10 SCIENCE - Notes

GHS
DODDABELUR

C R MAHESH BABU
BT Assistant Science

LAWS OF MOTION

VI. Book Exercise – Answer briefly

1. Define inertia. Give its classification.

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

Types of Inertia :

- Inertia of rest.
- Inertia of motion.
- Inertia of direction.

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

- Like parallel forces.
- Unlike parallel forces.

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

Resultant Force $= F_2 - F_1$

$= 15N - 5N$

$= 10N.$

Direction is along F_2

4. Differentiate mass and weight.

S.No	Mass	Weight
1	It is the amount of matter contained in a body	It is the gravitational pull acting on the body
2	It's unit is kilogram	It is measured in newton
3	Remains the same	Varies from place to place

5. Define moment of a couple.

Rotating effect of a couple is known as moment of a couple.

Moment of a couple = Force × perpendicular distance between the line of action of forces.

$M = F \times S$

6. State the principle of moments.

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

7. State Newton's second law.

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

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

Moment of Force = Force × Perpendicular distance

= F × d

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

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

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

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

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

VIII. Book Exercise – Answer in detail

1. **What are the types of inertia? Give an example for each type.**

Types of Inertia

a) **Inertia of rest:** resistance of a body to change its state of rest.
Eg: shake the branches of a tree, some of the leaves and fruits detach and fall down.

b) **Inertia of motion**: resistance of a body to change its state ofmotion.
Eg: An athlete runs some distance before jumping.

c) **Inertia of direction:** The resistance of a body to change itsdirection of motion.
Eg: a sharp turn while driving a car, tend to lean sideways

2. **State Newton's laws of motion?**

Newton's First Law : everybody continues to be in its state of rest or motion along a straight line unless it is acted upon by some external force.

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

Newton's Third Law : for every action, there is an equal and opposite reaction

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

The force is directly proportional to the rate of change of linear momentum

Mass =m

Initial speed= u

Final speed= v

Time= t

Initial momentum of the body P_i = mu

Final momentum of the body P_f = mv

Change in momentum $\Delta P = P_f - P_i$

$\Delta P = mv - mu$

By Newton's second law of motion,

$F \alpha \frac{Change\ in\ momentum}{time}$

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

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

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

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

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

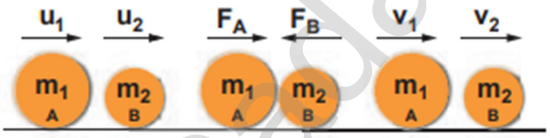
Hence we have

$F = m \times a$

Force = mass × acceleration

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

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



conservation of linear momentum

Proof : Let two bodies A and B having masses m_1 and m_2 move with initial velocity u_1 and u_2 and $u_1 > u_2$. During an interval of time 't' second, they tend to have a colliusion. Final will be velocity V_1 and V_2.

Force on body B due to A $F_B = m_2 \frac{(v_2 - u_2)}{t}$

Force on body A due to B $F_A = m_1 \frac{(v_1 - u_1)}{t}$

By Newton's III law of motion, $F_A = - F_B$

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

$$m_1 v_1 + m_2 v_2 = m_1 u_1 + m_2 u_2$$

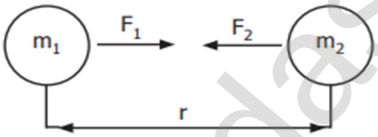
in the absence of an external force, the algebraic sum of momentum after collision is numerically equal to the algebraic sum of the momentum before collision.

5. Describe rocket propulsion.

- Propulsion of rockets **is based on the law of conservation of linear momentum** as well as **Newton's III law of motion**.
- Rockets are **filled with a fuel** in the propellant tank.
- When the rocket is fired, this fuel is burnt and a **hot gas is ejected with a high speed** from the nozzle of the rocket, **producing a huge momentum**.
- an **equal and opposite reaction force is produced** in the combustion chamber, which makes the rocket project forward.
- While **in motion,** the **mass of the rocket gradually decreases**, until the fuel is completely burnt out.
- Since, there is **no net external force acting on it**, the **linear momentum of the system is conserved.**
- The **mass of the rocket decreases** with altitude, which **results in the increase in velocity** of therocket.
- At one stage, it reaches a velocity, which is enough to just escape from the gravitational pull of theEarth. This velocity is called **escape velocity**.

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

The gravitational force is directly proportional to the product of their masses and inversely proportional to thesquare of the distance between the centers of the masses



Let, m_1 and m_2 be the masses of two bodies A and B placed r metre apart in space

Force $F = m_1 \times m_2$

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

On combining the above two expressions

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

$$F \propto \frac{Gm_1m_2}{r^2}$$

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

7. Give the applications of universal law gravitation.

- Dimensions of the heavenly bodies can be measured
- Helps in discovering new stars and planets.
- In 'Wobble' condition the mass of the star can becalculated
- Helps to explain germination of roots, a property ofgeotropism
- Helps to predict the path of the astronomical bodies.

IX. HOT Questions

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

$$F = \frac{m_2 F_2}{m_1 + m_2}$$

$$= \frac{2 \times 15}{8+2} = \frac{30}{10}$$

$$F_2 = 3N$$

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

Solution : According to kinetic energy,

Since K.E are equal

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

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

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

$$\frac{v_2}{v_1} = 2$$

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

$$= \frac{4m_2 v_1}{m_2 v_2}$$

$$= 4 \times \frac{1}{2} = \frac{2}{1}$$

Ratio of momentum = 2:1

Data

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

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

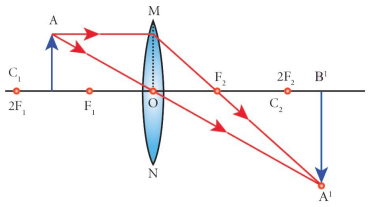
During the motion of car and two wheelers, when the brakes are applied, the vehicles slow down but our body tends to continue in the same state of motion due to inertia. So this may cause injuryto passengers. Hence they are advised to wear a helmet and seat belt.

OPTICS

VI. Book Exercise – Answer briefly

1. **What is refractive index?**
   The ratio of the speed of light in a vacuum to the speed of light in a medium
2. **State Snell's law.**
   The ratio of the sine of the angle of incidence and sine of the angle of refraction is equal to the ratio of refractive indices of the two media. $\frac{\sin i}{\sin r} = \frac{\mu_2}{\mu_1}$

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



4. **Define dispersion of light.**

When a beam of white light or composite light is refracted through any transparent media such as glass orwater, it is split into its component colours.

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

Amount of scattering of light is inversely proportional to the fourth power of its wavelength. $'S' \propto \frac{1}{\lambda^4}$

6. **Differentiate convex lens and concave lens.**

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

7. **What is power of accommodation of eye?**

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

8. **What are the causes of 'Myopia'?**

i) Lengthening of eye ball.

ii) Decrease in the focal length of the eyelens

9. **Why does the sky appear in blue colour?**

Blue colour (shorter wavelength) is scattered to a greaterextent than the red colour (longer wavelength). This scattering causes the sky to appear in bue colour.

10. **Why are traffic signals red in colour?**

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

VII. Book Exercise – Give the answer in detail

1. **List any five properties of light.**

   i) Light is a **form of energy**.

   ii) Light always **travels along a straight line**.

   iii) Light **does not need any medium** for its propagation.

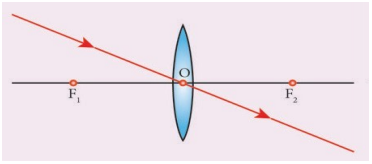
   iv) The **speed** of light in vacuum or air is **$C = 3 \times 10^8$ m/s**.

   v) **Different coloured light has different wavelength and frequency**.

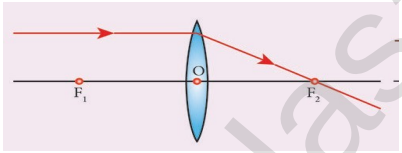
   vi) Violet light has the lowest wavelength and Red light has the highest wavelength.

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

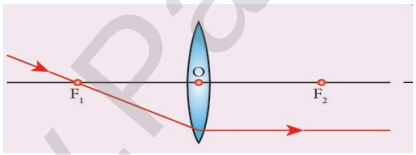
   Rule 1 : Ray through optical centre will emerge without any deviation



   Rule 2 : Rays parallel to the principal axis, refracted ray pass through the principal focus



   Rule 3 : When a ray passing through the principal focus the refracted ray will be parallel to the principal axis.

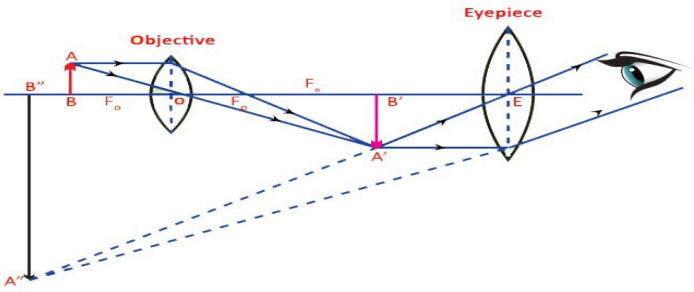


3. **Differentiate the eye defects: Myopia and Hypermetropia.**

   Ans :

S.No		Myopia	Hypermetropia
1.	Othername	Short sightedness	Long sightedness
2.	Corrected by	Concave lens	Convex lens
3.	eye ball	Lengthening	Shortening
4.	Clear vision	Near object	Distant object
5.	focal length of eye lens	reduced	increased
6.	Image Formation	Before retina	Behind retina

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



Construction :

i) A compound microscope consists of two convex lenses.

ii) objective lens is placed **near the object**

iii) **eye lens** placed **near the observer's eye**

iv) Both the lenses are **fixed in a narrow tube with adjustable** provision.

Working :

i) The object (AB) is placed at a distance slightly greater than the focal length of objective lens ($u > f_o$).

ii) A real, inverted and magnified image (A'B') is formed at the other side of the object lens.

iii) This image behaves as the object for the eye lens (A'B') falls within f_0.

iv) Compound microscope has 50 to 200 times more magnification power than simple microscope.

VIII. Numerical Problems

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

Since it is convex lens so

u = -20cm

f = 10 cm

v = ?

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

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

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

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

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

Image distance : $\boxed{v = 20cm}$

Nature of image: Real and same size.

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

u = –10cm

f = –15 cm (for concave lens)

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

$$\frac{1}{v}=\frac{1}{f}+\frac{1}{u} \Rightarrow \frac{1}{(-15)}+\frac{1}{(-10)} \Rightarrow$$

$$\frac{-10-15}{150} \Rightarrow \frac{-25}{150}$$

$$\frac{1}{v} = -1/6, \quad \boxed{v = -6cm}$$

height of object h = 3cm

Size of the image h' = ?

magnification $m=\frac{h'}{h}=\frac{v}{u}$

$$m=\frac{h'}{3}=\frac{-6}{-10}$$

$$h^1=\frac{-18}{-10}$$

Size of the image. $\boxed{h^1 = 1.8cm}$

IX. Higher order thinking (HOT) Questions

1. **While doing an experiment for the determination of focal length of a convex lens, Raja suddenly dropped the lens. It got broken into two halves along the axis. If he continues his experiment with the same lens,**

(a) Can he get the image?

Yes he can get the image

(b) Is there any change in the focal length?

There is no change in the focal length. The convex lens changes into plane of convex. It converges the light rays like that of convex lens.

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

The nocturnal birds like owl have large cornea and large pupil in their eyes. This will help the bird for the long sightedness while flying in the sky.

Large cornea and large pupil help the birds to focus the light from long distance.

THERMAL PHYSICS

VI. Book Exercise – Answer in briefly

1. **Define one calorie.**

amount of heat energy required to rise the temperature of 1 gram of water through 1°C.

2. **Distinguish between linear, arial or superficial expansion and Cubical Expansion.**

Linear Expansion	Arial Expansion	Cubical Expansion
Increase the length of the body changes due to change in its temperature.	**increase in the area** of a solid object due to heating	**increase in the volume** of a solid body due toheating,.
$\Delta L / L_o = \alpha_L \Delta T$	$\Delta A / A_o = \alpha_A \Delta T$	$\Delta V / V_o = \alpha_v \Delta T$

3. **What is co-efficient of cubical expansion?**

The ratio of increase in volume of the body per degree rise in temperature to its unit volume. Unit is K^{-1}.

4. **State Boyle's law.**

When the temperature of a gas is kept constant, the volume of a fixed mass of gas is inversely proportionalto its pressure.

$P \alpha 1/V$ (or) PV = constant

5. **State the law of volume.**

When the pressure is kept constant, the volume of a gas is directly proportional to the temperature of the gas.

$V \alpha T$ (or) V / T = constant.

6. **Distinguish between ideal gas and real gas.**

parameters	Ideal gas	Real gas
Atoms or molecules	Do not interact	interact
Inter atomic or inter molecular forces of attraction	weak	strong

7. **What is co-efficient of real expansion?**

The ratio of the true rise in the volume of the liquid per degree rise in temperature to its unit volume. unit is K^{-1}.

8. **What is co-efficient of apparant expansion?**

The ratio of the apparent rise in the volume of the liquid per degree rise in temperature to its unit volume. Unit is K^{-1}.

VIII. Book Exercise – Answer in detail

1. **Derive the ideal gas equation.**

An ideal gas obeysBoyle's law and Charles' law and Avogadro's law.

According to Boyle's law, PV = constant $\rightarrow 1$

According to Charles's law, V / T = constant $\rightarrow 2$

According to Avogadro's law, V/n = constant $\rightarrow 3$

After combining all equations

PV/nT = constant $\rightarrow 4$

The above relation is called the combined law of gases.

Let $n = \mu N_A \rightarrow 5$

From (5) and (4)

$PV / \mu N_A T$ = constant

The value of the constant k_B is called as Boltzmann constant(1.38×10^{-23} JK^{-1})

$PV / \mu N_A T = k_B$

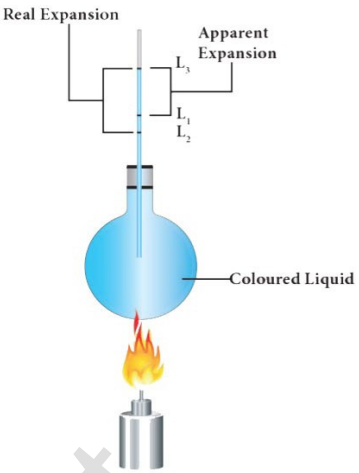
$PV = \mu N_A k_B T$

Here, $\mu N_A k_B = R$,is universal gas constant whose value is 8.31 J $mol^{-1}K^{-1}$

$PV = RT \longrightarrow 6$

Ideal gas equation is also called as equation of state.

2. **Explain the experiment of measuring the real and apparent expansion of a liquid with a neat diagram.**



- Poure the liquid in a container upto a level. Mark as L_1.
- Now, heat the container Initially, the container receives the thermal energy and it expands.
- As a result, the volume of the liquid appears to have reduced. Mark this reduced level of liquid as L_2.
- On further heating expansion of the liquid takes place, the level of liquid rises to L_3.
- Now, the difference between the levels L_1 and L_3 is as apparent expansion.
- The difference between the levels L_2 and L_3 is called real expansion.
- Real expansion = $L_3 - L_2$ Apparent expansion = $L_3 - L_1$.

VIII. Book Exercise – HOT question

1. **If you keep ice at 0°C and water at 0°C in either of your hands, in which hand you will feel more chillness?Why?**

   Ice transfer more chillness to our hands than water. Due to thermal conduction in between ice and environment. The latent heat of vaporisation for ice is more than water at 0°C

ELECTRICITY

VI. Book Exercise – Very short answer questions.

1. **Define the unit of current.**

   The SI unit of electric current is ampere (A).

   when a charge of one coulomb flows across any cross-section of a conductor, in one second is one ampere.

   1 ampere = $\frac{1\ coulomb}{1\ second}$

2. **What happens to the resistance, as the conductor is made thicker?**

   As the resistance is inversely proportional to the area, thick wires will decrease resistance .

3. **Why is tungsten metal used in bulbs, but not in fuse wires?**

   It has a very high melting point. it will not melt even when large amount of current is passed through it, the appliance will be damaged.

4. **Name any two devices, which are working on the heating effect of the electric current.**
   - Electric Heater
   - Electric Iron.

VII. Book Exercise – Short answer questions.

1. Define electric potential and potential difference.

Electrical potential :

The amount of work done in moving a unit positive charge from infinity to that point against the electric force.

Electric potential Difference :

The amount of work done in moving a unit positive charge from one point to another point against the electric force.

2. What is the role of the earth wire in domestic circuits?

- This wire provides a low resistance path to the electric current.
- The earth wire serves as a protective conductor, which saves us from electric shocks.

3. State Ohm's law.

At a constant temperature, the steady current 'I' flowing through a conductor is directly proportional to the potential difference 'V' between the two ends of the conductor.

$I \propto V$

$V = IR.$

4. Distinguish between the resistivity and conductivity of a conductor.

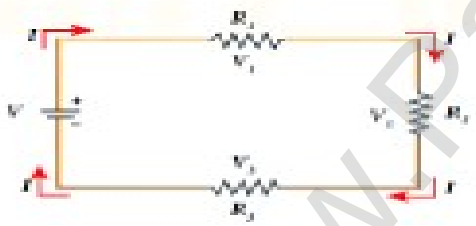
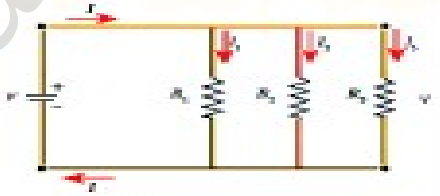
Resistivity	Conductivity
resistance of a conductor of unit length and unit area of cross section. Its unit is ohm metre.	The reciprocal of resistivity. Its unit is $Ohm^{-1}\ m^{-1}$ or mho m^{-1}

5. What connection is used in domestic appliances and why?

- The connections in houses for domestic appliances are **parallel**.
- Disconnection of one circuit does not affect the other
- **Get equal voltages** for all appliances, parallel circuit is used.

VIII. Book Exercise – Long answer questions.

1. With the help of a circuit diagram derive the formula for the resultant resistance of three resistances connected: a) in series and b) in parallel.

RESISTORS IN SERIES	RESISTORS IN PARALLEL
Three resistors of resistances R_1, R_2 and R_3 are connected in series connection.	Three resistors of resistances R_1, R_2 and R_3 are connected in parallel connection.
The current I through each resistor is same	The potential difference V across each resistor is same.
$V = V_1 + V_2 + V_3$	$I = I_1 + I_2 + I_3$
$V_1 = IR_1$ $V_2 = IR_2$ $V_3 = IR_3$,	$I_1 = \frac{V}{R_1}$ $I_2 = \frac{V}{R_2}$ $I_3 = \frac{V}{R_3}$,
$V = IR_S$	$I = \frac{V}{R_P}$
$IR_S = I(R_1 + R_2 + R_3)$	$\frac{V}{R_P} = V\left(\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}\right)$
$R_S = R_1 + R_2 + R_3$	$\frac{1}{R_P} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$
	

2. a) What is meant by electric current?

The rate of flow of charges in a conductor is called electric current

$$I = Q/t$$

b) Name and define its unit.

When a charge of one coulomb flows across any cross-section of a conductor, in one second is called one ampere.

$$1 \text{ ampere} = \frac{1\ coulomb}{1\ second}$$

c) Which instrument is used to measure the electric current? How should it be connected in a circuit?

Ammeter connected in **series** with a device to measure its current.

3. a) State Joule's law of heating.

The heat produced in any resistor is **directly proportional to the**

- square of the current passing (I^2)
- resistance (R)
- time for which the current is passing (t)

$$H = I^2Rt$$

b) An alloy of nickel and chromium is used as the heating element. Why?

(i) it has high resistivity, (ii) it has a high melting point, (iii) it is not easily oxidized.

c) How does a fuse wire protect electrical appliances?

- The **low melting point fuse wire** is connected in series, in an electric circuit.
- When a **large current passes** through the circuit, **the fuse wire melts**
- Hence the **circuit gets disconnected** so electric **appliances are saved** from any damage.

4. Explain about domestic electric circuits. (circuit diagram not required).

- The first step is to bring the power supply to the main-box from a transformer.
- The components of the main-box are:
  - (i) a fuse box – protect electric appliances
  - (ii) a meter – record electrical energy.
- two insulated wires.
  - a red insulation - 'live wire'.
  - a black insulation - 'neutral wire'.

  Both wire enter into a box where the main fuse is connected with the live wire.
- After the main switch, passes through two separate circuits.
- 5 A rating - lower power rating, such as tube lights, bulbs and fans.
- 15 A rating high power rating, such as electric iron and heaters.
- All the circuits in a house are connected in parallel.
- It does not affect the other circuit.
- each electric appliance gets an equal voltage.

5. a) What are the advantages of LED TV over the normal TV?

b) List the merits of LED bulb.

Advantages of LED TV

- brighter picture quality.
- thin in size.
- less power and less energy.
- More life
- reliable.

Merits of a LED bulb

- no loss of energy.
- cooler than the normal bulb.
- low power.
- not harmful
- A wide range of colours is possible here.
- cost and energy efficient.
- No usage of toxic materials.

X. Book Exercise – HOTS:

1. Two resistors when connected in parallel give the resultant resistance of 2 ohm; but when connected in series the effective resistance becomes 9 ohm. Calculate the value of each resistance.

Solution :

$$R_1 + R_2 = 9 \text{ ohm}$$
$$R_2 = 9 - R_1$$
$$1/R_1 + 1/R_2 = ½$$
$$1/R_1 + 1/9 - R_1 = ½$$
$$9 - R_1 + R_1 = 1/2$$
$$R_1(9 - R_1)$$
$$9 / 9R_1 - R_{12} = ½$$
$$R_{12} - 9R_1 + 18 = 0$$
$$(R_1 - 3)(R_1 - 6) = 0$$
$$R_1 = 3,6$$

When $R_1 = 3\Omega$, $R_2 = 9 - 3 = 6\Omega$

When $R_1 = 6\Omega$, $R_2 = 9 - 6 = 3\Omega$.

2. How many electrons are passing per second in a circuit in which there is a current of 5 A?

Solution :

$I = \frac{Q}{t}$

For 1 coluomb number of electrons = $\frac{1}{e} = \frac{1}{\text{charge}}$

$\frac{1}{e} = \frac{1}{1.6 \times 10^{-19}} = 6.25 \times 10^{18}$ electrons.

For 1A = $\frac{1c}{1s}$ =>: number of electrons for 1A= 6.25×10^{18} electrons.

For 5A of current number of electrons $= 5 \times 6.25 \times 10^{18}$

$= 3.125 \times 10^{19}$ electrons.

3. A piece of wire of resistance 10 ohm is drawn out so that its length is increased to three times its original length. Calculate the new resistance.

Solution :

Resistance (R) = Resistivity (r) × Length (L) / Area (A)

$$R = \frac{\rho l}{A}$$

When the length increases by three times, the cross section will reduce by three times. Hence the length will be 3L while area = A/3

New resistance $R' = \frac{\rho 3L}{A/3}$

$R' = 9 \times \frac{\rho L}{A}$

$= 9 \times 10 = 90\ \Omega$

Therefore the new resistance = 90 ohm.

ACOUSTICS

VI. Book Exercise – Answer very briefly

1. What is a longitudinal wave?

Ans : The particles of the medium vibrate along the direction of propagation of the wave is called longitudinal waves

2. What is the audible range of frequency?

Ans : between 20 Hz and 20,000 Hz

3. **What is the minimum distance needed for an echo?**

   Ans : 17.2 m.

4. **What will be the frequency sound having 0.20 m as its wavelength, when it travels with a speed of 331 ms^{-1}?**

   Ans :

   $\lambda = 0.20$ m; $V = 331\ ms^{-1}$

   $V = n\lambda$

   $n = V/\lambda$

   $n = 331 ms^{-1}/0.20m$

   $= 331/0.20$

   $= 1655$ Hz.

5. **Name three animals, which can hear ultrasonic vibrations.Ans :**

   Ans**:** Bat, Mosquito, Dogs.

VII. Book Exercise – Answer briefly

1. **Why does sound travel faster on a rainy day than on a dry day?**

   Ans : During rainy days, the moisture content is more in the atmosphere and speed or velocity of sound.

2. **Why does an empty vessel produce more sound than a filled one?**

   Ans : As the empty vessel vibrates more than a filled one, it producel large amplitude sound waves, so it produce more sound.

3. **Air temperature in the Rajasthan desert can reach 46°C. What is the velocity of sound in air at thattemperature? ($V_0 = 331\ ms^{-1}$)**

   Ans :

   $V_T = (V_0 + 0.61\ T)$

   $T = 46°C, \quad V_0 = 331\ m\ s^{-1}$

   $V_T = (331 + 0.61 \times 46)$

   $= 331 + 28.06$

   $V_T = 359.06$

4. **Explain why, the ceilings of concert halls are curved.**

   Ans : When a person is talking at one focus, his voice can be heard distinctly at the other focus. It is due to the multiple reflections of sound waves from the curved walls.

5. **Mention two cases in which there is no Doppler effect in sound?**

   Ans :

   a) When source (S) and listener (L) both are at rest.

   b) When S and L moving in mutually perpendicular directions

IX. Book Exercise – Answer in detail

1. **What are the factors that affect the speed of sound in gases?**

   Effect of density :

   - The velocity of sound is inversely proportional to the square root of the densityof the gas .

$$v \propto \sqrt{\frac{1}{d}}$$

- Velocity decreases as as density increases

Effect of temperature :

- The velocity of sound in a gas is directly proportional to the square root of its temperature. $v \propto \sqrt{T}$
- The velocity of sound increases with increase in temperature.
- velocity of sound changes by 0.61 m s^{-1} when the temperature changes by one degree celsius.

Effect of relative humidity :

- When humidity increases, the speed of sound increases.

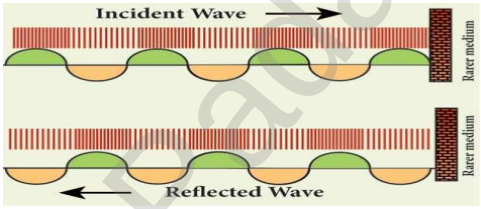
2. What is mean by reflection of sound? Explain.

Ans : When sound waves travel in a given medium and strike the surface of another medium, they can be bounced back into the first medium is known as reflection.

a) Reflection at the boundary of a rarer medium.

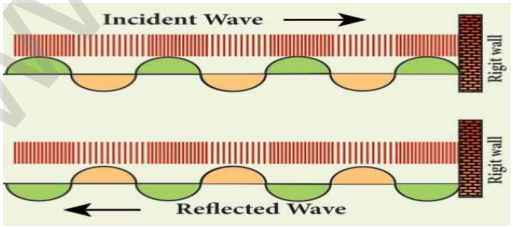
Ans :

- A wave travelling in a solid medium.
- It strikes the solid and air-interface
- The compression exerts a force F.
- A rarer medium has smaller resistance,the particles free to move produces rarefaction at the interface.
- Compression reflected as a rarefaction



b) Reflection at the boundary of a denser medium.

Ans :



- Compressions travelling in air reaches a rigid wall
- The compression exerts a force F
- The wall exerts opposite reaction R = -F
- Compression is reflected back compression in reverse direction.

c) Reflection of sound in curved surfaces:

- The intensity is changed Convex surface - intensity decreased - reflected waves get diverged.

- Concave surface - Focussed at a point - reflected waves get converged
- Parabolic surface - focus at a point.
- Elliptical surface - Reflected from one focus to other focus

3. **a) What do you understand by the term 'ultrasonic vibration'?**

Ans : The vibrations whose frequencies are greater than 20000Hz are called Ultrasonic Vibrations.

b) State three uses of ultrasonic vibrations.

Three uses of ultrasonic vibrations:

1. Ultrasonic communication:

Animals such as bats & frogs use ultrasonic wave to communicate with each other.

2. Ultrasonic cleaning:

It is used to remove impurities such as grease, oil from glass, metals and ceramics.

3. Ultrasonography:

To create the images of the internal organs of the body.

4. **What is an echo?**

a) State two conditions necessary for hearing an echo.

b) What are the medical applications of echo?

c) How can you calculate the speed of sound using echo?

Ans : An echo is the sound reproduced due to the reflection of the original sound from various rigid surfaces.

Conditions necessary for hearing an echo:

- The minimum time gap between the original sound and an echo must be 0.1 s.
- The minimum distance required to hear an echo is $1/20^{th}$.

Medical applications of echo :

- It is used in obstetric ultrasonography to create real time visual images of developing embryo or foetus in the mother's uterus.
- It is very safe, as it has no harmful radiations.

Calculation of speed of sound using echo:

- Total distance travelled from the source to the wall and then to the receiver = 2d
- Time taken = t.
- Speed of sound, v= 2d / t.

X. HOT Questions

1. **Suppose that a sound wave and a light wave have the same frequency, then which one has a longerwavelength?**

a) Sound **b) Light** **c) both a and b** **d) data not sufficient**

Ans : (b) Light has the greater speed and it will have longer wavelength.

2. **When sound is reflected from a distant object, an echo is produced. Let the distance between the reflecting surface and the source of sound remain the same.Do you hear an echo sound on a hotterday? Justify your answer**.

Ans : An echo is heard when the time interval between the original sound and the reflected sound is at least0.1s. The speed of sound in a medium increases with an increase in temperature. Hence, on a hotter day, the time interval between the original sound and the reflected sound will decrease.

NUCLEAR PHYSICS

IX. Book Exercise – Answer in one or two word (VSA)

1. **Who discovered natural radioactivity?**
   Henri Becquerel.
2. **Which radioactive material is present in the ore of pitchblende?**
   Uranium (U^{235}).
3. **Write any two elements which are used for inducing radioactivity?**
   Boron, Aluminium.
4. **Write the name of the electromagnetic radiation which is emitted during a natural radioactivity.**
   γ– rays.
5. **If A is a radioactive element which emits an α - particle and produces $_{104}Rf^{259}$. Write the atomic number and mass number of the element A.**
   Atomic number of A = 106, Mass number of A = 263.
6. **What is the average energy released from a single fission process?**
   3.2×10^{-11}J.
7. **Which hazardous radiation is the cause for the genetic disease?**
   γ– rays.
8. **What is the amount of radiation that may cause death of a person when exposed to it?**
   600R
9. **When and where was the first nuclear reactor built?**
   Chicago, USA 1942.
10. **Give the SI unit of radioactivity.**
    Becquerel.
11. **Which material protects us from radiation?**
    Lead- gloves and aprons

X. Book Exercise – Answer the following in few sentences

1. **Write any three features of natural and artificial radioactivity.**

S.No	Natural radioactivity	Artificial radioactivity
1	Spontaneous process	Induced process
2	Cannot be controlled	Can be controlled
3	Done by elements of atomic number less than 83	Done by elements of atomic number greater than 83

2. **Define critical mass.**
   The minimum mass of a fissile material necessary to sustain the chain reaction.
3. **Define one roentgen.**
   One roentgen is defined as the quantity of radioactive substance which produces a charge

of 2.58×10^{-4} coulombin 1 kg of air under standard conditions of pressure, temperature and Humidity.

4. **State Soddy and Fajan's displacement law.**
   i) When a radioactive element emits an alpha particle, a daughter nucleus is formed whose mass numberis less by 4 units and the atomic number is less by 2 units.
   ii) When a radioactive element emits a beta particle, a daughter nucleus is formed whose mass number is the same and the atomic number is more by 1 unit.
5. **Give the function of control rods in a nuclear reactor.**
   - to control the number of neutrons in order
   - to control chain reaction.
   - boron or cadmium rods absorb the neutrons.
6. **In Japan, some of the new born children are having congenital diseases. Why?**
   - Due to high exposure of radiation.
   - Caused by atom bomb during second world war
   - It affected the mother who were pregnant at that instant.
7. **Mr. Ramu is working as an X - ray technician in a hospital. But, he does not wear the lead aprons. What suggestion will you give to Mr. Ramu?**
   1. Mr. Ramu must wear a lead apron because X-ray radiation may injure him.
   2. Wear gloves, mask and gown when necessary.
   3. He should stand behind a protective shield.
8. **What is stellar energy?**

   Fusion reaction that takes place in the cores of the Sun and other stars emit a large amount of energy in the form of light and heat
9. **Give any two uses of radio isotopes in the field of agriculture?**

   To increase the productivity of crops.

   To kill the insects and parasites

XI. Book Exercise – Answer the following questions in detail

1. **Explain the process of controlled and uncontrolled chain reactions.**

Controlled chain reaction

- Neutron absorber absorb the extra neutrons
- The number of neutrons released is maintained to be one
- The fusion reaction is sustained in a controlled manner.
- The energy released is used for constructive purposes
- Eg.nuclear reactor

Uncontrolled chain reaction

- In neutrons multiplies indefinitely and causes fissionreaction.
- release of a huge amount of energy within a fraction of asecond.
- used in the atom bomb to produce an explosion

2. Compare the properties of alpha, beta and gamma radiations.

Properties	α rays	β rays	γ rays
Nature	Helium nucleus (2He4)	electrons (-1e0)	Electro magnetic waves of photons
Charge	+2e	-e	zero
Ionising power	100 times than β rays and 10,000 times than γ rays	Comparatively low	Very less
Penetratin power	Low	Greater than α rays	Very high
Effect of electrical and Magnetic field	Deflected	Deflected	Not deflected
Speed	1/10 to 1/20 time speed of light	9/10 times speed of light	Speed of light

3. What is a nuclear reactor? Explain its essential parts with their functions.

Nuclear reactor:Device in which the nuclear fission reaction takes place in a self-sustained and controlled manner to produce electricity is called Nuclear reactor.

Essential parts

i) Fuel:

- A fissile material is used as fuel.
- Fuel: Uranium

ii) Moderator:

- Used to slow down the high energy neutrons to provide slow neutrons. > Moderator: Graphite and heavy water.

iii) Control rod:

- Used to control the number of neutrons to have controlled chain reaction.
- Control rods: Boron or cadmium rods to absorb the neutrons

iv) Coolant:

- To remove the heat produced in the reactor core, to produce steam.
- Steam is used to run a turbine to produce electricity.
- Coolants: Water, air and helium.

v) Protection wall:

- It is made up of thick concrete lead wall to prevent the harmful, radiations.

XII. Book Exercise – HOT questions

1. Mass number of a radioactive element is 232 and its atomic number is 90. When this element undergoes certain nuclear reactions, it transforms into an isotope of lead with a mass number 208 and an atomic number 82. Determine the number of alpha and beta decay that can occur.?

A) Number of alpha decay:

$208 = 232 - 4X$

Solve for X

$$232 - 4X - 232 = 208 - 232 \text{ (substract 232 from both sides)}$$
$$-4X = -24$$
$$-X = -6$$
$$X = 6.$$

This means that this progress undergoes 6 alpha particle

B) Number of Beta decay

four.

2. **X – rays should not be taken often'. Give the reason.**

X- rays and gamma rays can cause a number of other problems besides cancer. Lower doses of radiation, such as from imaging tests are not known to cause short – term health problems.

3. **Cell phone towers should be placed far away from the residential area – why?**

Cell phone towers placed far away from the residential area because

- The microwaves cause many health problems to human like
  1. Memory loss
  2. It damage cell tissues and DNA.
  3. Head ache
  4. Birth defects
  5. Cancer
  6. Parts of the body nearest to an antenna absorb these radiation and cause harmful effects.

ATOMS AND MOLECULES

VI. Book Exercise – Short answer questions

1. **Define: Relative atomic mass.**

Ratio between the average mass of its isotopes to 1/12th part ofthe mass of a carbon–12 atoms.

$$An = \frac{\text{Average mass of the isotopes of the element}}{\frac{1}{12}\text{th of the mass of one carbon} - 12 \text{ atom}}$$

2. **Write the different types of isotopes of oxygen and its percentage abundance.**

Isotope	Mass (amu)	% abundance
$_8O^{16}$	16	99.757
$_8O^{17}$	17	0.038
$_8O^{18}$	18	0.205

3. **Define: Atomicity.**

The **number of atoms present in the molecule** is called its Atomicity.

$$Atomicity = \frac{Molecular\ mass}{Atomic\ mass}$$

4. Give any two examples for heterodiatomic molecules.

H_2O, CO, HCl

5. What is Molar volume of a gas?

- **One mole of any gas occupies 22.4 litre or 22400 ml at STP.**
- This is called molar volume.

6. Find the percentage of nitrogen in ammonia.

Molar mass of Ammonia = 14 + 3 = 17 g.

$$\% \text{ of Nitrogen} = \frac{14}{17} \times 100 = 82.35\%.$$

VII. Book Exercise – Long answer questions

1. **Calculate the number of water molecule present in one drop of water which weighs 0.18 g.**

Given Mass = 0.18 g

Avogadro Number = 6.023×10^{23}

Molecular Mass of water = $H_2O = 2(1) + 1(16) = 2 + 16 = 18g$

$$\text{No. of water molecules} = \frac{\text{Avogadro number} \times \text{given man}}{\text{Molecular Mass of water}}$$

$$= \frac{6.023 \times 10^{23} \times 0.18\,g}{18\,g}$$

$$= 6.023 \times 10^{23} \times 10^{-2}$$

$$= 6.023 \times 10^{21} \text{ molecules of water.}$$

2. $N_2 + 3H_2 \rightarrow 2NH_3$.

- 1 mole of nitrogen (_____g) +___.
- 3 moles of hydrogen (_____g) →_____
- 2 moles of ammonia (_____g).

Answer:

$N_2 + 3H_2 \rightarrow 2NH_3$

1 mole of N_2 = 28 g

3 moles of H_2 = 6 g

2 moles of NH_3 = 34 g

⇒ 1 mole of nitrogen (28 g) +3 moles of hydrogen (6 g) → 2 moles of Ammonia (34 g)

3. **Calculate the number of moles in**
i) 27g of Al ii) 1.51×10^{23} molecules of NH_4Cl.

i) $$\text{No. of moles} = \frac{\text{Mass}}{\text{Atomic Mass}}$$

$$= \frac{27g}{27g}$$

$$= 1 \text{ mole.}$$

ii) No. of moles $= \frac{\text{No. of molecules of } NH_4Cl}{\text{Avogadro's number}}$

$= \frac{1.51 \times 10^{23}}{6.023 \times 10^{23}}$

$= \frac{1}{4}$

$= 0.25$ mole.

4. **Give the salient features of "Modern atomic theory".**

Modern Atomic Theory:

- An atom is no longer indivisible
- Atoms of the same element may have different atomic mass (Isotopes).
- Atoms of different elements may have same atomic masses (Isobars).
- Atoms of one element can be transmuted into atoms of other elements
- Atoms may not always combine in a simple whole number ratio.
- Atom is the smallest particle that take part in a chemical reaction.
- The mass of an atom can be converted into energy ($E=MC^2$).

5. **Derive the relationship between Relative molecular mass and Vapour density.**

Relative Molecular Mass : The ratio of Mass of one molecule of gas or vapour to the mass of one atom of hydrogen.

$$\text{Relative Molecular Mass} = \frac{\text{Mass of one molecule of gas or vapour}}{\text{Mass of one atom of hydrogen}} \quad \text{.....(1)}$$

Vapour density : The ratio of mass of a certain volume of a gas or vapour to the mass of an equal volume of hydrogen, measured under the same conditions of temperature and pressure.

$$\text{Vapour Density} = \frac{\text{Mass of 1 volume of gas or vapour}}{\text{Mass of 1 volume of hydrogen}} \quad \text{.....(2)}$$

$$\text{VD} = \frac{\text{Mass of 1 volume of gas or vapour}}{\text{Mass of 1 volume of hydrogen}} \quad \text{.....(3)}$$

Applying Avogadro's law,

$$\text{VD} = \frac{\text{Mass of 1 molecule of gas or vapour}}{\text{Mass of 1 molecule of hydrogen}} \quad \text{.....(4)}$$

Hence hydrogen is diatomic

$$\text{VD} = \frac{\text{Mass of 1 molecule of gas or vapour}}{\text{Mass of 2 } \times \text{ atoms of hydrogen}} \quad \text{.....(5)}$$

$$\text{VD} = \frac{\text{Mass of 1 molecule of gas or vapour}}{2 \times \text{mass of 1 atom of hydrogen}} \quad \text{.....(6)}$$

Multiplying '2' on both sides

$$2 \times \text{VD} = \frac{\cancel{2} \times \text{Mass of 1 molecule of gas or vapour}}{\cancel{2} \times \text{Mass of 1 atom of hydrogen}} \quad \text{.....(7)}$$

$$2 \times \text{VD} = \frac{\text{Mass of 1 molecule of gas or vapour}}{\text{Mass of 1 atom of hydrogen}} \quad \text{.....(8)}$$

$$2 \times \text{VD} = \text{Relative Molecular Mass} \quad \text{.....(9)}$$

$$\text{VD} = \frac{\text{RMM}}{2} \text{ or } \frac{\text{Molecular Weight}}{2} \quad \text{.....(10)}$$

VIII. Book Exercise – HOT question

1. Calcium Carbonate is decomposed on heating in the following reaction.

$CaCO_3 \rightarrow CaO + CO_2$

i) How many moles of Calcium Carbonate are involved in this reaction?

ii) Calculate the gram molecular mass of Calcium Carbonate involved in this reaction.

iii) How many moles of CO_2 are there in this equation?

Ans:

i. 1 mole of Calcium carbonate.

ii. GMM of $CaCO_3$ = 1 (Ca) + 1 (C) + 3 (O)
= 1 (40) + 1 (12) + 3 (16) = 1 (40) + 1 (12) + 48
= 40 + 12 + 48 = 100 g.

iii. 1 mole of CO_2.

PERIODIC CLASSIFICATION OF ELEMENTS

VI. Book Exercise – Short answer questions

1. **A is a reddish brown metal, which combines with O_2 at < 1370 K gives B, a black coloured compound.At a temperature > 1370 K, A gives C which is red in colour. Find A,B and C with reaction.**

Reddish brown metal (A) is copper.

Reacts with O_2 at bleow 1370 K gives Copper (II) oxide (B), which is black in colour.

$$2\,Cu + O_2 \xrightarrow{\text{below } 1370K} 2\,CuO$$

(copper II oxide- black)

(A) reacts with O_2 at above 1370 K gives Copper (I) oxide (C), which is red in colour

$$4Cu + O_2 \xrightarrow[\text{above}]{1370\ K} 2Cu_2O$$ (Copper (I) oxide) (C)

A	Copper	Cu
B	Copper (II) oxide	CuO
C	Copper (I) oxide	Cu_2O

2. **A is a silvery – white metal. A combines with O_2 to form B at 800°C, the alloy of A is used inmaking the aircraft. Find A and B**

- Silver – white metal (**A**) is Aluminium.
- Aluminium combines with O_2 to form aluminium oxide (**B**) at 800°C.

$$\underset{(A)}{4Al} + 3O_2 \xrightarrow{800°C} \underset{\text{(Aluminium oxide) (B)}}{2Al_2O_3}$$

- Duralumin is the alloy of Al, which is used to make aircraft

A	Aluminium	Al
B	Aluminium oxide	Al_2O_3

3. **What is rust? Give the equation for formation of rust.**
When iron is exposed to moist air, it forms a layer of brown hydrated ferric oxide on its surface. Thiscompound is known as rust and the phenomenon of formation of rust is known as rusting.

Rust is hydrated ferric oxide. It is formed when iron is exposed to moist air.

$$4Fe + 3O_2 + xH_2O \longrightarrow 2Fe_2O_3.xH_2O \text{ (Rust)}$$

4. **State two conditions necessary for rusting of iron.**
Oxygen and **Water** are necessary for rusting of iron.

VII. Book Exercise – Long answer questions

1. a) State the reason for addition of caustic alkali to bauxite ore during purification of bauxite

b) **Along with cryolite and alumina, another substance is added to the electrolyte mixture. Namethe substance and give one reason for the addition.**

a) **Reason** : Because Bauxite ore is finely ground and heated under pressure with a solution of concentrated caustic soda at 150°C to obtain Sodium meta aluminate. On diluting sodium meta aluminate with water, a precipetate of aluminium hydroxide is formed. This precipitate is filtered, washed, dried and ignited at 1000°C to get alumina.

b) Fluorspar. **Reason:** It lowers the fusion temperature of electrolyte

2. The electronic configuration of metal A is 2,8,18,1.
The metal A when exposed to air and moisture forms B a green layered compound. A with con. H_2SO_4 forms C and D along with water. D is a gaseous compound. Find A,B,C and D.

i) Metal A is copper.

ii) **Action of Air and Moisture :** Copper gets covered with a green layer of Basic Copper Carbonate in thepresence of CO_2 and moisture.

$$\underset{\text{(A) copper}}{2\,Cu} + O_2 + CO_2 + H_2O \longrightarrow \underset{\text{Basic copper carbonate (Malachite green) B}}{CuCO_3.Cu(OH)_2}$$

iii) Copper is react with Conc.H_2SO_4 to form copper sulphate and sulphur dioxide.

$$Cu + 2H_2SO_4 \longrightarrow \underset{\text{Copper Sulphate (C)}}{CuSO_4} + \underset{\text{Sulphur dioxide (D)}}{SO_2\uparrow} + 2H_2O$$

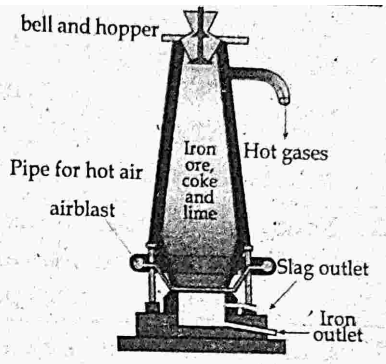
compound	molecular formula	name
A	Cu	copper
B	$CuCO_3.Cu(OH)_2$	malachite green
C	$CuSO_4$	copper sulphate
D	SO_2	sulphurdioxide

3. Explain smelting process.

- Chief ore : Haematite (Fe_2O_3)
- Concentration : Gravity Separation

Smelting :

- Furnace - Blast furnace
- Charge - Roasted ore, coke and lime stone
- Ratio - 8 : 4 : 1
- Introduced through cup and cone arrangement at the top.
- Important regions in the furnace - 3



(a) The lower Region (Combustion Zone)

- Temperature = 1500°C
- Charge comes in contact with a hot, blast of air
- Coke burns with oxygen to form CO_2
- Heat is liberated, hence it is an exothermic reaction

$$C + O_2 \xrightarrow[\Delta]{1500^\circ C} CO_2 + \text{heat}$$

(b) The middle Region (Fusion Zone)

- Temperature = 1000°C
- CO_2 is reduced to CO
- Lime stone decomposes to calcium oxide and CO_2
- In these two reactions heat is absorbed hence they are endothermic reactions.
- Calcium oxide combines with silica to form calcium silicate as slag.

$$CO_2 + C \xrightarrow[\Delta]{1000^\circ C} 2CO - \text{heat}$$

$$CaCO_3 \xrightarrow[\Delta]{1000^\circ C} CaO + CO_2 - \text{heat}$$

$$CaO + SiO_2 \rightarrow CaSiO_3$$

(c) The upper Region (Reduction Zone)

- Temperature = 400°C
- Carbon monoxide reduces ferric oxide to a fairly pure spongy iron.
- The molten iron is collected at the bottom of the furnace after removing the slag.
- The iron formed is called Pig iron.
- Pig iron is remelted and cast into different moulds. This is called cast iron.

$$Fe_2O_3 + 3CO \xrightarrow[\Delta]{400^\circ C} 2Fe + 3CO_2\uparrow$$

VIII. Book Exercise – HOT question

1. Metal A belongs to period 3 and group 13. A in red hot condition reacts with steam to form B. A withstrong alkali forms C. Find A,B and C with reactions.

i) The metal **A is Aluminium**.

ii) When steam is passed over red hot aluminium, hydrogen only produced.

$$2Al + 3H_2O \rightarrow Al_2O_3 + 3H_2\uparrow$$
(A) (B)

B→ Aluminium Oxide

iii) It reacts with strong caustic alkalis forming aluminates.

$2Al + 2NaOH + 2H_2O \rightarrow 2NaAlO_2 + 3H_2\uparrow$

(C)

C→Sodium meta Aluminate

compound	molecular formula	name
A	Al	aluminium
B	Al_2O_3	aluminium oxide
C	$NaAlO_2$	sodium meta aluminate

2. Name the acid that renders aluminium passive. Why?

Conc Nitric Acid and **dil Nitric acid** does not attack aluminium, but it renders aluminum passive **due to the formation of an oxide film** on its surface.

3. i) Identify the bond between H and F in HF molecule.

Ans: Ionic**.**

ii) What property forms the basis of identification?

Ans: Electronegativity**.**

iii) How does the property vary in periods and in groups?

Ans:

Propert	Along the period from left to right	Down the group from top to bottom
Electronegativity	Increases	decreases

SOLUTIONS

V. Book Exercise – Short answer questions

1. Define the term: Solution.

Solution is a homogeneous mixture of two or more substances.

2. What is mean by binary solution.

A solution contains one solvent and one solute is called Binary solution. Eg. Salt in water.

3. Give an example each.

i) **gas in liquid.** →Soda water.

ii) **solid in liquid**. → Salt in water.

iii) **solid in solid**. →Copper in Gold (alloys).

iv) **gas in gas**. → Air, Mixture of He – O_2 gases.

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

i) **Aqueous solution :** The solution in which water acts as a solvent. **eg**: Salt in water.

ii) **Non–aqueous solution :** The solution in which any liquid other than water, acts as a solvent. **eg:** iodine in CCl_4.

5. Define Volume percentage.

percentage by volume of solute present in the given volume of the solution.

$$\text{Volume percentage} = \frac{\text{Volume of the solute}}{\text{Volume of the solute + Volume of the solvent}} \times 100$$

6. **The aquatic animals live more in cold region. Why?**
Because, more amount of dissolved oxygen is present in the water of cold regions. This shows that the solubility of oxygen in water is more at low temperature.

7. **Define Hydrated salt.**
The number of water molecules found in the crystalline substance is called water of crystallisation. Such saltsare called hydrated salts.

8. **A hot saturated solution of copper sulphate forms crystals as it cools. Why?**
As temperature decreases the solubility of copper sulphate in the solution decreases hence its crystalls are formed

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

Deliquescent	Hygroscopic
Calcium Chloride	i) conc. H_2SO_4
	ii) Silica gel
	iii) Copper sulphate penta hydrate
	iv) Gypsum salt

VI. Book Exercise – Long answer questions

1. **Write notes on;**
i) Saturated solution.
ii) **Unsaturated solution**.

Saturated Solution	Unsaturated Solution
A solution in which no more solute can be dissolved in a definite amount of the solvent at a given temperature is called saturated solution. eg: 36 g of sodium chloride in 100 g of water at25° C.	**A solution is one that contains less solute** than that of the saturated solution at a given temperature form unsaturated solution. Eg.10 g or 20 g or 30 g of Sodium chloride in 100 g of water at 25°C forms an unsaturatedsolution.

2. **Write notes on various factors affecting solubility.**
Factors affecting solubility :
i) Nature of the solute and solvent.
ii) Temperature.
iii) Pressure.
Nature of the solute and solvent :
The nature of the solute and solvent plays an important role in solubility. Although water dissoves an enormous variety of substances, both ionic and covalent, it does not dissove everything. For example: Common salt is a polar compound and dissolves in polar solvent like water. Non–polar compounds aresoluble in non–polar solvents. For example: Fat dissolved in Ether.

Effect of temperature :
Solubility of a solid solute in liquid solvent increases with increase in temperature.
In endothermic Process :Solubility increases with increase in temperature.

In exothermic Process :Solubility decreases with increase in temperature.

Solubility of gases in liquid **:**

Solubility of gases in liquid decrease with increase in temperature.

When water is boiled the solubility of oxygen in water decreases. So oxygen escapes in the formof bubbles.

Effect of pressure :

When the pressure is increased, the solubility of a gas in liquid increases. Eg.: Carbonated beverages.

3. a) What happens when $MgSO_4.7H_2O$ is heated? Write the appropriate equation.

When $MgSO_4.7H_2O$ are heated, it loses seven water molecules and becomes anhydrous magnesium sulphate.

$$\underset{\text{(Magnesium sulphate heptahydrate)}}{MgSO_4 \cdot 7H_2O} \overset{\text{Heating}}{\underset{\text{Cooling}}{\rightleftharpoons}} \underset{\text{(Anhydrous Magnesium sulphate)}}{MgSO_4 + 7H_2O}$$

b) Define solubility.

The number of grams of solute that can be dissolved in 100g of a solvent to form its saturated solution at a given temperature and pressure.

$$\text{Solubility} = \frac{\text{Mass of the solute}}{\text{Mass of the solvent}} \times 100$$

4. In what way hygroscopic substances differ from deliquescent substances.

Hygroscopic	Deliquescent
When exposed to the atmosphere at ordinary temperature, they **absorb moisture and do not dissolve.**	When exposed to the atmospheric air at ordinary temperature, they **absorb moisture and dissolve.**
do not change its physical state on exposure to air.	**change its physical state** on exposure to air.
may be **amorphous solids** orliquids.	**crystalline solids**.

5. A solution is prepared by dissolving 45 g of sugar in 180 g of water. Calculate the mass percentageof solute.

Given : Mass of the solute = 45g , Mass of the solvent = 180g

$$\text{Mass Percentage} = \frac{\text{Mass of the solute}}{\text{Mass of the solute + Mass of the solvent}} \times 100$$

$$= \frac{45g}{45g + 180g} \times 100$$

$$= \frac{45}{225} \times 100$$

$$= 20\%.$$

6. **3.5 litres of ethanol is present in 15 litres of aqueous solution of ethanol. Calculate volume percentof ethanol solution.**

Given : Volume of the solute = 3.5 litre of ethanol.

Volume of the solution = 15 litre.

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

$$= \frac{3.5 \text{ lit}}{15 \text{ lit}} \times 100$$

Volume Percentage = 23.33%.

VIII. Book Exercise – HOT question

1. **Vinu dissolves 50 g of sugar in 250 ml of hot water, Sarath dissolves 50 g of same sugar in 250 ml of cold water. Who will get faster dissolution of sugar? and Why?**
   Vinu will get faster dissolution of sugar. Solubility of a solid in liquidincreases with increase in temperature as it is endothermic.
2. **'A' is a blue coloured crystaline salt. On heating it loses blue colour and to give 'B'. When water isadded, 'B' gives back to 'A'. Identify A and B, write the equation.**

$$\underset{\substack{\text{Copper sulphate pentahydrate} \\ \text{(Blue colour)}}}{CuSO_4 . 5H_2O} \underset{\text{Cooling}}{\overset{\text{Heating}}{\rightleftharpoons}} \underset{\substack{\text{Anhydrous copper sulphate} \\ \text{(Colourless)}}}{CuSO_4 + 5H_2O}$$

A	Copper sulphate pentahydrate	$CuSO_4 . 5H_2O$
B	Anhydrous copper sulphate	$CuSO_4$

3. **Will the cool drinks give more fizz at top of the hills or at the foot? Explain.**
   Cool drinks give more fizz at top of hills because solubility of gas is low at high altitude and hence gives more fizz.

TYPES OF CHEMICAL REACTIONS

V. Book Exercise – Short answer questions

1. **When an aqueous solution of potassium chloride is added to an aqueous solution of silver nitrate, a white precipitate is formed. Give the chemical equation of this reaction.**
   $KCl + AgNO_3 \rightarrow AgCl \downarrow + KNO_3$.
2. **Why does the reaction rate of a reaction increase on raising the temperature?**
   Adding heat to the reactants provides energyto break more bonds and thus speed up the reaction.
3. **Define combination reaction. Give one example for an exothermic combination reaction**
   A combination reaction is a reaction in which two or more reactants combine to form a compound. It isotherwise called synthesis reaction (or) composition reaction.
   $2\ Mg_{(s)} + O_{2(s)} \rightarrow 2\ MgO_{(s)}$
4. **Differentiate reversible and irreversible reactions.**

Reversible reaction	Irreversible reaction
1. Reactions can be reversed	1. The reaction cannot bereversed
2. It proceeds in both directions	2. It is unidirectional

3. It attains equilibrium	3. Equilibrium is not attained
4. It is relatively slow	4. It is fast

VI. Book Exercise – Long answer questions

1. What are called Thermolysis reactions?

Ans : A chemical reaction is a process in which old bond breaks up and new chemical bond get formed. Thermolysis chemical reactions is a special type of chemical reaction in which the reactant get decomposedby heat.

$$CaCO_{3(s)} \xrightarrow{Heat} CaO_{(s)} + CO_{2(g)}$$

$$2\,HgO_{(s)} \xrightarrow{Heat} 2\,Hg_{(l)} + O_{2(g)}$$

In these reactions heat is supplied to break the bonds, so generally they are endothermic in nature.

2. Explain the types of double displacement reactions with examples.

Ans : When two compounds react, if their ions are interchanged, then the reaction is called double displacementreactions. There are two types of double displacement reactions. They are:

i) Precipitation reaction.
ii) Neutralisation reaction.

Precipitation Reaction :

When aqueous solutions of two compounds are mixed, if they react to form an insoluble compound and a solute compound, then it is called Precipitation reaction. Because the insoluble compound formed asone of the products and hence the reaction is so called.

Eg.: The aqueous solution of Potassium iodide and Lead (II) nitrate are mixed, a double displacementreactions take place between them.

$Pb(NO_3)_{2(aq)} + 2KI_{(aq)} \rightarrow PbI_{2(s)}\downarrow + 2KNO_{3(aq)}$

Potassium and Lead displace one other and form a yellow precipitate of Lead (II) iodide.

Neutralisation Reaction :

The reaction between an acid and a base. It is called Neutralisation reaction.

Acid + Base → Salt + Water

$NaOH_{(aq)} + HCl_{(aq)} \rightarrow NaCl_{(aq)} + H_2O_{(l)}$

3. Explain the factors influencing the rate of a reaction.

Ans : Important factors that affect rate of reaction are;

i) **Nature of the Reactants :**
The reaction of sodium with hydrochloric acid is faster than that with acetic acid. Because, Hydrochloricacid is a stronger acid than acetic acid and thus more reactive. So, the nature of the reactants influencethe reaction rate.

ii) **Concentration of the Reactants :**
Changing the amount of the reactants also increases the reaction rate. More the concentration, more particles per volume exist in it and hence faster the reaction.

iii) **Temperature** :
Most of the reactions go faster at higher temperature. Because adding heat to the

reactants provides energy to break more bonds and thus speed up the reaction

iv) **Pressure :**

If the reactants are gases, increasing their pressure increases the reaction rate. This is because, on increasing the pressure the reacting particles come closer and collide frequently.

v) **Catalyst** :

In certain reactions, adding a substance as catalyst speeds up the reaction.

vi) **Surface Area of the Reactants** :

When solid reactants are involve in a reaction, their powdered form reacts more readily.

4. How does pH play an important role in everyday life?

i. Living organisms can survive only in a narrow range of pH change.

ii. pH of blood is from 7.35 to 7.45. Any increase or decrease in this value leads to diseases.

iii. Our stomach produces hydrochloric acid. It helps in the digestion of food pH is 2.0.

iv. pH of the saliva normally ranges between 6.5 to 7.5.

v. When the pH of the mouth saliva falls below 5.5, the enamel gets weathered.

vi. The pH of rain water is approximately 7, which means that it is neutral.

vii. In agriculture, the pH of soil is very important. It depends upon the nature and the range of differentsoil, different crops are cultivated.

5. What is a chemical equilibrium? What are its characteristics?

Chemical Equilibrium :

It is state of a reversible chemical reaction in which no change in the amount of the reactants andproducts takes place. At equilibrium,

Rate of Forward reaction = Rate of Backward reaction

Characteristics of Equilibrium :

- In a chemical equilibrium, the rates of the forward and backward reactions are equal.
- The observable properties such as pressure, concentration, colour, density, viscosity etc., of the systemremain unchanged with time.
- The chemical equilibrium is a dynamic equilibrium, because both the forward and backward reactionscontinue to occur even though it appears static externally.
- In physical equilibrium, the volume of all the phases remain constant.

VII. Book Exercise – HOT question

1. A solid compound 'A' decomposes on heating into 'B' and a gas 'C'. On passing the gas 'C' through water, it becomes acidic. Identify A, B and C.

A solid compound 'A' is Calcium carbonate decomposes on heating into Calcium (B) oxide and a gas Carbondioxide (O). On passing this Carbon dioxide (O) through water, it becomes audic because the formation of Carbonic acid.

compound	molecular formula	name
A	$CaCO_3$	calcium carbonate
B	CaO	calcium oxide
C	CO_2	carbon dioxide

$$\underset{A}{CaCO_3} \rightarrow \underset{B}{CaO} + \underset{C}{CO_2}$$

$$CO_2 + H_2O \rightarrow \underset{\text{Carbonic acid}}{H_2CO_3}$$

2. Can a nickel spatula be used to stir copper sulphate solution? Justify your answer.

Since the EMF of the cell is positive the reaction will displace Copper from its solution and Copper will be deposited on the Nickel spatula. Thus Nickel cannot be used as to stir the Copper sulphate solution.

CARBON AND ITS COMPOUNDS

V. Book Exercise – Short answer questions

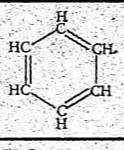
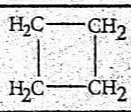
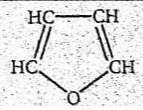
1. Name the simplest ketone and give its structural formula.

Acetone.

Structure :

$CH_3 - \underset{\underset{O}{\|}}{C} - CH_3$ [Acetone] (propane)

2. Classify the following compounds based on the pattern of carbon chain and give their structural formula:

Name	Class		Structural formula
Propane	acyclic compounds		CH_3-CH_2-CH_3
Benzene	Cyclic compounds	Aromatic compound	
Cyclobutane	Cyclic compounds	Alicyclic compound	
Furan	Cyclic compounds	Heterocyclic compound	

3. How is ethanoic acid prepared from ethanol? Give the chemical equation.

Ethanoic acid is prepared by the oxidation of ethanol in the presence of alkaline potassiumpermanganate or acidified potassium dichromate.

$$\underset{\text{Ethanol}}{CH_3CH_2OH} \xrightarrow[2(O)]{KMnO_4/OH^-} \underset{\text{Ethanoic Acid}}{CH_3COOH} + H_2O$$

4. How do detergents cause water pollution? Suggest remedial measures to prevent this pollution?

Some detergents having a branched hydrocarbon chain are not fully bio degradable by microorganism present in water and they cause water pollution.

Remedial Action: We have to use biodegradable detergents which have linear hydrocarbonchains.

5. Differentiate soaps and detergents.

S.No.	Soap	Detergents
1	It is a Sodium salt of long chain fatty acids.	It is sodium salts of sulphonic acids
2	It forms a scum in hard water.	Does not form a scum in hard water.
3	It has poor foaming capacity.	It has rich foaming capacity.
4	Soaps are biodegradable.	Most of the detergents are non–biodegradable.

VI. Book Exercise – Long answer questions

1. What is called homologous series? Give any three of its characteristics?

Homologous series is a group or a class of organic compounds having same general formula and similar chemical properties in which the successive members differ by a -CH_2 group.

Characteristics of Homologous series :

- All members of a homologous series contain the same elements and functional group.
- Chemical properties of the members of a homologous series are similar.
- All the members can be prepared by a common method.

2. Arrive at, systematically, the IUPAC name of the compound: $CH_3–CH_2–CH_2–OH$.

Step 1 : The parent chain consists of 3 carbon atoms. The root word is 'prop'.

Step 2 : There are single bonds between the carbon atoms of the chain. So the primary suffix is 'ane'.

Step 3 : Since the compound contains –OH group, it is an alcohol. The carbon chain is numbered from the end which is closest to –OH group

Step 4 : The locant number of –OH group is 1 and thus the secondary suffix is 1–ol. The name of the

compound is prop+ane + (1–ol) = propan–1–ol.

Terminal 'e' of 'ane' is removed as per Rule 5.

3. How is ethanol manufactured from sugarcane?

Fermentation method can be used to obtain ethanol from sugarcane. Actually, in industries, C_2H_5OH is prepared by the fermentation of molasses, which is a by – product obtained during the manufacture of sugar from sugarcane.

It is converted into ethanol by following steps:

a) Dilution of molasses
b) Addition of nitrogen source
c) Addition of yeast
d) Distillation of wash.

Chemical Reactions:

$$\underset{\text{Sugar}}{C_{12}H_{22}O_{11}} + H_2O \xrightarrow{\text{Invertase}} \underset{\text{Glucose}}{C_6H_{12}O_6} + \underset{\text{Fructose}}{C_6H_{12}O_6}$$

$$\underset{\text{Glucose or Fructose}}{C_6H_{12}O_6} \xrightarrow{\text{Zymase}} \underset{\text{Ethanol}}{2C_2H_5OH} + 2CO_2$$

4. **Give the balanced chemical equation of the following reactions:**
   - i) **Neutralization of NaOH with ethanoic acid.**
   - ii) **Evolution of carbon dioxide by the action of ethanoic acid with $NaHCO_3$.**
   - iii) **Oxidation of ethanol by acidified potassium dichromate.**
   - iv) **Combustion of ethanol.**

(*i*) Neutralization reaction:

$$\underset{\text{Acetic acid}}{CH_3COOH} + \underset{\text{Sodium hydroxide}}{NaOH} \longrightarrow \underset{\text{Sodium acetate}}{CH_3COONa} + H_2O$$

(*ii*) Evolution of CO_2:

$$CH_3COOH + NaHCO_3 \longrightarrow CH_3COONa + H_2O + CO_2$$

(*iii*) Oxidation of ethanol by $K_2Cr_2O_7$:

$$CH_3CH_2OH \xrightarrow[2[O]]{K_2Cr_2O_7 \mid H^+} \underset{\text{Ethanoic acid}}{CH_3COOH} + H_2O$$

(*iv*) Combustion of ethanol:

$$C_2H_5OH + 3O_2 \longrightarrow 2CO_2 + 3H_2O$$

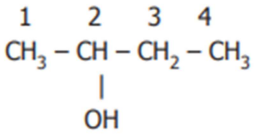
5. **Explain the mechanism of cleansing action of soap.**
   - A soap molecule contains two chemically distinct parts that interact differently with water. It has one polar end, which is a short head with a carboxylate group (-COONa) and one non-polar end having the long tail made of the hydrocarbon chain.
   - The polar end is hydrophilic (Water loving) in nature and this end is attracted towards water. The non-polar end is hydrophobic (Water hating) in nature and it is attracted towards dirt or oil on the cloth, but not attracted towards water. Thus, the hydrophobic part of the soap molecule traps the dirt and the hydrophilic part makes the entire molecule soluble in water.
   - When a soap or detergent is dissolved in water, the molecules join together as clusters called 'micelles'. Their long hydrocarbon chains attach themselves to the oil and dirt. The dirt is thus surrounded by the non-polar end of the soap molecules. The charged carboxylate end of the soap molecules makes the micelles soluble in water. Thus, the dirt is washed away with the soap.

VII. Book Exercise – HOT question

1. **The molecular formula of an alcohol is $C_4H_{10}O$. The locant number of its –OH group is 2.**
   - i) **Draw its structural formula.**
   - ii) **Give its IUPAC name.**
   - iii) **Is it saturated or unsaturated?**

Ans:

i.



ii. Butan-2-ol

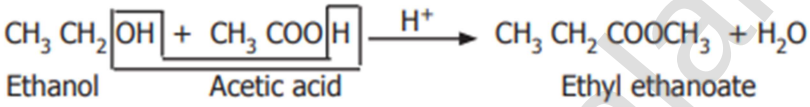
iii. Saturated (C – C single bond).

2. **An organic compound 'A' is widely used as a preservative and has the molecular formula $C_2H_4O_2$. This compound reacts with ethanol to form a sweet smelling compound 'B'.**
   - **i) Identify the compound 'A'.**
   - **ii) Write the chemical equation for its reaction with ethanol to form compound 'B'.**
   - **iii) Name the process.**

Ans:

i. Ethenoic acid

ii. Ethyl ethanoate



iii. Esterification.

PLANT ANATOMY AND PLANT PHYSIOLOGY

V. Book Exercise – Answer in a sentence

1. **What is collateral vascular bundle?**

   Towards the centre and phloem lies towards the periphery is called as **collateral vascular bundle.**

2. **Where does the carbon that is used in photosynthesis come from?**

   CO_2 from atmosphere

3. **What is the common step in aerobic and anaerobic pathway?**

   Glycolysis

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

   Anaerobic respiration

VI. Book Exercise – Short answer questions

1. **Give an account on vascular bundle of dicot stem.**
   - i) Vascular bundles of dicot stem are conjoint, collateral, endarch and open.
   - ii) They are arranged in the form of a ring around the pith.
2. **Write a short note on mesophyll.**

   The tissue present between the upper and lower epidermis is called mesophyll.

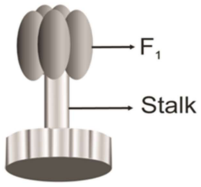
   It is differentiated into

   a) Palisade parenchyma : It is found just below the upper epidermis. The cells are

elongated. These cells have more number of chloroplasts. The cells do not have intercellular spaces and they take part inphotosynthesis.

b) **Spongy parenchyma :** It is found below the palisade parenchyma tissue. Cells are almost spherical or
oval and are irregularly arranged. Cells have intercellular spaces. It helps in gaseous exchange.

3. **Draw and label the structure of oxysomes.**



4. **Name the three basic tissues system in flowering plants.**
The three basic tissues system in flowering plants are
   i) Dermal or Epidermal tissue system
   ii) Ground tissue system on fundamental tissue system and
   iii) Vascular tissue system on conducting tissue system

5. **What is photosynthesis and where in a cell does it occur?**
   - Photosynthesis is a process in which **carbon dioxide** combines with **water** in the presence of **sunlight** and **chlorophyll** to form **carbohydrates**. During this process **oxygen** is released as a by product.
   - It occurs in the **chloroplast** of plant cell.

6. **What is respiratory quotient?**
Respiratory quotient is the ratio of volume of carbon dioxide liberated and the volume of oxygen consumedduring respiration. It is expressed as

$$\text{Respiratory Quotient (RQ)} = \frac{\text{Volume of } CO_2 \text{ liberated}}{\text{Volume of } O_2 \text{ consumed}}$$

7. **Why should the light dependent reaction occur before the light independent reaction?**
The light dependent reaction (Light reaction) should occur before light independent reaction (Dark reaction). Because **light dependent reaction only have to supply organic energy molecules** such as ATP and **$NADPH_2$ necessary to reduce CO_2 into carbohydrate** in the light independent reaction.

8. **Write the reaction for photosynthesis?**

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

Carbon dioxide + Water Glucose + Water + Oxygen

VII. Book Exercise – Long answer questions

1. **Differentiate the following**
   a) Monocot root and Dicot root **b) Aerobic and Anaerobic respiration.**

a) Monocot root and Dicot root

S.No.	Tissue	Dicot root	Monocot root
1.	Number of Xylem	Tetrarch	Polyarch
2.	Cambium	Present	Absent
3.	Secondary Growth	Present	Absent
4.	Pith	Absent	Present
5.	Conjunctive Tissue	Paranchyma	Sclerenchyma

b) Aerobic and Anaerobic respiration

Aerobic Respiration	Anaerobic Respiration
1. It takes place in **higher plants andanimals**.	1. It takes place in **lower plants.(Yeast andBacteria)**.
2. Oxygen is **utilized** for respiration.	2. Oxygen is **not utilized** for respiration.
3. Glucose is **completely** oxidized.	3. **Incomplete** oxidation of Glucose takes place.
4. **More energy** is produced. (38 ATP)	4. **Less energy** is produced. (2 ATP)
5. The end products are **CO_2 , H_2O andEnergy**	5. The end products are **Ethanol or Lactic acid,CO_2 and Energy**.

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

Stages of Aerobic respiration

a) Glycolysis (Glucose splitting):

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

ii) **takes place in cytoplasm** of the cell.

b) Krebs Cycle:

i) This cycle **occurs in mitochondria matrix**.

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

iii) The **oxidation of pyruvic acid into CO_2 and water** takes place through this cycle. It is also called Tricarboxylic Acid Cycle (TCA).

c) Electron Transport Chain :

i) Occurs in the **inner membrane of the mitochondria**.

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

iii) The electrons, as they move through the system, **release energy in the formof ATP**. This is called **oxidative phosphorylation**.

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

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

	Light dependent reaction	Light independent reaction
Differences	It takes place in the **presence of light**.	It takes place in the **absence of light**.
Reactants	Light, Water, ADP and NADPH.	CO_2, ATP and $NADPH_2$
End Product	O_2, ATP and $NADPH_2$	Carbohydrate.
Location	It takes place in the **thylakoid membranes** of the chloroplast.	It takes place in the **stroma** of the chloroplast.

VIII. Book Exercise – Higher Order Thinking Skills (HOTS)

1. **The reactions of photosynthesis make up a biochemical pathway.**
   - **A) What are the end products for both light and dark reactions.**
   - **B) Explain how the biochemical pathway of photosynthesis recycles many of its own reactions andidentify the recycled reactants.**
     - **A) The reactants and products for both light and dark reactions**

	Light reaction	Dark reaction
End Product	O_2, ATP and $NADPH_2$,H_2O	Carbohydrate.

- The end products of ADP, NADP of light dependt reaction are the reactants of light dependent reactions
- The products of light reaction, ATP and $NADPH_2$, utilized in Calvin cycle converted to ADP and $NADP^+$.
- Light reaction converts these energy back to the high energy forms ATP and NADPH.

2. **Where do the light dependent reaction and the Calvin cycle occur in the chloroplast?**

	Light dependent reaction	Calvin cycle
Location	It takes place in the **thylakoid membranes (Grana)** of the chloroplast.	It takes place in the **stroma** of the chloroplast.

STRUCTURAL ORGANISATION OF ANIMALS

V. Book Exercise – Answer in a sentence (1 mark)

1. **Give the common name of the *Hirudinaria granulosa*.**
   Indian Cattle Leech.
2. **How does leech respire?**
   Leech respires through the skin.
3. **Write the dental formula of rabbit.**
   Dental formula of rabbit is, $I\frac{2}{1}$, $C\frac{0}{0}$, $PM\frac{3}{2}$, $M\frac{3}{3}$, which can be written as $\frac{2033}{1023}$.
4. **How many pairs of testes are present in leech?**
   Eleven pairs of testes.

5. **How is diastema formed in rabbit?**
   Due to absence of Canines gap between incisors and premolar forms the diastema.
6. **What organs are attached to the two bronchi?**
   Lungs
7. **Which organ acts as suction pump in leech?**
   Muscular Pharynx.
8. **What does CNS stand for?**
   Central Nervous System.
9. **Why is the teeth of rabbit called heterodont?**
   As there are three different kinds of teeth
10. **How does leech suck blood from the host?**
    Leech attaches itself to the body of the host by suckers. Jaws of mouth causes wound. Then the blood is sucked by pharynx.

VI. Book Exercise – Short answer question (2 mark)

1. **Why are the rings of cartilages found in trachea of rabbit?**
   Tracheal walls are supported by rings of cartilage help in the free passage of air.
2. **List out the parasitic adaptations in leech.**
   i) Blood is sucked by pharynx.
   ii) Anterior and posterior suckers help the leech attacks itself to the body of the host.
   iii) The three jaws inside the mouth, causes a painless Y–shaped wound in the skin of the host.
   iv) **The salivary glands produce hirudin** which does not allow the blood to coagulate. Thus, a continuoussupply of the blood is maintained.
   v) **Blood is stored in the crop**. It gives nourishment to the leech for several months.

VII. Book Exercise – Long answer question (5 mark)

1. **How is the circulatory system designed in leech to compensate the heart structure?**
   i) In leech, circulation is brought about by haemocoelic system.
   ii) There are no true blood vessels. The blood vessels are replaced by channels called haemocoelic channels or canals filled with blood like fluid.
   iii) There are four channels. One on dorsal, one on ventral other.
   iv) Two channels lies on the lateral side of the alimentary canal which serve as heart and have inner values.
   v) All four channels are connected together posteriorly in the 26^{th} segment.
2. **How does locomotion take place in leech?**
   Locomotion in leech takes place by
   i) **Looping or crawling movement :** This is brought about by the contraction and relaxation of muscles. The two suckers serve for attachment.
   ii) **Swimming movement :** Leeches swim very actively and perform undulating movements in water.

3. Explain the male reproductive system of rabbit with a labelled diagram.

Male Reproductive System in Rabbit :

The male reproductive system of rabbit consists of,

i) A pair of testes.

ii) The associated ducts

iii) Three accessory glands.

i) Testes :

a) The testes located in a sac of skin called the scrotum produce sperms.

ii) Ducts :

a) Each testis consists of a numerous fine tubules called seminiferous tubules lead into a coiled tubules called epididymis, which lead into the sperm duct called vas deferens.

b) The urethra runs backward and passes into the penis.

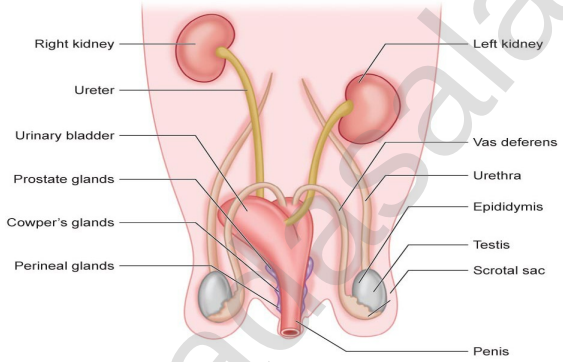
iii) Accessory glands :

Three accessory glands involve in reproduction. They are;

a) Prostate gland.

b) Cowper's gland and

c) Perineal gland.



VIII. Book Exercise – Higher Order Thinking Skills (HOTS)

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

Leech bite could not be felt as soon as it attaches to the skin, because leech injects a anasthetic substance and the person can't feel the bite.

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

Shylesh's grandfather explained about the teeth of rabbit as follows :

i) The rabbit has two sets of teeth (Diphyodont dentition).

ii) The two types of teeth are;

a) Milk teeth (yound ones) and

b) Permanent teeth (in adults).

iii) In rabbit the teeth are of three different kinds (Heterodont). They are;

a) Incisors.
b) Premolars and
c) Molars.

iv) Diastema is the gap between the incisors and premolar which helps in mastication and chewing offood.

IX. Book Exercise – Value based questions

1. **Leeches do not have secretion of digestive juices and enzymes -Why ?**
   The leech feeds by sucking the blood of cattle and other domestic animals. Then the blood is stored in the crop. It gives noureshment to the leech for several months. Due to this reason there is no elaborate secretionof digestive juices and enzymes.
2. **How is the digestive system of rabbit suited for herbivorous mode of feeding?**
   i) The digestive system of rabbit is uniquely designed to consume large amounts of plant materials.
   ii) The teeth are of three types viz incisors, premolars and molars (Heterodont).
   iii) Diastema, a gap between incisors and premolar, helps in mastication and chewing of food in herbivorousanimals.
   iv) The plants that rabbits eat are high in fibre, which is indigestible to mammalian digestive enzymes.
   So alimentary canal contains bacteria that helps in digestion of cellulose.

TRANSPORTATION IN PLANTS AND CIRCULATION IN ANIMALS

V. Book Exercise – Answer in a word or sentence *[1 Mark]*

1. **Name two layered protective covering of human heart.**
   Pericardium.
2. **What is the shape of RBC in human blood?**
   Biconcave and **disc-shaped**.
3. **Why is the colour of the blood red?**
   Presence of **haemoglobin**.
4. **Which kind of cells are found in the lymph?**
   White Blood cells (WBC).
5. **Name the heart valve associated with the major arteries leaving the ventricles**.
   Semilunar valves.
6. **Mention the artery which supplies blood to the heart muscle.**
   Coronary artery

VI. Book Exercise – Short answer questions *[2 Marks]*

1. **What causes the opening and closing of guard cells of stomata during transpiration?**
   The opening and closing of the stomata is due to the **change in turgidity** of the **guard cells**.

a) When **turgidity increases** within the two guard cells **stoma opens**.
b) When the guard cells lose water, it becomes **flaccid** and the **stoma closes**.

2. **What is cohesion?**
The **force of attraction between molecules of water** is called cohesion.

3. **Trace the pathway followed by water molecules from the time it enters a plant root to the time itescapes into the atmosphere from a leaf.**

ROOT HAIR ⟶ CORTICAL CELLS ⟶ XYLEM ⟶ STEM ⟶ LEAVES⟶ ATMOSPHERE

4. **What would happen to the leaves of a plant that transpires more water than its absorption in theroots?**
When transpiration exceeds water absorption by the roots, the plant **dehydrates.** Which can result in **wilting** of plants and **dying** of the plant.

5. **Describe the structure and working of the human heart.**
i) The heart is enclosed in a double walled sac called **pericardium**.
ii) The human heart is **four chambered**.
iii) The two **upper thin walled** chambers → **auricle or atria**.
iv) The two **lower thick walled** chambers →**ventricles**.
v) Right auricle right ventricle seperated by Tricuspid valve.
vi) Left auricle left ventricle seperated by bicuspid valve.
vii) The **right atrium receives deoxygenated blood** form body parts
viii) **Pulmonary veins** bring **oxygenated blood** to the left atrium from the **lungs**.
ix) The right and left auricles pump blood into the right and left ventricles respectively.
x) **From the right ventricle deoxygenated blood** pumped to the **lungs.**
xi) The **left ventricle** pump **oxygenated blood** to various organs of the body.
xii) The **coronary arteries** supply blood to the **heart**.

6. **Why is the circulation in man referred to as double circulation?**
Because the **blood circulates twice** through the heart in one complete cycle.

7. **What are heart sounds? How are they produced?**
The rhythmic closure and opening of the valves cause the sound of the heart.
a) **LUBB** (longer) duration is produced by the closure of the **tricuspid and bicuspid valves**.
b) **DUPP** (shorter) duration and produced by the closure of **semilunar valves.**

8. **What is the importance of valves in the heart?**
Valves **regulate the flow of blood** in a single direction and prevent back flow of blood.

9. **Who discovered Rh factor? Why was it named so?**
1. Rh factor was discovered by **Landsteiner** and **Wiener** in 1940.
2. The Rh factor is named after the **Rhesus monkey,** where it was first identified.

10. How are arteries and veins structurally different from one another?

No.	Arteries	No.	Veins
1.	Wall of artery is **strong, thick and elastic**.	1.	Wall of vein is **weak, thin and non – elastic**.
2.	Internal valves are **absent**.	2.	Internal valves are **present**.

11. Why is the Sinoatrial node called the pacemaker of heart?

Because it is capable of initiating impulse which can stimulate the heart muscles to contract

12. Differentiate between systemic circulation and pulmonary circulation.

No.	Systemic circulation	No.	Pulmonary circulation
1.	It occurs **between** the **heart** and the **entirebody**.	1.	It occurs **between** the **heart** and the **lungs**.
2.	It carries **oxygenated blood** from the heart around the body then carries the **deoxygenated blood** from the body back to the heart.	2.	It carries **deoxygenated blood** from the heart to the lungs and **oxygenated blood** from lungs to the heart.

13. The complete events of cardiac cycle last for 0.8 sec. What is the timing for each event?

a) **Atrial systole :** Contraction of auricles : **0.1 sec**.
b) **Ventricular systole :** Contraction of ventricles : **0.3 sec**.
c) **Ventricular diastole :** Relaxation of ventricles : **0.4 sec**.

VII. Book Exercise – Give reasons for the following statements ***[2 Marks]***

1. Minerals cannot be passively absorbed by the roots.

Minerals cannot be passively absorbed by the roots because

a) Minerals are present in the soil as **charged particles** which cannot move across the cell membranes.
b) The **concentration of minerals** in the soil is usually **lower** than the concentration of minerals in the root.

2. Guard cells are responsible for opening and closing of stomata.

The opening and closing of the stomata is due to the **change in turgidity** of the **guard cells**.

a) When **turgidity increases** within the two guard cells **stoma opens**.
b) When the **guard cells lose water**, it becomes **flaccid** and the **stoma closes**.

3. The movement of substances in the phloem can be in any direction.

a) During the growth of a plant, its leaves act as the **source of food** as they carry out **photosynthesis**.
b) The phloem conducts the food from the source to the sink
c) **During spring**, this process is reversed as the food stored in the sink is transported toward the growing buds of the plant, through the phloem.
d) Thus, the movement of food in the phloem is **bidirectional**

4. Minerals in the plants are not lost when the leaf falls.

In deciduous plants, minerals like phosphorus, suphur, nitrogen and potassium are remobilized from olderdying leaves to younger leaves. So minerals in the plants are not

lost when the older leaf falls.

5. **The walls of the right ventricle are thicker than the right auricles**.
   Usually walls of the ventricles are thicker than auricles because the ventricles have to pump out **blood withforce** away from the heart.
6. **Mature RBC in mammals do not have cell organelles**.
   a) The lack of cell organelles **allows** it to **carry more oxygen**.

VIII. Book Exercise – Long answer questions ***[5 Marks]***

1. **How do plants absorb water? Explain.**
   1. Water is absorbed along with minerals, by the root hairs, purely by **diffusion**.
   2. Root hairs are thin walled, **slender extension** of **epidermal cell** that increase the surface area ofabsorption.
   3. Once the water enters the root hairs, the **concentration** of water molecules in the root hair cells become
      more than that of the **cortex**.
   4. Thus water from the root hair moves to the **cortical cells** by **osmosis** and then reaches the xylem. From
      there the water is **transported** to the **stem and leaves**.
   5. Once water is absorbed by the root hairs, it can move deeper into root layers by two distinct pathways:
      a) **Apoplast Pathway :** The **apoplastic** movement of water occurs exclusively **through the intercellular spaces** and the walls of the cells. Apoplastic movement does not involve crossing the cell membrane. This movement is dependent on the gradient.
      b) **Symplast Pathway :** In **symplastic** movement, the water travels through the cells i.e. their cytoplasm; intercellular movement is through the **plasmodesmata**. Water enters the cells through the cell membrane. Movement is again down a potential gradient.
2. **What is transpiration? Give the importance of transpiration.**
   Transpiration is the **evaporation of water** in plants through stomata in the leaves.

Importance of Transpiration

1. Creates transpirational pull for **transport of water.**
2. Supplies water for photosynthesis.
3. **Transports minerals** from soil to all parts of the plant.
4. **Cools** the surface of the leaves by evaporation.
5. Keeps the **cells turgid**; hence, maintains their **shape**.

3. **Why are leucocytes classified as granulocytes and agranulocytes? Name each cell and mention its functions.**
   Based on the presence or absence of granules , leucocytes are classified into two types.
   i) **Granulocytes :** They contain granules in their cytoplasm.
   ii) **Agranulocytes :** Granules are not found in the cytoplasm of these cells.

I. Types of Granulocytes and their functions :

Name of Granulocyte Cells	Functions
1.Neutrophils	Their numbers are increased during **infection** and **inflammation**.
2.Eosinophils	Their number increases during conditions of **allergy** and **parasiticinfections**. It brings about detoxification of toxins.
3.Basophils	They release chemicals during the process of **inflammation**.

II. Types of Agranulocytes and their functions :

Name of Agranulocyte Cells	Functions
1.Lymphocytes	They produce **antibodies** during bacterial and viral infections.
2.Monocytes	They are the largest of the leucocytes and are amoeboid in shape.They are **phagocytic** and can **engulf bacteria**.

4. Differentiate between systole and diastole. Explain the conduction of heart beat.

I. Differences between Systole and Diastole.

Systole	Diastole
1. It is the **contraction** of heart chambers	1. It is the **relaxation** of heart chambers
2. Pressre is 120mm.	2. Pressure is 80mm.
3. Consistes **Atrial systole** and **Ventricular systole**.	3. Consists **Atrial diastole** and **Ventricular diastole.**

II. The conduction of heart beat

i) **Sino-atrial node** acts as the **'pacemaker'** of the heart because it is capable of initiating impulse which can stimulate the heart muscles to contract.

ii) The impulse from the sinoatrial node spreads as a wave of contraction over the right and left atrial wall.

iii) The wave of contraction from SA node reaches the **atrioventricular** (AV) **node**, which emits an impulse of contraction spreading to the ventricular muscle via the **atrioventricular bundle** and **the Purkinje fibres**.

5. Enumerate the functions of blood.

Functions of blood

i) Transport of respiratory gases (Oxygen and CO_2).

ii) Transport of digested food materials to the different body cells.

iii) Transport of hormones.

iv) Transport of nitrogenous excretory products like ammonia, urea and uric acid.

v) It is involved in protection of the body and defense against diseases.

vi) It acts as buffer and also helps in regulation of pH and body temperature.

vii) It maintains proper water balance in the body.

X. Book Exercise – High Order Thinking Skills (HOTS).

1. **When any dry plant material is kept in water, they swell up. Name and define the phenomenon involved in this change.**

   Ans :**Imbition**, Imbibition is defined as the **uptake of water** by solids and swelling.

2. **Why are the walls of the left ventricle thicker than the other chambers of the heart?**

   Ans : Because the ventricles have to pump out **blood withforce** to all the parts of body.

3. **Doctors use stethoscope to hear the sound of the heart. Why?Ans :**
   a) to hear the sound of the heart.
   b) to identify and localize health problems and diagnose disease.

4. **How does the pulmonary artery and pulmonary vein differ in their function when compared to anormal artery and vein?**

   Ans :
   a) All arteries carry oxygenated blood except the pulmonary artery which carry deoxygenatedblood to the lungs.
   b) All veins carry deoxygenated blood except the pulmonary vein which carry oxygenated blood from the lungs to the heart.

5. **Transpiration is a necessary evil in plants. Explain.**

   Ans :
   a) Transpiration is essential for the **movement of water** and **minerals** from the root **to the healthy parts** of the plant.
   b) But **excess transpiration** may result in **drying up** of the leaves or **wilting** and **loss of soil water**.
   Hence it is termed as a necessary evil.

NERVOUS SYSTEM

VI. Book Exercise – Short answer question.

1. **Define stimulus.**

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

2. **Name the parts of the hind brain.**

   Hindbrain is formed of three parts
   a) Cerebellum,
   b) Pons and
   c) Medulla oblongata.

3. **What are the structures involved in the protection of brain?**

   The structures involved in the protection of brain are
   a) Skull
   b) Three membranes of meninges
      i) Duramater
      ii) Arachnoid membrane and
      iii) Piamater
   c) Cerebrospinal fluid.

4. **Give an example for conditioned reflexes.**
   Playing harmonium by striking a particular key on seeing a music note is an example of conditioned reflexeswhich required conscious training effort.
5. **Which acts as a link between the nervous system and endocrine system?**
   Hypothalamus.
6. **Define reflex arc.**
   The pathway taken by nerve impulse to accomplish reflex action is called reflex arc.

VII. Book Exercise – Differentiate between.

1. **Voluntary and involuntary actions.**

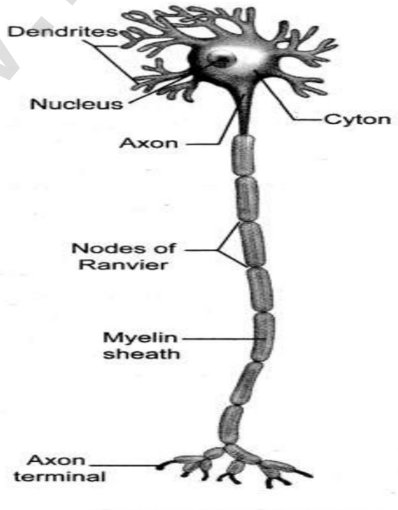
Voluntary action	Involuntary action
i) The Voluntary actions are **under the control of our will**. e.g Eating, Locomotion etc.	i) Involuntary action are **not under our control**. e.g Breathing,Heart beat etc.
ii) It is controlled by the **brain**.	ii) It is controlled by the **spinal cord**.
iii) All voluntary actions result in a **muscularaction**.	iii) Involuntary actions result certain activites to maintain steady state.

2. **Medullated and non-medullated nerve fibre.**

Medullated nerve fibre	Non-medullated nerve fibre
i) The axon is **covered with myelin sheath**.	i) The axon is **not covered by myelin sheath**.
ii) They form the **white matter** of the brain.	ii) They form the **grey matter** of the brain.
iii) They also known as **Myelinated** nerve fibre.	iii) They also known as **Non-myelinated** nerve fibre.

VIII. Book Exercise – Long answer question :

1. **With a neat labelled diagram explain the structure of a neuron.**



Structures of Neuron

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

i) **Cyton :**

1. It has a central nucleus with abundant cytoplasm called **neuroplasm**.
2. The cytoplasm has large granular body called **Nissl's granules** and the other cellorganelles like mitochondria, ribosomes, lysosomes, and endoplasmic recticulum.
3. Neurons do not have the ability to divide.
4. Several neurofibrils are present in the cytoplasm that help in transmission of nerve impulses to and from the cell body.

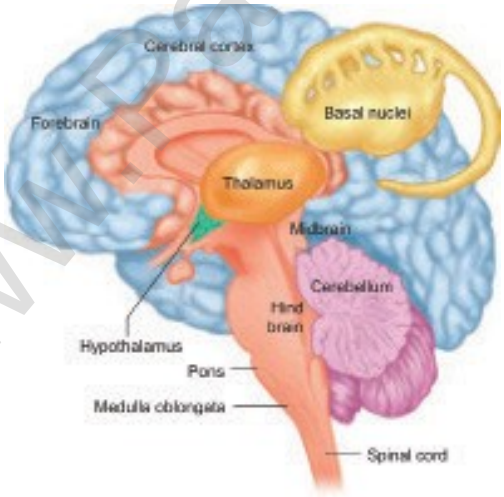
ii) **Dendrites**:1.These are the numerous branched cytoplasmic processes that project from the surfaceof the cell body. They conduct nerve impulses towards the cyton.

2. The branched projections increase the surface area for receiving the signals from othernerve cells.

iii) **Axon:** 1. The axon is a single, elongated, slender projection.

2. The end of axon terminates as fine branches which terminate into knob like swellings called **synaptic knob**.
3. The plasma membrane of axon is called **axolemma**, while the cytoplasm is called **axoplasm**. It carries impulses away from the cyton.
4. The axons may be covered by a protective sheath called **myelin sheath** which is further covered by a layer of **Schwann cells** called **neurilemma**.
5. Myelin sheath breaks at intervals by depressions called **Nodes of Ranvier**.
6. The region between the nodes is called as **internode**.
7. Myelin sheath acts as insulator and ensures rapid transmission of nerve impulses.

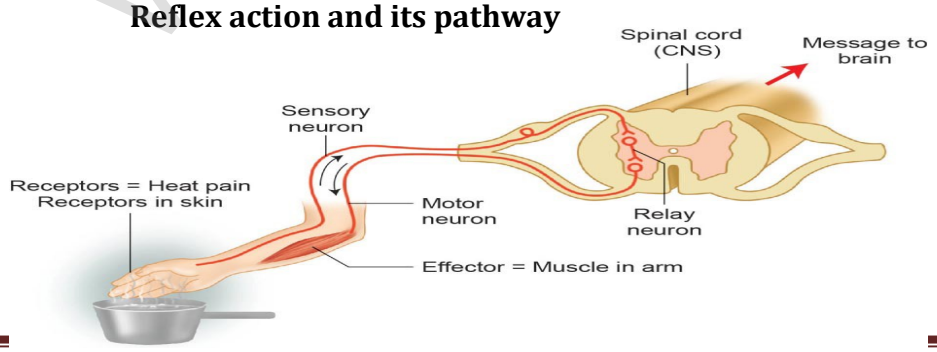
2. Illustrate the structure and functions of brain.



Structure	Functions
I. Fore brain	
1. **Cerebrum** is the largest portion forming nearly two-third of the brain. The cerebrum is longitudinally divided into two halves as right and left **cerebral hemispheres**. The **outer** portion of each cerebral hemisphere is formed of **grey matter** and is called **cerebral cortex**. The **inner or deeper** part is formed of **white** matter and is called **cerebral medulla**.	The cerebrum is responsible for the thinking, intelligence, consciousness, memory, imagination, reasoning and willpower.
2. **Thalamus** present in cerebral medulla	Acts as relay station.
3. **Hypothalamus** lies at the base of the thalamus.	Temperature control, thirst, hunger, urination, important link between nervous system and endocrine glands
II. Mid brain	
4. **Corpora quadrigemina** is the dorsal portion of the mid brain consists of four rounded bodies.	It controls visual and auditory (hearing) reflexes.
III. Hind brain	
5. **Cerebellum** is second largest part of the brain formed of two large sized hemispheres and middle vermis.	It coordinates voluntary movements and also maintains body balance.
6. **Pons** is a bridge of nerve fibre that connects the lobes of cerebellum.	It relay signals between the cerebellum, spinal cord, midbrain and cerebrum. It controls respiration and sleep cycle.
7. **Medulla oblongata** is the posterior most part of the brain that connects spinal cord and various parts of brain.	It has cardiac centres, respiratory centres, vasomotor centres to control heart beat, respiration and contractions of blood vessels respectively. It also regulates vomiting and salivation.

3. What will you do if someone pricks your hand with a needle? Elucidate the pathway of response with a neat labelled diagram.

Reflex action and its pathway



i) When a needle pricks our hand, we withdraw our hand away from the source of pain, the needle. Thisstimulus (pain) in turn triggers an impulse in sensoryneuron.

ii) The **sensory neuron** transmits or conveys the message to the spinal cord.

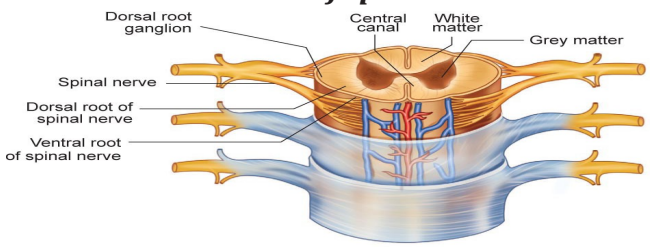
iii) **Spinal cord** interprets the stimulus and the impulse ispassed on to the relay neuron which in turn transmitsit to a motor neuron.

iv) **Motor neurons** carry command from spinal cord toour arm.

v) Muscle in our arm contracts and we withdraw our hand immediately from the source of pain, theneedle.

4. Describe the structure of spinal cord.

Structure of spinal cord



i) Spinal cord is a cylindrical structure lying in the neuralcanal of the vertebral column.

ii) It is covered by meninges.

iii) It extends from the lower end of medulla oblongata to the first lumbar vertebra.

iv) The posterior most region of spinal cord tapers into a thin fibrous thread like structure called **filum terminale**.

v) Internally, the spinal cord contains a cerebrospinal fluid filled cavity known as the **central canal**.

vi) The grey matter of spinal cord is 'H' shaped. The upper end of letter 'H" forms **posterior horns** andlower end forms **anterior horns**.

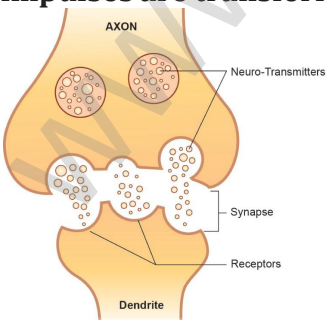
vii) A bundle of fibres pass into the posterior horn forming **dorsal** or **afferent root**. Fibres pass outwardfrom the anterior horn forming **ventral** or **efferent root**.

viii) These two roots joins to form **spinal nerves**.

ix) The white matter is external and have bundle of nerve tracts.

x) Spinal cord conducts sensory and motor impulses to and from the brain. It controls reflex actions of the body.

5. How nerve impulses are transferred from one neuron to next neuron?



i) All the information from the environment are detected by the receptors located in our sense organs such as the eyes, the nose, the skin etc.

ii) Information from the receptors is transmitted as **electrical impulse** and is received by the dendritic tips of the neuron.

iii) This impulse travels from the dendrite to the cell body and then alongthe axon to its terminal end.

iv) On reaching the axonal end, it causes the nerve endings to release a chemical called **neurotransmitter** which diffuses across a synapse and starts a similar electrical impulse in the dendrites of the next neuron,then to their cell body to be carried along the axon.

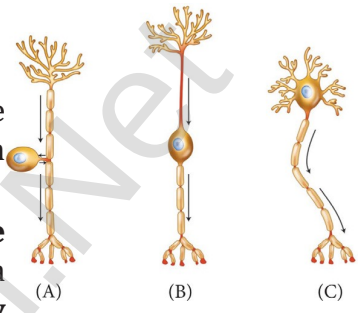
v) In this way, the electrical signal reaches the brain or spinal cord.

vi) The response from brain (or spinal cord) is similarly passed on to the effector organs such as the muscle or gland cell, that undergoes the desired response.

vii) The flow of nerve impulses from axonal end of one neuron to dendrite of another neuron through a **synapse** is called **synaptic transmission**.

6. Classify neurons based on its structure.

Based on structure the neurons classified as follows:



i) **Unipolar neurons:** Only **one nerve process** arises from the cyton which acts as both axon and dendron. They found in **early embryos** but not in adult.

ii) **Bipolar neurons:** The cyton gives rise to **two nerve processes** of whichone acts as an axon while another as a dendron. They found in **retina of eye** and **olfactory epithelium** of nasal chambers.

iii) **Multipolar neurons:** The cyton gives rise to **many dendrons** and an **axon**. They found in **cerebral cortex** of brain.

IX. Book Exercise – Higher Order Thinking Skills (HOTS)

1. 'A' is a cylindrical structure that begins from the lower end of medulla and extend downwards. It isenclosed in bony cage 'B' and covered by membranes 'C'. As many as 'D' pairs of nerves arise from the structure 'A'.

i) What is A?

ii) Name (a) bony cage 'B' and (b) membranes 'C'.

iii) How much is D?

i) A is **Spinal cord**.

ii) (a) Bony cage 'B' is **Vertebral column**.

(b) Membranes 'C' are **Duramater, Arachnoid membrane** and **Piamater of Meninges**.

iii) D – **31 Pairs** of nerves.

2. Our body contains a large number of cells 'L' which are the longest cells in the body. L has long andshort branch called as 'M' and 'N' respectively. There is a gap 'O' between two 'L' cells, through whichnerve impulse transfer by release of chemical substance 'P'.

i) Name the cells L.

ii) What are M and N?

iii) What is the gap O?

iv) Name the chemical substance P.

i) L – **Neurons or Nerve cells.**

ii) M – **Axon** and N - **Dendron.**

iii) **Synapse** is the gap O.

iv) The chemical substance P is Neurotransmitters (Acetylcholine).

PLANT AND ANIMAL HORMONES

VI. Book Exercise – Answer in a sentence (1 mark)

1. **Which hormone promotes the production of male flowers in Cucurbits?**
   Gibberellins
2. **Write the name of a synthetic auxin.**
   2,4 D – (2,4 Dichlorophenoxy Acetic Acid).
3. **Which hormone induces parthenocarpy in tomatoes?**
   Gibberellins
4. **What is the hormone responsible for the secretion of milk in female after child birth?**
   Prolactin (PRL) or Lactogenic Hormone
5. **Name the hormones which regulates water and mineral metabolism in man.**
   Aldosterone
6. **Which hormone is secreted during emergency situation in man?**
   Adrenaline.
7. **Which gland secretes digestive enzymes and hormones?**
   Pancreas.
8. **Name the endocrine glands associated with kidneys.**
   Adrenal Gland.

VII. Book Exercise – Short answer question (2 mark)

1. **What are synthetic auxins? Give examples.**
   - Artificially synthesized auxins that have properties like natural auxins are called as synthetic auxins.
   - Example: 2, 4 D (2,4 Dichlorophenoxy Acetic Acid).
2. **What is bolting? How can it be induced artificially?**
   - **Bolting :**sudden shoot elongation followed by flowering.
   - It is induced by artificial treatment with plant hormone gibberellin.
3. **Bring out any two physiological activities of abscisic acid.**
   - ABA promotes the process of abscission.
   - ABA promotes senescence in leaves by causing loss of chlorophyll.
4. **What will you do to prevent leaf fall and fruit drop in plants? Support your answer with reason**.
   We can spray auxins to prevent leaf fall and fruit drop in plants. Auxins prevent the formation of abscissionlayer thus delay the abscission of leaves and fruits.
5. **What are chemical messengers?**
   Hormones are powerful chemical messengers that control and coordinate essential processes such as growth,metabolism and fertility.
6. **Write the differences between endocrine and exocrine gland.**

S.No.	Endocrine gland	Exocrine gland
1	They secrete hormones	They secrete enzymes, saliva and milk
2	They are ductless gland	They may have or may not have ducts
3	They are transported through blood stream	They are transported through ducts or tubes

7. What is the role of parathormone?

Role of parathormone

- The parathormone regulates calcium and phosphorus metabolism in the body.
- They act on bone, kidney and intestine to maintain blood calcium levels

8. What are the hormones secreted by posterior lobe of the pituitary land? Mention the tissues on which they exert their effect.

S.No.	Hormones secreted by posterior lobe of the pituitary gland	Hormones excert effect on
1	Vasopressin or Antidiuretic hormone	kidney tubules
2	Oxytocin	uterus andmammary gland

9. Why are thyroid hormones refered as personality hormone?

As thyroid hormones are essential for normal physical, mental and personality development, they are also known as personality hormone.

10. Which hormone requires iodine for its formation? What will happen if intake of iodine in our diet islow?

- Thyroid hormones, Triiodothyronine (T3) and Tetraiodothyronine or Thyroxine (T4) require iodine forits formation.
- The inadequate supply of iodine in our diet leads to the enlargement of thyroid gland which protrudesas a marked swelling in the neck and is called as goitre.

VII. Book Exercise – Long answer question (5 mark)

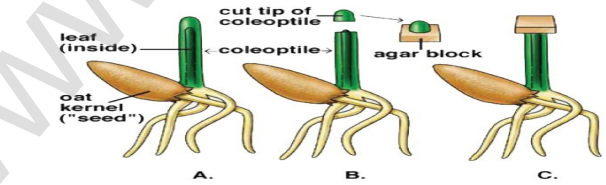
1. a) **Name the gaseous plant hormone. Describe its three different actions in plants. Physiological effects of ethylene :**

- promotes the ripening of fruits
- inhibits the elongation of stem and root in dicots.
- hastens the senescence of leaves and flowers.

b) **Which hormone is known as stress hormone in plants? Why?**

Abscisic acid (ABA) is the stress hormone. Because it increases tolerance of plants to various kinds of stress.

2. Describe an experiment which demonstrates that growth stimulating hormone is produced at the tipof coleoptile.



A. Germination of an oat seed
B. Decapitate tip of coleoptile and place on agar block.
C. Agar block is placed on top of the decapitated tip of the seedling.

Went's Experiment

- Frits Warmolt Went (1903–1990), demonstrated the existence and effect of auxin in plants.
- He did a series of experiments in Avena coleoptiles.
- In his first experiment he removed the tips of Avena coleoptiles.

- The cut tips did not grow indicating that the tips produced something essential for growth.
- In his secondexperiment he placed the agar blocks on the decapitated coleoptile tips.
- The coleoptile tips did not show any response.
- In his next experiment he placed the detached coleoptiletips on agar blocks.
- After an hour, he discarded the tips and placed this agar block on the decapitated coleoptile.
- It grew straight up indicating that some chemical diffusing from the tip was responsible for growth.

3. Write the physiological effects of gibberellins.

Physiological effects of Gibberellins:

- Application of gibberellins on plants stimulate extraordinary elongation of internode. eg: Corn and.
- Treatment of rosette plants with gibberellin induces sudden shoot elongation followed by flowering.
- Promote the production of male flowers in monoecious plants (Cucurbits).
- Gibberellins break dormancy of potato tubers.
- Seedless fruits are induced eg: Tomato.

4. Where are estrogens produced? What is the role of estrogens in the human body?

Estrogens are produced by the Graafian follicles of the ovary.

Functions of estrogens :

- It brings about the changes that occur during puberty.
- It initiates the process of cogenesis.
- It stimulates the maturation of ovarian follicles in the ovary.
- It promotes the development of secondary sexual characters (breast development, high pitched voiceetc).

5. What are the conditions which occur due to lack of ADH and insulin? How are the conditions differentform one another?

i) The conditions occur due to lack of ADH and insulin

- Deficiency of ADH causes Diabetes insipidus.
- The deficiency of insulin causes Diabetes mellitus.

ii) Differences between Diabetes insipidus and Diabetes mellitus

S.No.	Diabetes insipidus	Diabetes mellitus
1	It reduces reabsorption water in kidney tubules	It increases blood sugar level (Hyperglycemia)
2	**Sympoms :** i) Frequenty and excessive urination ii) Dehydration iii) Increased thirst (Polydipsia)	**Symptoms :** i) Excretion of excess glucose in the urine ii) Frequenty urination iii) Increased thirst iv) Increase in appetite

VIII. Book Exercise – Higher Order Thinking Skills (HOTS)

1. **What would be expected to happen if** :

   a. Gibberellin is applied to rice seedlings.

   internode-elongation and increase in height.

   b. A rotten fruit gets mixed with unripe fruits.

   Ethylene produced from the rotten fruits will hastensthe ripening of the unripe fruits.

   c. When cytokinin is not added to culture medium.

   it slows down the cell division

2. **A plant hormone was first discovered in Japan when rice plants were suffering from Bakanae disease caused by Gibberella fujikoroi. Based on this information answer the following questions:**

   a. Identify the hormone involved in this process.

   Gibberellins.

   b. Which property of this hormone causes the disease?

   Gibberellins has the property of stimulating the extraordinary elongation of internode.

   c. **Give two functions of this hormone**.

   i. Gibberellins **promote the production of male flowers** in monoecious plants (Cucurbits).

   ii. Gibberellins **break dormancy** of potato tubers.

3. **Senthil has high blood pressure, protruded eyeball and an increased body temperature. Name the endocrine gland involved and hormone secretion responsible for this condition.**

   a) The endocrine gland involved for this condition is **Thyroid gland**.

   b) Hormones responsible for this condition are **Thyroid hormones**

4. **Sanjay is sitting in the exam hall. Before the start of the exam , he sweats a lot, with increased rateof heart beat. Why does this condition occur?**

   In **stressful situations**, the **body releases** "Emergency hormones" called **Epinephrine** (Adrenaline) and **Norepinephrine** (Noradrenaline).

   Secretion of these hormones **leads to conditions** such as more sweating and increased rate of heart beat.

5. **Susan's father feels very tired and frequently urinates. After clinical diagnosis he was advised to take an injection daily to maintain his blood glucose level. What would be the possible cause for this? Suggest preventive measures.**

   Prevention of Diabetes mellitus

   - Manage the weight
   - Exercise regularly
   - Eat a balanced healthy diet
   - Limit alcohol intake
   - Quit smoking
   - Control the blood pressure

REPRODUCTION IN PLANTS AND ANIMALS

V. Book Exercise – Answer in a sentence (1 mark)

1. **If one pollen grain produces two male gametes, how many pollen grains are needed to fertilize 10ovules?**
   Ten pollen grains.
2. **In which part of the flower germination of pollen grains takes place?**
   Stigma of flower
3. **Name two organisms which reproduces through budding.**
   - Yeast
   - Bryophyllum
4. **Mention the function of endosperm.**
   Endosperm is the nutritive tissue. It provides food to the developing embryo.
5. **Name the hormone responsible for the vigorous contractions of the uterine muscles.**
   Oxytocin
6. **What is the enzyme present in acrosome of sperm?**
   Hyaluronidase
7. **When is World Menstrual Hygiene Day observed?**
   May 28.
8. **What is the need for contraception ?**
   Contraception is one of the best birth control measures is needed to follow the small family norms,which improve economic status, living status and the quality of life.
9. **Name the part of the human female reproductive system where the following occurs.**
   a. **Fertilization.**
      Fertilization : ampulla of fallopian tube.
   b. **Implantation**.
      Implantation : in the uterus.

VII. Book Exercise – Short answer question (2 mark)

1. **What will happen if you cut planaria into small fragments?**
   Each piece will regenerate into a complete worm by the process regeneration.
2. **Why is vegetative propagation practiced for growing some type of plants?**
   - Some plants have reduced power of sexual reproduction.
   - Seeds of some plants have long dormant period or poor viability.
   - It is a rapid and easier method.
   - Good characters can be preserved.
3. **How does binary fission differ from multiple fission?**

S.No.	Binary fission	Multiple fission
1	A single parent cell divides into two daughter cells	A single parent cell divides into many daughter cells
2	It occurs during favourable conditions eg: Amoeba	It occurs during unfavourable conditions eg: Plasmodium

4. Define triple fusion.

The fusion of second sperm (n) with secondary nucleus (2n) is known as triple fusion. As the result of triplefusion endosperm nucleus is formed.

Second sperm (n) + Secondary nucleus (2n) = Endosperm nucleus (3n).

5. Write the characteristics of insect pollinated flowers.

- To attract insects these flowers are brightly coloured, have smell and nectar.
- The pollen grains are larger in size, the exine is pitted, spiny.

6. Name the secondary sex organs in male.

The secondary sex organs in male are;

- Epididymis.
- Vas deferens.
- Seminal vesicles.
- Prostate gland.
- Penis.

7. What is colostrum? How is milk production hormonally regulated ?

- The first fluid which is released from the mammary gland after child birth is called as colostrum.
- **Milk production** stimulated **by prolactin** secreted from the anterior pituitary. The **ejection of milk** is stimulated by posterior pituitary hormone **oxytocin**.

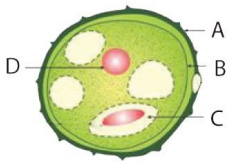
8. How can menstrual hygiene be maintained during menstrual days?

- Sanitary pads should be changed regularly, to avoid infections.
- Use of warm water to clean genitals.
- Wearing loose clothing will ensure the airflow around the genitals and prevent sweating.

9. How does developing embryo gets its nourishment inside the mother's body?

- After fertilization, the lining of uterus thickens and is richly supplied with blood to nourish the growing embryo.
- The embryo gets nutrition from the mother's blood with the help of special tissue called placenta.
- Umbilical cord connects the placenta and foetus.

10. Identify the parts A, B, C and D



A : Exine.

B : Intine.

C : Generative cell.

D : Vegetative nucleus.

11. Write the events involved in the sexual reproduction of a flowering plant.

a. Discuss the first event and write the types.

i) Process of sexual reproduction in flowering plants. It involves :

- Pollination.
- Fertilization.

Pollination : The transfer of pollen grains from anther to stigma of a flower is called as pollination.

Types of Pollination :

- **Self-pollination**
- **Cross pollination**

b. Mention the advantages and the disadvantages of that event.

Advantages of self-pollination

- Self-pollination is possible in certain bisexual flowers.
- Flowers do not depend on agents for pollination.
- There is no wastage of pollen grains.

Disadvantages of self-pollination

- The seeds are less in numbers.
- The endosperm is minute. Therefore, the seeds produce weak plants.
- New varieties of plants cannot be produced

Advantages of cross pollination

- Cross pollination leads to the production of new varieties.
- More viable seeds are produced.

Disadvantages of cross-pollination

- More wastage of pollen grains.
- It may introduce some unwanted characters.
- Flowers depend on the external agencies for pollination.

12. Why are the human testes located outside the abdominal cavity? Name the pouch in which they are present.

Human testes responsible for formation of sperms (Spermatogenesis) **need slightly lower temperature than the normal body temperature for this function**. So human testes are located outside the abdominal cavity **in sac-like structure called scrotum**.

13. Luteal phase of the menstrual cycle is also called the secretory phase. Give reason.

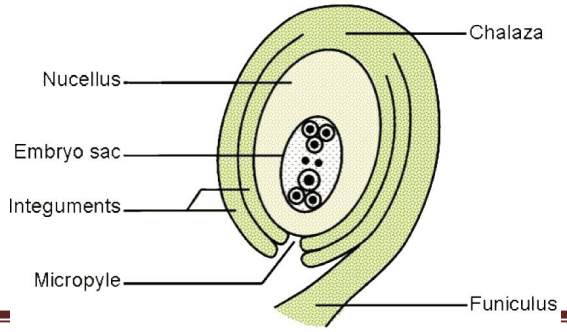
In leutal phase LH and FSH decreases, corpus luteum produces progesterone and its level increases followed by a decline progesterone also stimulates the glands in the uterus to secrete substances that maintain the endometrium and keep it from breaking down. For this reason, this phase of menstrual cycle is called secretory phase

14. Why are family planning methods not adopted by all the people of our country?

- Due to lack of awareness about family planning.
- Myths and misconceptions about family planning.
- Long distance to Health facility.
- Unavailability of preferred contraceptive methods.
- high cost of managing side effects.
- Desire for big family size.

VII. Book Exercise – Long answer question (5 mark)

1. With a neat labelled diagram describe the parts of a typical angiospermic ovule.



- The main part of the ovule is the nucellus which is enclosed by two integuments leaving an openingcalled as micropyle.
- The ovule is attached to the ovary wall by a stalk known as funiculus.
- Chalaza is the basal part.
- The embryo sac contains seven cells and the eighth nuclei located within the nucellus.
- Three cells at the micropylar end form the egg apparatus and the three cells at the chalaza end are theantipodal cells.
- The remaining two nuclei are called polar nuclei found in the centre.
- In the egg apparatus one is the egg cell (female gamete) and the remaining two cells are thesynergids.

2. What are the phases of menstrual cycle? Indicate the changes in the ovary and uterus.

S.No.	Phase	Days	Changes in Ovary	Changes in Uterus
1	Menstrual phase	4–5 days	Development of primaryfollicles	Breakdown of uterine endometrial lining leads to bleeding
2	Follicular phase	6^{th} – 13^{th} day	Primary follicles grow to become a fully mature Graafian follicle	endometrium regenerates throughproliferation
3	Ovulatory phase	14^{th} day	The Graafian follicle ruptures and releases the ovum (egg)	Increase in endometrial thickness
4	Luteal phase	15^{th} – 28^{th}day	Emptied Graafian follicle develops into corpus luteum	Endometrium is prepared for implantation if fertilization of egg takes place, if fertilization does notoccur corpus luteum degenerates, uterine wall ruptures, bleeding starts and unfertilized egg is expelled

VIII. Book Exercise – Higher Order Thinking Skills (HOTS)

1. In angiosperms the pollen germinates to produce pollen tube that carries two gametes. What is thepurpose of carrying two gametes when single gamete can fertilize the egg?

In angiosperms, one sperm cell fuses with the egg cell to form the zygote, while the other fuses with the two polar nuclei that form the endosperm which nourishes the developing embryo.

2. Why menstrual cycle does not take place before puberty and during pregnancy ?

Only at the time of puberty (age of 11-13 years), the pituitary gland starts making hormones (LH and FSH) that stimulate the ovaries to produce female sex hormones,

including estrogen and progesterone. These hormones are responsible for first menstruation (Menarche). That's why menstrual cycle does not take place before puberty.

3. **Read the following passage and answer the questions that follow Rahini and her parents were watching a television programme. An advertisement flashed on the screen which was promoting use of sanitary napkins. Rahini's parents suddenly changed the channel, but she objected to her parents and explained the need and importance of such advertisement.**

a) What is first menstruation called? When does it occur ?

b) List out the napkin hygiene measures taken during menstruation ?

c) Do you think that Rahini's objection towards her parents was correct? If so, Why?

a) First menstruation is called **menarche**. The first menstruation occurs at the age of **11-13 years**.

b) Girls should be educated about napkin hygiene in the following ways

- The sanitary pad and tampons should be wrapped properly and discarded because they can spreadinfections.
- Sanitary pad or tampon should not be flushed down the toilet.
- Napkin incinerators are to be used properly for disposal of used napkins.

c) **Yes she is correct**. Rahini's parents must explain about the use of napkins and their proper disposal

HEREDITY

V. Book Exercise – Answer in a sentence (1 mark)

1. **What is a cross in which inheritance of two pairs of contrasting characters are studied?**
Dihybrid cross.

2. **Name the conditions when both the alleles are identical?**
Homozygous condition.

3. **A garden pea plant produces axial white flowers. Another of the same species produced terminal violet flowers. Identify the dominant trait?**
The dominant trait is **axial white flower**.

4. **What is the name given to the segments of DNA, which are responsible for the inheritance of a particular character?**
The segments of DNA, which are responsible for the inheritance of a particular character is gene.

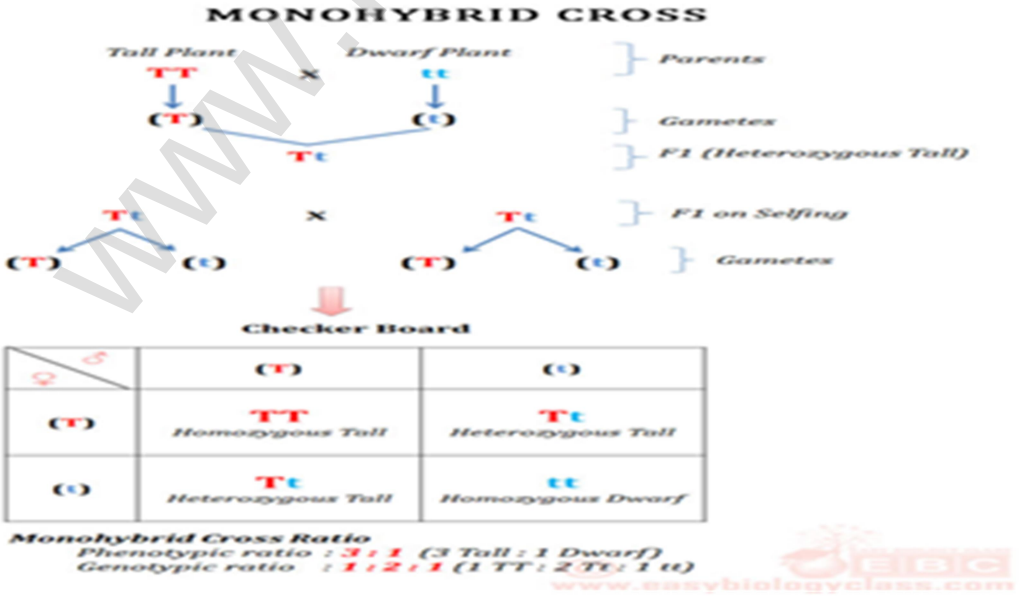
5. **Name the bond which binds the nucleotides in a DNA.**
Phosphodiester bond.

VII. Book Exercise – Short answer question (2 mark)

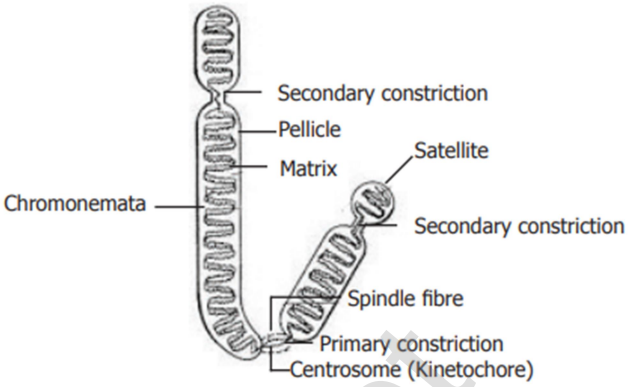
1. **Why did Mendel select pea plant for his experiments?**
   - It is naturally self–pollinating and is very easy to raise pure breeding individuals.
   - It has a short life span so it is possible to follow several generations.
   - It is easy to cross–pollinate.
   - It has deeply defined contrasting characters.
   - The flowers are bisexual.
2. **What do you understand by the term phenotype and genotype?**
   - **Phenotype :** External expression of of a particular trait.
   - **Genotype :** Genetic expression of an organism.
3. **What are allosomes?**

   Allosomes are chromosomes which are responsible for determining the sex of an individual. They are also called as sex chromosomes or hetero-chromosomes.
4. **What are Okazaki fragments**?

   Okazaki fragments are short sequences of DNA synthesized in the lagging strand joined together by the enzyme DNA Ligase.
5. **Why is euploidy considered to be advantageous to both plants and animals?**
   - Plants with euploidy condition have increased fruit and flower size.
   - They are typically sterile**.**
6. **A pure tall plant (TT) is crossed with pure dwarf plant (tt), what would be the F1 and F2 generations?Explain**.
   - Mendel selected tall (TT) and dwarf (tt) garden pea plants, Pisum sativum, for the Monohybrid cross.
   - When a pure breeding tall plant (TT) was crossed with a pure breeding dwarf plant(tt), all plants weretall in the first filial generation (F1)
   - When such an F1 tall plant (Tt) was allowed to self-pollination, both the tall and dwarf plants appearedin second filial generation (F2) in the ratio of 3:1.

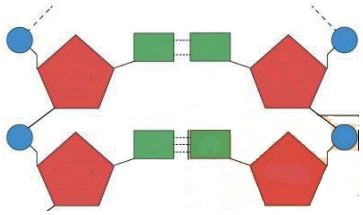


7. Explain the structure of a chromosome.

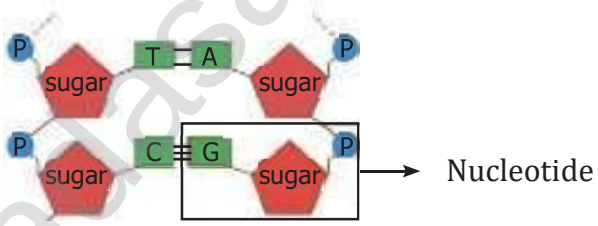


- The chromosomes are thin, long and thread like structures consisting of two identical strands called sister chromatids.
- They are held together by the centromere.
- Each chromatid is made up of spirally coiled thin structure called chromonema.
- The chromonema has number of bead-like structures along its length which are called chromomeres.
- The chromosomes are made up of DNA, RNA, chromosomal proteins (Histones and non–histones) and certain metallic ions.
- These proteins provide structural support to the chromosome.
- Some of the chromosomes have an elongated knob-like appendage at one end of the chromosomeknown as satellite.
- The chromosomes with satellites are called as the sat-chromosomes.

8. Label the parts of the DNA in the diagram given below. Explain the structure briefly.



Ans



DNA is a large molecule consisting of millions of nucleotides. Each nucleotide consists of three components.

i) A sugar molecules – Deoxyribose sugar.

ii) A nitrogenous base. There are two types of nitrogenous bases in DNA. They are;
- Purines (Adenine and Guanine).
- Pyrimidines (Cytosine and Thymine).

iii) A phosphate group.

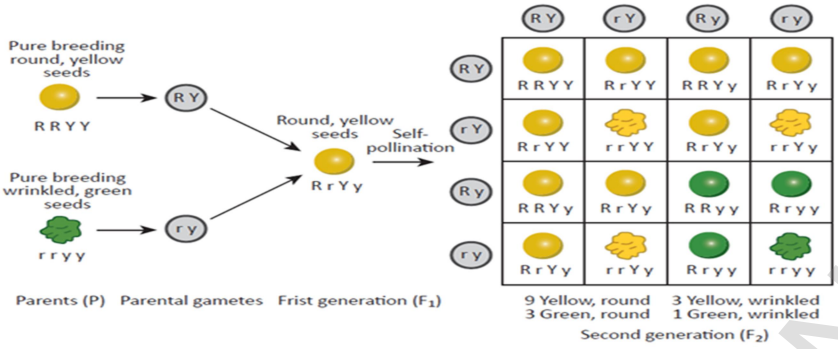
VII. Book Exercise – Long answer question (5 mark)

1. Explain with an example the inheritance of dihybrid cross. How is it different from monohybrid cross?

- Dihybrid cross involves the inheritance of two pairs of contrasting characteristics (or contrasting traits)
at the same time.
- Mendel first crossed pure breeding pea plants having round-yellow (RRYY) seeds with pure breeding peaplants having wrinkled-green (rryy) seeds and found that only round-yellow (RrYy) seeds were producedin the first generation (F1).
- When the hybrids of F1 generation pea plants having round-yellow (RrYy) seeds

were cross-bred by self pollination, then four types of seeds having different combinations of shape and color were obtained in second generation or F2 generation. They were round yellow, round-green, wrinkled yellow and wrinkled-green seeds.

- The ratio of each phenotype (or appearance) of seeds in the F2 generation is 9:3:3:1. This is known asthe Dihybrid ratio.



Differences between Monohybrid and Dihybrid cross.

S.No.	Monohybrid cross	Dihybrid cross
1	The inheritance of one pair of contrastingcharacteristics	The inheritance of two pairs of contrasting characteristics
2	The phenotypic ratio is 3:1	The phenotypic ratio is 9:3:3:1

2. How is the structure of DNA organised? What is the biological significance of DNA?

The structure of DNA

- DNA molecule consists of two polynucleotide chains.
- These chains form a double helix structure with two strands which run anti-parallel to one another.
- Nitrogenous bases in the centre is linked by sugar-phosphate units which form the backbone of the DNA.
- Pairing between the nitrogenous bases is very specific and is always between purine and pyrimidinelinked by hydrogen bonds.
  - i) Adenine (A) links Thymine (T) with two hydrogen bonds (A = T).
  - ii) Cytosine (C) links Guanine (G) with three hydrogēn bonds(C = G).This is called complementary base pairing.
- Hydrogen bonds between the nitrogenous bases make the DNA molecule stable.
- Each turn of the double helix is 34 A° (3.4 nm). There are ten base pairs in a complete turn.
- The nucleotides in a helix are joined together by phosphodiester bonds.

Biological significance of DNA

- It is responsible for the transmission of hereditary information from one generation to next generation.
- It contains information required for the formation of proteins.
- It controls the developmental process and life activities of an organism.

3. **The sex of the new born child is a matter of chance and neither of the parents may be considered responsible for it. What would be the possible fusion of gametes to determine the sex of the child?**

The sex of the new born child is a chance of probability as to which category of sperm fuses with the egg.

If the egg (X) is fused by the X-bearing sperm an XX individual (female) is produced.

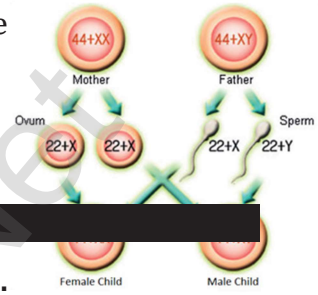
Egg (22+X) + Sperm (22+X) = Female child (44+XX)

If the egg (X) is fused by the Y-bearing sperm an XY individual (male) is produced.

Egg (22+X) + Sperm (22+Y) = Male child (44+XY)

Thus the sperm, produced by the father, determines the sex of the child.

The mother is not responsible in determining the sex of the child.



VIII. Book Exercise – Higher Order Thinking Skills (HOTS)

1. **Flowers of the garden pea are bisexual and self-pollinated. Therefore, it is difficult to perform hybridization experiment by crossing a particular pistil with the specific pollen grains. How Mendelmade it possible in his monohybrid and dihybrid crosses?**

In pea plants, cross pollination can be easily achieved by emasculation in which the stamen of the floweris removed without affecting the pistil. The emasculated flower is immediately enclosed in a bag to prevent pollination by unwanted pollen. Then, the specific , mature and viable pollen grains are collected from the male parent, the bag is opened and the pollen grains are dusted on the stigma.

2. **Pure-bred tall pea plants are first crossed with pure-bred dwarf pea plants. The pea plants obtained in F1 generation are then cross-bred to produce F2 generation of pea plants.**

   a. **What do the plants of F1 generation look like?**
   All the plants of F1 generation are tall (Tt).

   b. **What is the ratio of tall plants to dwarf plants in F2 generation?**
   The ratio of tall plants to dwarf plants in F2 generation is 3:1.

   c. **Which type of plants were missing in F1 generation but reappeared in F2 generation?**
   The trait dwarf is missing in F1 generation but reappeared in F2 generation.

3. **Kavitha gave birth to a female baby. Her family members say that she can give birth to only female babies because of her family history. Is the statement given by her family members true. Justify youranswer.**

The statement given by her family members is not true. Because, the sex of the new born child is a chanceof probability as to which category of sperm fuses with the egg.

If the egg (X) is fused by the X-bearing sperm an XX individual (female) is produced.

Egg (22+X) + Sperm (22+X) = Female child (44+XX)

If the egg (X) is fused by the Y-bearing sperm an XY individual (male) is produced.

Egg (22+X) + Sperm (22+Y) = Male child (44+XY)

Thus the sperm, produced by the father, determines the sex of the child. The mother or her familyhistory is not responsible in determining the sex of the child.

VIII. Book Exercise – Higher Order Thinking Skills (HOTS)

1. **Under which conditions does the law of independent assortment hold good and why**?
   - The factors for each character or trait remain independent and maintain their identity in the gametes.
   - The factors are independent to each other and pass to the offspring (through gametes).
   - If the law of independent assortment did not happen, all the genes have been locked with each otherand not a single gene can be able to express independently.
   - Independent assortment of genes is important to produce new genetic combinations that increasegenetic variations within a population.

ORIGIN AND EVOLUTION OF LIFE

V. Book Exercise – Answer in a sentence (1 mark)

1. **A human hand, a front leg of a cat, a front flipper of a whale and a bat's wing look dissimilar and adapted for different functions. What is the name given to these organs?**
   Homologous organs.
2. **Which organism is considered to be the fossil bird?**
   Archaeopteryx
3. **What is the study of fossils called?**
   Palaeontology.

VI. Book Exercise – Short answer question (2 mark)

1. **The degenerated wing of a kiwi is an acquired character. Why is it an acquired character?**
   - The kiwi do not use its wings for a long time
   - According to use and disuse theory, the wing of kiwi degenerated.
   - So, it is known as acquired character.
2. **Why is Archaeopteryx considered to be a connecting link?**
   - It had wings with feathers, like a bird.
   - It had long tail, clawed digits and conical teeth, like a reptile.
   - So it is connecting link between reptiles and birds.
3. **Define Ethnobotany and write its importance.**
   Ethnobotany is the study of a region's plants and their practical uses through the traditional knowledge of the local culture of people.
   Importance of Ethnobotany
   - It provides traditional uses of plant.
   - It gives information about certain unknown and known useful plants.
   - Tribal communities utilize ethnomedicinal plant parts for the treatment of diseases.

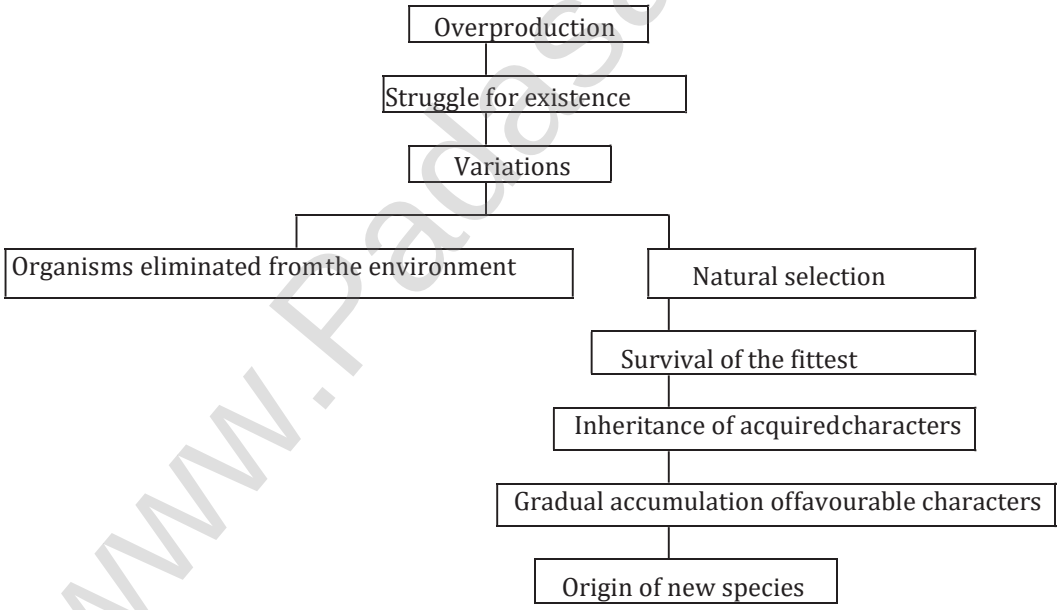
4. How can you determine the age of the fossils?

The age of fossils is determined by radioactive elements present in it. They may be carbon, uranium, lead orpotassium.

VII. Book Exercise – Long answer question (5 mark)

1. Natural selection is a driving force for evolution-How?

- **Overproduction :** Living beings have the ability to reproduce more individuals and form their own progeny. This will increase reproductive potential, leading to overproduction.
- **Struggle for existence :** Overproduction creates an intense competition among the organisms for food and space leading to struggle.
- **Variation :** Small variations are important for evolution. According to Darwin favourable variations are useful to the organism. These variations are inherited by offspring from their parents.
- **Survival of the fittest or Natural selection :** During the struggle for existence, the organisms which can overcome the challenging situation, survive and adapt to the surrounding environment. Organisms which are unable to face the challenges, are unfit to survive and disappear. The process of selection oforganisms with favourable variation is called as natural selection.
- **Origin of species** According to Darwin, new species originates by the gradual accumulation of favourablevariations for a number of generations.



2. How do you differentiate homologous organs from analogous organs?

S. No.	Homologous organs	Analogous organs
1	Organs are inherited from common ancestors.	Analogous organs are those which have inherited from different.
2	Homologous organs look dissimilar and adapted for different functions	The analogous organs look similar and performsimilar functions

3	They have similar development pattern	They have different developmental pattern.
4	The mode of development and basic structure are similar	Their mode of development and basic structures are different.
4	Example 2 : A human hand, a front leg of a cat, flipper of a whate and a bat's wing.	Example 2 : Wings of bat, Wings of bird, wings of insect.

3. How does fossilization occur in plants?

The process of formation of fossil in the rocks is called fossilization.

Common methods of fossilization.

- **Petrifaction :** Minerals like silica slowly penetrate in and replace the original organic tissue and formsa rock like fossil. This method of fossilization can preserve hard and soft parts. Most bones and wood fossils are petrified.
- **Mold and Cast :** A replica of a plant or animal is preserved in sedimentary rocks. When the organism gets buried in sediment it is dissolved by underground water leaving a hollow depression called a mold. It shows the original shape but does not reveal the internal structure. Minerals or sediment fill the hollow depression and forms a cast.
- **Preservation :** Original remains can be preserved in ice or amber (tree sap). They protect the organisms from decay. The entire plant or animal is preserved.
- **Compression :** When an organism dies, the hard parts of their bodies settle at the bottom of the sea bed and are covered by sediment. The process of sedimentation goes on continuously and fossils are formed.
- **Infiltration or Replacement :** The precipitation of minerals takes place which later on infiltrate the cell wall. The process is brought about by several mineral elements such as silica, calcium carbonate and magnesium carbonate. Hard parts are dissolved and replaced by these minerals.

VIII. Book Exercise – Higher Order Thinking Skills (HOTS)

1. Arun was playing in the garden. Suddenly he saw a dragon fly sitting on a plant. He observed the wings of it. He thought it looked similar to a wing of a crow. Is he correct? Give reason for your answer.

No, He is not correct.

The wing of crow and the wing of dragon fly have different developmental origin and structural design

but perform similar function. They are known as analogous organs.

2. Imprints of fossils tell us about evolution- How?

- The study of fossils helps us to understand the line of evolution of many invertebrates and vertebrates.
- Fossil records show that the evolution has taken a gradual process from simple to complex organisms.
- The origin of modern birds is supported by the evidences from palaeontology.
- Fossils provide solid evidence that organisms from the past are not the same as those found today.

3. **Octopus, cockroach and frog all have eyes. Can we group these animals together to establish a common evolutionary origin? Justify your answer**.
No, they can't be grouped together.
Reason: Their organs look similar and perform similar function but they have different origin and developmet way. So, we may group these animals together in analogous organs.

BREEDING AND BIOTECHNOLOGY

V. Book Exercise – Answer in a sentence (1 mark)

1. **Give the name of wheat variety having higher dietary fibre and protein.**
Atlas 66
2. **Semi-dwarf varieties were introduced in rice. This was made possible by the presence of dwarfing gene in rice. Name this dwarfing gene.**
Dee-geo-woo-gen (DGWG).
3. **Define genetic engineering.**
Genetic engineering is the manipulation and transfer of genes from one organism to another organisms to create a new DNA.
4. **Name the types of stem cells**.
   - **Embryonic stem cells**
   - **Adult stem cells**
5. **What are transgenic organisms?**
Plants or animals expressing a foreign gene are known as transgenic organisms.
6. **State the importance of Biofertiliser .**
Biofertiliser helps in sustainable agriculture.
They help in recycling the organic matter.
They do not pollute the field and water body. Eg: Rhizobium.

VI. Book Exercise – Short answer question (2 mark)

1. **Discuss the method of breeding for disease resistance.**
Plant diseases are caused by pathogens like viruses, bacteria and fungi. This affects crop yield. Hence, it is important to develop disease resistant varieties of crops, that would increase the yield and reduce the use offungicides and bactericides.
2. **Name three improved characteristics of wheat that helped India to achieve high productivity**.
   - Higher yield with better quality. eg: Protein Rich Atlas 66
   - Resistance to diseases. eg: Himgiri
   - Shorter duration / Semidwarf. eg: Sonalika and Kalyan Sona
3. **Name two maize hybrids rich in amino acid lysine**
   - Protina,
   - Shakti and
   - Rathna
4. **Distinguish between**
   a. Somatic gene therapy and germ line gene therapy
   b. Undifferentiated cells and differentiated cells

a) **Differences between Somatic gene therapy and Germ line gene therapy**.

S.No.	Somatic Gene Therapy	Germline Gene Therapy
1	It is the replacement of defective gene in somaticcell.	It is the replacement of defective gene in germ cell.
2	Only the individual will be benefitted	It will be beneficial to next generation.

b) **Differences between Undifferentiated cells and Differentiated cells**.

S.No.	Undifferentiated cells	Differentiated cells
1	They are unspecialized of cells.	They are specialized.
2	They have variable potency.	They carry out specific function
3	Eg.Umbilical cord	Pancreatic cell

5. State the applications of DNA fingerprinting technique.

- DNA fingerprinting technique is widely used in **forensic applications like crime investigation** such as identifying the culprit. It is also used for **paternity** testing in case of disputes.
- It also helps in the study of genetic diversity of population, evolution and speciation.

6. How are stem cells useful in regenerative process?

- Sometimes cells, tissues and organs in the body may be permanently damaged or lost due to genetic condition or disease or injury.
- In such situations stem cells are used for the treatment of diseases which is called stem-cell therapy.
- In treating neurodegenerative disorders like Parkinson's disease and Alzheimer's disease neuronal stemcells can be used to replace the damaged or lost neurons.

7. Differentiate between outbreeding and inbreeding.

S.No.	Outbreeding	Inbreeding
1	breeding of unrelated animals.	mating of closely related animals within the same breed.
2	The hybrids are stronger and vigorous than their parents.	It helps in the accumulation of superior genes and elimination of undesirable genes.
3	Mule.	Hissardale Sheep.

VII. Book Exercise – Long answer question (5 mark)

1. What are the effects of hybrid vigour in animals.

Effects of hybrid vigour in animal breeding

- Increased production of milk by cattle
- Increased production of egg by poultry
- High quality of meat is produced
- Increased growth rate in domesticated animals

2. Describe mutation breeding with an example.

Mutation is defined as the sudden heritable change in the nucleotide sequence of DNA in an organism. It is a process by which genetic variations are created which in turn brings about changes in the organism. The organism which undergoes mutation is called a mutant. The factors which induce mutations are known as mutagens or mutagenic agents.

i) **Physical mutagens :** Radiations like X-rays, α, β and γ-rays, UV rays, temperature etc. which induce mutations are called physical mutagens

ii) **Chemical mutagens :** Chemical substances that induce mutations are called chemical mutagens. e.g. Mustard gas and nitrous acid. The utilisation of induced mutation in crop improvement is called mutation breeding.

Achievements of mutation breeding :

Some achievements of mutation breeding are

- Sharbati Sonora wheat produced from Sonora-64 by using gamma rays.
- Atomita 2 rice with saline tolerance and pest resistance.
- Groundnuts with thick shells.

3. Biofortification may help in removing hidden hunger. How?

- Biofortification is the scientific process of developing crop plants enriched with high levels of desirable nutrients like vitamins, proteins and minerals.
- Nutritional quality of crops depends on quality and quantity of nutrients.
- Protina, Shakti and Rathna are lysine rich maize hybrids (developed in India).
- Atlas 66, a protein rich wheat variety.
- Iron rich fortifi ed rice variety.
- Vitamin A enriched carrots, pumpkin and spinach.

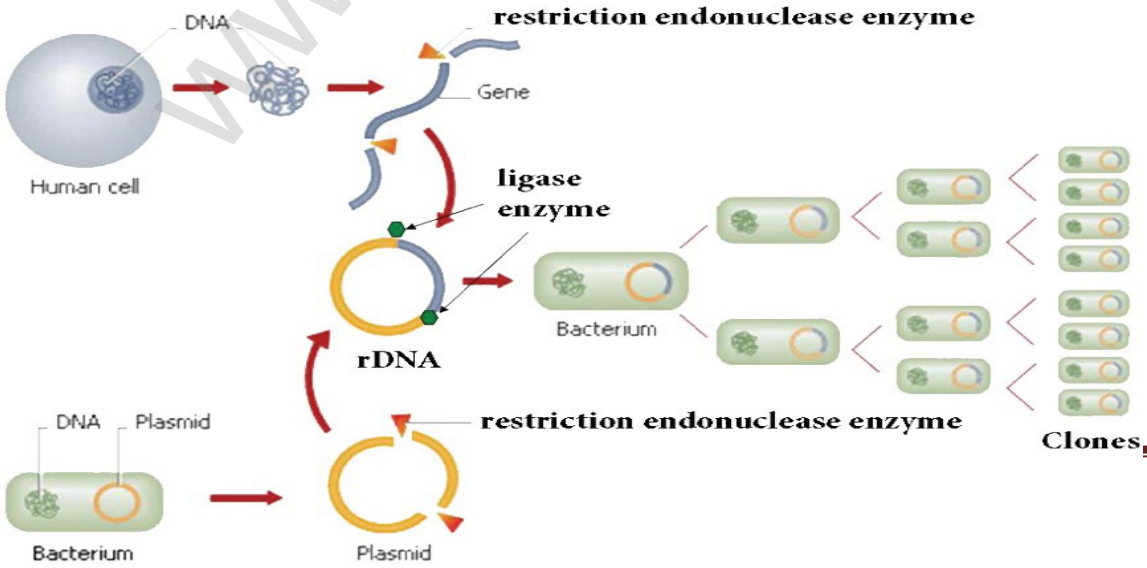
4. With a neat labelled diagram explain the techniques involved in gene cloning.

The carbon copy of an individual is oft en called a clone. However, more appropriately, a clone means to makea genetically exact copy of an organism.

In gene cloning, a gene or a piece of DNA fragment is inserted into a bacterial cell and multiplied.

Steps involved in gene cloning are :

- Isolation of desired DNA fragment by using restriction enzymes.
- Insertion of the DNA fragment into a suitable vector (Plasmid) to make rDNA.
- Transfer of rDNA into bacterial host cell (Transformation).Selection and multiplication of recombinant host cell to get a clone v. Expression of cloned gene in hostcell.



5. Discuss the importance of biotechnology in the field of medicine.

- Using genetic engineering techniques medicinally valuable valuable pharmaceutical products are developed.
- Insulin used in the treatment of diabetes.
- Human growth hormone used for treating children with growth deficiencies.
- Blood clotting factors are developed to treat haemophilia.
- Tissue plasminogen activator is used to dissolve blood clots and prevent heart attack.
- Development of vaccines against various diseases like Hepatitis B and rabies.

VIII. Book Exercise – Higher Order Thinking Skills (HOTS)

1. A breeder wishes to incorporate desirable characters into the crop plants. Prepare a list of charactershe will incorporate.

i) Higher yield.
ii) Resistance to diseases.
iii) Insects/Pests Resistance.
iv) Drought resistant.
v) Shorter duration.
vi) Fertilizer responsive.
vii) nutritional quality

2. Organic farming is better than Green Revolution. Give reasons.

Green Revolution:

- The aim of it is to increase the yield by the following steps.
- Improve the seed quality by selection.
- By increasing the soil fertility with chemical fertilizers.
- Extracting the maximum of nutrients, water source etc, to increase the yield.

Organic Revolutions

- The aim of it is sustainable agriculture practice.
- Use of organic fertilizers which do not pollute the soil.
- Crop remains is used as manure. It is a long term farming.
- The product is harmless

3. Polyploids are characterised by gigantism. Justify your answer.

An organism having more than two sets of chromosomes is called polyploidy.

Quantitative changes in the mass of chromosomes and genes must have played a very important part in the development of plants towards greater variability including the size of the organisms and with it more appropriate adaptations to the demands of their environment. Mostly gigantism is usual consequence in plants. It seems as though doubling the number of chromosomes will increase the size of the organism also.

4. 'P' is a gene required for the synthesis of vitamin A. It is integrated with genome of 'Q' to produce genetically modified plant 'R'.

i. What is P, Q and R?
ii. State the importance of 'R' in India.

i) P = Beta Carotene Gene
Q = Genome of Rice plant
R = Golden Rice

ii) The geneticall modified rice can produce beta carotene that can prevent vitamin 'A' defeciency.

HEALTH AND DISEASES

VII. Book Exercise – Answer in a sentence

1. **What are psychotropic drugs**?
   The drugs which act on the brain and alter the behaviour, consciousness, power of thinking and perceptionare called **Psychotropic drugs**.
2. **Mention the diseases caused by tobacco smoke.**
   1.Lung cancer 2.Bronchitis 3.Pulmonary tuberculosis 4.Emphysema 5.Hypoxia and 6.Oral cancer
3. **What are the contributing factors for Obesity?**
   Genetic factors, physical inactivity, eating habits and endocrine factors.
4. **What is adult onset diabetes?**
   Type-2 Non-Insulin Dependent Diabetes Mellitus is called as adult onset diabetes.
5. **What is metastasis**?
   The cancerous cells migrate to distant parts of the body and affect new tissues is called metastasis**.**
6. **How does insulin deficiency occur?**
   Insulin deficiency occurs due **destruction of β-cells of the pancreas**.

VIII. Book Exercise – Short answer questions

1. **What are the various routes by which transmission of human immuno deficiency virus takes place ?**
   HIV is transmitted generally by
   i) Sexual contact with infected person
   ii) Use of contaminated needles or syringes especially in case of intravenous drug abusers
   iii) By transfusion of contaminated / infected blood or blood products
   iv) From infected mother to her child through placenta.
2. **How is a cancer cell different from a normal cell ?**

	Cancer cell	Normal cell
1.	These cells divide in uncontrolled manner.	These cells divide in a regulated manner.
2.	Their life span is not definite.	They have a definite life span.
3.	They remain immature and undifferentiated.	They mature into specialized cells.

3. **Differentiate between Type-1 and Type-2 diabetes mellitus.**

Factors	Type-1 Insulin dependent diabetes mellitus (IDDM)	Type-2 Non-insulin dependent diabetes mellitus (NIDDM)
Prevalence	10-20%	80-90%
Age of onset	Juvenile onset (< 20 years)	Maturity onset (>30 years)

Body weight	Normal or Underweight	Obese
Defect	Insulin deficiency due to destruction ofβ-cells	Target cells do respond to insulin
Treatment	Insulin administration is necessary	Can be controlled by diet, exercise andmedicine

4. **Why is a dietary restriction recommended for an obese individual ?**

Low calorie, normal protein, vitamins and mineral, restricted carbohydrate and fat, high fiber diet can prevent overweight.

5. **What precautions can be taken for preventing heart diseases ?**

i) Diet management :

a) **Food to avoid or reduce :** High calories, low saturated fat and cholesterol rich food, low carbohydrates and common salt.

b) **Food to take :** Diet rich in polyunsaturated fatty acids (PUFA), fibre diet, fruits and vegetables, protein, minerals and vitamin.

ii) Physical activity: Regular exercise, walking and yoga are essential for body weight maintenance.

iii) Addictive substance avoidance: Alcohol consumption and smoking are to be avoided.

IX. Book Exercise – Long answer questions

1. **Suggest measures to overcome the problems of an alcoholic.**

i) Education and counselling: Education and proper counselling will help the alcoholics to overcome their problems and stress, to accept failures in their life.

ii) Physical activity: Individuals undergoing rehabilitation should be channelized into healthy activities like reading, music, sports, yoga and meditation.

iii) Seeking help from parents and peer groups: When a problematic situation occurs, the affected individuals should seek help and guidance from parents and peers. This would help them to share theirfeeling of anxiety, wrong doing and get rid of the habit.

iv) Medical assistance: Individual should seek help from psychologists and psychiatrists to get relieved from this condition and to lead a relaxed and peaceful life.

Alcohol de-addiction and rehabilitation programmes are helpful to the individual so that they could get rid of the problem completely and can lead a normal and healthy life.

2. **Changes in lifestyle is a risk factor for occurrence of cardiovascular diseases. Can it be modified ? If yes, suggest measures for prevention.**

Yes, it can be modified

Preventive Measures

i) Diet management:

a) **Food to avoid or reduce :** High calories, low saturated fat and cholesterol rich food, low carbohydrates
and common salt.

b) **Food to take :** Diet rich in polyunsaturated fatty acids (PUFA), fibre diet, fruits and vegetables,
protein, minerals and vitamin.

ii) **Physical activity:** Regular exercise, walking and yoga are essential for body weight maintenance.

iii) **Addictive substance avoidance:** Alcohol consumption and smoking are to be avoided.

iv) **Aim for a healthy weight :** Good nutrition, controlling calorie intake and physical activity are the onlyway to maintain a healthy weight. Obesity places you at risk for high cholesterol — the very factors thatheighten our risk of cardiovascular disease.

v) **Reduce stress :** There is a relationship between coronary heart disease risk and stress in a person's life that may affect the risk factors for heart diseases.

X. Book Exercise – Higher Order Thinking Skills (HOTS)

1. **What is the role of fat in the cause of atherosclerosis?**

   Deposition of cholesterol in the blood vessels usually develops slowly over many years beginning from childhood, they may form a fatty streak to a fibrous complicated **plaque**. It leads to the narrowing of blood vessels leading to **atherosclerosis** in the large and medium sized arteries that supply the heart muscle with oxygen.

2. **Eating junk food and consuming soft drinks results in health problems like obesity, still children prefer. What are the suggestions you would give to avoid children eating junk food/ consumption ofsoft drinks?**

   i) **Start with a Balanced Breakfast :** have a protein-rich breakfast item to keep hunger levels sustained
   until a midmorning snack or lunchtime.

   ii) **Keep Junk Food Away :** The statement "Out of sight, out of mind," holds so much truth when it comes to how to get rid of and fight junk food cravings! Instead of packaged pastries and chips located in thecomfort of home, avoid their purchase altogether.

   iii) **Purchase Healthier Foods:** Fill the diet with more whole grains, lean proteins, healthful fats, and fresh fruits and veggies.

   iv) **Find Distractions :** If truly having temptation to eat junk food , try to find some sort of distraction. Aquick walk or piece of gum can not only fight junk food cravings, but save on hundreds of unwanted calories!

   v) **Drink Plenty of Water :** Thirst is often mistaken for hunger. So instead of reaching for that snack, pour up a glass of water! Staying hydrated further aids in digestion and promotes a healthy metabolism.

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

   i) Exercising regularly can **improve your mood** and **reduce feelings of anxiety and depression.**

   ii) Exercise is crucial to supporting a fast metabolism and burning more calories per day. It also helps you maintain your muscle mass and weight loss.

   iii) Physical activity helps you build muscles and strong bones. It may also help prevent osteoporosis.

   iv) Engaging in regular physical activity can increase your energy levels. This is true even in people with persistent fatigue and those suffering from serious illnesses.

   v) Daily physical activity is essential to maintaining a healthy weight and reducing the risk of chronic disease.

   vi) Moderate exercise can provide antioxidant protection and promote blood flow, which can protect your skin and delay signs of aging.

vii) Regular exercise improves blood flow to the brain and helps brain health and memory. Among older adults, it can help protect mental function.

4. A leading weekly magazine has recently published a survey analysis which says that number of AIDSpatient in the country is increasing day by day. The report says that the awareness among the people about AIDS is still very poor. You are discussing the magazine report in your class and a team of yourclass decides to help people to fight against the dreadful disease.

a) What problem you face when trying to educate the people in your village near by your school?

b) How do you overcome the problem?

Problem we face while educate village people about HIV.

i) Illiteracy among village people.
ii) Lack of scientific knowledge about HIV and AIDS.
iii) Social and religious restrictions.
iv) Lack of knowledge about effects or consequences of AIDS.

Steps to be taken to overcome the problem.

i) Using locally available educated people for campaign.
ii) Using health workers to impart knowledge about causative agent HIV and its prevention.
iii) Using news and social medias to create awareness
iv) Using school and college students to impart knowledge about effects or consequences of AIDS through
cultural programmes.

XI. Book Exercise – Value based questions

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

Drug and alcohol consumption has an inherent addictive nature associated with euphoria and a temporary feeling of well-being. Repeated intake of drugs increases the tolerance level of the body's receptors, leadingto more consumption of drugs.

2. Men addicted to tobacco lead to oxygen deficiency in their body. What could be the possible reason?

1. Carbon monoxide of tobacco smoke binds to haemoglobin of RBC and decreases its oxygen carrying capacity and it takes the place of oxygen in the blood causing hypoxia in body tissues.
2. Smoking causes inflammation of lung's alveoli and decreases the surface area for O_2 diffusion into blood.

Thus men, addicted to tobacco, have oxygen deficiency in their body.

3. Name any three foods that are to be avoided and included in the diet of a diabetic patient. Whyshould it be followed?

Food to be avoided in diet

i) Refined sugar
ii) Saturated fat and
iii) White bread, pasta and rice.

Food to be included in diet

i) Millets
ii) Green leafy vegetables and
iii) Wheat.

4. How can informational efforts change people's HIV knowledge and behaviour?

Informational efforts have changed people's HIV knowledge and behaviour regarding HIV, including

i) Screening of blood for HIV before transfusion
ii) Use of disposable needles and syringes in hospitals and clinics.
iii) Safe sex and advantages of using condoms and
v) Attitude towards people infected with HIV.

ENVIRONMENTAL MANAGEMENT

V. Book Exercise – Answer in a sentence

1. What will happen if trees are cut down?

Effect of cutting trees

i) Ecological problems like floods and drought
ii) Soil erosion
iii) Loss of wild life
iv) Extinction of species
v) Imbalance of biogeochemical cycles
vi) Alteration of climatic conditions and
vii) Desertification.

2. What would happen if the habitat of wild animals is disturbed?

The habitat provides food, shelter and protection to the animals. If the habitat is disturbed then the animals become unprotected and may decline in numbers and become endangered.

3. What are the agents of soil erosion?

Agents of soil erosion are

i) High velocity of wind,
ii) Air currents,
iii) Flowing water,
iv) Landslide,
v) Human activities (deforestation, farming and mining) and
vi) Overgrazing by cattle.

4. Why fossil fuels are to be conserved?

i) They are limited. Once they are exhausted there will be none.
ii) There are no ideal alternative for fossil fuels.
iii) We have to use in a control way to control global warming.

5. Solar energy is a renewable energy. How?

Solar energy is the energy obtained from the sun. It is a renewable free source of energy that is sustainable and totally inexhaustible, unlike fossil fuels which are finite.

6. How are e-wastes generated?

E-wastes are generally called as electronic wastes. They are generated from the spoiled, outdated, non-repairable electrical and electronic devices.

VI. Book Exercise – Short answer questions.

1. What is the importance of rainwater harvesting?

Rainwater harvesting helps to

i) Overcome the rapid depletion of ground water levels.
ii) To Meet the increase demand of water.
iii) Reduces flood and soil erosion
iv) Water stored in ground is not contaminated by human and animal wastes and hence can be used fordrinking purpose.

2. What are the advantages of using biogas?

Advantages of biogas

i) It burns without smoke and therefore causes less pollution.
ii) An excellent way to get rid of organic wastes like bio-waste and sewage material.
iii) Left over slurry is a good manure rich in nitrogen and phosphorus
iv) It is safe and convenient to use
v) It can reduce the amount of greenhouse gases emitted.

3. What are the environmental effect caused by sewage?

i) Sewage is the leading polluter of water sources
ii) Sewage water results in agricultural contamination and environmental degradation.

4. What are the consequences of deforestation?

Deforestation gives rise to ecological problems like floods, drought, soil erosion, loss of wild life, extinction of species, imbalance of biogeochemical cycles, alteration of climatic conditions and desertification.

VII. Book Exercise – Long answer questions

1. How does rainwater harvesting structures recharge ground water?

The mainpurpose of rainwater harvesting is to make the rainwater percolate under the ground so as to recharge **'groundwater level'**.

Methods of rainwater harvesting :

i) **Roof top rainwater harvesting:** Roof-tops are excellent **rain catchers**. The rain water that falls on the roof of the houses, apartments, commercial buildings etc. is collected and stored in the surface tank andcan be used for domestic purpose.
ii) **Recharge pit:** In this method, the rainwater is first collected from the roof tops or open spaces and is directed into the **percolation pits** through pipes for filtration. After filtration the rainwater enters the **recharge pits** or **ground wells**.

2. How will you prevent soil erosion?

i) Retain vegetation cover, so that soil is not exposed.
ii) Cattle grazing should be controlled.
iii) Crop rotation and soil management improve soil organic matter.
iv) Runoff water should be stored in the catchment.
v) Reforestation, terracing and contour ploughing.

vi) Wind speed can be controlled by planting trees in form of a shelter belt.

3. What are the sources of solid wastes? How are solid wastes managed?

Sources of solid waste : i) Municipal wastes ii) Hospital wastes iii) Industrial wastes and iv) e-wastes **Solid-waste management** It involves the collection, treatment and proper disposing of solid material that is discarded from the household and industrial activities.

i) **Segregation:** It is the separation of different type of waste materials like biodegradable and non biodegradable wastes.

ii) **Sanitary landfill :** Solid wastes are dumped into low lying areas. The layers are compacted by trucks to allow settlement. The waste materials get stabilised in about 2-12 months. The organic matter undergoes decomposition.

iii) **Incineration :** It is the burning of non-biodegradable solid wastes (medical wastes) in properly constructed furnace at high temperature.

iv) **Composting :** Biodegradable matter of solid wastes is digested by microbial action or earthworms andconverted into humus.

v) **Recycling of wastes** :

a) Papers from old books, magazines and newspapers are recycled to produce papers in paper mills.

b) Agricultural wastes like coconut shells, jute cotton stalk, bagasse of sugarcane can be used to make paper and hard board. Paddy husk can be used as livestock fodder.

c) Cow dung and other organic wastes can be used in gobar gas plant to provide biogas and manure for fields.

4. Enumerate the importance of forest.

- Forests are an important component of our environment.
- Forests consist of economically and medicinally valuable microorganisms, flowering plants, shrubs, climbers and dense trees.
- Forests provide a vast habitat for wild animals.
- Forests also contribute to the economic development of our country.
- Forests are important source for a wide range of renewable natural resource.
- They provide wood, food, fodder, fibre and medicine.
- Forests act as carbon sink, regulate climatic conditions, increase rainfall, reduce global warming, prevent natural hazards like flood and landslides, protect wildlife and also act as catchments for waterconservation.
- They also play a vital role in maintaining the ecological balance.

5. What are the consequences of soil erosion?

i) **Fertility loss and land degradation:** The direct and primary effect of soil erosion is soil loss and nutrient leaching resulting in reduction of land productivity.

ii) **Air Pollution :** Wind erosion picks up dust particles of the soil and throws them into the air, causing airpollution.

iii) **Destruction of Infrastructure :** Soil erosion can affect infrastructural projects such as dams and drainages. The accumulation of soil sediments in dams and drainages can reduce their operational lifetime and efficiency.

iv) **Desertification :** Soil erosion is a major driver of desertification. It gradually transforms a habitable land

into deserts.

v) **Water Pollution:** Soils eroded from agricultural lands carry pesticides, heavy metals, and fertilizers which are washed into streams and major water ways. This leads to water pollution and damage to marine and freshwater habitats.

vi) **Clogging of Waterways :** Accumulated sediments can also cause clogging of water ways and raises the water level leading to flooding.

6. **Why is the management of forest and wildlife resource considered as a challenging task**?

i) People living in and around forests are dependent on forest ie plants and animals products for variousaspects of their life such as livelihood.

ii) The forest department of the government who judicially allowed for owning the land and controlling theresources from forests.

iii) The industrialists who use forest products such as timber, leaves, latex and raw materials for theirindustries.

iv) Global warming and climate change results in water scarcity and changes in rainfall pattern in forestarea.

v) Lack of proper law enforcement and lack of sufficient number of guards lead to indiscriminate illegal poaching affects wildlife populations and the environment.

IX. Book Exercise – Higher Order Thinking Skills (HOTS)

1. **Although coal and petroleum are produced by degradation of biomass, yet we need to conserve them. Why?**

The formation of coal and petroleum is a very slow process and takes very long period of time for renewal. The coal and petroleum reserves can get exhausted if we continue using them at a rapid rate. So it is necessaryto conserve or save coal and petroleum resources for the future use, which can be done by reducing their consumption.

2. **What are the objectives for replacing non-conventional energy resources from conventional energyresources?**

The objective in using non-conventional (Renewable) resources is to reduce the pessimistic environmental effects associated with conventional (Non-renewable) resources such as coal, petroleum and natural gas. Reusable or non-conventional energy is greener and keeps our planet clean. We need to make sure our future generation need not have to walk around with an oxygen mask on their face.

3. **Why is the Government imposing ban on the use of polythene bags and plastics? Suggest alternatives. How is this ban likely to improve the environment**?

Government is imposing ban on polythene bags and plastics, because they are non-biodegradable substancesand harmful to the environment .

Alternatives to Polythene bags and plastics : Instead of polythene bag, "Paper Bags" and "cloth bags "and instead of non-biodegradable plastics, bio-plastics can be used as they are biodegradable and will get decomposed and they will not pollute the environment.

This ban will improve the environment in the following ways :-

i) It will help to prevent land and water pollution .

ii) It will lead to less productions of polythenes , which help in reduction of harmful gases from factories.

X. Book Exercise – Value based questions

1. **Why is it not possible to use solar cells to meet our energy needs? State three reason to support toyour answer.**

   Solar cells are not used in our daily routine because :

   i) Solar cells work on the basis of solar energy which is not provided at night. Moreover in the winterseason sunlight is minimal.

   ii) They take lot of time in completing any work depending on the intensity of light.For Eg : solar cookers take much time in cooking food in low intensity of light.

   iii) The installing cost of solar cell panel is high as the silicon wafer is very expensive also same for the silverwhich is used in connecting solar cells.

   iv) Only DC electricity is produced by SPV (Solar Photovoltaic system).To operate any AC device, this dc hasto be converted in as by using inverters.

   v) The efficiency of energy conversion is low as compared to other means of generating electricity.

2. **How would you dispose the following wastes**?

   a. Domestic wastes like vegetable peels

   b. Industrial wastes like metallic cans

   Can the disposal protect the environment? How?

   a) Disposal of vegetable peels and metallic cans

   i) Peels and scrapings from fruit and vegetables can be composted along with other degradablematter.

   ii) Industrial waste like metallic cans can be recycled as they are non - biodegradable.

   b) Disposal can protect environment :

   i) Biodegradable matter of solid wastes such as Peels and scrapings from fruit are digested by microbialaction or earthworms and converted into humus.

   ii) Recycling of industrial waste like metallic cans helps to reduce air pollution, water pollution, greenhouse gas emissions and often a conservation of global resources.

3. **List any three activities based on 3R approach to conserve natural resources**.

   First 'R' - Reuse : Bring cloth bags to the store with you instead of asking shopkeeper for new paper or polythene bags. You can use cloth bags again and again. You can save some trees and can prevent pollutioncaused by polythene bags.

   Second 'R' – Reduce : When we reduce the use of electric power, we reduce the amount of toxic fumes released by power plants, conserve the earth's natural resources and protect ecosystems from destruction.

   Third 'R' – Recycle : Many of the things we use every day, like paper bags, soda cans, and milk cartons, are made out of materials that can be recycled. Recycled items are put through a process that makes it possible to create new products out of the materials from the old ones.

VISUAL COMMUNICATION

III. Book Exercise – Answer in a sentence (1 mark)

1. **What is Scratch?**

   'Scratch' is a software used to create animations, cartoons and games easily. Scratch, on the other hand, isa visual programming language.

2. **Write a short note on editor and its types?**

   The Scratch editor has three main parts:

   - **Stage :** Stage is the background appearing when we open the scratch window.
   - **Sprite :** The characters on the background of a Scratch window are known as Sprite.
   - **Script editor / costume editor :** Where you edit your programs or your sprite's pictures. It has threemain parts:
     a) **Script area :** Where you build scripts.
     b) **Block menu :** Where you choose the category of blocks (programming statements) to use.
     c) **Block palette :** Where you choose the block to use.

3. **What is Stage?**

   Stage is the background appearing when we open the scratch window. The background will most often bewhite. You can change the background colour as you like.

4. **What is Sprite**?

   The characters on the background of a Scratch window are known as Sprite. Usually a cat appears as a spritewhen the Scratch window is opened. The software provides facilities to make alternations in sprite.