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Preface

Education is not the learning of facts.
It is rather training of the mind to think.

- **Albert Einstein**

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From the bottom of our heart, we at SURA Publications sincerely thank you for the support and patronage that you have extended to us for more than a decade.

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I once again sincerely thank the Teachers, Parents and Students for supporting and valuing our efforts.

God Bless all.

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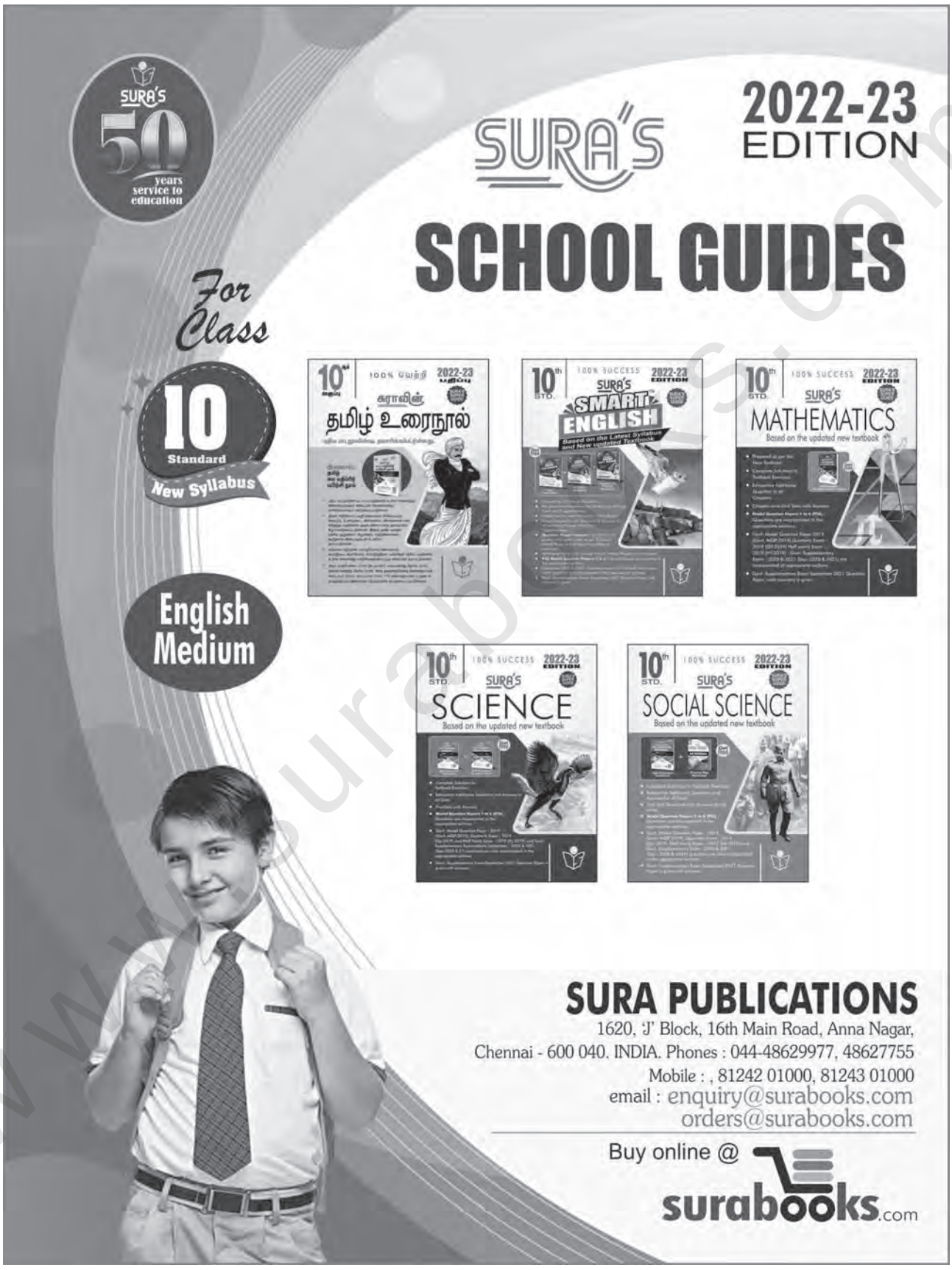
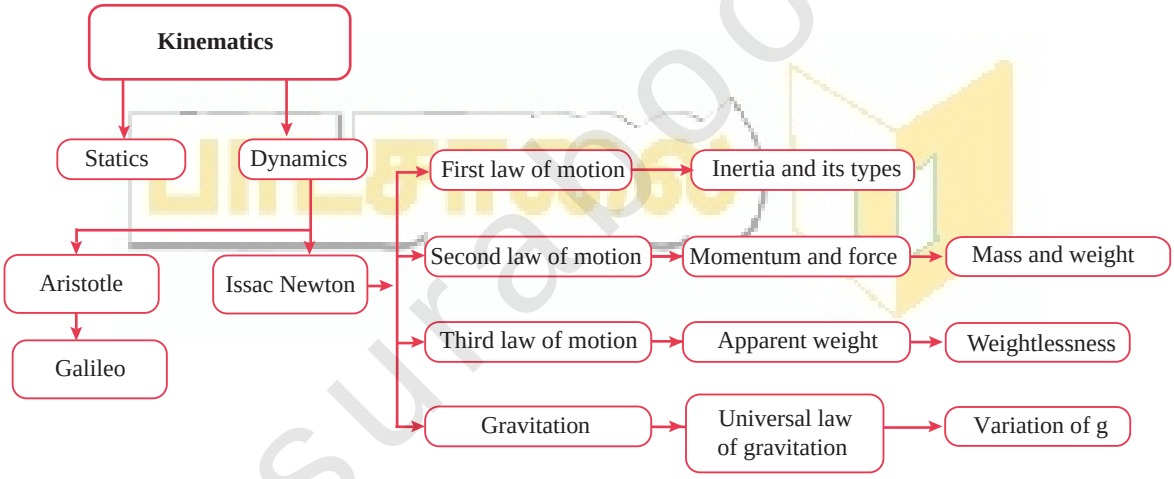


PHYSICS

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
(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 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
(a) $cm\ s^{-1}$ (b) $N\ kg^{-1}$
(c) $N\ m^2\ kg^{-1}$ (d) $cm^2\ s^{-2}$ **Ans. (b) $N\ kg^{-1}$**

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

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
(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]*
(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**
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.

Ans. The inherent property of the 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.

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.

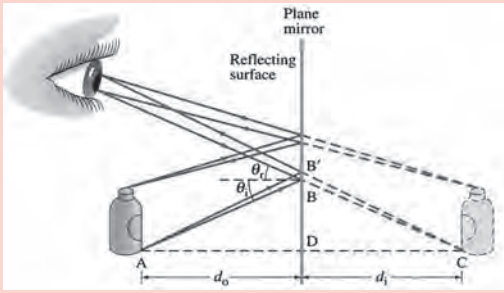
$F_1 = 5\ N$

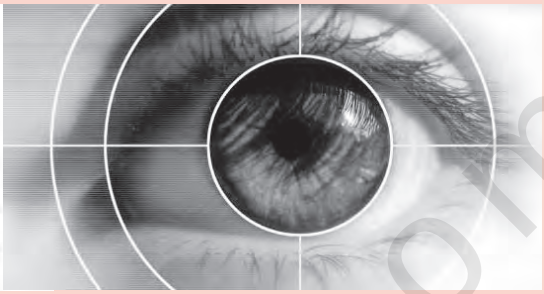
$F_2 = 15\ N$

$R = F_2 - F_1$ (if $F_2 > F_1$)

$= 15 - 5 = 10$

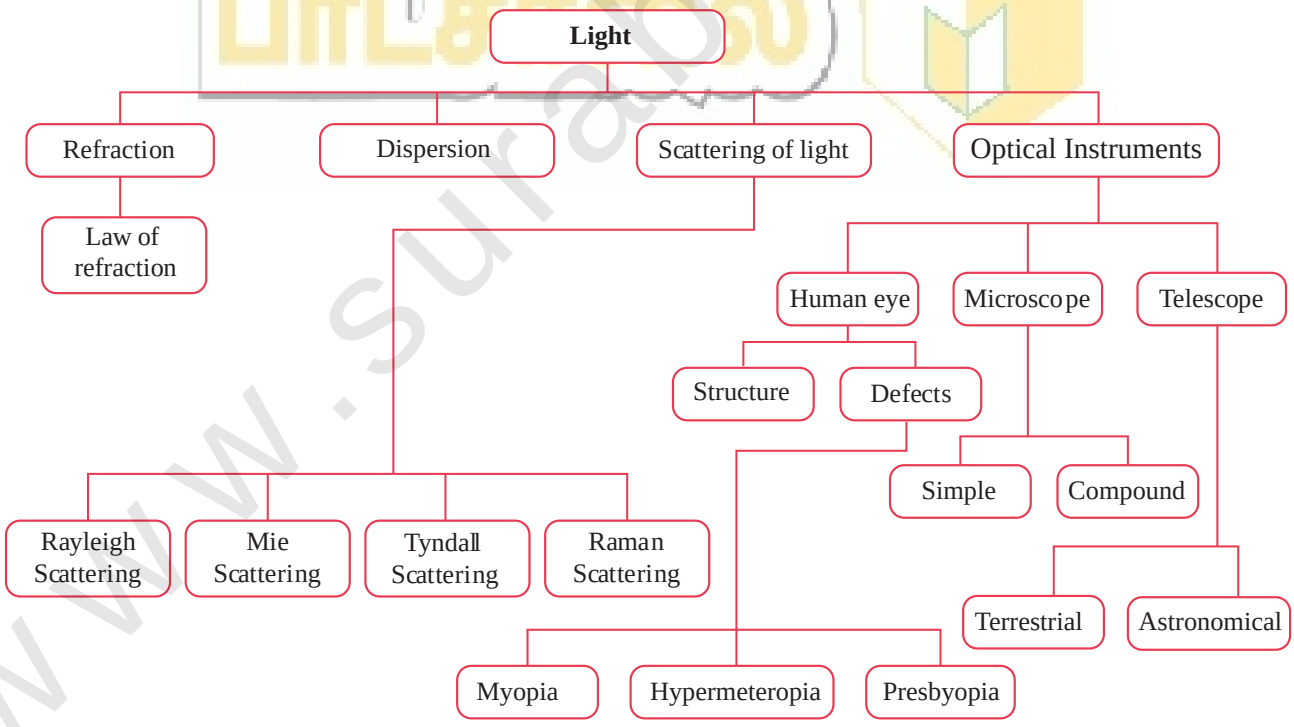
UNIT 2





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
(a) A (b) B
(c) C (d) D
Ans. (a) A

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

3. A small bulb is placed at the principal focus of a convex lens. When the bulb is switched on, the lens will produce *(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
(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
(a) focus (b) infinity
(c) at 2f (d) between f and 2f
Ans. (b) infinity

6. Power of a lens is –4D, then its focal length is
(a) 4m (b) – 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
(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)*
(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 _____. 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. True.

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

VI. ANSWER BRIEFLY :

1. What is refractive index?

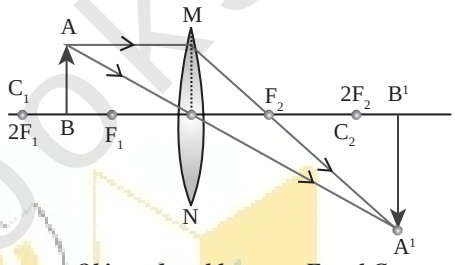
Ans. The ratio of speed of light in vacuum to the speed of light in a medium is defined as refractive index 'μ' of that medium.

2. State Snell's law. *[Qy-2019]*

Ans. 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. *[GMQP-2019]*



Object placed between F and C

4. Define dispersion of light.

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]*

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

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

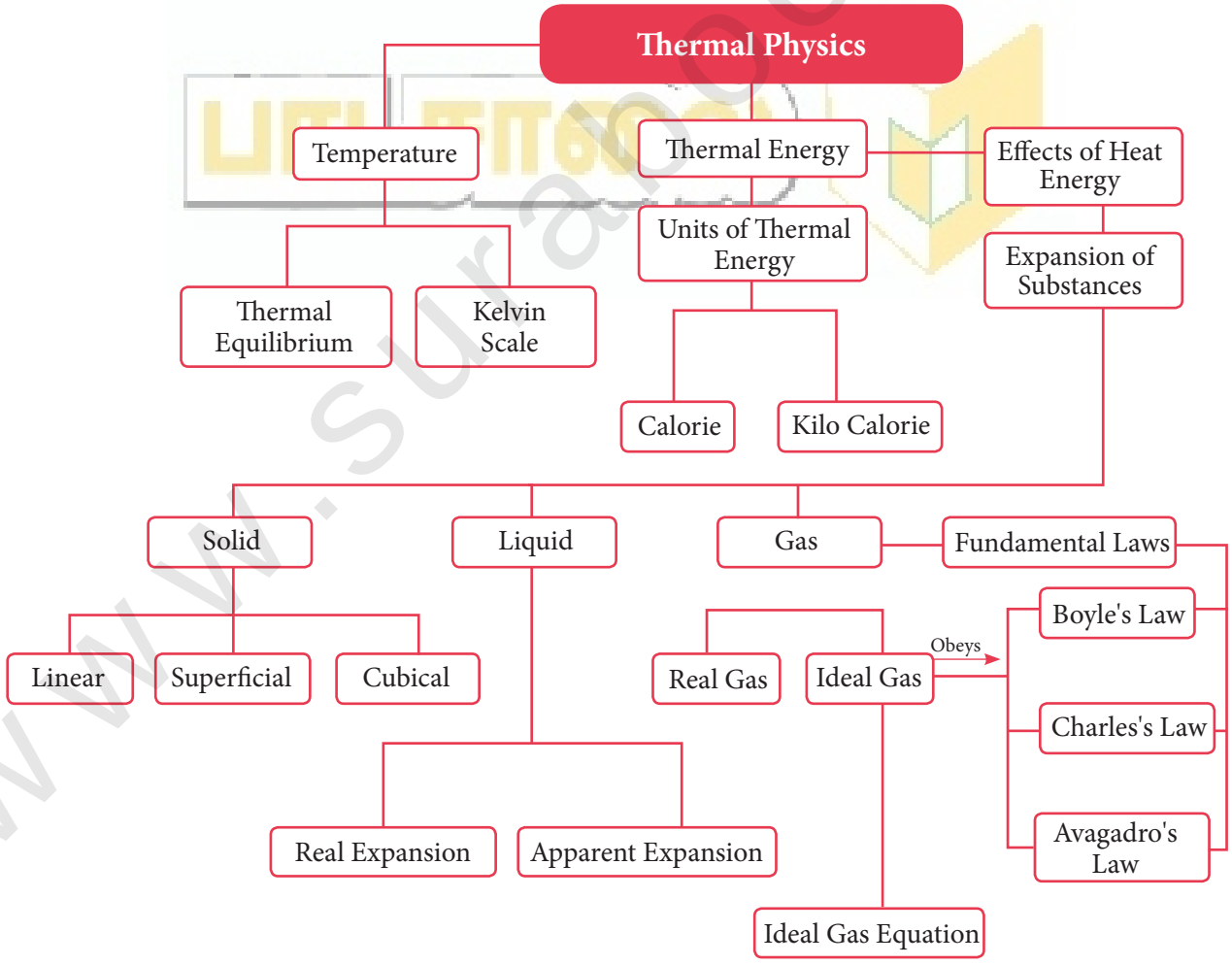
6. Differentiate convex lens and concave lens. *[PTA-3; Qy-2019]*

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.	It is diverging.
3.	Produces mostly real images.	Produces a virtual image.
4.	Used to treat hypermeteropia.	Used to treat myopia.

UNIT 3

THERMAL PHYSICS

CONCEPT MAP



MUST KNOW DEFINITIONS

Thermal energy	:	A thermal energy is a form of energy which is transferred between any two bodies due to the difference in their temperatures.
Temperature	:	The degree of hotness of a body. SI unit of temperature is kelvin (K).
Thermal equilibrium	:	Two or more physical systems or bodies are said to be in thermal equilibrium if there is no net flow of thermal energy between the systems.
Linear expansion	:	When a body is heated or cooled, the length of the body changes due to change in its temperature.
Areal expansion	:	If there is an increase in the area of a solid object due to heating.
Cubical expansion	:	If there is an increase in the volume of a solid body due to heating.
Real expansion	:	If a liquid is heated directly without using any container, then the expansion that you observe.
Apparent expansion	:	The expansion of a liquid apparently observed without considering the expansion of the container.
Coefficient of linear expansion	:	The ratio of increase in length of the body per degree rise in temperature to its unit length.
Coefficient of superficial expansion	:	Superficial expansion is determined in terms of coefficient of superficial expansion. The ratio of increase in area of the body per degree rise in temperature to its unit area.
Coefficient of cubical expansion	:	The ratio of increase in volume of the body per degree rise in temperature to its unit volume.
Coefficient of real expansion	:	The ratio of the true rise in the volume of the liquid per degree rise in temperature to its unit volume. The SI unit of coefficient of real expansion is K^{-1}.
Coefficient of apparent expansion	:	The ratio of the apparent rise in the volume of the liquid per degree rise in temperature to its unit volume. The SI unit of coefficient of apparent expansion is K^{-1}.
Real gases	:	If the molecules or atoms of a gas interact with each other with a definite amount of intermolecular or inter atomic force of attraction.
Ideal gases	:	If the atoms or molecules of a gas do not interact with each other.
Boyle's law	:	When the temperature of a gases kept constant, the volume of a fixed mass of gas is inversely proportional to its pressure. $P \propto 1/V$ or Pv = constant of a gas
Charles's law	:	When the pressure of a gas is kept constant, the volume of a gas is directly proportional to the temperature of the gas. $V \propto T$ (or) V/T = constant
Avogadro's law	:	Avogadro's law states that at constant pressure and temperature, the volume of a gas is directly proportional to number of atoms or molecules present in it. i.e. $V \propto n$ or $\frac{V}{n}$ = constant

FORMULAE

1.	Relation between Celsius & Kelvin	$k = C + 273$
2.	Relation between Fahrenheit and kelvin	$[k] = (F + 460) \times \frac{5}{9}$
3.	Coefficient of linear expansion	$\frac{\Delta L}{L_o} = \alpha_L \Delta T$
4.	Coefficient of areal expansion	$\frac{\Delta A}{A_o} = \alpha_A \Delta T$
5.	Coefficient of cubical expansion	$\frac{\Delta V}{V_o} = \alpha_V \Delta T$
8.	Boyle's law	$P \propto \frac{1}{V}$ (or) PV = constant
9.	Charles's law	$V \propto T$ (or) $\frac{V}{T}$ = constant
10.	Avogadro's law	$V \propto n$ (or) $\frac{V}{n}$ = constant
11.	Ideal gas equation	$PV = RT$

TEXTBOOK EVALUATION

I. CHOOSE THE CORRECT ANSWER :

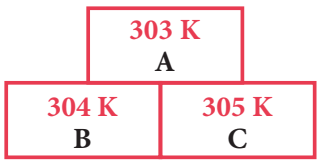
1. The value of universal gas constant
(a) 3.81 $Jmol^{-1} K^{-1}$ (b) 8.03 $Jmol^{-1} K^{-1}$
(c) 1.38 $Jmol^{-1} K^{-1}$ (d) 8.31 $Jmol^{-1} K^{-1}$
Ans. (d) 8.31 $Jmol^{-1} K^{-1}$

2. If a substance is heated or cooled, the change in mass of that substance is *[PTA-1; Qy-2019]*
(a) positive (b) negative
(c) zero (d) none of the above
Ans. (c) zero

3. If a substance is heated or cooled, the linear expansion occurs along the axis of
(a) X or –X (b) Y or –Y
(c) both (a) and (b) (d) (a) or (b)
Ans. (c) both (a) and (b)

4. Temperature is the average _____of the molecules of a substance
(a) difference in K.E and P.E
(b) sum of P.E and K.E
(c) difference in T.E and P.E
(d) difference in K.E and T.E
Ans. (c) difference in T.E and P.E

5. In the Given diagram, the possible direction of heat energy transformation is



(a) A ⟵ B, A ⟵ C, B ⟵ C
(b) A ⟶ B, A ⟶ C, B ⟶ C
(c) A ⟶ B, A ⟵ C, B ⟶ C
(d) A ⟵ B, A ⟶ C, B ⟵ C
Ans. (a) A ⟵ B, A ⟵ C, B ⟵ C

II. Fill in the blanks :

1. The value of Avogadro number _____
Ans. 6.023×10^{23} / mol (or) mol^{-1}

2. The temperature and heat are _____ quantities. Ans. Scalar *[PTA-2]*

3. One calorie is the amount of heat energy required to raise the temperature of _____ of water through_____. Ans. 1 gm; 1° C

4. According to Boyle's law, the shape of the graph between pressure and reciprocal of volume is _____ Ans. straight line

III. State whether the following statements are true or false, if false explain why?

1. **For a given heat in liquid, the apparent expansion is more than that of real expansion.**
Ans. False.
Correct Statement : The apparent expansion is less than that of real expansion.

2. **Thermal energy always flows from a system at higher temperature to a system at lower temperature.**
Ans. True.

3. **According to Charle's law, at constant pressure the temperature is inversely proportional to volume.**
Ans. False.
Correct Statement: Volume is directly proportional to temperature at constant pressure.

IV. Match the items in column-I to the items in column-II :

Column-I		Column-II	
1.	Linear expansion	(a)	change in volume
2.	Superficial expansion	(b)	hot body to cold body
3.	Cubical expansion	(c)	1.381×10^{-23} JK^{-1}
4.	Heat transformation	(d)	change in length
5.	Boltzmann constant	(e)	change in area

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

V. Assertion and reason type questions :

(a) Both the assertion and the reason are true and the reason is the correct explanation of the assertion.
(b) Both the assertion and the reason are true but the reason is not the correct explanation of the assertion.
(c) Assertion is true but the reason is false.
(d) Assertion is false but the reason is true.

1. **Assertion:** There is no effects on other end when one end of the rod is only heated.
Reason: Heat always flows from a region of lower temperature to higher temperature of the rod.

Hint: **Heat always flow from a region of higher temperature to lower temperature.**

Ans. (c) Assertion is true but the reason is false

2. **Assertion:** Gas is highly compressible than solid and liquid *[PTA-2]*
Reason: Interatomic or intermolecular distance in the gas is comparably high.
Ans. (a) Both the assertion and the reason are true and the reason is the correct explanation of the assertion

VI. Answer in briefly :

1. **Define one calorie.** *[GMQP-2019]*
Ans. One calorie is defined as the amount of heat energy required to rise the temperature of 1 gram of water through 1°C.

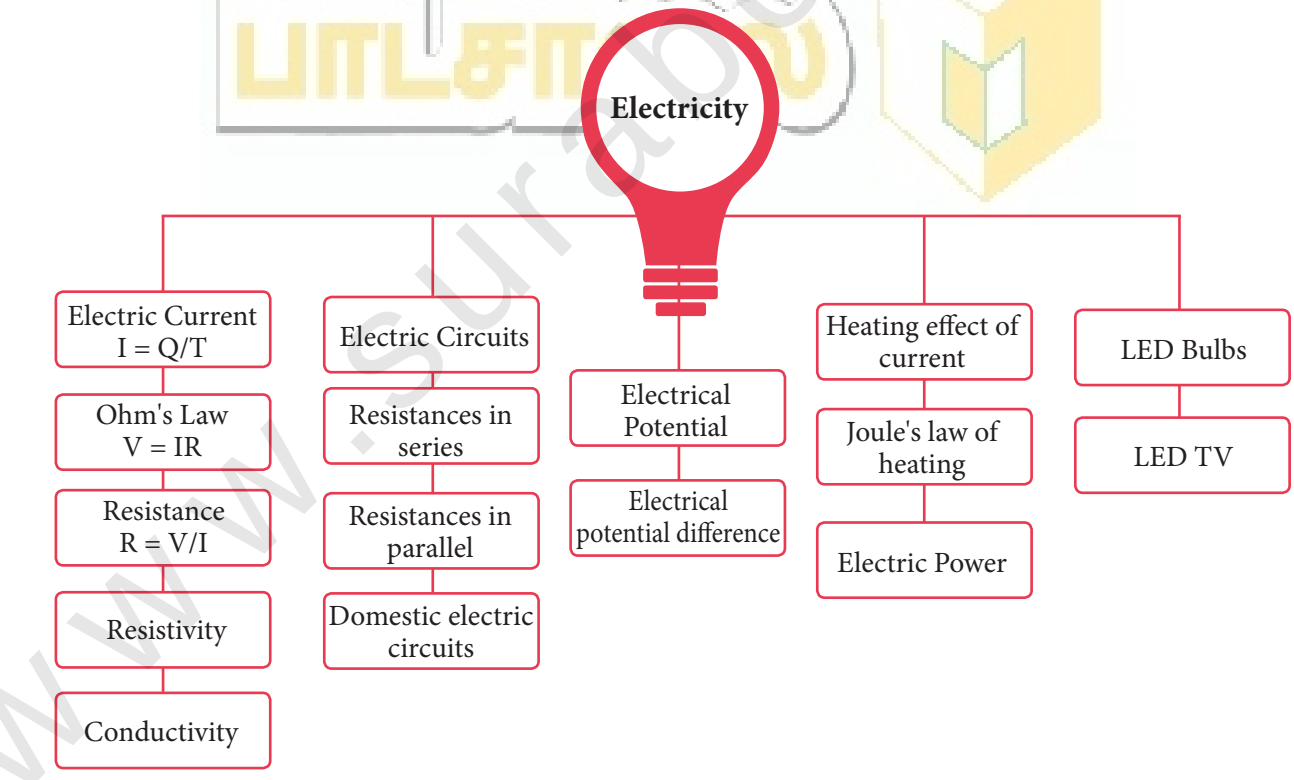
2. **Distinguish between linear, areal (or) superficial expansion.**

	Liner Expansion	Areal Expansion (or) superficial expansion
(i)	Length of the body changes due to change in its temperature.	Increase in the area of a solid object due to heating, then the expansion is called superficial or areal expansion.
(ii)	The ratio of increase in length of the body per degree rise in temperature to its unit length is called as the coefficient of linear expansion.	The ratio of increase in area of the body per degree rise in temperature to its unit area called coefficient of superficial expansion.
(ii)	$\frac{\Delta L}{L_o} = \alpha_L \Delta T$	$\frac{\Delta A}{A_o} = \alpha_A \Delta T$

UNIT 4

ELECTRICITY

CONCEPT MAP



MUST KNOW DEFINITIONS

Electric current	:	Rate of flow of charges in a conductor.
Specific resistance (or) electrical resistivity of a material	:	Resistance of a conductor of unit length and unit area of cross section.
Electrical resistance	:	It is the ratio between the potential difference across the ends of the conductor and the current flowing through it.
Electrical conductance	:	It is the reciprocal of resistance.
Electrical conductivity	:	The reciprocal electrical resistivity of a material.
Electric power	:	The rate of consumption of electrical energy.
One watt	:	One watt is the power consumed when a electric device is operated at a potential difference of one volt and it carries a current of one ampere.
Ohm's law	:	The relation between the potential difference and current.
Unit of potential difference (or) One Volt	:	One volt is the potential difference between two points, if one joule of work is done in moving one coulomb of charge from one point to another against the electric force.
Electric potential difference	:	The amount of work done in moving a unit positive charge from one point to another against the electric force.

FORMULAE

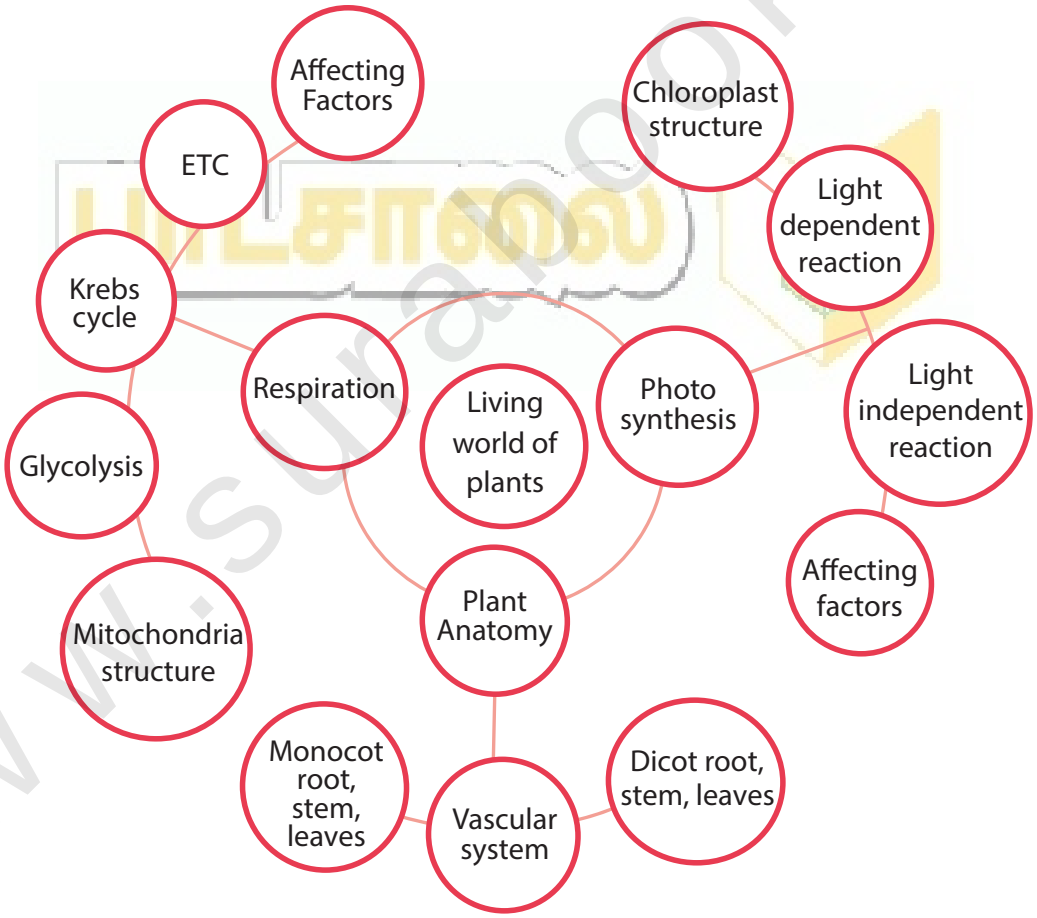
1.	**Electric Current**	$I = \frac{Q}{t} = \frac{\text{Charge}}{\text{Time}}$
2.	**Potential difference**	$V = \frac{W}{Q} = \frac{\text{worke done}}{\text{charge}}$
3.	**Ohm's law**	$V = IR$; $R = \frac{V}{I}$
4.	**Electrical Resistivity (or)specific resistance**	$\rho = \frac{RA}{L}$
5.	**Conductance**	$G = \frac{1}{R} = \frac{1}{\text{resistance}}$
6.	**Conductivity**	$\sigma = \frac{1}{\rho} = \frac{1}{\text{resistivity}}$
7.	**Equivalent resistance in a series combinations**	$R_s = R_1 + R_2$
8.	**When 'n' resistors are connected in a series combinations**	$R_s = nR$; when 'n' resistors are connected in parallel. $R_p = \frac{R}{n}$

BIOLOGY

UNIT 12

Plant Anatomy and Plant Physiology

CONCEPT MAP



MUST KNOW DEFINITIONS

Tissues	:	Tissues are the group of cells that are similar or dissimilar in structure and origin, but perform similar function.
Vascular tissues	:	Xylem and phloem.
Stele	:	All tissues inner to endodermis constitute stele.
Casparian strip	:	The endodermal cells of roots show band like thickenings on their radial and inner tangential walls.
Mesophyll	:	The ground tissue that is present between both epidermal layers is called **mesophyll** in a dicot leaf.
Grana	:	Stack of thylakoids seen in stroma of chloroplast.
Plastids	:	Plastids are double membrane bound organelles found in plants and some algae.
Chloroplast	:	Chloroplasts are green plastids containing green pigment.
Light reaction	:	Phase of photosynthesis requiring the presence of light.
Dark reaction	:	Phase of photosynthesis which takes place in the absence of light.
Primary pigment	:	Chlorophyll 'a' molecules which trap solar energy.
Glycolysis	:	Breakdown of one molecule of glucose (6 carbon) into two molecules of pyruvic acid (3 carbon).
Oxysome	:	Racket shaped particles found in inner mitochondrial membrane and involved in ATP synthesis.
Accessory pigments	:	Chlorophyll 'b' and carotenoids which absorb solar energy and pass it to reaction centre (Chlorophyll 'a').
Photosynthetic pigments	:	Pigments involved in photosynthesis.
Ground tissue	:	The entire mass of parenchyma cells next to hypodermis and extending to the centre is called **ground tissue.**

TEXTBOOK EVALUATION

I. CHOOSE THE CORRECT ANSWER :

1. Casparian strips are present in the _____ of the root. *[GMQP-2019]*

(a) cortex (b) pith
(c) pericycle (d) endodermis

Ans: (d) endodermis

2. The endarch condition is the characteristic feature of

(a) root (b) stem
(c) leaves (d) flower

Ans: (b) stem

3. The xylem and phloem arranged side by side on same radius is called _____.

(a) radial (b) amphivasal
(c) conjoint (d) None of these

Ans: (c) conjoint

4. Which is formed during anaerobic respiration *[GMQP-2019; Sep-2020]*

(a) Carbohydrate
(b) Ethyl alcohol
(c) Acetyl CoA
(d) Pyruvate

Ans: (b) Ethyl alcohol

5. **Kreb's cycle takes place in** *[PTA-3; Qy-2019]*
(a) chloroplast
(b) mitochondrial matrix
(c) stomata
(d) inner mitochondrial membrane
Ans. **(b) mitochondrial matrix**

6. **Oxygen is produced at what point during photosynthesis?** *[PTA-4]*
(a) when ATP is converted to ADP.
(b) when CO_2 is fixed.
(c) when H_2O is splitted.
(d) All of these.
Ans. **(c) when H_2O is splitted**

II. Fill in the blanks :

1. The innermost layer of cortex in root is called _____.
Ans. **epidermis**

2. Xylem and phloem are arranged in an alternate radii constitute a vascular bundle called _____.
Ans. **Radial Bundles**

3. Glycolysis takes place in _____.
Ans. **cytoplasm**

4. The source of O_2 liberated in photosynthesis is _____.
Ans. **water**

5. _____ is ATP factory of the cells.
Ans. **Mitochondria**

III. State whether the statements are true or false. Correct the false statement :

1. **Phloem tissue is involved in the transport of water in plant.**
Ans. **False.**
Correct Statement : Phloem tissue is involved in the transport of **food** in plant.

2. **The waxy protective covering of a plant is called as cuticle.**
Ans. **True.**

3. **In monocot stem cambium is present in between xylem and phloem.**
Ans. **False.**
Correct Statement : In **dicot** stem, cambium is present between xylem and phloem.

4. **Palisade parenchyma cells occur below upper epidermis in dicot root.**
Ans. **False.**
Correct Statement : Palisade parenchyma cells occur below upper epidermis in dicot leaf.

5. **Mesophyll contains chlorophyll.**
Ans. **True.**

6. **Anaerobic respiration produces more ATP than aerobic respiration.**
Ans. **False.**
Correct Statement : Aerobic respiration produces more ATP than **anaerobic** respiration.

IV. Match the following :

1.	Amphicribral	-	*Dracaena*
2.	Cambium	-	Translocation of food
3.	Amphivasal	-	Fern
4.	Xylem	-	Secondary growth
5.	Phloem	-	Conduction of water

Ans.

1.	Amphicribal	-	Fern
2.	Cambium	-	Secondary growth
3.	Amphivasal	-	*Dracaena*
4.	Xylem	-	Conduction of water
5.	Phloem	-	Translocation of food

V. Answer in a sentence :

1. **What is collateral vascular bundle?**
Ans. Collateral vascular bundle is one type of conjoint vascular bundle in which xylem lies towards the centre and phloem lies towards the periphery.
(i) When cambium is present in collateral bundles it is called open. **Eg : Dicot stem.**
(ii) When collateral bundle without cambium is called closed. **Eg: Monocot stem.**

2. **Where does the carbon that is used in photosynthesis come from?**
Ans. The carbon that is used in photosynthesis comes from carbon dioxide from atmosphere.

3. **What is the common step in aerobic and anaerobic pathway?** *[PTA-5]*
Ans. Glycolysis is the common step in aerobic and anaerobic pathway.

4. Name the phenomenon by which carbohydrates are oxidized to release ethyl alcohol.

Ans. Fermentation or anaerobic respiration.

VI. Short answer questions :

1. Give an account on vascular bundle of dicot stem.

Ans. (i) Vascular bundles are conjoint, collateral, endarch and open.

(ii) They are arranged in the form of a ring around the pith.

2. Write a short note on mesophyll.

Ans. (i) The tissue present between the upper and lower epidermis of a dicot leaf is called **mesophyll.**

(ii) It is differentiated into Palisade parenchyma and Spongy parenchyma.

Palisade parenchyma :

(i) It is found just below the upper epidermis. The cells are elongated.

(ii) These cells have more number of chloroplasts.

(iii) The cells do not have intercellular spaces and they take part in photosynthesis.

Spongy parenchyma :

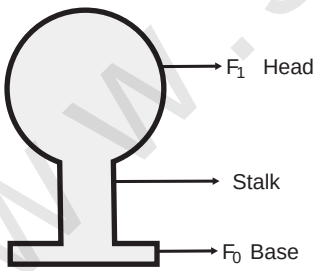
(i) It is found below the palisade parenchyma tissue.

(ii) Cells are almost spherical or oval and are irregularly arranged.

(iii) Cells have intercellular spaces. It helps in gaseous exchange.

3. Draw and label the structure of oxysomes.

Ans.



4. Name the three basic tissue system in flowering plants.

Ans. (i) Epidermal tissue system

(ii) Ground tissue system

(iii) Vascular tissue system

5. What is photosynthesis and where in a cell does it occur? *[PTA-3; Sep-2021]*

Ans. (i) Photosynthesis is a process by which autotrophic organisms like green plants, algae and chlorophyll containing bacteria utilize the energy from sunlight to synthesize their own food.

(ii) In this process, carbon dioxide combines with water in the presence of sunlight and chlorophyll to form carbohydrates and oxygen is released as a byproduct.

Carbon dioxide + Water ⟶ Glucose + Water + Oxygen

(iii) It occurs in the chloroplast of plant cells.

(iv) Light reaction occures in grana of chloroplast and dark reaction occurs in strong of chloroplast.

6. What is respiratory quotient? *[PTA-1; Sep-2021]*

Ans. (i) Respiratory quotient is the ratio of volume of carbon dioxide liberated and the volume of oxygen consumed during respiration.

(ii) It is expressed as

$$RQ = \frac{\text{Volume of } CO_2 \text{ liberated}}{\text{Volume of } O_2 \text{ consumed}}$$

7. Why should the light dependent reaction occur before the light independent reaction?

Ans. (i) During light dependent process photosynthetic pigments absorb the light energy, and convert it into chemical energy ATP and NADPH2. This reaction occurs in the presence of light in the grana of chloroplast.

(ii) During light independent reaction CO_2 is reduced into carbohydrates with the help of light generated ATP and $NADPH_2$. This occurs in stroma of chloroplast.

(iii) Thus light dependent reaction occurs before the light independent reaction.

8. Write the reaction for photosynthesis.

Ans. $6CO_2 + 12H_2O \xrightarrow[\text{chlorophyll}]{\text{Light}} C_6H_{12}O_6 + 6H_2O + 6O_2\uparrow$

Carbon dioxide + Water ⟶ Glucose + Water + Oxygen

VII. Long answer questions :

1. Differentiate the following

a) **Monocot root and Dicot root** *[Sep-2020]*

b) **Aerobic and Anaerobic respiration** *[GMQP-2019; Sep-2021]*

Ans. a) Monocot root and dicot root

S. No.	Tissues	Monocot Root	Dicot Root
1.	Number of Xylem	Polyarch	Tetrarch
2.	Cambium	Absent	Present (During secondary growth only)
3.	Secondary Growth	Absent	Present
4.	Pith	Present	Absent
5.	Conjunctive Tissue Ex.	Sclerenchyma Maize	Parenchyma Bean

b) Aerobic respiration and anaerobic Respiration:

S. No.	Aerobic Respiration	Anaerobic Respiration
1.	Organic food is completely oxidised with the help of oxygen.	Organic food is broken down in the absence of oxygen.
2.	Glucose is broken down into carbon dioxide, water and energy.	Glucose is converted into ethanol or lactic acid.
3.	Lot of energy is produced	Very small quantity of energy is produced
4.	It is a complex process and occurs in three major steps.	It is a simpler process.

2. Describe and name three stages of cellular respiration that aerobic organisms use to obtain energy from glucose.

Ans. Stages of aerobic respiration :

(a) Glycolysis (Glucose splitting) :

(i) It is the breakdown of one molecule of glucose (6 carbon) into two molecules of pyruvic acid (3 carbon).

(ii) It takes place in cytoplasm of the cell.

(b) Krebs Cycle :

(i) This cycle occurs in mitochondrial matrix.

(ii) At the end of glycolysis, 2 molecules of pyruvic acid enter into mitochondria.

(iii) The oxidation of pyruvic acid into CO_2 and water takes place through this cycle.

(iv) It is also called **Tricarboxylic Acid Cycle (TCA)**.

(c) Electron Transport Chain :

(i) This is accomplished through a system of electron carrier complex called **electron transport chain** (ETC) located on the inner membrane of the mitochondria.

(ii) $NADH_2$ and $FADH_2$ molecules formed during glycolysis and Krebs cycle are oxidised to NAD^+ and FAD^+ to release the energy via electrons.

(iii) The electrons, as they move through the system, release energy which is trapped by ADP to synthesize ATP. This is called **oxidative phosphorylation.**

(iv) In this process, O_2 the ultimate acceptor of electrons gets reduced to water.

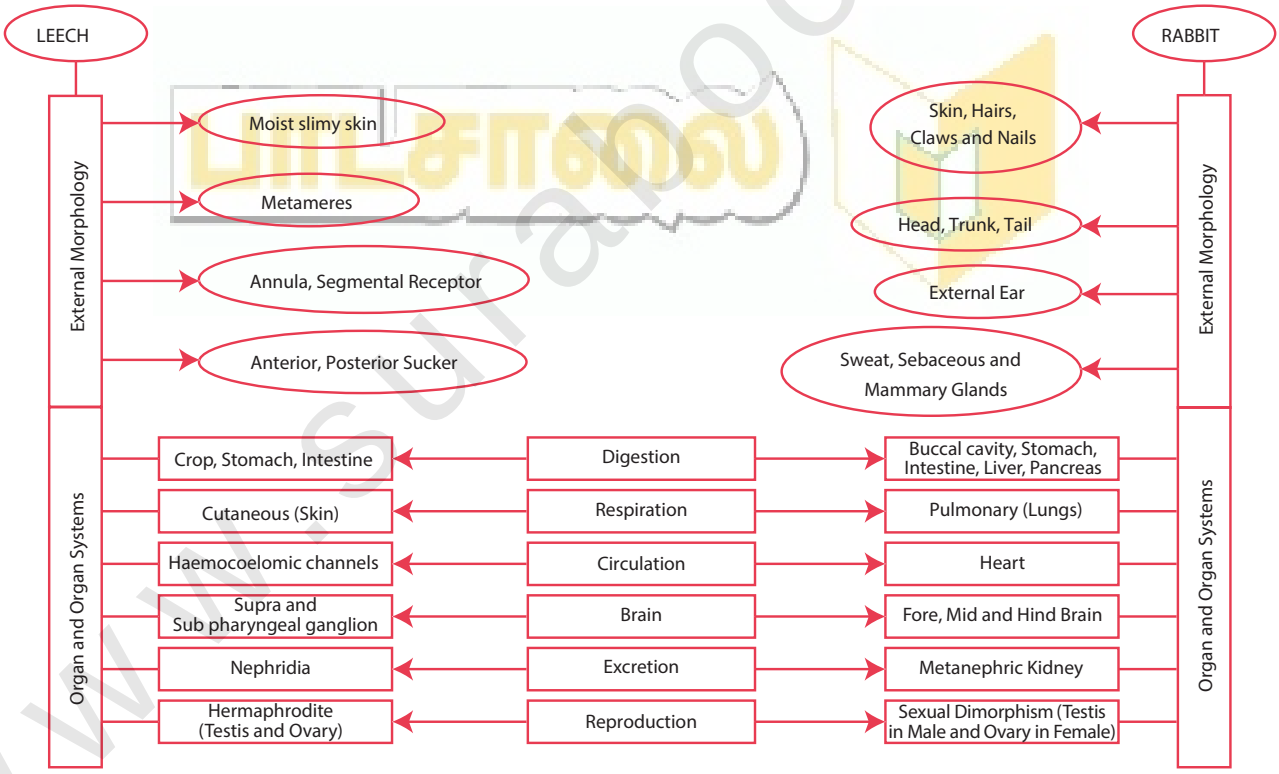
3. How does the light dependent reaction differ from the light independent reaction? What are the end product and reactants in each? Where does each reaction occur within the chloroplast?

S. No.	Light dependent reaction	Light Independent reaction
1.	It takes place in the presence of light and is called as Light **reaction of photosynthesis or Hill reaction.**	This takes place independent of the presence of light and is called dark **reaction of photosynthesis or biosynthetic phase.**
2.	It takes place in the grana of the chloroplast.	It takes place in the stroma of the chloroplast.
3.	Photosyntetic pigments absorb the light energy and convert it into chemical energy ATP and $NADPH_2$.	CO_2 from the atmosphere is reduced into carbohydrates with the help of light generated ATP and $NADPH_2$.
4.	The inputs are water, solar energy, photosynthetic pigments.	The inputs are CO_2 from the atmosphere and ATP and $NADPH_2$ from the light reaction.
5.	The end products are ATP and $NADPH_2$.	The end product is glucose.

UNIT 13

STRUCTURAL ORGANISATION OF ANIMALS

CONCEPT MAP



MUST KNOW DEFINITIONS

Heterodont	:	Occurrence of different types of teeth in an individual.
Diphyodont	:	Existence of two types of teeth in the life of an animal.
Hirudin	:	Protein present in saliva of leech which acts as an anticoagulant.
Cocoon	:	Egg case (E.g. leech).
Annelids	:	Phylum comprising of metamerically segmented worms with well developed organ systems.
Crop	:	Largest part of alimentary canal in leech.
Metamerism	:	Segmentation of the body in leech.
Sanguivorous	:	Blood sucking habit.
Nephridia	:	Segmentally arranged paired tubules which serve as excretory organs in leech.
Diastema	:	Gap between Incisors and Premolars in rabbit.
Caecum	:	Thin walled sac present at the junction of small intestine and large intestine in rabbit (Contains cellulose digesting bacteria).
Direct development	:	Young one resembles the adult.
Corpus callosum	:	The right and left cerebral hemispheres are connected by transverse band of nerve tissue called **corpus callosum.**
Epididymis	:	Network of tubules lead into a coiled tubule called **epididymis** in testis of Rabbit.
Ejaculatory duct	:	The epididymis leads to a short duct called **ejaculatory duct.**
Haemocoelic channels	:	The blood vessels are replaced by channels called **haemocoelic channels** or canals filled with blood like fluid in leech.

TEXTBOOK EVALUATION

I. CHOOSE THE CORRECT ANSWER:

1. In leech locomotion is performed by
(a) Anterior sucker
(b) Parapodia
(c) Setae
(d) Contraction and relaxation of muscles
Ans. (d) Contraction and relaxation of muscles

2. The segments of leech are known as
(a) Metameres (somites)
(b) Proglottids
(c) Strobila
(d) All the above **Ans. (a) Metameres (somites)**

3. Pharyngeal ganglion in leech is a part of
(a) Excretory system
(b) Nervous system
(c) Reproductive system
(d) Respiratory system **Ans. (b) Nervous system**

4. The brain of leech lies above the
(a) Mouth (b) Buccal Cavity
(c) Pharynx (d) Crop **Ans. (c) Pharynx**

5. The body of leech has
(a) 23 segments (b) 33 segments
(c) 38 segments (d) 30 segments
Ans. (b) 33 segments

6. Mammals are _____ animals
(a) Cold blooded (b) Warm blooded
(c) Poikilothermic (d) All the above
Ans. (b) Warm blooded

7. The animals which give birth to young ones are
(a) Oviparous (b) Viviparous
(c) Ovoviviparous (d) All the above
Ans. (b) Viviparous

II. Fill in the blanks :

1. The posterior sucker is formed by the fusion of the _____ segments. **Ans. last 7**
2. The existence of two sets of teeth in the life of an animal is called _____ dentition. **Ans. diphyodont**
3. The anterior end of leech has a lobe-like structure called _____ **Ans. anterior sucker**
4. The blood sucking habit of leech is known as _____. *[PTA-5]* **Ans. sanguivorous**
5. _____ separate nitrogenous waste from the blood in rabbit. **Ans. kidney**
6. _____ spinal nerves are present in rabbit. **Ans. 37 pairs**

III. Identify whether the statements are True or False. Correct the false statement :

1. **An anticoagulant present in saliva of leech is called heparin.**

Ans. False.
Correct Statement : Anticoagulant present in saliva of leech is called hirudin.

2. **The vas deferens serves to transport the ovum.** *[PTA-6]*

Ans. False.
Correct Statement : The vas deferens serves to transport the sperm.

3. **Diastema is a gap between premolar and molar teeth in rabbit.**

Ans. False.
Correct Statement : Diastema is a gap between incisors and premolar in rabbit.

4. **The cerebral hemispheres of rabbit are connected by band of nerve tissue called corpora quadrigemina.** *[PTA-6]*

Ans. False.
Correct Statement : The cerebral hemispheres of rabbit are connected by a band of nerve tissue called corpus callosum.

IV. Match columns I, II and III correctly :

Organs	Membranous Covering	Location
Brain	pleura	abdominal cavity
Kidney	capsule	mediastinum
Heart	meninges	enclosed in thoracic cavity
Lungs	pericardium	cranial cavity

Ans. *[PTA-2]*

Organs	Membranous Covering	Location
Brain	meninges	cranial cavity
Kidney	capsule	abdominal cavity
Heart	pericardium	mediastinum
Lungs	pleura	enclosed in thoracic cavity

V. Answer in a sentence :

1. **Give the common name of the *Hirudinaria granulosa*.**

Ans. Indian cattle leech is the common name of *Hirudinaria granulosa*.

2. **How does leech respire?** *[PTA-1]*

Ans. Leech respires through the skin.

3. **Write the dental formula of rabbit.**

Ans. $(I\ \frac{2}{1}, C\ \frac{0}{0}, PM\ \frac{3}{2}, M\ \frac{3}{3})$. *[GMQP-2019, Qy-2019]*

4. **How many pairs of testes are present in leech?**

Ans. 11 pairs of testes are present in leech.

5. **How is diastema formed in rabbit?** *[PTA-6; Qy-2019]*

Ans. The gap between the incisors and premolar is called diastema. It helps in mastication and chewing of food.

6. **What organs are attached to the two bronchi?**

Ans. Lungs are attached to the two bronchi.

7. **Which organ acts as suction pump in leech?**

Ans. Muscular pharynx acts as suction pump in leech.

8. **What does CNS stand for?**

Ans. Central Nervous System.

9. Why is the teeth of rabbit called heterodont? *[PTA-4]*

Ans. Different types of teeth are present. (Incisors, Premolars & Molars). Hence it is called heterodont.

10. How does leech suck blood from the host? *[PTA-2]*

Ans. Muscular pharynx helps the leech to suck blood from the host.

VI. Short Answer Questions :

1. Why are the rings of cartilages found in trachea of rabbit? *[PTA-4; Sep-2020]*

Ans. Trachea is the wind pipe. Tracheal walls are supported by rings of cartilage which help in the free passage of air.

2. List out the parasitic adaptations in leech. *[GMQP-2019]*

Ans. Leeches lead a parasitic mode of life by sucking the blood of vertebrates, and show several important modifications in their structure.

(i) Blood is sucked by pharynx.

(ii) Anterior and posterior ends of the body are provided with suckers by which the animal attaches itself to the body of the host.

(iii) The three jaws inside the mouth, causes a painless Y-shaped wound in the skin of the host.

(iv) The salivary glands produce hirudin which does not allow the blood to coagulate. Thus, a continuous supply of the blood is maintained.

(v) Parapodia and setae are completely absent

(vi) Blood is stored in the crop gives nourishment to the leech for several months.

VII. Long Answer Questions :

1. How is the circulatory system designed in leech to compensate the heart structure?

Ans. (i) In leech, circulation is brought about by **haemocoelic system.**

(ii) There are no true blood vessels.

(iii) The blood vessels are replaced by channels called **haemocoelic channels or canals** filled with blood-like fluid.

(iv) The coelomic fluid contains haemoglobin.

(v) There are four longitudinal channels. One channel lies above (dorsal) the alimentary canal, one below (ventral) the alimentary canal.

(vi) The other two channels lie on either (lateral) side of the alimentary canal which serve as heart and have inner valves.

(vii) All the four channels are connected together posteriorly in the 26th segment.

2. How does locomotion take place in leech? *[PTA-5]*

Ans. Locomotion in leech takes place by (i) looping or crawling movement (ii) Swimming movement.

(i) **Looping or Crawling movement :**

- This movement is brought about by the contraction and relaxation of muscles.
- The two suckers serve for attachment during movement on a substratum.

(ii) **Swimming movement :**

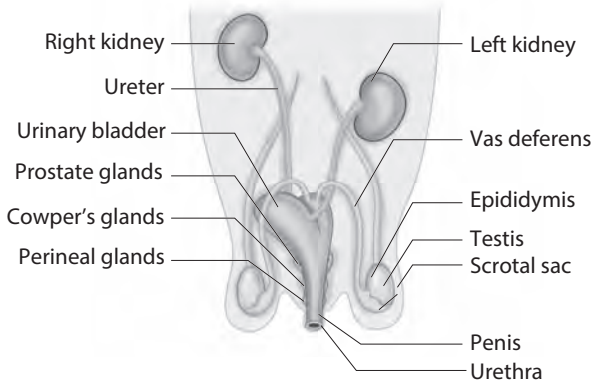
Leeches swim very actively and perform undulating movements in water.

Hint: Undulating movement: It is a flowing up and down movement like the motion of waves.

3. Explain the male reproductive system of rabbit with a labelled diagram. *[Qy-2019]*

Ans. Male Reproductive system :

(i) Consists of a pair of testes which are ovoid in shape.



Male reproductive system of Rabbit

(ii) Testes are enclosed by scrotal sacs in the abdominal cavity.

(iii) Each testis consists of numerous fine tubules called **seminiferous tubules**.

(iv) This network of tubules lead into a coiled tubule called **epididymis**, which lead into the sperm duct called **vas deferens**.

(v) The vas deferens join in the urethra just below the urinary bladder.

(vi) The urethra runs backward and passes into the penis.

(vii) There are three accessory glands namely **prostate gland, cowper's gland and perineal gland.** Their secretions are involved in reproduction.

VIII. Higher Order Thinking Skills (HOTS) :

1. Arjun is studying in tenth standard. He was down with fever and went to meet the doctor. As he went to the clinic he saw a patient undergoing treatment for severe leech bite. Being curious, Arjun asked the doctor why leech bite was not felt as soon as it attaches to the skin? What would have been the reply given by the doctor?

Ans. **The doctor would have explained to Arjun as follows :**

Leeches inject an anaesthetic substance that prevents the host from feeling their bite. They also prevent blood clotting by secreting a protein called hirudin. Thus the person who is bit by the leech will feel the pain only ofter a long time.

2. Shylesh has some pet animals at his home. He has few rabbits too, one day while feeding them he observed something different with the teeth. He asked his grandfather, why is it so? What would have been the explanation of his grandfather?

Ans. Shylesh observed that in Rabbits there was a gap between incisor and premolars. This is called **diastema.** This is due to absence of canines since rabbit is herbivorous in nutrition. Canines are teeth needed for flesh eating animals. His Grandfather explained to him that the diastema also helps in mastication and chewing of food in herbivorous animals.

IX. Value based Questions :

1. Leeches do not have an elaborate secretion of digestive juices and enzymes - Why?

Ans. (i) The leech is sangivorous in habit, sucking the blood of cattle and other domestic animals.

(ii) Digestion takes place in stomach by the action of **proteolytic enzyme.**

(iii) The digested blood is then absorbed slowly by the intestine.

(iv) Blood is stored in the crop gives nourishment to the leech for several months.

(v) Due to this reason, there is no elaborate secretion of the digestive juices and enzymes.

2. How is the digestive system of rabbit suited for herbivorous mode of feeding? *[PTA-3]*

Ans. (i) The digestive system of rabbit includes the alimentary canal and digestive gland.

(ii) The alimentary canal consists of mouth, buccal cavity, pharnyx, oesophagus, stomach, small intestine, caecum, large intestine and anus. The digestive system is suited to the herbivorous mode of nutrition seen in rabbit.

(iii) Caecum is a thin walled sac present at the junction of small intestine and large intestine. It contains bacteria that helps in digestion of cellulose.

(iv) In rabbit the teeth are of different types. Hence, the dentition is called heterodont.

(v) There are three kinds of teeth in rabbits.

(vi) In rabbit it is written as $\frac{2033}{1023}$. Canines are absent. The gap between the incisors and premolar is called **diastema.** It helps in mastication and chewing of food in herbivorous animals.

PTA Questions & Answers

2 MARKS

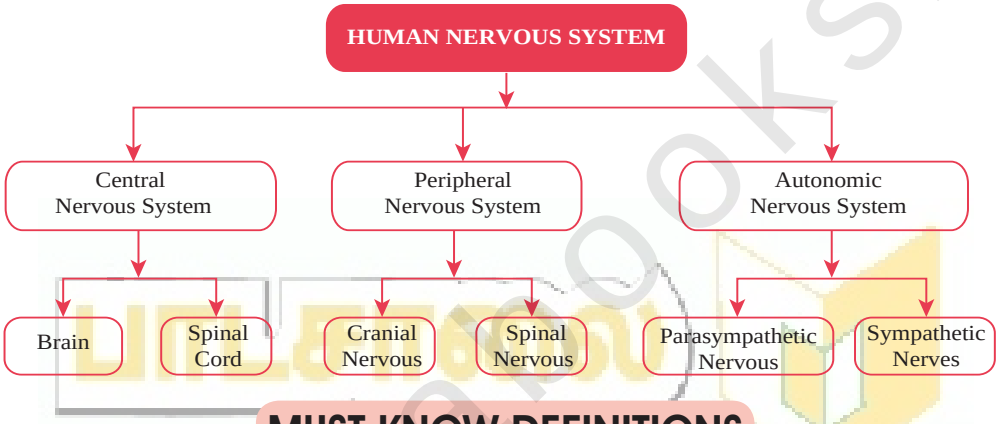
1. What are the glands embedded in the Rabbit skin to regulate the body temperature? *[PTA-3]*

Ans. The sweat glands and sebaceous glands embedded in the skin regulate the body temperature.

UNIT 15

NERVOUS SYSTEM

CONCEPT MAP



MUST KNOW DEFINITIONS

Stimulus	:	'Stimulus' refers to the changes in the environmental conditions, that are detected by receptors present in the body.
Neuron	:	Structural and functional unit of nervous system.
Cyton	:	Cell body of neuron.
Myelin sheath	:	Protective sheath which covers the axons of a neuron.
Synapse	:	Junction between synaptic knob of axon of one neuron and dendron of next neuron.
Sensory neuron	:	Neurons which carry impulses from sense organ to the central nervous system.
Motor neuron	:	Neuron which carry impulses from central nervous system to effector organ.
Association neuron	:	Neurons which conduct impulses between sensory and motor neurons.
Neuro transmitter	:	Chemicals which allow the transmission of nerve impulses from axon terminal of one neuron to dendron of another neuron.
Meninges	:	Membranes covering the brain and spinal cord.
EFA	:	Essential fatty acids - Molecules which determine our brain's ability.
CSF	:	Cerebrospinal Fluid
Reflex action	:	An action / response that occurs automatically without consciousness.
Reflex arc	:	The pathway taken by nerve impulse to accomplish reflex action.
EEG	:	Electroencephalogram
Neuroglia	:	They are non-exciting, supporting cell of the nervous system. They do not initiate or conduct nerve impulses.

TEXTBOOK EVALUATION

I. CHOOSE THE CORRECT ANSWER :

1. **Bipolar neurons are found in** *[Qy-2019]*
(a) retina of eye (b) cerebral cortex
(c) embryo
(d) respiratory epithelium **Ans. (a) retina of eye**

2. **Site for processing of vision, hearing, memory, speech, intelligence and thought is**
(a) kidney (b) ear
(c) brain (d) lungs
Ans. (c) brain

3. **In reflex action, the reflex arc is formed by**
(a) brain, spinal cord, muscle
(b) receptor, muscle, spinal cord
(c) muscle, receptor, brain
(d) receptor, spinal cord, muscle
Ans. (d) receptor, spinal cord, muscle

4. **Dendrites transmit impulse _____ cell body and axon transmit impulse _____ cell body.**
(a) away from, away from
(b) towards, away from
(c) towards, towards
(d) away from, towards
Ans. (b) towards, away from

5. **The outer most of the three cranial meninges is**
(a) arachnoid membrane (b) piamater
(c) duramater (d) myelin sheath
Ans. (c) duramater

6. **There are _____ pairs of cranial nerves and _____ pairs of spinal nerves.**
(a) 12, 31 (b) 31,12
(c) 12, 13 (d) 12, 21
Ans. (a) 12, 31

7. **The neurons which carries impulse from the central nervous system to the muscle fibre.**
(a) afferent neurons
(b) association neuron
(c) efferent neuron
(d) unipolar neuron **Ans. (c) efferent neuron**

8. **Which nervous band connects the two cerebral hemispheres of brain?** *[PTA-5]*
(a) thalamus (b) hypothalamus
(c) corpus callosum (d) pons
Ans. (c) corpus callosum

9. **Node of Ranvier is found in** *[Sep-2020]*
(a) muscles (b) axons
(c) dendrites (d) cyton
Ans. (b) axons

10. **Vomiting centre is located in**
(a) medulla oblongata (b) stomach
(c) cerebrum (d) hypothalamus
Ans. (a) medulla oblongata

11. **Nerve cells do not possess**
(a) neurilemma (b) sarcolemma
(c) axon (d) dendrites
Ans. (b) sarcolemma

12. **A person who met with an accident lost control of body temperature, water balance, and hunger. Which of the following part of brain is supposed to be damaged?**
(a) Medulla oblongata (b) cerebrum
(c) pons (d) hypothalamus
Ans. (d) hypothalamus

II. FILL IN THE BLANKS :

1. ____ is the longest cell in our body. **Ans. Neuron**
2. Impulses travels rapidly in _____ neurons.
Ans. myelinated
3. A change in the environment that causes an animal to react is called _____. **Ans. stimulus**
4. ____ carries the impulse towards the cell body.
Ans. Dendrite
5. The two antagonistic component of autonomic nervous system are _____ and _____.
Ans. sympathetic nerves, para sympathetic nerves
6. A neuron contains all cell organelles except_____.
Ans. centrioles
7. _____ maintains the constant pressure inside the cranium. **Ans. Cerebro spinal fluid**
8. _____ and _____ increases the surface area of cerebrum. **Ans. Sulci, gyri**
9. The part of human brain which acts as relay center is _____. *[PTA-1]* **Ans. thalamus**

III. State whether true or false, if false write the correct statement:

1. **Dendrons are the longest fibres that conducts impulses away from the cell body.**

Ans. False.
Correct Statement : Dendrone are the longest fibres and they conduct impulses towards cell body.

Hint: **Axon are the largest fibres that conducts impulse away from the cell body.**

2. **Sympathetic nervous system is a part of central nervous system.** *[PTA-3]*

Ans. False.
Correct Statement : Sympathetic nervous system is a part of autonomous nervous system.

3. **Hypothalamus is the thermoregulatory centre of human body.**

Ans. True.

4. **Cerebrum controls the voluntary actions of our body.**

Ans. False.
Correct Statement : Cerebellum controls the voluntary actions of our body.

5. **In the central nervous system myelinated fibres form the white matter.**

Ans. True.

6. **All the nerves in the body are covered and protected by meninges.** *[PTA-3]*

Ans. False.
Correct Statement : The brain and spinal cord are covered and protected by meninges.

7. **Cerebrospinal fluid provides nutrition to brain.**

Ans. True.

8. **Reflex arc allows the rapid response of the body to a stimulus.**

Ans. True.

9. **Pons helps in regulating respiration.**

Ans. True.

IV. Match the following :

	Column I	Column II
A.	Nissil's granules	Forebrain
B.	Hypothalamus	Peripheral Nervous system
C.	Cerebellum	Cyton
D.	Schwann cell	Hindbrain

Ans.

	Column I	Column II
A.	Nissil's granules	Cyton
B.	Hypothalamus	Forebrain
C.	Cerebellum	Hindbrain
D.	Schwann cell	Peripheral Nervous system

V. Understand the assertion statement. Justify the reason given and choose the correct choice :

(a) Assertion is correct and reason is wrong
(b) Reason is correct and the assertion is wrong
(c) Both assertion and reason are correct
(d) Both assertion and reason are wrong

1. **Assertion:** Cerebrospinal fluid is present throughout the central nervous system.
Reason: Cerebrospinal fluid has no such functions.

Ans. **(a) Assertion is correct and reason is wrong**

2. **Assertion:** Corpus callosum is present in space between the duramater and piamater.
Reason: It serves to maintain the constant intracranial pressure.

Ans. **(d) Both assertion and reason are wrong**

VI. Short answer questions :

1. **Define stimulus.**

Ans. 'Stimulus' refers to the changes in the environmental condition, that are detected by receptors present in the body.

2. **Name the parts of the hind brain.** *[PTA-2]*

Ans. It is formed of three parts cerebellum, pons and medulla oblongata.

3. What are the structures involved in the protection of brain? *[PTA-4]*

Ans. The brain is covered and protected by three connective tissue membranes or meninges :

(i) Outer Duramater
(ii) Middle arachnoid
(iii) Inner piamater

It protects the brain from mechanical injury.

4. Give an example for conditioned reflexes.

Ans. Playing a harmonium by striking a particular key on seeing a music note is an example of conditioned reflex.

5. Which acts as a link between the nervous system and endocrine system?

Ans. **Hypothalamus of the fore brain** acts as a link between nervous and endocrine system.

6. Define reflex arc. *[PTA-4]*

Ans. The pathway taken by nerve impulse to accomplish reflex action is called **reflex arc**.

VII. Differentiate Between :

1. Voluntary and involuntary actions. *[PTA-5]*

Ans.

	Voluntary actions	involuntary actions
1.	Actions performed with our will and control.	Actions performed without our control.
2.	They are controlled by the cerebellum.	They are controlled by the medulla and spinal cord.
3.	**Eg:** Writing, Speaking	**Eg:** Heart beat, Peristalsis

2. Medullated and non-medullated nerve fibre.

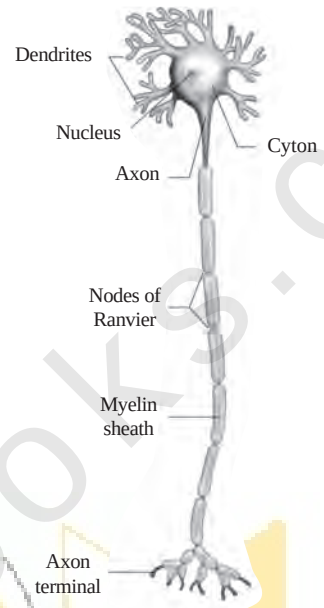
Ans.

	Medullated nerve fibre	Non-medullated nerve fibre
1.	The axon is covered with myelin sheath.	The axon is not covered with myelin sheath.
2.	It forms the white matter of the brain	It forms the grey matter of the brain

VIII. Long Answer Questions :

1. With a neat labelled diagram explain the structure of a neuron. *[GMQP-2019; Qy-2019]*

Ans.



Structure of Neuron

A neuron typically consists of three basic parts: **Cyton, Dendrites** and **Axon.**

(i) **Cyton :**
- (a) Cyton is also called **cell body** or **perikaryon**.
- (b) It has a central nucleus with abundant cytoplasm called **neuroplasm**.
- (c) The cytoplasm has large granular body called **Nissl's granules** and the other cell organelles like mitochondria, ribosomes, lysosomes, and endoplasmic recticulum.
- (d) Neurons do not have the ability to divide.

(ii) **Dendrites :**
- (a) These are the numerous branched cytoplasmic processes that project from the surface of the cell body. They conduct nerve impulses towards the cyton.
- (b) The branched projections increase the surface area for receiving the signals from other nerve cells.

(iii) **Axon :**

(a) The axon is a single, elongated,slender projection.

(b) The end of axon terminates as fine branches which terminate into knob like swellings called **synaptic knob**.

(c) The plasma membrane of axon is called **axolemma**, while the cytoplasm is called **axoplasm**. It carries impulses away from the cyton.

(d) The axons may be covered by a protective sheath called **myelin sheath** which is further covered by a layer of **Schwann cells** called **neurilemma**.

(e) Myelin sheath breaks at intervals by depressions called **Nodes of Ranvier**.

(f) The region between the nodes is called as **internode**.

(g) Myelin sheath acts as insulator and ensures rapid transmission of nerve impulses.

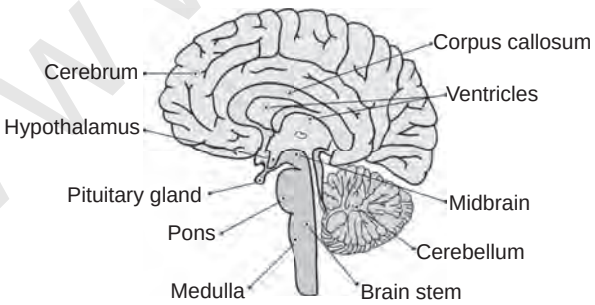
(iv) **Synapse :**

(a) A junction between synaptic knob of axon of one neuron and dendron of next neuron is called **synaptic junction**.

(b) Information from one neuron can pass to another neuron through these junctions with the release of chemicals known as **neurotransmitters** from the synaptic knob.

2. Illustrate the structure and functions of brain. *[PTA-1; Qy-2019]*

Ans. A human brain is formed of three main parts: (a) forebrain (b) midbrain and (c) hindbrain.



L.S of Human Brain

Forebrain : The forebrain is formed of **cerebrum** and **diencephalon**. Diencephalon consists of dorsal thalamus and ventral hypothalamus.

Cerebrum :

(i) It is the largest portion forming nearly two-third of the brain.

(ii) The cerebrum is longitudinally divided into two halves called **cerebral hemispheres** by a deep cleft which are interconnected by **thick band of nerve fibres called corpus callosum**.

(iii) The outer portion of each cerebral hemisphere is formed of grey matter and is called **cerebral cortex**.

(iv) The inner or deeper part is formed of white matter and is called **cerebral medulla**.

(v) The cortex is extremely folded forming elevations called **gyri** with depressions between them termed as **sulci** that increase its surface area.

(vi) The cerebrum is also responsible for the thinking, intelligence, consciousness, memory, imagination, reasoning and willpower.

Thalamus: It is present in cerebral medulla is a major conducting centre for sensory and motor signalling. It acts as a **relay centre**.

Hypothalamus :

(i) It lies at the base of the thalamus.

(ii) It controls involuntary functions like hunger, thirst, sleep, sweating, sexual desire, anger, fear, water balance, blood pressure etc.

(iii) It acts as a **thermoregulatory** (temperature control) **center** of the body.

(iv) It controls the secretion of hormones from anterior pituitary gland and is an important link between nervous system and endocrine system.

Midbrain :

(i) It is located between thalamus and hind brain.

(ii) It consists of four rounded bodies called **corpora quadrigemina** that control visual and auditory (hearing) reflexes.

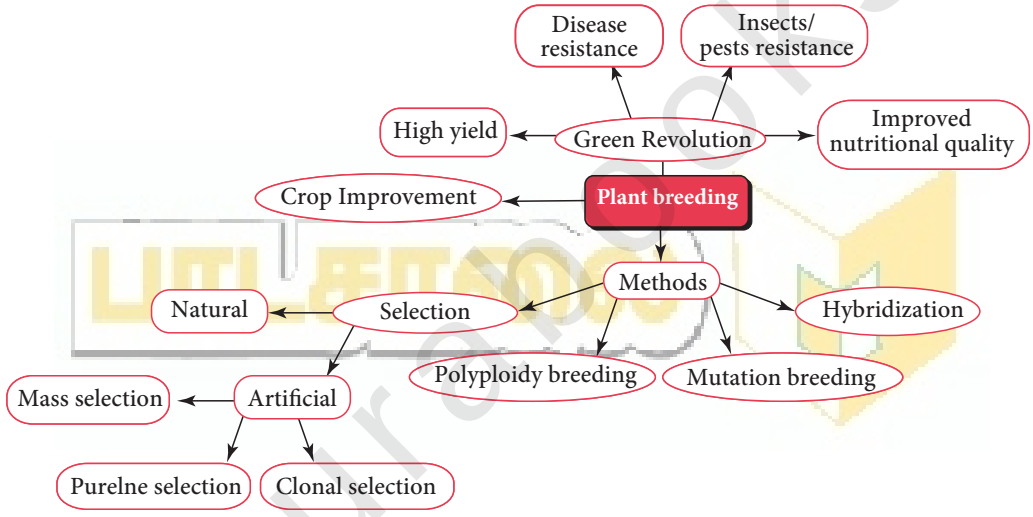
Hindbrain: It is formed of three parts **cerebellum, pons** and **medulla oblongata**.

UNIT 20

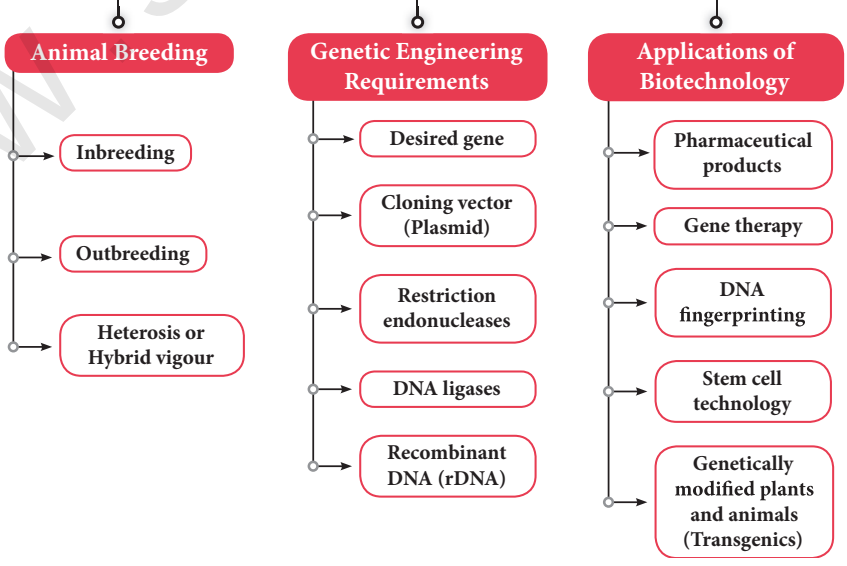
BREEDING AND BIOTECHNOLOGY

CONCEPT MAP

Plant Breeding



Animal Breeding and Biotechnology



MUST KNOW DEFINITIONS

Plant breeding	:	**Plant breeding** is the art of developing economically important plants with superior quality.
Biofortification	:	Scientific process of developing crop plants enriched with high levels of desirable nutrients.
Exotic species	:	Plant / animal species introduced from other countries.
Mass selection	:	Seeds of best plants showing desired characters are collected from a mixed population.
Pureline	:	Pureline is "the progeny of a single individual obtained by self breeding".
Polyploid	:	An organism having more than two sets of chromosomes.
Mutation	:	Sudden **heritable change** in the nucleotide sequence of DNA is an organism.
Mutagen	:	Factors which induce mutation.
Triticale	:	First man made cereal hybrid by crossing rye and wheat.
Hybridization	:	The process of crossing two or more types of plants for bringing their desired characters together into one progeny called **hybrid**.
Inbreeding	:	The **mating of closely related animals within the same breed** for about 4-6 generations.
Outbreeding	:	Breeding of unrelated animals.
Heterosis / hybrid vigour	:	The superiority of the hybrid obtained by cross breeding.
rDNA	:	Recombinant DNA got by combining DNA from two different sources by genetic engineering.
Restriction enzyme	:	Enzymes which cut or break DNA at specific sites.
DNA ligase	:	Enzymes which help to join the broken DNA fragments.
Gene therapy	:	**Gene therapy** refers to the replacement of defective gene by the direct transfer of functional genes into humans to treat genetic disease or disorder.
Stem cells	:	They are undifferentiated or unspecialised cells and have the ability to give rise to specialised cells.
DNA fingerprinting	:	A technique to compare genetic differences among two individuals by analysing unique DNA sequences of an individual.
Genetically modified organisms	:	**Genetic modification** refers to the alteration or manipulation of genes in the organisms using rDNA techniques in order to produce the desired characteristics.
Transgenic organisms	:	Plants or animals expressing a modified endogenous gene or a foregin gene.

TEXTBOOK EVALUATION

I. Choose the correct answer :

1. **Which method of crop improvement can be practised by a farmer if he is inexperienced?**
(a) clonal selection (b) mass selection
(c) pureline selection (d) hybridisation
Ans. (b) mass selection

2. **Pusa Komal is a disease resistant variety of _____ .** *[Sep-2021]*
(a) sugarcane (b) rice
(c) cow pea (d) maize
Ans. (c) cow pea

3. **Himgiri developed by hybridisation and selection for disease resistance against rust pathogens is a variety of _____.**
(a) chilli (b) maize
(c) sugarcane (d) wheat
Ans. (d) wheat

4. **The miracle rice which saved millions of lives and celebrated its 50th birthday is _____**
(a) IR 8 (b) IR 24
(c) Atomita 2 (d) Ponni
Ans. (a) IR 8

5. **Which of the following is used to produce products useful to humans by biotechnology techniques?**
(a) enzyme from organism
(b) live organism
(c) vitamins
(d) both (a) and (b) Ans. (d) both (a) and (b)

6. **We can cut the DNA with the help of**
(a) scissors *[PTA-2; Sep-2020]*
(b) restriction endonucleases
(c) knife
(d) RNAase
Ans. (b) restriction endonucleases

7. **rDNA is a**
(a) vector DNA
(b) circular DNA
(c) recombinant of vector DNA and desired DNA
(d) satellite DNA
Ans. (c) recombinant of vector DNA and desired DNA

8. **DNA fingerprinting is based on the principle of identifying _____ sequences of DNA**
(a) single stranded (b) mutated *[PTA-5]*
(c) polymorphic (d) repetitive
Ans. (d) repetitive

9. **Organisms with modified endogenous gene or a foreign gene are also known as**
(a) transgenic organism
(b) genetically modified
(c) mutated
(d) both a and b Ans. (d) both a and b

10. **In a hexaploid wheat ($2n = 6x = 42$) the haploid (n) and the basic (x) number of chromosomes respectively are**
(a) $n = 7$ and $x = 21$ (b) $n = 21$ and $x = 21$
(c) $n = 7$ and $x = 7$ (d) $n = 21$ and $x = 7$
Ans. (d) $n = 21$ and $x = 7$

II. Fill in the blanks :

1. Economically important crop plants with superior quality are raised by _____ .
Ans. plant breeding

2. A protein rich wheat variety is _____ .
Ans. Atlas 66

3. _____ is the chemical used for doubling the chromosomes. Ans. Colchicine

4. The scientific process which produces crop plants enriched with desirable nutrients is called _____.
Ans. Bio-fortification

5. Rice normally grows well in alluvial soil, but _____ is a rice variety produced by mutation breeding that grows well in saline soil.
[Sep-2021] Ans. atomita 2

6. _____ technique made it possible to genetically engineer living organism.
Ans. Recombinant DNA

7. Restriction endonucleases cut the DNA molecule at specific positions known as _____ .
Ans. restriction site

8. Similar DNA fingerprinting is obtained for _____. Ans. identical twins

9. _____ cells are undifferentiated mass of cells.
Ans. stem

10. In gene cloning, the DNA of interest is integrated in a _____ .
Ans. vector

III. State whether true or false. If false, write the correct statement :

1. ***Raphano brassica*** **is a man-made tetraploid produced by colchicine treatment.**
Ans. True.

2. **The process of producing an organism with more than two sets of chromosome is called mutation.**
Ans. False.
Correct Statement : The process of producing an organism with more than two sets of chromosome is called polyploidy.

3. **A group of plants produced from a single plant through vegetative or asexual reproduction are called a pureline.**
Ans. False.
Correct Statement : A group of plants produced from a single plant through vegetative or asexual reproduction are called a Clone.

4. **Iron fortified rice variety determines the protein quality of the cultivated plant.**
Ans. False.
Correct Statement : Amino acid rich fortified rice variety containing more amino acids determines the protein quality of the cultivated plant.

5. **Golden rice is a hybrid.**
Ans. False.
Correct Statement : Golden rice is a genetically modified plant.

6. **Bt gene from bacteria can kill insects.**
Ans. True.

7. ***In vitro fertilisation*** **means the fertilisation done inside the body.**
Ans. False.
Correct Statement : In vitro fertilisation means the fertilisation taking place outside the body by artificial means.

8. **DNA fingerprinting technique was developed by Alec Jeffrey.**
Ans. True.

9. **Molecular scissors refers to DNA ligases.**
Ans. False.
Correct Statement : Molecular scissors refers to restriction endonucleases.

IV. Match the following :

	Column A		Column B
1.	Sonalika	-	*Phaseolus mungo*
2.	IR 8	-	Sugarcane
3.	Saccharum	-	Semi-dwarf wheat
4.	Mung No. 1	-	Ground nut
5.	TMV – 2	-	Semi-dwarf Rice
6.	Insulin	-	*Bacillus thuringienesis*
7.	Bt toxin	-	Beta carotene
8.	Golden rice	-	first hormone produced using rDNA technique

Ans.

	Column A		Column B
1.	Sonalika	-	Semi-dwarf wheat
2.	IR 8	-	Semi-dwarf Rice
3.	Saccharum	-	Sugarcane
4.	Mung No. 1	-	*Phaseolus mungo*
5.	TMV – 2	-	Ground nut
6.	Insulin	-	first hormone produced using rDNA technique
7.	Bt toxin	-	*Bacillus thuringienesis*
8.	Golden rice	-	Beta carotene

V. Understand the assertion statement, justify the reason given and choose the correct choice.

(a) Assertion is correct and reason is wrong.
(b) Reason is correct and the assertion is wrong.
(c) Both assertion and reason is correct.
(d) Both assertion and reason is wrong.

1. Assertion: Hybrid is superior than either of its parents.
Reason: Hybrid vigour is lost upon inbreeding.
Ans. (a) Assertion is correct and reason is wrong

2. **Assertion:** Colchicine reduces the chromosome number. *[PTA-2]*
Reason: It promotes the movement of sister chromatids to the opposite poles.
Ans. (d) Both assertion and reason is wrong

3. **Assertion:** rDNA is superior over hybridisation techniques. *[PTA-4]*
Reason: Desired genes are inserted without introducing the undesirable genes in target organisms.
Ans. (c) Both assertion and reason is correct

VI. Answer in a sentence :

1. **Give the name of wheat variety having higher dietary fibre and protein.**
Ans. Triticale (6n)

2. **Semi-dwarf varieties were introduced in rice. This was made possible by the presence of dwarfing gene in rice. Name this dwarfing gene.**
Ans. The dwarfing gene was got from a dwarf variety of rice from China, named Dee-geo-woo-gen (DGWG).

3. **Define genetic engineering.**
Ans. Genetic engineering is the manipulation and transfer of genes from one organism into another to create a new DNA called as **recombinant DNA** (rDNA).

4. **Name the types of stem cells.** *[PTA-2]*
Ans. Embryonic stem cells and Somatic stem cell.

5. **What are transgenic organisms?** *[PTA-6]*
Ans. (i) The DNA fragment inserted is called **transgene.** Plants or animals expressing a modified endogenous gene or a foreign gene are known as **transgenic organisms.**

6. **State the importance of biofertilizer.**
Ans. The term biofertilizer denotes all nutrient inputs of biological origin for plant growth.
Eg: Artificial inoculation of rice with cyanobacteria to increase soil fertility.
Significance :
(i) They are ecofriendly.
(ii) They do not cause pollution like artificial fertilizers.
(iii) Help to safeguard natural resources.
(iv) They are cheaper and economical.

VII. Short Answer Questions :

1. **Discuss the method of breeding for disease resistance.** *[PTA-6]*

Crop	Variety	Resistance to diseases
Wheat	Himgiri	Leaf and stipe rust, hill bunt
Cauliflower	Pusa Shubhra, Pusa Snowball K-1	Black rot
Cowpea	Pusa Komal	Bacterial blight

2. **Name three improved characteristics of wheat that helped India to achieve high productivity.** *[PTA-4]*
Ans.

S. No.	Varieties of wheat	Characteristics
1.	Himgiri	Disease resistant variety - Resistant to disease like leaf and stipe rust, hill bunt.
2.	Atlas 66	Protein rich wheat variety.
3.	Sonalika, Kalyan Sona	High yielding semi-dwarf wheat variety.

The above mentioned characteristics seen in different varieties of wheat helped India to achieve high productivity.

3. **Name two maize hybrids rich in amino acid lysine.** *[GMQP-2019]*
Ans. Shakti, Rathna, Protina are maize hybrids rich in amino acid lysine.

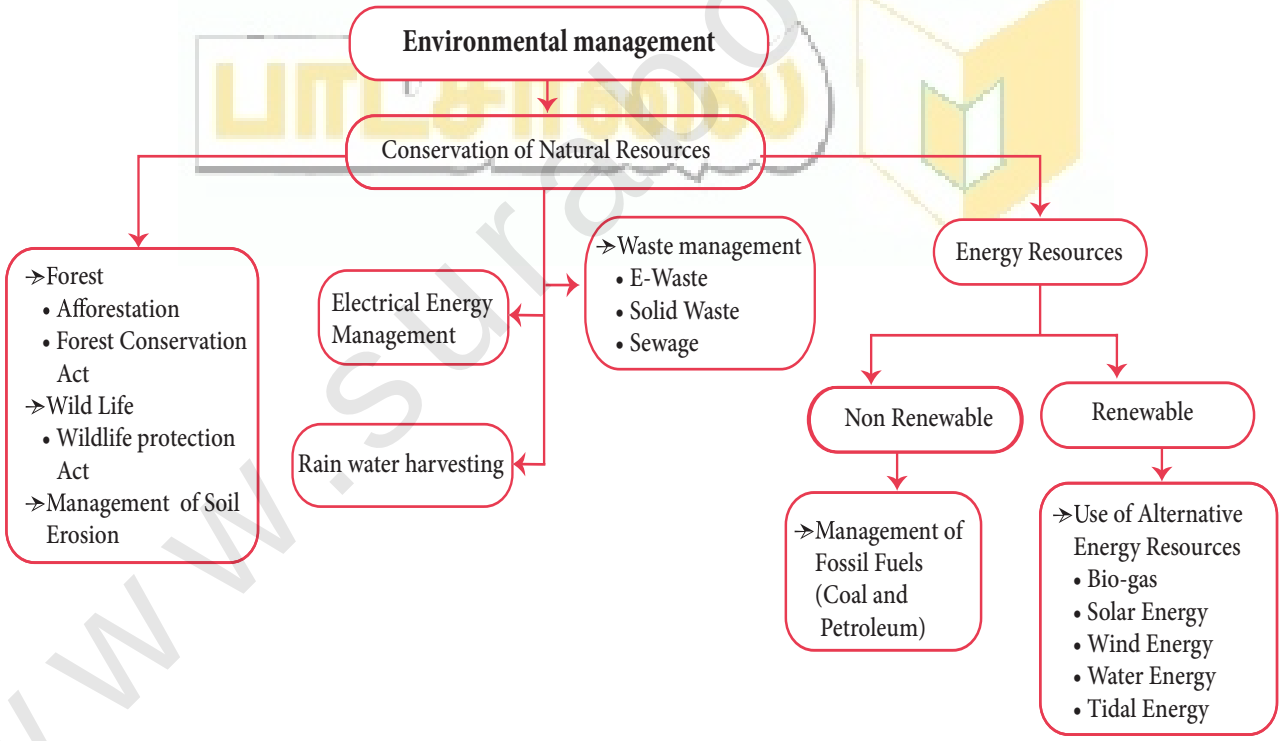
4. **Distinguish between**
a. **somatic gene therapy and germ line gene therapy.** *[PTA-1; Sep-2021]*
b. **undifferentiated cells and differentiated cells.**
Ans. a. Somatic gene therapy and germ line gene therapy :

S. No.	Somatic gene therapy	Germ line gene therapy
1.	It is the replacement of defective gene in somatic cells.	It is the replacement of defective gene in germ cells (egg and sperm).
2.	It is only beneficial to the patient but not carried to the next generation.	The gene can be carried to the next generation but till date only somatic gene therapy has been targeted.

UNIT 22

ENVIRONMENTAL MANAGEMENT

CONCEPT MAP



MUST KNOW DEFINITIONS

Habitat	:	The natural home of an animal, plant or other organism
Resources	:	All the land, forests, energy sources and minerals existing naturally in a place that can be used by people.
Conservation	:	Protection of plants and animals, natural areas, important buildings from the damaging effects of human activity.
Soil erosion	:	Displacement of upper layer of soil from one place to another
Renewable energy	:	Source of energy that is not depleted when used, such as wind and solar energy.
Fossil fuels	:	Formed by anaerobic decomposition of buried dead organism over millions of years (coal and petroleum).
Sewage	:	Waste water generated from domestic and industrial process
Shale	:	Soft finely stratified sedimentary rock that is formed from the compaction of small old rocks containing mud and minerals
Non-renewable energy	:	Energy obtained from sources that cannot renew themselves over a short period of time such as coal and petroleum
Deforestation	:	Destruction of large area of forests
E-wastes	:	Electronic wastes
4 R approach	:	Reduce, Reuse, Recovery and Recycle
Solar cells	:	Solar energy device for harvesting sun's energy
Biogas or Gobar gas	:	Gas produced by decomposition of animal wastes (cow dung) and plant wastes in the absence of oxygen.
Afforestation	:	Planting and protecting trees.
Wild life	:	Wild life refers to the undomesticated animals living in their natural habitats (forests, grasslands and deserts) an area without human habitation
Solar energy	:	Energy obtained from the sun.
Wind energy	:	The energy got by converting the kinetic energy of wind into mechanical power by wind turbines.
Tidal energy	:	Tidal energy is the energy obtained from the bulk movement of water due to ocean tides.
Rainwater harvesting	:	Rain water harvesting is a technique of collecting and storing rainwater for future use.
Ooranis	:	These are small ponds to collect rainwater.
Incineration	:	It is the burning of non - biodegradable solid wastes (medical wastes) in properly constructed furnace at high temperature.
National park	:	National park is a reserved area for the conservation of entire wildlife including plants and animals.
Sanctuary	:	Sanctuary is a place reserved exclusively for the use of animals.

TEXTBOOK EVALUATION

I. FILL IN THE BLANKS :

1. Deforestation leads to _____ in rainfall.
Ans. decrease

2. Removal of soil particles from the land is called _____.
Ans. soil erosion

3. Chipko movement is initiated against _____.
Ans. deforestation

4. _____ is a biosphere reserve in Tamilnadu.
Ans. Nilgiris

5. Tidal energy is _____ type of energy.
Ans. renewable

6. Coal, petroleum and natural gas are called _____ fuels.
Ans. fossil

7. _____ is the most commonly used fuel for the production of electricity.
Ans. Coal

II. STATE WHETHER TRUE OR FALSE. CORRECT THE STATEMENTS WHICH ARE FALSE :

1. **Biogas is a fossil fuel.**
Ans. False.
Correct Statement : Petroleum is a fossil fuel.

2. **Planting trees increases the ground water level.**
Ans. True.

3. **Habitat destruction cause loss of wild life.**
Ans. True.

4. **Nuclear energy is a renewable energy.**
Ans. False.
Correct Statement : Nuclear energy is a non renewable source of energy.

5. **Overgrazing prevents soil erosion.**
Ans. False.
Correct Statement : Overgrazing can lead to soil erosion.

6. **Poaching of wild animals is a legal act.**
Ans. False.
Correct Statement : Poaching of wild animals is illegal.

7. **National park is a protected park.**
Ans. True.

8. **Wild life protection act was established in 1972.**
Ans. True.

III. MATCH THE FOLLOWING :

1	Soil erosion	-	energy saving
2	Bio gas	-	acid rain
3	Natural gas	-	removal of vegetation
4	Green house gas	-	renewable energy
5	CFL bulbs	-	CO_2
6	Wind	-	non - renewable energy
7	Solid waste	-	lead and heavy metals

1	Soil erosion	-	removal of vegetation
2	Bio gas	-	CO_2
3	Natural gas	-	non - renewable energy
4	Green house gas	-	acid rain
5	CFL bulbs	-	energy saving
6	Wind	-	renewable energy
7	Solid waste	-	lead and heavy metals

IV. CHOOSE THE CORRECT ANSWER :

1. **Which of the following is / are a fossil fuel?**
i. Tar ii. Coal iii. Petroleum
(a) i only (b) i and ii *[PTA-5]*
(c) ii and iii (d) i, ii and iii
Ans. (c) ii and iii

2. **What are the steps will you adopt for better waste management?**
(a) reduce the amount of waste formed
(b) reuse the waste
(c) recycle the waste
(d) all of the above
Ans. (d) all of the above

3. **The gas released from vehicles exhaust are**
i. Carbon monoxide
ii. Sulphur dioxide
iii. Oxides of nitrogen
(a) i and ii (b) i and iii
(c) ii and iii (d) i, ii and iii
Ans. (d) i, ii and iii

4. Soil erosion can be prevented by
(a) deforestation (b) afforestation
(c) over growing
(d) removal of vegetation **Ans. (b) afforestation**

5. A renewable source of energy is
(a) petroleum (b) coal
(c) nuclear fuel (d) trees
Ans. (d) trees

6. Soil erosion is more where there is
(a) no rainfall (b) low rainfall
(c) rainfall is high (d) none of these
Ans. (c) rainfall is high

7. An inexhaustible resources is
(a) wind power (b) soil fertility
(c) wild life (d) all of the above
Ans. (a) wind power

8. Common energy source in village is
(a) electricity (b) coal
(c) biogas
(d) wood and animal dung
Ans. (d) wood and animal dung

9. Green house effect refers to
(a) cooling of earth
(b) trapping of UV rays
(c) cultivation of plants
(d) warming of earth **Ans. (d) warming of earth**

10. A cheap, conventional, commercial and inexhaustible source of energy is *[PTA-2]*
(a) hydropower (b) solar energy
(c) wind energy (d) thermal energy
Ans. (a) hydropower

11. Global warming will cause
(a) raise in level of oceans
(b) melting of glaciers
(c) sinking of islands
(d) all of these **Ans. (d) all of these**

12. Which of the following statement is wrong with respect to wind energy?
(a) wind energy is a renewable energy
(b) the blades of wind mill are operated with the help of electric motor
(c) production of wind energy is pollution free
(d) usage of wind energy can reduce the consumption of fossil fuels.
Ans. (b) the blades of wind mill are operated with the help of electric motor

V. ANSWER IN A SENTENCE :

1. What will happen if trees are cut down?
Ans. Cutting down of trees gives rise to **ecological problems** like floods, drought, soil erosion, loss of wildlife, extinction of species, imbalance of biogeochemical cycles, alteration of climatic conditions and desertification.

2. What would happen if the habitat of wild animals is disturbed?
Ans. The animal **will not be able** to find **food, shelter** or **live** with its community. Such animals tend to migrate into residential areas, fields etc., affecting human life.

3. What are the agents of soil erosion? *[PTA-2]*
Ans. Agents of soil erosion are **high velocity of wind**, air **currents, flowing water, landslide, human activities** (deforestation, farming and mining) and **overgrazing by cattle.**

4. Why fossil fuels are to be conserved? *[PTA-4]*
Ans. **(i)** The formation of these fossil fuels coal and petroleum is a very slow process and takes very long period of time for renewal.
(ii) They are **available in limited amounts in nature**. Therefore the coal and petroleum reserves can get exhausted if we use them at a rapid rate. Thus they must be conserved.

5. Solar energy is a renewable energy. How?
Ans. **(i)** It is said to be renewable since it is **available in unlimited amount in nature.**
(ii) It can be renewed over a short period of time and can be harvested continuously.

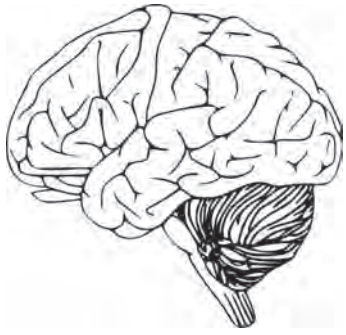
6. How are e-wastes generated?
[PTA-6; Sep-2021]
Ans. **(i)** E - wastes are generally called as **electronic wastes**, which includes the spoiled, outdated, non-repairable electrical and electronic devices.
(ii) They are generated at houses, Industries etc.

VI. SHORT ANSWER QUESTIONS :

1. What is the importance of rainwater harvesting?
[PTA-4]
Ans. **(i)** Overcome the rapid depletion of groundwater levels.
(ii) To meet the increase demand of water.

PRACTICALS

S.NO		NAME OF THE EXPERIMENT	TIME
1.	PHYSICS	Determination of weight of an object using the principle of moments	40 minutes
2.		Determination of focal length of a convex lens	40 minutes
3.		Determination of resistivity	40 minutes
4.	CHEMISTRY	Identification o the dissolution of the given salt whether it is exothermic or endothermic	40 minutes
5.		Testing the solubility of the salt	40 minutes
6.		Testing the water of hydration of salt	40 minutes
7.		Test the given sample for the presence of acid or base	40 minutes
8.	BIO-BOTANY	Photosynthesis-Test tube and Funnel Experiment (Demonstration)	40 minutes
9.		Parts of a Flower	40 minutes
10.		Mendel's Monohybrid cross	40 minutes
11.		Observation of Transverse Section of Dicot stem and Dicot Root	40 minutes
12.	BIO-ZOOLOGY	Observation of Models-Human Heart and Human Brain	40 minutes
13.		Identification of Blood Cells	40 minutes
14.		Identification of Endocrine Glands	40 minutes



PHYSICS

LAWS OF MOTION

1. DETERMINATION OF WEIGHT OF AN OBJECT USING THE PRINCIPLE OF MOMENTS

Aim :

To determine the weight of an object using the principle of moments

Apparatus required :

A metre scale, a knife edge, slotted weights, thread

Procedure :

i. A metre scale is supported at its centre of gravity by a knife edge or suspended by using a thread tied to its centre so that the scale is in the horizontal position. Ensure that the scale is in equilibrium position.

ii. A known weight W_2 and an unknown weight W_1 are suspended from to either side of the scale using the weight hangers.

iii. Fix the position of one weight hanger and adjust the position of the second weight hanger such that the scale is in equilibrium.

iv. Measure the distance d_1 and d_2 of the two weight hangers from the centre of the scale accurately.

v. The experiment is repeated for different positions of the unknown weight. Measure the distances. The readings are tabulated as follows :

Observation :

S.No	Weight in the weight hanger (W_2) kg	Distance of known weight d_1 (m)	Distance of unknown weight d_2 (m)	$W_2 \times d_2$ (kg m)	Unknown weight $W_1 = \frac{W_2 \times d_2}{d_1}$ (kg) $\times 10^{-3}$ (kg)
1	200×10^{-3}	20×10^{-2}	15×10^{-2}	$(200 \times 10^{-3}) \times (15 \times 10^{-2})$	150
2	200×10^{-3}	30×10^{-2}	22.5×10^{-2}	$(200 \times 10^{-3}) \times (22.5 \times 10^{-2})$	150
3	200×10^{-3}	40×10^{-2}	30×10^{-2}	$(200 \times 10^{-3}) \times (30 \times 10^{-2})$	150

Mean Weight : 150×10^{-3} kg Wt.

Calculations:

Moment of a force can be calculated using the formula

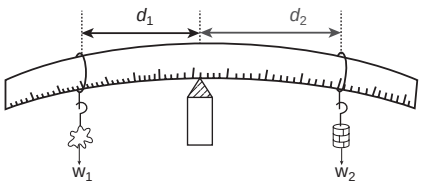
Moment of the force = Force × distance

Anti-clock wise moment by unknown weight $= W_1 \times d_1$

Clockwise moment by known weight $= W_2 \times d_2$

$W_1 \times d_1 = W_2 \times d_2$

Unknown weight $= W_1 = \frac{W_2 \times d_2}{d_1}$



Result :

Using the principle of moments, the weight of the unknown body $W_1 = 150 \times 10^{-3}$ kg.

7. TEST THE GIVEN SAMPLE FOR THE PRESENCE OF ACID OR BASE

Aim :

To identify the presence of an acid or a base in a given sample.

Materials Required: :

Test tubes, test tube stand, glass rod, phenolphthalein, methyl orange, sodium carbonate salt and the given sample.

Principle :

In acid medium,

(a) Phenolphthalein is colourless

(b) Methyl orange is pink in colour

(c) Sodium carbonate gives brisk effervescence.

S.No	Experiment	Observation	Inference
1	Take 5ml of the test solution in a test tube and add a few drops of Phenolphthalein in it.	No change in colour.	Presence of acid
2	Take 5ml of the test solution in a test tube and add a few drops of Methyl orange in it.	Solution Turns pink in colour	Presence of acid
3	Take 5ml of the test solution in a test tube and add a pinch of sodium carbonate salt.	Brisk effervescence occurs.	Presence of acid

Result : The given test solution contains **ACID**.

Principle : In base medium,

(a) Phenolphthalein is pink in colour

(b) Methyl orange is yellow in colour

(c) Sodium carbonate does not give brisk-effervescence.

S.No	Experiment	Observation	Inference
1	Take 5ml of the test solution in a test tube and add a few drops of Phenolphthalein in it.	Solution Turns pink in colour	Presence of base
2	Take 5ml of the test solution in a test tube and add a few drops of Methyl orange in it.	Solution Turns yellow in colour	b) Presence of base
3	Take 5ml of the test solution in a test tube and add a pinch of sodium carbonate salt.	No brisk effervescence.	Presence of base

Result : The given test solution contains **BASE**.

BIO - BOTANY

8. PHOTOSYNTHESIS-TEST TUBE AND FUNNEL EXPERIMENT(DEMONSTRATION)

Aim :

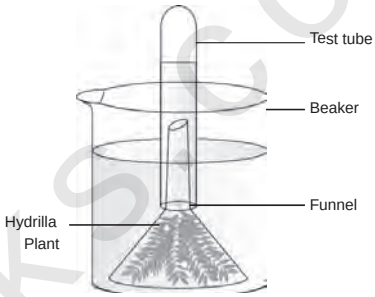
To prove that oxygen is evolved during photosynthesis.

Materials required :

Test tube, funnel, beaker, pond water and Hydrilla plant.

Procedure :

1. Take a few twigs of Hydrilla plant in a beaker containing pond water.
2. Place an inverted funnel over the plant.
3. Invert a test tube filled with water over the stem of the funnel.
4. Keep the apparatus in the sunlight for few hours.



Observation :

After one hour, it is noted that water gets displaced down from the test tube.

Inference

During photosynthesis, oxygen is evolved as a by-product. Gas bubbles liberated from the Hydrilla plant reach the top of the test tube and it displaces the water downwards. Take the test tube and keep the burning stick near the mouth of the test tube. Increased flame will appear. Hence, it is proved that oxygen is evolved during photosynthesis.

9. PARTS OF A FLOWER

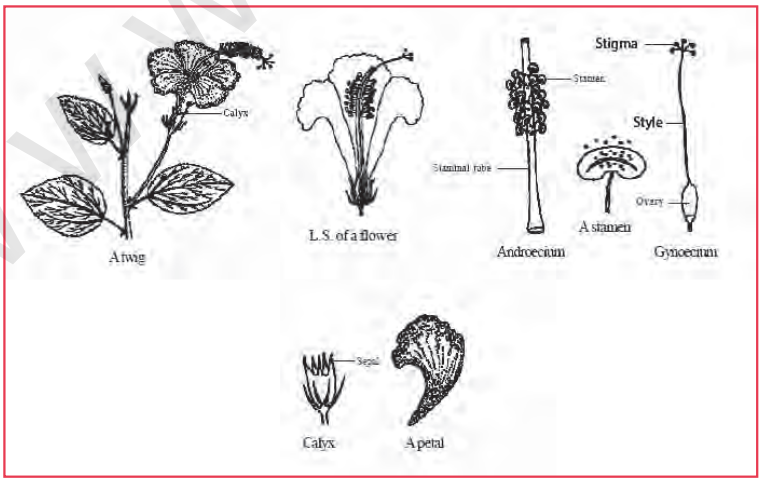
Aim :

To dissect and display the parts of the given flower and observe the Calyx, Corolla, Androecium and Gynoecium. Draw labelled sketches.

Materials Required : Flower, needle and paper.

Procedure : With the help of the needle dissect the different whorls of the flower Floral Parts:

Calyx Corolla	-	Accessory organ	Presence of acid
Androecium	-	Male part of the flower	Reproductive organ
Gynoecium	-	Female part of the flower	



Observation : Draw and label the parts of the flower.

Parts of a flower

10. MENDEL'S MONOHYBRID CROSS

Aim :

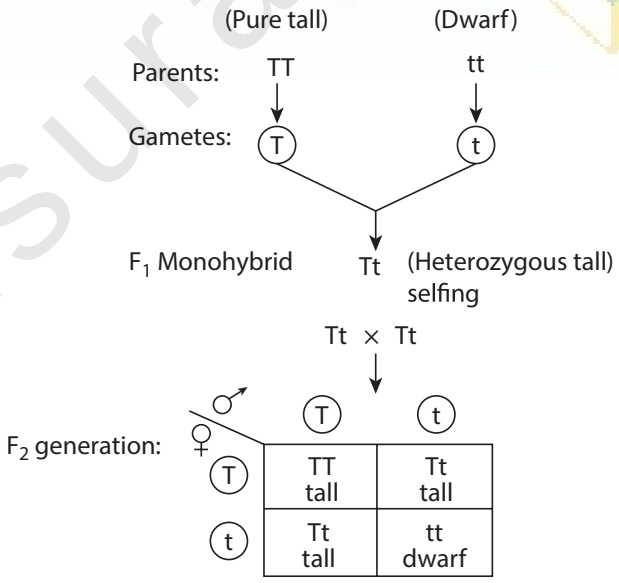
To study the monohybrid cross by using model / picture / photograph. To find out the phenotypic ratio and genotypic ratio in pea plant using checker board

Note: Depict parental generation and the gametes using colour chalk pieces

Definition: Cross involving one pair of contrasting characters is called monohybrid cross.

Procedure:

1. Pure breeding tall plant is crossed with pure breeding dwarf plant.
2. All the F1 hybrid plants were tall (Tt)
3. Selfing the F1 hybrid plants resulted in tall and dwarf plants in F2 generation.

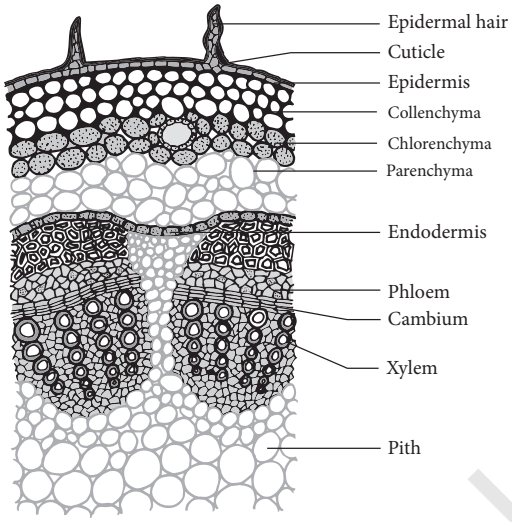


Result :

Phenotypic ratio = Tall - 3 : Dwarf - 1

Genotypic ratio = Pure Tall - 1 : Hybrid Tall - 2 : Pure Dwarf - 1

11. OBSERVATION OF TRANSVERSE SECTION OF DICOT STEM AND DICOT ROOT



Aim :

To observe transverse section (T.S) of Dicot Stem / Dicot Root from permanent slides.

Observation :

A. The given slide is identified as T.S of Dicot Stem

Reasons :

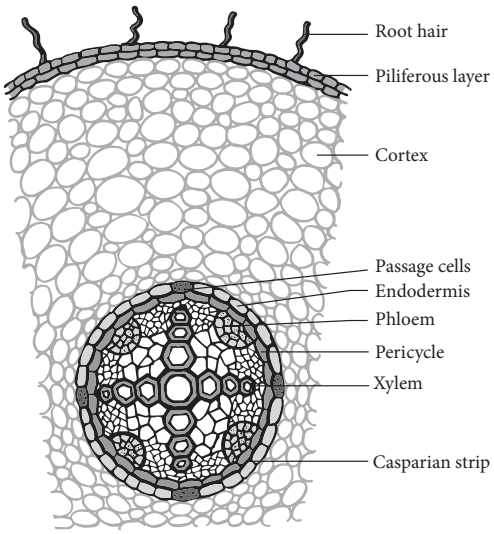
(i) Vascular bundles are arranged in a ring.
(ii) Conjoint, collateral, endarch and open vascular bundle.
(iii) Ground tissued differentiated into cortex, endodermis, pericycle and pith.
(iv) 3 to 6 layer of collenchymas tissues present in hypodermis.

Observation :

B. The given slide is identified as T.S of Dicot Root.

T.S of Dicot Root

(i) Vascular bundle are radial
(ii) Xylem is exarch and Tetrarch
(iii) Casparian strips and passage cells are present in endodermis
(iv) Cortex is made up of parenchymatous cells



10th STD

Govt. Supplementary Examination
September - 2021
Part - III
SCIENCE
(with Answers)

Time : 3.00 hours. 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. To project the rockets which of the following principle(s) is /(are) required?
   (a) Newton's third law of motion
   (b) Newton's law of gravitation
   (c) Law of conservation of linear momentum
   (d) Both (a) and (c)

2. SI unit of resistance is _____.
   (a) Mho (b) Joule
   (c) Ohm (d) Watt

3. Sound waves travel in air with a speed of about _____ at NTP.
   (a) 340×10^8 m/s (b) 340 m/s
   (c) 3×10^8 m/s (d) 3×10^{-8} m/s

4. Unit of radioactivity is _____.
   (a) Roentgen (b) Curie
   (c) Becquerel (d) All the above

5. Alloy used in the manufacturing of pressure cooker is _____.
   (a) Brass (b) Bronze
   (c) Magnalium (d) Duralumin

6. The IUPAC name of an organic compound is 3-methyl butan-1-ol. What type compound it is?
   (a) Aldehyde (b) Carboxylic acid
   (c) Ketone (d) Alcohol

7. The concept of blood group is derived by _____.
   (a) Wiener (b) Karl Landsteiner
   (c) William Harvey (d) His

8. Syngamy results in the formation of _____ .
   (a) Zoospores (b) Conidia
   (c) Zygote (d) Chlamydospores

9. The large elongated cells that provide nutrition to developing sperms are _____.
   (a) Primary germ cells (b) Sertoli cells
   (c) Leydig cells (d) Spermatogonia

10. Life originates from pre-existing life was showed by :
    (a) Louis Pasteur (b) Oparin
    (c) Haldane (d) Lamarck

11. Pusa Komal is a disease resistant variety of _____.
    (a) sugarcane (b) rice
    (c) cow pea (d) maize

12. _____ is a rice variety produced by mutation breeding that grows well in saline soil.
    (a) Sharbati Sonora (b) Atomita 2
    (c) Pusa Gaurav (d) Himgiri

PART - II

Note: **Answer any seven questions: Question No. 22 is compulsory** **(7 × 2 = 14)**

13. When a sound wave travels through air, the air particles :
    (a) vibrate along the direction of the wave motion.
    (b) vibrate but not in any fixed direction.
    (c) vibrate perpendicular to the direction of the wave motion.
    (d) do not vibrate.

14. (a) What is the audible range of frequency?
    (b) What is the minimum distance needed for an Echo?

15. Write any 2 uses of Ethanol.

16. What is respiratory quotient?

17. Draw and label the parts of a sperm.

18. What is called evolution?
19. Distinguish between somatic gene therapy and germ line gene therapy.
20. How is Cancer Cell different from Normal Cell?
21. How are e-wastes generated?
22. State Avogadro's Law.

PART - III

Note: Answer any seven questions. Question No. 32 is compulsory. (7 × 4 = 28)

23. (a) Write the symbol for the following component.
    (i) Ground connection
    (ii) Resistor
    (iii) Light emitting diode
    (iv) A diode
    (b) A charge of 12 Coulomb flows through a bulb in 5 seconds. What is the current through the bulb?
24. (a) Define Atomicity.
    (b) Calculate the molecular mass of CO_2.
25. (a) How is rust formed? Give the equation for formation of rust.
    (b) State 2 methods of preventing corrosion.
26. (a) What is photosynthesis and where does it occur in a cell?
    (b) Differentiate Aerobic and Anaerobic respiration.
27. Name the gaseous plant hormone. Mention any three of its physiological effects in plants.
28. (a) What is pollination?
    (b) State the importance of pollination.
29. Explain the structure of chromosome.
30. Discuss the importance of biotechnology in the field of medicine.
31. How do rainwater harvesting structures recharge ground water?
32. $_{92}U^{238}$ experience α-decay. Find the number of neutrons in the daughter element.

PART - IV

Note : Answer all the questions. Draw diagrams wherever necessary. (3 × 7 = 21)

33. (a) State Newton's Laws of motion.

(OR)

    (b) (i) Differentiate the eye defects : Myopia and Hypermetropia.
    (ii) Write any 2 applications of concave lens.
34. (a) (i) What happens when $MgSO_4 \cdot 7H_2O$ is heated? Write the appropriate equation.
    (ii) Explain hygroscopic substances and deliquescent substances with examples.

(OR)

    (b) (i) What are called thermolysis reactions?
    (ii) Differentiate reversible and irreversible reactions.
35. (a) (i) Enumerate the functions of blood.
    (ii) Guard cells are responsible for opening and closing of stomata. Give reason for this statement.

(OR)

    (b) (i) Suggest measures to overcome the problems of an alcoholic.
    (ii) What are the contributing factors for obesity?

★ ★ ★

Answers

PART - I

1. (d) Both (a) and (c)
2. (c) Ohm
3. (b) 340 m/s
4. (d) All the above
5. (d) Duralumin
6. (d) Alcohol
7. (b) Karl Landsteiner
8. (c) Zygote
9. (b) Sertoli cells
10. (a) Louis Pasteur
11. (c) cow pea
12. (b) Atomita 2

PART - II

13. **(a)** vibrate along the direction of the wave motion
14. **(a)** Audible range of frequency is 20 and 20,000 Hz.
    (b) The minimum distance needed for an echo 17.2 m.
15. (i) Used as an anti-freeze in automobile radiators.
    (ii) Used as an antiseptic to sterilize wounds, in hospitals.
    (iii) Used as a solvent for drugs, oils, fats, perfumes, dyes, etc.
16. (i) Respiratory quotient is the ratio of volume of carbon dioxide liberated and the volume of oxygen consumed during respiration.
    (ii) It is expressed as

$$RQ = \frac{\text{Volume of } CO_2 \text{ liberated}}{\text{Volume of } O_2 \text{ consumed}}$$

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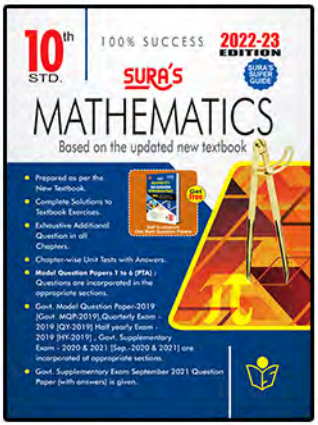
SURA'S 10TH STD SCHOOL GUIDES



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