = 50 × 10^{-3} kg
Final speed, v = 0
Initial speed, u = 250 ms^{-1}
Time, t = 1ms = 10^{-3} s

To find : J = F × t = ? Average force, F = ma = ?

Solution

$$F = \frac{m(v-u)}{t} = \frac{50\times10^{-3}[0-250]}{1\times10^{-3}s}$$

F = 12500 = 1.25 × 10^4 N
J = F × t = 1.25 × 10^4 × 10^{-3}
J = **12.5 Ns**

15. Force of 50 N acts perpendicular on a body, which is fixed at a point O. The distance of point of action of force from O is 5 cm. Find the momentum of force.

Given

Force, F =50 N; Distance, d = 5 cm

To find : Momentum of force= F × d

Solution

Momentum of force, = 50 × 5 × 10^{-2}
= 250 × 10^{-2}
= **2.5 Nm**

16. A person of weight 50 kg is moving down in an elevator Calculate downward acceleration offered by the elevator whose reaction force is 400 N on the surface.

Given Weight = 50 kg

To find : Acceleration, a = ? (downward)
Reaction, R = 400 N

Solution

R = m (g – a)
400 = 50 (10 – a)
400 = 500 – 50 a
500 = 500 – 400
50 a = 100

$$a = \frac{100}{50}$$

Downward acceleration, a = **20 ms^{-1}**

17. Calculate the force of gravitation between two bodies of weight 50 kg and 10 kg respectively place at 10 m apart. If their distance increased to 100 % then find the change in percentage of force. (New force is 75% less than the original force)

Given

Mass of body 1, m_1 = 50 kg
Mass of body 2, m_2 = 10 kg
Distance, R = 10 m
Universal gravitation constant, G = 6.67 × 10^{-11} Nm^2 kg^{-2}

To find : Force of gravitation, $F = \frac{Gm_1m_2}{R^2}$

Solution

$$F = \frac{6.67\times10^{-11}\times50\times10}{10^2}$$

Force, F = **33.35 × 10^{-11} N**

LONG ANSWERS 7 MARKS

1. What are the concepts prepared by Galileo?

Ans. (i) The natural state of all earthly bodies is either the state of rest or the state of uniform motion.
(ii) An body in motion will continue to be in the same state of motion as long as no external force is applied.
(iii) When force is applied on bodies, they resist any change in their state. This property of bodies is called "inertia".
(iv) When dropped from a height in vacuum, bodies of different size, shape and mass fall at the same rate and reach the ground at the same time.

2. Give the application of torque.

Ans. (i) **Gears :** A gear is a circular wheel with teeth around its rim. It helps to change the speed of rotation of a wheel by changing the torque and helps to transmit power.
(ii) **Seasaw :** When the heavier person comes closer to the pivot point (fulcrum) 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 easily by transferring a torque to the wheels with less effort.

3. Give examples for Newton's third law.

Ans. **(i)** When birds fly, they push the air downwards by their wings (Action).

(ii) The air pushes the bird upwards (Reaction).

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

(iv) Rockets expel gas at high velocity (Action). The downward moving gas pushes the rocket in upward direction (Reaction).

(v) When we fire a bullet, the gun recoils back, Bullet is moving forward (action). The gun equalise this forward action by moving backward (reaction).

4. Derive the Relation between g and G.

Ans. **(i)** Let, M be the mass of the Earth and m be the mass of the object.

(ii) The entire mass of the Earth is assumed to be concentrated at its centre. The radius of the Earth is R (= 6378 km = 6400 km approximately).

(iii) By Newton's law of gravitation, the force acting on the object is given by

$$F = G M m / R^2 \quad \ldots (A)$$

(iv) According to Newton second law, the force acting on the object is given by the product of its mass and acceleration. Here acceleration of the is under the action of gravity hence $a = g$.

$$F = ma = mg$$

$$F = \text{weight} = mg \quad \ldots (B)$$

Comparing equations (A) and (B), we get

$$mg = G M m / R^2$$

Acceleration due to gravity

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

HIGHER ORDER THINKING (HOTS)

1. Why does the recoil of a heavy gun on firing not so strong as of a light gun using the same cartridges?

Ans. Recoil velocity of a gun $\propto \frac{1}{m}$. So light rifle recoils with large velocity than the heavy rifle.

2. If a body moves with uniform velocity, what is the net force acting on a body?

Ans. If a body moves with uniform velocity, the acceleration of body is zero.

$\therefore$ net force acting on the body is zero.

$F = ma$ [$a = 0$]

3. Meteorites are shooting stars. They completely burn out while they hit Earth's atmosphere. Apply impulse concept to explain their burning action.

Ans. A shooting star is a small piece of rock that hits Earth's atmosphere. It heats up due to air temperature. They enter with very high speeds. When it strikes with high speed in short duration (i.e. impulse = $p = \lambda t$) causes burning. But when hit the ground, it becomes cool.

4. A rocket with a lift - off mass 20,000 kg is blasted upwards with an initial acceleration of 5.0 ms^{-2}. Calculate the initial thrust (Force) of the blast.

Ans. **Given**

Initial mass of the rocket, $m = 20{,}000$ kg

Initial acceleration, $a = 50\ ms^{-2}$

(Upward direction)

Let initial thrust of the blast be T

To find : $T = mg + ma$

Solution

$$T = m(g + a)$$

$$= 20{,}000\ (9.8 + 50)$$

$$T = 2 \times 10^4 \times 59.8$$

Initial thrust,

$$T = 119.6 \times 10^4\ N$$

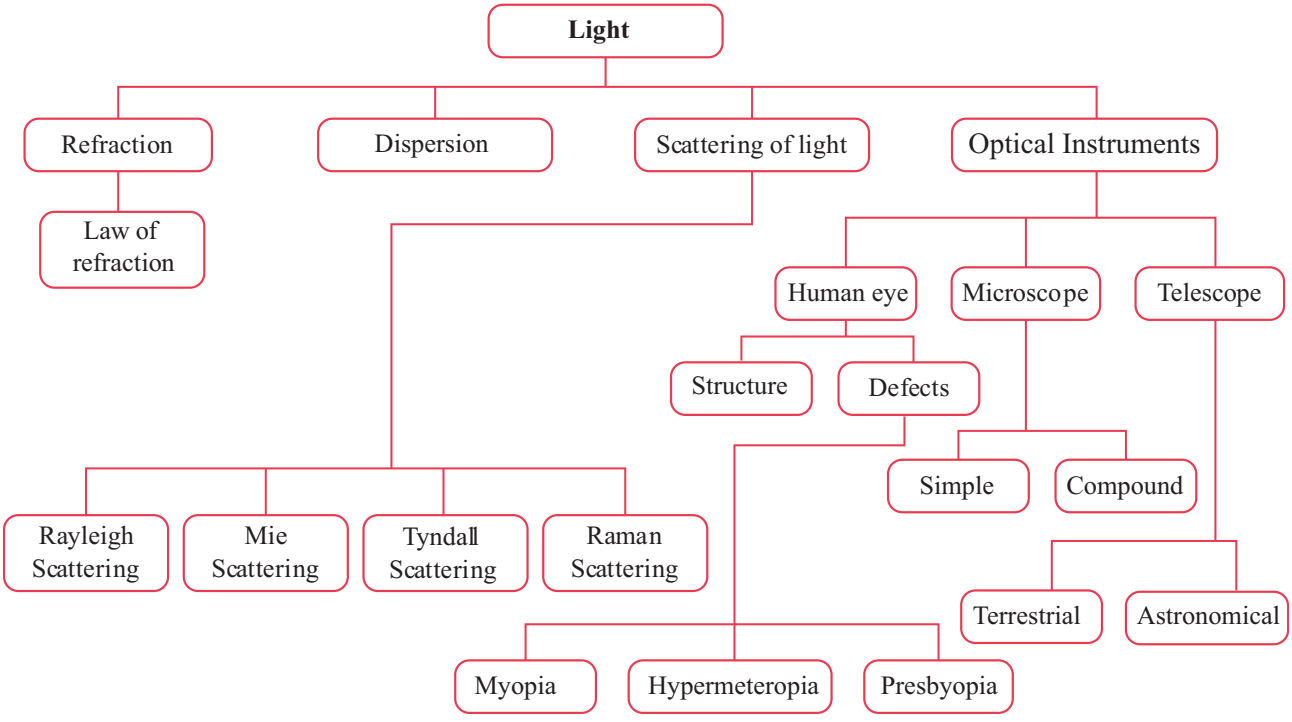
☆ ☆ ☆

UNIT

2

OPTICS

CONCEPT MAP



MUST KNOW DEFINITIONS

Refraction	:	When a ray of light travels from one transparent medium into another obliquely, the path of light undergoes deviation. This deviation of ray of light is called refraction.
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.
Refractive index	:	The ratio of speed of light in vacuum to the speed of light in a medium.
Dispersion of light	:	When a beam of white light or composite light is refracted through any transparent media such as glass or water, it is split into its component colours.
Scatterer	:	Scattering is the phenomenon by which a beam of light is redirected in many different directions when it interacts with a constituent particle of the atmosphere. The interacting particle of the atmosphere is called as **scatterer**.
Elastic scattering	:	If the energy of incident beam of light and scattered light beam are the same, then the scattering.
Inelastic scattering	:	If the energy of incident beam of light and scattered beam of light are not the same, then the scattering.
Rayleigh scattering law	:	The amount of scattering of light is inversely proportional to the fourth power of the wavelength.
Mie scattering	:	Mie scattering takes place when the diameter of the scatterer is similar to or larger than the wavelength of the incident light. It is also an elastic scattering.
Tyndall scattering	:	The scattering of light rays by the colloidal particles in the colloidal solution.
Raman scattering	:	The interaction of light ray with the particles of pure liquids or transparent solids, which leads to a change in wavelength or frequency.

FORMULAE

Velocity of light	$C = \nu\lambda$
Snell's law	$\frac{\sin i}{\sin r} = \frac{\mu_2}{\mu_1}$
Rayleigh's Scattering Law	$S \alpha \frac{1}{\lambda^4}$
lens formula	$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$
Magnification	$m = \frac{h^1}{h} = \frac{v}{u}$

Power of lens	$P = \frac{1}{f}$
len's maker's formula	$\frac{1}{f} = (\mu - 1)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$
Focal length of required concave lens for myopia	$f = \frac{xy}{x - y}$
Focal length of the required convex lens for hypermeteropia	$f = \frac{dD}{d - D}$

TEXTBOOK EVALUATION

I. CHOOSE THE CORRECT 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 *[FRT-'22]*

(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 *[May-'22]*

(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 *[PTA-3]*

(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 *[April-'23]*

(a) Positive (b) negative
(c) either positive or negative
(d) zero **[Ans. (c) either positive or negative]**

5. A convex lens forms a real, diminished point sized image at focus. Then the position of the object is at *[FRT-'22]*

(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 *[QY-'23]*

(a) 4m (b) – 40m
(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 *[FRT-'22]*

(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 *[PTA-2; Sep-2020; FRT-'24]*

(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. (c) $V_B < V_G < V_R$]

II. FILL IN THE BLANKS :

1. The path of the light is called as _____.
[Ans. ray of light]

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. wavelength]

5. Amount of light entering into the eye is controlled by _____. *[FRT-'22]* **[Ans. Iris]**

III. TRUE OR FALSE. IF FALSE CORRECT IT:

1. Velocity of light is greater in denser medium than in rarer medium

Ans. **False.**

Correct Statement: Velocity of light is **lesser** in denser medium than in rarer 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. False.

Correct Statement: Decrease in the converging power of eye lens cause hypermetropia.

4. The convex lens always gives small virtual image.

Ans. False.

Correct Statement: Concave lens always gives small virtual image.

IV. MATCH THE FOLLOWING:

Column – I		Column – II	
(1)	Retina	a	Pathway 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 accommodation

[Ans. 1-d, 2-a, 3-e, 4-b, 5-c]

V. ASSERTION AND REASONING TYPE:

Mark the correct choice 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 but reason is not the correct explanation of assertion.
(c) Assertion is true but reason is false.
(d) Assertion is false but 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) If both assertion and reason are true and 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. (a) If both assertion and reason are true and reason is the correct explanation of assertion]

VI. ANSWER BRIEFLY :

1. What is refractive index? *[FRT-'22]*

Ans. The ratio of speed of light in vacuum (c) to the speed of light in a medium (v) is defined as refractive index 'μ' of that medium.

$$\mu = \frac{c}{v}$$

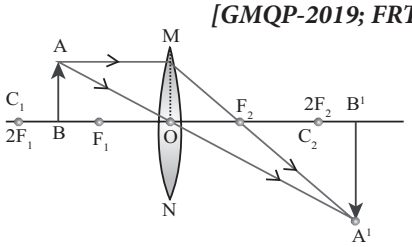
2. State Snell's law. ⊛ *[QY-2019; FRT & Aug.-'22]*

Ans. Snell's law states that, 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.

$$\frac{\sin i}{\sin r} = \frac{\mu_2}{\mu_1}$$

3. Draw a ray diagram to show the image formed by a convex lens when the object is placed between F and 2F.

Ans. *[GMQP-2019; FRT-'22; July-'23]*



4. Define dispersion of light. ⊛ *[April-'24]*

Ans. When a beam of white light or composite light is 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. *[PTA-3; July-'23]*

Ans. The amount of scattering of light is inversely proportional to the fourth power of the wavelength. This is called as Rayleigh scattering law.

$$\text{Amount of scattering 'S'} \propto \frac{1}{\lambda^4}$$

6. Differentiate convex lens and concave lens.

Ans. *[PTA-3; QY-2019; July-'23; FRT-'24]*

S. No.	Convex Lens	Concave Lens
1.	Thicker in the middle than at edges.	Thinner in the middle than at edges.
2.	It is converging lens.	It is diverging lens.
3.	Produces mostly real images.	Produces a virtual image.
4.	Used to treat hypermeteropia.	Used to treat myopia.

7. What is power of accommodation of eye? ⊗

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

8. What are the causes of 'Myopia'?

[GMQP-2019; FRT-'22]

Ans.
(i) Myopia, also known as short sightedness, occurs due to the lengthening of eye ball.
(ii) Nearby objects can be seen clearly but distant objects cannot be seen clearly.
(iii) The focal length of eye lens is reduced or the distance between eye lens and retina increases.
(iv) Far point will not be infinity and the far point has come closer.
(v) Due to this, the image of distant objects are formed before the retina.

9. Why does the sky appear in blue colour?

[PTA-1; April-'23]

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

10. Why are traffic signals red in colour?

[PTA-4; HY-'23; April-'24]

Ans.
(i) Red has the longest wavelength so it is scattered the least by atmospheric particles.
(ii) As a result whether it is fog or smoke, red light passes comparatively easily through them.

VII. Give the answer in detail :

1. List any five properties of light. ⊗

[QY-2019; FRT-'22; May-'22; HY-'23]

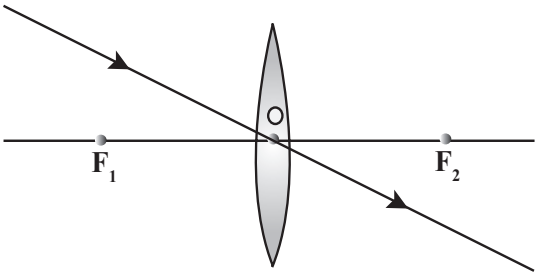
Ans.
(i) Light is a form of energy.
(ii) Light always travels along a straight line.
(iii) Light does not need any medium for its propagation. It can even travel through vacuum.
(iv) The speed of light in vacuum or air is, $c = 3 \times 10^8\ ms^{-1}$.
(v) Different coloured light has different wavelength and frequency.
(vi) 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.

[FRT-'22; HY-'23]

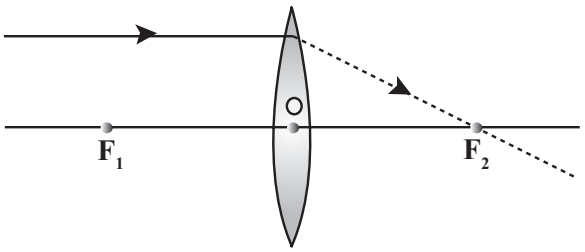
Ans. When an object is placed in front of a lens, the light rays from the object fall on the lens.

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.



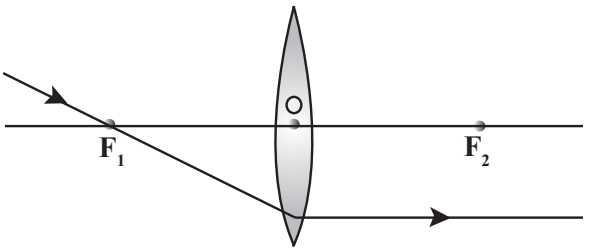
Rays passing through the optical centre

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 passes 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 focus

Ans. When the source is moving away from the stationary listener, the expression for the apparent frequency is

$$n' = \left(\frac{v}{v+v_s}\right)\cdot n$$

$$\frac{n}{2} = \left(\frac{v}{v+v_s}\right)\cdot n$$

$$v_s = v$$

5. Why does sound propagate faster on a rainy season than on summer season?

(* Part of 4 Marks) *[PTA-6]*

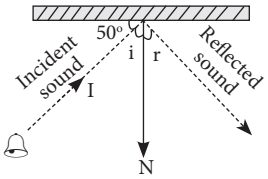
Ans. Effect of relative humidity:

(i) Humidity increases, the speed of sound increases.

(ii) That is why we can hear sound from long distances clearly during rainy seasons.

4 MARKS

1. From the given figure, calculate angle of reflection of sound. *[PTA-4]*



Ans. Angle of incidence ∠i = ∠90° – ∠50°

∠i = 40°

According to laws of reflection,

Angle of incidence ∠i = Angle of reflection ∠r

∠i = 40°

∠r = 40°

Angle of reflection = 40°

GOVERNMENT EXAM QUESTIONS & ANSWERS

1 MARK

1. Sound waves travel in air with a speed of about _____ at NTP. *[Sep-2021]*

(a) 340×10^8 m/s (b) 340 m/s

(c) 3×10^8 m/s (d) 3×10^{-8} m/s

[Ans. (b) 340 m/s]

2 MARKS

1. What do you understand by the term 'Untrasonic waves'? *[GMQP-2019; Sep-2020]*

Ans. Ultrasonic waves :

(i) Sound wave with frequency greater than 20 kHz.

(ii) Human ear cannot detect these waves.

(iii) Certain creatures like mosquito, dogs, bats, dolphins can detect these waves.

(iv) E.g.: waves produced by bats.

4 MARKS

1. Write the applications of using echo. *[May-'22]*

Ans. (i) Some animals communicate with each other over long distances and also locate objects by sending sound signals and receiving the echo as reflected from targets.

(ii) Echo is used in obstetric ultrasonography, to create real-time visual images of the developing embryo or fetus in the mother's uterus.

(iii) It's a safe testing tool, does not use any harmful radiations.

(iv) It is used to determine the velocity of sound waves in any medium.

7 MARKS

1. A source of sound is moving with a velocity of 50 ms^{-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 ms^{-1}). *[GMQP-2019]*

Solution

When the source is moving towards the stationary listener, the expression for apparent frequency is

$$n' = \left(\frac{v}{v-v_s}\right)n;$$

$$1000 = \left(\frac{330}{330-50}\right)n$$

$$n = \left(\frac{1000\times 280}{330}\right)$$

$$n = 848.48 \text{ Hz.}$$

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

$$n' = \left(\frac{v}{v+v_s}\right)n$$

$$= \left(\frac{330}{330+50}\right) \times 848.48 = 736.84 \text{ Hz.}$$

ADDITIONAL QUESTIONS & ANSWERS

CHOOSE THE CORRECT ANSWER — 1 MARK

1. Which statement is true?

(a) Sound waves can propagate as longitudinal or transverse depending on the transmitting medium.
(b) Sound waves are transverse and they propagate perpendicular to the transmitting medium.
(c) Sound waves are longitudinal waves and they propagate parallel to the transmitting medium.
(d) Sound waves can propagate as longitudinal or transverse depending on the temperature.

[Ans. (c) Sound waves are longitudinal waves and they propagate parallel to the transmitting medium.]

2. The velocity of sound in gases is affected by _____.

(a) temperature (b) density
(c) relative humidity
(d) all the above **[Ans. (d) all the above]**

3. A sound wave passes through gold rod and comes into the surrounding air. What is the relation between original wavelength λ and new wavelength λ' ?

(a) $\lambda = \lambda'$ (b) $\lambda > \lambda'$
(c) $\lambda < \lambda'$ (b) None of the above

[Ans. (b) $\lambda > \lambda'$]

4. At what velocity should a source of sound move towards a listener so that apparent frequency is twice the actual frequency?

(a) 165 m/s (b) 330 m/s
(c) 660 m/s (d) 110 m/s

[Ans. (a) 165 m/s]

5. The region of a sound wave having low pressure is _____.

(a) interference (b) refraction
(c) rarefaction (d) compression

[Ans. (c) rarefaction]

6. A car playing music at a frequency of 250 Hz moves at 20 m/s towards an observer that has frequency. What frequency the observer can hear when (i) it approaches and (ii) when it passes by?

(a) approaching : $250 \times \left(\frac{v+20}{v}\right)$;
leaving : $250 \times \left(\frac{v-20}{v}\right)$

(b) approaching : $250 \times \left(\frac{v}{v+20}\right)$;
leaving : $250 \times \left(\frac{v}{v-20}\right)$

(c) approaching : $250 \times \left(\frac{v-20}{v}\right)$;
leaving : $250 \times \left(\frac{v+20}{v}\right)$

(d) approaching : $250 \times \left(\frac{v}{v-20}\right)$;
leaving : $250 \times \left(\frac{v}{v+20}\right)$

[Ans. (d) approaching : $250 \times \left(\frac{v}{v-20}\right)$; leaving : $250 \times \left(\frac{v}{v+20}\right)$]

7. Ultrasound waves compared to audible sound waves have _____.

(a) Lower frequency and Shorter wavelength
(b) Lower frequency and longer wavelength
(c) higher frequency and longer wavelength
(d) higher frequency and shorter wavelength.

[Ans. (d) higher frequency and shorter wavelength]

8. The speed of sound in air is 300 m/s. What is the frequency as heard by the human ear?

(a) 0.001 Hz (b) 1 Hz
(c) 10,000 Hz (d) 1,00,000 Hz

[Ans. (c) 10,000Hz]

9. **Distance between two consecutive compressions is _____.**
(a) λ (b) λ/2
(c) λ/4 (d) 2λ [Ans. (a) λ]

10. **Earthquake produces _____.**
(a) Ultrasound (b) Infrasound
(c) audible sound (d) none
[Ans. (b) Infrasound]

11. **Infrasound can be heard or produced by _____.**
(a) dog (b) bat
(c) rhinoceros (d) human beings
[Ans. (c) rhinoceros]

12. **Before playing guitar, guitarist adjust the tension and pluck the string. By doing so, he is adjusting _____.**
(a) intensity of sound only
(b) amplitude (c) frequency
(d) loudness of sound [Ans. (c) frequency]

13. **The pitch of sound depends on _____.**
(a) frequency (b) amplitude
(c) both (d) none
[Ans. (a) frequency]

14. **Sound waves in air are _____ .**
(a) Transverse (b) longitudinal
(c) both a & b (d) none
[Ans. (b) longitudinal]

15. **Sound can travel in _____.**
(a) air
(b) any material medium
(c) vacuum
(d) none [Ans. (b) any material medium]

16. **The region of increased pressure in a wave is called _____.**
(a) crest (b) through
(c) compression (d) particle
[Ans. (c) compression]

17. **Which voice is likely to have minute frequency?**
(a) baby girl (b) boy
(c) A man (d) A woman
[Ans. (c) A man]

18. **What is the frequency range of audible sound?**
(a) 20 Hz to 20 kHz (b) 1.5 Hz to 20 kHz
(c) 10 Hz to 15 kHz (d) 20 Hz to 25 kHz
[Ans. (a) 20 Hz to 20 kHz]

19. **How long sound persists in our ears?**
(a) $\frac{1}{10}$ of a second (b) $\frac{1}{9}$ s
(c) $\frac{1}{8}$ s (d) $\frac{1}{7}$ s
[Ans. (a) $\frac{1}{10}$ of a second]

20. **Sound travels with a speed of 330 ms^{-1}. What is the wavelength of sound whose frequency is 550 Hz?**
(a) 0.6 m (b) 0.7 m
(c) 0.4 m (d) 0.2 m [Ans. (a) 0.6 m]

21. **Sound travels with a velocity of _____ in dry air**
(a) 332 ms^{-1} (b) 330 ms^{-1}
(c) 331 ms^{-1} (d) 336 ms^{-1}
[Ans. (a) 332 ms^{-1}]

22. **Dogs can receive sound upto _____ kHz.**
(a) 20 (b) 25
(c) 10 (d) 15 [Ans. (b) 25]

23. **Sound propagates maximum in _____.**
(a) gas (b) liquid
(c) solid (d) all [Ans. (c) solid]

24. **Loudness of sound varies directly with vibrating body's _____.**
(a) intensity (b) amplitude
(c) pitch (d) quality
[Ans. (b) amplitude]

25. **Sound energy passing per second through a unit area held perpendicular is called _____.**
(a) intensity (b) frequency
(c) amplitude (d) quality
[Ans. (a) intensity]

26. **Bats deflect from the obstacles in their path by receiving the reflected _____ waves.**
(a) radio (b) ultrasonic
(c) electromagnetic (d) infrasonic
[Ans. (b) ultrasonic]

27. **When sound travels through air, the air particles _____.**
(a) do not vibrate
(b) vibrate but not in any fixed direction
(c) vibrate perpendicular to the direction of wave propagation
(d) vibrate along the direction of wave propagation
[Ans. (d) vibrate along the direction of wave propagation]

28. Sound waves do not travel through _____.
(a) vacuum (b) solid
(c) liquid (d) gases
[Ans. (a) vacuum]

29. The speed of sound in a medium depends upon _____.
(a) frequency (b) amplitude
(c) wavelength
(d) properties of the medium
[Ans. (d) properties of the medium]

30. A source emits a frequency of 1 kHz is moving toward a rest listener with a speed of 0.9 V, where V is the speed of sound wave. The frequency heard by the listener is _____
(a) 10 Hz (b) 0.1 Hz
(c) 100 Hz (d) 10 kHz
[Ans. (d) 10 kHz]

Note: $\left(\frac{v}{v-0.9v}\right)\times 1 = \left(\frac{v}{v-0.9v}\right)\times 1$

$= \frac{1}{0.1}\times 1 =$ **10 kHz**

Fill in the blanks

1. A wave motion is a transfer of _____.
[Ans. energy]

2. For propagation of sound wave, the medium must possess _____ . **[Ans. volume elasticity]**

3. Speed of sound in solid is _____ than liquid.
[Ans. greater]

4. In a region of compression there is _____ in volume. **[Ans. decrease]**

5. Velocity of sound in air _____ by _____ for every _____. **[Ans. increases, 0.61 m/s, 1° C rise in temperature]**

6. To hear a distinct echo, each time interval below the original sound and the reflected sound must be _____ **[Ans. 0.1 s]**

7. Speed of sound depends upon _____ of the medium. **[Ans. temperature]**

8. Loud sound can travel a larger distance due to _____ **[Ans. high energy]**

9. High and low pressure regions of longitudinal wave is called _____ and _____.
[Ans. compression and rarefaction]

10. The frequency of sound wave whose time period is 0.02 second is _____ **[Ans.** $n = \frac{1}{T} = 50Hz$**]**

Hint: $n = \frac{1}{T} = \frac{1}{0.02} = 50$ Hz

11. Sound is a form of _____ and produced by _____. **[Ans. energy, vibrating bodies]**

12. Energy of the sound wave is proportional to _____. **[Ans. square of the amplitude]**

13. Distance below two consecutive compression is called _____. **[Ans. wavelength]**

14. Number of vibrations produced in one second is _____ of the wave. **[Ans. frequency]**

15. SI unit of frequency is _____. **[Ans. hertz]**

16. Velocity of sound is _____ in solids.
[Ans. maximum]

17. For louder sound ____ will be greater.
[Ans. intensity]

18. To differentiate two sounds is called _____.
[Ans. quality]

19. The speed of sound is inversely proportional to _____. **[Ans. square root of density]**

20. When humidity increases, the speed of sound _____. **[Ans. increases]**

21. Reflection of sound is called _____. **[Ans. echo]**

22. Pitch depends upon _____ of a wave.
[Ans. frequency]

23. _____ surfaces are used to focus the sound at particular point. **[Ans. Parabolic]**

24. Elliptical surfaces are used in designing _____.
[Ans. whispering halls]

25. The minute distance required to hear an echo is _____ magnitude of the velocity of sound in air. **[Ans. 1/20th part]**

26. To determine the velocity of sound in any medium _____ is used **[Ans. echo]**

27. When source and listener move towards each other the apparent frequency is _____ than actual frequency. **[Ans. more]**

28. When distance between source and listener decreases apparent frequency become _____ than the actual frequency. **[Ans. more]**

29. The average speed of sound wave in sea water is _____. **[Ans. 1533 ms^{-1}]**

30. The loudness of normal human voice is _____
[Ans. 60 dB]

31. The minimum distance required to hear an echo is 1/20th part of the magnitude of velocity of sound in air, if the velocity of sound is _____ then the minimum distance required to hear an echo is 17.2 m. [Ans. 344 ms^{-1}]
32. The velocity of sound increases when the _____ of the material increases. [Ans. elasticity]
33. The speed of sound is inversely proportional to the square root of the _____. [Ans. density]
34. The _____ of sound in a gas increases with the increase in temperature. [Ans. velocity]
35. The velocity of sound changes by _____ when the temperature changes by 1°C. [Ans. 0.61 ms^{-1}]
36. The angle of incidence is equal to the angle of _____. [Ans. reflection]
37. The _____ and refraction of sound is similar to the reflection of light. [Ans. reflection]
38. Sound waves that travel towards the reflecting surface are called the _____ waves. [Ans. incident]
39. The point of incidence and the point of reflection is the _____ on the reflection surface. [Ans. same point]
40. A perpendicular line drawn at the point of incidence is called the _____. [Ans. normal]
41. In ear trumpet, the sound enters into the _____ with more intensity. [Ans. ear drum]
42. The apparent change in frequency first observed and explained by ___. [Ans. Christian Doppler]
43. An _____ is emitted by a source attached to a police car. [Ans. Electromagnetic wave]
44. _____ is the frequency of the sound as heard by the listener. [Ans. Apparent frequency]
45. The product of the time period of a wave and its frequency is _____. [Ans. unity]
46. In ordinary talk, amplitude of vibration is approximately _____. [Ans. 10.9 meters]
47. If the time period of a wave increases then its frequency will _____. [Ans. decrease]
48. In a whispering hall, the speech of a person standing in one focus can be heard clearly by a _____ standing at the other focus. [Ans. listener]
49. The angle which the incident sound wave makes with the normal is called the _____. [Ans. angle of incidence]
50. A compression travelling towards the rigid wall is reflected back as a _____. [Ans. compression]
51. The angle which the reflected wave makes with the normal is called the _____. [Ans. angle of reflection]
52. Rarefaction travels from _____ to _____. [Ans. right, left]
53. Sound waves requires a _____ for propagation. [Ans. medium]
54. The wavelength of sound waves ranges from _____ . [Ans. 1.65 cm to 1.65 m]
55. The wavelength of light waves ranges from _____ . [Ans. 4×10^{-7} m to 7×10^{-7} m]
56. Two types of velocity are _____ velocity and _____ velocity. [Ans. particle, wave]
57. SI unit of velocity is _____. [Ans. ms^{-1}]
58. The distance travelled by a sound wave in _____ is called the velocity of the sound wave. [Ans. unit time]
59. The speed of sound is directly proportional to the square root of the _____. [Ans. elastic modulus]
60. Velocity of sound in solids decreases as the _____ increases. [Ans. density]
61. When sound is reflected from a convex surface, the reflected waves are _____ out and the intensity is decreased. [Ans. diverged]
62. When sound is reflected from a concave surface, the reflected waves are _____ and focused at a point. [Ans. converged]
63. Many halls are designed with _____ reflecting surfaces to required to focus the sound at a particular point. [Ans. parabolic]
64. In _____ surfaces, sound from one focus will always be reflected to the other focus, no matter where it strikes the wall. [Ans. elliptical]
65. The persistence of hearing for human ears is _____. [Ans. 0.1 second]
66. The minimum time interval between the two sound is _____. [Ans. 0.1 s]
67. The minimum distance required to hear an echo is _____ part of the magnitude of the velocity of sound in air. [Ans. 1/20th]
68. The principle of echo is used in _____ ultrasonography. [Ans. obstetric]
69. Echo is used to determine the _____ of sound waves in any medium. [Ans. velocity]
70. _____ are basically curved surfaces which are used in auditoria and halls to improve the quality of sound. [Ans. Sound boards]
71. _____ is a hearing aid used by people, who have difficulty in hearing. [Ans. Ear trumpet]

72. A _____ is a horn-shaped device used to address a small gathering of people. [Ans. megaphone]

73. The frequency of radio waves emitted by a satellite decreases as the satellite passes away from the_____. [Ans. Earth]

74. From the frequency change, the speed and location of the aeroplanes and aircrafts are tracked by _____. [Ans. RADAR]

75. The speed of marine animals and submarines can be determined by using _____. [Ans. SONAR]

76. _____ is a branch of physics that deals with production, transmission, reception, control and effects of sound. [Ans. Acoustics]

77. The vibrating bodies produce energy in the form of waves are _____. [Ans. sound waves]

78. Sound is produced by _____ by different bodies. [Ans. vibration]

79. Sound can propagate through _____ medium. [Ans. a solid or liquid or gas]

80. The distance travelled by one wave is taken as _____. [Ans. one wavelength]

81. The velocity of sound is _____ in gaseous medium. [Ans. least]

82. As the density increases, the velocity of sound _____. [Ans. decreases]

83. Velocity of sound in solids decreases as the _____ increases. [Ans. density]

84. The bouncing of sound waves from the interface between two media is termed as _____. [Ans. reflection of sound]

85. The waves that strike the interface are termed as _____. [Ans. incident wave]

STATE WHETHER THE FOLLOWING STATEMENTS ARE TRUE OR FALSE. CORRECT THE STATEMENT IF IT IS FALSE

1. **Sound can propagate through gaseous medium only.**

Ans. False.

Correct Statement : Sound can propagate through all medium i.e solid, liquid and gaseous medium.

2. **The maximum displacement of a vibrating particle in a medium is called wavelength.**

Ans. False.

Correct Statement : The maximum displacement of a vibrating particle in a medium is called amplitude.

3. **Pitch of sound depends on the frequency of the wave.**

Ans. True.

4. **Velocity of sound decreases with the increase in density of gas.**

Ans. True.

5. **Time in which a wave moves a distance equal to wavelength is frequency of sound wave.**

Ans. False.

Correct Statement : Time in which a wave moves a distance equal to wavelength is time period of sound wave.

6. **Sound travels faster in air than solid.**

Ans. False.

Correct Statement : Sound travels slower in air than solid.

7. **Velocity of sound in a gas is directly proportional to square root of temperature.**

Ans. True.

8. **Sound from long distance cannot be heard clearly during rainy reasons.**

Ans. False.

Correct Statement: Sound from long distance can be heard clearly during rainy reasons.

9. **Sound is a form of energy**

Ans. True.

10. **The particles of the medium move from one part to another part during propagation.**

Ans. False.

Correct Statement : The energy of the medium move from one part to another part during propagation

11. **Sound requires a material medium for its propagation.**

Ans. True.

12. **Compressions are region of lowest pressure.**

Ans. False.

Correct Statement : Compressions are region of highest pressure.

13. **The amount of energy passing per second through unit area is called intensity of sound.**

Ans. True.

14. **SI unit of wavelength is cm**

Ans. False.

Correct Statement : SI unit of wavelength is m.

15. The sound of less than 20 Hz is called ultrasound.

Ans. False.

Correct Statement : The sound of less than 20 Hz is called infrasound.

16. Sound waves follow the same laws of reflection as light.

Ans. True.

17. The range of hearing in humans is from 20 Hz to 2000 Hz.

Ans. False.

Correct Statement : The range of hearing in humans is from 20 Hz to 20,000 Hz.

18. Repetition of sound due to reflection of original sound from a surface is called echo.

Ans. True.

19. The sensation of sound persists in all brains for about 1 second.

Ans. False.

Correct Statement : The sensation of sound persists in all brains for about 0.1 second.

20. The higher the frequency of sound, the lower is its pitch.

Ans. False.

Correct Statement : The higher the frequency of sound, the higher is its pitch.

21. The number of oscillations per unit time is called frequency of the wave.

Ans. True.

22. Infra sound is produced during earthquake.

Ans. True.

23. Sound waves in air are longitudinal in nature.

Ans. True.

24. The speed of sound in air at 22°c is 344 m/s.

Ans. True.

25. To hear a distinct echo, the minute distance below source of rigid surface should be 27 m.

Ans. False.

Correct Statement : To hear a distinct echo, the minute distance below source of rigid surface should be 17.2 m

26. The speed of sound in air increases with decrease in temperature.

Ans. False.

Correct Statement : The speed of sound in air increases with increase in temperature

27. The speed of sound in air at 0°c is 331 ms^{-1}.

Ans. True.

28. The pitch of the wave is directly proportional to the frequency.

Ans. True.

MATCH THE FOLLOWING

I

1.	Pitch	(a)	intensity
2.	loudness	(b)	frequency
3.	quality	(c)	distance
4.	Intensity	(d)	shape of wave form
5.	Wavelength	(e)	*d*B

[Ans. 1-b, 2-a, 3-d, 4-e, 5-c]

II

1.	Velocity of sound increases	(a)	i = r
2.	Law of reflection	(b)	0.1 s
3.	Persistence of hearing for human	(c)	0.61 ms^{-1}
4.	Change in velocity of sound for 1°c	(d)	elastic modulus
5.	Acoustic impedance	(e)	density × speed

[Ans. 1-d, 2-a, 3-b, 4-c, 5-e]

III

1.	Reflection of sound from concave surface	(a)	principle of echo
2.	Reflection of sound from convex surface	(b)	Intensity decreases
3.	Whispering gallery	(c)	17.2 m
4.	Minimum, distance to hear echo	(d)	multiple reflections
5.	Obstetric ultrasonography	(e)	intensity increases

[Ans. 1-e, 2-b, 3-d, 4-c, 5-a]

IV

1.	Sound board	(a)	detect objects in ocean
2.	Mega phone	(b)	auditorium and halls
3.	Ear trumpet	(c)	horn shaped device
4.	Stethoscope	(d)	hearing aid
5.	SONAR	(e)	hear sounds from internal organs

[Ans. 1-b, 2-c, 3-d, 4-e, 5-a]

V

1.	Reflection of sound	(a)	sound of high pitch
2.	Shriller sound	(b)	echo
3.	120 dB	(c)	Doppler Effect
4.	Apparent change in frequency	(d)	noise

[Ans. 1-b, 2-a, 3-d, 4-c]

VI

1.	Acoustician	(a)	designs SONAR hardware
2.	Bio - acoustician	(b)	Diagnoses hearing impairments
3.	Audiologist	(c)	designs concert halls
4.	Architectural acoustician	(d)	Analyses bird & animal populations
5.	Under water acoustician	(e)	Designs transducers

[Ans. 1-e, 2-d, 3-b, 4-c, 5-a]

VII

(a)	Elliptical surface	-	(1)	Whispering halls
(b)	Audible waves	-	(2)	Doppler effect
(c)	Ocean waves	-	(3)	reflection
(d)	Sound board	-	(4)	Stretched strings
(e)	RADAR	-	(5)	Infrasonic

[Ans. a-4, b-1, c-5, d-2, e-3]

VIII

(a)	Infrasonic	-	(1)	17.2 m
(b)	Ultrasonic	-	(2)	location of aeroplanes
(c)	Satellite	-	(3)	Bats
(d)	Echo	-	(4)	radio waves
(e)	RADAR	-	(5)	Whale

[Ans. a-5, b-3, c-4, d-1, e-2]

IX

(a)	Automobile	-	(1)	2d/t
(b)	Law of reflection	-	(2)	doppler effect
(c)	Speed of sound	-	(3)	whispering gallery
(d)	St. Paul's cathedral	-	(4)	Acoustics
(e)	Production of sound	-	(5)	<i = <r

[Ans. a-2, b-5, c-1, d-3, e-4]

X

(a)	Megaphone	-	(1)	Hearing aid
(b)	Ear trumpet	-	(2)	3×10^8 ms^{-1}
(c)	Sound Boards	-	(3)	Small gathering
(d)	Speed of light	-	(4)	340 ms^{-1} at NTP
(e)	Speed of sound	-	(5)	Auditoria

[Ans. a-3, b-1, c-5, d-2, e-4]

Assertion and Reason

(a) Both assertion and reason are true and reason is the 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) Assertion is false but reason is true.

1. **Assertion:** Sound wave propagate fastest in solids.
Reason: Sound wave can propagate slightly in vacuum.
[Ans. (c) Assertion is true but reason is false]

2. **Assertion:** Ocean waves hitting a beach are transverse waves.
Reason: Ocean waves hitting a beach are assumed to be plane wave.
[Ans. (a) Both assertion and reason are true and reason is the correct explanation of assertion]

3. **Assertion:** Velocity of sound is maximum in solids than liquid and gases.
Reason: Gases are least elastic in nature.
[Ans. (a) Both assertion and reason are true and reason is the correct explanation of assertion]

4. **Assertion:** Human ear can defect infrasonic waves.
Reason: Infrasonic waves have frequency greater than 20 Hz.
[Ans. (d) Assertion is false but reason is true]

5. **Assertion:** Pitch distinguishes a sharp from dull sound.
Reason: A female voice is shrill and male voice is grave.
[Ans. (b) Both assertion and reason are true but reason is not the correct explanation of assertion]

6. **Assertion:** Distinguishing the loud sound from faint sound is called loudness.
Reason: Loudness of normal human voice is 100 dB.
[Ans. (c) Assertion is true but reason is false]

TEXTBOOK EVALUATION

I. CHOOSE THE CORRECT 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 _____ *[May-'22]*
(a) 2 (b) 3
(c) 4 (d) 5 **[Ans. (a) 2]**

3. Which of the following is the universal solvent? *[April & QY-'23; FRT-'24]*
(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. *[Sep-2020]*
(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? _____. *[HY-'23]*
(a) 12g (b) 11g
(c) 16g (d) 20g **[Ans. (b) 11g]**

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 _____ *[PTA-5]*
(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? *[July-'23]*
(a) ferric chloride
(b) copper sulphate penta hydrate
(c) silica gel (d) none of the above
[Ans. (c) silica gel]

II. FILL IN THE BLANKS :

1. The component present in lesser amount, in a solution is called _____ *[GMQP-2019]*
[Ans. Solute]

2. Example for liquid in solid type solution is_____
[Ans. Mercury with sodium (amalgam)]

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 percentage decreases with increases in temperature because _____
[Ans. of expansion of liquids]

III. MATCH THE FOLLOWING :

1.	Blue vitriol	-	$CaSO_4.2H_2O$
2.	Gypsum	-	CaO
3.	Deliquescence	-	$CuSO_4.5H_2O$
4.	Hygroscopic	-	NaOH

Ans. *[QY-2019]*

1.	Blue vitriol	-	$CuSO_4.5H_2O$
2.	Gypsum	-	$CaSO_4.2H_2O$
3.	Deliquescence	-	NaOH
4.	Hygroscopic	-	CaO

IV. TRUE OR FALSE: (IF FALSE GIVE THE CORRECT STATEMENT)

1. Solutions which contain three components are called binary solution.
Ans. False.
Correct statement: Solutions which contain three components are called **Ternary** solution.

2. In a solution the component which is present in lesser amount is called solvent. *[PTA-4]*

Ans. **False.**

Correct statement: In a solution of the component which is present in lesser amount is called **solute**.

3. Sodium chloride dissolved in water forms a non-aqueous solution. *[PTA-4]*

Ans. **False.**

Correct statement: Sodium chloride dissolved in water forms an aqueous solution.

4. The molecular formula of green vitriol is Mg $SO_4.7H_2O$. ⊗

Ans. **False.**

Correct statement : The molecular formula of **green vitriol** is $FeSO_4.7H_2O$. The molecular formula of **Epsom salt** is Mg $SO_4.7H_2O$.

5. When Silica gel is kept open, it absorbs moisture from the air, because it is hygroscopic in nature.

Ans. **True.** *[PTA-4]*

V. SHORT ANSWER :

1. Define the term: Solution. ⊗

Ans. A solution is a homogeneous mixture of two or more substances. (E.g) Sea water.

2. What is mean by binary solution? *[Qy-2019]*

Ans. Solutions which are made of one solute and one solvent (two components) are called **binary solutions**.

3. Give an example each

i) **gas in liquid** *[PTA-1]*
ii) **solid in liquid** *[PTA-1]*
iii) **solid in solid**
iv) **gas in gas**

Ans. (i) Gas in Liquid - carbon-di-oxide dissolved in water (Soda water).
(ii) Solid in Liquid - Sodium chloride dissolved in water.
(iii) Solid in Solid - Copper dissolved in gold (Alloys)
(iv) Gas in Gas-Mixture of Helium-Oxygen gases.

4. What is aqueous and non-aqueous solution? Give an example. ⊗

Ans. (i) **Aqueous solution:** The solution in which water acts as a solvent.
E.g. Common salt in water, Sugar in water, Copper sulphate in water etc.
(ii) **Non – Aqueous solution:** The solution in which any liquid, other than water acts as a solvent.
E.g: Sulphur dissolved in carbon disulphide.

5. Define Volume percentage. ⊗

Ans. Volume percentage is defined as the percentage by volume of solute (in ml) present in the given volume of the solution.

$$\text{Volume Percentage} = \frac{\text{Volume of the solute}}{\text{Volume of the solution}} \times 100$$

6. The aquatic animals live more in cold region Why? *[PTA-5]*

Ans. Aquatic animals live more in cold regions because, more amount of dissolved oxygen is present in the water of cold regions. This shows that the solubility of oxygen is more in water at low temperature.

7. Define Hydrated salt. ⊗

Ans. The ionic substances crystallize out from their saturated aqueous solution with a definite number of molecules of water. The number of water molecules found in the crystalline substance is called water of crystallization. Such salts are called hydrated salts.

8. A hot saturated solution of copper sulphate forms crystals as it cools. Why?

Ans. As the solution cools, the water molecules move closer together again and there is less room for the solution to hold onto as much of the dissolved solid. So copper sulphate crystallises as the solid is cooled.

9. Classify the following substances into deliquescent, hygroscopic.
Conc. Sulphuric acid, Copper sulphate penta hydrate, Silica gel, Calcium chloride and Gypsum salt. *[Aug.-'22]*

Ans.

Deliquescent	Hygroscopic
Calcium chloride, Copper sulphate, pentahydrate and gypsum salts	Silica gel, Conc. Sulphuric acid

VI. LONG ANSWER :

1. Write notes on *[July-'23]*

i) **saturated solution**
ii) **unsaturated solution**

Ans. (i) **Saturated solution :** A solution in which no more solute can be dissolved in a definite amount of the solvent at a given temperature.
E.g. 36 g of sodium chloride in 100g of water at 25° C forms saturated solution.

14. By active transport _____ moves into the cells where it is utilised or stored.
(a) glucose (b) sucrose
(c) fructose (d) water
[Ans. (b) sucrose]

15. Water from soil enters the root hairs due to _____.
(a) capillary Action (b) cohesion
(c) adhesion (d) osmosis
[Ans. (d) osmosis]

16. _____ is the main circulatory medium in the human body.
(a) Blood (b) Water
(c) Lymph (d) Plasma
[Ans. (a) Blood]

17. Plasma is slightly alkaline, containing non-cellular substances which constitutes about _____ of the blood.
(a) 55% (b) 44%
(c) 35% (d) 50%
[Ans. (a) 55%]

18. Life span of RBC is about _____.
(a) 100 days (b) 200 days
(c) 150 days (d) 120 days
[Ans. (d) 120 days]

19. The other name of red blood corpuscles is _____.
(a) erythrocytes (b) leucocytes
(c) granulocytes (d) agranulocytes
[Ans. (a) erythrocytes]

20. Normal pulse rate ranges from _____.
(a) 80 - 90 / min (b) 70 - 90 / min
(c) 50 - 60 / min (d) 70 - 80 / min
[Ans. (b) 70 - 90 / min]

Fill in the blanks

1. A mature RBC lacks a _____. **[Ans. nucleus]**
2. 60 - 65% of total leucocytes consists of _____. **[Ans. neutrophils]**
3. _____ among the leucocytes produce antibodies during infection. **[Ans. Lymphocytes]**
4. Among the WBC, _____ release chemicals during the process of inflammation. **[Ans. Basophils]**
5. The body cavity filled with blood is called _____. **[Ans. haemocoel]**
6. Closed circulatory system was discovered by _____. **[Ans. William Harvey]**
7. Heart is made up of _____ muscle. **[Ans. cardiac]**
8. Heart is enclosed in a double walled sac called _____. **[Ans. pericardium]**
9. The atrio ventricular valves are held in position by _____. **[Ans. chordae tendinae]**
10. Bicuspid valve is also known as _____. **[Ans. mitral valve]**
11. Similar to mammals, _____ also have four chambered heart. **[Ans. Aves]**
12. Human heart is ___ in nature. **[Ans. myogenic]**
13. Blood pressure is measured by an instrument called _____. **[Ans. sphygmomanometer]**
14. _____ supplies nutrition and oxygen to those parts where blood cannot reach. **[Ans. Lymph]**
15. Uphill transport refers to _____. **[Ans. active transport]**
16. _____ is a passive process. **[Ans. Diffusion]**
17. Root hairs are extensions of _____. **[Ans. epidermis]**
18. In _____ movement, water occurs through the cytoplasm of cells. **[Ans. symplastic]**
19. Stoma is open when guard cells are _____. **[Ans. turgid]**
20. Stoma remains closed when guard cells are _____. **[Ans. flaccid]**
21. The process of _____ helps to cool the plant. **[Ans. transpiration]**
22. Elements like _____ are not remobilised in the plant. **[Ans. calcium]**
23. Translocation of food is described as ____ movement. **[Ans. bidirectional]**
24. Plants prepare food in the form of _____. **[Ans. glucose]**
25. In translocation, food moves in the form of _____. **[Ans. sucrose]**
26. Guttation occurs through _____. **[Ans. hydathodes]**
27. _____ acts as the 'pacemaker' of the heart. **[Ans. Sino - atrial node]**
28. Atrioventricular bundle was discovered by _____. **[Ans. His]**
29. The expansion of the artery every time the blood is forced into is called _____. **[Ans. pulse]**
30. The sequence of events occurring from the beginning to the completion of one heart beat is called _____. **[Ans. cardiac cycle]**

9. Blood clotting factors produced by biotechnology helps patients suffering from _____
(a) haemophilia (b) homeostasis
(c) cerebral palsy (d) CHD
[Ans. (a) haemophilia]

10. In human beings, _____ of the DNA base sequences are the same and this is called as bulk genomic DNA.
(a) 99% (b) 50%
(c) 90% (d) 70%
[Ans. (a) 99 %]

11. The human genome has _____ base pairs.
(a) 3 billion (b) 3 million
(c) 30 million (d) 30 billion
[Ans. (a) 3 billion]

12. _____ is father of "Indian Green Revolution"
(a) Dr. M. S. Swaminathan
(b) Dr. Norman
(c) Alec Jeffrey (d) Dr. Ian Wilmut
[Ans. (a) Dr. M. S. Swaminathan]

13. _____ is a hybrid of wheat and rye
(a) *Triticale* (b) Raphano brassica
(c) Bananas (d) Water melons
[Ans. (a) *Triticale*]

Fill in the blanks

1. _____ is the Father of Green revolution. **[Ans. Dr. Norman E. Borlaug]**
2. IR-8 is also called _____. **[Ans. Miracle rice]**
3. Green revolution in India was brought about by _____. **[Ans. Dr. M.S. Swaminathan]**
4. Kalyan sona is a variety of _____. **[Ans. wheat]**
5. The allopolyploid Raphano brassica was produced by _____ **[Ans. G.D. Karpechenko]**
6. TV - 29 is a _____ variety of tea. **[Ans. triploid]**
7. _____ is an example of a chemical mutagen. **[Ans. Mustard gas / Nitrous acid]**
8. Sharbati sonora is a mutant got by using _____. **[Ans. gamma rays]**
9. _____ is a rice variety with saline tolerance and pest resistance. **[Ans. Atomita 2 rice]**
10. Atomic garden is also known as _____ . **[Ans. Gamma garden]**
11. _____ is the first man made cereal. **[Ans. Triticale]**
12. Karan Swiss is a cross breed of cow got by crossing brown swiss and _____. **[Ans. Sahiwal]**
13. Hissardale is a breed of sheep developed by _____. **[Ans. inbreeding]**
14. Hybrid vigour is also called ___. **[Ans. heterosis]**
15. Hybrid DNA got by genetic engineering is called _____. **[Ans. rDNA / recombinant DNA]**
16. The extra chromosomal DNA present in a bacteria is called _____ . **[Ans. plasmid]**
17. Restriction enzyme cleaves the _____ bond in DNA. **[Ans. phosphodiester]**
18. A genetically exact copy of an organism is called _____. **[Ans. clone]**
19. Dolly was the first cloned female sheep, developed by _____. **[Ans. Dr. Ian Wilmut]**
20. Plasmid acts as a _____ in recombinant DNA technology. **[Ans. vector]**
21. Golden rice can produce_____. **[Ans. beta carotene]**
22. _____ gene from *Bacillus thuringiensis* produce a protein that is toxic to insects. **[Ans. Bt]**
23. For improved wool quality, transgenic sheep are produced by inserting gene for synthesis of _____ . **[Ans. cysteine]**
24. _____ are undifferentiated mass of cells with variable potency. **[Ans. Stem cells]**
25. _____ is the art of developing economically important plants with superior quality. **[Ans. Plant breeding]**
26. The aim of _____ improvement is to develop improved crop varieties. **[Ans. crop]**
27. _____ introduced Mexican wheat varieties in India. **[Ans. Dr. M.S. Swaminathan]**
28. _____, _____ are semi-dwarf varieties of wheat. **[Ans. Sonalika, Kalyan Sona]**
29. _____ is a high-yielding semi-dwarf rice variety. **[Ans. IR-8]**
30. Protina, Shakti and Rathna are _____ rich maize hybrids . **[Ans. Lysine]**
31. _____ enriched carrots, pumpkin and spinach are results of biofortification. **[Ans. Vitamin A]**
32. _____ is one of the oldest methods of plant breeding. **[Ans. Selection]**
33. Groundnut varieties, the TMV - 2 and AK - 10 are examples of _____ selection. **[Ans. mass]**
34. _____ is the progeny of a single individual obtained by self breeding. **[Ans. Pureline]**

35. _____ is also called as individual plant selection. [Ans. Pureline selection]
36. A group of plants produced from a single plant through vegetative or asexual reproduction are called _____. [Ans. clones]
37. All the plants of a clone are similar both in _____ and _____. [Ans. genotype, phenotype]
38. The _____ cells have only one set of chromosome. [Ans. gametic]
39. Seedless watermelons (3n) and bananas (3n) are got as a result of _____. [Ans. polyploidy]
40. *Raphano brassica* is an allotetraploid got by _____ treatment. [Ans. colchicine]
41. The organism which undergoes mutation is called a _____. [Ans. Mutant]
42. The factors which induce mutations are known as _____ . [Ans. mutagens]
43. Groundnut with thick shells are produced by _____. [Ans. mutation breeding]
44. _____ is the common method of creating genetic variation to get improved varieties. [Ans. Hybridization]
45. A _____ is a group of animals of common origin within a species. [Ans. breed]
46. _____ involves mating parents of different varieties each having some desired trait. [Ans. Breeding]
47. α, β and γ -rays are _____ mutagens. [Ans. physical]
48. _____ in bacteria can undergo replication independently along with chromosomal DNA. [Ans. Plasmid]
49. _____ cuts or break DNA at specific sites. [Ans. Restriction enzymes]
50. _____ are the enzymes which help in ligating the broken DNA fragments. [Ans. DNA ligases]
51. The carbon copy of an individual is called a _____. [Ans. clone]
52. The transfer of rDNA into bacterial host cell is called _____. [Ans. Transformation]
53. _____ are also called as molecular scissors. [Ans. Restriction enzymes]
54. _____ was created by somatic cell transfer technique. [Ans. Dolly]
55. Insulin used in the treatment of diabetes is developed by _____ technique. [Ans. rDNA]
56. Tissue plasminogen activator is used to dissolve_____ to prevent heart attack. [Ans. blood clots]
57. _____ gene therapy is the replacement of defective gene in somatic cells. [Ans. Somatic]
58. _____ gene therapy involves replacement of defective gene in germ cell. [Ans. Germ line]
59. The genetic difference among two individuals can be compared using _____. [Ans. DNA fingerprinting]
60. DNA fingerprinting was developed by _____. [Ans. Alec Jeffrey]
61. _____ stem cells can be extracted and cultured from a early embryo. [Ans. Embryonic]
62. _____ stem cells are derived from the inner cell mass of blastocyst. [Ans. Embryonic]
63. The 1% of DNA sequence is present as small stretch of repeated sequence is known as _____. [Ans. satellite DNA]
64. DNA fingerprinting technique is widely used in _____ applications. [Ans. forensic]
65. Plants or animals expressing a modified endogenous gene are known as _____ organisms. [Ans. transgenic]
66. _____ involves the breeding of animals. [Ans. Animal husbandry]
67. _____ is an exotic plant introduced from China. [Ans. *Phaseolus Mungo*]
68. _____ is a high yielding rice variety from Indonesia. [Ans. Peta]
69. Dee-geo-voo-gen a dwarf variety rice from _____. [Ans. China]
70. _____ was a Tamil agricultural scientist. [Ans. Dr. G. Nammalvar]
71. _____ is the mating of closely related animals within the same breed. [Ans. Inbreeding]
72. *Hissardale* is a new breed of sheep developed by crossing Bikaneri (Magra) ewes and Australian _____ . [Ans. Marino rams]
73. Continued inbreeding reduces _____ and _____. [Ans. fertility, productivity]
74. The superiority of the hybrid obtained by cross breeding is called as _____. [Ans. heterosis]
75. _____ is also called as recombinant DNA technology. [Ans. Genetic engineering]
76. _____ recognises a specific base pair sequence in DNA called as restriction site. [Ans. Restriction enzymes]

MATCH THE FOLLOWING

I

A)	Langdon Down	1)	base pairs
B)	Chargaff	2)	Trisomy
C)	Miracle rice	3)	Sonora -64
D)	Sharbati Sonora	4)	IR -8

	A	B	C	D
(a)	1	2	3	4
(b)	4	3	2	1
(c)	2	1	4	3
(d)	1	3	4	2

[Ans. (c) A- 2, B - 1, C- 4, D - 3]

II

A)	AK-10	1)	Rice
B)	IR-8	2)	Wheat
C)	Triticale	3)	Ground nut
D)	Sahiwal	4)	Cow

[Ans. A - 3, B - 1, C - 2, D - 4]

III

A)	Plasmid	1)	Joining DNA
B)	Restriction enzymes	2)	Recombinant DNA Technology
C)	DNA ligases	3)	Replication
D)	Genetic Engineering	4)	Break DNA

	A	B	C	D
(a)	1	2	3	4
(b)	2	3	4	1
(c)	2	4	3	1
(d)	3	4	1	2

[Ans. (d) A - 3, B - 4, C - 1, D - 2]

IV

A)	X-rays	1)	Paste
B)	Colchicine	2)	Mutagen
C)	Ligase	3)	Alzheimer's disease
D)	Stem cell	4)	Polyploidy

[Ans. A - 2, B - 4, C - 1, D - 3]

STATE WHETHER THE FOLLOWING STATEMENTS ARE TRUE OR FALSE. CORRECT THE FALSE STATEMENT

1. In India Dr. M. S. Swaminathan introduced Mexican wheat varieties.

Ans. True.

2. IR - 8 is a rice variety developed by Indian Agricultural Research Institute.

Ans. False.

Correct Statement : IR-8 is a rice variety developed by **International Rice Research Institute, Philippines.**

3. *Phaseolus mungo* is a exotic species introduced from Mexico.

Ans. False.

Correct Statement : *Phaseolus mungo* is a exotic species introduced from **China.**

4. Colchicine is a mutagenic agent.

Ans. False.

Correct Statement : Colchicine is a chemical agent **used to induce polyploidy.**

5. Triticale is got by hybridization.

Ans. True.

6. Sharbati Sonora is a variety of wheat got by gene cloning.

Ans. False.

Correct Statement : Sharbati Sonora is a variety of wheat got by **mutation breeding**.

7. Continued inbreeding produces stronger individuals.

Ans. False.

Correct Statement : Continued inbreeding **reduces fertility and productivity**.

8. In human beings 1% of DNA sequences differs from one individual to another.

Ans. True.

9. VNTRs are similar in all human beings.

Ans. False.

Correct Statement : VNTRs **differs from one individual to another**.

10. Transgenic fish with increased growth have been produced to increase commercial valve.

Ans. True.

ASSERTION AND REASON

(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:** The progeny of pureline varieties are similar in genotype and phenotype.
Reason: They are raised by self fertilization.
[Ans. (a) Both Assertion and Reason are true and Reason is correct explanation of Assertion]

2. **Assertion:** Continued outbreeding reduces fertility and productivity.
Reason: It helps to eliminate useful genes.
[Ans. (d) Both Assertion and Reason are false]

3. **Assertion (A):** Hybridization is the common method of creating genetic variation.
Reason (R): *Triticale* is the first man made cereal hybrid.
[Ans. (b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion]

4. **Assertion (A):** The organism which undergoes mutation is called a mutant.
Reason (R): It is a common method of creating genetic variation, which brings about changes in the organism.
[Ans. (a) Both Assertion and Reason are true and Reason is correct explanation of Assertion]

Analogy type questions. Identify the first words and their relationship and suggest a suitable word for the fourth blank

1. **DNA finger printing : Alec Jeffrey :: Green revolution : _____ .**
Ans. Dr. Norman E. Borlaug.
2. **Protina : Lysine :: Atlas 66 : _____.**
Ans. Protein.
3. **Cauliflower : Black rot :: Cowpea : _____.**
Ans. Bacterial blight.
4. **Physical mutagens : X-rays :: Chemical mutagens : _____.**
Ans. Nitrous acid.
5. **Differentiated cells : Heart cells :: Undifferentiated cells: _____**
Ans. Stem cells.

Answer in one word

1. **Science dealing with breeding of animals.**
Ans. Animal husbandry.

2. **Initiative taken to increase food production through modern agricultural techniques.**
Ans. Green revolution.

3. **Name the Chinese Dwarf Rice variety.**
Ans. Dee-geo-woo-gen.

4. **Disease resistant variety of wheat.**
Ans. Himgiri.

5. **Disease resistant variety of cowpea.**
Ans. Pusa Komal.

6. **Disease resistant variety of cauliflower.**
Ans. Pusa snowball.

7. **Insect resistant variety of Brassica.**
Ans. Pusa Gaurav.

8. **Name the scientific process of developing crop plant enriched with nutrients.**
Ans. Biofortification.

9. **Plants introduced from other places.**
Ans. Exotic species.

10. **Selection of best plants from a mixed population to raise the next generation.**
Ans. Mass selection.

11. **Group of plants produced from a single plant by vegetative reproduction.**
Ans. Clone.

12. **Name some insect pests that affect plants.**
Ans. Leaf hopper, aphids, shoot and fruit bores.

13. **Sudden heritable change in the nucleotide sequence of DNA.**
Ans. Mutation.

14. **Crop improvement brought about by induced mutations.**
Ans. Mutation breeding.

15. **Process of crossing two or more types of plants.**
Ans. Hybridization.

16. **Give an example of allotetraploid.**
Ans. *Raphano brassica.*

17. **Diseases treated by stem cell therapy.**
Ans. Parkinson's disease and Alzheimer's disease.

18. **Technique by which mule was produced.**
Ans. Cross breeding.

19. **Group of animals of common origin within a species.**
Ans. Breed.

20. Mating of closely related animals.
Ans. Inbreeding.

21. Breeding of unrelated animals
Ans. Outbreeding.

22. Superiority of hybrid over the parents.
Ans. Heterosis / Hybrid vigour.

23. Manipulation of genes leads to productivity of new DNA.
Ans. Recombinant DNA (rDNA).

24. Enzymes called as molecular scissors.
Ans. Restriction enzymes.

25. Enzyme used to join broken DNA fragments.
Ans. DNA ligase.

26. Technique used in creating Dolly.
Ans. Somatic cell nuclear transfer technique.

27. Vector used in rDNA technology .
Ans. Plasmid.

28. Replacement of defective genes by transfer of functional genes.
Ans. Gene Therapy.

29. Another name for adult stem cell.
Ans. Somatic stem cells.

30. Technique based on similarity in DNA base pairs and genetic differences among individuals.
Ans. DNA finger printing.

31. What does VNTRs stands for?
Ans. Variable Number of Tandem Repeat sequences.

32. Genetically modified rice which can prevent vitamin A deficiency.
Ans. Golden rice.

33. Type of gene introduced in Tilapia (Transgenic fish).
Ans. Growth hormone gene.

34. Scientist who developed Dolly.
Ans. Dr. Ian Wilmut.

Answer in a sentence

1. Define plant breeding.
Ans. Plant breeding is the art of developing economically important plants with superior quality.

2. Define a Pureline.
Ans. Pureline is "the progeny of a single individual obtained by self breeding". This is also called as **Individual plant selection**.

3. What is a Clone?
Ans. A group of plants produced from a single plant through vegetative or asexual reproduction are called **Clones.**

4. What is a polyploid?
Ans. An organism having more than two sets of chromosomes is called **polyploid.**

5. What is Colchicine?
Ans. It is a chemical agent which can induce **polyploidy.**

6. What are Mutagens?
Ans. The factors which induce mutations are known as Mutagens or Mutagenic agents.
E.g Nitrous acid.

7. What is Hybrid vigour / Heterosis?
Ans. The superiority of the hybrid obtained by cross breeding is called as **Heterosis** or **Hybrid vigour**.

8. What are DNA ligases?
Ans. DNA ligases are the enzymes which help in ligating (joining) the broken DNA fragments in genetic engineering.

9. What are restriction enzymes or molecular scissors?
Ans. Restriction enzymes cut or break DNA at specific sites and are also called as molecular scissors. They are used in Genetic engineering.

10. Mention the kinds of stem cells.
Ans. (i) Embryonic stem cells
(ii) Adult stem cell / somatic stem cell.

Give reasons for the following statements

1. Why are Lysine rich maize hybrids developed by Biofortification?
Ans. (i) **Reason:** Lysine is an essential amino acid that our body does not produce naturally.
(ii) Consuming more lysine through diet or through supplements may improve our health by helping our body produce collagen, digestive enzymes, antibodies and protein hormones.

2. It is important to develop disease resistant varieties of crops.
Ans. **Reason:** This would increase the yield and reduce the use of fungicides and bactericides.

3. DNA fingerprinting is used for paternity testing.

Ans. **Reason:** DNA paternity testing is the use of DNA biologically parent of the child in the case of a disputes.

VERY SHORT ANSWERS 2 MARKS

1. What is Green Revolution?

Ans. Green Revolution is the process of increasing food production through high yielding crop varieties and modern agricultural techniques in underdeveloped and developing nations.

2. Define inbreeding.

Ans. Inbreeding refers to the mating of closely related animals within the same breed for about 4-6 generations.

3. What is gene therapy?

Ans. Gene therapy refers to the replacement of defective gene by the direct transfer of functional genes into humans to treat genetic disease or disorder.

4. What is a plasmid?

Ans. The small circular double stranded DNA molecule found in the cytoplasm of bacterial cell and separated from chromosomal DNA is called a **plasmid.** It acts as a vector in genetic engineering.

5. Define mutation.

Ans. 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.

6. Name the methods of selection.

Ans. There are three methods of selection. They are

(i) Mass selection
(ii) Pureline selection
(iii) Clonal selection.

7. Mention two characteristics of stem cells.

Ans. The two important properties of stem cells that differentiate them from other cells are:

(i) Its ability to divide and give rise to more stem cells by self-renewal.
(ii) Its ability to give rise to specialised cells with specific functions by the process of differentiation.

8. What is Inbreeding depression?

Ans. Continued inbreeding reduces fertility and productivity. Inbreeding exposes harmful recessive genes that are eliminated by selection.

9. Name the methods of plant breeding to develop high yielding varieties or crop improvment.

Ans. Methods of plant breeding to develop high yielding varieties are given below:

(i) Introduction of new varieties of plants.
(ii) Selection.
(iii) Polyploidy breeding.
(iv) Mutation breeding.
(v) Hybridization.

10. Differentiate Embryonic and Adult stem cells.

Ans.

S. No.	Embryonic stem cells	Adult stem cell / Somatic stem cells
1.	They can be extracted and cultured from early embryos and are derived from inner cell mass of blastocyst.	They are found in the newborn and adults.
2.	They can be developed into any cell in the body.	They have the ability to divide and give rise the specific cell types.

11. What are the applications of Stem cell therapy?

Ans. Stem cell therapy used 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.

SHORT ANSWERS 4 MARKS

1. How was IR-8 variety produced?

Ans. (i) IR-8 (Miracle rice) is a high-yielding semi-dwarf rice variety developed by International Rice Research Institute (IRRI), Philippines.

(ii) It was a hybrid of a high yielding rice variety Peta from Indonesia, and a dwarf variety from China, named Dee-geo-woo-gen (DGWG).

2. List the objective of animals breeding?

Ans. **(i)** Animal breeding aims at improving the genotypes of domesticated animals to increase their yield and improve the desirable qualities to produce **milk, egg** and **meat**.

(ii) The cross between animals of the same breed, it is called **inbreeding.**

(iii) The cross between animals of different breeds is called **out breeding**.

3. What do you know about Green Revolution?

Ans. **(i)** Green Revolution is the process of increasing food production through high yielding crop varieties and modern agricultural techniques in underdeveloped and developing nations.

(ii) Dr. Norman E. Borlaug, an American agronomist the "Father of the Green Revolution", received the Nobel Peace Prize in 1970. In India Dr. M. S. Swaminathan joined with Dr. Borlaug in bringing Green Revolution to India by introducing Mexican wheat varieties.

(iii) This eventually increased wheat and rice production between 1960 and 2000.

LONG ANSWERS — 7 MARKS

1. What is selection. Explain the methods.

Ans. Oldest methods of plant breeding in which individual plants or groups of plants are sorted out from a mixed population based on the morphological characters.

Methods of selection :

There are three methods of selection. They are

1. Mass selection
2. Pure line selection
3. Clonal selection

1. Mass selection :

(i) Seeds of best plants showing desired characters are collected from a mixed population and allowed to raise the second generation. This process is carried out for seven or eight generations.

(ii) At the end, they will be multiplied and distributed to the farmers for cultivation.

(iii) Eg: Groundnut varieties like TMV–2 and AK–10.

2. Pureline selection :

(i) Pureline is "the progeny of a single individual obtained by self breeding", also called as individual plant selection.

(ii) In pureline selection, large numbers of plants are selected from a self-pollinated crop and harvested individually.

(iii) Individual plant progenies from them are evaluated separately.

(iv) The best one is released as a pureline variety.

(v) Progeny is similar both genotypically and phenotypically.

3. Clonal selection :

(i) A group of plants produced from a single plant through vegetative or asexual reproduction are called clones.

(ii) All the plants of a clone are similar both in genotype and phenotype.

(iii) Selection of desirable clones from the mixed population of vegetatively propagated crop is called clonal selection.

2. Write a note on Triticale.

Ans. **(i)** Triticale is the first man - made cereal hybrid.

(ii) It is obtained by crossing wheat (*Triticum durum*, $2n = 28$) and rye (*Secale cereal*, $2n = 14$). The F1 hybrid is sterile ($2n = 21$).

(iii) Then the chromosome number is doubled using colchicine and it becomes a hexaploid *Triticale* ($2n = 42$).

(iv) The cycle of crop raising and selection continues till the plants with the desired characters are finally obtained. The development of new varieties is a long-drawn process.

(v) Two main aspects of hybridization are to combine the characters of two plants in one plant and to utilize hybrid vigour.

(vi) Triticale has high dietary fiber and protein.

3. Write a essay on polyploidy breeding.

Ans. **(i)** An organism having more than two sets of chromosomes is called **polyploid**. Such condition is called **Polyploidy**.

(ii) It can be induced by physical agents such as heat or cold treatments, X-rays, Chemical agents like colchicine.

Achievements of polyploidy breeding :

(i) Seedless watermelons ($3n$) and bananas ($3n$).

(ii) TV-29 (triploid variety of tea) with larger shoots and drought tolerance

(iii) Triticale ($6n$) is a hybrid of wheat and rye. To make this plant fertile polyploidy is induced. It has higher dietary fibre and protein.

(iv) *Raphano brassica* is a allotetraploid by colchicine treatment.

4. Write a note an DNA fingerprinting Technology.

Ans. (i) DNA finger printing is the easier & quicker method to compare the genetic difference among the two individuals. This technique was developed by Alec Jeffrey.

(ii) The technique analyses each individual's unique DNA sequences and provides distinctive characteristics of individual which helps in identification.

(iii) Variable Number of Tandem Repeat sequences (VNTRs) serve as molecular markers for identification.

(iv) In human beings, 99% of the DNA base sequences are the same and this is called as **bulk genomic DNA**.

(v) The 1% DNA sequence is present as small stretch of repeated sequences which is known as **satellite DNA.**

(vi) The number of copies of the repeat sequence also called as **VNTRs** differs from one individual to another, and results in variation in the size of the DNA segment.

(vii) Satellite DNA bring about variation within the population. Variation in DNA banding pattern reveals differences among the individuals.

5. Why are Genetically modified organisms produced? Explain the purpose and advantages.

Ans. Genetically Modified Organisms :

(i) Genetic modification refers to the alteration or manipulation of genes in the organisms using rDNA techniques in order to produce the desired characteristics.

(ii) The DNA fragment inserted is called **transgene.**

(iii) Plants or animals expressing a modified endogenous gene or a foreign gene are also known as **transgenic organisms.**

Advantages :

(i) The transgenic plants are much stable, with improved nutritional quality, resistant to diseases and tolerant to various environment conditions.

(ii) Similarly transgenic animals are used to produce proteins of medicinal importance at low cost and improve livestock quality.

eg Golden Rice is a genetically modified Rice which can produce Beta carotene.

Higher Order Thinking Skills (HOTS)

1. Mention any situation where you have gone for DNA fingerprinting?

Ans. (i) Obtaining Aadhar cards.

(ii) To obtain Passports.

Value Based Questions

1. Plants seeds got from other countries are tested in plant quarantine. Reason out.

Ans. Plant materials brought into a country must be free from pathogens. It may lead to outbreak of new disease or introduction of a new pathogen into the environment. Thus plant materials (seeds / saplings)are tested in plant quarantine.

2. A farmer has lot of banana trees in his farm. He wishes to go in for selection to improve the crop. Which method can he adopt in banana?

Ans. He can adopt clonal selection since banana reproduces asexually from the underground stem.

Expand the following abbreviations

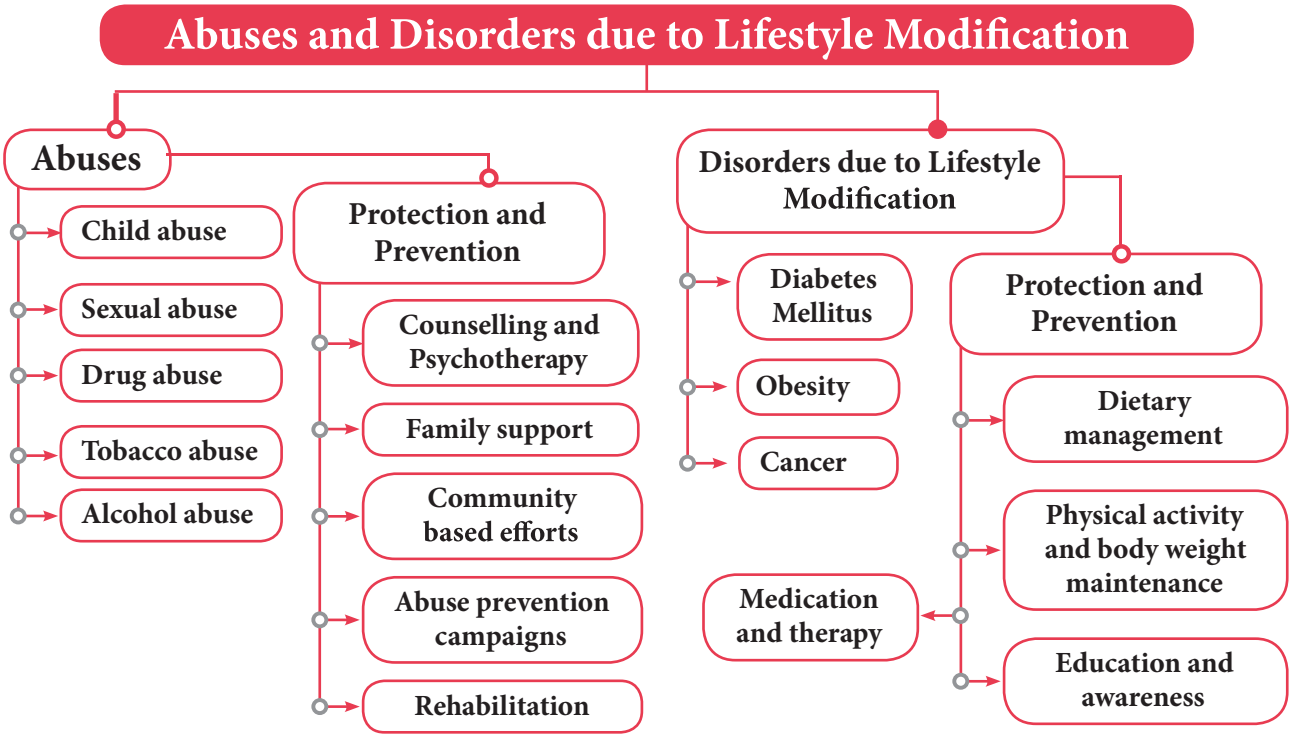
1.	DNA	-	Deoxyribo Nucleic Acid.
2.	DGWG	-	Dee-geo-woo-gen.
3.	IRRI	-	International Rice Research Institute.
4.	DNA	-	Recombinant Deoxyribo Nucleic Acid.
5.	VNTRs	-	Variable Number of Tandem Repeat sequences.
6.	GMOs	-	Genetically Modified Organisms.

☆ ☆ ☆

UNIT

21 HEALTH AND DISEASES

CONCEPT MAP



MUST KNOW DEFINITIONS

Abuse	:	**Abuse** refers to cruel, violent harmful or injurious treatment of another Human being.
Drug Addiction	:	A person who is habituated to a drug due to its prolonged use is called **drug addict**. This is called **drug addiction or drug abuse**.
Emphysema	:	Inflammation of lung alveoli, decrease surface area for gas exchange and cause emphysema.
Metastasis	:	The cancerous cells migrate to distant parts of the body and affect new tissues. This process is called **metastasis**.
Myocardial Infarction	:	Death of a part of heart muscle following stoppage / cessation of blood supply to it.
Psychotropic drugs	:	Drugs act on the brain and alter behaviour, consciousness and power of thinking perception. **(mood altering drugs)**
Hyperglycemia	:	Elevated blood glucose levels.
Insulin	:	Hormone produced by pancreas which controls blood sugar levels.
Oncology	:	Study of cancer.
Carcinogen	:	Cancer causing agent.
Retrovirus	:	Group to which HIV belongs to.
Detoxification	:	The first phase of treatment in drug de-addiction is **detoxification**. The drug is stopped gradually and the addict is helped to overcome the withdrawal symptoms.
Glycosuria	:	Excess glucose exerted in urine.
Obesity	:	Obesity is the state in which there is an accumulation of excess body fat with an abnormal increase in body weight.
Atherosclerosis	:	Narrowing of blood vessels due to deposition of cholesterol.
Chemotherapy	:	Administration of anti cancerous drugs to treat cancer.
Interferons	:	Biological response modifiers used to activate immune system and destroy tumours.

TEXTBOOK EVALUATION

I. CHOOSE THE CORRECT ANSWER :

1. Tobacco consumption is known to stimulate secretion of adrenaline. The component causing this could be ⊗ *[FRT-'24]*

(a) Nicotine (b) Tannic acid
(c) Curcumin (d) Leptin

[Ans. (a) Nicotine]

2. World 'No Tobacco Day' is observed on *[PTA-1; Aug.-'22; July-'23]*

(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) Mutated Cells
(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 *[GMQP-2019; HY-'23]*
(a) Loss of memory
(b) Cirrhosis of liver
(c) State of hallucination
(d) Supression of brain function
[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 *[PTA-6; April-'24]*
(a) Leukemia (b) Sarcoma
(c) Carcinoma (d) Lipoma
[Ans. (c) Carcinoma]

8. Metastasis is associated 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. State whether True or False, if false write the correct statement:

1. AIDS is an epidemic disease.
Ans. False.
Correct Statement : AIDS is an **pandemic** disease.

2. Cancer causing genes are called Oncogenes.
Ans. True.

3. Obesity is characterized by tumour formation.
Ans. False.
Correct Statement : Cancer is characterized by tumour formation.

4. In leukemia both WBCs and RBCs increase in number.
Ans. False.
Correct Statement : In Leukemia **WBC increases** 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 : Type 1 diabetes mellitus results due to Insulin deficiency.

8. Carcinogens are cancer causing agents.
Ans. True.

9. Nicotine is a narcotic drug.
Ans. False.
Correct Statement: Nicotine is not a narcotic drug. It is a addictive drug.

10. Cirrhosis is associated with brain disorder.
Ans. False.
Correct Statement : Cirrhosis is associated with liver disorder.

III. Expand the following abbreviations :

1. IDDM 2. HIV 3. BMI
4. AIDS 5. CHD 6. NIDDM

Ans.
1. **IDDM** - Insulin Dependent Diabetes Mellitus.
2. **HIV** - Human Immunodeficiency Virus.
3. **BMI** - Body Mass Index.
4. **AIDS** - Acquired Immuno Deficiency Syndrome.
5. **CHD** - Coronary Heart Disease.
6. **NIDDM** - Non-Insulin Dependent Diabetes Mellitus.

IV. Match the following : *[April-'23]*

1.	Sarcoma	-	Stomach cancer
2.	Carcinoma	-	Excessive thirst
3.	Polydipsia	-	Excessive hunger
4.	Polyphagia	-	Lack of blood flow to heart muscle
5.	Myocardial Infarction	-	Connective tissue cancer

Ans.

1.	Sarcoma	-	Connective tissue cancer
2.	Carcinoma	-	Stomach cancer
3.	Polydipsia	-	Excessive thirst
4.	Polyphagia	-	Excessive hunger
5.	Myocardial Infarction	-	Lack of blood flow to heart muscle

V. 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 _____. ⊗ *[PTA-4]* **[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. Analogy type questions. Identify the first words and their relationship and suggest a suitable word for the fourth blank :

1. **Communicable: AIDS: Non communicable: _____**

Ans. Diabetes mellitus.

2. **Chemotherapy: Chemicals: Radiation therapy: _____**

Ans. Radiation.

3. **Hypertension: Hypercholesterolomia: Glycosuria: _____**

Ans. Hyperglycemia.

VII. Answer in a sentence :

1. **What are psychotropic drugs?** ⊗ *[PTA-2]*

Ans.
(i) There are certain drugs called psychotropic drugs which act on the brain and alter the behaviour, consciousness, power of thinking and perception.
(ii) They are **referred as mood altering drugs**.

2. **Mention the diseases caused by tobacco smoke.** *[HY-'23]*

Ans. Bronchitis, Pulmonary tuberculosis, Emphysema, Oral cancer, Lung Cancer, hypoxia, Gastric and duodenal ulcers.

3. **What are the contributing factors for Obesity?** *[PTA-5; Sep-2021; Aug.-'22]*

Ans. Genetic factors, Physical inactivity, Eating habits (over eating), Endocrine factors.

4. **What is adult onset diabetes?** ⊗

Ans.
(i) **Type 2 Non-Insulin Dependent Diabetes Mellitus** is called **adult onset diabetes**
(ii) Affecting middle aged and elder people.
(iii) It develops slowly and later becomes stable.

5. **What is metastasis?** ⊗ *[April-'24]*

Ans.
(i) The cancerous cells migrate to distant parts of the body and affect new tissues.
(ii) This process is called **metastasis.**

6. **How does insulin deficiency occur?** *[HY-'23]*

Ans.
(i) In the case of Type I insulin dependent diabetes, the β-cells of the pancreas get destroyed.
(ii) This results in deficiency of insulin produced by the pancreas, since β-cells produce insulin.
(iii) In the case of non - insulin dependent diabetes mellitus, insulin production by the pancreas is normal but its action is impaired.
(iv) Thus in both cases, deficiency of insulin is observed.

VIII. Short answer questions :

1. **What are the various routes by which transmission of human immuno deficiency virus takes place?** *[PTA-1; July-'23]*

Ans. HIV is transmitted generally by
(i) Sexual contact with infected person.
(ii) Use of contaminated needles or syringes.
(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 ?** *[PTA-4; Sep-2021; FRT-'24]*

Ans.

S.No.	Cancer Cell	Normal cell
1.	The size of the nucleus is large.	They have normal small sized nucleus.
2.	The nucleoli are very prominent.	The nucleoli are less prominent.
3.	They can multiply indefinitely.	They have fixed rate of multiplication.

4.	They invade surrounding tissues.	They do not invade surrounding tissues.
5.	They remains less differentiated.	They are well differentiated cells.

3. Differentiate between Type-1 and Type-2 diabetes mellitus. *[PTA-4; April-'24]*

Ans.

Factors	Type I - Insulin dependent diabetes mellitus (IDDM)	Type II - 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 ?

Ans. Eating habits are a major cause for obesity (overeating).

(i) Diet Management : Low calorie, normal protein, vitamins and mineral, restricted carbohydrate and fat, high fiber diet can prevent overweight.

(ii) Calorie restriction for weight reduction is safe and most effective.

5. What precautions can be taken for preventing heart diseases ? *[GMQP-2019; Sep-2020]*

Ans. Diet Management:

(i) Reduction in the intake of calories, low saturated fat and cholesterol rich food, low carbohydrates and common salt are some of the dietary modifications.

(ii) Diet rich in poly unsaturated fatty acids (PUFA) is essential.

(iii) Increase in the intake of fibre diet, fruits and vegetables, protein, minerals and vitamin are required.

Physical activity:

Regular exercise, walking and yoga are essential for body weight maintenance

Addictive substance avoidance :

Alcohol consumption and smoking are to be avoided.

IX. Long answer questions :

1. Suggest measures to overcome the problems of an alcoholic. *[Sep-2021; May-2022]*

Ans. (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.

(v) 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.

Ans. Changes in life style are a important factor for the occurrence of heart disease:

Yes. It can be modified by conscious efforts such as:

(i) Eating healthy food rich is proteins and carbohydrates and avoiding Junk food.

(ii) Avoiding food items rich in cholesterol.

(iii) Avoiding sedentary life style at home and work place by indulging in lot of physical activity.

(iv) Avoid smoking, alcohol consumption.

(v) Go for regular medical tests to determine the blood cholesterol levels and related body functions.

(vi) Eating habits must be regular and food must not be compromised.

(vii) Lot of fresh fruits and salads included in the diet can help to remain healthy.

X. Higher Order Thinking Skills (HOTS) :

1. What is the role of fat in the cause of atherosclerosis? *[PTA-3]*

Ans. (i) The deposition of fat leads to the narrowing of blood vessels leading to atherosclerosis in the large and medium sized arteries that supply the heart muscle with oxygen.

(ii) It leads to ischemia (deficient blood supply to heart muscle) and myocardial infarction (death of the heart muscle tissue).

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?

Ans. (i) Children must be given healthy foods from childhood and healthy snacks must be given to them so that they develop a taste for the same from a young age.

(ii) They can be given fruit juices, sugarcane juice etc., instead of cool drinks. Parents must also adhere to this.

(iii) As they grow up, they can be taught about the negative impact of Junk food and cool drinks.

(iv) Even in schools, teachers advise parents to send healthy snacks instead of chips / other Junk food.

(v) Though children will find it difficult to avoid Junk food / Cool drinks because of advertisment, influence of friends etc., we should make a conscious effort to create awareness among students.

3. Regular physical exercise is advisable for normal functioning of human body. What are the advantages of practising exercise in daily life? *[PTA-6]*

Ans. Regular physical exercise can give the following benefits.

(i) It helps to burn calories and brings about weight loss. Obesity can be avoided by exercising regularly.

(ii) It brings about changes in the brain which can reduce stress and anxiety due to production of certain hormones.

(iii) It increases energy levels in the body.

(iv) It is good for the muscles and bones.

(v) It brings in a lot of positive thoughts and helps fight depression.

(vi) It can reduce risk of chronic diseases.

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 nearby your school?

b) How do you overcome the problem?

Ans. (a)

(i) People in the village may not easily understand the scientific concept and use of vernacular language will be required.

(ii) They may not be willing to cooperate.

(iii) It may be a sensitive issue to educate them regarding safe sex.

(b)

(i) This problem can be overcome by identifying some responsible people in the village such as panchayat body or NGO workers or some educated people who will understand the issue and convince people to cooperate with us.

(ii) Film shows can be screened regarding the disease which will have a better impact on the people.

XI. Value Based Questions :

1. Once a person starts taking drugs or alcohol it is difficult to get rid of the habit. Why?

Ans. (i) Once a person starts taking alcohol or drugs, he becomes addicted to these substances physically and mentally.

(ii) Whenever he tries to get rid of this habit, he shows unpleasant 'withdrawal symptoms' and these include vomiting, diarrhea, shivering, twitching, perspiration, abdominal and muscular cramps etc.,

(iii) So, it becomes difficult for a person to get rid of this habit.

State whether the following statements are True or False. Correct the false statement

1. **LINUX is a multi-purpose application.**

Ans. False. LINUX is an operating system.

2. **Multiple folders combine to form on file.**

Ans. False.
A folder contains multiple files.

3. **Scratch is an animation software.**

Ans. True.

4. **Scratch is a visual programming language.**

Ans. True.

5. **Scratch is difficult to use and do programming.**

Ans. False.
Scratch is easy to use.

6. **To choose the background in scratch, we can do using stage.**

Ans. True.

7. **Block menu is used to choose the category of blocks.**

Ans. True.

8. **Scripts tab is placed on the left corner.**

Ans. False.
Script tab is on the right side.

9. **In scratch, to run a program we need to click the red button.**

Ans. False.
Click the green flag to run the program.

10. **Script area is used to build scripts.**

Ans. True.

11. **Blackboard is a good example for 'Visual Communication Device'.**

Ans. False.
Cinema is a good example for 'Visual Communication Device'.

12. **The characters on the background of a scratch window are known as sprite.**

Ans. True.

13. **Sprite is the background appearing when we open the scratch window.**

Ans. False.
Stage is the background appearing when we open the scratch window.

Answer in a word or sentence

1. **What is a file?**

Ans. The output we get from any application is commonly referred as file.

2. **What is a folder?**

Ans. A folder is a storage space that contains multiple files.

3. **Name any two operating systems you know.**

Ans. (i) LINUX (ii) WINDOWS

4. **What is 'NOTE PAD' application used for?**

Ans. To collect notes, type and edit it in a file.

5. **What is 'paint app' used for?**

Ans. We can draw and edit pictures.

6. **Write the uses of 'Scratch' software.**

Ans. Scratch is a software used to create animations, cartoons and games easily.

7. **When is green - flag clicked?**

Ans. The green flag is clicked on the top right corner of the stage to run the program.

Give reasons for the following statements

1. **We cannot create images using "Notepad".**

Ans. Reason : Notepad application is used to collect notes. "Paint" app is used to create pictures.

2. **The nature of files are determined by its application.**

Ans. Reason : The output we get from an application is called as a file, so the nature of the file is determined by the type of application.

3. **What are three main parts of the scratch editor?**

Ans. (i) Stage
(ii) Sprite
(iii) Script editor / Costume editor.

4. **Mention the three menu parts of script editor.**

Ans. (i) Script area
(ii) Block menu
(iii) Block palette

VERY SHORT ANSWERS 2 MARKS

1. Distinguish file and folder.

Ans.

	File		Folder
(1)	The output from any application is referred as 'File'	-	A folder is a storage space, contains multiple files.
(2)	A file cannot contain a folder	-	A folder can contain many files.

2. Write the uses of 'Note Pad' and 'Paint' app.

Ans. **Note Pad :** It can be used to type notes, edit it and save it as a file.

Paint App : Paint app can be used to used to draw and edit pictures.

SHORT ANSWERS 4 MARKS

1. Write a note on 'Visual Communication Device'.

Ans. 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'.

2. Write a short note on script editor.

Ans. Script editor is where you edit your programs or your sprite's pictures.

The script editor has three main parts:

(i) **Script area:** Where you build scripts.

(ii) **Block menu:** Where you choose the category of blocks (programming statements) to use.

(iii) **Block palette:** Where you choose the block to use.

LONG ANSWERS 7 MARKS

1. Explain in detail the uses and main parts of the 'SCRATCH' animation software.

Ans. (i) 'Scratch' is a software used to create animations, cartoons and games easily.

(ii) Scratch is a **Visual Programming Language**.

(iii) It was developed in the **Massachusetts Institute of Technology** (MIT) Media Lab to make programming easier and more fun to learn.

Scratch Environment Editor :

(iv) **The Scratch editor has three main parts:** They are Stage, Sprite and Script editor.

(v) **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.

(vi) **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.

(vii) **Script editor / Costume editor :** Where you edit your programs or your sprite's pictures.

The script editor has three main parts :

(i) **Script area:** Where you build scripts.

(ii) **Block menu:** Where you choose the category of blocks (programming statements) to use.

(iii) **Block palette:** Where you choose the block to use.

HIGHER ORDER THINKING SKILLS (HOTS)

1. In what way computer can help to improve your studies?

Ans. (i) Computer helps me to explore ideas and concepts in more depth, such as by using a multimedia CD - ROM or DVD with interactive exercises.

(ii) Computer also helps teacher to prepare good study material with audio - visuals, images and animation.

2. If you are an artist, which computer applications will be relevant for you?

Ans. If I were an artist, I would be using Paint application to draw images.

3. Which is important - Hardware or Software?

Ans. Both are integral part of the computer and dependent to each other.

Value Based Questions

1. In a biology period, the teacher drew the heart of rabbit on the board and explained its structure and functions. After the class, your friend told you that he finds it difficult to understand the concept and felt he wanted a detailed explanation.

(i) In what way, the teaching can be made easily understandable?

(ii) Do you think using technologies like Visual Communication help students to understand the difficult concepts in a simple way?

(iii) By what means the Visual Communication improve the learning ability?

Ans. (i) Pictures and Audio-Visuals give us more understanding than teaching and writing on black board. So, any visual representation of the concepts would help us to understand better and make teaching simple.

(ii) Yes. Visual Communication helps us to easily conceptualize complicated theorems and concepts. When the teacher shows pictures / videos that represent the concept, we would easily relate to its application and firmly understand the concept without any mis-conception.

(iii) Pictures, Audio-Visuals, animations provide additional information and helps us to easily correlate the concepts. We can understand the concept easily by seeing the video and also it registers firmly in the minds of the students.

Expand the following abbreviations

1. **CPU** - Central Processing Unit
2. **.DOC** - Document
3. **.JPEG** - Joint Photographic Experts Group (File format)
4. **PPTs** - Power Point Presentations
5. **MIT** - Massachusetts Institute of Technology
6. **CSS** - Cascading Style Sheets (Language)
7. **MP3** - MPEG Audio Layer 3 (File format)
8. **.PDF** - Portable Document Format (File format)
9. **.DLL** - Dynamic Link Library (File format)
10. **.PNG** - Portable Network Graphics (Images)
11. **.XLS** - Microsoft Excel Spreadsheet (File format)
12. **.PSD** - PhotoShop Document (File format)
13. **Window OS** - Windows Operating System

10th STD

PUBLIC EXAMINATION APRIL - 2024

Reg. No.

Part - III

Science (With Answers)

Time Allowed : 3.00 Hours] **[Maximum Marks**: 75

Instructions : 1. Check the question paper for fairness of printing. If there is any lack of fairness, inform the Hall Supervisor immediately.
2. Use **Blue** or **Black** ink to write and underline and pencil to draw diagrams.

Note : This question paper contains **four** parts.

PART - I

Note: (i) Answer **all** the questions. **(12 × 1 = 12)**
(ii) Choose the most appropriate answer from the given **four** alternatives and write the option code and the corresponding answer.

1. The endarch condition is the characteristic feature of :
(a) Root (b) Stem
(c) Leaves (d) Flowers

2. TFM in soaps represents _____ content in soap.
(a) Mineral (b) Vitamin
(c) Fatty matter (d) Carbohydrate

3. The value of Universal Gas Constant :
(a) 3.81 J mol^{-1} K^{-1}
(b) 8.03 J mol^{-1} K^{-1}
(c) 1.38 J mol^{-1} K^{-1}
(d) 8.31 J mol^{-1} K^{-1}

4. Kilowatt hour is the unit of :
(a) resistivity
(b) conductivity
(c) electrical energy (d) electrical power

5. An enzyme which cuts DNA is :
(a) Protease
(b) Restriction endonuclease
(c) DNA Ligase (d) RNAase

6. One 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}

7. Which one is referred as "Master gland"?
(a) Pineal gland (b) Pituitary gland
(c) Thyroid gland (d) Adrenal gland

8. Which among the following is not the characteristic of anemophilous plants?
(a) the flowers produce enormous amount of pollen grains.
(b) the stigmas are large and protruding.
(c) the flowers are brightly coloured, have smell and nectar.
(d) pollen grains are small and dry.

9. Inertia of a body depends on :
(a) Weight of the object
(b) Acceleration due to gravity of planet
(c) Mass of the object
(d) Both (a) and (b)

10. Which is the correct sequence of blood flow?
(a) Ventricle → Atrium → Vein → Arteries
(b) Atrium → Ventricle → Vein → Arteries
(c) Atrium → Ventricle → Arteries → Vein
(d) Ventricle → Vein → Atrium → Arteries

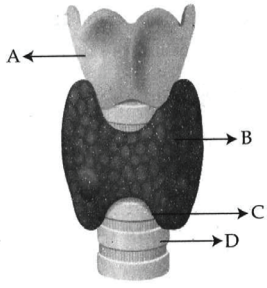
11. Which of the following is not an "element + element ⟶ compound" type reaction?
(a) $C_{(s)} + O_{2(g)} \longrightarrow CO_{2(g)}$
(b) $2K_{(s)} + Br_{2(l)} \longrightarrow 2KBr_{(s)}$
(c) $2CO_{(g)} + O_{2(g)} \longrightarrow 2CO_{2(g)}$
(d) $4Fe_{(s)} + 3O_{2(g)} \longrightarrow 2Fe_2O_{3(s)}$

12. Cancer of the epithelial cell is called as _____.
(a) Leukaemia (b) Sarcoma
(c) Carcinoma (d) Lipoma

PART - II

Note: Answer **any seven** questions. Question No. **22** is **compulsory.** **(7 × 2 = 14)**

13. What is coefficient of apparent expansion?
14. Why is tungsten metal used in bulbs but not used as fuse wires?
15. What is rust? Give the equation for the formation of rust.
16. What is stage?
17. Why is sinoatrial node called as pacemaker of heart?
18. What are the parts of the hind brain?
19. Identify the parts A, B, C, and D in the given figure.



20. What is colostrum? How is milk production hormonally regulated?
21. What is metastasis?
22. If the pH of a solution is 4.5, find the value of its pOH.

PART - III

Note: Answer **any seven** questions. Question No. **32** is **compulsory.** **(7 × 4 = 28)**

23. Explain the various types of inertia with examples.
24. (a) Write any three features of natural and artificial radioactivity.
    (b) Name any two devices, which are working on the heating effect of current.
25. (a) What happens when $MgSO_4.7H_2O$ is heated? Write the appropriate equation.
    (b) Define : Solubility.
26. (a) What is Respiratory Quotient?
    (b) Why should the light dependent reaction occur before light independent reaction during photosynthesis?
27. Write the dental formula of rabbit.
28. (a) Why is Euploidy considered to be advantageous to both plants and animals?
    (b) Classify Neurons based on its structure.
29. How are Arteries and Veins structurally different from one another?
30. Define Ethnobotany and write its importance.
31. (a) What are the consequences of deforestation?
    (b) State the applications of DNA finger printing technique.
32. (a) Name the acid that renders Aluminium passive. Why?
    (b) Calculate the number of moles in 1.51×10^{23} molecules of NH_4Cl.

PART - IV

Note : Answer **all** the questions. Draw diagrams wherever **necessary.** **(3 × 7 = 21)**

33. (a) (i) What are the uses of convex lens?
    (ii) Define dispersion of light.
    (iii) Why are traffic signals red in colour?
    (iv) What is the least count of travelling microscope?

    (OR)

    (b) (i) What is an echo?
    (ii) State two conditions necessary for hearing an echo.
    (iii) What are the medical applications of echo?
    (iv) How can you calculate the speed of sound using echo?

34. (a) (i) Under same conditions of temperature and pressure, if you collect 3 litre O_2, 5 litre of Cl_2 and 6 litre of H_2.
    (A) Which has the highest number of molecules?
    (B) Which has the lowest number of molecules?
    (ii) Give the salient features of 'Modern Atomic theory'.

    (OR)

    (b) (i) How do detergents cause water pollution?
    (ii) 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', then

(A) Identify the compound 'A'.

(B) Write the chemical equation for its reaction with ethanol to form compound 'B'.

(C) Name this process.

35. (a) (i) What are synthetic auxins? Give an example.

(ii) With a neat labelled diagram, describe the parts of the typical angiospermic ovule.

(OR)

(b) (i) Who is called the "Father of Indian Green Revolution"?

(ii) Differentiate between out-breeding and in-breeding.

(iii) Differentiate between Type-I and Type-II Diabetes mellitus.

Answers

PART - I

1. (b) Stem
2. (c) Fatty matter
3. (d) 8.31 J mol^{-1} K^{-1}
4. (c) electrical energy
5. (b) Restriction endonuclease
6. (a) 6.023×10^{23}
7. (b) Pituitary gland
8. (c) the flowers are brightly coloured, have smell and nectar.
9. (c) Mass of the object
10. (c) Atrium ⟶ Ventricle ⟶ Arteries ⟶ Vein
11. (c) $2CO_{(g)} + O_{2(g)} \longrightarrow 2CO_{2(g)}$
12. (c) Carcinoma

PART - II

13. **Co-efficient of apparent expansion :**

(i) The ratio of the apparent rise in the volume of the liquid per degree rise in temperature to its unit volume.

(ii) It's SI unit is K^{-1}.

14. (i) Tungsten has high melting point, it can bear high heat for glowing.

(ii) But in fuse wire, the wire will not melt when a large amount of current is passed through it, but the appliance will get damaged.

15. 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.

$4Fe + 3O_2 + x\ H_2O \longrightarrow 2Fe_2O_3.xH_2O$(rust)

16. **Satge :**

(i) Stage is the background appearing when we open the scratch window.

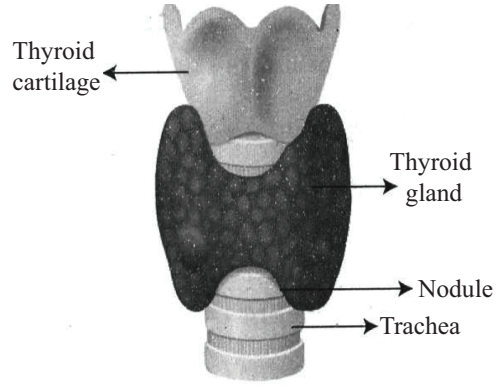
(ii) The background will most often be white. We can change the background colour as we like.

17. (i) Sino-atrial node called as the "pacemaker" of heart because it is capable of initiating impulse, which can stimulate the heart muscles to contract.

(ii) The impulse from this node spreads as a wave of contraction over the right and left atrial wall pushing the blood through the atrioventricular values into the ventricles.

18. It is formed of three parts cerebellum, pons and medulla oblongata.

19.



20. (i) The first fluid which is released from the mammary gland after child birth is called colostrum.

(ii) Milk production from alveoli of mammary glands is stimulated by prolactin secreted from the anterior pituitary.

(ii) The ejection of milk is stimulated by posterior pituitary hormone oxytocin.

21. **Metastasis :**
    (i) The cancerous cells migrate to distant parts of the body and affect new tissues.
    (ii) This process is called metastasis.

22. **Solution:**

$pH + pOH = 14$

$pOH = 14 - 4.5 = 9.5$

$pOH = 9.5$

PART - III

23. Inertia is of three types
    (i) Inertia of rest (ii) Inertia of motion (iii) Inertial of direction
    (i) **Inertia of rest :** The resistance of a body to change its state of rest is called inertia of rest. **Eg:** When you vigorously shake the branches of a tree some of the leaves and fruit are detached and they fall down.
    (ii) **Inertia of motion :** The resistance of a body to change its state of motion is called inertia of motion. **Eg :**An athlete runs some distance before jumping. Because, this will help him jump longer and higher.
    (iii) **Inertia of direction :** The resistance of a body to change its direction of motion is called inertia of direction. **Eg :** When you make a sharp turn while driving a car, you tend to lean sideways.

24. **(a)**

Sl. No	Natural radioactivity	Artificial radioactivity
1	Emission of radiation by self-disintegration of nucleus	Emission of radiation by disintegration of nucleus 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.

(b) Electric iron box, electric toaster.

25. **(a)** When magnesium sulphate heptahydrate crystals are gently heated, it loses seven water molecules, and becomes anhydrous magnesium sulphate.

$$\underset{\text{(Magnesium sulphate heptahydrate)}}{MgSO_4.7H_2O} \underset{\text{Cooling}}{\overset{\text{Heating}}{\rightleftharpoons}} \underset{\text{(Anhydrous Magnesium sulphate)}}{MgSO_4 + 7H_2O}$$

(b) Solubility is defined as the number of grams of a solute that can be dissolved in 100g of a solvent to form its saturated solution at a given temperature and pressure.

$$\text{Solubility} = \frac{\text{Mass of the solute}}{\text{Mass of the solvent}} \times 100$$

26. **(a) Respiratory quotient :**

(i) Respiratory quotient is the ratio of volume of carbon dioxide liberated and the volume of oxygen consumed during respiration.

$$RQ = \frac{\text{Volume of } CO_2 \text{ liberated}}{\text{Volume of } O_2 \text{ consumed}}$$

(b) (i) The light independent reactions use the end products ATP and $NADPH_2$ of the light dependent reactions.

(ii) Light independent reactions use the energy (ATP) derived from light dependent reactions.

(ii) Hence the light dependent reaction occurs before the light independent reaction.

27. **Dental formula of rabbit :**

$$(I\ \frac{2}{1}, C\ \frac{0}{0}, PM\ \frac{3}{2}, M\ \frac{3}{3}) = \frac{2033}{1023}.$$

It is written as 2033 / 1023.

28. **(a)** (i) Euploid plants often result in increased fruit and flower size. Therefore it is advantageous for them.

(ii) The euploid animals are sterile.

(b) Structure of Neuron :

The neurons may be of different types based on their structure and functions.

Structurally the neurons may be of the following types :

(i) **Unipolar neurons :** Only one nerve process arises from the cyton which acts as both axon and dendron.

(ii) **Bipolar neurons :** The cyton gives rise to two nerve processes of which one acts as an axon while another as a dendron.

(iii) **Multipolar neurons :** The cyton gives rise to many dendrons and an axon.

29.

S. No	ARTERIES	VEINS
1	Distributing vessel	Collecting vessel
2.	Pink in colour	Red in colour
3.	Deep location	Superficial in location
4.	Blood flow with high pressure	Blood flow with low pressure
5.	Internal valves are absent	Internal valves are present

30. **Ethnobotany and its importance :**

(i) 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 :

(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 to treat disease.

31. **(a) 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.

(b) Applications of DNA finger printing technique.

(i) DNA finger printing technique is widely used in forensic applications like crime investigation such as identifying the culprit.

(ii) It is also used for paternity testing in case of disputes.

(iii) It also helps in the study of genetic diversity of population, evolution and speciation.

32. **(a)** Dilute or concentrated nitric acid does not attack aluminium, but it renders aluminium passive due to the formation of an oxide film on its surface.

(b) 1.51×10^{23} molecules of NH_4Cl

$$\text{No. of moles} = \frac{\text{Number of molecules}}{\text{Avogadro number}} = \frac{1.51 \times 10^{23}}{6.023 \times 10^{23}} = 0.25 \text{ mole}$$

PART - IV

33. **(a)**

(i) Uses of convex lenses :

(a) Convex lenses are used as camera lenses.

(b) Used as magnifying lenses.

(c) Used in making microscope, telescope and slide projectors.

(d) Used to correct the defect of vision called hypermetropia.

(ii) Dispersion of light :

(a) When a beam of white light or composite light is refracted through any transparent media such as glass or water, it is split into its component colours.

(b) This phenomenon is called as dispersion of light.

(iii) Traffic signals red in colur :

(a) Red has the longest wavelength so it is scattered the least by atmospheric particles.

(a) As a result whether it is fog or smoke, red light passes comparatively easily through them.

(iv) The least count of travelling microscope is 0.01mm.

(OR)

(b) (i) Echo: An echo is the sound reproduced due to the reflection of the original sound from various rigid surfaces.

(ii) Conditions necessary for hearing an echo:

(a) The minimum time gap between the original sound and echo must atleast 0.1 s.

(b) The minimum distance required to hear an echo is 17.2 m.

(iii) The medical applications of echo:

(a) Used in obstetric ultrasonography,

(b) To create real-time visual images of the developing embryo or fetus in the mother's uterus.

(iv) Calculate the speed of sound using echo:

$$\text{Speed of sound} = \frac{\text{Distance travelled}}{\text{Time taken}} = \frac{2d}{t}$$

34.

(a) (i) (A) 6 litre of H_2

(B) 3 litre of O_2

(ii) An atom is no longer indivisible :

(a) Atoms of the same element may have different atomic mass. **Eg:** isotopes $_{17}Cl^{35}$, $_{17}Cl^{37}$.

(b) Atoms of different elements may have same atomic masses. **Eg:** Isobars $_{18}Ar^{40}$, $_{20}Ca^{40}$.

(c) Atoms of one element can be transmuted into atoms of other elements.

(d) Atom is no longer indestructible discovery of artificial transmutation.

(e) Atoms may not always combine in a simple whole number ratio. **Eg :** Glucose $C_6H_{12}O_6$.

(f) Atom is the smallest particle that takes part in a chemical reaction.

(g) Mass of an atom can be converted into energy. $E = mc^2$.

(OR)

(b) (i) Detergents cause water pollution :

Some detergents having a branched hydrocarbon chain are not fully biodegradable by micro-organisms present in water. So, they cause water pollution.

(ii) (A) Ethanoic acid (acetic acid).

(B) $CH_3COOC_2H_5$ (Ethyl acetate).

$$\underset{\text{Ethanol}}{C_2H_5OH} + \underset{\text{Ethanoic acid}}{CH_3COOH} \xrightarrow{\text{conc.}H_2SO_4} \underset{\text{Ethyl ethanoate}}{CH_3COOC_2H_5} + H_2O$$

(C) Esterification.

35.

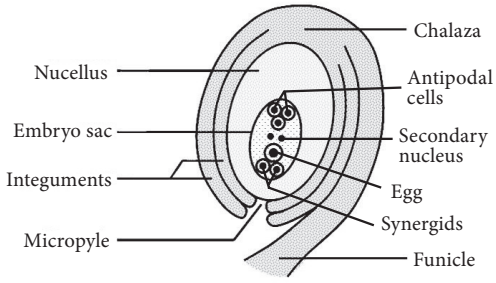
(a) (i) Synthetic auxins with examples:

(a) Artificially Synthesized Auxins that have properties like auxins are called as synthetic auxins.

(b) **Eg:** 2, 4 D (2,4 Dichlorophenoxy Acetic Acid)

(ii) The parts of a typical angiospermic ovule.

(a) The main part of the ovule is the nucellus which is enclosed by two integuments leaving an opening called as micropyle.



Structure of an Ovule

(b) The ovule is attached to the ovary wall by a stalk known as funiculus. Chalaza is the basal part.

(c) The embryo sac contains seven cells and eight nuclei located within the nucellus.

(d) Three cells at the micropylar end form the egg apparatus and the three cells at the chalaza end are the antipodal cells.

(e) The remaining two nuclei are called polar nuclei found in the centre.

(f) In the egg apparatus one is the egg cell (female gamete) and the remaining two cells are the synergids.

(OR)

(b) (i) Dr. M. S. Swaminathan is called the "Father of Indian Green Revolution"

(ii)

S. No.	Outbreeding	Inbreeding
1.	It is the breeding of unrelated animals.	It refers to the mating of closely related animals within the same breed for about 4-6 generations.
2.	The hybrids are stronger and vigorous than their parents.	It helps to accumulate superior genes and eliminate undesirable genes.
3.	**Eg.:** Mule	**Eg.:** Sheep Hissar die

(iii)

Factors	Type I - Insulin dependent diabetes mellitus (IDDM)	Type II - 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.

☆☆☆