SUPPORT MATERIAL

CLASS-X
SUBJECT – SCIENCE & TECHNOLOGY
(English Medium)

An Educational Support Initiative by:
NIOS Project, DoE, GNCTD

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(MESSAGE)

"The highest education is that which does not merely give us information but makes our life in harmony with all existence." - Rabindranath Tagore

In the pursuit of equitable and quality education, the NIOS Project team of DoE has undertaken the initiative to develop this specially designed Support Material for the learners who require additional guidance. This comprehensive resource has been thoughtfully designed to bridge learning gaps, cater to the diverse needs of our students and foster academic excellence. By providing a structured framework for learning, this material aims to empower students to take ownership of their educational journey and achieve their full potential.

A lot of hand work has gone into the preparation of this material. I would like to express my sincere appreciation to all the teachers and the Subject Experts of CAU for writing and editing this material. I encourage all students and teachers to utilize this resource effectively.

I wish all the students of this project success, happiness and fulfilment.

(Pandurang K. Pole)

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1580/NIOS/P
Dated - 23.12.2025

MESSAGE

"Education is the most powerful weapon which you can use to change the world." - **Nelson Mandela**.

It gives me immense pleasure to introduce this Support Material developed by the NIOS Project Branch of DoE in collaboration with a selected team of NIOS teachers and meticulously reviewed by the subject teams of CAU, DoE for the students of Class X of NIOS Project of DoE.

This comprehensive resource is a testimony of our commitment to providing quality education and ensuring that every student has access to the resources they need to succeed.

The Directorate of Education has always strived to create an environment that fosters academic excellence, creativity, and innovation. This Support Material is a significant step towards achieving this goal, as it provides students with a structured framework for learning and assessment.

Our teachers play a pivotal role in guiding and supporting students and I urge them to use this material to provide targeted support to NIOS students.

Let us work together to create a supportive learning environment and I am confident that this support material will play a significant role in achieving this goal.

Veditha

(VEDITHA REDDY, IAS)

NIOS Project
Directorate of Education
Govt. of NCT, Delhi

Support Material

Class-X

Subject- Science & Technology

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Subject- Science & Technology

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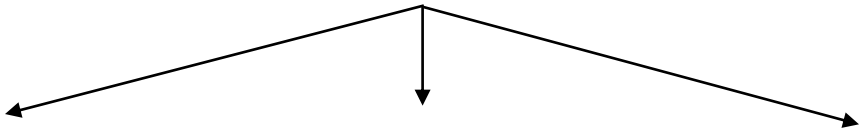
Content

Chapter -1
Measurement in Science and Technology

Measurement - Numerical form of measuring the quantity of an object, event or qualities.

Units



Meter (m): Length, Distance **kilogram (kg)**: Mass **Second (Sec)**: Time

MUST DO QUESTIONS

Q1. Length can be measured in-

(a) kg (b) mol (c) m (d) sec

Ans: (c) m.

Q2. In ancient times, people used for measurement-

(a) Thumb (b) Palm (c) Foot step (d) All of above

Ans: (d) All of above

Q3. Write the names of those parts of the human body which are used for measurement?

Ans: Arm, finger, Cubit etc.

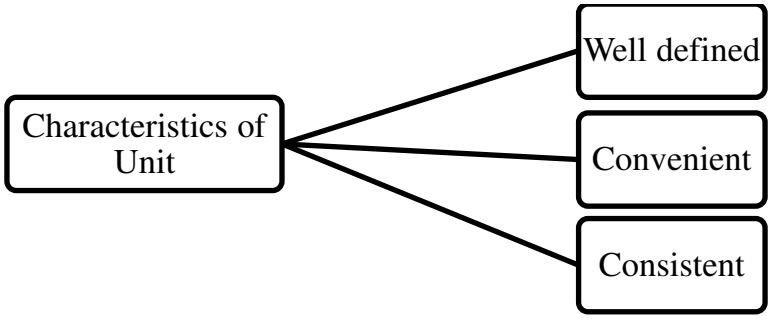
Q.4 Why can't precise measurement be done by the parts of the human body?

Ans: Because the size of body parts of every person is different.

UNIT - Measurement of a Physical Quantity.

Example : length, Breadth etc.

Value of Physical Quantity = Numerical Quantity x Unit



SI Unit → International Unit of measurement.

Basic Unit	Derived Unit
There are only 7 units.	Their number is large.
These do not depend on each other.	These are obtained from fundamental units
Example: length, time etc.	Example: Area, Density, Volume etc.

Base physical quantity	Symbol of Physical quantity	Name of SI Unit	Symbol for SI Unit
length	l	metre	m
mass	m	kilogram	kg
time	t	second	s
electric current	I	ampere	A
thermodynamic temperature	T	kelvin	K
amount of substance	n	mole	mol
Luminous intensity	I	candela	cd

Some examples of physical Quantities derived from commonly used physical quantities:

Derived Quantity	Dimensions	Name of Unit	Symbol of the Unit
area	Length × length	square meter	m^2
volume	Length × length × length	cubic metre	m^3
speed, velocity	Length/time	metre per second	$m\ s^{-1}$
acceleration	(Length/time)/time	metre per second squared	$m\ s^{-2}$
wavenumber	1/length	reciprocal metre	m^{-1}
density	Mass/(length)^3	kilogram per cubic metre	$kg\ m^{-3}$
Work	(Mass × length^2)/(time)^2	kilogram square metre per square second	$kg\ m^2/s^2$

Specific Names of derived units with symbols assigned to them:-

Physical Quantity	Derived SI unit	Special name assigned to the Unit	Symbol assigned to the special name
frequency	s^{-1}	Hertz	Hz
force	$m.kg.s^{-2}$	Newton	N
Pressure or stress	$m^{-1}.kg.s^{-2}$	Pascal	Pa
Energy or work	$kg.m^2.s^{-2}$	Joule	J
Power	$kg.m^2.s^{-3}$	Watt	W

Prefixes of:-

Multiple	Prefix	Symbol	Sub multiple	Prefix	Symbol
10^{24}	yotta	Y	10^{-1}	deci	d
10^{21}	zetta	Z	10^{-2}	centi	c
10^{18}	exa	E	10^{-3}	milli	m
10^{15}	peta	P	10^{-6}	micro	m
10^{12}	tera	T	10^{-9}	nano	n
10^{9}	giga	G	10^{-12}	pico	p
10^{6}	mega	M	10^{-15}	femto	f
10^{3}	kilo	k	10^{-18}	atto	a
10^{2}	hecto	h	10^{-21}	zepto	z
10^{1}	deca	da	10^{-24}	yocto	y

MUST DO QUESTIONS

Q1. Which of the following is not an S.I. unit?

(a) Meter (b) Pound (c) Kilogram (d) Second

Ans: (b) Pound

Q2. Derived unit of Power is -

(a) kg m s^{-2} (b) kg m^2 s^{-3} (c) kg m s^{-3} (d) kg m^{-1} s^{-2}

Ans: (b) kg m^2 s^{-3}

Q3. Derived Unit of Pressure is -

(a) Hertz (b) Newton (c) Pascal (d) Watt

Ans: (c) Pascal

Q4. Advantages of S.I. unit?

Ans: (a) Compatible system (b) Internationally accepted

Q5. Write the common unit and S.I. unit for measuring body temperature.

Ans: Common Unit - Celsius (°C) S.I. Unit - Kelvin (K)

Q6. What is a unit? List essential characteristics of a unit?

Ans: Measurement of Physical quantity is called Unit.

Characteristics: Relevant, Convenient, Well-defined.

Q7. Derive unit of Pressure?

Ans: Unit of Pressure = Unit of force / Unit of Area

= kg m s^{-2} / m^2

= kg m^{-1} s^{-2}

Q8. Fill in the blanks (According to Conversion of Units).

(a) The effective radius of a proton is 1.2 x 10^{-15} m_____

(b) Radius of Human red blood cell, 3.7 x 10^{-6} m_____

(c) Radius of our Galaxy, 6 x 10^{20} m_____

Ans: (a) 1.2 fm (b) 3.7 µm (c) 60 Em

Q.9 Match the following:

(1) Electric current flowing in electric heater (a) Kelvin (K)

(2) Temperature of furnace (b) Mole (mol)

(3) Amount of substance (c) Ampere (A)

Ans: (1) c(Ampere (2) a(Kelvin) (3) b(Mole)

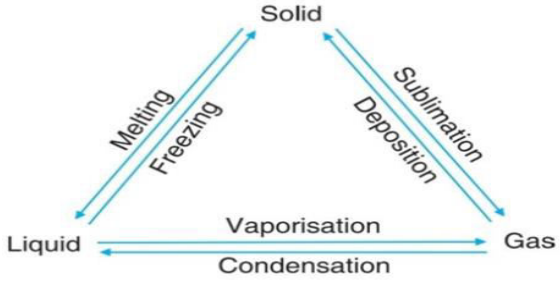
Chapter-2
Matter in our Surroundings

Matter: Matter is anything which has mass and occupies space.
Physical States of Matter - Solid, Liquid, Gas

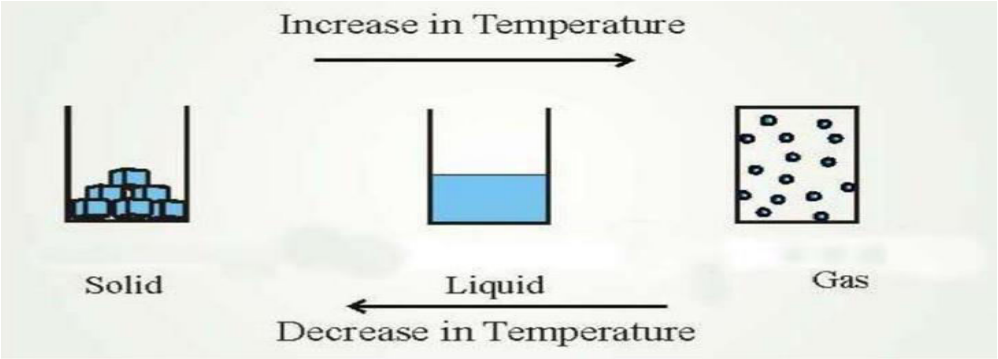
State of matter	Volume	Density	Shape	Fluidity	Compressibility
Solid	Has fixed volume	High	Has definite shape	Does not flow	Negligible
Liquid	Has fixed volume	Lower as compared to solid	Has no definite shape. It takes the shape of container.	Flows smoothly	Very small
Gas	Has no fixed volume	Low	Has no definite shape.	Flows smoothly	Highly compressible

Solid	Liquid	Gas
Constituent particles are very close to each other. So, solids are rigid and hard.	Liquids can flow and constituent particles do not occupy fixed positions as in solids.	Constituent particles are very far from each other.

Temperature and Pressure affects the physical States of matter.



Inter conversion of states of matter: -



MUST DO QUESTIONS

Q1. Which state of matter has the property of flow?
(a) Solid (b) Liquid (c) Gas (d) Both b and c
Ans: (d) Both b and c

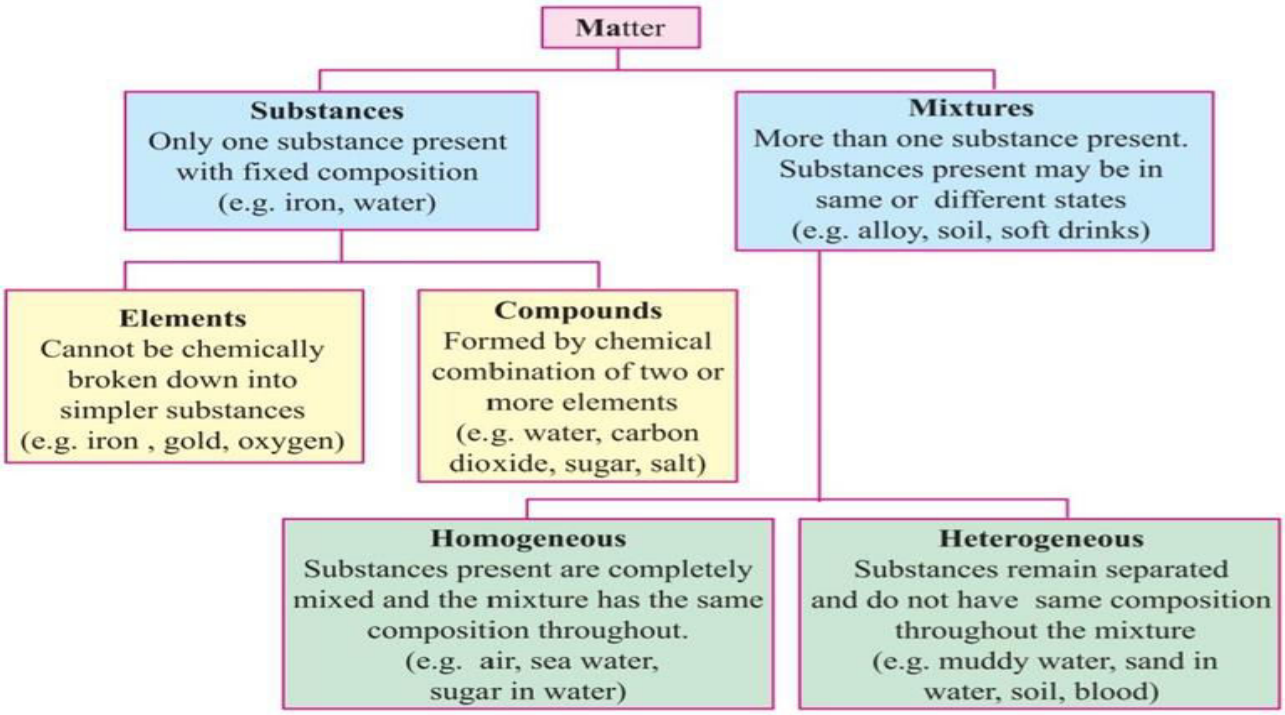
Q2. Which of the following substances exists in its pure state?
(a) Milk (b) Gold (c) Sand (d) Air
Ans: (b) Gold.

Q3. Name a substance which exists in all three states of matter.
Ans: Water

Q4. Why gases don't have a definite shape?
Ans: The particles in gases do not have fixed positions and weak interparticles forces are acting between them.

Q5. What is sublimation?
Ans: A substance that converts directly from a solid state to gaseous state without passing through the liquid state. Example Camphor

	Solution	Suspension	Colloid
Appearance	Clear, transparent and homogeneous	Cloudy, heterogeneous, at least two substances visible	Cloudy but uniform and homogeneous
Particle Size	molecule in size (10^{-7}-10^{-8} cm)	larger than 10,000 Angstroms (10^{-3}-10^{-5} cm)	10-1000 Angstroms (10^{-3}-10^{-7} cm)
Effect of Light Tyndall Effect	none -- light passes through, particles do not reflect light	variable	light is dispersed by colloidal particles
Effect of Sedimentation	None	particles will Eventually settle out	None
Visibility	Particles non visible even under The ultramicroscope	Particles visible even with naked eye	Particles visible under ultramicroscope



MUST DO QUESTIONS

Q1. Smoke is an example of:
(a) Suspension (b) Aerosol (c) Emulsion (d) Foam
Ans: (b) Aerosol

Q2. Which of the following is not a homogeneous mixture?
(a) Milk (b) Air (c) Copper (d) Sugar Solution
Ans: (a) Milk

Q3. Identify whether each of them is an element, compound, or mixture:

Milk, Air, Iron, Sugar, Water, Silver, Sea Water, Carbon Dioxide, Copper

Ans:

Element	Compound	Mixture
Iron	Sugar	Sea Water
Silver	Carbon dioxide	Milk
Copper	Water	Air

Methods of separation of Mixtures:

(1) Separating Funnel - (e.g., oil and water)

(2) Evaporation - (Salt is obtained from sea water)

(3) Filtration - (muddy water)

(4) Crystallization - (sugar crystals)

(5) Distillation - (separation of gases from air)

(6) Magnetic properties - (Iron & sand)

MUST DO QUESTIONS

Q1. Write the full form of: (a) CNG (b) LPG
Ans: **C.N.G.** - Compressed Natural Gas
L.P.G. - Liquefied Natural Gas

Q2. Why are solids less compressible as compared to gases and liquids?
Ans: Particles in solid are closely packed and have strong inter particle forces between them.

Q3. Why is it important to store cooking gas cylinders away from heat and flame?
Ans: By increase in temperature, the kinetic energy between the atoms increases which tend to explode.

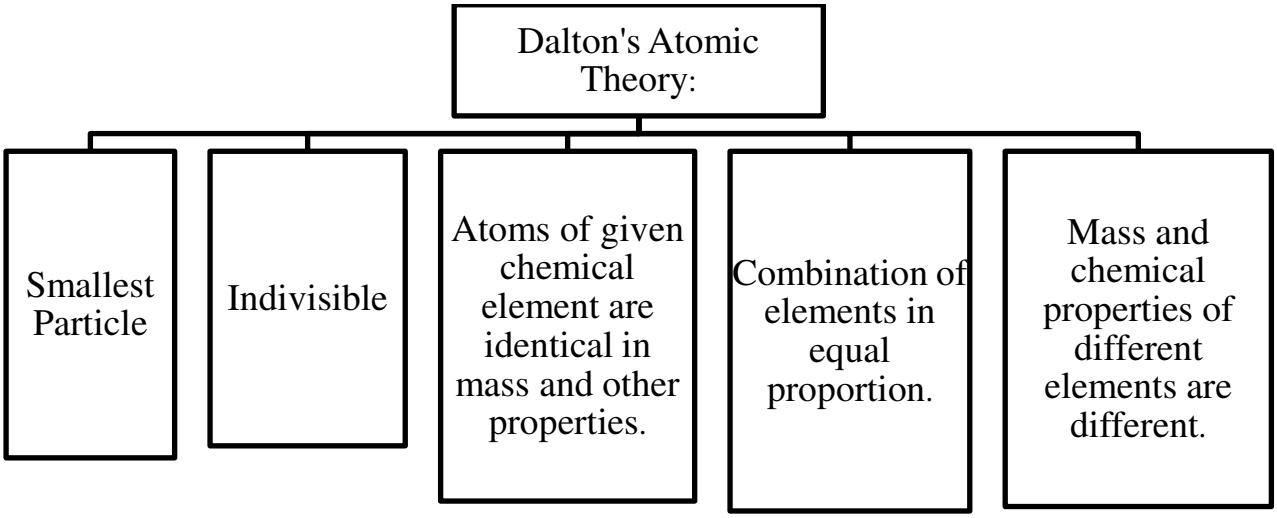
Q4. Identify the most appropriate method to separate the following:

Ans:

Substances	Method of Separation
1)Separate clean water from muddy	Filtration
2)Separate oil from water mixture	Separating funnel
3)Separate iron nails from sand	Magnetic properties
4)Separate sugar from saturated sugar	Crystallization
5)Mixture of water and acetone	Distillation

Chapter-3
Atoms and Molecules

Law of Conservation Mass: Given by Antoine Lavoisier
Total mass of Reactants = Total mass of Products
e.g. C (12g) + O_2 (32g) → CO_2 (44g)



Law of Constant Proportion: Compound always consists of same elements combined in same proportion by mass.
e.g., H_2 O = 2:16 = (1:8)
Atom: Smallest indivisible particle .
e.g. H, O, N
Molecule: A group of two or more atoms held together by chemical bonds.
e.g. H_2 , O_2 , CO_2
Atomic mass: Total number of proton and neutron in an atom.

$$A = P + N$$

(Atomic mass) (Proton) (Neutron)

Law of Multiple Proportion: When two elements form more than one compound, the masses of one element in these compounds for a fixed mass of other element are in the ratio of small whole numbers.
e.g.C:O :-(i)CO (A fixed mass of 12 grams of carbon combines with 16 grams of oxygen)
(ii) CO_2(A fixed mass of 12 grams of carbon combines with 32 grams oxygen)

MUST DO QUESTIONS

Q1.Name the scientists who proposed the law of conservation of mass and law of constant proportion.
Ans**:** Law of conservation of mass - Lavoisier.
Law of constant proportion - Proust

Q2. 12g of magnesium powder was ignited in a container having 20g of oxygen. After the reaction was over, it was found that 12g of oxygen was left unreacted. Show that it is according to Law of constant proportions.

$2Mg + O_2 \rightarrow 2MgO$

Unreacted O_2: (20 - 12)g = 8g

12g Mg + 8g O_2 → MgO

24g Mg + 16g O_2 → 2(12g Mg + 8g O_2)

(40g) → 2 × 20g (40g) In this reactions ratio of masses of Mg and O is 48:32=3:2

And this experiment, The same as same i.e 12:8g =3:2

Isotopes: Atoms of an element that have the same atomic number (Z) but different mass number (A). e.g., $^{16}O_8$, $^{17}O_8$, $^{18}O_8$.

Molecular mass: Sum of Atomic masses of all atoms in a molecule.

Unit: a.m.u.

e.g.: $CO_2 = 1\times12 + 2\times16 = 44$ u.

Mole: Amount of substance which contains the same number of particles (atoms, ions or molecules) equal to Avogadro's number, which is approximately 6.022×10^{23}

Molar mass: Mass of one mole of a substance.

e.g., Mass of one mole atoms of oxygen = 16g mol^{-1}

Mass of one mole molecules of oxygen = 32g mol^{-1}

MUST DO QUESTION

Q1. Atomic number of silicon is 14. If there are three isotopes of silicon having 14, 15 and 16 neutrons in their nuclei, what would be the symbol of the isotope?

Ans: Atomic Number (Si) = 14; Mass Number (Si) = 28, 29, 30.

Isotope symbol: $^{28}Si_{14}$; $^{29}Si_{14}$; $^{30}Si_{14}$

Q2) Calculate molecular mass of the compounds:

1) $C_2H_4 = 2\times12 + 4\times1 = 24 + 4 = 28u$

2) $H_2O = 2\times1 + 16\times1 = 16 + 2 = 18u$

3) $CH_3OH = CH_4O = 1\times12 + 4\times1 + 16\times1 = 32u$

4) $NH_3 = 1\times14 + 3\times1 = 14 + 3 = 17u$

Q3) Nitrogen forms three oxides: NO, NO_2 , and N_2O_3 . Show that it obeys law of multiple proportions.

Ans. N : O (14 : 16) NO_2 : 14 : (16×2) N_2O_3 : (14×2) : (16×3)

14 : 32 28 : 48

16 : 32 : 24

Ratio: 2 :4 : 3

Q4) Write the number of protons, neutrons, and electrons in each of isotopes:

$^{2}H_1$, $^{18}O_8$, $^{19}F_9$, $^{40}Ca_{20}$

Ans. $^{2}H_1$ -----e=1,p=1,n=1

$^{18}O_8$-------e=8,p=8,n=10

$^{19}F_9$-------e=9, p=9, n=10

$^{40}Ca_{20}$-------- e=20, p=20, n=20

Q5. Chlorine has two isotopes $^{35}Cl_{17}$ and $^{37}Cl_{17}$ present in ratios of 3:1. What will be the average atomic mass of Chlorine?
Ans: Average atomic mass =(35×3+37×1)/4=142/4=35.5u

Q6. How many grams are there in 3.5 mol of oxygen?
Ans: Molecular mass of O_2 (1 mole) = 32 g/mol
3.5 mole =32×3.5=112g

Q7) Find out number of molecules in 27g of water?
Ans: Number of mole of H_2O = mass of water (H_2O)/molar mass of H_2O=
=27g/18gmol=3/2 mol=1.5 mol
1 mole H_2O =6.022×10^{23}molecules
1.5 mole H_2O =$6.022\times10^{23}\times1.5=$ 9.03×10^{23}molecules of water.

VALENCY: Combining capacity of an element.

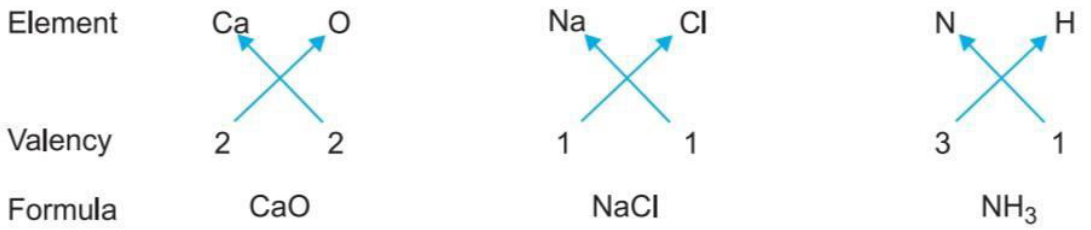
Elements	Symbol	Valency	Elements	Symbol	Valency
Hydrogen	H	1	Phosphorus	P	5
Oxygen	O	2	Sodium	Na	1
Carbon	C	4	Magnesium	Mg	2
Nitrogen	N	3	Calcium	Ca	2
Chlorine	Cl	1	Aluminium	Al	3
Bromine	Br	1	Iron	Fe	2
Iodine	I	1	Barium	Ba	2

Numerical prefixes:-

Number of atoms	Prefix	Example
1	Mono	carbon monoxide, CO
2	Di	carbon dioxide, CO_2
3	Tri	phosphorus trichloride, PCl_3
4	Tetra	carbon tetrachloride, CCl_4
5	Penta	Dinitrogen pentoxide, N_2O_5

Charges of some cations and anions which form ionic compounds:

Anions	Charge	Cations	Charge
Chloride ion, Cl^-	–1	Potassium ion, K^+	+1
Nitrate ion, NO_3^-	–1	Sodium ion, Na^+	+1
Hydroxide ion, OH^-	–1	Ammonium ion, NH_4^+	+1
Bicarbonate ion, HCO_3^-	–1	Magnesium ion, Mg^{2+}	+2
Nitrite ion, NO_2^-	–1	Calcium ion, Ca^{2+}	+2
Acetate ion, CH_3COO^-	–1	Lead ion, Pb^{2+}	+2
Bromide ion, Br^-	–1	Iron ion (ous), Fe^{2+}	+2
Iodide ion, I^-	–1	Zinc ion, Zn^{2+}	+2
Sulphite ion, SO_3^{2-}	–2	Copper ion (cupric), Cu^{2+}	+2
Carbonate ion, CO_3^{2-}	–2	Mercury ion (Mercuric), Hg^{2+}	+2
Sulphate ion, SO_4^{2-}	-2	Iron (ic) ion, Fe^{3+}	+3
Sulphide ion, S^{2-}	–2	Aluminium ion, Al^{3+}	+3
Phosphate ion, PO_4^{3-}	–3	Potassium ion, K^+	+1
		Sodium ion, Na^+	+1



MUST DO QUESTIONS

Q1.Write chemical formulas of the following compounds:

(a) Copper (II) sulphate (b) Aluminium chloride (c) Potassium iodide (d) Ammonium sulphate (e) Hydrogen sulphide (f) Magnesium oxide

Ans: (a) $CuSO_4$ (b) $AlCl_3$ (c) KI (d) $(NH_4)_2 SO_4$ (e) $H_2 S$ (f) MgO

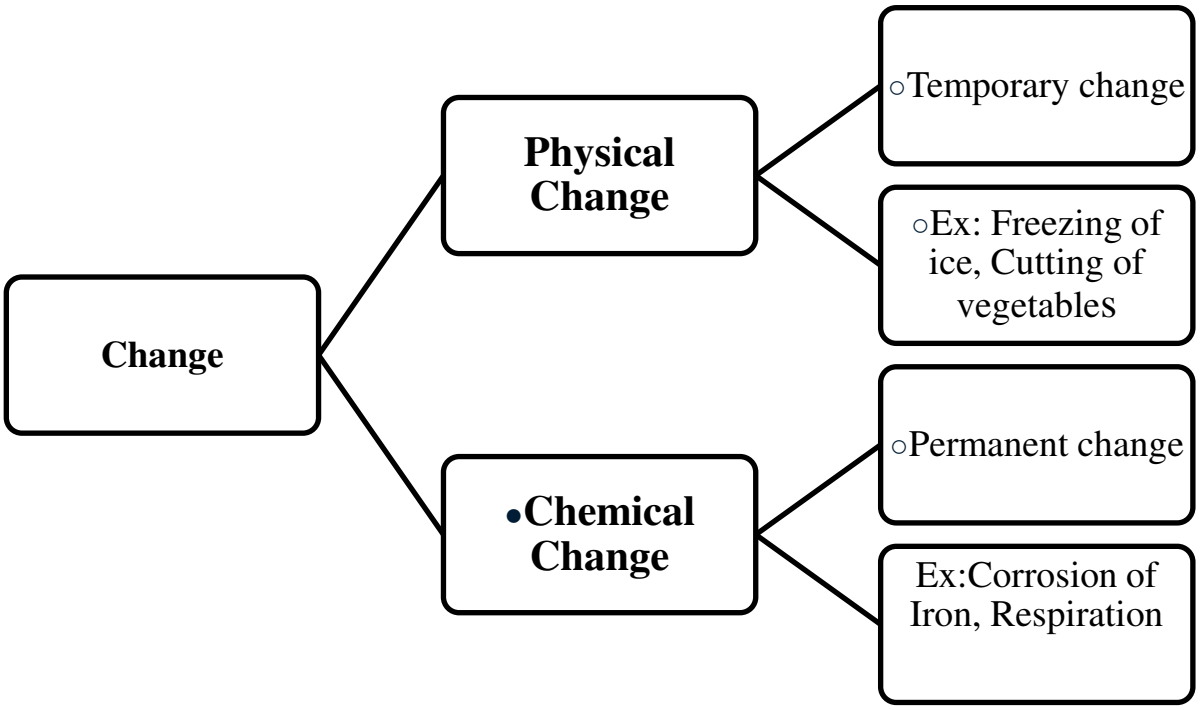
Q2. Write the formula of the compound formed between:

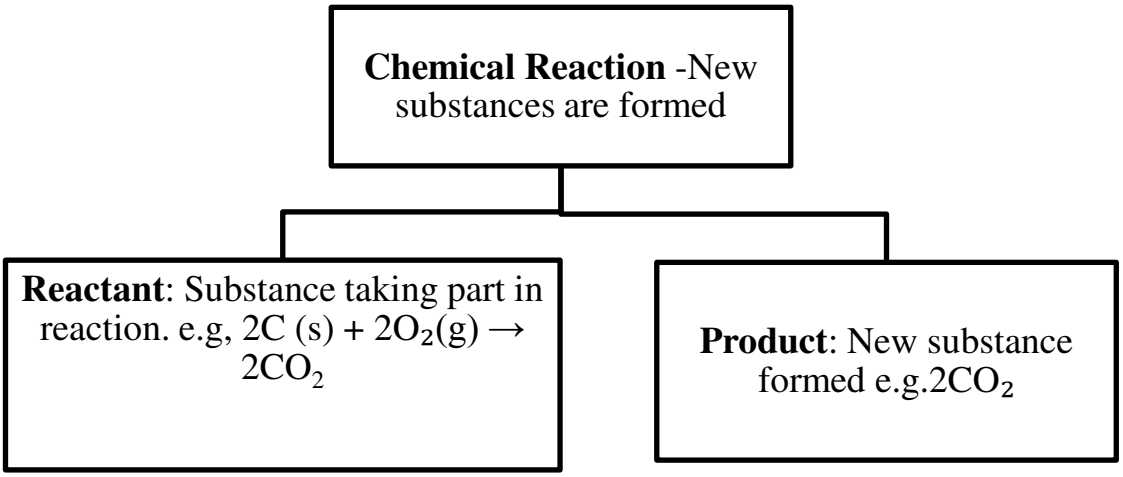
(a) Al^{3+} and PO_4^{3-} (b) Ba^{2+} and SO_4^{2-}

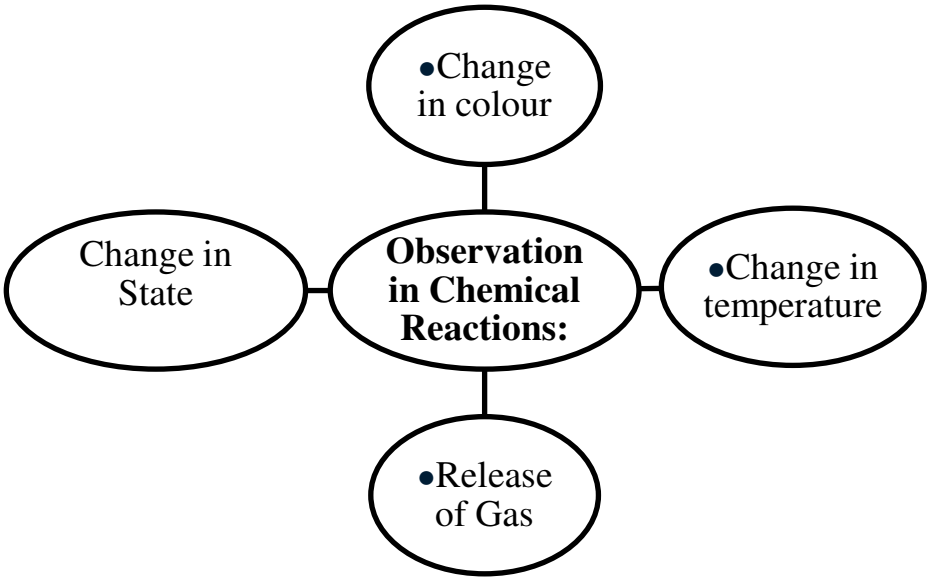
(c) Pb^{2+} and Cl^- (d) Na^+ and CO_3^{2-}

Ans:(a) $AlPO_4$ (b) $BaSO_4$ (c) $PbCl_2$ (d) $Na_2 CO_3$

Chapter-4
Chemical Reactions and Equations







Unbalanced Equation	Balanced Equation
(1)$Mg + O_2 \rightarrow MgO$	(1)$2\ Mg + O_2 \rightarrow 2\ MgO$
(2) $CO_2 + H_2O \rightarrow C_6H_{12}O_6 +$	(2)$6\ CO_2 + 6\ H_2O \rightarrow C_6H_{12}O_6$
(3) $Fe + H_2O \rightarrow Fe_3O_4 + H_2$	(3) $3\ Fe + 4\ H_2O \rightarrow Fe_3O_4 + 4\ H_2$

MUST DO QUESTIONS

Q1. Which of the following is not a chemical Change?
(a) Digestion of food (b) Respiration (c) Cutting of wood (d) Making curd
Ans: (c) Cutting of wood.

Q2. Which product is formed by burning of Magnesium ribbon in the presence of air?
(a) Mg (b) O_2 (c)MgO (d) MgO_2
Ans: (d) MgO (Magnesium oxide)

Q3. Balance the following Reactions:
(a) $H_2S(g) + SO_2(g) \rightarrow S(s) + H_2O(l)$
(b) $CuSO_4(aq) + Zn(s) \rightarrow ZnSO_4(aq) + Cu(s)$
Ans:(a) $2H_2S(g) + SO_2(g) \rightarrow 3S(s) + 2H_2O(l)$
(b) $CuSO_4(aq) + Zn(s) \rightarrow ZnSO_4(aq) + Cu(s)$

Q4.Write the Balanced equation for the following Reactions:
(a) Sodium reacts with oxygen to form Sodium Oxide.
(b) Iron reacts with steam to form Iron oxide and hydrogen gas.
Ans:(a) $4Na(s) + O_2(g) \rightarrow 2Na_2O(s)$
(b) $3Fe(s) + 4H_2O(l) \rightarrow Fe_3O_4(s) + 4H_2(g)\uparrow$

Types of Chemical Reactions:

(1). Combination Reaction: A single product is formed from two or more reactants. **Examples:** (i) Combustion of coal: $C(s) + O_2\ (g) \rightarrow CO_2\ (g)$

(ii) Formation of water: $2H_2\ (g) + O_2\ (g) \rightarrow 2H_2\ O(l)$

It is also known as **Exothermic Reaction** (Heat is given out during product formation).

Example: Respiration: $C_6\ H_{1\ 2}\ O_6\ + 6O_2\ \rightarrow 6CO_2\ + 6H_2\ O$ + Energy

(**2). Decomposition Reaction:** A single substance decomposes to give two or more substances. **Examples:**

i) Thermal Decomposition: $CaCO_3\ (s)$ + Heat $\rightarrow CaO(s) + CO_2\ (g)$

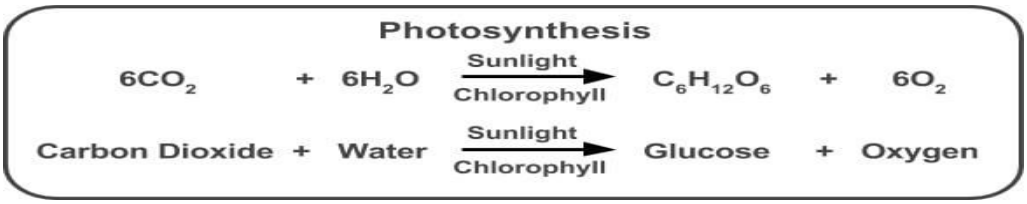
(Limestone)(Quicklime)

(ii) Photochemical Decomposition: $2AgCl(s)$ + Sunlight $\rightarrow 2Ag(s) + Cl_2\ (g)$

(iii) Electrolytic Decomposition: $2H_2\ O(l)$ + Electricity $\rightarrow 2H_2\ (g) + O_2\ (g)$

It is also known as **Endothermic Reaction** (Heat is absorbed during product formation).eg. Photosynthesis.

(3). Displacement Reaction: A less reactive element is displaced by a more reactive element. **Examples:** (i) $Fe(s) + CuSO_4\ (aq) \rightarrow FeSO_4\ (aq) + Cu(s)$



(ii) $Zn(s) + CuSO_4\ (aq) \rightarrow ZnSO_4\ (aq) + Cu(s)$

(4). Double Displacement Reaction

Exchange of ions between the reactants.

Examples: (i) $NaSO_2(aq) + BaCl_2(aq) \rightarrow BaSO_4(s) + 2NaCl(aq)$

(ii) $2KBr + BaI_2\ \rightarrow 2KI + BaBr_2$

Reactivity Series: K > Na > Ca > Mg > Al > Zn > Fe > Pb > H > Cu > Ag >Au

Decreasing Order of Reactivity Series of Metals.

MUST DO QUESTIONS

Q1. Shining of wall after white washing is due to:

(a) Calcium oxide (b) Calcium hydroxide

(b) (c) Calcium carbonate (d) Calcium phosphate

Ans: (c) Calcium carbonate

Q2. Combustion of Methane is an example of:

(a) Exothermic Reaction (b) Decomposition Reaction

(c) Displacement Reaction (d) Both (a) and (b)

Ans: (a) Exothermic Reaction

Q3. Given Chemical Reaction is an example of

$Zn + CuSO_4\ \rightarrow ZnSO_4\ + Cu$

(a) Combination Reaction (b) Displacement Reaction

(c) Decomposition Reaction (d) Double Displacement Reaction

Ans: (b) Displacement Reaction.

Q4. When iron nail is immersed in copper sulphate solution then change in colour of copper sulphate solution is:

(a) Green to Blue (b) Blue to Green

(c) Green to colorless (d) Blue to colorless

Ans: (b) Blue to Green

Q5. Classify the following Changes:

(i) Melting of ice.(ii) Milk changes into Curd

Ans:(i) Physical Change(ii) Chemical Change

Q6. What happens when a strip of zinc is dipped in copper sulphate solution?

Ans: $CuSO_4$ (aq) + Zn(s) → $ZnSO_4$ + Cu

Zinc is more reactive than Copper. Hence, Copper is displaced from the solution and $ZnSO_4$ is formed.

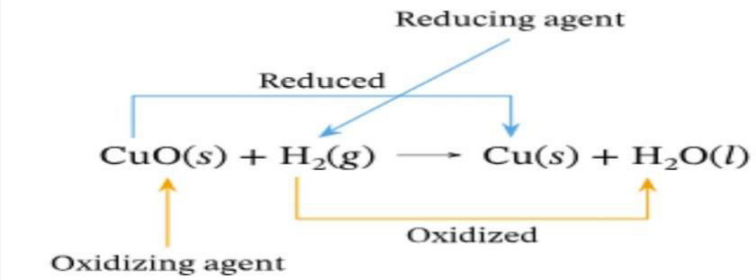
Q7. Differentiate between exothermic and endothermic reactions?

Exothermic Reaction	**Endothermic Reaction**
Heat is given out during product formation.	Heat is absorbed during product formation.
e.g.$CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + H_2O(g)$ + Heat	e.g. $2FeSO_4$ (s) + Heat → $Fe_2O_3(s) + SO_2(g) + SO_3(g)$

Oxidation and Reduction:-

Oxidation	**Reduction**
1. Gain of oxygen. or	1.Loss of oxygen. or
2. Loss of Hydrogen.	2.Gain of Hydrogen.

Redox Reaction: Oxidation and Reduction reactions occur simultaneously.



Effects of Oxidation Reactions in Everyday Life

(1) Corrosion: Destructive chemical process in which metals are oxidized in presence of air and moisture.

e.g. a) Rusting of Iron. b) Tarnishing of silver. c) Formation of green coating on copper, bronze items.

Prevention of Corrosion: (1) Oiling or Painting (2) Galvanization

Rancidity: Oxidation of fats and oils resulting in the formation of acids. It changes the smell and taste of stale fats and oil.

Prevention: Use of Air tight containers, Use of antioxidants

MUST DO QUESTIONS

Q1. Which gas is filled in Chips packets?

(a) Cl_2 (b) O_2 (c) N_2 (d) H_2

Ans: (c) N_2

Q2. Which statement follows the Oxidation Process

(a) Gain of oxygen (b) Loss of oxygen (c) Gain of Hydrogen (d) None of the above.

Ans: (a) Gain of oxygen

Q3. Identify oxidising and reducing agent:

(a) $H_2\ (g) + Cl_2\ (g) \rightarrow 2HCl(g)$

(b) $Zn(s) + 2AgNO_3\ (aq) \rightarrow Zn(NO_3\ )_2\ (aq) + 2Ag(s)$

Ans: (a) Cl_2 = oxidising agent, H_2 = Reducing agent

(b) $AgNO_3$= oxidising agent, Zn = Reducing agent

Q4. Which of the following is not an example of Redox reaction?

(a) $AgNO_3\ (aq) + HCl(aq) \rightarrow AgCl(s) + HNO_3\ (aq)$

(b) $4Na(s) + O_2\ (g) \rightarrow 2Na_2\ O(s)$

(c) $MnO_2\ (s) + 4HCl \rightarrow MnCl_2\ (aq) + 2H_2\ O(l) + Cl_2$

(d) None of the above.

Ans: (a) $AgNO_3(aq) + HCl(aq) \rightarrow AgCl(s) + HNO_3(aq)$

Chapter-5
Atomic Structure

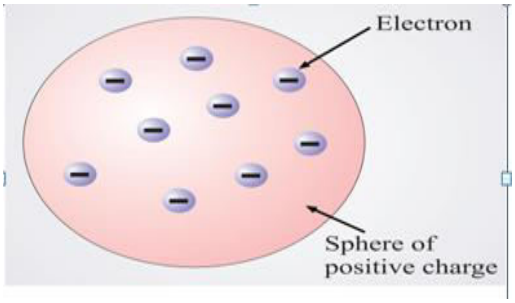
Proton
- Positively (+) Charged Particle.
- Present in the nucleus with neutrons.

Neutron
- Neutral in nature
- Present in nucleus with Proton.

Electron
- Negatively (-) Charged Particle.
- Electrons are present in shells around the atom.

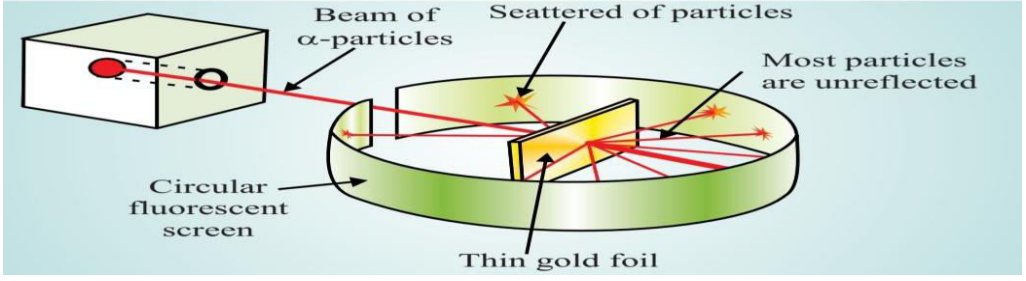
Thomson Model (Plum Pudding model)

Atoms can be considered as a large sphere of uniform positive charge with a number of small negatively charged electrons scattered through it.



Rutherford Model (α-Ray scattering experiment)

- Most of the α-particles passed straight through the gold foil.
- Some of the α-particles were deflected by small and large angles.
- About 1 in every 12000 particles experienced a rebound.



Result:-

- Centre of Atom is Nucleus (Positively Charged).
- Mass was contained in the nucleus.
- Rest of an atom must have empty space which contains the much smaller and negatively charged electrons.

Drawbacks: -

- Can't explain the stability of atoms.
- Distribution of electrons around the nucleus.
- Relationship between atomic mass and atomic number.

MUST DO QUESTIONS

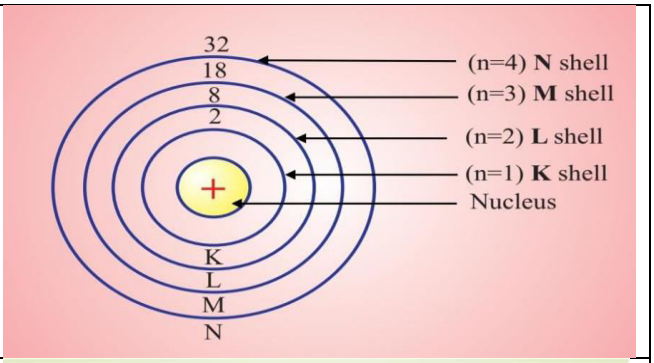
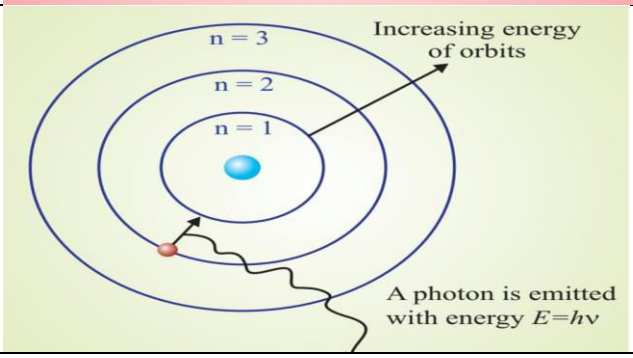
Q1. Which of the following are usually found in the nucleus of an atom?
(a) Only Protons and neutrons. (b) Protons, neutrons and electrons.
(c) Only neutrons. (d) Only electrons and neutrons.
Ans: (a) Only Protons and neutrons

Q2. Result of Rutherford's α-ray scattering experiment is -
(a) The positive charge of the atom is concentrated at the centre.
(b) neutrons exist in the nucleus.
(c) Helium α-particles present in the nucleus.
(d) electrons present in the nucleus.
Ans: (a) The positive charge of the atom is concentrated at the centre.

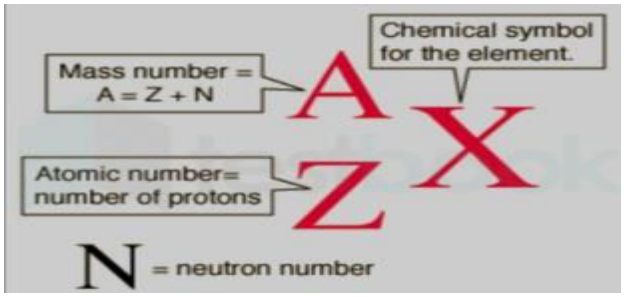
Q3. Who discovered i) e^- ii) p^+ iii) n?
Ans: i) e^- - J.J. Thomson ii) p^+ - Rutherford iii) n - James Chadwick

Q4. What is neutron and where is the position of neutron in an atom?
Ans: Neutron is a neutral subatomic particle present in the nucleus of the atom.

Bohr's Atomic Model

Postulate-1: Electrons move in definite circular paths of fixed energy around a central nucleus.	
Postulate-2: Electrons can change their shells or energy level by absorbing or releasing energy.	

Atomic Number (Z) = No. of Protons = No. of electrons.



e.g. ${}^{12}_{6}C$ Proton = 6, Electron = 6, Neutron = 6

MUST DO QUESTIONS

Q1. Atomic No. of Sodium atom is 11 and mass no. is 23. What is no. of electrons, protons and neutrons in a sodium atom?
Ans: e^- = 11, p^+ = 11, n = 12

Q2. Atom of an element has 9 Protons and 10 neutrons, what is mass number?
Ans. Mass No. = No. of Proton + No. of neutron
= 9 + 10 =19 (Mass No.)

Q3. Calculate no. of electron, proton and neutron :

(a) ${}^{40}K_{19}$ (b) ${}^{40}Ca_{20}$

Ans. (a) Electron = 19, Proton = 19, Neutron = 21

(b)Electron = 20, Proton = 20, Neutron= 20

Electronic Configuration: Electrons are distributed in different shells in the order of increasing energy
Maximum no. of electrons in a shell = $2n^2$ (n=no. of orbit)

Valency: Combining capacity of an element

Name of Element	Symbol	Atomic Number	Number of Protons	Number of Neutrons	Number of Electrons	Distribution of Electrons				Valency
						K	L	M	N	
Hydrogen	H	1	1	–	1	1	–	–	–	1
Helium	He	2	2	2	2	2	–	–	–	0
Lithium	Li	3	3	4	3	2	1	–	–	1
Beryllium	Be	4	4	5	4	2	2	–	–	2
Boron	B	5	5	6	5	2	3	–	–	3
Carbon	C	6	6	6	6	2	4	–	–	4
Nitrogen	N	7	7	7	7	2	5			3
Oxygen	O	8	8	8	8	2	6	–	–	2
Fluorine	F	9	9	10	9	2	7	–	–	1
Neon	Ne	10	10	10	10	2	8	–	–	0
Sodium	Na	11	11	12	11	2	8	1		1
Magnesium	Mg	12	12	12	12	2	8	2	–	2
Aluminium	Al	13	13	14	13	2	8	3	–	3
Silicon	Si	14	14	14	14	2	8	4	–	4
Phosphorus	P	15	15	16	15	2	8	5	–	3, 5
Sulphur	S	16	16	16	16	2	8	6	–	2
Chlorine	Cl	17	17	18	17	2	8	7	–	1

MUST DO QUESTIONS

Q1.How many shells are occupied in the Sodium (Atomic No: 11) atom?
Ans: 2,8,1 (3 Shells)

Q2. Name the element which has completely filled the first shell?
Ans: Helium.

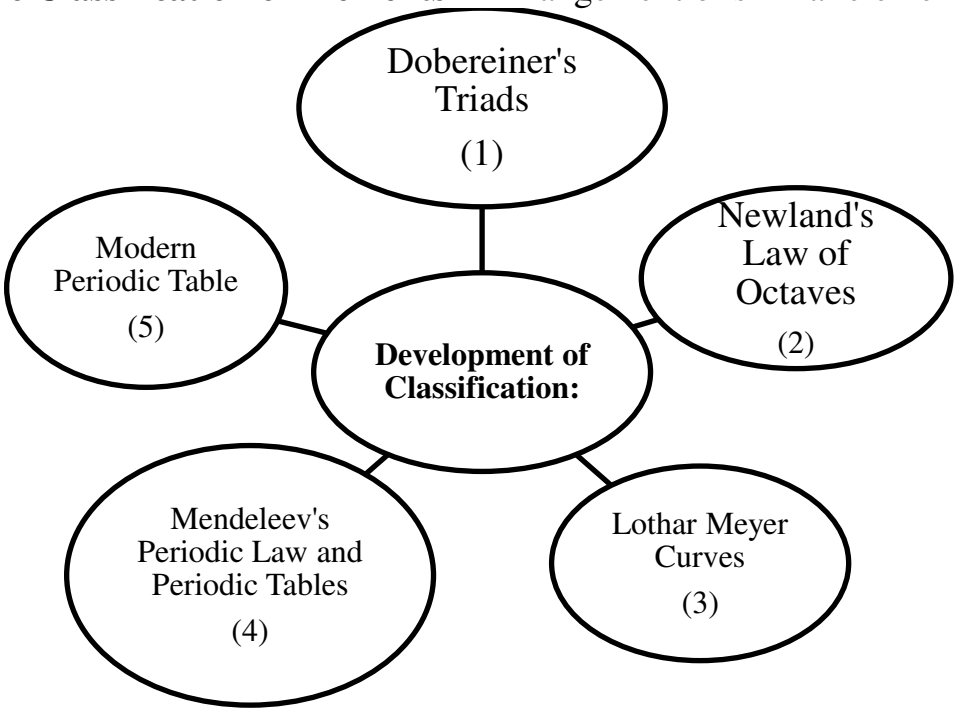
Q3. An element has atomic No. 16. Write its electronic configuration.
Ans: 2, 8, 6

Q4.Fill in the Blanks:
(a) Rutherford's α-ray scattering experiment leads to discovery of_____.
(b) Isotopes have the same _____ but different_____.
(c) Silicon has electronic configuration_____ and Sulphur has _____.
(d) Neon and Chlorine have atomic number 10 and 17. Their valencies are ____and ___.
Ans.(a) Nucleus (b)Atomic No., Mass No. (c) 2,8,4 and 2,8,6 (d)0 and -1

Q5. Why did Rutherford choose gold foil in the α-ray scattering experiment?
Ans: Gold has high malleability and can be hammered into thin sheets.

Chapter -6
Periodic Classification of Elements

Element: Only one type of atom
e.g., Sodium (Na), Gold (Au), Magnesium (Mg)
Total no. of elements = 118Natural elements = 94
Need for Classification of Elements - Systematic study of elements
Periodic Classification of Elements = Arrangement of similar elements



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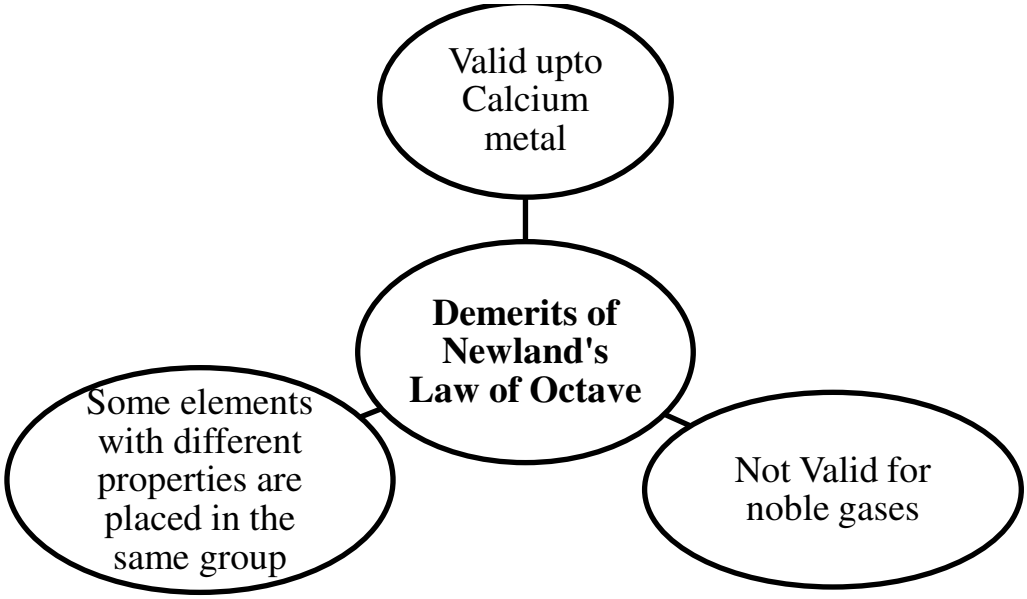
(1)Dobereiner's Triads (1829 - Johann Wolfgang Dobereiner)
(a)Elements were arranged in increasing order of atomic mass.
(b)Atomic mass and properties of the middle element were the mean of the other two.

Element	**Atomic mass**	**Average**
Calcium	40	
Strontium	88	(40+137)/2 = 88.5
Barium	137	

Limitations: Only a few elements could be arranged into triads.
Newland's Law of Octaves - (1864 - John Alexander Newland): When elements are arranged in increasing order of their atomic mass, every eighth element had properties similar to the first element.
e.g., Starting from Lithium (Li), the eighth element is Sodium (Na) and its properties are similar to those of the Lithium.



Must Do Questions

Q1. Law of Octaves was given by:
(a) Mendeleev (b) Newland (c) Lothar Meyer (d) Dobereiner
Ans**:** (b) Newland

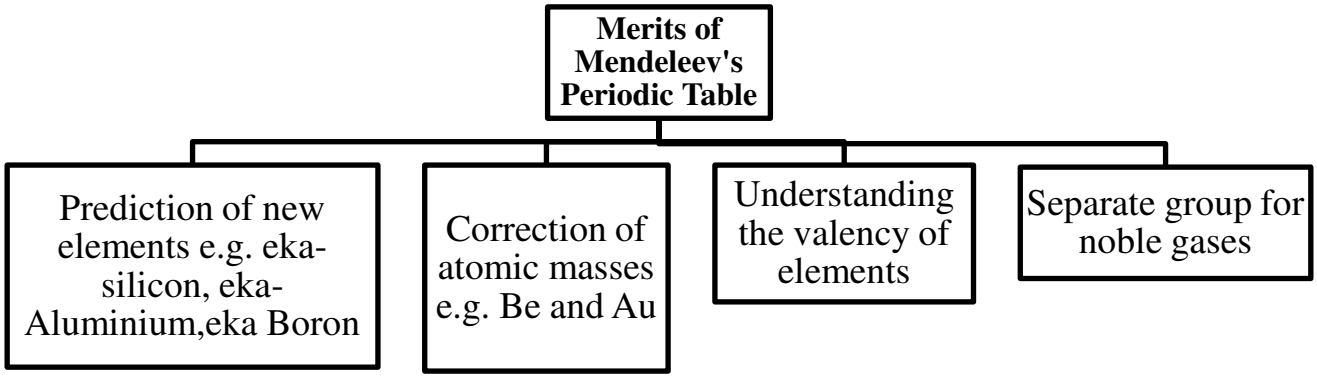
Q2. Which of the following is not a Dobereiner Triad?
(a) Li, Na, K (b) Cl, Br, I (c) Ca, Sr, Ba (d) Fe, Co, Ni
Ans**:** (d) Fe, Co, Ni

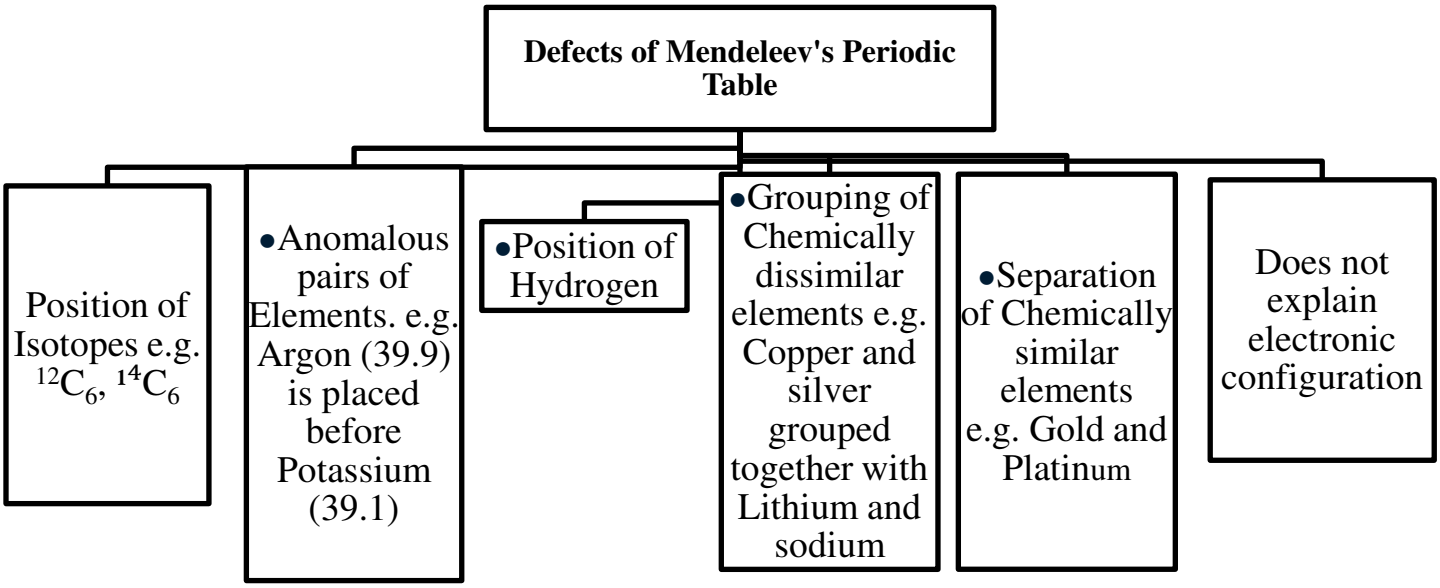
Q3. Elements A, B and C constitute a Dobereiner's Triad. The atomic mass of A is 20 and that of C is 40. Predict the atomic mass of B.
Ans**:** Atomic mass of B = (20 + 40) / 2 = 30

Q4. Which Classification of elements failed after the discovery of noble gases? Give two examples of noble gas?
Ans: Newland law of Octanes. Noble gases are Helium (He) and Neon (Ne).

Mendeleev's Periodic table (1869 by D'mitri Mendeleev)

- Number of Known elements = 63
- Elements are arranged in increasing order of atomic mass
- There are 6 Periods and 8 Groups





MUST DO QUESTIONS

Q1. According to the periodic law given by Mendeleev, the properties of an element are a periodic function of its:

(a) Atomic volume (b) Atomic size (c) Atomic number (d) Atomic mass

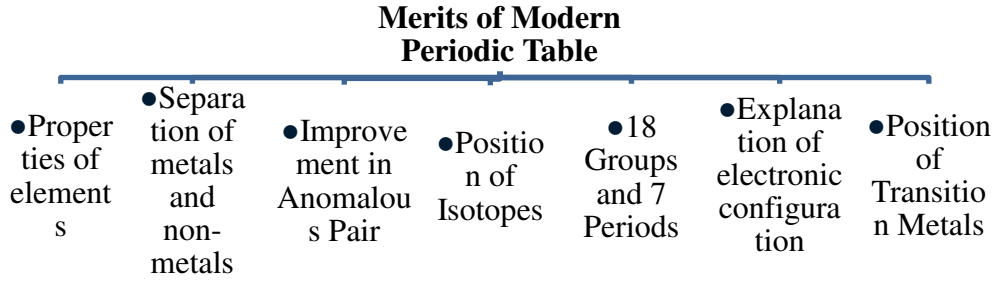
Ans: (d) Atomic mass

Q2. Particle which is universally present in the nucleus of all elements is:

(a) Neutron (b) Proton (c) Electron (d) α-particle

Ans: (b) Proton

Modern Periodic Table (in 1913 by Henry Moseley): Elements are arranged in increasing order of atomic No.



Important Points:

1.Groups=18, Periods=7

2.Group 18 of the Periodic table contains Noble gases - (He, Ne, Ar etc.)
It has completely filled outermost shell.

3.Noble gases do not take part in any chemical reaction as valency of noble gases is zero.

4.Basic Properties of Transition Elements

- All elements are metals
- High Melting and Boiling Point
- Good Conductor of Heat and Electricity
- Some elements get attracted towards magnet

5.Inner transition elements (Rare-earth elements) e.g., Lanthanoids and Actinoids

6. Metals

- Alkali metals (Group 1 - Li, Na, K, Rb, Cs, Fr)
- Alkaline earth metals (Group 2 - Be, Mg, Ca, Sr, Ba)

7. Non-metals

- Halogens (Group 17 - F, Cl, Br, I, At)
- Chalcogens (Group 16 - O, S, Se, Te, Po)

8.Metalloids (Mixed properties of both metals and non-metals) e.g., Boron, Silicon, Polonium

Property	In a Period (From left to right)	In a Group (From top to Bottom)
Atomic number	increases	increases
Atomic size	decreases	increases
Metallic character	decreases	increases
Non-metallic character	increases	decreases

MUST DO QUESTIONS

Q1. The number of elements in 5th Period of Periodic table is:
(a) 2 (b) 8 (c) 32 (d) 18
Ans: (d) 18.

Q2. Which one of the following does not belong to the family of the alkali metals?
(a) Li (b) Na (c) Be (d) K
Ans: (c) Be

Q3. Which one of the following elements has the least tendency to form Cation?
(a) Na (b) Ca (c) B (d) Al
Ans: (c) B

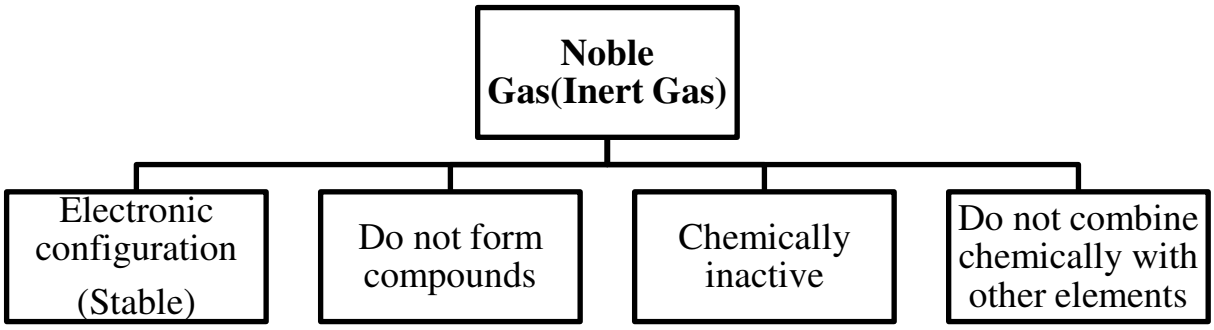
Q4.Which of the following are True and False?
(a) Modern periodic table contains 18 Groups.
(b) Modern periodic table is based upon atomic mass.
(c) The elements in a particular group show similar chemical properties.
(d) Atomic radius is measured in Picometer (1 pm = 10^{-12} m).
Ans. (a) True (b) False (c) True (d) True

Q5. Fill in the Blanks:-
(a) Atomic radii of elements _____ a period from Left to Right.
(b) All the elements of group 15 have _____ valence electrons.
(c) The second and third periods of the periodic table are called _____ period.
(d) All elements of a particular group have _____ electronic configuration.
Ans. (a) Decreases (b) Same (c) Short (d) Similar

Q6. Where are the following types of elements located in the periodic table?
(a) Main group elements (b) Noble gases
(c) Transition elements (d) Inner transition elements
Ans.(a) Group 1, 2 and 13 to 18
(b) Group 18
(c) Group 3 to 12.
(d) Lanthanoid (Atomic Number 58 to 71) ;
Actinoid (Atomic Number 90 to 103)

Chapter -7
Chemical Bonding

Chemical Bond - Atoms of different elements are held together by a force.



Name	Symbol	Atomic Number	Electronic Configuration	No. of electrons in the outermost shell
Helium	He	2	2	2
Neon	Ne	10	2,8	8
Argon	Ar	18	2,8,8	8
Krypton	Kr	36	2,8,18,8	8
Xenon	Xe	54	2,8,18,18,8	8
Radon	Ra	86	2,8,18,32,18,8	8

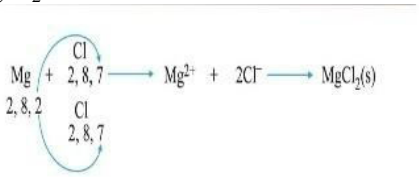
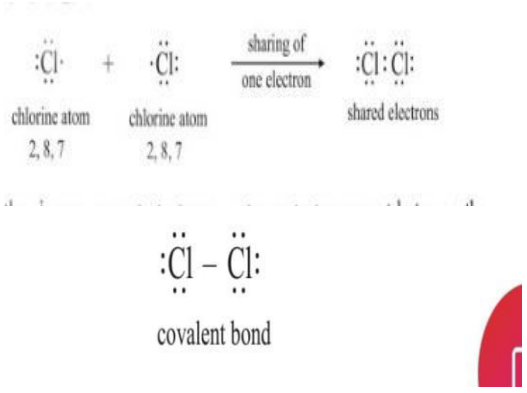
MUST DO QUESTIOS

Q1. Which of the following is not a noble gas?
(a) He (b) H_2 (c) Ne (d) Ar
Ans: (b) H_2

Q2. What is the electronic configuration of Argon (Ar)?
(a) 2,8,7 (b) 2,8,6 (c) 2,8 (d) 2,8,8
Ans: (d) 2,8,8

Q3. Why are noble gases chemically inactive?
Ans: Noble gases have 8 electrons in the outermost shell (except Helium which has 2 electrons).

Q4. State Octet Rule?
Ans: Atoms tend to have 8 electrons in their outermost shell to achieve stability.

Feature	**Electrovalent Bond / Ionic Bond**	**Covalent Bond**
Definition	Transfer of electrons from metal to non-metal	Sharing of equal electrons between two atoms
Physical State	Hard and Solid	Solid, Liquid, and Gas
Melting & Boiling Point	High	Low
Attraction Force	Held by strong force of attraction	Held by weak force of attraction
Need of Energy	Lot of thermal energy to overcome strong force of attraction	Less thermal energy required
Electrical Conductivity	Aqueous Solution - Good conductor; Solid State - Bad conductor	Bad conductor of electricity due to deficiency of free electrons
Solubility	Normal water - soluble; organic solvent (e.g., ethyl alcohol) - Insoluble	Normal water - Insoluble; organic solvent - soluble
Example	$MgCl_2$ 	Cl_2 

MUST DO QUESTIONS

Q1. Which of the following isa property of Ionic compounds?
(a) They are good conductors in solid state.
(b) They have high melting and boiling point.
(c) They dissolve in organic solvents
(d) Bad conductor of electricity in molten state.
Ans: (b)They have high melting and boiling point.

Q2. If two chlorine atoms share one of their electrons, they both can attain stable configuration of a noble gas
(a) Neon (b) Argon (c) Krypton (d) Xenon
Ans: (b) Argon

Q3. Identify which of the following compounds is formed by transfer of electrons?
(a) Oxygen (b) Nitrogen (c) Hydrogen (d) Sodium chloride.
Ans: (d) Sodium Chloride**Q4.**Consider the formation of following Compound – $Na^+ + Cl^- \rightarrow X$
What is 'X' in the above reaction?
(a) Solid Sodium Chloride(b) Liquid Sodium Chloride
(c) Gaseous Sodium Chloride (d) Molten Sodium Chloride
Ans: (a) Solid Sodium Chloride.

Q5. Write the name of ions present in sodium chloride solution?
Ans: Na^+ , Cl^-

Q6. How many shells are present in Na^+ ion?
Ans: Na (11) → 2, 8, 1; $Na^+ = 11 - 1 = 10 \rightarrow 2,8$; Shell = 2.

Q7. What is the number of electrons in Cl^- ion?
Ans- Cl (17) → 2,8,7 ;Cl^- → 17+1=18 → 2,8,8; Number of electrons = 18.

Q8. Why is solid sodium chloride a bad conductor of electricity? Why?
Ans. Due to the absence of Na^+ and Cl^- ions.

Q9. Why ethyl alcohol in aqueous solution is a bad conductor of electricity?
Ans. Ethyl alcohol does not give H^+ ion.

Q10. Explain Bonding in HCl and N_2 ?
Ans.HCl **:**H· + · Cl: → H^+ + Cl^- → HCl (Ionic Bond)
N_2 : N: : : N → N≡N (Covalent Bond)

Q11. Complete the fill in the Blanks:
(a) The atoms of elements in a molecule are held together by ____.
(b) _____ of electrons leads to the formation of cations in metals.
(c) _____ of electrons leads to the formation of anions in non-metals.
(d) Ethyl alcohol in aqueous solution is _____.
Ans (a) Chemical Bond (b) Loss(c) Gain (d) Bad conductor

Q12. Classify True(T) or False (F)in the following:
(a) Argon has electronic configuration 2,8,8.
(b) Covalent Bond is formed by equal sharing of electrons between atoms.
(c) Ionic compounds have high melting and boiling point.
Ans. (a) True (b) True (c) True.

Q13. Element 'A' has atomic Number 12 and Element 'B' has atomic Number 8. Which type of chemical Bond is formed and write the formula of compound formed?
Ans: A (Atomic No. = 12) = Mg (Magnesium) ;B (Atomic No. = 8) = O (Oxygen)
$Mg + :O: \rightarrow Mg^{2+} + O^{2-} \rightarrow MgO$ [Ionic Bond]
2,8,2 2,8 2,8Formula of Compound = MgO

Q14. Find the number of electrons gained or lost in the following Process:
(1) $N \rightarrow N^{3-}$ (2) $Cl \rightarrow Cl^{-}$ (3) $Cu \rightarrow Cu^{2+}$
Ans. (1) Gain of $3e^{-}$ (2) Gain of $1e^{-}$ (3) Loss of $2e^{-}$

Chapter 8
Acid, Base and Salt

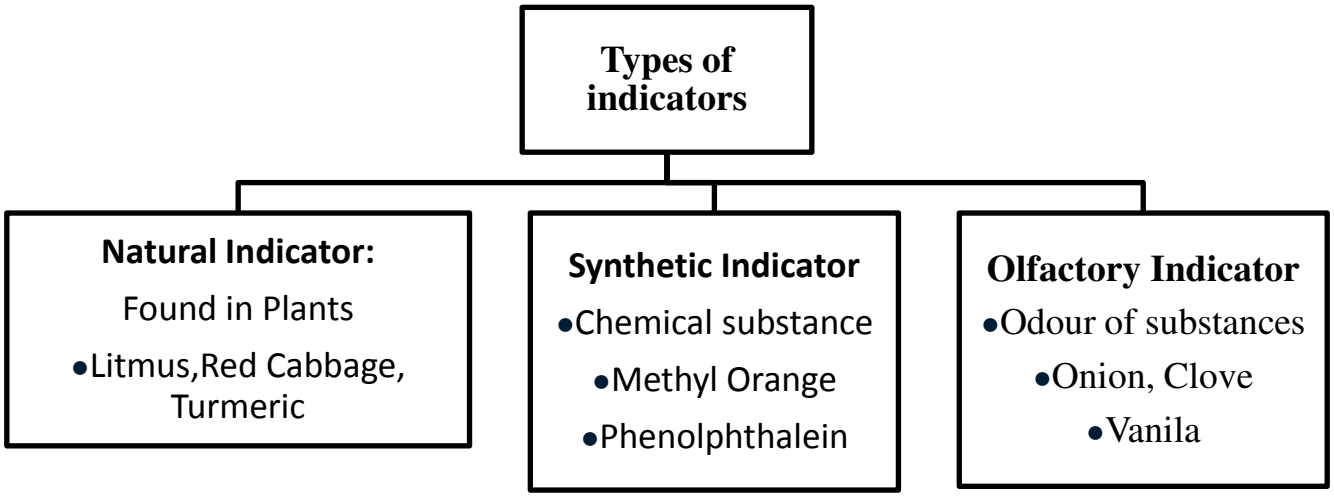
Feature	Acid	Base
1. Physical State	Sour taste (Solid, Liquid, Gas)	Bitter taste and Soapy touch.
2. Define	Produces H+ ions when dissolved in water.	Produces OH- ions when dissolved in water.
3. Strength	Depends on H+ ion.	Depends on OH- ions.
4. Litmus	Blue → Red	Red → Blue
5. pH value	Below 7	Above 7
6. Neutralisation Reaction	Reacts with base to form salt and water.	Reacts with acid to form salt and water.
7. Example	Strong acid: HCl, H_2 SO_4 , HNO_3 , HI, HBr,Weak acid: CH_3 COOH, HF, HCN, C_6 H_5 COOH, HCOOH	Strong Base: NaOH, KOH, $Mg(OH)_2$, $Ca(OH)_2$, $Ba(OH)_2$ Weak Base: NH_4 OH, $Cu(OH)_2$, $Zn(OH)_2$, $Cr(OH)_2$

Use of Acid and Base in Daily Life:-

Acid	Formula	General Use
Hydrochloric acid	HCl	Helps in digestion, killing of Harmful
Sulphuric acid	$H_2\ SO_4$	Car batteries
Nitric acid	HNO_3	Fertilizers, Explosive
Acetic acid	$CH_3\ COOH$	Vinegar
Citric acid	$C_6\ H_8\ O_7$	Lemons and oranges
Lactic acid	$C_3\ H_6\ O_3$	Milk, Curd
Formic acid	HCOOH	Stings of ants and bees
Oxalic acid	$C_2\ H_2\ O_4$	Cleaning, Bleaching

Base	Formula	General Use
Sodium Hydroxide	NaOH	Soap formation
Ammonium Hydroxide	$NH_4\ OH$	Hair dyes
Magnesium Hydroxide	$Mg(OH)_2$	Antacid
Baking Soda	$NaHCO_3$	Baking, Antacid
Calcium Hydroxide	$Ca(OH)_2$	Lime water, whitewash
Potassium Hydroxide	KOH	Bathing Soap, Batteries

Indicator – shows the presence of acid, Base in the solution



Indicator	Colour in acidic solutions	Colour in neutral solutions	Colour in basic solutions
Litmus	red	purple	blue
Phenolphthalein	colourless	colourless	pink
Methyl orange	red	orange	yellow

MUST DO QUESTIONS

Q1) In an aqueous solution of HCl which of the following species is not present?

(a) H^+ (b) OH^- (c) HCl (d) Cl^-

Ans: (b) OH^-

Q2) Which of the following is not a strong acid?

(a) HCl (b) HBr (c) HI (d) HF

Ans: (d) HF

Q3) Aqueous solutions of acids conduct electricity. This shows that:

(a) H^+ ions (b) OH^- ions (c) Cation and Anion (d) Both H^+ and OH^- ions

Ans: (a) H^+ ions

Q4) Lemon juice contains –
(a) Tartaric acid (b) Ascorbic acid(c) Acetic acid (d) Lactic acid.
Ans: (b) Ascorbic acid.

Q5) Self dissociation of water produces –
(a) large no. of H^+ ions(b) large no. of OH^- ions
(c) H^+ and OH^- ions in equal number(d) H^+ and OH^- ions in unequal number
Ans: (C) H^+ and OH^- ions in equal number.

Q.6 Which acid is found in the following?
(a) Cold drink (b) Tea (c) Vinegar (d) Stomach
Ans:(a) Carbonic acid (H_2CO_3) (b) Tannic acid (c) Acetic acid (CH_3COOH)
(c) Hydrochloric acid (HCl)

Q.7 Fill in the Blanks:
(a) Milk of Magnesia changes _____ litmus to _____ litmus.
(b) Corrosive action of Acid is due to presence of _____ ions.
(c) Red, Blue (d) Anion.

Q.8 When dry blue litmus paper is brought in contact with HCl gas, why does its colour not change?
Ans: Because ions are not formed in absence of water.

Chemical Properties of Acids:
1. Reaction of acid with Metals
Acid + Metal → Salt + Hydrogen gas
Example: $Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2$
(Zinc metal) (Dil. Sulphuric acid) (Zinc sulphate) (Hydrogen gas)

2. Reaction of acids with metal carbonate
Na_2CO_3 (s) + 2 HCl (aq) → 2 NaCl (aq) +H_2O (l) + CO_2 (g)
(Sodium carbonate) (Dil. Hydrochloric acid) (Sodium chloride) (water) (carbon dioxide)

3. Reaction of acids with metal Hydrogen carbonate
$NaHCO_3$ (s) + HCl (aq) → NaCl (aq) + H_2O (l) + CO_2 (g)
(Sodium Hydrogen carbonate) (Dilute Hydrochloric acid) (Sodium Chloride) (water) (carbon dioxide)

4. Reaction of Acids with metal oxides
(a) CaO (s) + 2 HCl (aq) →$CaCl_2$ (aq) + H_2O (l)
(Calcium oxide) (Dilute Hydrochloric acid) (Calcium Chloride) (water)
Metal oxide + Acid → Salt + H_2O

5. Neutralisation Reaction
Acid + Base → Salt + Water

$HCl(aq) + NaOH(aq) \rightarrow NaCl(aq) + H_2O(l)$

Hydrochloric acid Sodium hydroxide Sodium chloride Water.
6. Corrosive nature - Ability of acids to react with metal oxide and Hydroxide.
Corrosive nature of acid is due to presence of negatively charged $(OH)^-$ ions.
Chemical Properties of Bases
1. Reaction of bases with metal
$Zn(s) + 2NaOH(aq) \rightarrow Na_2ZnO_2(aq) + H_2(g)$
Zinc metal Sodium hydroxide Sodium zincate Hydrogen
2.Reaction of Bases with non-metal oxides:
$Ca(OH)_2(aq) + CO_2(g) \rightarrow CaCO_3(s) + H_2O(l)$
Calcium Hydroxide Carbon dioxide Calcium Carbonate Water (Lime Water)

MUST DO QUESTIONS

Q.1 Shine of white wash is due to presence of:
(a) $Ca(OH)_2$ (b) $CaCO_3$ (c) Na_2CO_3 (d) CaO
Ans. (b) $CaCO_3$

Q.2 The chemical formula of Caustic Soda is ____.
(a) KOH (b) NaOH (c) NaCl (d) $Ca(OH)_2$
Ans. (b) NaOH (Sodium Hydroxide)

Q.3 Complete the following Reaction:
(a) $Ca(OH)_2 + CO_2(g) \rightarrow$ _____ $+ H_2O$.
(b) $H_2SO_4(aq) + 2NaOH(aq) \rightarrow$ ____ $+ 2H_2O(l)$.
Ans. (a) $CaCO_3$ (s) (b) Na_2SO_4 (aq)

Self Dissociation of Water: $H_2O(l) \rightleftharpoons H^+(aq) + OH^-(aq)$
In pure water and neutral solution: $[H^+] = [OH^-]$
$K_w = [H^+][OH^-]$ K_w = Ionic product constant of water

Concentration of H^+ and OH^- ion	**Nature of solution**
$[H^+] = [OH^-]$	Neutral
$[H^+] > [OH^-]$	Acidic
$[H^+] < [OH^-]$	Basic

pH Scale

Common Acids	pH	Common Bases	pH
HCl (4%)	0	Blood plasma	7.4
Stomach acid	1	Egg white	8
Lemon juice	2	Sea water	8
Vinegar	3	Baking soda	9
Oranges	3.5	Antacids	10
Soda, grapes	4	Ammonia water	11
Sour milk	4.5	Lime water	12
Fresh milk	5	Drain cleaner	13
Human saliva	6-8	Caustic soda 4% (NaOH)	14
Pure water	7		

pH of some common acids and bases
pH + pOH = 14 (At 25°C)
Importance of pH in everyday life

- pH in Human and Animals: 7 to 7.8
- Acid rain: Below 5.6
- Tooth decay: Below 5.5
- Blood Plasma: ~ 7.4
- Human saliva: 6 - 8
- Pure water: 7
- Acid present in stomach: Helps in digestion

MUST DO QUESTIONS

Q.1 Enamel is made up of _____?
(a) Calcium Phosphate (b)Baking soda (c)Potassium Phosphate (d)None of above
Ans. (a)Calcium phosphate.
Q.2 Which chemical is used for relieving the severe pain and burning sensation of Bee sting?
(a) Milk of Magnesia (b) Baking soda (c) Lactic acid (d) Sodium Chloride
Ans. (B) Baking soda.

Q.3 Which of the following compound is used as an antacid?
(a) Nitric acid (b) Ammonia (c) Milk of Magnesia (d) Sodium Chloride
Ans. (C) Milk of Magnesia

Q.4 In aqueous solution of pure water
(a) [H+] > [OH-] (b) [H+] = [OH-] (c) [H+] < [OH-] (d) [H+] = 0.
Ans. (b) [H+] = [OH-]

Q.5 pH of solution A is 9 and pH of solution B is 3. Which is more acidic 'A' or 'B'?
Ans. Solution B has more H+ ion so it is more acidic

Q.6 Why water is not added in Acid?
Ans. It is an exothermic reaction. Due to which lot of heat forms and test tube may break and fall on skin and cause burns.

Q.7$CuSO_4$ is formed by reaction between acid and base? Identify the acid and Base?
Ans. Acid - $H_2\ SO_4$ (Acidic radical SO_4^{2-})
Base - $Cu(OH)_2$ (Basic radical Cu^{2+})

Table:- Comparison of Salt, Baking Soda, Washing Soda, Plaster of Paris, and Bleaching Powder

Feature	Salt	Baking Soda	Washing Soda	Plaster of Paris	Bleaching Powder
Chemical Formula	—	$NaHCO_3$	$Na_2\ CO_3 \cdot 10H_2\ O$	$CaSO_4 \cdot ½H_2\ O$	$CaOCl_2$
Materials Required	—	$CaCO_3$, Conc. NaCl	$NaHCO_3$, $H_2\ O$	$CaSO_4 \cdot 2H_2\ O$	Cl_2 , gas
Process	—	$NaCl\ (aq) + CO_2\ (g) + NH_3\ (g) + H_2\ O(l) \downarrow NaHCO_3\ (s) \downarrow + NH_4\ Cl\ (aq)$	$2NaHCO_3 \downarrow Na_2\ CO_3 \cdot 10H_2\ O$	$CaSO_4 \cdot ½H_2\ O \downarrow CaO(H)_2 + H_2\ O$	$Cl_2 + H_2\ O$

Uses	—	1) Used in Baking 2) Used as an antacid to relieve acidity in the stomach 3) Used in Fire extinguishers	1) Used for softening hard water 2) Used in the manufacture of Glass, soap, paper 3) Used in Cleaning	1) Used in textile industry 2) Used in making statues, toys and decorative articles 3) Used in surgical bandages 4) Used in construction	1) Used in textile industry 2) Used to disinfect drinking water 3) Used as an oxidizing agent

MUST DO QUESTIONS

Q.1 Which of the following is not a raw material in the manufacture of washing soda?
a) Lime water b) Ammonia c) Slaked Lime d) Sodium Chloride
Ans.(d) sodium chloride.

Q.2 An acid reacts with a substance X with the liberation of a gas which burns with a "pop" sound when a burning match stick is brought near it. What is the nature of X?
Ans -Nature of X – Metal

Q.3 An acid reacts with a substance Z with the liberation of CO2 gas. What can be the nature of 'Z'?
Ans. Metal Carbonate or Metal Hydrogen Carbonate.

Q.4 Write the chemical formula of Bleaching Powder. How is bleaching powder formed? How Bleaching Powder is used in drinking water.
Ans. The Chemical formula of Bleaching Powder = CaOCl2
Formation of Bleaching Powder :-
$Ca(OH)_2 + Cl_2 \rightarrow CaOCl_2 + H_2O$
Slaked Lime Bleaching Powder**:-**Bleaching powder is used as disinfectant and germicide for sterilization of water.

Q.5 Which salt is used to make tasty and crispy pakoras (whose ph value = 9) find out the salt and write its preparation. Also, write their two uses.
Ans. Used Salt - Sodium Bicarbonate ($NaHCO_3$) pH = 9
Formation : $NaCl + H_2O + CO_2 + NH_3 \rightarrow NH_4Cl + NaHCO_3$
Uses - (1) Used as an antacid in medicines.
(2) Used in making food and Bakery items like cakes and pastries.

Q.6 A doctor uses white coloured powder in Fracture -
(a) Write the name of its Chemical name & formula
(b) Write preparation of this powder from Gypsum
Ans. (a) Chemical Name - Calcium Sulphate Hemihydrate
Chemical Formula - $CaSO_4 . \frac{1}{2} H_2O$
(b)$CaSO_4 . 2H_2O$

(Gypsum) $\rightarrow CaSO_4 . \frac{1}{2} H_2O$ (P.O.P) $+3/2H_2O$

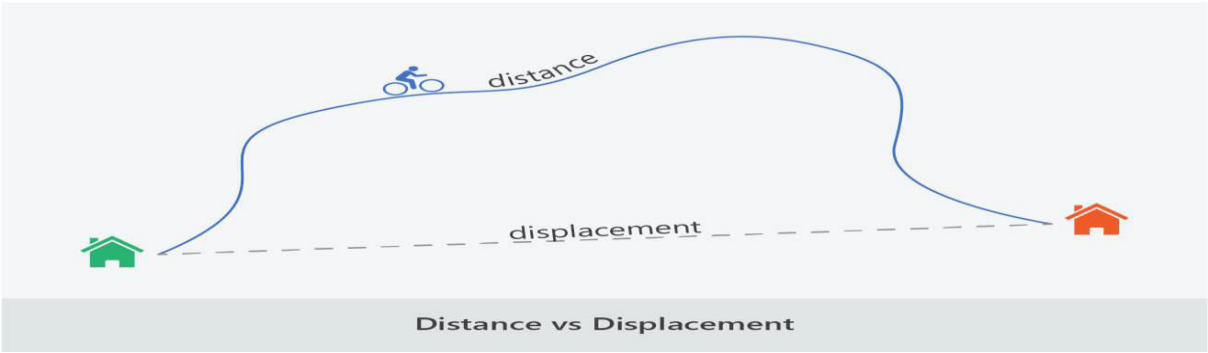
Chapter-9
Motion and its Description

Motion: -Motion is the change in position of an object with respect to its surroundings in a given interval of time.

Scalar Quantity	**Vector Quantity**
Physical quantity having only magnitude and no direction.	Physical quantity having both magnitude and direction
Example: Speed, Distance	Example: Velocity, Displacement

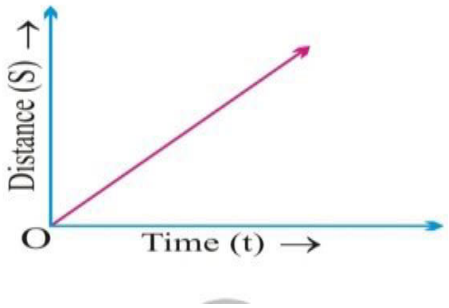
Difference between distance and displacement

Distance	**Displacement**
1. Actual path travelled by object	1. Shortest straight-line path travelled by object between initial and final position
2. Scalar quantity	2.Vector quantity
3. Always positive (can never be negative)	3.Can be positive, negative, or zero.
4. Distance can be equal to or greater than displacement.	4.Displacement can be equal to or less than distance.



Distance vs Displacement

Uniform Motion: Covering equal distance in equal intervals of time.



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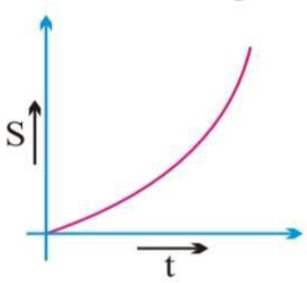
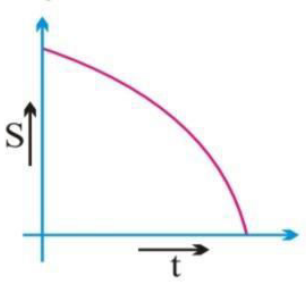
Non-Uniform Motion: Covering unequal distance in equal intervals of time.

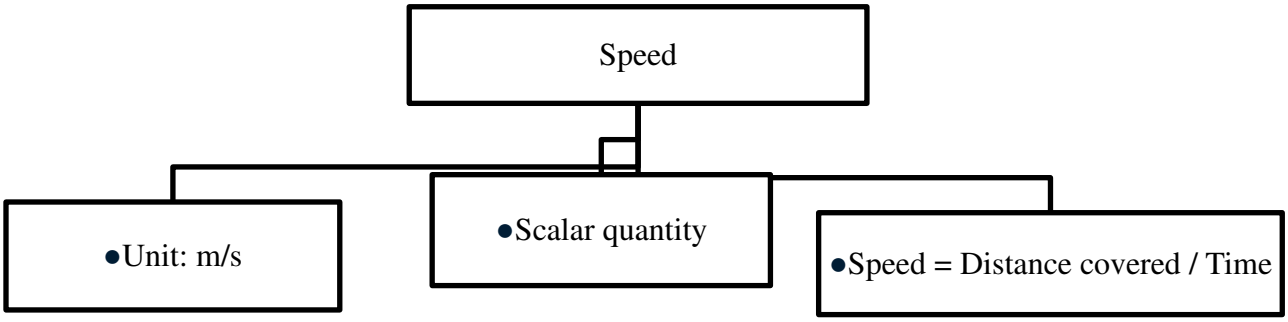


Continuous increase in slope of curve indicates accelerated non-uniform motion.



Continuous decrease in slope of curve indicates decelerate non-uniform motion.

Speed: Distance travelled by object in given time-interval.



Average Speed = Total distance / Total time

Velocity = Displacement (shortest distance)/time

$$\textbf{Average Velocity} = \frac{\textbf{Total Displacement}}{\textbf{Total time}}$$

MUST DO QUESTIONS

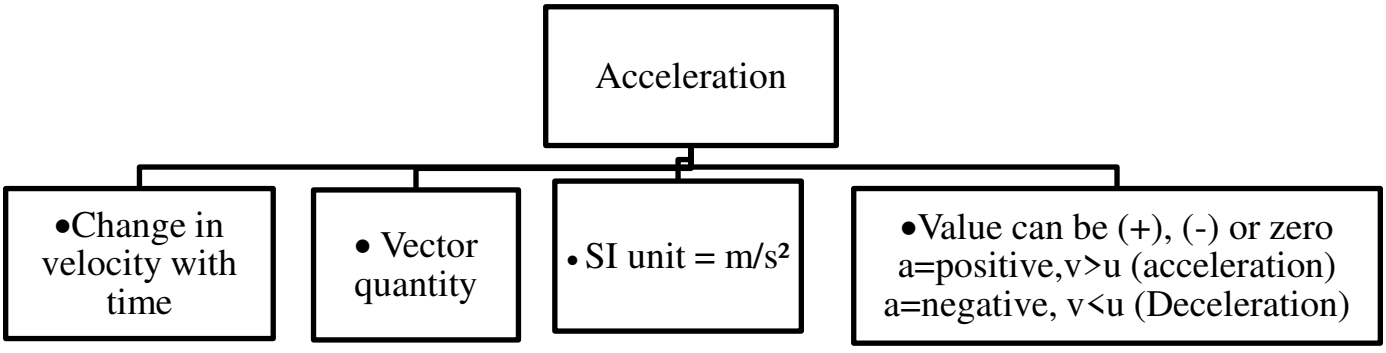
Q1. In circular motion:
(a) Distance > Displacement (b) Distance<Displacement
(c) Distance =Displacement (d) Distance is zero when displacement is zero.
Ans.(a)Distance >Displacement

Q2: For an object moving in a straight line without changing direction.
(a) Distance covered > Displacement (b) Distance covered < Displacement
(c) Distance covered = Displacement (d) Distance is not zero but displacement is zero.
Ans.(c)Distance covered = Displacement

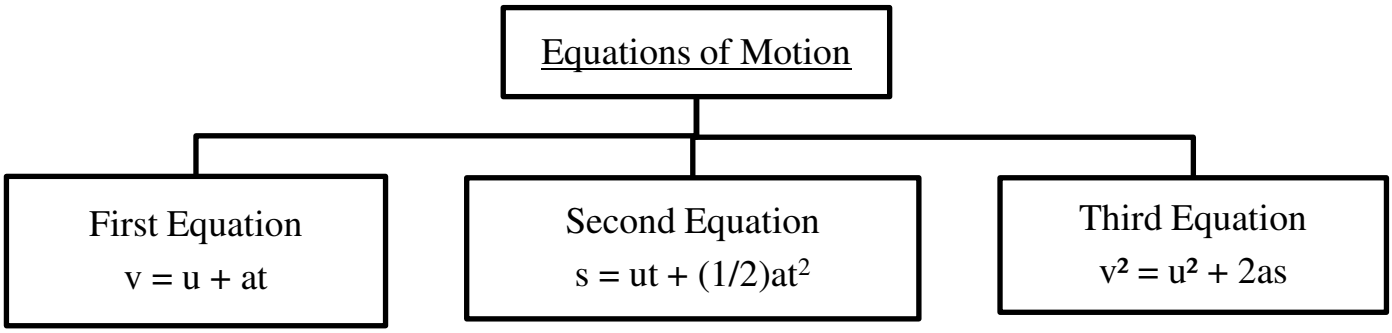
Q3. An object is thrown upwards to a height of 20m and returns to the thrower's hand in 10s. The displacement of the object is:
(a) 20m (b) 40m (c) Zero (d) 60m
Ans. (c) Zero

Q4.A motorcar covers a distance of 20 km in the first hour, 40 km in the second hour, and 30 km in the last hour. What will be its average speed?
Ans. Average Speed = Total distance / Total time = (20 + 40 + 30) / 3
= 90 / 3 = 30 km/hr.

Acceleration: The rate of change of velocity with time. a=(v-u)/t
v = Final velocity; u= Initial velocity; t = Time



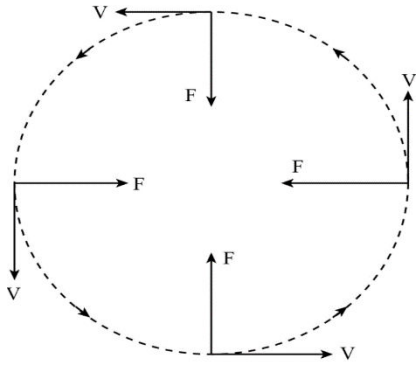
Equations of Motion: - For uniformly accelerated motion.



Uniform Circular Motion: -

In uniform motion of an object on a circular path.

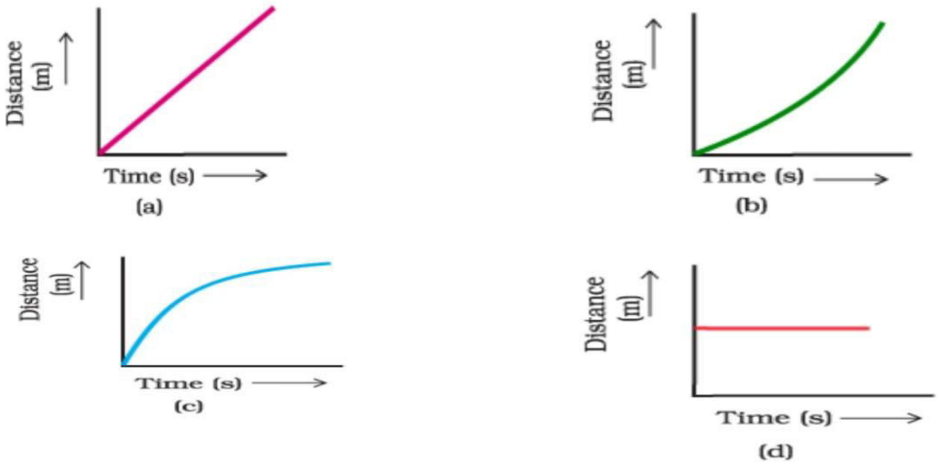
- No change in speed but continuous change in velocity.
- $v=\frac{2\pi r}{t}$ Where v= velocity, t = time and r = radius



MUST DO QUESTIONS

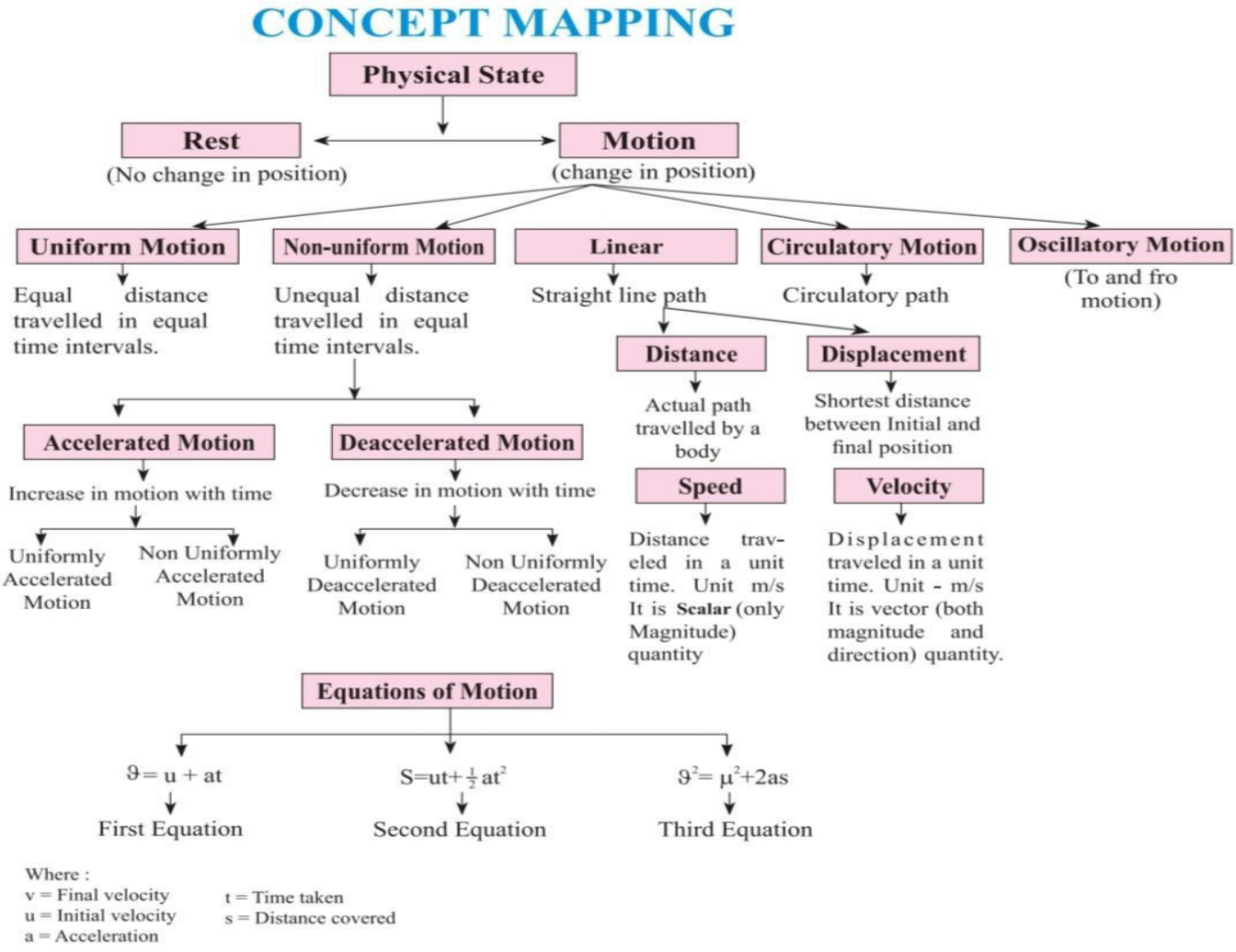
Q1. Which of the following is a scalar quantity among the following?
(a) Acceleration (b) Velocity (c) Displacement (d) Distance
Ans:(d) Distance

Q2.A car is initially at rest on the side of a road. Which of these graphs is related to it?



Ans:(d)

Q3. Explain the use of a speedometer and odometer.
Ans: Speedometer- measures the speed of the vehicle at any instant of time.
Odometer - tells the distance covered by the vehicle.
Q4. What is the other name for negative acceleration? Write the formula and S.I. unit of acceleration.
Ans.The other name for negative acceleration is retardation.
Formula of acceleration: $a=(v-u)/t$ S.I. unit $=m/s^2$
Q5. A car starting from rest accelerates at a rate of 0.1 m/s^2 for 4 minutes. Find the distance covered (displacement) and the final velocity of this car.
Ans:Given: $a=0.1m/s^2$ (as the car is starting from rest), u=0m/s v=? $t=4\times60=240sec$
$v= u + at$, $v = 0 + 0.1 \times 240 \Rightarrow v = 24$ m/s
Distance covered $[s = ut + \frac{1}{2}at^2]$, $s=0\times240 +(\frac{1}{2}\times 0.1\times240\times240) =0+ 2880.0$
$=2880$ m
Displacement= Distance = 2880m (if the car is moving straight line path).



Chapter – 10
Force and Motion

Force: The push or pull acting on an object is called force.

Effect of Force:

- Change in velocity
- Making an object move
- Changing the direction of an object
- Stopping a moving object
- Changing the shape of an object

Balanced Force	Unbalanced Force
The sum of all forces acting on an object is zero.	Acts on an object and the resultant force is not zero.
No change in motion or state.	Change in motion or state occurs.

MUST DO QUESTIONS

Q 1. Can balanced force cause acceleration in an object?
Ans. No
Q 2. Write the formula of force.
Ans. F=ma
Q 3. What is the SI unit of force?
Ans. Newton (N) or Kgm/s^2

Newton's First Law of Motion:
If an object is at rest, it will remain at rest, and if an object is in motion, it will remain in motion, unless an external force is applied to it.
Examples:
i) Suddenly, when the bus starts, passengers fall backward.
ii) Suddenly, when a moving bus stops, passengers lean forward.

Inertia - An object's resistance to change in its state.

Mass - Measure of inertia.

MUST DO QUESTIONS

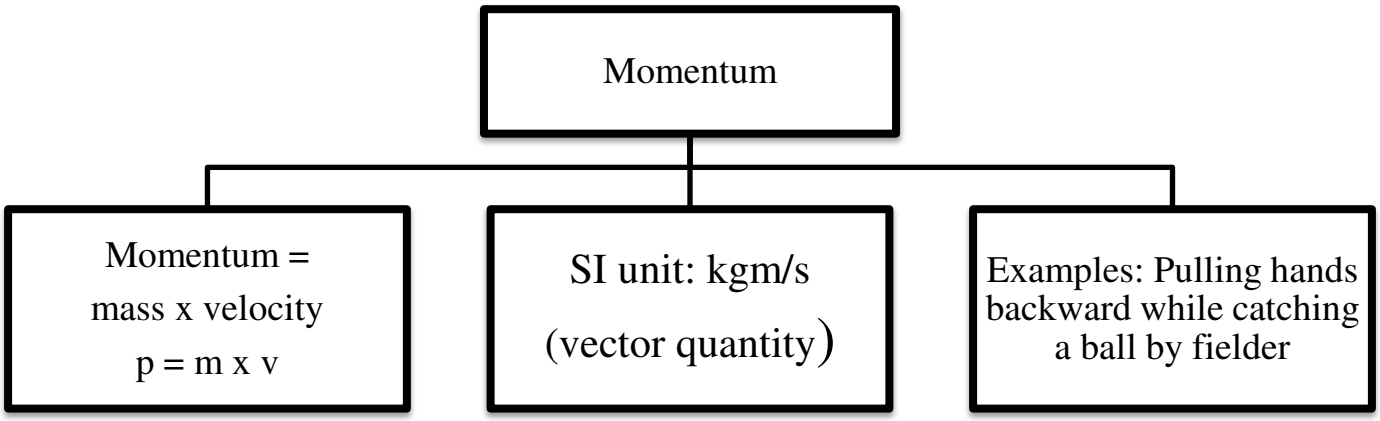
Q 1. Why is luggage kept on the roof of a bus tied with a rope?

Ans. Due to inertia of motion, the luggage can fall forward/backward.

Q 2. Newton's First Law is also called the Law of Inertia. Explain.
Ans. According to Newton's First Law - every object tends to remain in its state of rest or uniform motion unless an external force is applied. In other words, every object resists a change in its state, this is also the Law of Inertia.

Q 3. Is the mass of an object a measure of its inertia? Explain.
Ans. If the mass of an object is less, then the inertia will be less, if the mass is more than the inertia will be more. Thus, the mass of an object is a measure of its inertia.

Newton's Second Law of Motion: The rate of change of momentum of a body is directly proportional to the force acting on it and takes place in the same direction as the force. (F=ma)
OR- Force acting on a body is equal to product of a mass and acceleration.
Example1. Breaking an ice slab with a single blow by a player.
Example2. Breaking a rope by pulling a bundle of ropes quickly.
Example 3. The vehicles are fitted with shockers(springs)



Mathematical Calculation of the Second Law -
Let the mass of the object = m, Initial velocity = u, Final velocity = v
Change in momentum = Final momentum - Initial momentum
= mv - mu
= m (v - u)
Rate of change of momentum = Change in momentum / time

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

$$F = ma \quad \text{where} \quad \left(a = \frac{v-u}{t}\right)$$

The rate of change of momentum is directly proportional to the applied force:
$F \propto ma$
$F = kma$ (k - constant)
If k = 1 then $F = ma$

MUST DO QUESTIONS

Q 1. How much force should be applied on an object of 50kg mass so that its acceleration is 5m/s²?

Ans. Given: m = 50kg; a = 5m/s²

From Newton's Second Law F = ma
F = 50kg × 5m/s²
F = 250N

Q 2. Fill in the blanks

(i) Newton's Second Law of Motion is the law of _____.

(ii) The rate of change of momentum of an object is proportional to the _____ acting on it.

Ans. (i) Acceleration (ii) Force

Q 3. Write two applications of the Second Law.

Ans. (i)Applying force in a specific direction when kicking a ball.

(ii) It is easier to catch a tennis ball than a cricket ball.

Que 4. Define 1 Newton.

Answer: 1 Newton is defined as the force required to produce an acceleration of 1m/s² in an object of 1kg mass.

Newton's Third Law of Motion

Every action has an equal and opposite reaction.

Example: Action - A sailor jumping off a boat.
Reaction - The boat moving backward due to the force.

Law of Conservation of Momentum

The total momentum of two objects before collision and after collision remains constant, as long as no external force is applied.

$m_1 \xrightarrow{u1}$ $m_2 \xrightarrow{u2}$ $m_1 m_2$ $m_1 \xrightarrow{v1}$ $m_2 \xrightarrow{v2}$

Before collision at collision After collision

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

Example: Recoiling of a gun, explosion of a bomb.

MUST DO QUESTION

Q1. On what factors does the momentum of an object depend?

Ans. Momentum = Mass × Velocity

Momentum depends on two factors:

1. Mass
2. Velocity

As the mass and velocity of an object increase, its momentum will also increase.

Q2. Write important characteristics of Newton's Third Law of Motion.

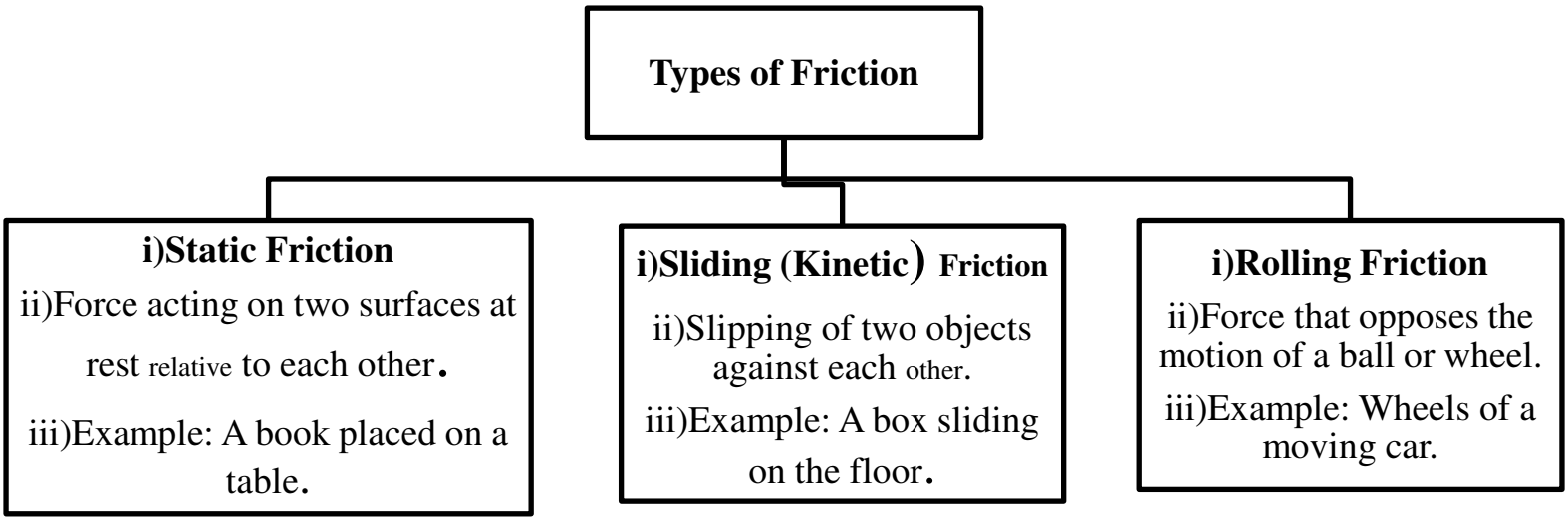
Ans. (i) Action and reaction forces are mutually exchangeable.
(ii) Action and reaction forces act on different objects.
(iii) The reaction force will act as long as the action force is present.

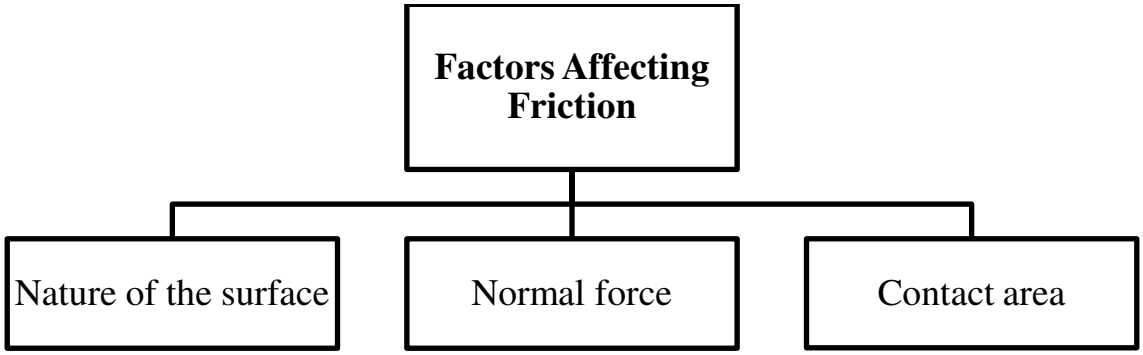
Q3. If an object with a mass of 5kg moves with a velocity of 10m/s, what will be its momentum?

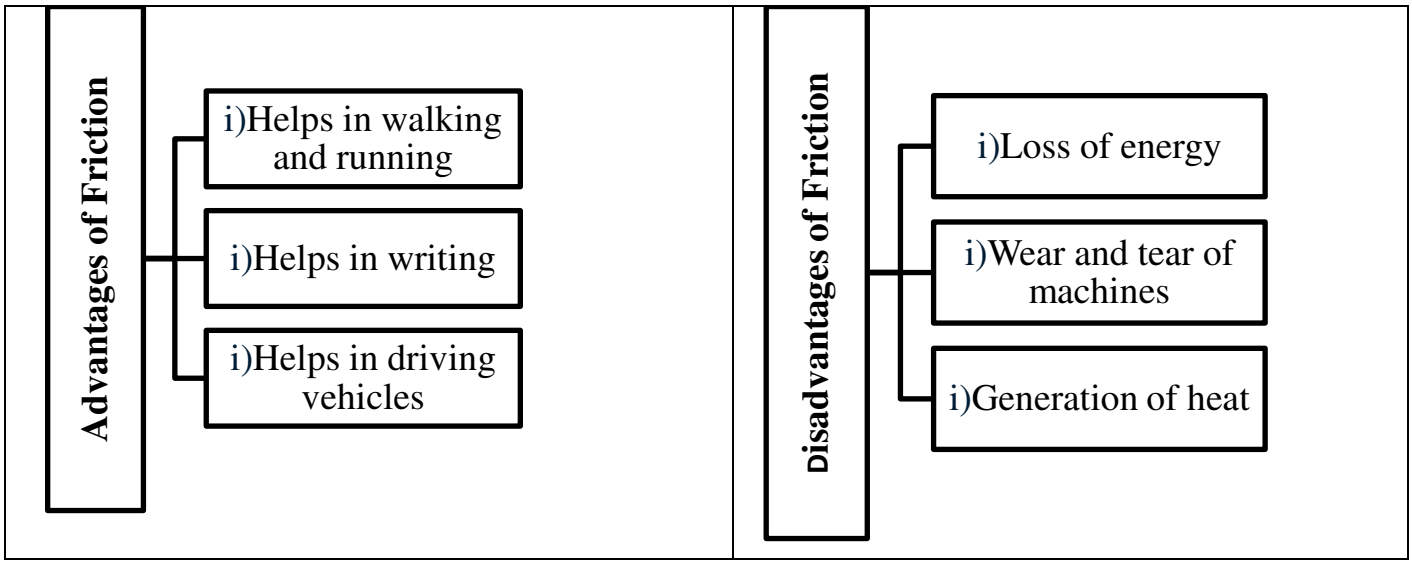
Ans. Momentum = Mass × Velocity = 5kg × 10m/s = 50 kg m/s

Friction: -

Opposition to relative motion between two surfaces in contact with each other. The direction of the Frictional force is always in a direction opposite to the motion.







Thrust	Pressure
Normal force acting on an object's surface.	Force acting per unit area on an object. P= Thrust /area
Vector quantity	Scalar quantity
SI unit - Newton (N)	SI unit - Nm^{-2} Pascal (Pa)
Example - Gas escaping from a rocket engine	Example - Hammering a nail

MUST DO QUESTION

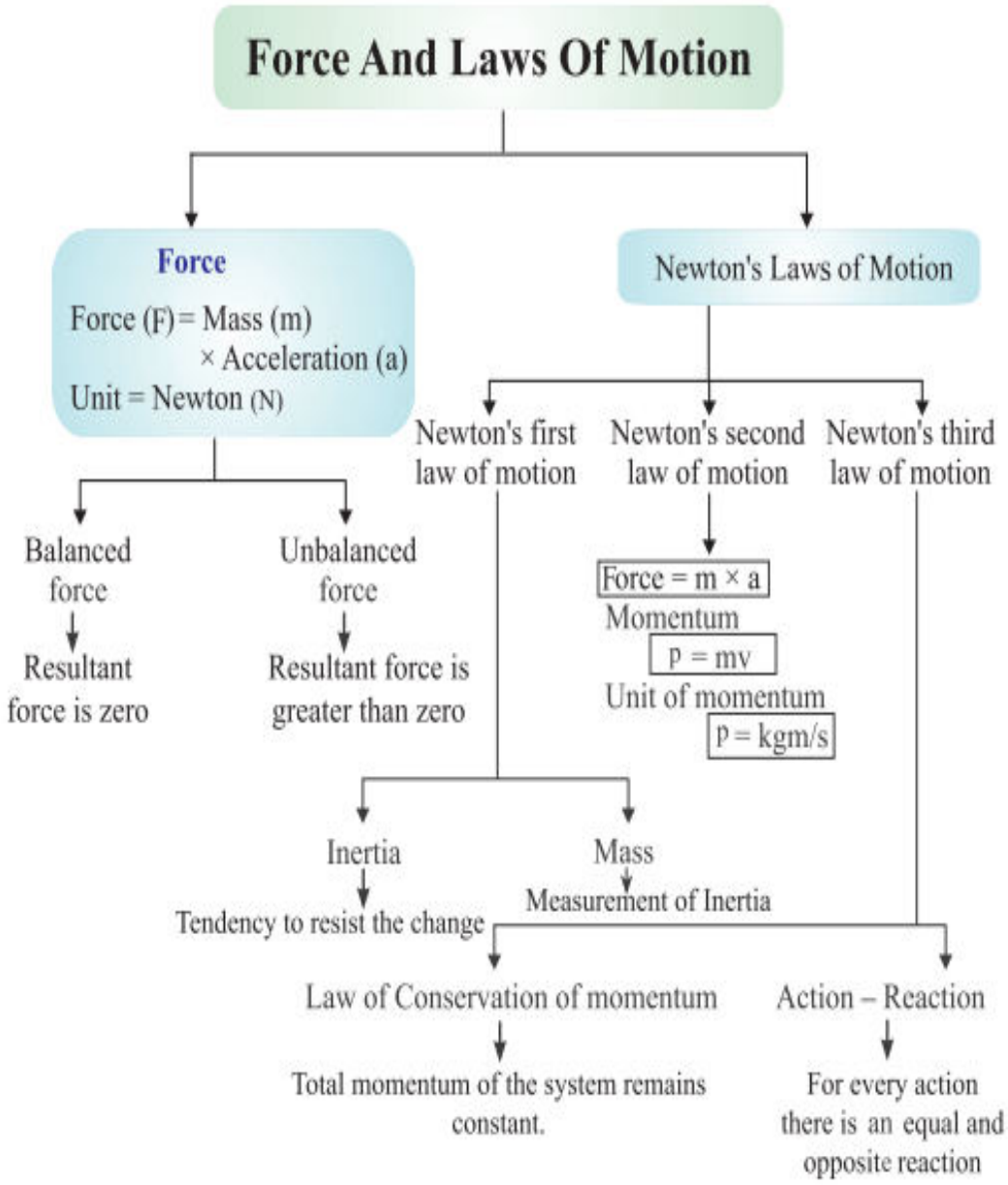
Q1. Why is one end of a nail pointed?
Ans. To increase pressure.
Q2. Why do porters carry heavy loads place a round piece of cloth on their heads?
Ans. To decrease pressure.
Q3. What is the international unit of pressure?
Ans Pascal (Pa)
Q4. Which force helps in walking or swimming?
Ans Frictional force
Q5. Which order of frictional force is correct?

i) Sliding friction > Rolling friction > Static friction
ii) Static friction > Sliding friction > Rolling friction
iii) Rolling friction > Sliding friction > Static friction
iv) Static friction > Rolling friction > Sliding friction

Ans (B) Static friction > Sliding friction > Rolling friction
Q 6. Write the methods to reduce friction.
Ans. (i) By lubricating the surface.
(ii) By using ball bearings.
(iii) By using lubricants.

Q 7. Why are the wheels of automatic vehicles grooved?
Ans. Grooved wheels provide a good grip on the ground, which increases friction.
Q 8. Why are broad straps attached to the handles used for carrying loads?
Ans. When the surface area of straps increases, the pressure decreases.

CONCEPT MAPPING

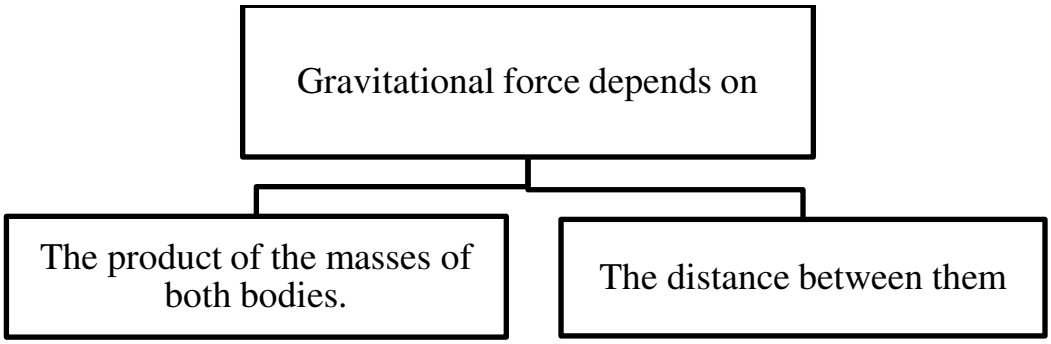


Chapter -11
Gravitation

Gravitational Force - The force that causes all objects in the universe attract to each other.

Newton's Law of Gravitation (1687)

(Universal Law of Gravitation): Everybody in the universe attracts every other body with a force called gravitational force.

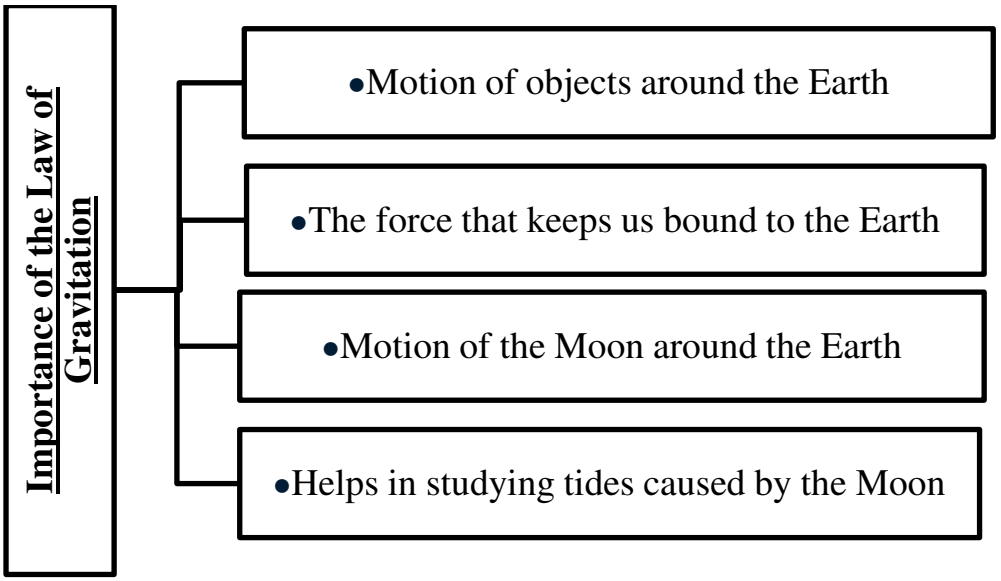


$$F = G (m_1 \ m_2 \ / d^2)$$

Where: m_1, m_2 are the masses of two bodies , d is the separation between two body.

And G = Universal Gravitational Constant. Its value is = 6.67×10^{-11} Nm^2/kg^2

Importance of the Law of Gravitation:



Free Fall

→ No change in direction

→ Change in velocity

→It is the falling of an object under the influence of Earth's gravitational pull.

Acceleration due to gravity (g)

→ Change in the velocity of an object due to Earth's gravitational force. SI unit = m/s^2

Acceleration due to gravity (g)	**Gravitational constant(G)**
1) Its value is 9.8 m/s^2	1) Its value is 6.7×10^{-11} Nm^2/kg^2
2) Unit = m/s^2	2)Unit = $N/m^2/kg^2$
3) Varies at different places	3) Constant everywhere

Relationship between 'g' and 'G'

According to Newton's second law of motion F = ma.

In the context of Earth, acceleration = gravitational acceleration or a = g.

Therefore, F = mg --- (I)

According to the Universal Law of Gravitation, $F = GmM/d^2$ --- (II)

Substituting the value of (I) in (II):

$mg = GmM/d^2$

g = GM/d^2 **M=**Mass of earth

d= Disatnce between two objects,in which one object is the earth.

G=Gravitational constant

MUST DO QUESTIONS

Q1. Which central force causes the Moon to orbit the Earth?

(a) Gravitational force (b) Electric force

(c) Magnetic force (d) Gravitational force

Ans.(d) Gravitational force

Q2. What is the Universal Law of Gravitation between two bodies?

(a) Proportional to the product of the masses of both bodies

(b) Inversely proportional to the square of the distance between them

(c) (a) and (b) both

(d) None of these

Ans.(c) (a) and (b) both

Q3. In a free fall , initial velocity is

(a) Zero (b) Highest (c) Lowest (d) Infinity

Ans. (a) Zero

Q4. If acceleration is acting opposite to the direction of velocity, what will be the acceleration?

(a) Positive (+) (b) Negative (-)

(c) Zero (d) Both (b) and (c)

Ans.(b) Negative (-)

Q5. Why is 'G' considering the universal gravitational constant?
Ans. The value of G is the same everywhere in the universe. Therefore, G is called the universal constant.
Q6. When a heavy and a light object are dropped simultaneously from the same height, why do they fall at the same rate?

Ans. Because the value of gravitational acceleration is the same for both light and heavy objects.

Q7. If the mass of a body is doubled, what will be the effect on the gravitational force between them?

Ans. Gravitational force will double.

Q8. At which place on the Earth's surface is the weight of an object minimum and maximum?

Ans. Minimum - at the equator, Maximum - at the poles
Weight at the center of the Earth – Zero

Mass (m)	Weight (W=mg)
1. Quantity of matter in an object.	1. Force acting on an object towards the center of the Earth.
2. It is the same everywhere.	2.Varies with location due to gravitational force.
3. Scalar quantity.	3.Vector quantity.
4. Measured by a beam balance.	4.Measured by a spring balance
5. SI unit = kilogram (kg).	5.SI unit = Newton (N).
6. Cannot be zero	6.Weight is zero at the center of the Earth.

Weightlessness - The state in which an object does not experience weight.
Examples - in space, free fall and at the center of the earth

Buoyancy: When an object is immersed in a liquid, its tendency to be pushed upwards is called buoyancy or buoyant force or up thrust.
It depends on:

(i) Density of the fluid(liquid)
(ii) Volume of the body immersed in the fluid (liquid)

Archimedes Principle: - When an object is fully or partially immersed in any liquid, there is some reduction in its weight, and this reduction in weight is equal to the weight of the liquid displaced by the object.

Applications of the Principle:

- In making ships and submarines
- Hydrometer (instrument for measuring density)
- Lactometer (instrument for measuring milk purity)

MUST DO QUESTIONS

Q1. Why do we not experience weightlessness on the moon?
Ans. Because the moon's mass is less than mass of the earth and acceleration due to gravity on the moon is not zero.
Q2. On what factors does the weight of an object depend?
Ans. (1) On mass (2) On acceleration due to gravity.
Q3. At what temperature is the density of water highest?
Ans. At 4°C.
Q4. Name the forces acting on an object when it is immersed in a liquid.
Ans. (1) Buoyant force (2) Gravitational force.
Q5. What is buoyant force? On what factors does it depend?
Ans. Buoyant force – The upward force exerted by a liquid on the surface of an object immersed in it is called buoyant force.
Buoyant force depends on the following:
(1) Density of water (liquid) (2) Mass or volume of the object.

Q6. What will be the mass of an object whose weight is 49 N? ($g = 9.8\ m/s^2$)
Ans. $w = mg$
$49N = m \times 9.8\ m/s^2$
$49 / 9.8 = m$
$m = 5\ kg$
Mass = 5 kg.

Chapter-12
Sources of Energy

Energy: - Capacity to do work.

- Unit - Joule (J)
- Some sources of energy like - Coal, Sun, Air, etc.
- Requirement of energy in→ Photosynthesis, cooking food, producing light in CFL, LED, bulbs

Sources of Energy	
Renewable Sources	**Non-renewable Sources**
• Sources whose replenishment is possible. • Examples: Solar energy, Wind energy, Hydroelectric energy, etc.	• Sources whose replenishment is not possible. • Examples: Coal, Petroleum, Fossil fuels, etc.

Traditional Sources of Energy

(1) Fossil Fuels: - (a) Coal (b) Oil (Petroleum) (c) Natural Gas

(a) Coal: - **Formation process** - Coal formation (Coalification): Gradual process over millions of years where buried dead plant matter is transformed into coal.

Peat (Collection of dead matter) Lignite (Brown color)

Types of Coal

Sub-bituminous (Light black color) Bituminous (Completely black, shiny coal)

(b) Natural Gas (Methane):-

- ❖ Formula of Methane = CH_4
- ❖ Better fuel than gasoline
- ❖ Produces Carbon Dioxide (CO_2) on burning.

Fossil Fuels: -Fossil fuels are natural, combustible energy sources formed from the remains of ancient plants and animals over millions of years.

Advantages	**Disadvantages**
❖ Easy production and low cost. ❖ High calorific value. ❖ Helpful in electricity generation.	❖ Release of poisonous gases during combustion. ❖ Limited supply. ❖ Environmental imbalance.

Nuclear Energy: -The energy released during nuclear reaction is called nuclear energy.

Sources of Nuclear Energy

Nuclear Fission	**Nuclear Fusion**
Breaking of heavy nuclei into lighter ones and releasing energy.	Joining of light nuclei to release immense energy

Uses:

Operating ships and submarines, In medicine, agriculture, and research work, In electricity generation

Dangers

Nuclear accidents, Adverse effects on health, Radioactive waste

MUST DO QUESTIONS

Q1. Which of the following is NOT an example of a biomass energy source?

(a) Coal (b) Wood

(c) Gobar Gas (Cow Dung Gas) (d) Nuclear Energy

Ans. (d) Nuclear Energy

Q2. Which of the following is NOT a radioactive substance?

(a) Uranium (b) Radium (c) Plutonium (d) Sodium

Ans.(d) Sodium

Q3. What is used to slow down the speed of neutrons in nuclear reactors?

(a) Fuel (b) Moderator (c) Control Rods (d) Coolant

Ans. (b) Moderator

Q4. Which of the following nuclear reaction produces energy:

(a) Atomic bomb _____ (b) In stars _____

(c) In the Sun _____ (d) Hydrogen bomb _____

Ans.(a) Nuclear fission (b) Nuclear fusion (c) Nuclear fusion (d) Nuclear fusion

Q5. Write the benefits of nuclear energy.

Answer: Clean fuel, produces more energy in less quantity.

Renewable Energy Sources

Solar Energy - Energy obtained from the Sun.

Uses of Solar energy: -Heating, Cooking, Production of electricity, Desalination of water

Solar energy

Benefits	Limitations
• Source of pollution-free energy • Never-ending energy source • Requires less electricity consumption	• Available only during the day • Very high cost • Requires maintenance and cleaning • Less production when it rains

Wind Energy: -It is a clean, renewable resource derived from the natural movement of air.

Uses	Benefits	Limitations
1. Grinding grain. 2. Electricity generation.	1. Source of pollution-free energy. 2. Low cost for electricity generation. 3. Excellent source of renewable energy.	1. Irregularity of wind. 2. High initial cost. 3. Adverse effects on animals.

Hydropower Energy or Hydroelectricity: - It is generated by harnessing the kinetic energy of moving water, through dams or rivers to spin turbine.

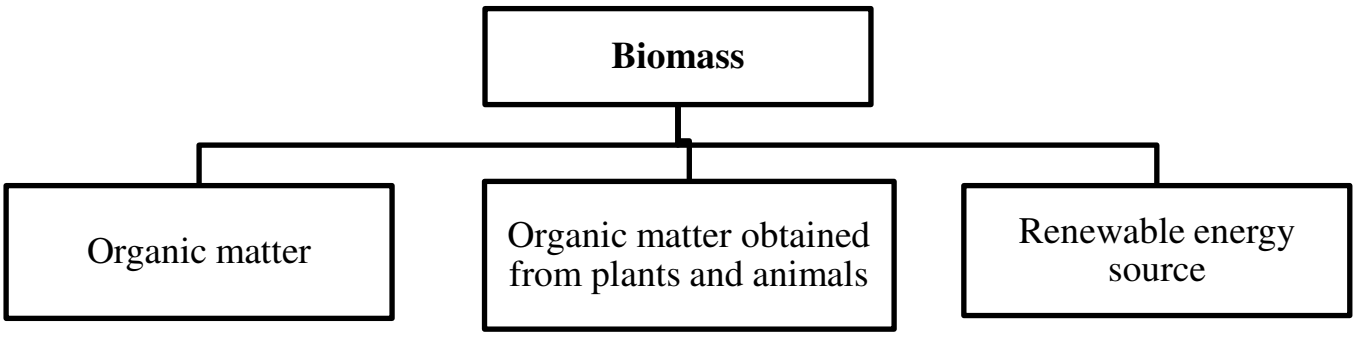
Uses:	**Advantages of Hydropower Energy**	**Limitations**
Electricity generation Irrigation, Flood control.	Pollution-free renewable source and low cost. No use of fossil fuels. Used in agricultural work.	High cost. Negative impact on wild life.

Geothermal Energy: - Energy obtained from within the Earth

Use	**Advantages**	**Disadvantages**
Electricity generation, Agriculture, fisheries.	Low cost. Pollution-free. Continuous electricity generation.	Available only in limited locations. Difficult and expensive to lay pipes inside the Earth.

Ocean Thermal Energy Conversion (OTEC)
Definition: A technology that generates electricity using the temperature difference in oceans.
Advantages:
Renewable and pollution-free, Helpful in hydrogen production.
Disadvantages:
High cost in initial setup, Applicable only in tropical regions.

Biomass: -It is a renewable energy derived from recently living organic materials such as plants, wood, agricultural waste and animal waste which are converted into heat electricity or gaseous fuels.

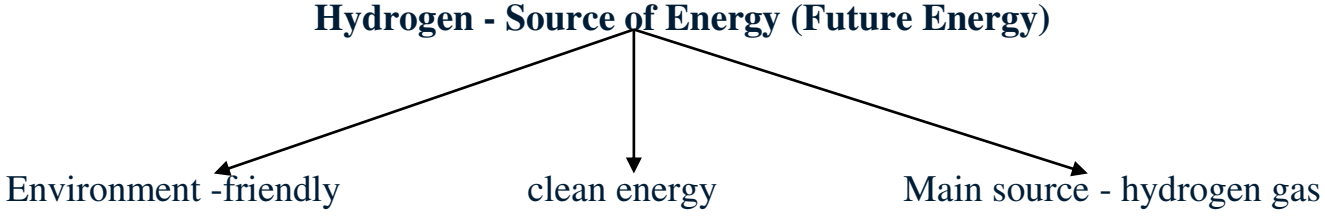


Uses: - Electricity generation, Transport fuel, Cement production, paper manufacturing

Biomass: -

Advantages	Disadvantages
Locally available Renewable energy source Available globally	Problem of global warming Expensive technology Water pollution

Hydrogen - Source of Energy (Future Energy)



Hydrogen Energy

Advantage	Disadvantages
Clean energy Electricity generation Various uses like transport, heating, etc	High production cost Highly flammable Hydrogen leakage difficult to detect

MUST DO QUESTIONS

Q1. The main component of biogas is:

(a) CO_2 (b) CH_4 (c) H_2 S (d) H_2

Ans: (b) CH_4

Q2. Extensive use of fossil fuels:

(a) Pollutes the environment. (b)Does not affect the environment.

(c) Maintains the amount of toxic gases in the environment.

(d) None of these.

Ans :(a) Pollutes the environment.

Q3: Which of these emits the most greenhouse gases?

(a) Fossil fuels (b) Biogas (c) CNG (d) All of the above

Ans (a) Fossil fuels

Q4: Which is the most popular fuel used in Indian kitchens?
(a) LPG (b) Kerosene (c) Coal (d) Wood
Ans. (a) LPG

Q5. Differentiate between traditional and non-traditional sources of energy.

Traditional Sources of Energy	**Non-Traditional Sources of Energy**
The reserves of these sources are limited.	Reserves are unlimited.
These sources cause pollution	Non-polluting energy sources.
Examples: Coal, Petroleum, Natural Gas, etc.	Examples: Solar energy, Wind energy, Tidal energy, etc.

Q 6: "Energy can neither be created nor destroyed." What do you understand by this statement?
Ans: This statement means that the total energy remains constant. Energy can only be converted from one form to another.
Energy Transformation: -
Energy conversion from one form to another.
Examples:

1. The thermal energy of coal changes into mechanical energy when it goes into the turbine.
2. 2 The chemical energy of coal changes into thermal energy.

Energy Crisis: -It is shortage of oil, electricity or other natural resources.
Causes: Growing gap between energy demand and supply, Over-exploitation and wastage of resources, Shortage of raw materials.
Solutions:
Energy conservation, increasing public awareness, increasing investment in energy production and distribution.
Energy Conservation: - Reduce Consumption, Stop Energy Wastage
Contribution to energy saving in daily life:

1. Switch off fans, lights, and electrical appliances when not in use.
2. Use LED bulbs instead of ordinary bulbs or tube lights.
3. Cover vessels while cooking rice, pulses, etc.

MUST DO QUESTIONS

Q1. State two reasons behind the "energy crisis" in our country.
Ans. (1) The increasing gap between the demand and supply of energy.
(2) The continuously rising prices of energy and fuel compared to other countries.

Q2. When you ride a bicycle, what are the energy transformations that occur?
Ans. Chemical energy → Mechanical energy → Kinetic energy.

Chapter-13
Work and Energy

Work: Displacement of an object when force is applied on it.
Work = Force × Displacement in the direction of force (S)
$W = F \times S$
S.I Unit of Work = Nm (Newton meter) or J (Joule)

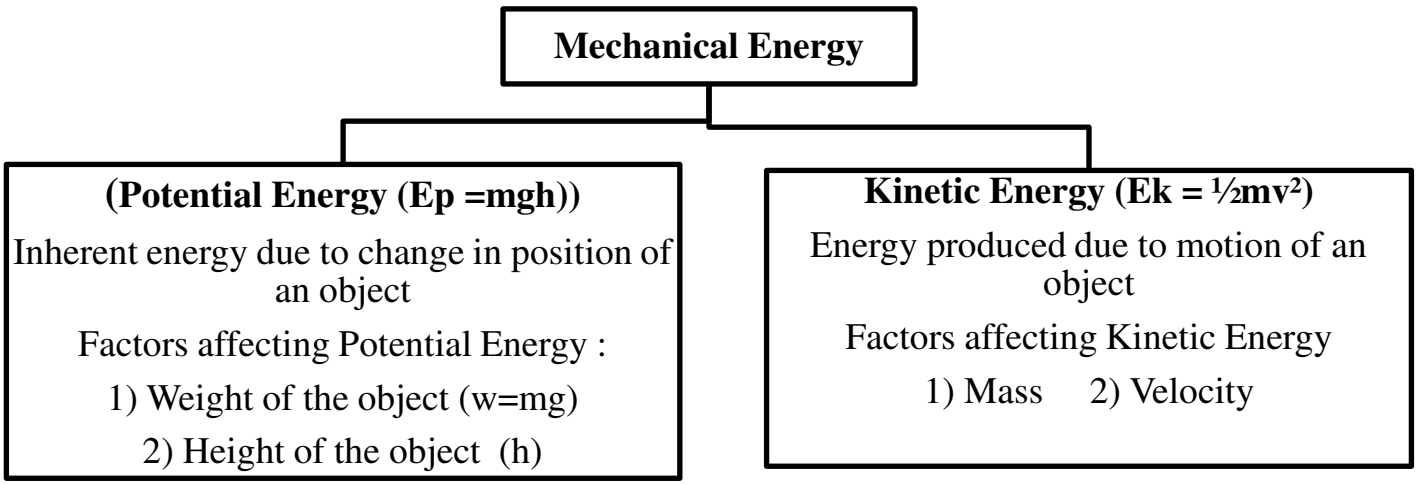
MUST DO QUESTIONS

Q.1 In which of the following statements is work being done?
a) A boy pushing a wall.
b) A porter carrying weight and walking.
c) When force and displacement are in the same direction.
d) None of the above.

Ans: (c)When force and displacement are in the same direction.
Q.2 The work done on an object does not depend on which of the following?
a) Displacement
b) Angle between force and displacement
c) Applied force
d) Initial velocity of the object
Ans: (d)Initial velocity of the object

Q.3 Define 1 Joule.
Ans: Work done when a force of 1 Newton is applied on an object and it causes a displacement of 1 meter.
1 Joule = 1 N × 1 m

Relationship between Energy and Work
Energy of an object = Total work that the object can do.
Types of Energy: - Mechanical, Heat, Light, Electric, Magnetic, Sound and Nuclear Energy.



Energy Transformation: Transformation of energy from one form to another

Example-1. Solar energy → Chemical energy in plants

2. Microphone: Sound energy → Electrical energy

Energy Conservation: The total energy before and after some energy transformations always remains the same.

Power – Rate of doing work

Power = Work Done / Time Taken P = W/t

SI unit = watt (W)

1 Horsepower = 746 watt (W)

MUST DO QUESTIONS

Q.1 The unit of work is:

(a) Watt (b) Newton (c) Joule (d) Kilogram

Ans: c) Joule

Q.2 Factors affecting kinetic energy:

(a) Velocity (b) Mass

(c) Both(a) and(b) (d) Height of the object above the ground

Ans: c) Both a and b

Q.3 Fill in the blanks:

i) The ability to do work is called…… .

ii) A heat engine converts heat into.....energy.

iii) The conversion of chemical energy into.....energy occurs in cell/ battery.

Ans.(I) Energy, (ii) Mechanical, (iii)Electrical

Q.4 Write the type of energy conversion in the following:

a) Lighting of a bulb

Ans: Electrical energy → Light energy

b) Physical exercise

Ans: Chemical energy from food → Muscular energy

c) Loudspeaker

Ans: Electrical energy → Sound energy

d) Electric fan

Ans: Electrical energy → Kinetic, Heat energy

Q.5 A 50 kg object is lifted to a height of 5 m. Calculate:

a) Work done

b) Potential Energy

Ans. a) Work done=mgh

Work done: $W=50kg\times10m/s^2\times5m$

$W=2500J=2.5KJ$

b) Potential Energy: mgh

$50kg\times10\ m/s^2\times5m$

$E_p=2500J$

$E_p = 2500J = 2.5\ KJ$

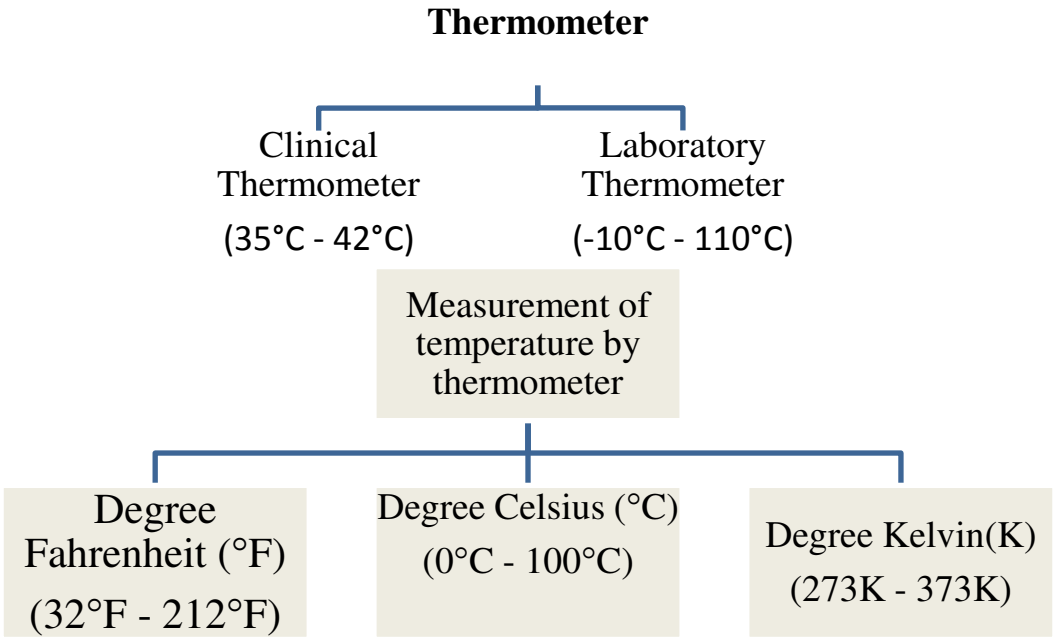
Chapter-14
Thermal Energy

Heat: Form of energy which gives us the sensation of hotness or coldness.

Temperature: The warmth of a body; temperature increases with increasing heat.

Flow of Heat: High Temperature → Low Temperature

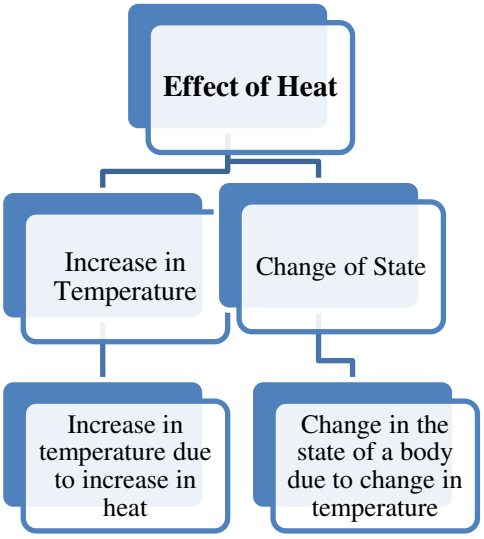
Thermometer → Device for measuring temperature.

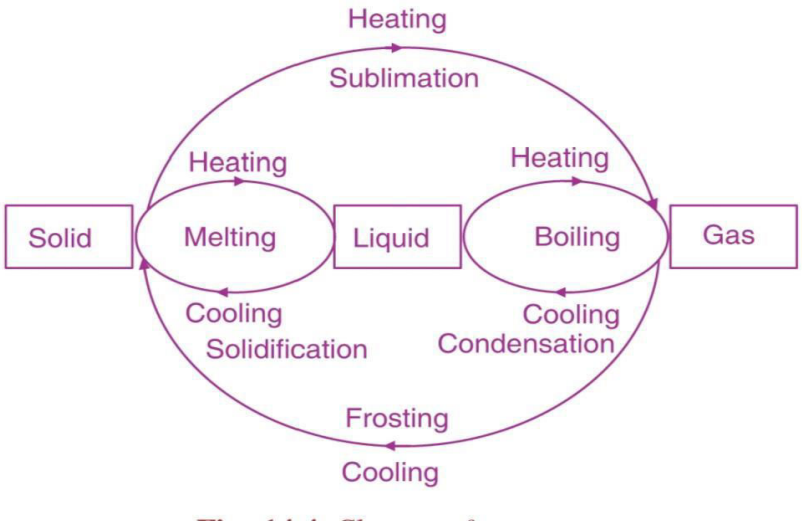


Formula for conversion:

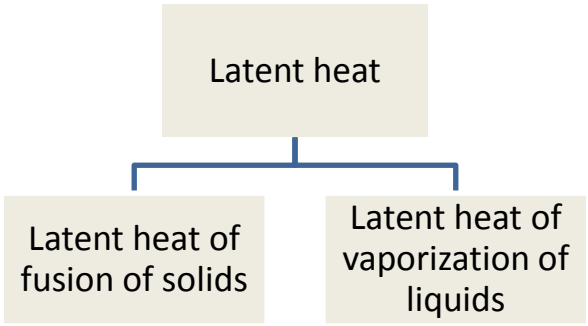
$$\frac{C}{100} = \frac{F-32}{180} = \frac{K-273}{100}$$

Change of state





Latent Heat: The heat given during the change of state of a substance, which does not cause an increase in temperature.



MUST DO QUESTIONS

Q1. How many Joules are there in one calorie?

(a)2.6 Joule (b) 4.2 Joule (c) 6.2 Joule (d) 9.2 Joule

Ans.(b) 4.2 Joule

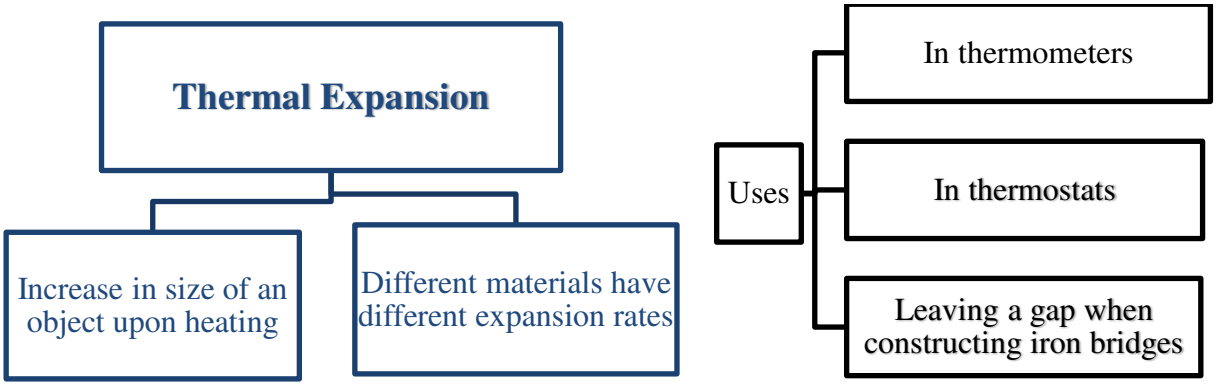
Q2. The change of solid into liquid is called?

(a)Freezing (b) Melting (c) Boiling (d) Cooling

Ans. (b) Melting

Q3. What is the latent heat of vaporization of a liquid?

Ans. It is the amount of heat that changes 1 kg of a substance from liquid to gaseous state at a constant temperature.



Bimetallic Strip: A strip made of two metals (e.g., Steel and Aluminum).
Coefficient of Linear Expansion: Increase in length of a 1-meter rod when its temperature is raised by 1°C.
SI Unit: per Kelvin (K^{-1})
Specific Heat Capacity: The amount of heat required to raise the temperature of 1 kg mass by 1 K.SI Unit: $Jkg^{-1}K^{-1}$

MUST DO QUESTIONS

Q.1 What happens when water is heated from 0°C to 4°C?
(a) Expansion of water (b) Contraction of water
(c) Vaporization of water (d) No change occurs
Ans.(b) Contraction of water

Q.2 In which of the following will expansion be the most?
(a) Solid (b) Liquid (c) Gas (d) None of these
Ans.(c) Gas

Q.3 How is an iron ring fitted onto the wooden wheel of a horse cart?
Ans. The iron ring is heated, causing it to expand, and then it is fitted onto the wooden wheel.

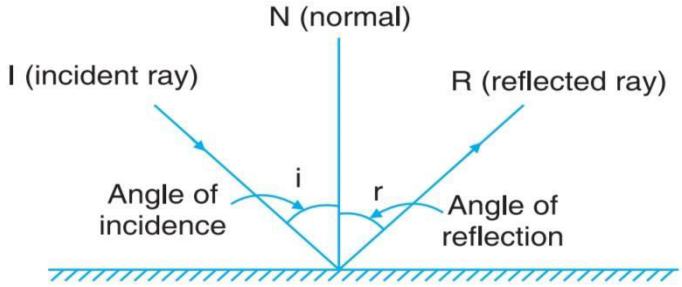
Q.4 Why does a glass crack when hot tea is poured into it?
Ans. Due to the sudden expansion caused by the heat in the glass.

Q.5 Why is a gap left between railway tracks?
Ans. To prevent the tracks from bending due to the higher temperature and expansion in summer.

Q.6 Why is a bimetallic strip used in a thermostat?
Ans. Because due to the difference in expansion of the two metals, the bimetallic strip bends when heated.

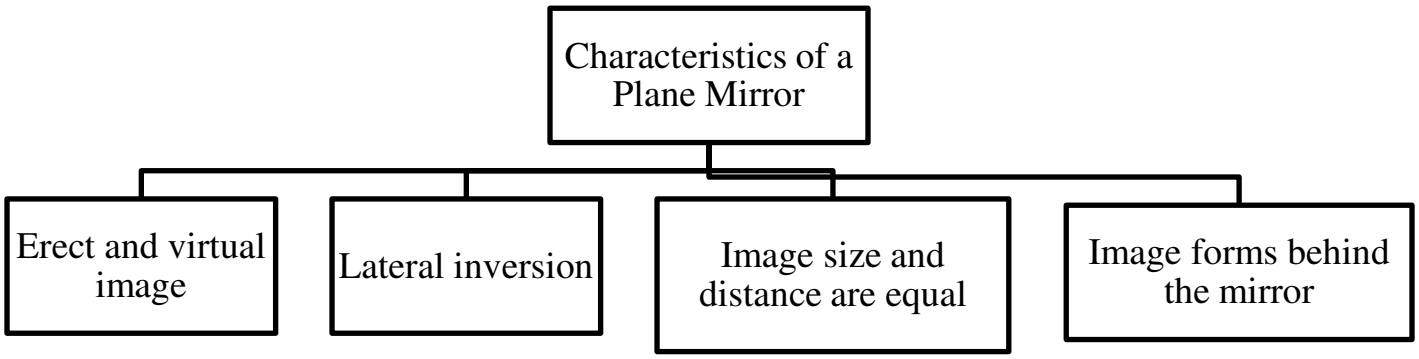
Chapter-15
Light Energy

Reflection of Light -Bouncing back of light after falling on smooth reflecting surface.
Example: Seeing your face in a mirror, seeing a reflection in water.



Laws of Reflection: 1. The reflected ray, incident ray, and normal all lie in the same plane.
2.Angle of incidence is equal to Angle of reflection ($\angle i = \angle r$)

Regular Reflection	**Diffused Reflection**	
1. Light strikes a smooth and shiny surface.	1. Light strikes an uneven or rough surface.	
2. Rays return in the same	2. Rays return in different directions.	
3. A clear image is formed.	3. No image is formed.	
Example: Seeing your face in a mirror.	Example: Torchlight on a wall.	
Image Feature	**Real Image**	**Virtual Image**
Forms on a screen	Yes	No
Orientation	Inverted	Erect
Reflected rays actually meet	Yes	No
Examples	Ex: Projector image, Camera	Ex: Face in mirror, Spoon



MUST DO QUESTIONS

Q1. Which property of light changes during reflection?

(a) Wavelength (b) Speed (c) Frequency (d) Direction

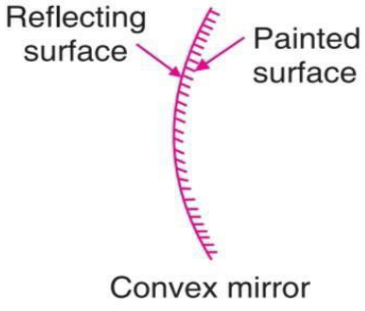
Ans: (d) Direction

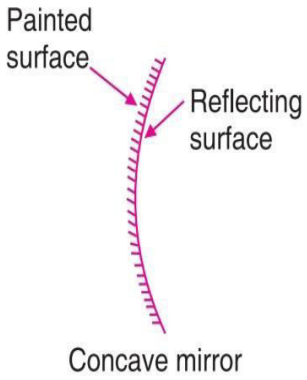
Q2. Write two uses of a plane mirror?

Ans: -1. To see face at home.

2. To see behind in vehicles.

Spherical Mirrors





Reflecting surface: Bulging out Reflecting surface: Bulging in

Point	Convex Mirror	Concave Mirror
Direction of light	Spreads out rays	Concentrates rays at one point
Nature of image	Always virtual and erect	Virtual or real, inverted or erect
Position of image	Always smaller	Larger, smaller or equal
Image forms on screen	No	Yes, if the image is real
Example	Side view mirror (in vehicles)	Dental mirror, Solar cooker

Image formation by Convex Mirrors: -

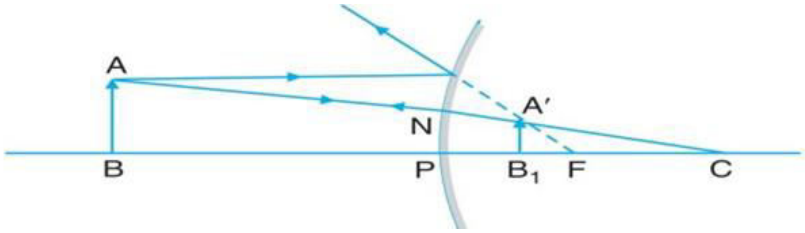
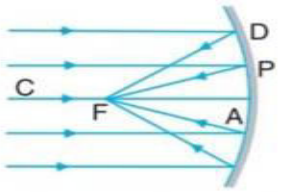
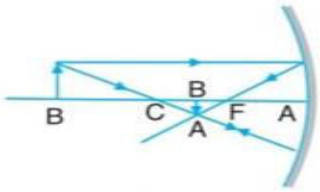


Image formation by concave mirror: -



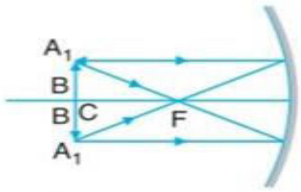
Real, inverted, highly diminished image at focus

(a) When the object is situated at ∞



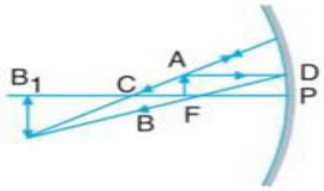
Real, inverted, diminished between C and F

(b) Object beyond C



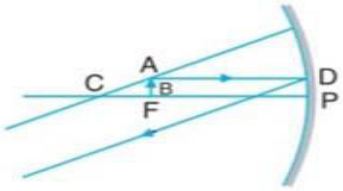
Real, inverted image of the same size as object at C

(c) Object at C



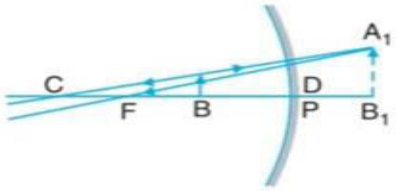
Real, inverted, enlarged image beyond C

(d) Object between C and F



Real, inverted, highly enlarged image at infinity

(e) Object at F



Virtual, erect, enlarged mage behind the mirror

(f) Object between F and P

Position of the object	Position of image formed	Nature of image	Size of image
(A) For concave mirror			
(i) between *P* and *F*	behind the mirror	virtual	larger
(ii) at *F*	at infinitely	real	highly enlarged
(iii) between F and 2*F*	beyond 2*F*	real	larger
(iv) at 2*F*	at 2*F*	real	same size
(v) beyond 2*F*	between *F* and 2*F*	real	smaller in size
(vi) at infinity	at *F*	real	highly diminished
(B) For convex mirror			
anywhere infront of mirror	between *P* and *F*	virtual	always smaller

Mirror Formula

1/f=1/v+1/u

f=focal length u=distance of object v= distance of image

Magnification - This is the ratio of the height of the image to the height of the object.

$m=h_2/ h_1 = -v/u$

Note -

1. m = +ve: Image - virtual, erect
2. m = -ve: Image - real, inverted
3. m = 1: Image - equal to the object
4. m > 1: Image - larger than the object
5. m < 1: Image - smaller than the object

MUST DO QUESTIONS

Q1.A spherical mirror forms an image of an object placed 30cm away from the pole of the mirror. The magnification forms on the screen -

(a) Write the type of mirror. (b) What is the focal length of the mirror?

(c) What is the nature of the image?

Ans.- Here, object distance (u)=30 cm Magnification (m) = -1

(a) Since m is negative, the mirror is concave.

(b) m=−v/u Therefore, v= -(m x u) = -(-1x30) =30cm Therefore, f=15 cm.

(c) Nature of the image -The value of m is negative.

Therefore, the image will be real and inverted. m=1 means the size of the object = size of the image.

Refraction of Light: The bending of light when it enters from one medium to another.

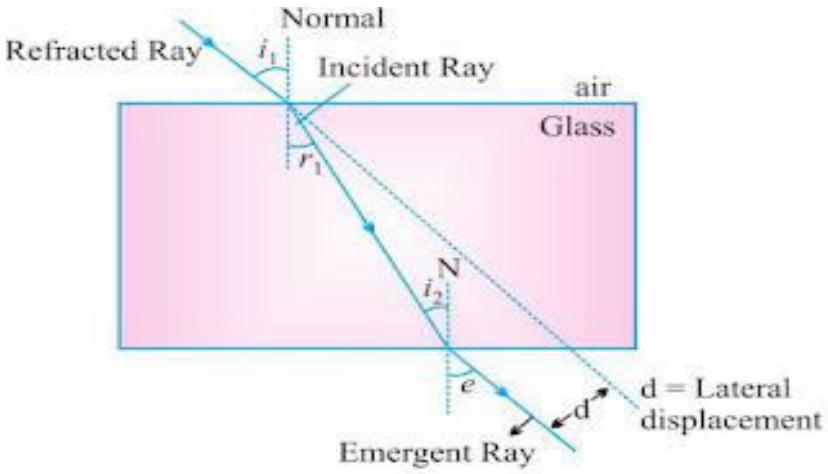
Example (1)A coin kept in water appears raised.

(2) Colored rays emerge from a prism.

Laws of Refraction:

(1) Incident ray, refracted ray and normal all lie in one plane.

(2) Snell's law: sin i/ sin r = constant = n

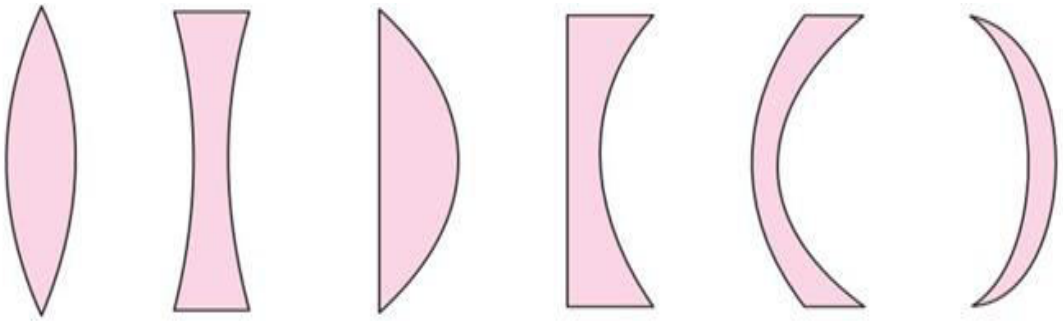


Refractive Index (n):

n = Speed of light in medium-1 / Speed of light in medium-2

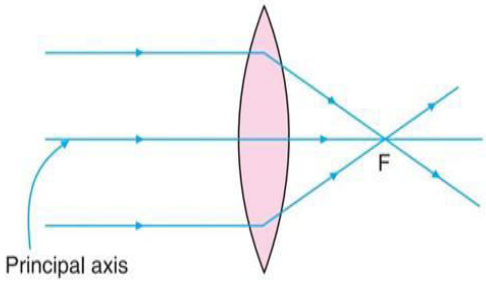
n = sin i / sin r

Different Type of lenses

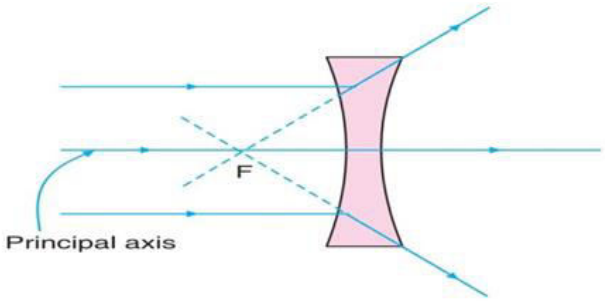


Convex or double convex | *Concave or double concave* | *Plano-convex* | *plano-concave* | *Convexo concave* | *Concavo convex*

Converging action of a convex lens



Diverging action of a concave lens



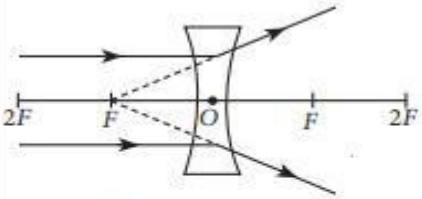
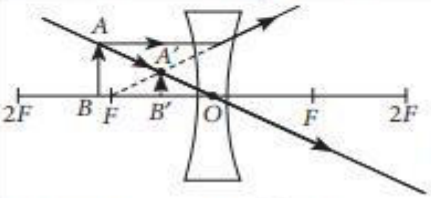
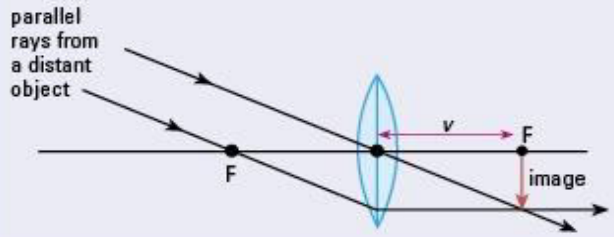
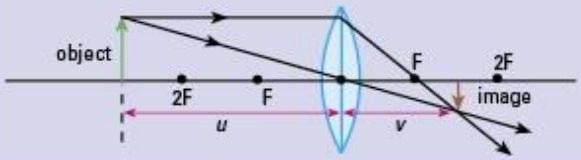
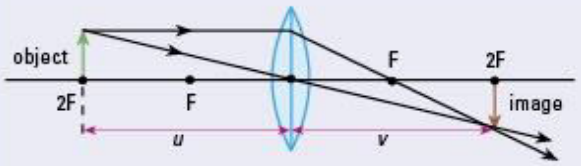
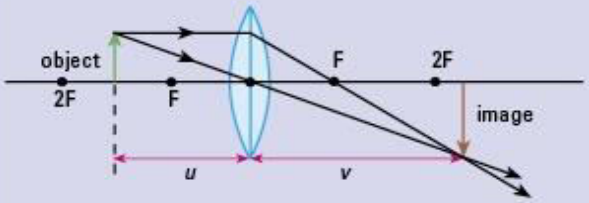
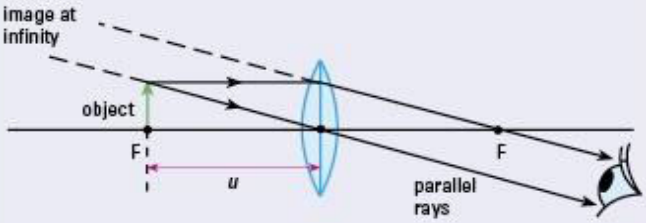
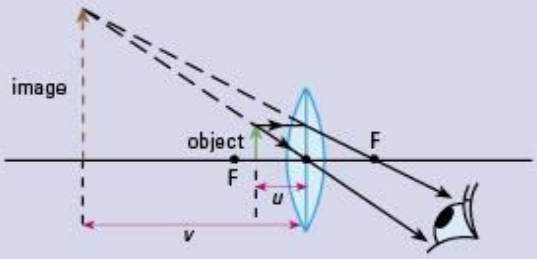
Concave lens				
	Ray diagram	**Position of object**	**Position of image**	**Nature of image**
(a)	 u = –ve, v = –ve and f = –ve	At infinity	At F	Virtual, erect and highly diminished
(b)	 u = –ve, v = –ve and f = –ve	Between infinity and O	Between F and O	Virtual, erect and diminished

Image Formation by Lenses: -

Object distance (u)	Ray diagram	Type of image	Image distance (v)	Uses
$u = \infty$		- inverted - real - diminished	$v = f$ - opposite side of the lens	- object lens of a telescope
$u > 2f$		- inverted - real - diminished	$f < v < 2f$ - opposite side of the lens	- camera - eye
$u = 2f$		- inverted - real - same size	$v = 2f$ - opposite side of the lens	- photocopier making same-sized copy
$f < u < 2f$		- inverted - real - magnified	$v > 2f$ - opposite side of the lens	- projector - photograph enlarger
$u = f$		- upright - virtual - magnified	- image at infinity - same side of the lens	- to produce a parallel beam of light, e.g. a spotlight
$u < f$		- upright - virtual - magnified	- image is behind the object - same side of the lens	- magnifying glass

Lens Formula: -

$$1/v - 1/u = 1/f$$

where u = Distance of object from lens = Distance of image from lens
f = Focal length

Lens Magnification:

Magnification (m) = Height of image (h') / Height of object (h)

m = v/u

Lens Power: P = 1/f (f = focal length)

Unit: Diopter (D)

MUST DO QUESTIONS

Q 1.A convex lens forms a real and point-sized image at what position? What will be the position of the object?

(a) At focus (b) At infinity (c) At 2F (d) Between F and 2F

Ans: (b) At infinity

Q2. What is the distance between the optical center and the principal focus called?

(a) Radius (b) Diameter (c) Refractive index (d) Focal length

Ans: (d) Focal length

Q3. A convex lens has a focal length f = +10 cm. If an object is placed 30 cm away from the lens, at what distance will the image be formed?

Ans: Lens formula: 1/f = 1/v - 1/u

f = +10 cm

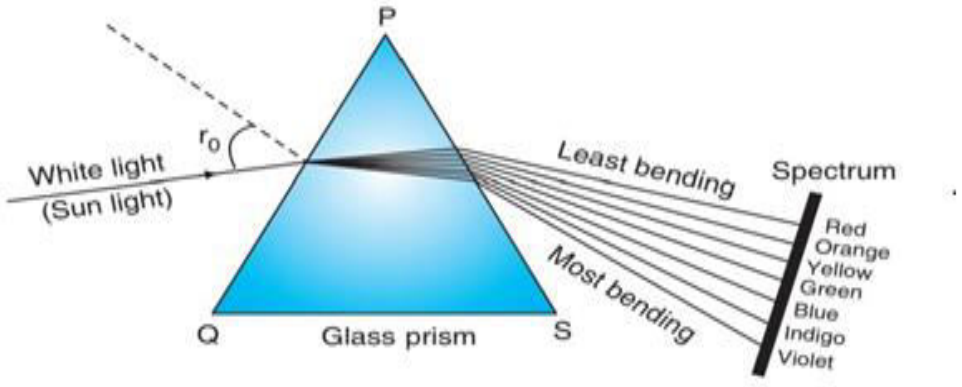
u = -30 cm

1/v = 1/f + 1/u = 1/10 + 1/(-30) = (3 - 1)/30 = 2/30 = 1/15

v = +15 cm

Dispersion of light by a glass prism

Breaking of white light into different colors after passing through a prism.



Dispersion of light

Eye Defects and Vision: -

Eye Defect Name	Symptom	Cause	Lens Used
Farsightedness (Hypermetropia)	Difficulty seeing nearby objects clearly	Shortening of the eyeball, reduced curvature of the lens	Convex lens
Nearsightedness (Myopia)	Difficulty seeing distant objects clearly	Elongation of the eyeball, increased curvature of the lens	Concave lens
Presbyopia	Difficulty seeing both near and far objects clearly	Reduced flexibility of the lens due to aging	Bifocal lens
Astigmatism	Blurred or distorted vision	Uneven surface of the cornea	Cylindrical lens

MUST DO QUESTIONS

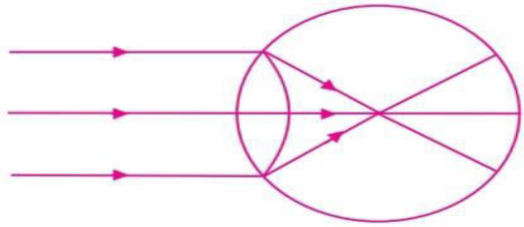
Q1. The image formed on the retina of the human eye is:
(a) Virtual and erect (b) Real and inverted
(c) Virtual and inverted (d) Real and erect
Ans: (b) Real and inverted

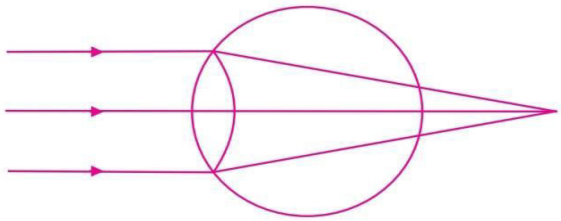
Q2. What is the power of accommodation of a normal human eye?
(a) 25m (b) 20m (c) 20cm (d) 25cm
Ans: (d) 25cm

Q3. In a prism, which color is minimally deviated and which is maximally deviated?
Ans: Minimally deviated color**:** Red
Maximally deviated color: Violet

Q4. Draw diagrams illustrating:

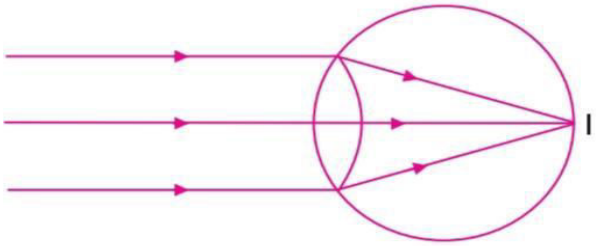
- Myopic eye(ii) Hyperopic eye(iii) Relaxed eye
- Ans:(i) **Myopic eye:** **(ii) Hypermetropic eye:**





Hypermetropic eye

(iii) **Relaxed eye:**



Relaxed eye

Chapter-16
Electrical Energy

Electric Current: Rate of flow of electric charges

S.I Unit: Ampere (A)

Measurement: By Ammeter

Formula: $I = Q/t$
Q = Charge t = Time I = Electric Current

Electrostatics potential: The electrostatics potential at any point is defined as the amount of work done in bringing a unit positive charge from infinity to that point.
It is scalar quantity.
$V = W/Q$
V = Potential W = Work Q = Charge
Unit: Volt (V) or Joule/Coulomb (JC^{-1})

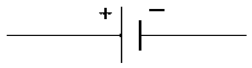
Potential Difference: The difference of electrical potential between two points.
It is defined as amount of work done in moving a unit charge between two points.

$$V_B - V_C = \frac{w_B - w_c}{q}$$

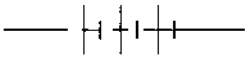
Measurement of Potential Difference by Voltmeter

Subject	Voltmeter	Ammeter
Measurement	Potential Difference	Current
Connection in Circuit	Parallel	Series
Unit	volt (V)	ampere (A)
Resistance	Very High	Very Low
Application	To measure voltage between two points	To measure current in a wire or device

Symbols used in Electric Circuit Diagram

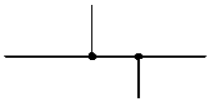


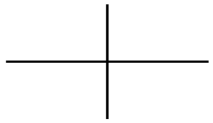
Single electric cell

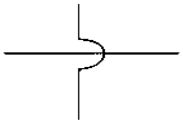

Battery

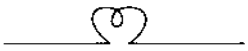

An open plug key or switch


A closed plug key or switch

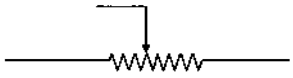

Wires joined


Wires crossed

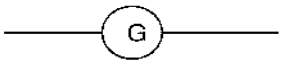

Wires crossing without contact


An electric bulb


A resistor


A Rheostat

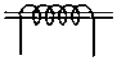
An ammeter

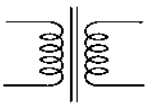


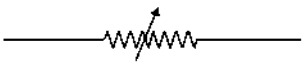
A galvanometer

A voltmeter


Electromagnet

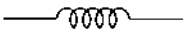

Electromagnet with iron core


Transformer

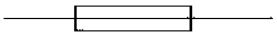

Variable resistance

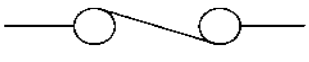

Open switch

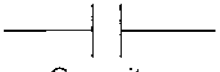
Closed switch


Inductor


Tapping key

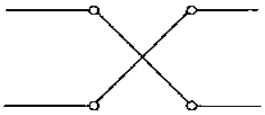

OR


Electric fuse


Capacitor

240V

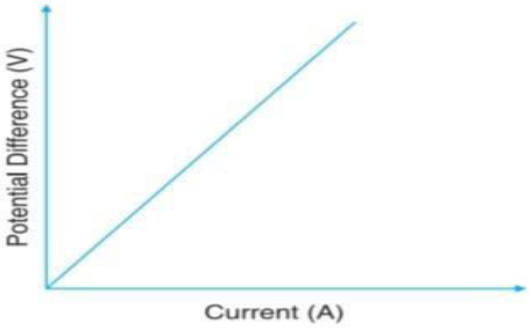

a.c. supply


Reversing key

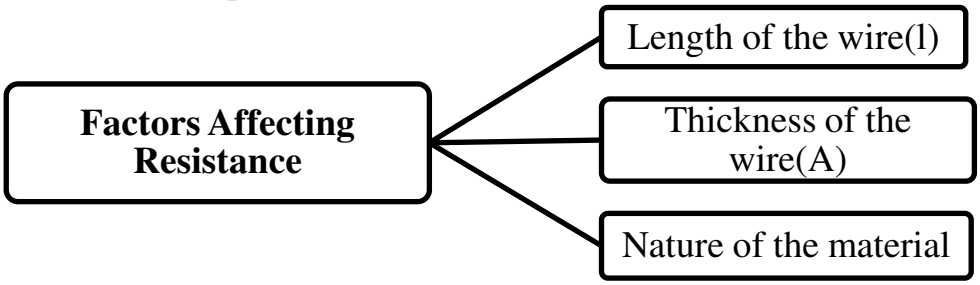
Ohm's Law: The relationship between Voltage (V) and Current (I), When the temperature in a conductor remains constant electric current flowing through a conductor is directly proportional to the potential difference across its ends.

Variation of voltage with current

$V \propto I \qquad V = I \times R$
V = Voltage (Volts)
I = Current (Amperes)
R = Resistance (Ohm)

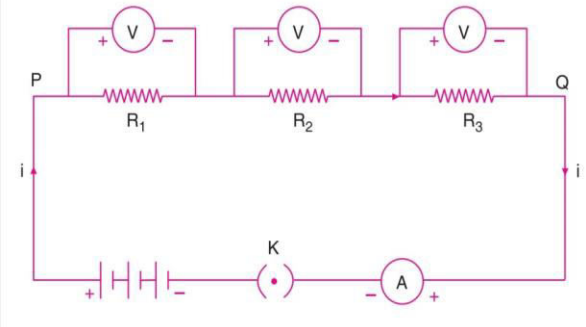
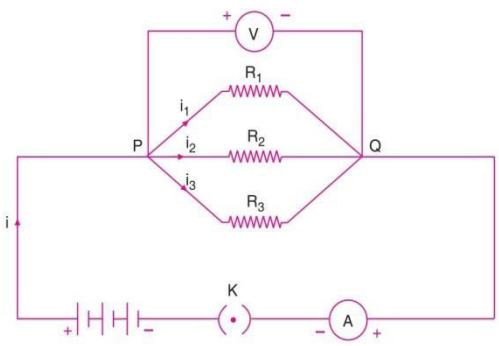


Resistance: Opposition to the flow of current in a conductor.
SI Unit - Ohm (Ω)
R= V/I
1 Ohm = 1 Volt / 1 Ampere



R= ρl/A where ρ ⟶ Resistivity of the material

Combination of Resistors

Series Combination	Parallel Combination
	

$R_s = R_1 + R_2 + R_3$	$\frac{1}{Rp} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$
Uses:(1) Torch Batteries (2) LED Strip Lights (3) Old Fairy Lights	**Uses:** (1) House Wiring (2) Car Wiring (3) Inverter Connection

MUST DO QUESTIONS

Q1. What is the main function of a rheostat?
Ans. To decrease and increase the amount of electric current.

Q2: Which of the following resistance does not depends on:
(A) Length of wire (B) Area of wire (C) Nature of material (D)Humidity
Ans.(D) Humidity

Q3. When the potential difference across the ends of a wire is doubled, what will be the effect on the following?
(i) Resistance of the wire (ii) Current flowing through the wire
Ans:(i) There will be no effect on the resistance of the wire.

- The value of the current flowing through the wire will become double.

Q4. State two advantages of connecting electrical appliances in parallel instead of series with a battery.
Ans.(i) The total resistance of the circuit decreases.

- If one appliance stops working, the others continue to operate.

Q5. A bulb is rated 60 watts and operates on a 220-volt supply. Calculate the current flowing through that bulb.
Ans.P = V x I
I = P / V
I = 60 / 220 = 0.27A

Heating effects of electric current
When electric current flows through a conductor, it gets heated some amount of electric energy is converted into heat energy.

Joule's Law: - H = I^2RT
I= Current; R=Resistance; T=Time; H= Heat produced
Work = Potential Difference (V) x Charge (Q)
W= VIt [: Q = It]

From Ohm's Law :-- V = IR
W = (IR)It
W = I^2Rt
SI Unit of Heat = Joule (J)
Electric Power (P): The rate of energy consumption
P = VI P = I^2R P = V^2/R

SI Unit of Power= Watt (W)
Practical Unit of Energy = Kilowatt-hour = kWh
1 kWh = 3.6 x 10^6 J
1 (hp) = 746 W

Q6. The electricity bill comes in units. Here 1 Unit is equal to:
(A) 3.6 x 10^5 Joule (B) 3.6 x 10^5 Watt
(C) 3.6 x 10^6 Joule (D) 3.6 x 10 Watt
Ans. (C) 3.6 x 10^6 Joule

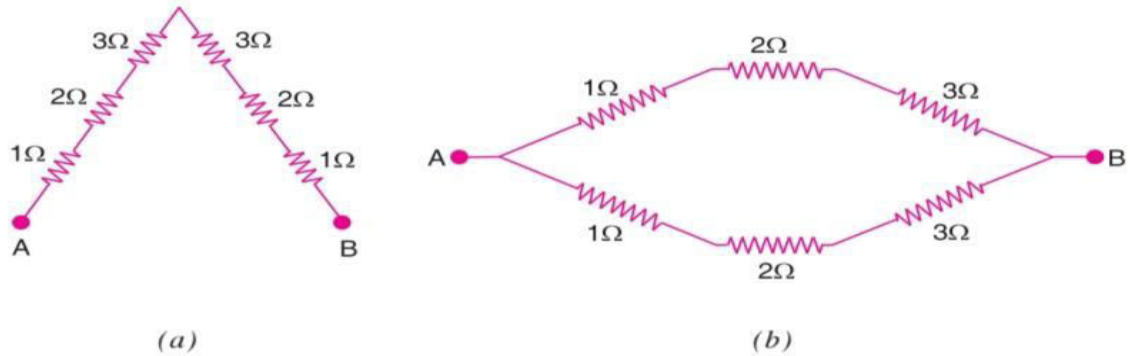
Q 7. Metals are good conductors due to presence of?
(A) Protons (B) Free electrons
(C) Core electron (D) None of these
Ans. (B) Free electrons

Q 8. If a 2-horsepower motor is run for ten hours, how many kilowatt-hours of energy will be consumed?
Ans. P = 2 hp
P = 2 x 746 P = 1.492 kW
e = Pt **e**= 1.492 kW x 10h = 14.92 kWh
e= 14.92KWh

Q 9. An electric iron has a resistance of 25 Ω. If a 5A current flows through it for 1 minute, calculate the heat produced.
Ans. R = 25 Ω
I = 5A, t = 1 min (= 60 sec)
Heat produced, **H = I^2Rt**
H = $(5A)^2$ x 25Ω x 60s H = 37500 J
H = 3.75 x 10^4 J

Q 10. The filament of a bulb is made of which element, and why does it have a high melting point?
Ans. Tungsten, because it does not melt at high temperatures.

Q11. Find the resultant resistance for the resistor combinations given below.



(a) (b)

Ans. (a) All the resistors are connected in series.

If all resistors are connected in series, then: - $R_s = R_1+R_2+R_3+R_4+R_5+R_6$

$\mathbf{R_s = (1+2+3+3+2+1)\ \Omega}$

$\mathbf{R_s} = 12\ \Omega$

(b) $R_1 = 1+2+3 = 6\ \Omega$ (in series)

$R_2 = 1+2+3 = 6\ \Omega$(in series)

$\frac{\mathbf{1}}{\boldsymbol{Rp}} = \frac{1}{R1} + \frac{1}{R2} = \frac{\mathbf{1}}{\mathbf{6}} + \frac{\mathbf{1}}{\mathbf{6}} = \frac{2}{6}$(in parallel)

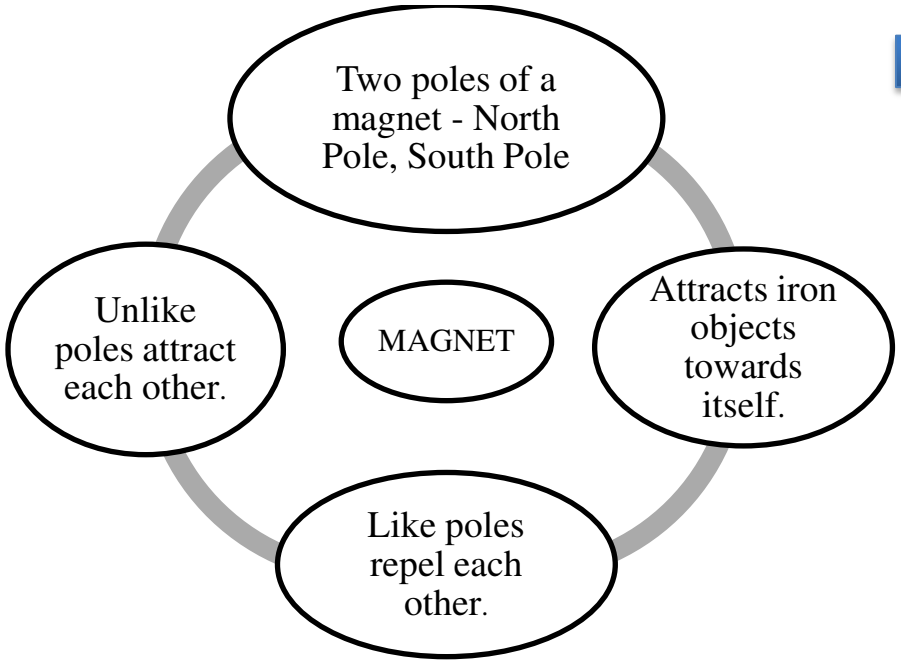
$$\frac{1}{Rp} = \frac{1}{3}$$

$R_p = 3\ \Omega$

Chapter -17
Magnetic Effects of Electric Current

Magnet: A material or object that produce a magnetic field.

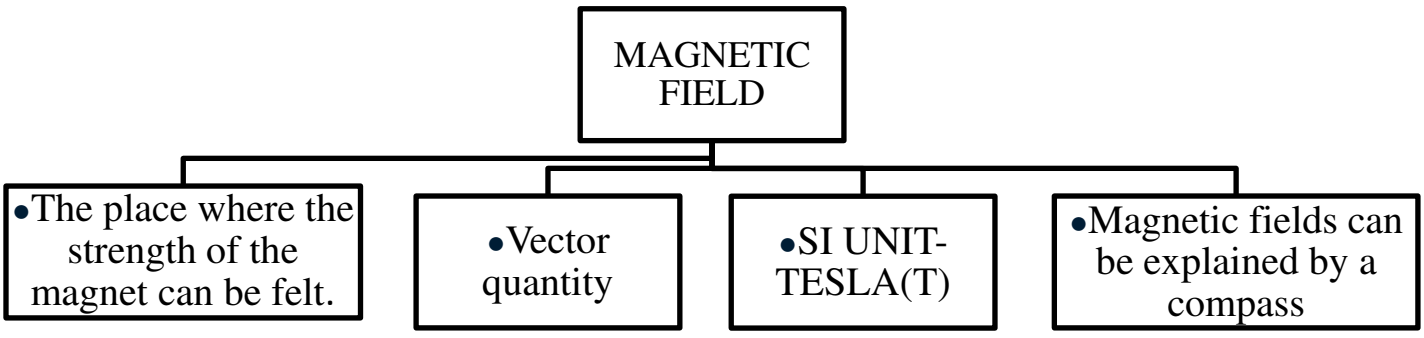
BAR MAGNET



Uses of Magnet

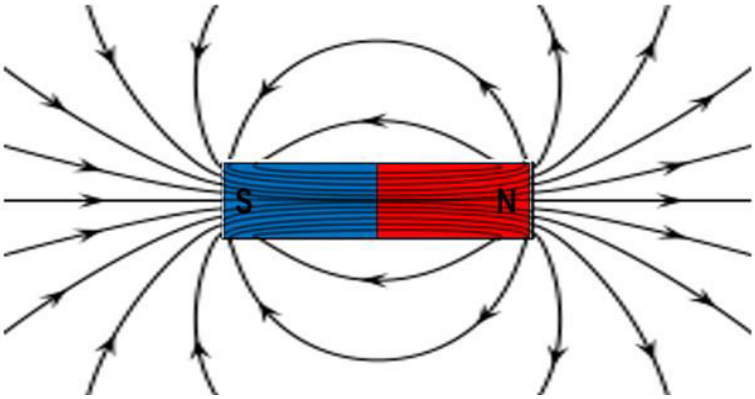
- Tape recorders, radios, motors, doorbells, headphones
- Navigation

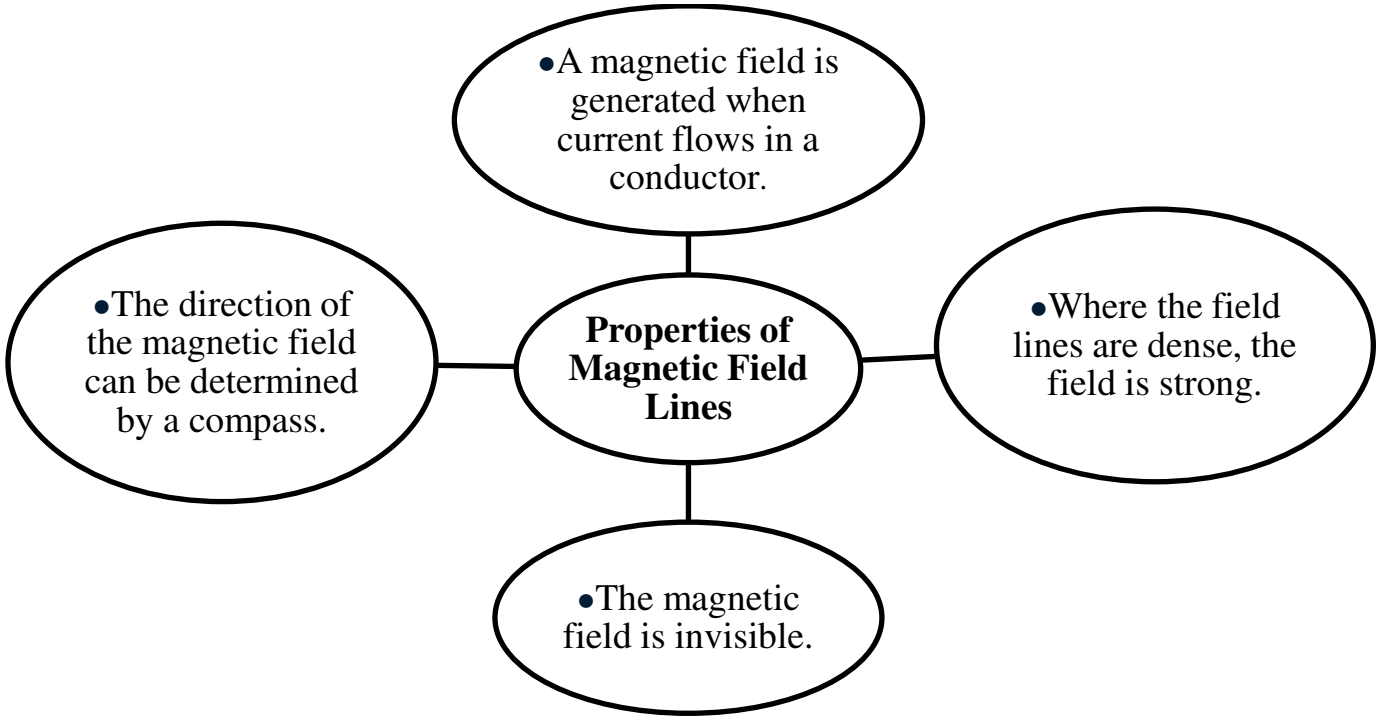
Magnetic Field: The region around the magnet or current carrying conductor where magnetic needle experience force and stops at a fix direction.



Magnetic Field Lines

- Do not intersect each other.
- Originate from the North Pole and end at the South Pole.





MUST DO QUESTIONS

Q1. When a bar magnet is suspended freely, in which direction does it always rest?

(a) East-West (b) West-South (c) North-East (d) North-South

Ans.(d) North-South

Q2. Lodestone is-

(a) Fe_2O_3 (b) Fe_3O_4 (c) FeO (d) Fe

Ans - (b) Fe_3O_4

Magnetic Effect of Electric Current

In a conductor, when electric current flows, a magnetic field is generated around it.

Discovered by **Oersted.**

Applications:

- Electric Motor
- Electric Bell
- MRI Machines

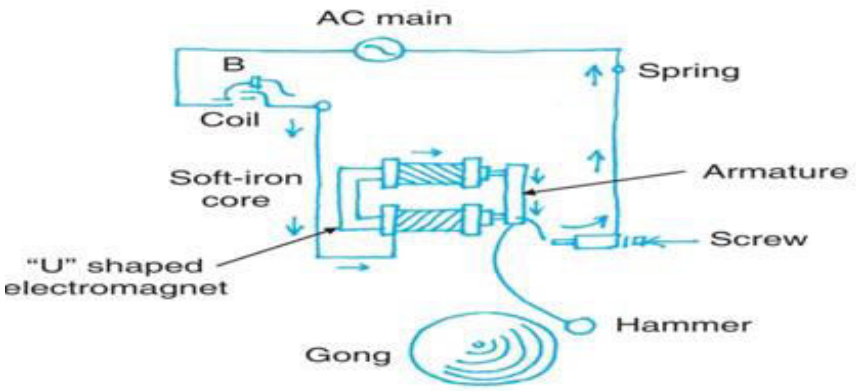
Bar Magnet (Permanent Magnet)	Electromagnet (Temporary Magnet)
1. Permanent magnet	Temporary magnet
2. Magnetic property always remains.	Magnetic property only lasts as long as current flows.
3. Magnetic strength is fixed.	Magnetic strength can be increased or decreased.
4. Cannot be turned off.	Can be turned on/off.
5. Example: Permanent magnet used in schools.	Example: Crane, Electric Bell, etc.

Electric Bell

Principle: Magnetic Effect of Electric Current

Working Method:

1. Pressing the switch
2. Coil becomes an electromagnet
3. Iron strip is pulled
4. Hammer strikes the bell
5. Bell rings



Electric bell

Solenoid: A solenoid is a long coil of wire that produces a magnetic field when a electric current flows through it.

Factors affecting the magnetic field:

(i) Current
(ii) Number of turns per unit length(n)
(iii) Core material

Fleming's Left-Hand Rule

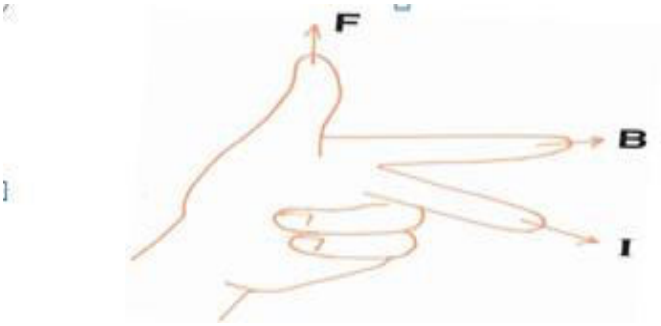
This indicates the direction of force due to current and magnetic field.

Thumb – Force

Forefinger - Magnetic Field

Middle Finger – Current

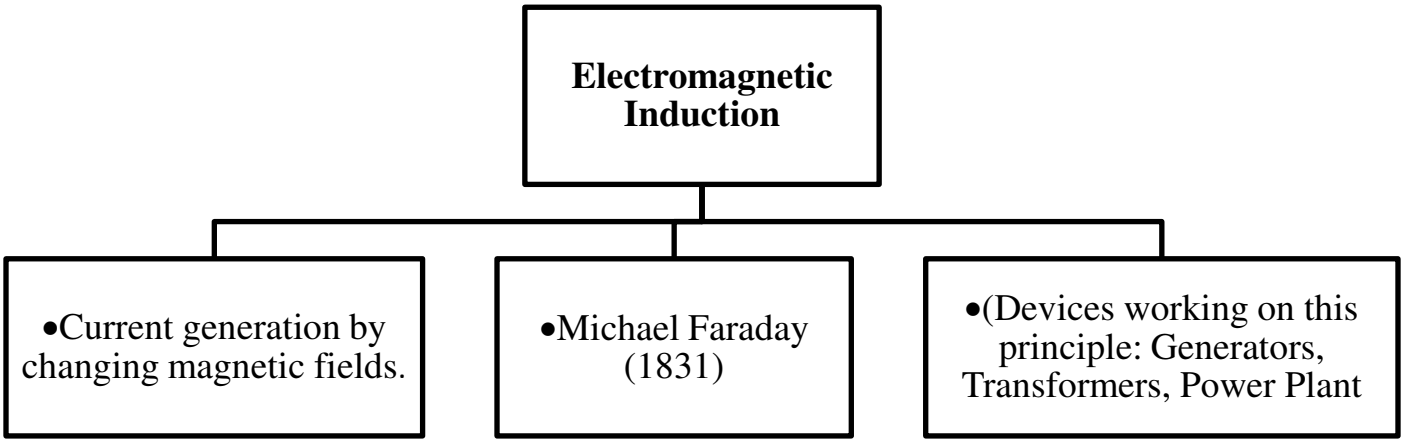
Application – Motor



Fleming's Left-Hand Rule

MUST DO QUESTIONS

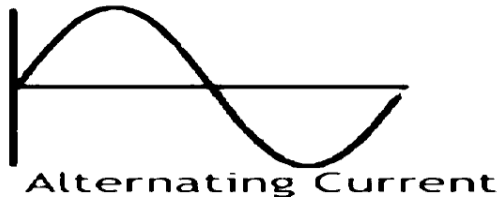
Q1.An electromagnet should be made of:
(a) Soft iron (b) Hard iron. (c) Rusted iron (d) Copper
Ans.(a) Soft iron
Q2.No force is exerted on a current-carrying conductor when:
(a) It is perpendicular to the magnetic field.
(b) It is parallel to the magnetic field.
(c) It is around the magnetic field.
(d) It is between the magnetic fields.
Ans. (b) It is parallel to the magnetic field.
Q3. List the factors that make an electromagnet powerful.
Ans.(i)Number of turns (in the coil)
(ii)Current flowing in the coil
(iii)Distance between the poles
Q4. What happens to the magnetic properties of a magnet when it is broken into two pieces?
Ans.The magnetic properties will not change.
Electromagnetic Induction (EMI): It is the process where a changing magnetic field creates an electromotive force and current in a conductor.



Electric Generator

(i)A device that converts mechanical energy into electrical energy.
(ii)It works on Faraday's principle of electromagnetic induction.

Working Principle	Uses
(i)Rotating the coil in a magnetic field. (ii)Current is generated due to electromagnetic induction.	(i)For generating electricity in power stations. (ii)In generators

Alternating Current (AC)	**Direct Current (DC)**
1. Changes direction with time.	1.Flows in one direction.
2. Flows in the form of a sine wave (up and down).	2.It is like a straight line.
3. Generated from power stations.	3.Obtained from batteries, cells, dynamos, etc.
4. Can be easily transmitted over long distances.	4.More energy loss when transmitted over long distances
5. Voltage can be increased or decreased.	5.Voltage cannot be easily changed.
Usage: Used in homes (fan, TV, fridge)	Usage: Mobile phones, laptops, etc.
	

Domestic Electric Circuit

- **Live Wire (Positive)**: Red insulated covering
- **Neutral Wire (Negative)**: Black insulated covering
- **Earth Wire**: Green insulated covering

Main Points

- In India, the potential difference between the live wire and the neutral wire is 220V.
- **Main Supply** → Electricity Meter → Fuse → Distribution Box → Appliances

Earth Wire

A safety wire that prevents electric shock by sending current to the ground.

Accidents caused by electricity:

1. Short Circuit

Incorrect contact between wires, faulty wiring, or current flowing in the wrong direction, leading to fire.

2.Current leakage through bare wires

3. Overloading: Drawing more current than the capacity of the electric wire.

Safety Devices used in electric circuits

1. Electric Fuse
2. Miniature Circuit Breaker (MCB)
3. Earth Wire

MUST DO QUESTIONS

Q1. What is used to convert high voltage to low voltage?
(A) Step-up transformer (B) Step-down transformer
(C) Rectifier (D) Amplifier
Ans: (B) Step-down transformer

Q2.For a fuse wire, it is necessary to have a combination of:
(a) High resistance and low melting point
(b) Low resistance and high melting point
(c) High resistance and high melting point
(d) Low resistance and low melting point
Ans. (a) High resistance and low melting point

Q3. Fuse wire is made of:
(a) Silicon and tin ore (b) Coated with zinc on tin
(c) Coated with nickel on tin (d) Coated with aluminum on tin
Ans. (a) Silicon and tin ore

Q4.What is used to convert alternating current (AC) to direct current (DC)?
Ans. Rectifier

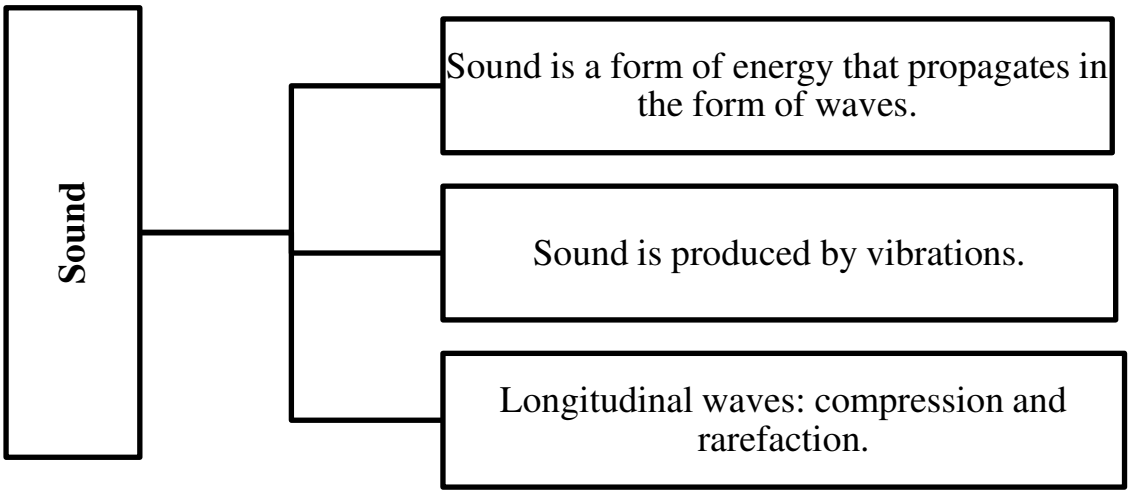
Q5. What changes occur in electric current during a short circuit?
Ans. The electric current becomes high.

Q6.Why are domestic electrical appliances always connected in parallel?
Ans. So that if one appliance breaks down, the other appliances continue to work.

Q7. Which device is used to check if current is flowing in the electrical wires in homes and factories?
Ans. Tester

Q8. How does electricity reach homes from power plants?
Ans. Through power lines and substations.
Process Flow (Production Electricity)→ Transmission(from high voltage) → Substation(reducing voltage)→Distribution(delivery to homes)

Chapter - 18
Sound and Communication

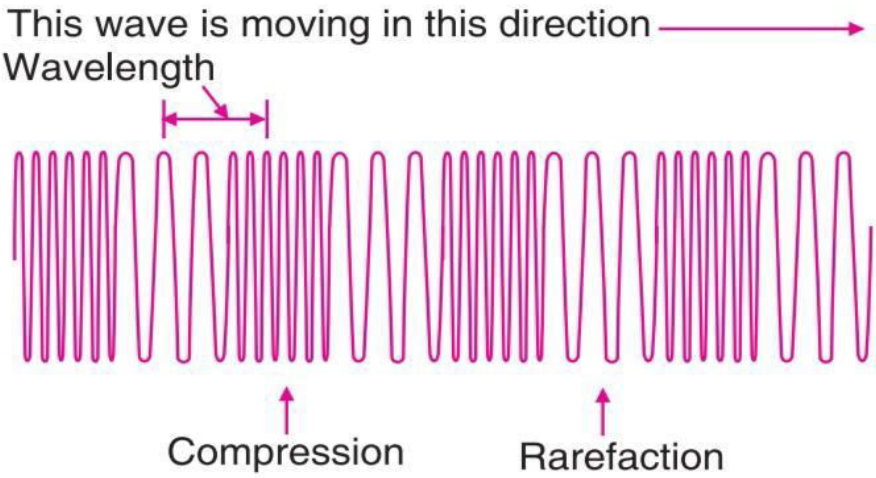


Characteristics of Sound	1. **Wavelength :**The distance between two consecutive crests or troughs. Unit: Meter
	2. **Frequency :**The number of complete cycles of a wave that occur in one second. Unit: Hertz
	3. **Time Period :**The time taken for a sound wave to complete one oscillation. Unit: Seconds
	4. **Amplitude :** The maximum displacement of a particle from its mean position. Unit: Meter
	5. **Velocity = Frequency × Wavelength** : Formula: $v = n \times \lambda$ (where v is velocity, n is frequency, and λ is wavelength

Propagation of Sound in Air

(i) Sound is a wave that propagates through a medium (like air) by means of alternate compression and rarefaction.

(ii) Sound cannot propagate without a medium, e.g., in space.



Infrasonic Waves	Audible Waves	Ultrasonic Waves
(Less than 20 Hz)	(20 Hz - 20000 Hz)	(More than 20000 Hz)
Inaudible to human ear	Audible to human ear	Inaudible to human ear
E.g., Earthquake waves, Elephants, whales, giraffes can hear them.	E.g., Human speech, animal sounds	E.g., Bats, dolphins

Feature	Longitudinal Waves	Transverse Waves
Direction of particle oscillation	Parallel to the direction of wave propagation	Perpendicular to the direction of wave propagation
Medium	Solids, Liquids, Gases	Primarily solids or surfaces
Formed in medium	Compression and Rarefaction	Crests and Troughs
Examples	Sound waves, Earthquake P-waves	Water waves, Light waves, Earthquake S-waves

MUST DO QUESTIONS

Q1. In which medium is the speed of sound highest?
(a) In solids (b) In liquids (c) In gases (d) In vacuum
Ans. (a) In solids

Q2. What is the audible range of sound for humans?
Ans. 20Hz - 20kHz

Q3. What is the unit of wavelength?
Ans. Meter (m)

Nature of Sound
Longitudinal Waves: Particles vibrate in the direction of the wave.
i) Requires a medium: (solid, liquid, gas) - does not travel in vacuum.
ii) Mechanical wave: Produced by vibrations, travels from one place to another.

Importance of Sound
i) Human communication - speaking, listening
ii) In industries - sound sensing, crack detection
iii) In medicine - ultrasound, sonography
iv) In education - audio recording

Evaluation of Sound:

(1)Pitch
i) Depends on frequency.
ii) Higher frequency → High pitch
iii) Lower frequency → Low pitch
iv) More than the sound of a girl or a boy.

(2) Loudness
i) Depends on the amplitude of sound waves.
ii) Loud sound → More amplitude
iii) Soft sound → Less amplitude
iv) Loudness is measured in Decibels (dB).

(3) Quality
i) Helps identify the source of sound.
ii) Difference between instruments like flute and guitar.
iii) **Tone** - Sound of a single frequency.
iv) **Note** - Sound of multiple frequencies.
v) **Noise** - Irregular, unpleasant sound.
vi) **Music** - Melodious, pleasant sound.
vii) **Echo:** The repetition of sound due to the reflection of sound waves.

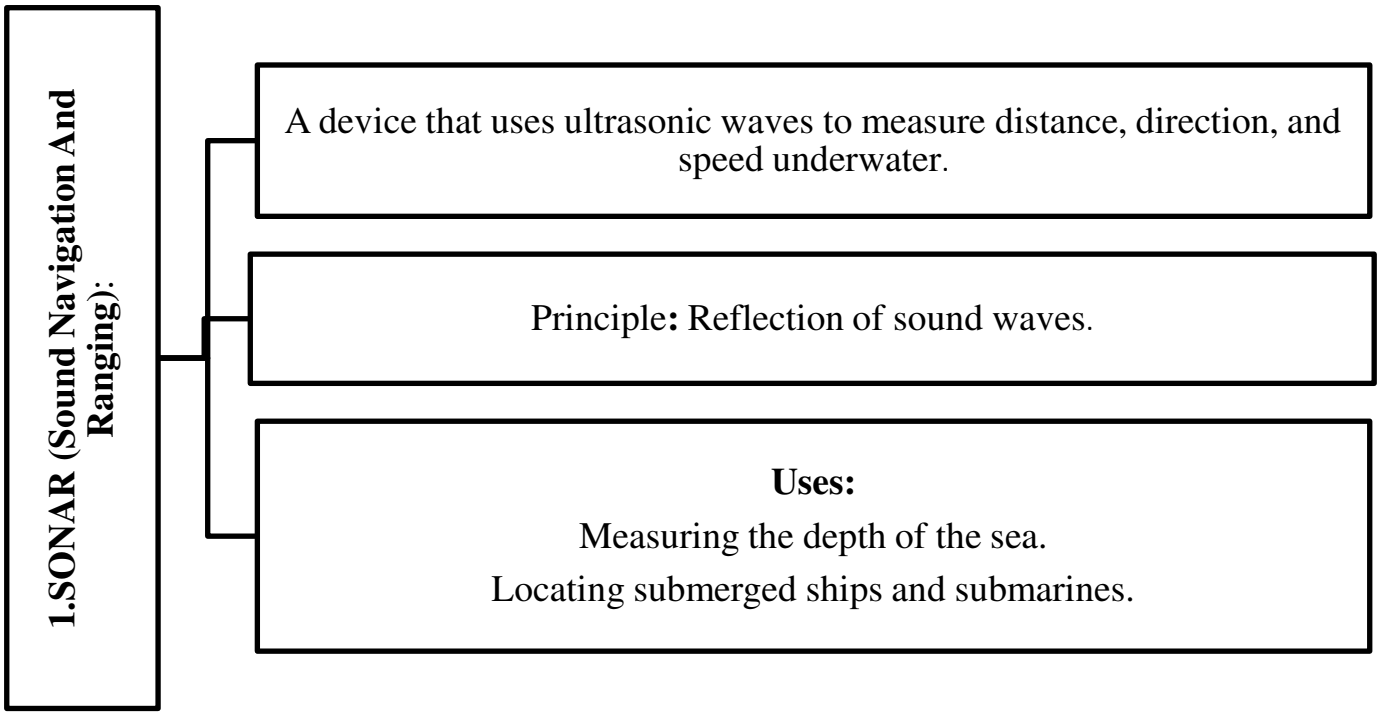
MUST DO QUESTIONS

Q1. What is the unit of loudness of sound?
Ans. Decibel (dB)
Q2. Why can't we hear each other on the moon?
Ans. Due to the absence of a medium as moon lacks atmosphere.
Q3. What do we use to recognize the voice of our friend?
Ans. Pitch
Q4. What type of sound waves are produced before the main tremors of an earthquake?
Ans Infrasonic waves.
Q5. Why are several holes made perpendicular to the side surface of a flute?
Ans; These holes are made perpendicular to the pipe of the flute so that different sounds can be produced by covering them with fingers.
Q6. The time period of a sound wave is 0.05 s. What will be its frequency?
Ans. Frequency (n) = $\frac{1}{T}$

$= \frac{1}{0.05} = \frac{100}{5} = 20$ Hz.

Frequency (n) = 20 Hz.

Use of Waves in Communication Devices

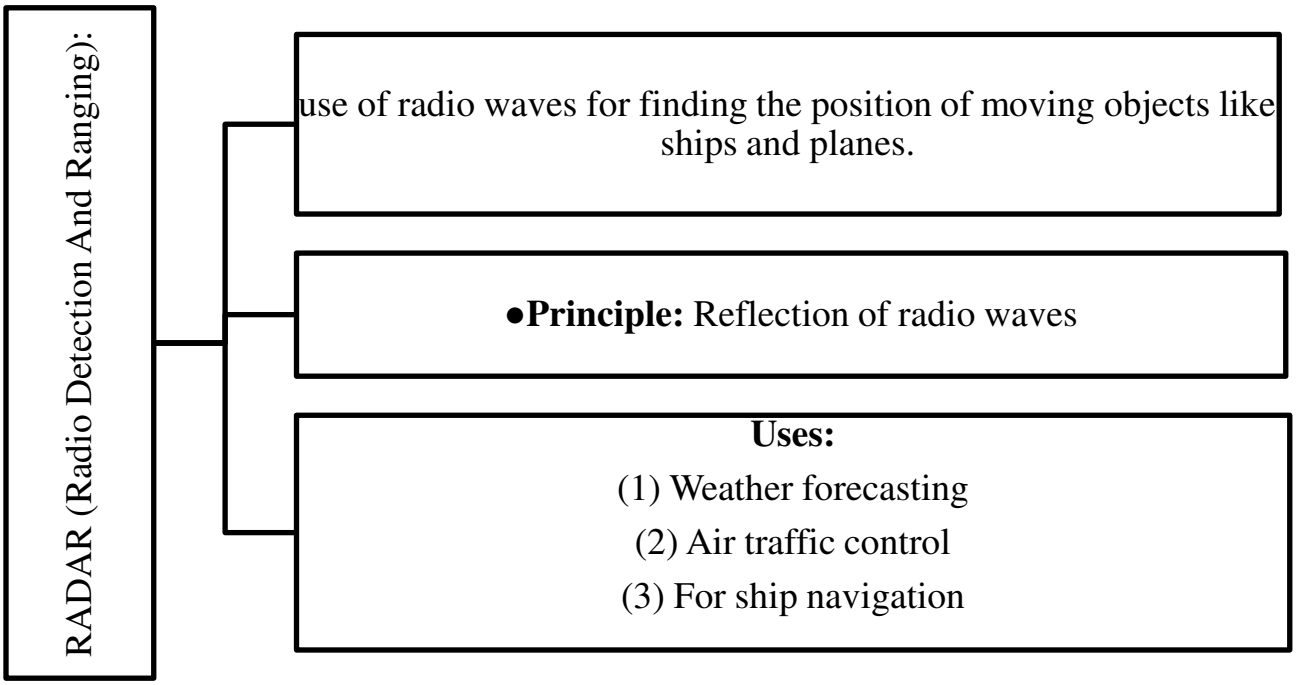


Important Components of SONAR:

i) **Transmitter** - It consists of a signal generator, power amplifier, and a transducer.
ii) Detector - A signal detector or a group of many signal detectors.

$$d = 1/2\ vt$$

v= Speed of sound
d= Distance covered by the wave
t = Time interval between transmission and detection



Important Components of RADAR:

(i)Pulse Generator (ii)Duplexer (iii)Receiver (iv)Display

Necessity of Communication:

i) Exchange of ideas
ii) For efficiency in work
iii) To impart information

Various Types of Communication Systems:

(1) Microphone and Speaker
(2) Telephone
(3) Satellite, Computer, and Internet in Communication
(4)HAM

MUST DO QUESTIONS

Q1. What is the most suitable medium for radar?
(a) Gas (b) Solid (c) Liquid (d) None of these
Ans: (a) Gas

Q 2. To increase the loudness of a mobile phone's ringtone, the frequency of the ringtone:
(a) Increases (b) Decreases
(c) Remains the same (d) Can't be determined
Ans: (c) Remains the same.

Q 3. Fill in the blanks:

a. The_____of a sound wave determines the loudness of the sound.
b. _____ waves are used in SONAR, while _____ waves are used in Radar.
c. When lightning strikes, we first see _____ and then hear the.

Ans: a. Amplitude . b. Ultrasonic, Radio c. Light, Sound

Q.4. List some uses of satellites.
Ans. Artificial satellites are used in communication, mapping of the Earth, studying geographical components, and astronomy.

Q3. Give three examples of devices in which microphones or speakers or both are used simultaneously?
Ans. In the speaking part of a telephone, a microphone is installed, and a speaker is installed at the other end. Speaker in radio and television.

Q4. Why is SONAR better than radar in water?
Ans. Because sonar's sound waves travel farther and more efficient in water than radar's radio wave its use is much better in water.

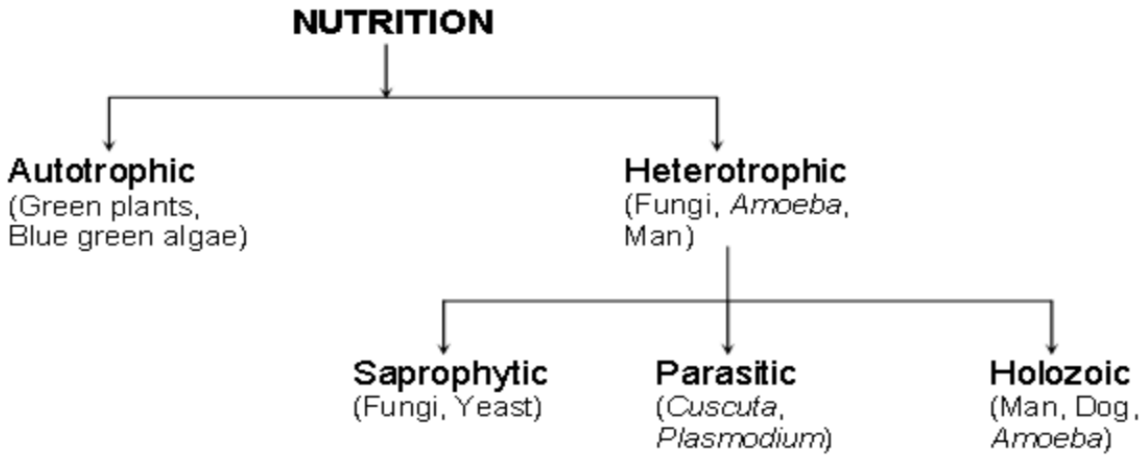
Q5. How is Active SONAR different from Passive SONAR?
Ans.

Active SONAR	Passive SONAR
Sends out sound waves itself and receives information about objects by listening to the returning waves.	Does not send out any sound waves itself; only listens to the sounds of others.
Use → In exploration and mapping.	Use → In espionage and surveillance.

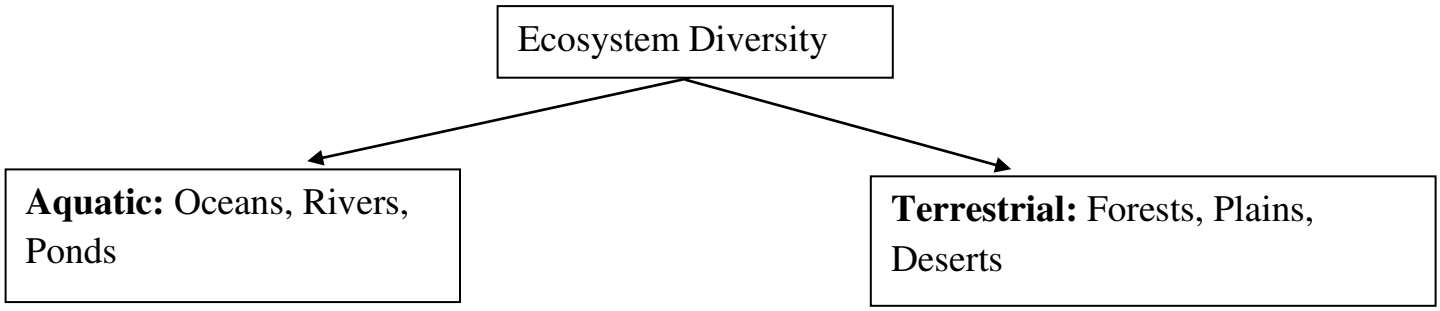
Chapter 19
Biodiversity and its Classification

Biodiversity: The immense variety of life on Earth for example**:** From single-celled organisms like bacteria to complex organisms made of billions of cells.

Diversity of Organisms based on Nutrition: -



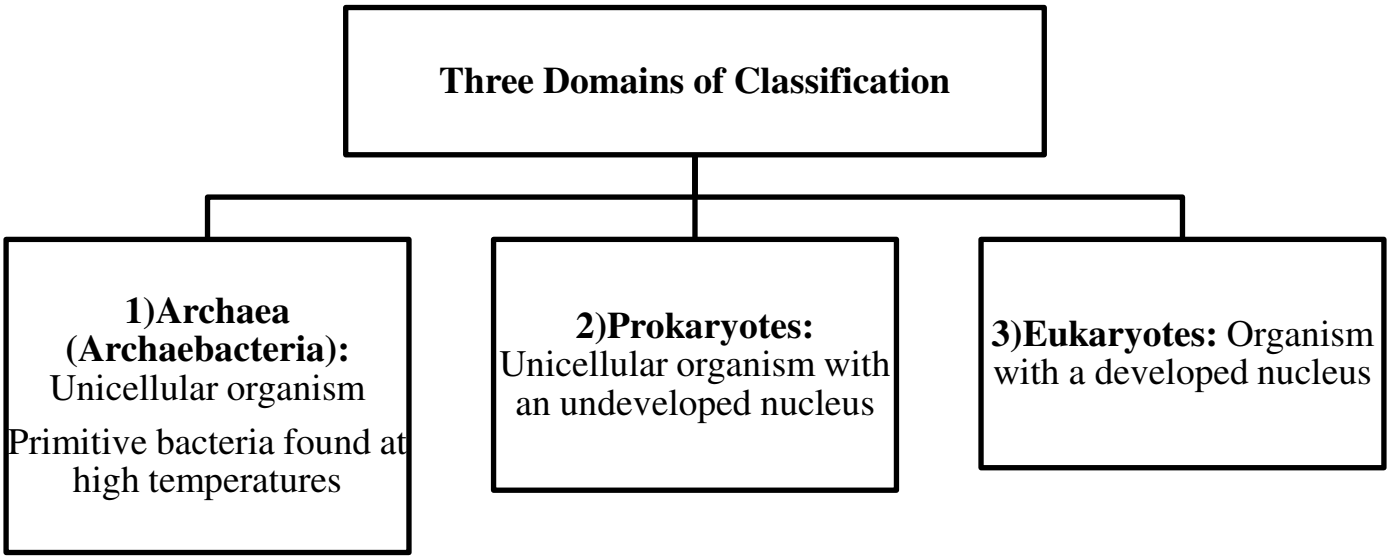
Levels of Biodiversity: Ecosystem Diversity:



- **Species Diversity:** Different species of organisms in a geographical area.
- **Genetic Diversity:** Diversity in the characteristics of a specific organism controlled by genes.
- **Hotspot**: Regions of the world where various types of organisms are found.
- **Examples:** Western Ghats, North-Eastern Region (India)

Naming and Classification of Organisms

- Dividing organisms based on their characteristics for study.
- This shows the evolutionary relationship between organisms.
- **Taxonomy:** The science of classification.



Five Kingdoms of Life – Whittaker

Five Kingdom Classification

Characteristics	Monera	Protista	Fungi	Plantae	Animalia
Cell Type	Unicellular, Prokaryotic.	Unicellular, Eukaryotic.	Multicellular, Non-green and Eukaryotic..	Multicellular, Eukaryotic.	Multicellular, Eukaryotic.
Nucleus	Absent	Present	Present	Present	Present
Body Organisation	Cellular Level of Organisation	Cellular Level of Organisation	Multicellular with loose tissue.	Tissue Level & Organ Level.	Tissue, organ and organ system
Mode of Nutrition	Auto (or) Heterotrophic	Auto (or) Heterotrophic	Saprophytic, Parasitic some time symbiotic	Autotrophic	Heterotrophic
Example	Bacteria and Blue green algae	Spirogyra and Chlamydomo-nas	Rhizopus and Agaricus	Herb, Shrub and Trees.	Fish, Frog, Crocodile, Birds and human being.

Nomenclature of Organisms - Carolus Linnaeus

- In scientific nomenclature, the name of an organism consists of its genus and species.
- The scientific name is written in italics or underlined.
- Ex- The scientific name of Mango is *Mangifera indica.*

MUST DO QUESTIONS

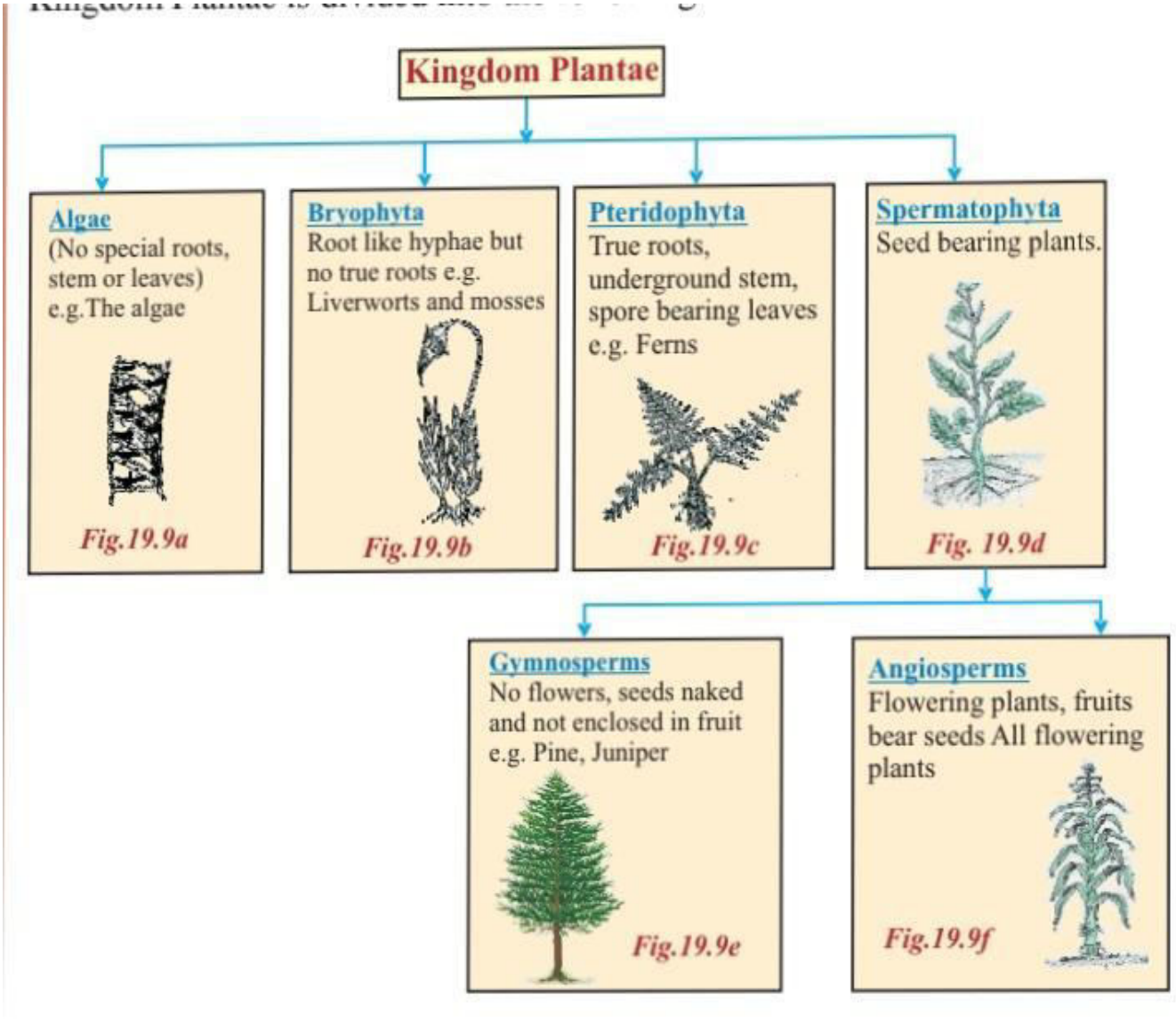
Q.1 Which of the following is an example of a Chemotropic?

a) Yeast b) Animals c) Bacteria d) Fungi

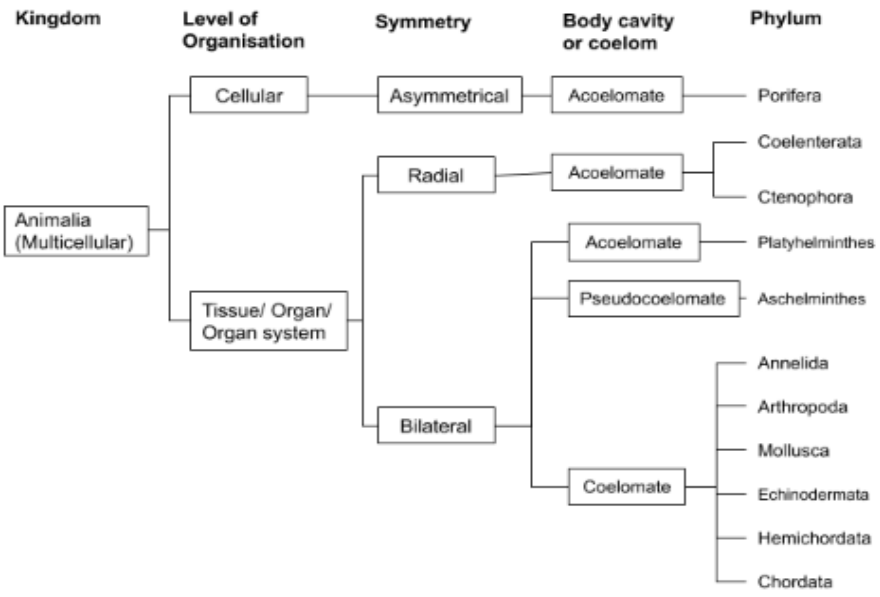
Ans: c) Bacteria

Q.2 What is the study of classification called?
a) Anatomy b) Taxonomy c) Phycology d) Mycology
Ans: b) Taxonomy
Q3 Write the scientific name of man.
Ans: *Homo sapiens*
Q4 Define the following:
(i) Species (ii) Biosphere
Ans: i) Species - Populations that interbreed
ii) Biosphere - Part of Earth where life can exist.

Plant and Animal Kingdom:Classification of Plants



Animal kingdom:-



Need of Biodiversity Conservation:-

i) To maintain the balance of nature.
ii) All living beings depend on each other for various functions.
iii) Prevent destruction of habitats of living beings.

MUST DO QUESTIONS

Q1 Which of the following produces seeds?
a) Pteridophytes b) Bryophytes c) Algae d) Gymnosperms
Ans: d) Gymnosperms

Q2 Which of the following are characteristics of an earthworm?
a) Hermaphrodite and self-fertilization c) Sexual and cross-fertilization
b) Hermaphrodite and cross-fertilization d) None of these
Ans: b) Hermaphrodite and cross-fertilization

Q3 What are amphibians of the plant and animal kingdom called? Write examples.
Ans: **Plant Kingdom:** Bryophytes **Animal Kingdom:** Frog

Q4 Write the scientific names of the following:
i) Frog ii) China Roseiii) Cat iv) Onion
Ans:i) *Rana tigrina* ii) *Hibiscus rosa-sinensis*
iii) *Felis domestica* *iv) Allium cepa*

Q5 Write the name of the phylum to which the following are related:
Earthworm, Sponge, Jellyfish, Pigeon, Butterfly, Starfish, Tapeworm, Roundworm
Ans: i) Earthworm – Annelida ii) Sponge – Porifera iii) Jellyfish – Cnidaria
iv) Pigeon – Chordata v) Butterfly – Arthropoda vi) Starfish – Echinodermata
vii) Tapeworm – Platyhelminthes viii) Roundworm - Aschelminthes

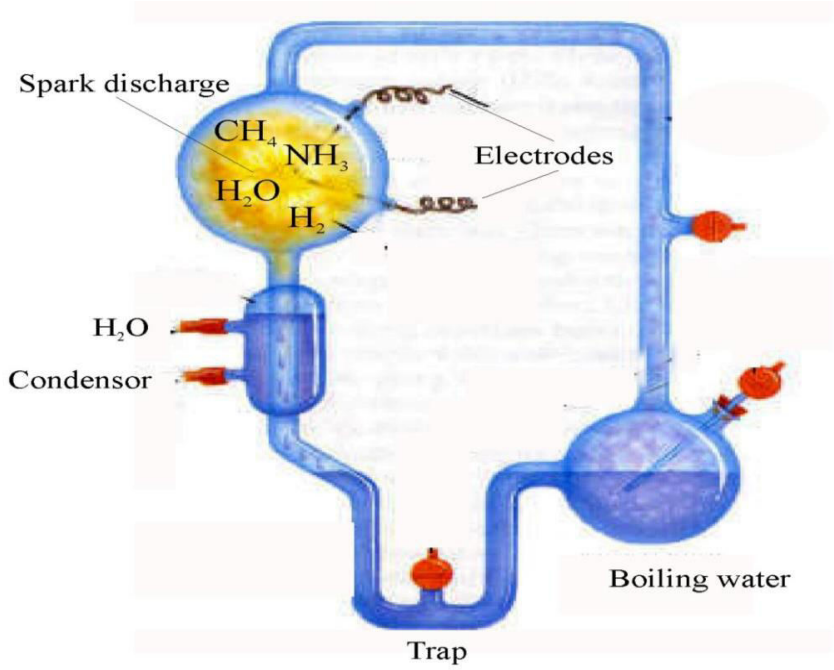
Chapter -20
History of Life on Earth

Physical conditions of the early Earth

- In the beginning, Earth was a sphere of hot gases.
- In the vast universe, Earth is like a grain of sand.

Origin of Life

- Life on Earth originated approximately 4.0 Giga year (1GY=1 Billion years) ago.
- Oparin and Haldane gave their experiments and opinions about the origin of Earth.



Oparin and Haldane's Experience

Beginning of Human Evolution:- 1.5 - 2 million years

Fossils - Remains from the past

Cambrian Explosion: Sudden Organization of various groups of invertebrates on Earth.

Charles Darwin's --Theory of Natural Selection., Traveled on the ship named Beagle,
Famous Book: The Origin of Species

Darwin's theory of Evolution - Theory of Evolution: - The origin of all living beings is due to changes in the first living beings born on Earth. ,

Two important points regarding Darwin's evolution

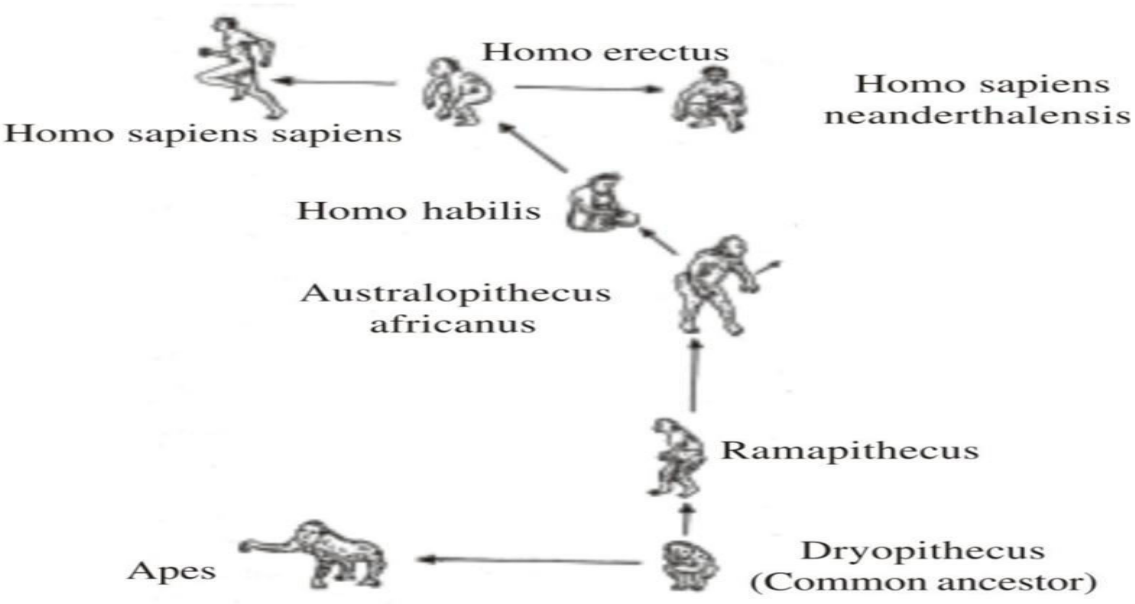
- All living beings are related through ancestry.
- Natural selection is the process that causes variations from ancestors.

Neo-Darwinism

According to this, evolution occurs through natural selection, genetic variation, and population genetics.

Example -1. Among the peppered moths - Typica (light color) and Carbonaria (dark color), only Typica survived. 2. Development of insecticide-resistant mosquitoes.

Stages of Human Evolution include two major steps:-
(1) Walking on two feet (2) A large developing brain



Evolution of humans showing ancestor common to apes and humans

MUST DO QUESTIONS

Q1. Who gave the theory of natural selection?
(a) Lamarck (b) Charles Darwin (c) Carolus Linnaeus (d) Whittaker
Ans: b) Charles Darwin

Q2. What is the development of the gene pool of genetic material called?
(a) Microevolution (b) Macroevolution (c) Racial evolution (d) Human evolution
Ans: a) Microevolution

Q3. Who was Lucy?
Ans: African fossil (Australopithecus)

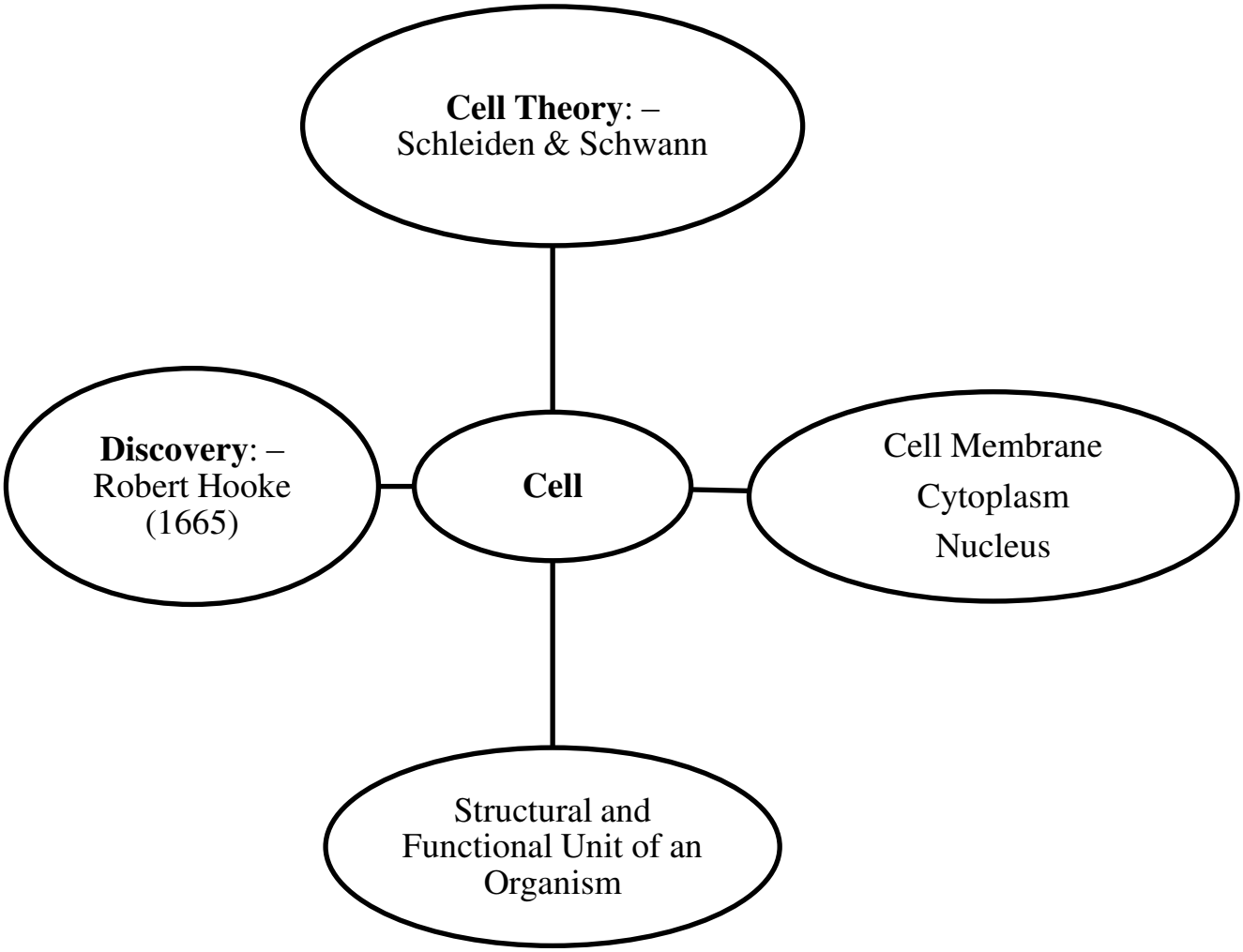
Q4. Write the scientific names of Cro-Magnon and Neanderthal man.
Ans : *Homo sapiens*

Q5. What four important observations did Darwin make during his voyage on the ship named Beagle?
Ans 1. All organisms produce excessive offspring, but not all of them survive.
2. Population remains stable even over a long period.
3. Some variations in the qualities of organisms within a single system are inherited.
4. Some variations are hereditary.

Q.6 Write the name of the oldest ancestor of modern humans.
Ans Australopithecus (Lucy)

Chapter -21
Cell and Tissue – The Building Blocks of Life

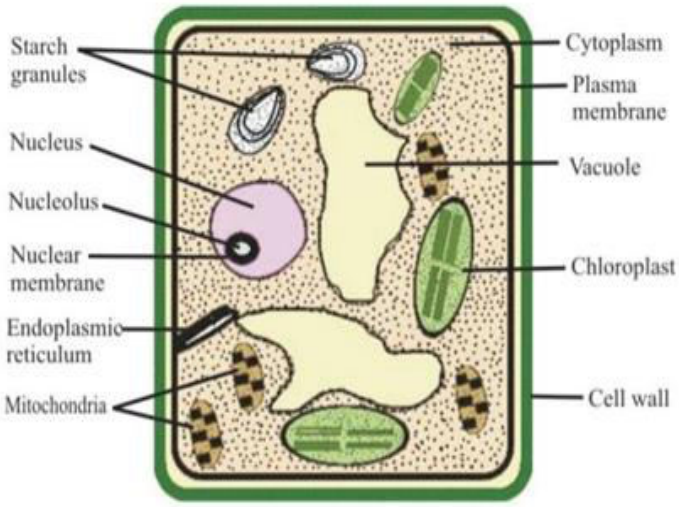
Cell– Structural and Functional Unit of an Organism.

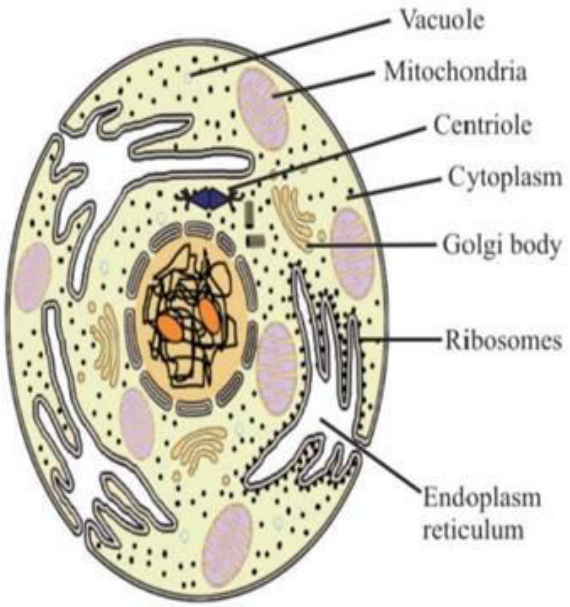


Prokaryotic Cell	**Eukaryotic Cell**
Nucleus is not well-organized Genetic material in cytoplasm Only a few organelles are present Examples: Bacteria, Blue-green algae	Well-organized nucleus Genetic material in nucleus All organelles are present Examples: Fungi, Animals

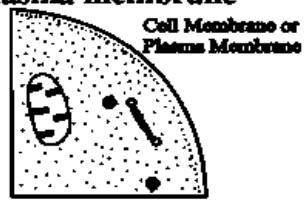
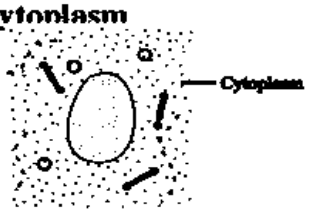
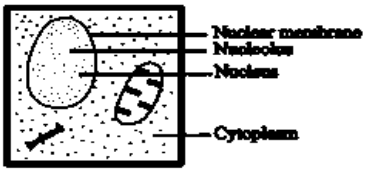
Feature	Plant cell	Animal cell
Size and Shape	Larger in size and rectangular in shape.	Smaller in size and oval in shape.
Cell wall	Cell wall is made up of cellulose.	Cell wall absent.
Vacuoles	Vacuoles are large. In a mature plant cell, usually a single large central vacuole is present.	Vacuoles are mostly absent or if present are small in size and scattered.
Golgi bodies	Golgi bodies are diffused in the plant cells and are called dictyosomes.	Golgi bodies are well-developed and present near nucleus.
Centrosome	Centrosome and centrioles are absent.	Centrosome and centrioles are present.
Plastids	Present	Absent
Storage of reserve food	Reserve food is stored in the form of starch or oil.	Reserve food is stored in the form of glycogen.

Eukaryotic cells:plant and animal cells:





Parts common to both plant and animal cells:

Basic parts	Key features	Functions
Cell Membrane or Plasma membrane 	• A thin delicate membrane enclosing the cell • Forms outermost covering in animal cell and inner to cell wall in plant cell • Selectively permeable.	• Selectively permeable, so allows only selected substances to pass in and out of the cell. • Protects cell from injury. • Maintains shape of cell.
Cytoplasm 	• Translucent, homogeneous, colloidal semi fluid filling the space between plasma membrane and nucleus. • Cell organelles are present in it.	• Helps in manufacture and distribution of substances within the cell and in exchange of materials between different cell organelles.
Nucleus 	• Small ,located in or near the centre of the cytoplasm. • bound by a **nuclear membrane**. • Network of chromosomes present as **chromatin.** • One or more rounded **nucleoli** (*sing.* **Nucleolus**) present in the nucleus.	• Coordinates the activities of the entire cell. • Contains the genetic material or DNA.

Cell organelles found in cytoplasm:		
Endoplasmic reticulum (ER) 	• Irregular network of double membranes in the cytoplasm. • Ribosomes may be present on endoplasmic reticulum.	• Gives rigidity to the cell. • Helps in the synthesis and transport of various proteins and fats within the cell to the outside.

MUST DO QUESTIONS

Q 1.What causes the orange color of carrots?

a) Chloroplast b) Chromoplast c) Carotenoid d) Leucoplast

Ans.(b)Chromoplast

Q2. Which is an example of a prokaryotic cell?

a) Animal b) Protozoa c) Fungi d) Blue-green algae

Ans: (d) Blue-green algae

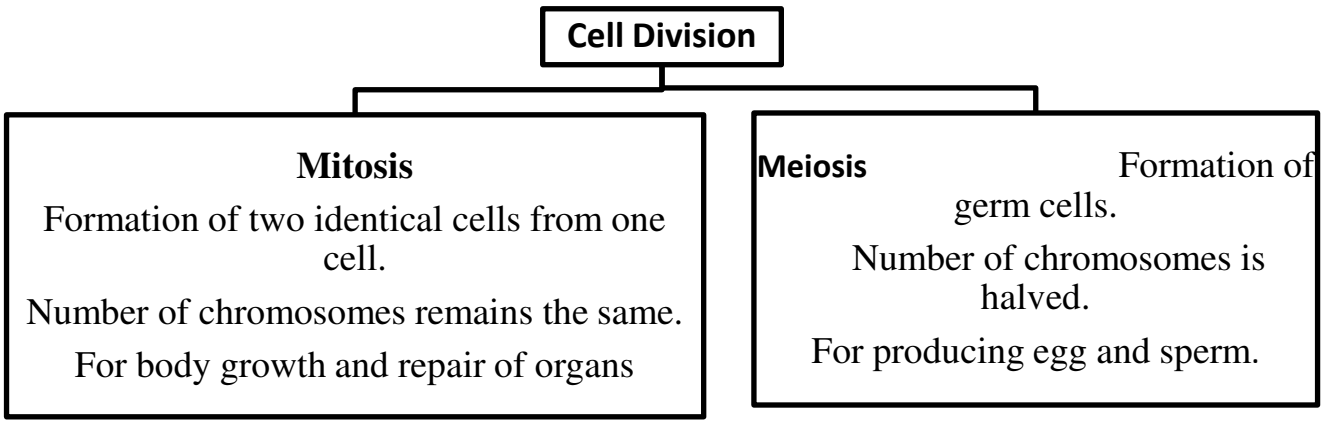
Q3. Name the part of the cell which:
(i) provides rigidity to the plant cell _____
(ii) bounds the semi-fluid content of the cell. _____
(iii) helps in intra-cellular distribution of molecules, enzymes and nutrients within the cell._____
Ans: (i) Cell wall (ii) Plasma membrane (iii) Cytoplasm

Q4. Match the following items in Column A with those in Column B.

Column A.	Column B
1. Master of the cell	a. chloroplast
2. Powerhouse of the cell.	b. endoplasmic reticulum
3. Protein factories of the cell	c. mitochondria
4. Kitchen of the cell	d. nucleus
5. Circulatory system of the cell	e. ribosome

Ans:1. (d) 2. (c) 3(e) 4. (a) 5 (b)
Q5. State the main function of lysosomes.
Ans. To destroy damaged cells and digest them, to clean the cell.

Cell Division (Formation of new cells:-

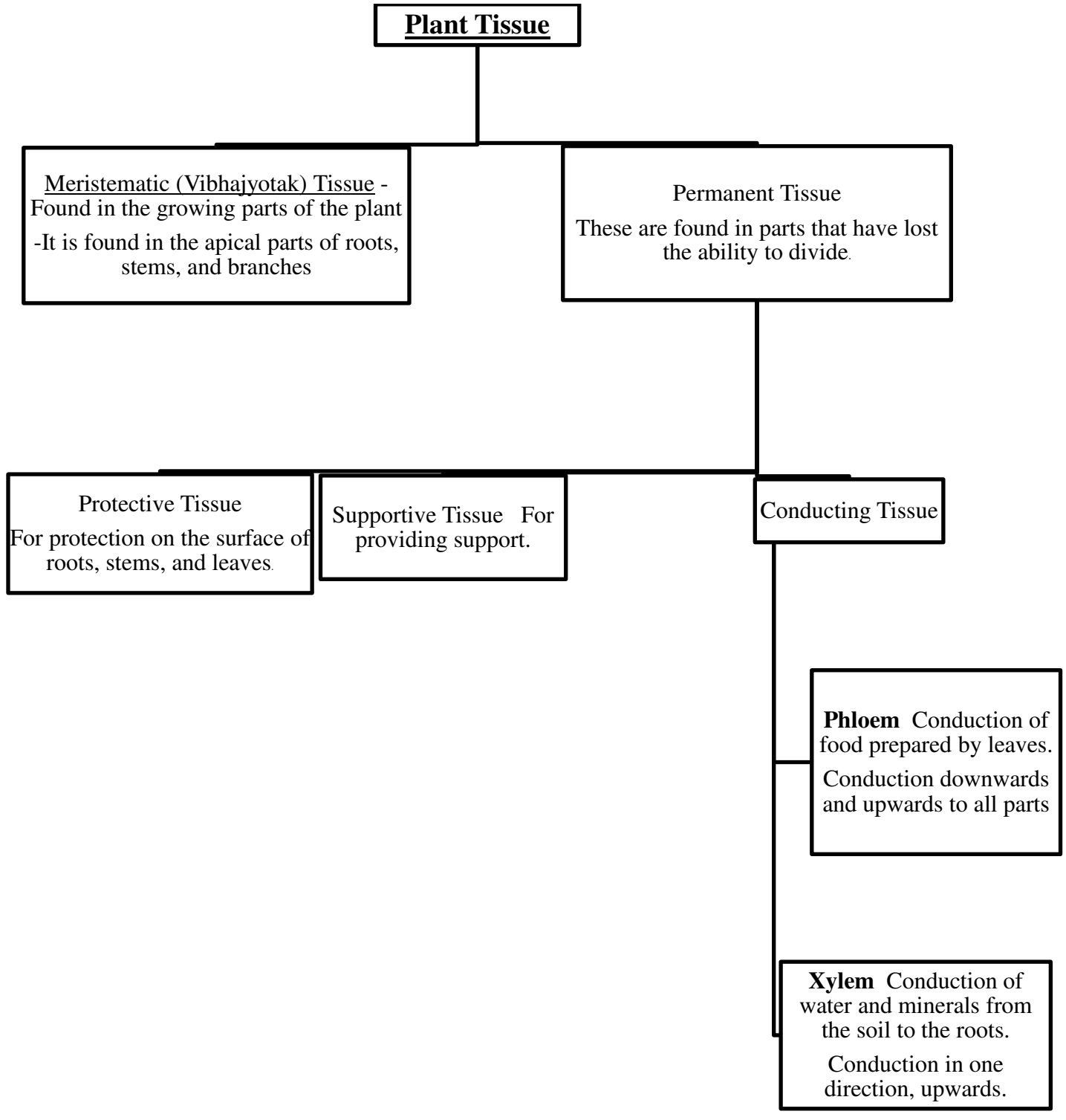


MUST DO QUESTIONS

Q1.Write two characteristics of Mitosis.
Ans.:i) This division helps in healing wounds and repairing damaged parts.
(iii) Asexual reproduction occurs in unicellular organisms like Amoeba.

Q2. Write the importance of meiotic division.
Ans:(i)In animals, production of sperm and egg from testes and ovaries.
(ii)In plants, production of egg and pollen from ovary.

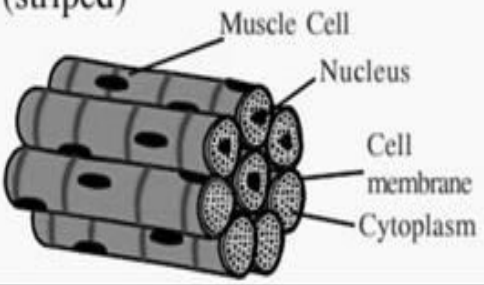
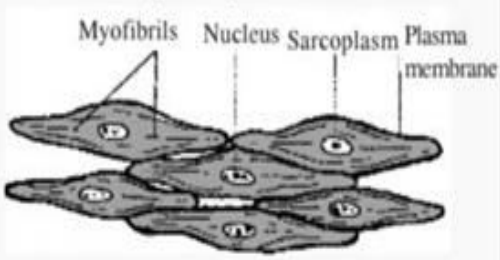
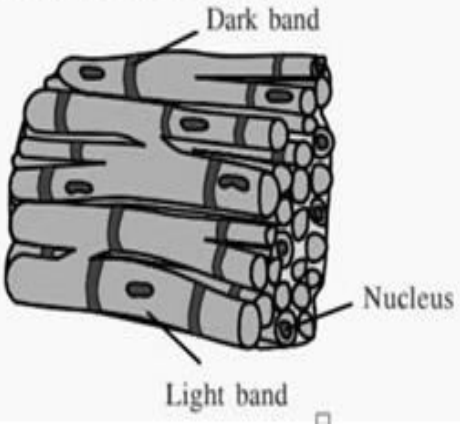
Tissue- A group of cells whose function and origin are similar.



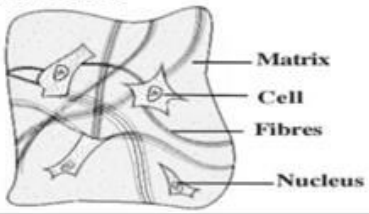
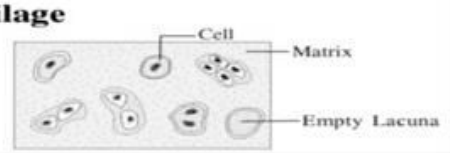
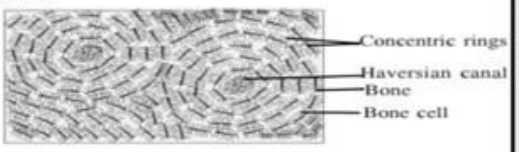
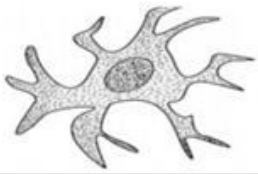
Animal Tissues

Epithelium Nervous Connective Muscular

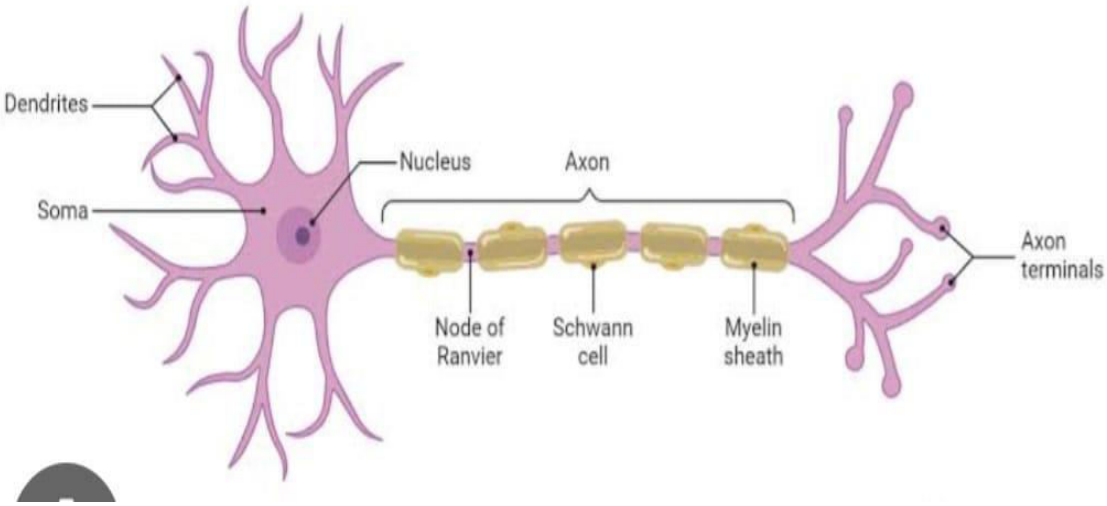
Types of Muscular tissue:-

Type	Nature of muscle	Example/location	Function
Striated or striped Their contraction is under ones control so called voluntary muscles	Multinucleated cells, show bundles of light and dark bands (striped)  	Muscles of arms, legs, face, neck, etc.	Cause movements that are under the control of our will
Unstriped or unstriated Also called smooth muscles as they lack transverse striations. Movement not under our will and hence called involuntary muscles.	Slender tapering cells  	Wall of blood vessels, urinary bladder, uterus, etc. muscles of alimentary canal contract to push that show peristalsis or food down.	Movement of the parts or contents of the part not under the control of our will.
Cardiac muscles (heart muscles) Exclusively present in the heart. They contract and relax rapidly, rhythmically and tirelessly, contracting and relaxing endlessly from early embryonic stage until death.	Striped seen on muscle fibre, short and branched, joined by intercalated discs.  	Heart muscles.	Contract and relax on their own.

Types of connective tissues:-

Type	Nature of tissue	Example/location	Function
Fibrous tissue 	Cells usually separated from one another by intercellular spaces. This space is filled with solid or liquid material.	Tendon Ligament Adipose (fat) tissue	Connect muscle to bone; connect two bones; packing and binding of most organs; store fat
Cartilage 	Thick: semi-transparent and elastic.	In nose, ears, walls of windpipe and at ends of long bones	Provide support and strength
Bone  	Hard and porous; consists of both living cells and rigid mass of non-living cells.	Ribs, thigh bone, backbone, etc.	Provide support and strength; help in movement
Fluid connective tissue	Contains both cellular and fluid parts	Blood and lymph	Transport of gases and chemical substances; protection from disease- causing germs

Nervous Tissue



Stem Cell Technology (Mother Cells)

- These are undifferentiated cells that have the ability to undergo mitotic division.
- These stem cells are found in the embryo, umbilical cord, and adults.

Uses of Stem Cells:

- In the replacement of damaged tissues
- In the study of human development
- In the treatment of certain cancers
- Gene therapy

MUST DO QUESTIONS

Q1. Bone and blood are example of _____ tissue?
a) Vascular b) Nervous c) Connective d) Muscular
Ans:(c) Connective

Q2. What is the outermost layer of the skin made of?
Ans: Squamous Epithelium

Q3. Write the functions of cardiac muscles.
Ans: To contract and relax the heart.

Q4.Write the functions of ligaments and tendons.
Ans: Ligament: Connects one bone to another bone.
Tendon: Connects muscles to bones.

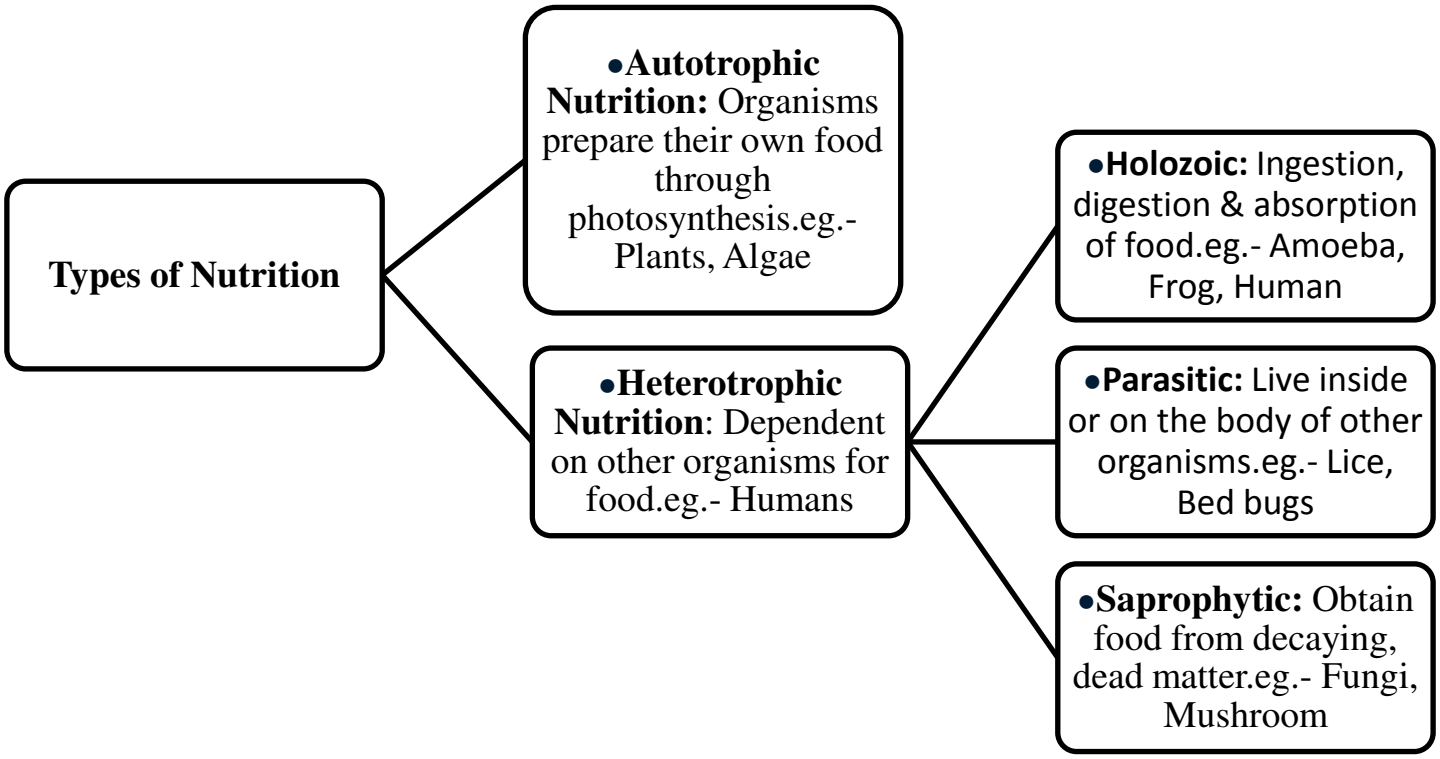
Q5.Write the names of the parts of a nerve cell.
Ans: i) Cell body / Cyton ii) Dendrites iii) Axon iv) Axon terminals

Q6 .Explain the complete difference between cytoplasm and protoplasm.
Ans. Cytoplasm: The living substance between the nucleus and the cell membrane is called cytoplasm.
Protoplasm: The entire living substance of the cell is called protoplasm.

Q7. Write the names of the tissues found in these plants :
(a) In the growing parts of the plant: tissue_____
(b) At the root tip_____
(c) In vascular bundles_____
(d) In the inner lining of the intestine: _____
(e) In the combination of nearby muscle fibers: _____
Ans: (a)Meristematic (b)Meristematic tissue (c)Xylem, Phloem
(d)Epithelial tissue (e)Connective tissue

Chapter-22
Biological Processes - Nutrition, Transport, Respiration & Excretion

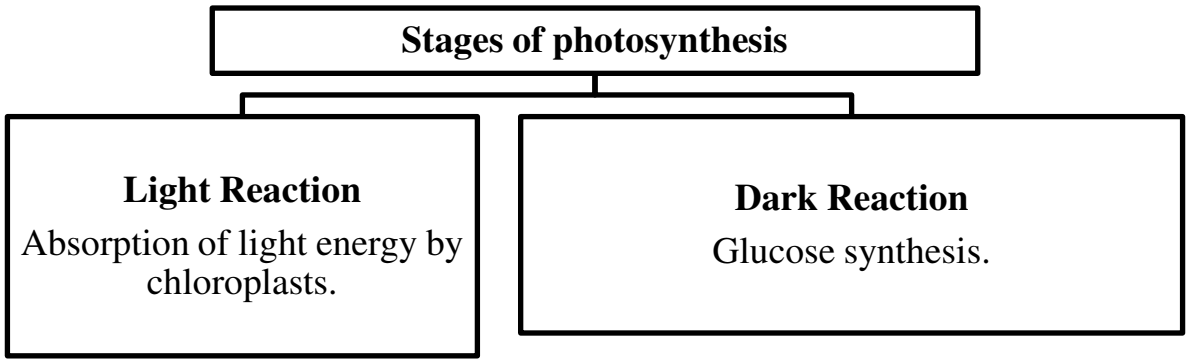
Nutrition: The process of ingesting food, digestion, absorption and its utilization for the maintenance of the body.



Photosynthesis: The process of conversion of solar energy into chemical energy.

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

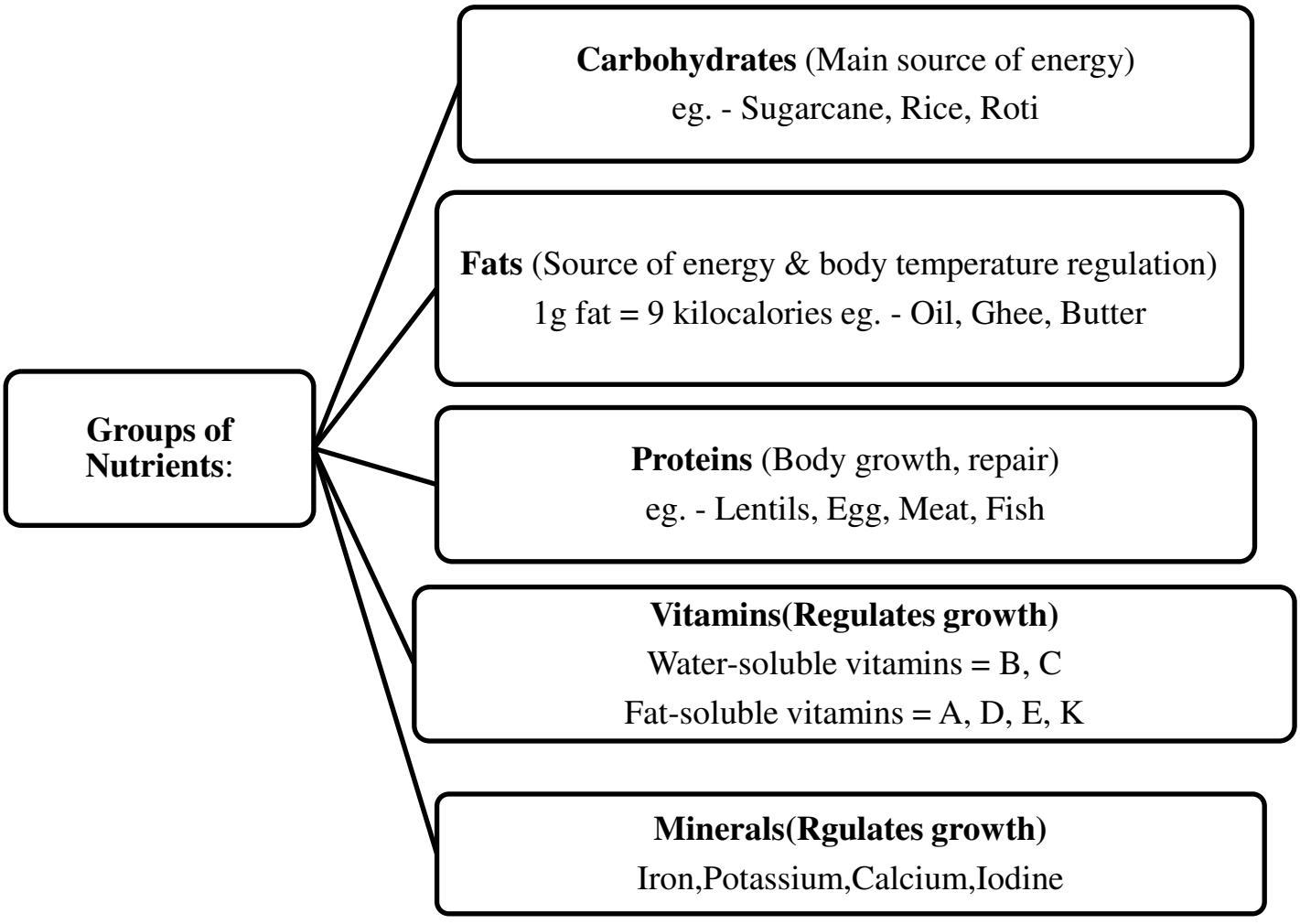
Carbon dioxide Water Glucose Water Oxygen



MUST DO QUESTIONS:

Q1Why does the body need food?
(a) Energy gain (b) Physical growth
(c) Enzyme and hormone production (d) All of the above
Ans: (d) All of the above
Q2. Which are the essential components for photosynthesis?
(a) Chlorophyll (b) Sunlight (c) Carbon dioxide and water (d) All of the above
Ans: (d) All of the above
Q3. Explain the importance of photosynthesis.
Ans:(i) For food for living beings (plants and animals)
(ii) For balancing carbon dioxide (iii) For oxygen production

Nutrition in Humans



Types of Vitamins, source and their deficiencies: -

Vitamin	Sources	Functions	Deficiency disease
A	Milk, carrots, tomatoes, egg.	keeps eyes and skin healthy.	Night blindness (Poor vision in dim light)
B_1	Milk, peas, cereals, green vegetables, meat	Growth and development	Beri-beri (a disease which affects the nervous system)
B_{12}	Liver, eggs, milk, fish	Form red blood corpuscles	Anaemia (deficiency of red blood corpuscles)
C	Amla, tomatoes, citrus fruits, water chestnut(Singhara)	Healthy growth, strong blood vessels	Scurvy (a disease in which gums swell up and bleed)
D	Sunlight, milk, whole grains and vegetables	Form strong bones and teeth	Rickets (a disease which affects bones in children making them soft and deformed)
E	Vegetable oils, milk, butter, whole grains, vegetables	Protects cell membranes	Affects fertility
K	Green vegetables like spinach and cabbage	Helps in the clotting of blood	Excessive bleeding from wounds

Some minerals, sources and their functions: -

Minerals	Sources	Functions
Iron	Green leafy vegetables, turnip, sprouts, yeast, liver, eggs, meat	Forms haemoglobin,
Calcium	Milk and milk products	Forms strong bones and teeth, and needed for muscle movement, clotting of blood
Potassium	Green and yellow vegetables	For growth and keeping osmotic balance of cells and blood
Iodine	Sea food, iodized salt	Body metabolism, development of brain

vi) **Water:** - 65-70% of the body, helpful in body temperature control and germicidal results.
vii)**Raw vegetables**: - Helpful in digestion of food.
Balanced diet: A diet in which all nutrients - carbohydrates, protein, vitamins, minerals, water and fiber are in sufficient quantity as per the body need.

MUST DO QUESTIONS

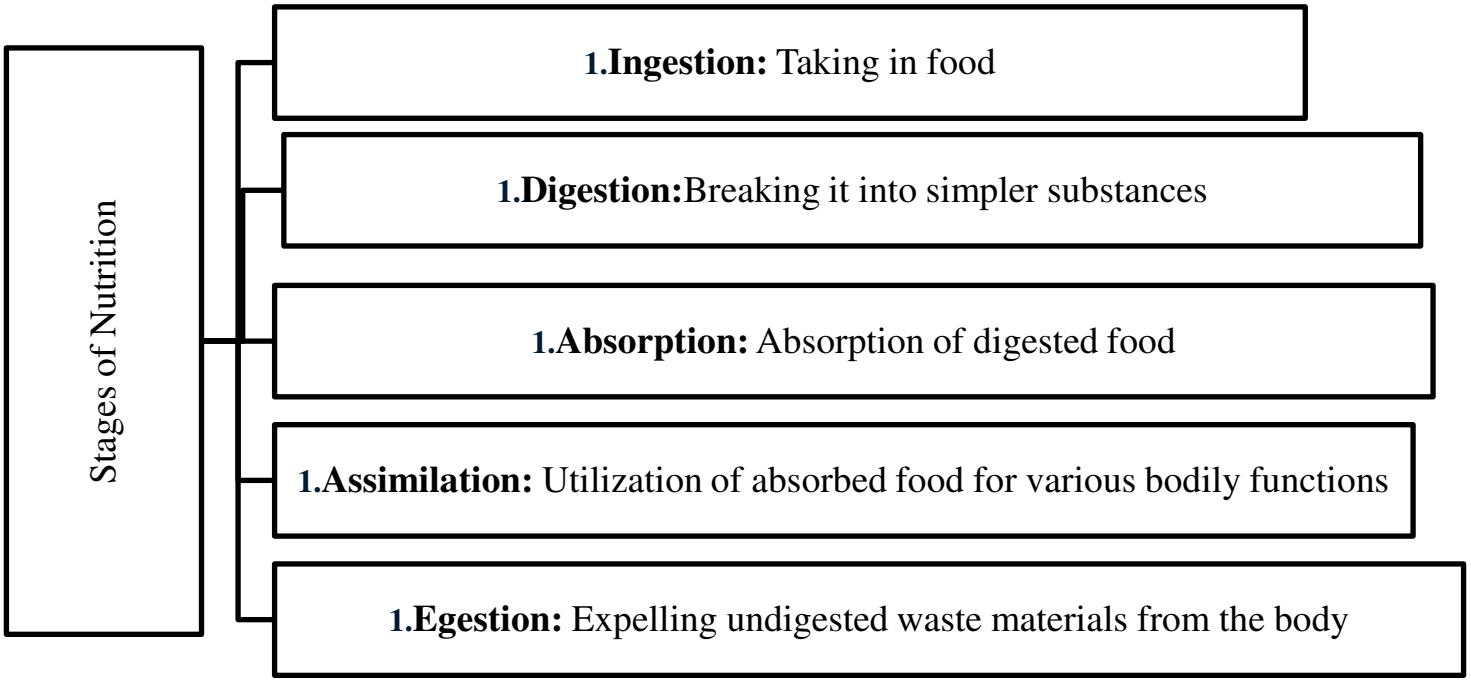
Q1) Which of the following vitamin is water soluble?
(a) Vitamin A (b) Vitamin D (c) Vitamin C (d) Vitamin K
Ans: (c) Vitamin-C

Q2) Which disease is caused by the deficiency of Vitamin D?
(a) Beriberi (b) Rickets (c) Scurvy (d) Night blindness
Ans: (b) Rickets

Q3) Night blindness is caused by the deficiency of which vitamin? How can it be prevented?
Ans: Due to deficiency of Vitamin A. To prevent it - include milk, carrots, tomatoes, eggs in your diet.

Q4) How can the problem of increasing obesity be reduced?
Ans: By reducing excessive fatty food.

Digestion in Humans:-
Conversion of complex substances into simpler substances.



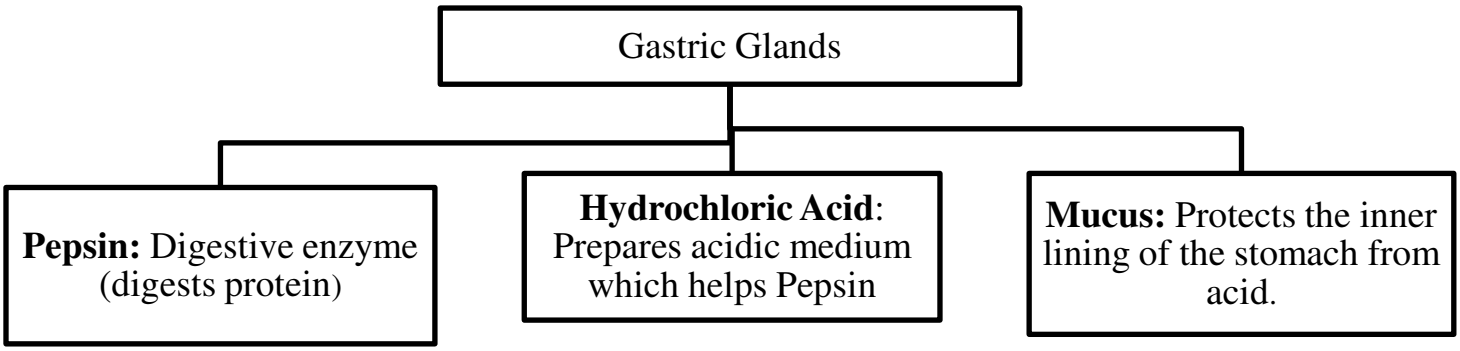
Stages of Nutrition in Humans: The alimentary canal is a long tube primarily extending from the mouth to the anus.

1.Ingestion

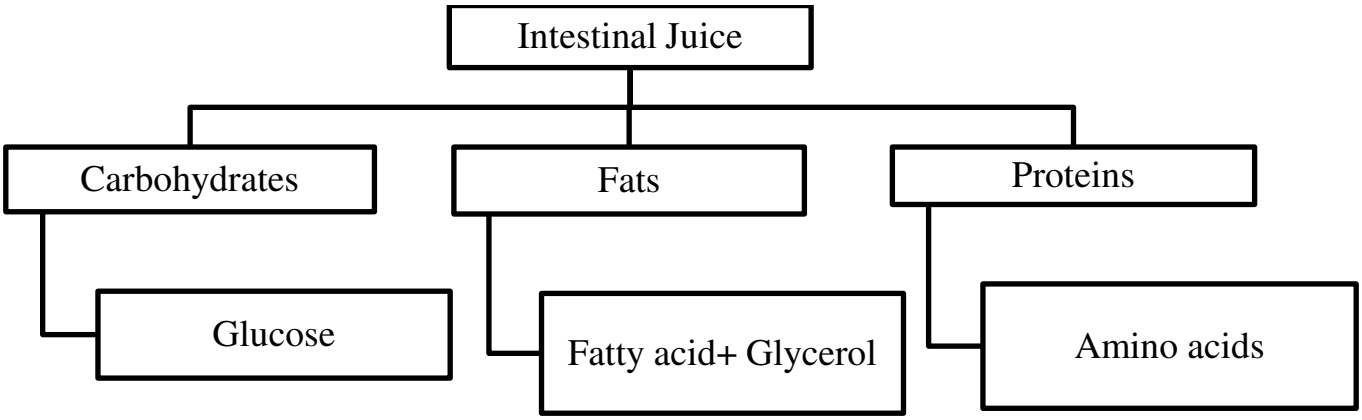
Mouth: Ingestion of food
Teeth: Chewing of food
Tongue: Thorough mixing of food with saliva
Salivary juice: The juice secreted by the salivary gland is called salivary juice or saliva
Starch: Starch using salivary amylase is converted to sugar

2. Oesophagus:-Food is transported from the mouth to the stomach by the peristaltic movement of the esophagus (Contraction and relaxation of esophageal muscles).

3.Stomach:-



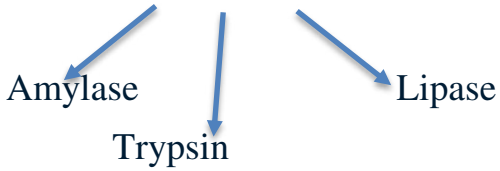
4.Small Intestine: -i) Digestion in small intestine.



ii) Receives secretion from liver and pancreas

a)Liver Bile juice → Bile salts → Fat(large globules) Emulsification

b) Pancreas → Pancreatic juice (secrets enzymes)



Protein $\xrightarrow{\text{Trypsin}}$ Peptones

Fats $\xrightarrow{\text{Lipase}}$ Fatty acids + Glycerol

Starch $\xrightarrow{\text{Amylase}}$ Glucose

iii) Villi → Finger like projections on the inner surface that increase the surface area for absorption.

5.Large Intestine- Water absorption, Waste Products are expelled from the body through the anus.

MUST DO QUESTIONS

Q1. Which enzyme is present in human saliva?

(A) Pepsin (B) Amylase (C) Trypsin (D) Cellulase

Ans: Amylase

Q2. In which part of the alimentary canal does the complete digestion of food take place?

(A) Stomach (B) Small Intestine (C) Large Intestine D) Small Intestine

Ans: (B)Small Intestine

Q3. In what form does the breakdown of fat occur?

Ans: Fat breakdown into Fatty acids + Glycerol

Q4. What is the function of the liver and pancreas in the digestion of starch, protein, and fat?

Ans:i)Liver → Bile juice → Bile salts

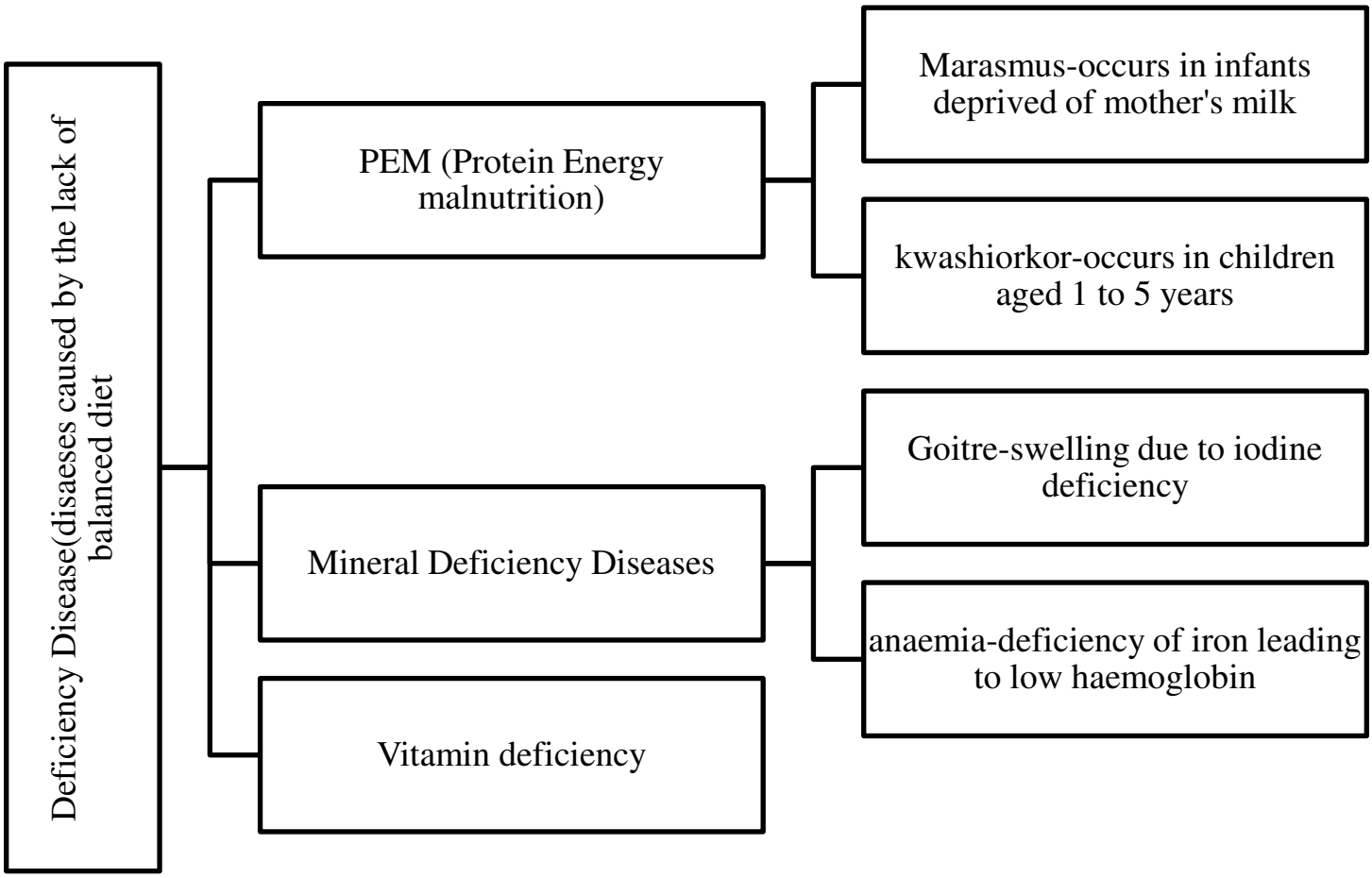
Breaks down large fat globules → Emulsification → Small fat globules

ii) Pancreas:Protein: Trypsin → Peptones

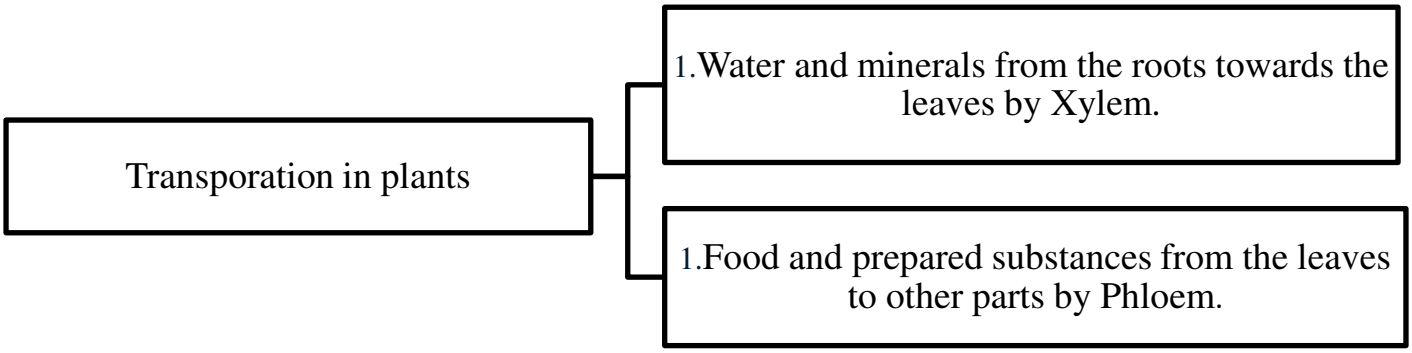
Fat: Lipase → Fatty acids + Glycerol

Starch: Amylase → Glucose

Deficiency Diseases:-

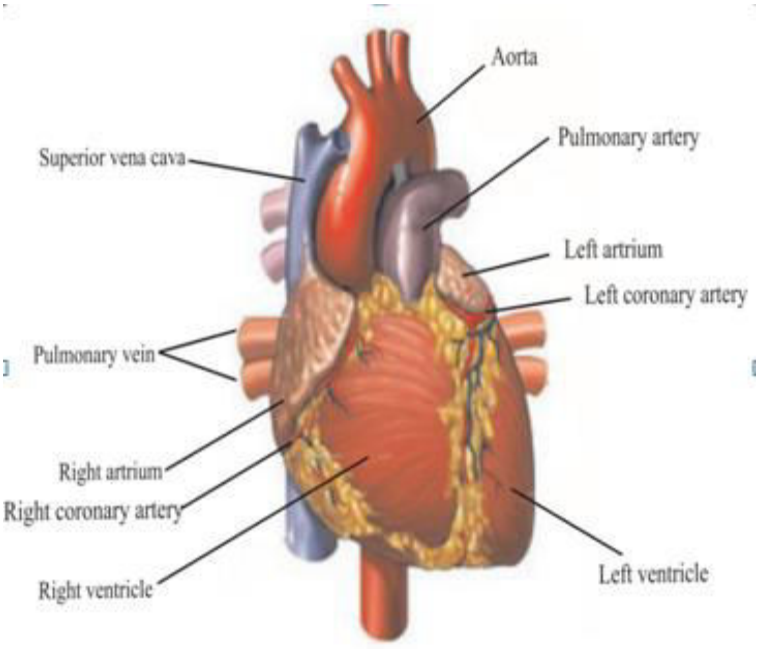


Transportation



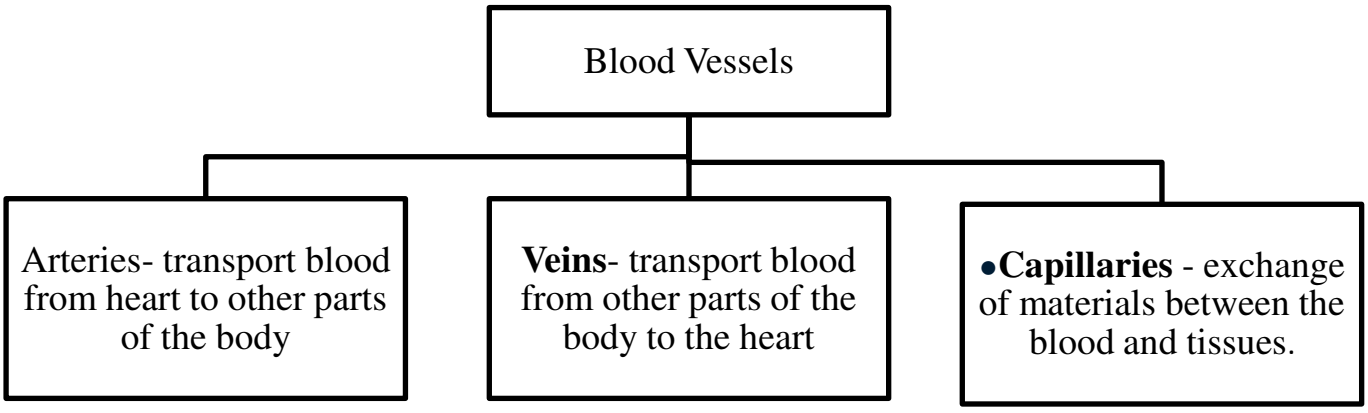
Transportation of Substances in Humans:- 1. Human Heart:

- Heartbeat - Continuous contraction and relaxation of the heart.
- Normal heartbeat: 72 beats/min.
- ECG (Electrocardiogram)- Checks for abnormalities of the heart

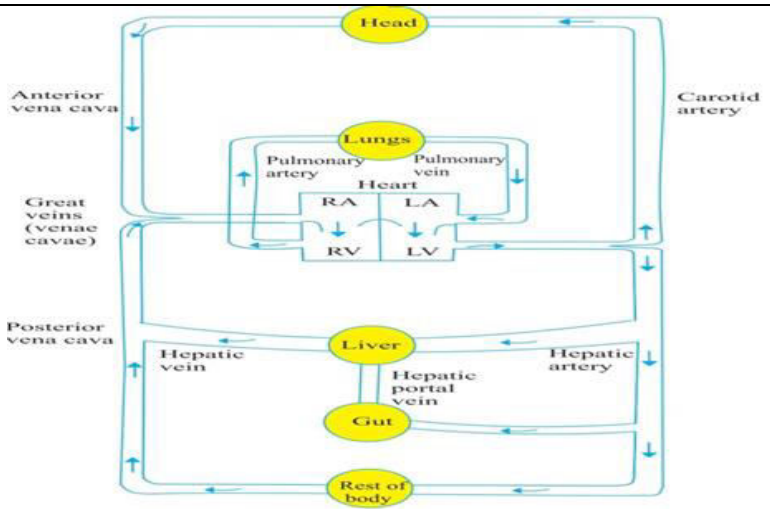


Human Heart

2.Blood Vessels:



3.Blood Pressure

Blood pressure - The force exerted by blood against the walls of the arteries.	
Normal blood pressure: 120/80 mmHg.	Human circulatory System
Sphygmomanometer - Instrument for measuring blood pressure.	

4.Circulatory Medium:

Blood-LIquid connective Tissue

- **Red Blood Cells:** pigment-Haemoglobin, transports oxygen.
- **White Blood Cells:** Protect against infection; Antibody formation.
- **Blood Platelets:** Blood clotting.

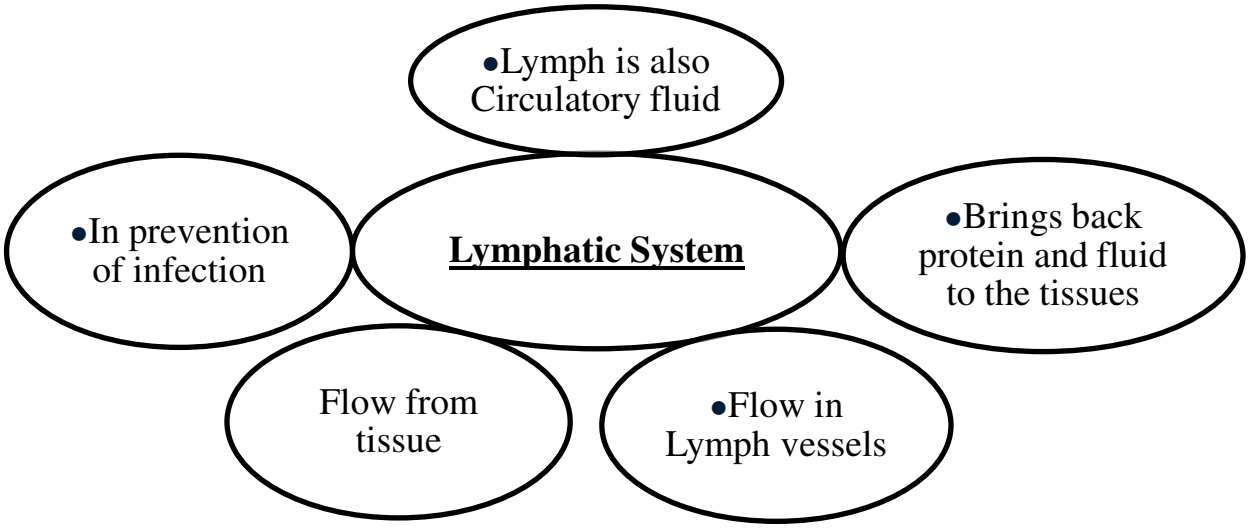
5.Human Blood Groups: ABO System:- A, B, AB, O

Human blood groups and their Compatibility:

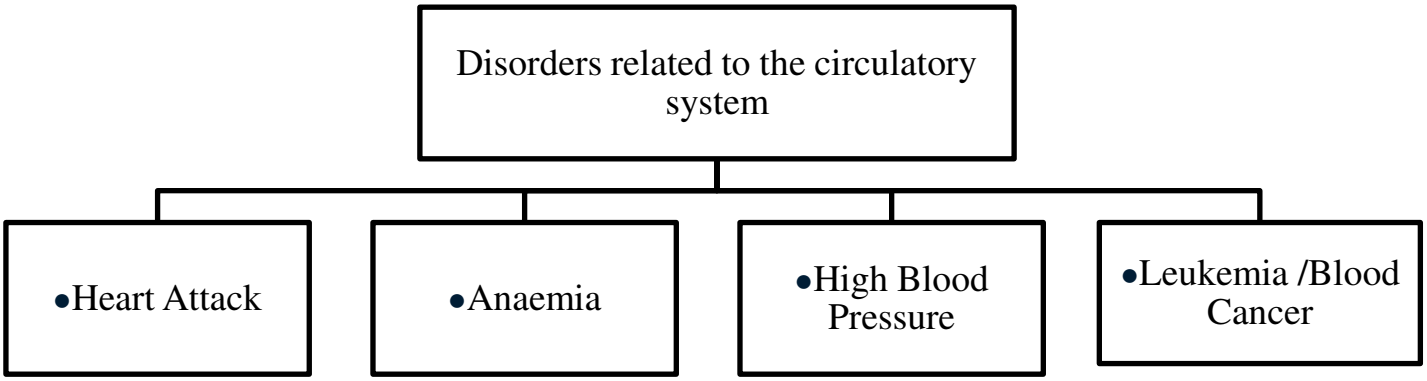
Blood group	Antigens on RBC	Antibodies in plasma	Can donate blood to	Can receive blood from
A	A	b	A, AB	A, O
B	B	a	B, AB	B, O
AB	AB	None	AB	A, B, AB,O
O	None	a, b	A, B, AB, O	O

Universal Donor: 'O^-' Blood Group, **Universal Recipient**: 'AB^+' Blood Group

Lymphatic System



Disorders related to the Circulatory system:-

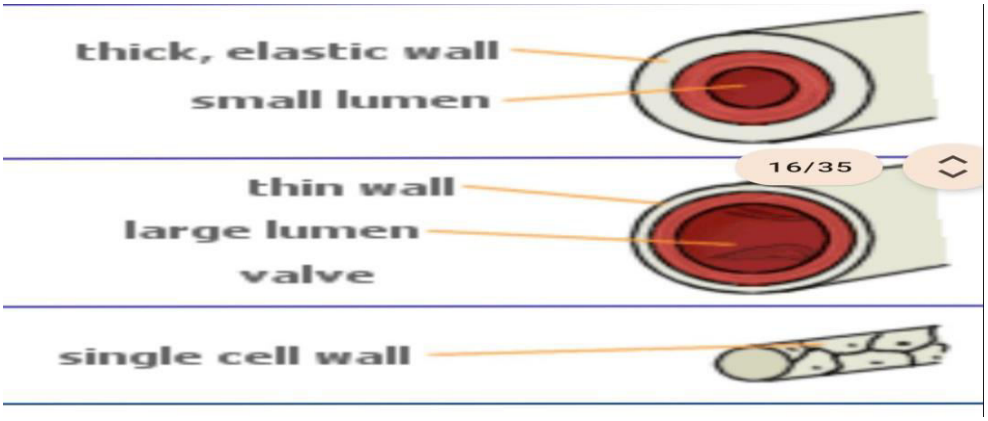


MUST DO QUESTIONS

Q1. Fill in the blanks:
a) The transport of water and mineral salts in plants is done by _____.
b) Pulmonary vein carries _____ blood.
c) Pulmonary artery carries _____ blood.
Ans: (a) Xylem (b) Oxygenated (c) Deoxygenated

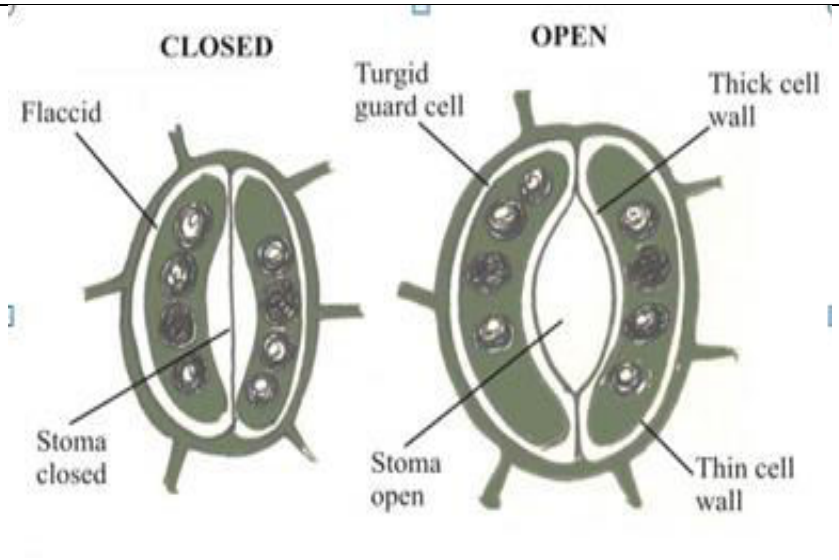
Q2. Write the functions of blood.
Ans: 1. Transport of Oxygen and Carbon Dioxide
2. Transport of hormones and waste products to appropriate parts
3. Transport of medicines in the body

Q3. Read the passage and answer the questions that follow it. (i) to (ii)
Human circulatory system consists of:
• Centrally located muscular pump called heart and
• Blood vessels which are tube-like structures connected to the heart, these are Arteries, Veins and Capillaries.



(i) The blood vessels that carry blood from heart are termed as _____ and those that bring blood from various parts of the body to the heart is termed as _____.
(ii) Name the thin structures that allows the exchange of materials between blood and tissues.
Ans:- (i) Arteries, Veins (ii) Capillaries

<u>Respiration(Oxidation of food):-</u>Respiration in plants

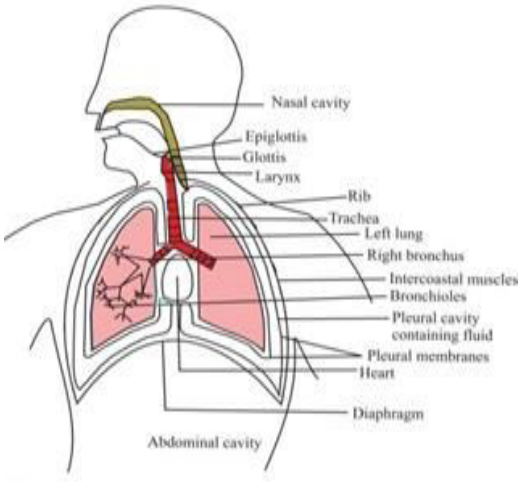
Respiration in Plants In roots: Tiny pores(Lenticels) In leaves: Microscopic pores (stomata-helpful in gaseous exchange and evaporation)	 Opening and closing of stomata

Respiration in Humans:-

Respiration in Humans

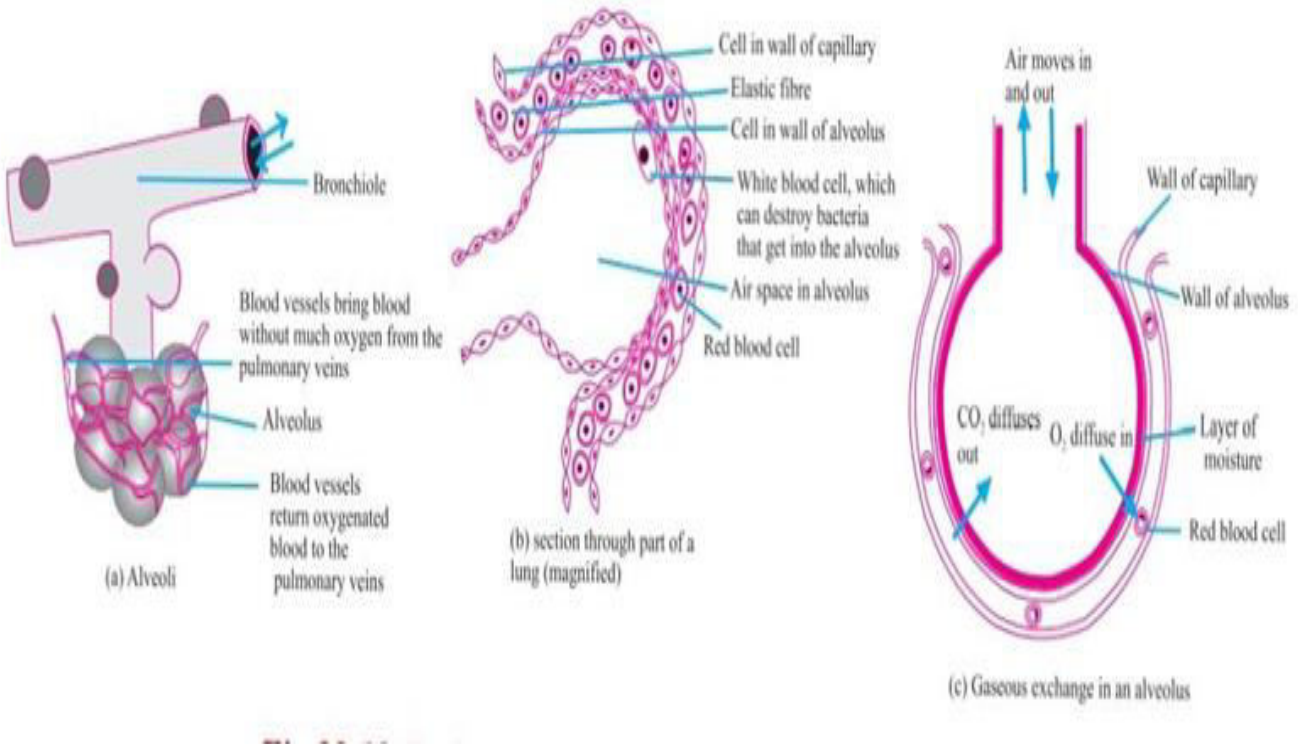
Breathing:Inhalation + Exhalation

Cellular Respiration:Oxidation of food (glucose), energy released in the form of ATP occurs in mitochondria, etc.



Respiratory system in human beings

Gas Exchange between Blood and Tissues:-

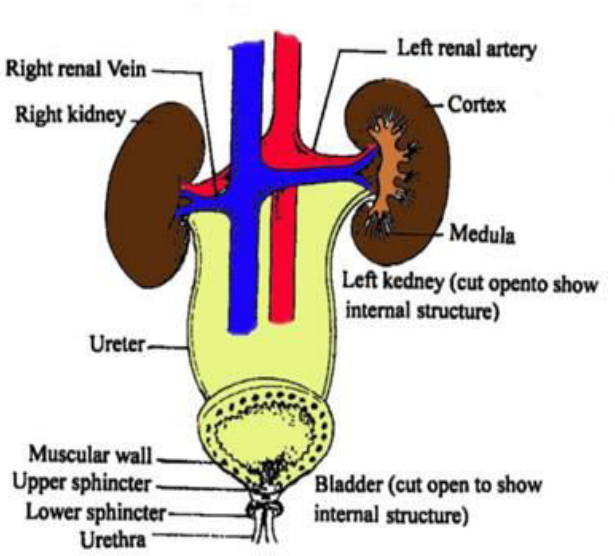


Exchange of gases between blood and alveoli

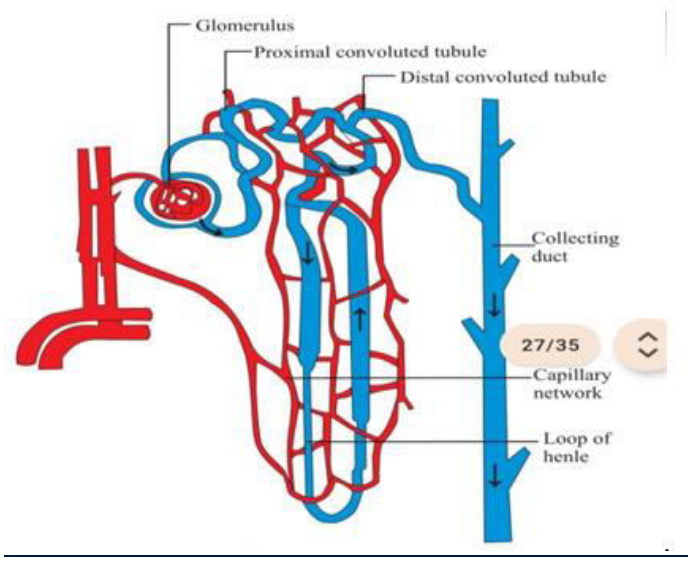
Artificial Respiration :- Providing oxygen artificially when there is difficulty in breathing.

Human Excretory System

- **Excretion:** Removal of waste products from the body.

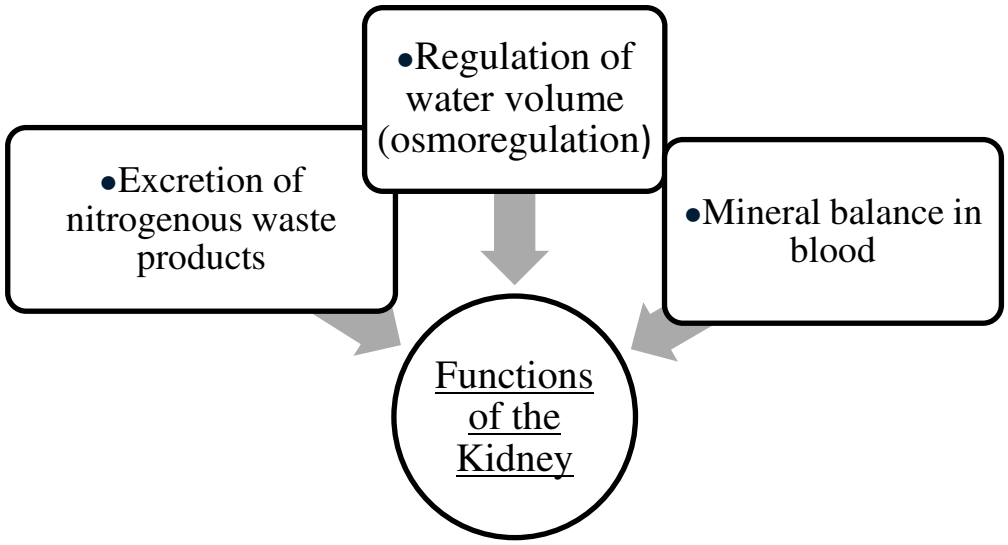


Human Excretary system



Structural and functional

Structural and Functional Unit of the Kidney - Nephron



Osmoregulation- Regulation of water mineral content in water in the field.
Other organs that remove waste from the body:- Skin, Liver, Lungs, Kidneys

Kidney failure:- Dialysis and kidney transplant are required if the kidney is damaged due to disease or accident.

Dialysis:- A machine that removes nitrogenous waste from the blood.

Kidney transplant:- Transplanting a healthy kidney from a willing relative into a sick person.

MUST DO QUESTIONS

Q1. Lungs have a large number of alveoli for:
(a) maintaining a spongy texture and proper shape.
(b) more surface area for diffusion of gases.
(c) more nerve supply.
(d) more space to increase volume of inspired air.
Ans:(d) more space to increase volume of inspired air.

Q2. The main function of lymph is to:
(a) transport O_2 to the brain. (b) transport CO_2 to lungs.
(c) return interstitial fluid to blood. (d) return RBCs and WBCs to lymph vessels.
Answer- d) return RBCs and WBCs to lymph vessels.

Q3. Which of the following disease caused by protein deficiency_____?
(a) Marasmus (b) Kwashiorkor (c) Both (a) and (b) (d) Anemia
Ans-(c) Both (a) and (b)

Q4. Fill in the blanks:
1. _____help in the opening and closing of stomata.
2. The opening through which the windpipe enters the respiratory tract is called_____.
3. A healthy adult human breathes _____ while resting.
4. Blood entering the glomerulus is filtered in_____.

Answer- 1.Guard cells 2.glottis 3.16 to 18 times per minute 4.Bowman's capsule

Q.5 What are the main parts of the excretory system? Write their name.
Ans:- Two kidneys, two ureters, one bladder, one urethra.

Q6. Name the following.
i. A fluid that transports fatty acid and glycerol.

ii. The valve present in between the chambers on the right side of the human heart.

iii. The respiratory pigment present in RBCs.

iv. The iron containing pigment in RBCs.

v. The phase of cardiac cycle in which the auricles contract.

Ans: (i) Blood (ii)Tricuspid valve (iii)Hemoglobin (iv)Hemoglobin (v) Systole

Q7 Match the columns A and B

COLUMN A	**COLUMN B**
1. Sponge-like organs located in the chest cavity	a)Trachea
2. Chamber acting as a common passage for food	b)Bronchioles and air
3. Elastic tissue that forms a flap over the top of	c)epiglottis the larynx
4. Main passageway to the lungs	d)Pharynx
5. Small tubes that branch from the bronchi	e)Bronchi
6. Small air sacs in the lungs	f)Lungs
	g)Alveoli
	h)Larynx

Ans:

COLUMN A	**COLUMN B**
1. Sponge-like organs located in the chest cavity	f)Lungs
2. Chamber acting as a common passage for food	d)Pharynx
3. Elastic tissue that forms a flap over the top of	c)Epiglottis the larynx
4. Main passageway to the lungs	a)Trachea
5. Small tubes that branch from the bronchi	b)Bronchioles and air
6. Small air sacs in the lungs	g)Alveoli

Chapter-23
Control and Coordination

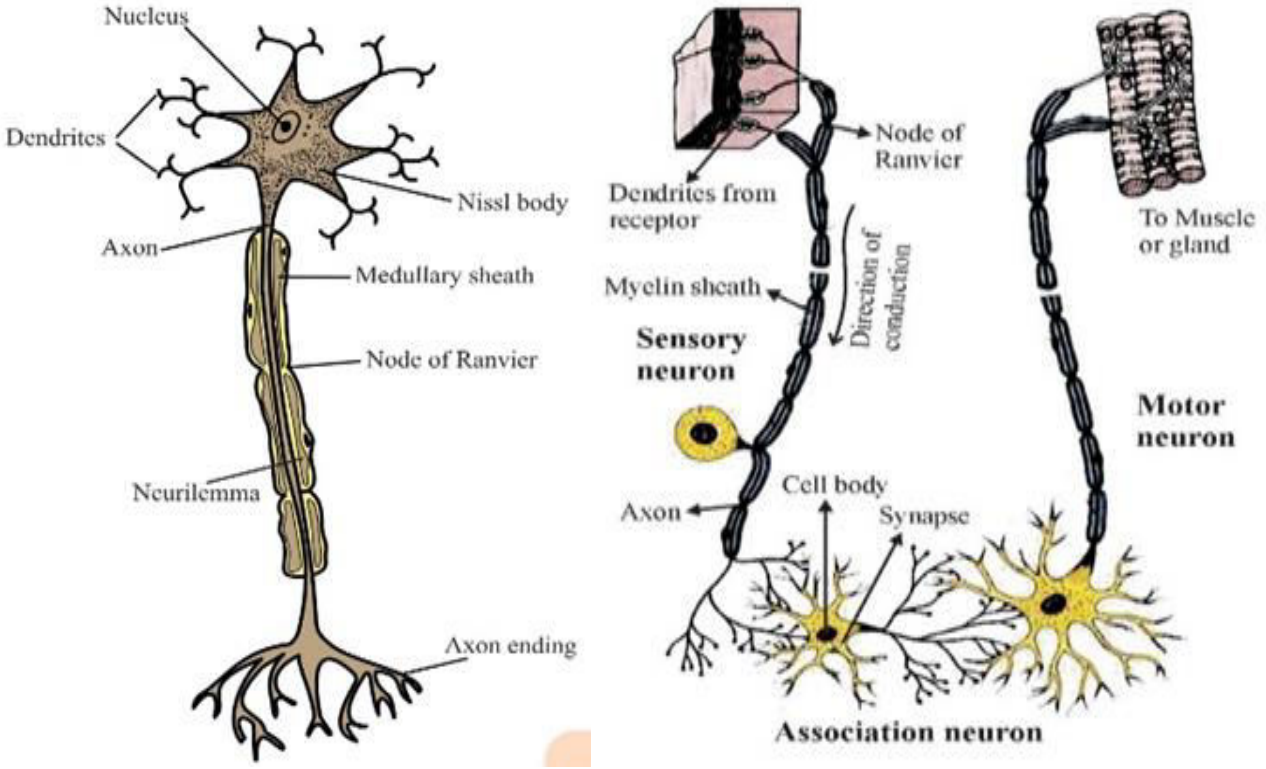
Nervous System: (Neuron is the basic unit of Nervous system)

1.Includes Brain and spinal 9+cord 2.It reacts to stimuli 3.Sensory organs 4.Nerves

Nerve cell (Neuron):-

1.Dendrite: Part that receives impulses

2.Cell body: Transmits nerve impulses to the nervous system



Neuron cells and three types of neurons

3.Axon: Transmits nerve impulses.

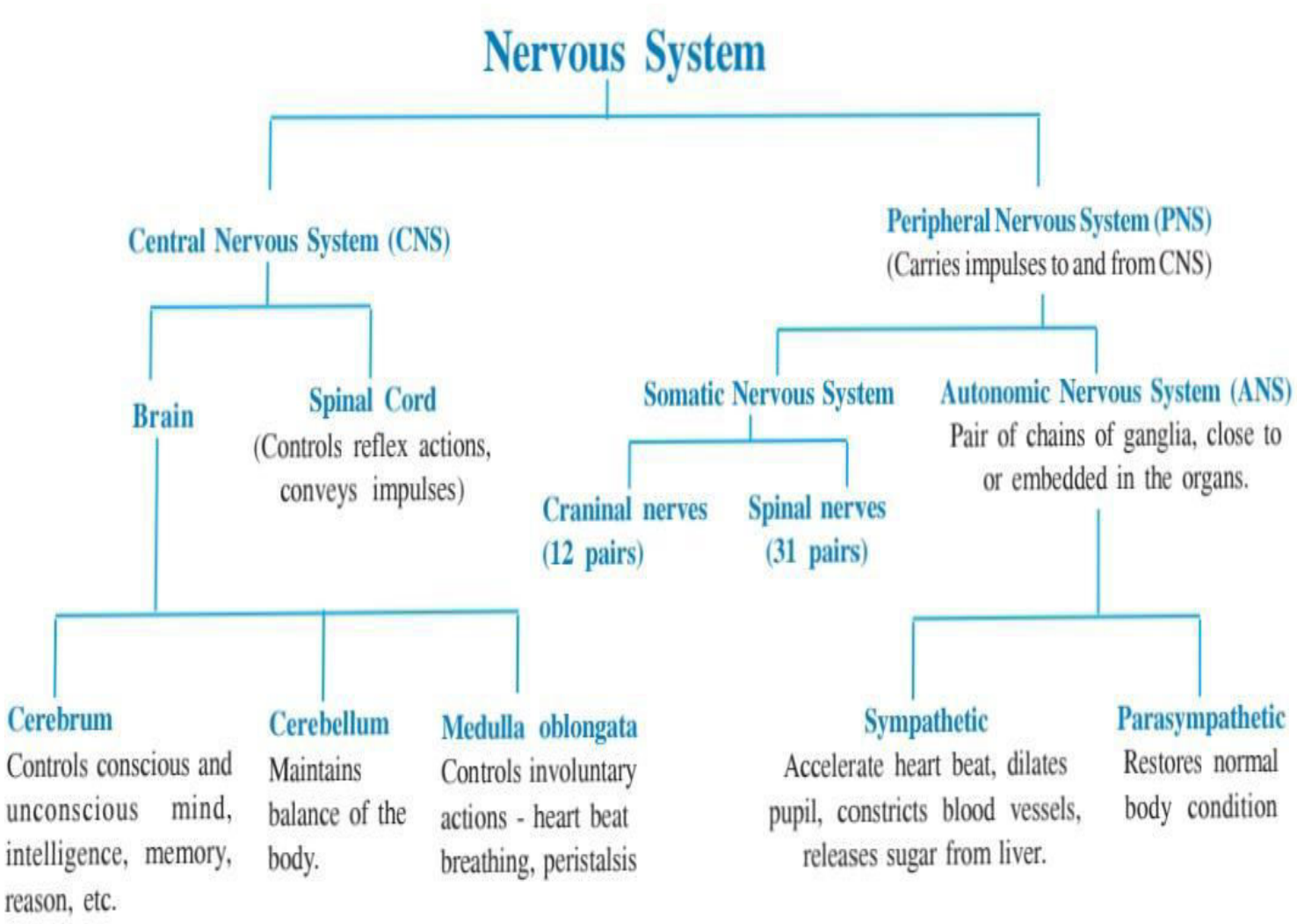
4.Synapse: Junction of two neurons where transfer of nerve impulse takes place.

Types of Nerve Cells

1.**Sensory nerve:** Transmits sensory impulses from sensory organs to main nerve

2. **Motor nerve:** Transmits impulses from the central nervous system to effector organ

3. **Connector/Association nerve cell:** Connects sensory and motor nerve cells



Brain:

Parts of the Brain:-

1.Cerebrum 2. Cerebellum 3. Medulla Oblongata

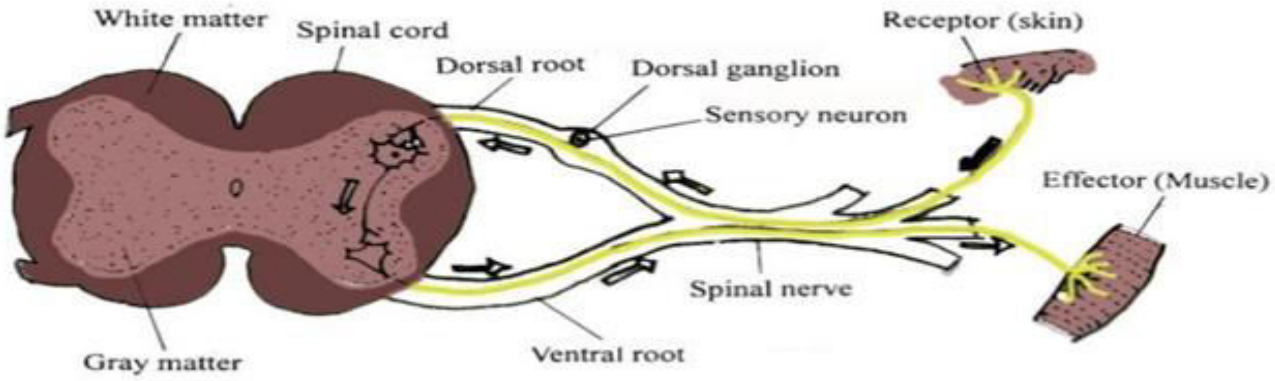
Meninges of the Brain

1.Dura Mater 2. Arachnoid 3. Pia Mater

Meningitis (Brain Fever)

This is caused by infection in the meninges and cerebrospinal fluid due to bacteria, viruses, fungi, and amoeba.

Spinal cord - originates from Medulla Oblongata till full length of spinal cord.



Diagrammatic sketch of the internal structure of spinal cord and nervous pathway in spinal reflex

Functions of the spinal cord: i) Control of reflexes in parts below the neck.
ii) Carrying sensory impulses from the skin and muscles to the brain.
iii) Carrying motor impulses from the brain to the muscles of the limbs.

MUST DO QUESTIONS

Q1 Fill in the blanks:

i) The junction between two nerve cells is called a _____.
ii) The empty space between the dendrites of two nerve cells is called the_____.
iii) The fluid filled between the membranes covering the brain is called _____.
iv) Two functions of the cerebrum are_____ and_____ .
v) Two main parts of Central nervous system are _____and _____.
Ans: i)Synapse ii)Synaptic cleft iii). Cerebrospinal fluid
iv)intelligence, wisdom v)Brain, spinal cord

Q2.Write the difference between sympathetic and parasympathetic nervoussystems.

Sympathetic	Parasympathetic
1. Helps in dealing with stressful situations.	1. Helps in providing comfort and relaxation to the body.
2. Increases heart rate and breathing rate.	2. Normalizes heart rate and breathing rate.

Q3.Explain the reflex arc with the help of a diagrammatic representation.

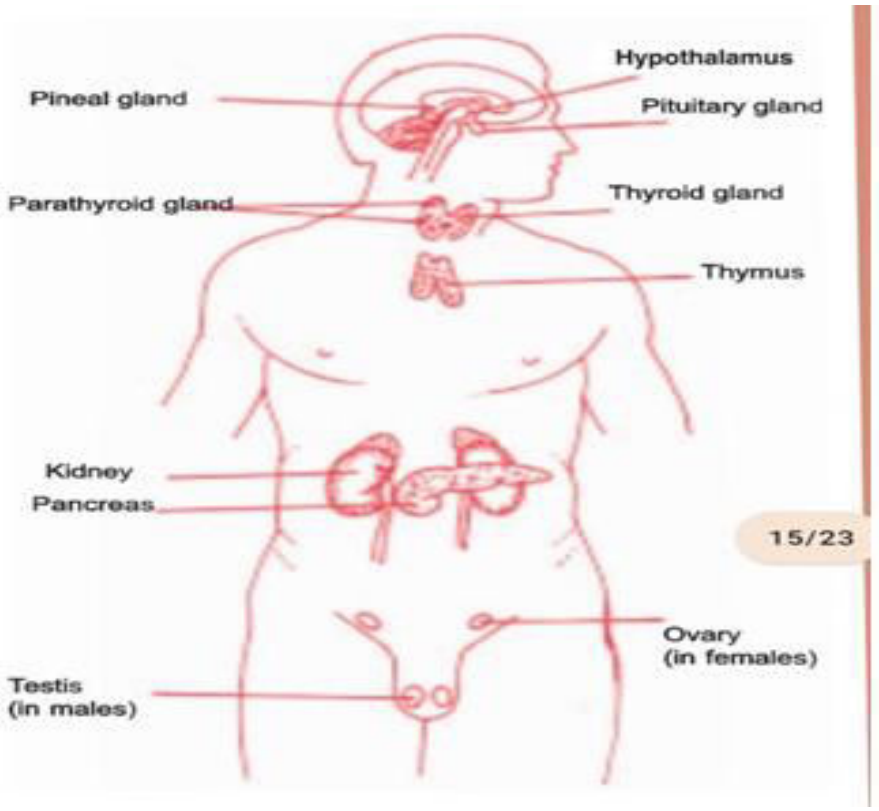
Ans: Stimulus → Sensory organ → Sensory nerve → Central nervous system → Motor nerve fiber → Muscle contraction → Glandular contraction.

Q4. Define the following:
1. Hormone 2. Stimulus:
Ans:1.Chemical substances that cause movement or excitement
2.A change in the surrounding environment that initiates a reaction in the body.

Q 5. Write the function of the following:
1. Cerebrum 2. Cerebellum 3. Hypothalamus 4. Medulla Oblongata.
Ans:**1) Cerebrum (Forebrain):** Direction, intelligence, logicand memory
2) Cerebellum (Hindbrain): Body balance
3) Hypothalamus: Hunger-thirst, sleep, and body temperature regulation
4) Medulla Oblongata: Involuntary actions (heart rate and respiration control)

Reflex Action
An action performed automatically without conscious thought in a necessary or dangerous situation.
eg. Suddenly pulling back the hand when touching a hot object.

Types of Reflex Action
1.**Natural Reflex:** All actions that do not require prior knowledge or experience.
eg. Swallowing, coughing, blinking.
2.**Conditioned (Acquired) Reflex:** Based on previously acquired experiences.
eg. Salivation at the smell of food.
Endocrine System:-



Endocrine glands

S.no.	Gland	Hormone	Function
1.	Pituitary gland (Master gland)	1.GSH 2.Growth hormone	Growth and development control
2.	Thyroid	Thyroxine	Metabolism control
3.	Pancreas	1.Insulin 2.Glucagon	Blood sugar level control
4.	Adrenal gland	Adrenaline	Fight or Flight Reaction (Emergency zone)
5.	Testis(male) Ovary(female)	Testosterone Estrogen	Development of Sexual Characteristics

MUST DO QUESTIONS

Q1 The spinal cord is extended from the medulla up to the whole length of the vertebral column and lies within the:

(a) Neural canal (b) Vertebral canal (c) Spinal canal (d) Eustachian canal

Ans:(c) spinal cord

Q2. Which one of the following hormones is secreted by the pancreas?

(a) Prolactin (b) Thyroxine (c) Adrenaline (d) Insulin

Ans:(d)Insulin

Q.3 Match the following:

COLUMN A	**COLUMN B**
i) Pituitary Gland	a) Brain and spinal cord
ii) Reflex Action	b) Diabetes
iv) Goiter	c)Regulation of Body Temperature
iv) Insulin	d) Growth Hormone
v) Hypothalamus	e) Iodine Deficiency

Ans: i-d, ii-a, iii-e, iv-b, v-c

Q 4. Given below is a table regarding various hormones secreted by the pituitary gland, and functions of these secretions.

Fill in the blanks (1 to 4);

Hormones secreted	**Functions**
Somatotropic hormone	(1)_____
(2)_____	Helps in the metabolism of glucose in our body
Thyroid hormone	(3)_____
(4)_____	In males it stimulates the secretion of testosterone.

Ans. 1**.** To promote growth 2. Insulin and glucagon

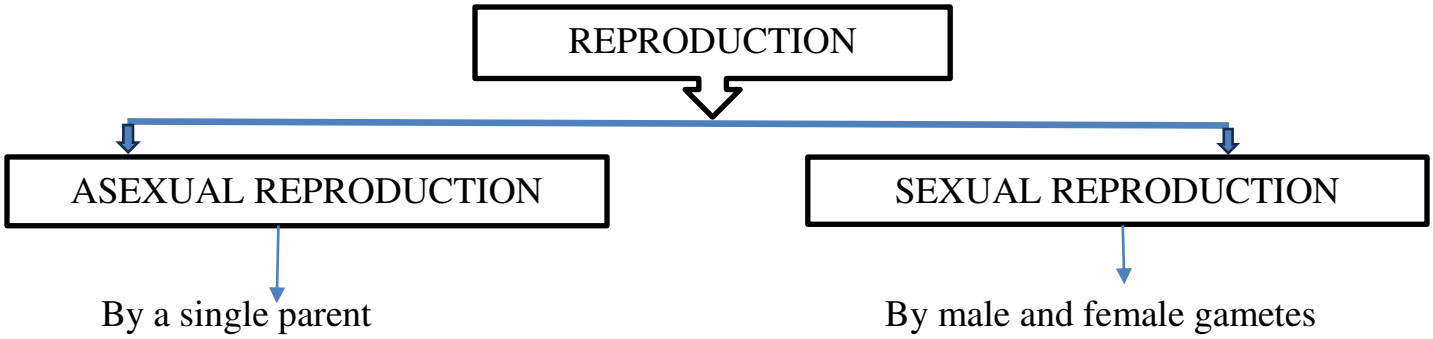
3. Growth and development 4. Growth stimulating hormone (GSH)

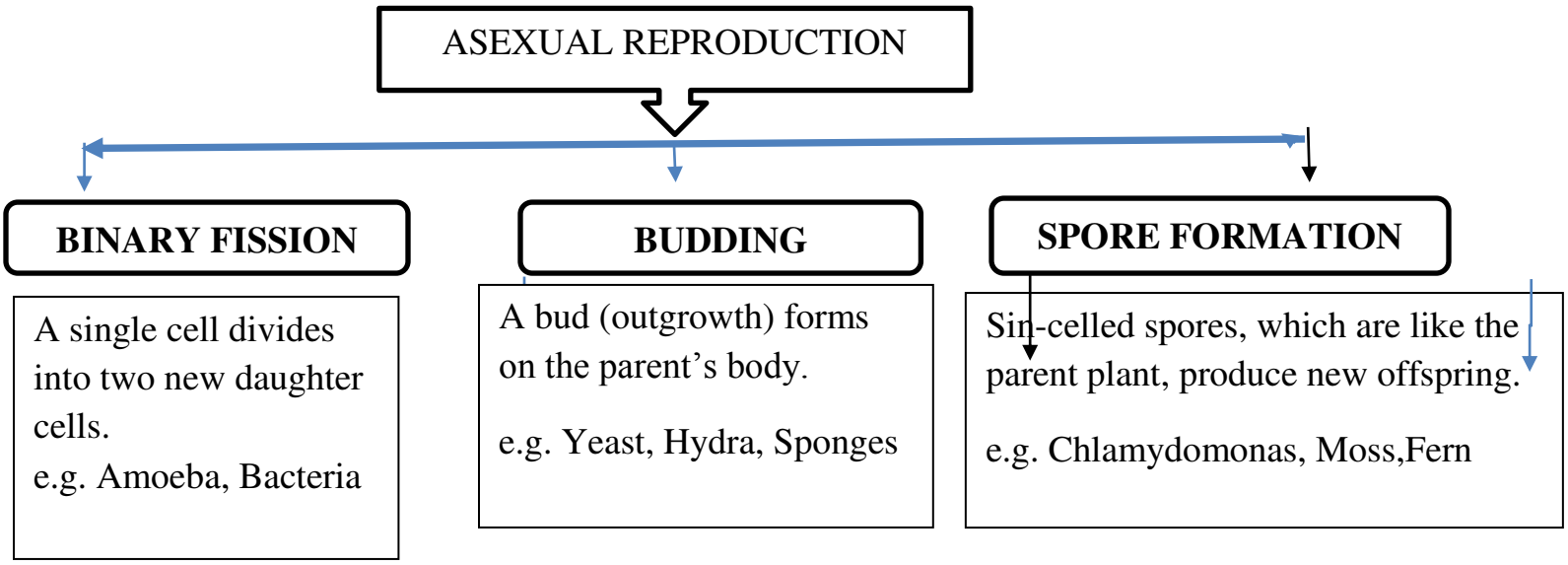
Q5 Write short notes on the following:
1) Cushing's disease, 2) Cretinism
Ans. 1)It is caused by over activity of the pituitary gland. In men, it causes infertility and growth of beard and mustache.
2) Physical and mental development is hindered due to iodine deficiency.

Q. 6 a) Write the name of the hormone secreted by the thyroid gland and its function in our body.
b) Define hyperthyroidism. (c) Define hypothyroidism.
Ans. a)Thyroxine hormone - Control of metabolism
b) Hyperthyroidism -Excess Secretion of thyroid hormone than needed.
c) Hypothyroidism - Secretion of less thyroid hormone than needed.

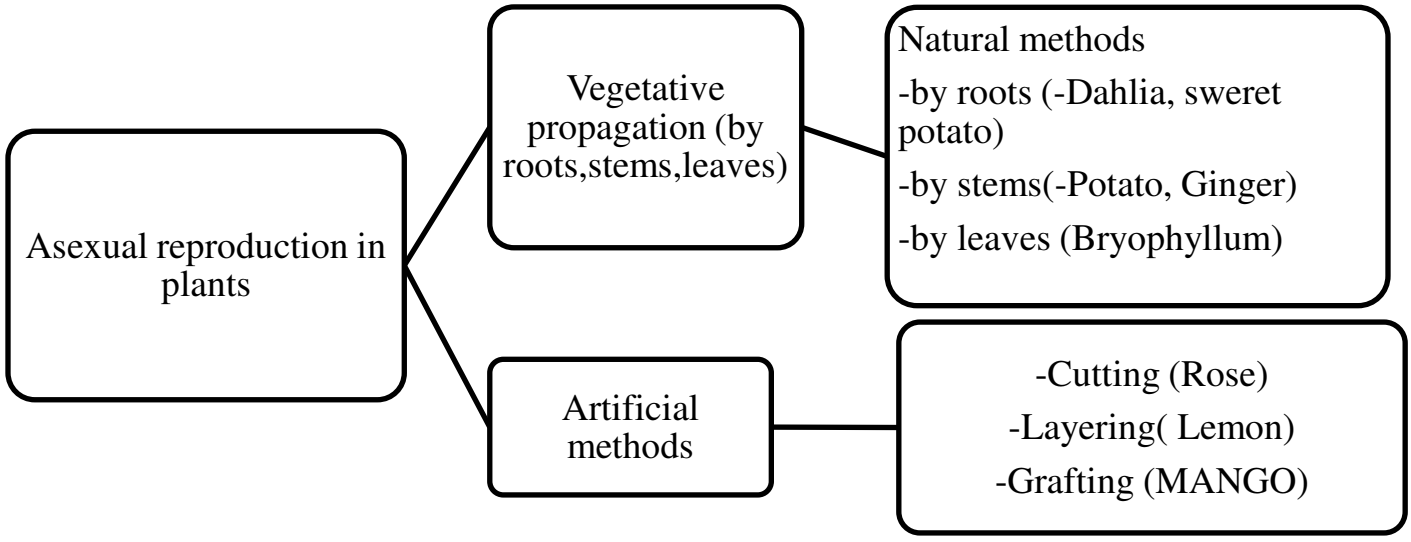
Chapter 24
Reproduction

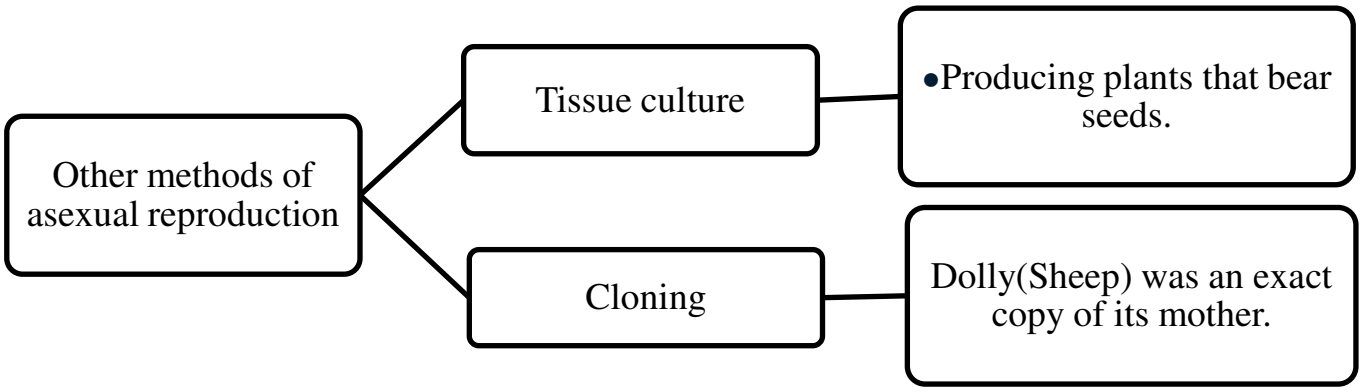
REPRODUCTION: Producing new organisms like oneself by living beings.





Asexual Reproduction in Plants:-





MUST DO QUESTIONS

Q1. Which of the following methods is NOT a method of artificial vegetative propagation in plants?

(a) By cutting (b) By layering (c) By grafting (d) By budding

Ans:(d) Budding

Q2. Which of the following is an example of a modified stem?

a) Ginger b) Onion c) Potato d) Sweet Potato

Ans:(a) Ginger

Q3. Give one example for each of the following methods of reproduction:

(i) Budding (ii) Spore Formation (iii) Binary fission (iv) Vegetative Propagation

Ans. - i)Hydra ii)Volvox/Chlamydomonas

iii)Amoeba iv)Bryophyllum

Q4. State the specific organ responsible for vegetative propagation in the following plants:

(i) Ginger (ii) Grass (iii) Onion (iv) Potato

Ans.(i) Rhizome (ii)Stolon (iii) Bulb (iv) Tuber

Q5. Define.

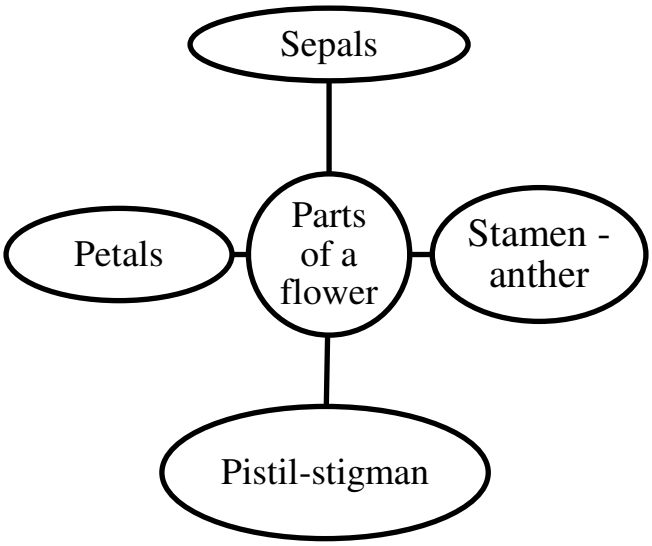
1.Tissue Culture 2. Callus

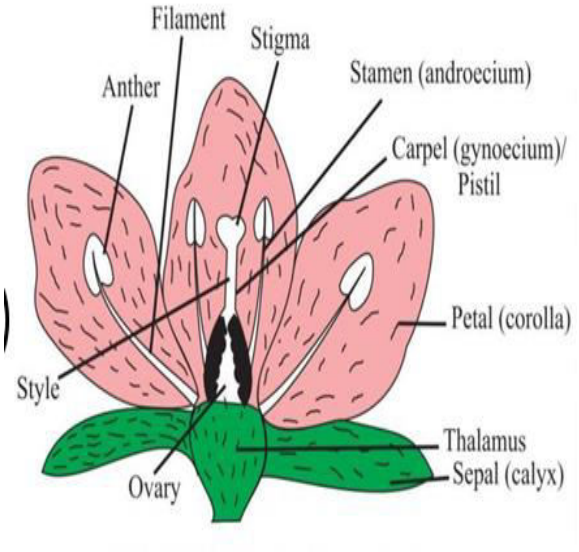
Ans.1) Origin of new organisms in the laboratory from the vegetative part of an organism.

2) Undifferentiated mass of cells in a culture medium.

Sexual Reproduction in Plants: (Fusion of male and female gametes)

Parts of a flower



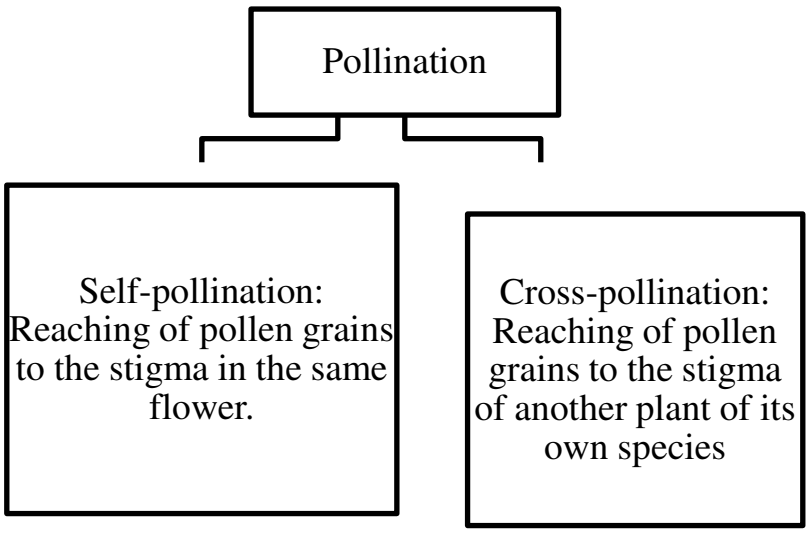


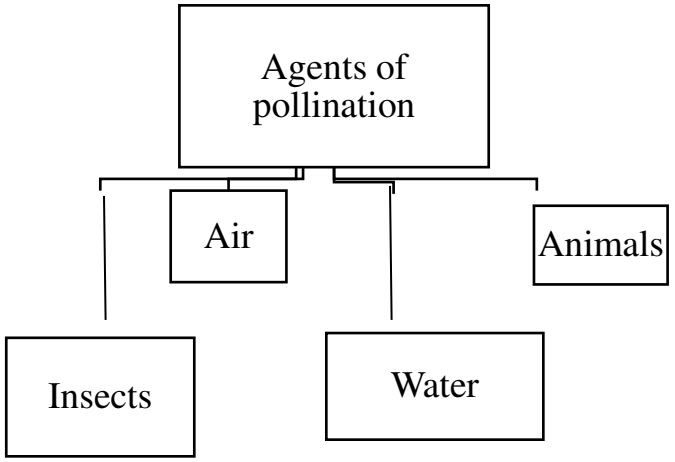
TS of a typical flower

Pollination: Reaching of pollen grains from the anther to the stigma.

Self-pollination: Reaching of pollen grains to the stigma in the same flower.

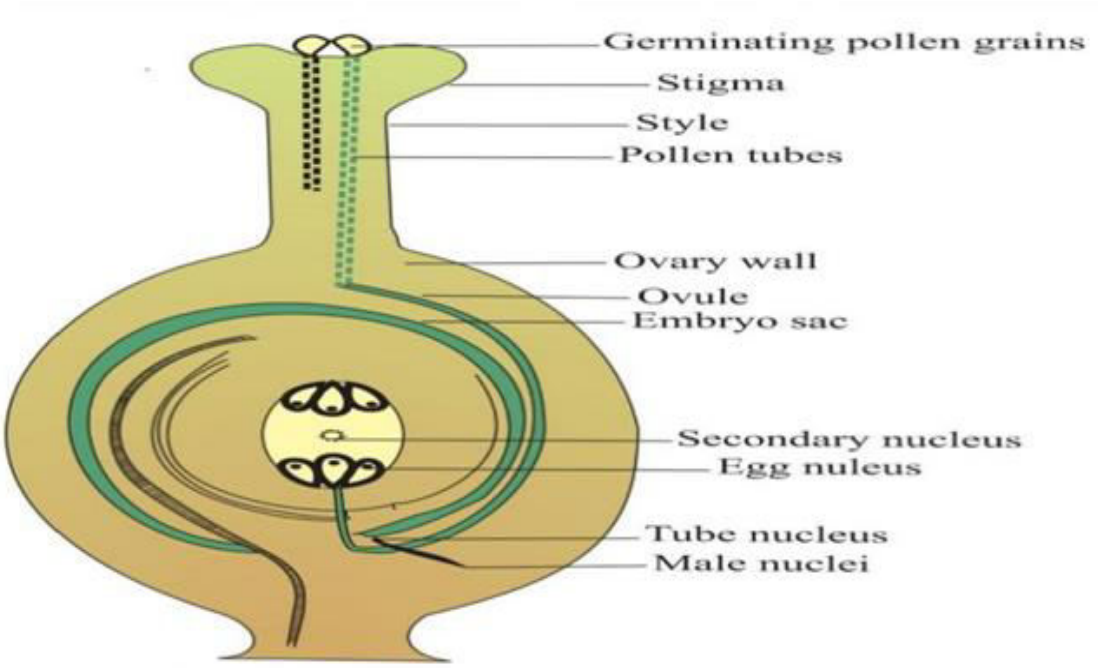
Cross-pollination: Reaching of pollen grains to the stigma of another plant of its own species.





Fertilization - Fusion of male and female gametes

Fertilization in plants:-



Process after fertilization

MUST DO QUESTIONS

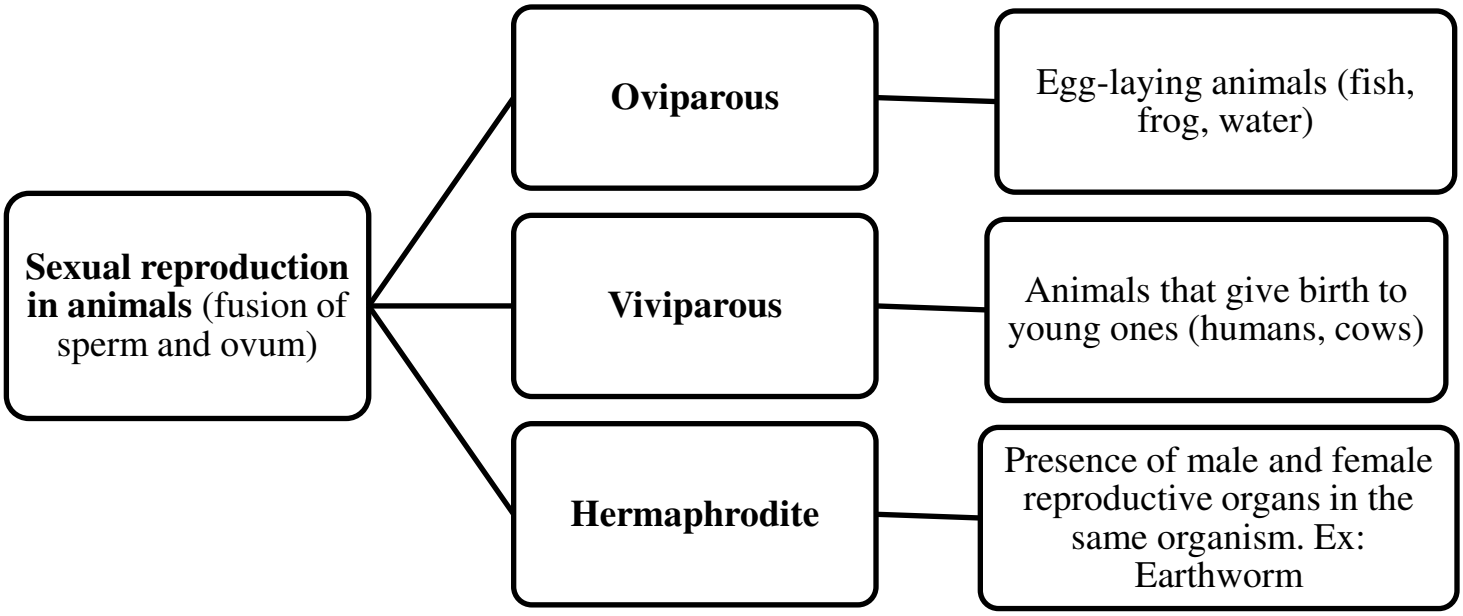
Q1. In which part of the flower does fertilization occur?
(a) Calyx (b) Stigma (c) Ovary (d) Anther
Ans:(c) Ovary

Q2. From which part of the flower seed is formed?
(a) Embryo sac (b) Ovule (c) Petal (d) Stamen
Ans:(b) Ovule

Q3. Write the function of the following parts of a flower :-
(i) part that produces pollen (ii) part of the flower that receives the pollen (iii) part that contains ovules (iv) the part of the flower that holds the anther.
Ans:(i) Pollen sac (ii) Stigma (iii) Ovule (Ovary) (iv) Filament

Q4. After reaching the stigma, by what path does it reach?
Ans:Through a pollen tube

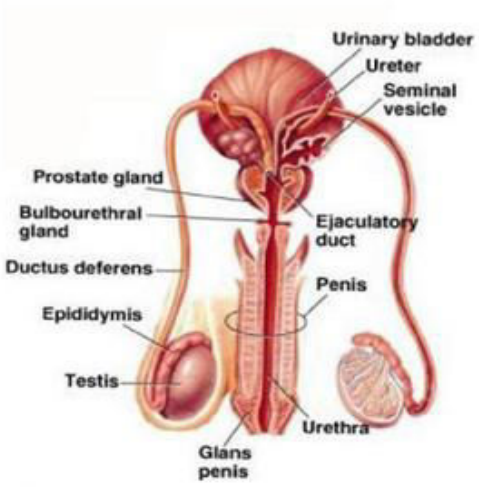
Reproduction:-



Changes occurring during puberty in humans:-

1. Increase in physical height
2. Change in physical size
3. Change in voice (Boy - Adam's apple)
4. Appearance of secondary sexual characteristics
5. Increased activity of sweat and oil glands
6. Increase level of hormones in blood and sex hormone levels
7. **Menstruation** - the first menstrual bleeding in females (menarche 11-13 years)
8. **Menopause-** stoppage of menstruation (45-55 years)
9. Mental, Emotional and Intellectual Maturity Development

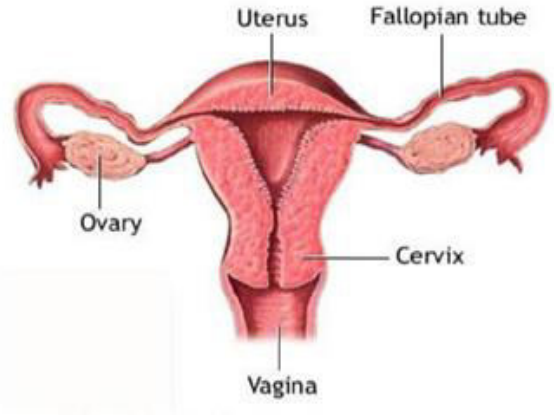
Male Reproductive System



Male Reproductive system

Organ	*Function*
A pair of testes	Generate Sperms
Two sperm ducts or vasa diferentia (Singular: Vas deferens)	Each arises from the testis and passes up into the body to join together and form the ejaculatory duct.
One ejaculatory duct	Is a common duct for passage of urine and sperms.
One Penis	Muscular organ which helps to transfer sperms into female body.

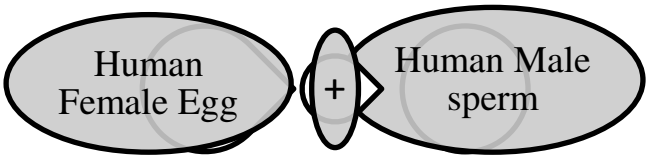
Female Reproductive System:



Organs	Function
A pair of ovaries	Produce ova
Two fallopian tubes	Are the oviducts through which eggs pass from the ovaries into uterus
One uterus	The womb in which the embryo develops
One cervix	The opening of uterus
One vagina	Female opening

Female reproductive organ in females

Fertilization and Embryonic Development in Humans:-



For fertilization (conception), spermatozoa (male haploid gametes) migrate through the cervical canal, the uterine cavity, and into the fallopian tubes. In the ovary, follicles develop and, during ovulation, the dominant follicle releases an oocyte (female haploid gamete).

MUST DO QUESTIONS

Q1. Which of the following is viviparous?
(a) Bat (b) whale (c) Both a and b (d) Fish
Ans: (c) Both (a) and (b)
Q2. What structure is formed after fertilization in the ovary?
(a) Sperm (b) Zygote (Gamete) (c) Embryo (d) Ovum
Ans. –(b) zygote(Gamete)
Q3. Fill in the blanks:-
i) The period of pregnancy in humans is _____ days.
ii) The uterus thickens due to the effect of _____ hormone.
iii)In human females fertilization occurs in the _____ part.
iv) The deepening of a boy's voice at puberty is due to the effect of _____.
Ans:(i) 280 (ii) Luteinizing (iii) Fallopian tube (iv) Adam's apple

Q4. Given below is a list of hormones related to reproduction. List influence on functions in the space given below: FSH, LH, Estrogen, Testosterone, Oxytocin

Ans.

Hormone	Function
FSH	Egg mature
LH	Egg shed
Estrogen	Secondary sexual characters in female
Testosterone	Secondary sexual characters in male
Oxytocein	Uterine contractions for deliver the baby

x

Q5. Identify (a) (b) (c) and (d) in the following table.

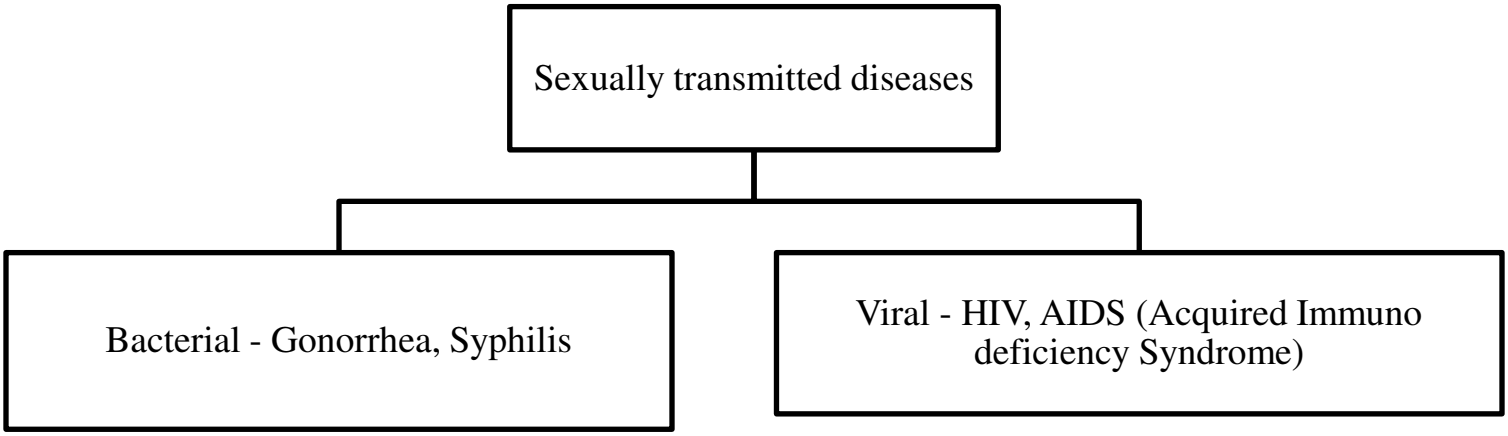
Reproductive organ of Human	Function
1.Testis produces the hormone	……..(a)……..
2.....(b).....	The womb in which the embryo develops
3.Cervix	.....(c).....
4.....(d).....	Arise from the testis and later join together to form

Ans. a. Testosterone b. Uterus c. Protective barrier for the uterus d. Vas deferens

Contraceptive Methods

Device	Function
Temporary Methods	
Condoms in males/ Diaphragms in Females	Physical barrier that prevents sperm from meeting the egg
Intra Uterine Contraceptive Device (IUCD), for example, Copper T	Inserted in female body by medical practitioner to prevent implantation of the growing embryo.
Oral contraceptive pills	Pills interfere with ovulation and prevent release of ova from the ovaries. As a result, fertilization cannot occur. These should be started under guidance from a trained medical practitioner.
Permanent Methods	
Vasectomy in males /Tubectomy in females	Are surgical methods for tying up the tube vas deferens through which sperms travel in males and in females blocking fallopian tube preventing fertilization.

Sexually Transmitted Diseases:-

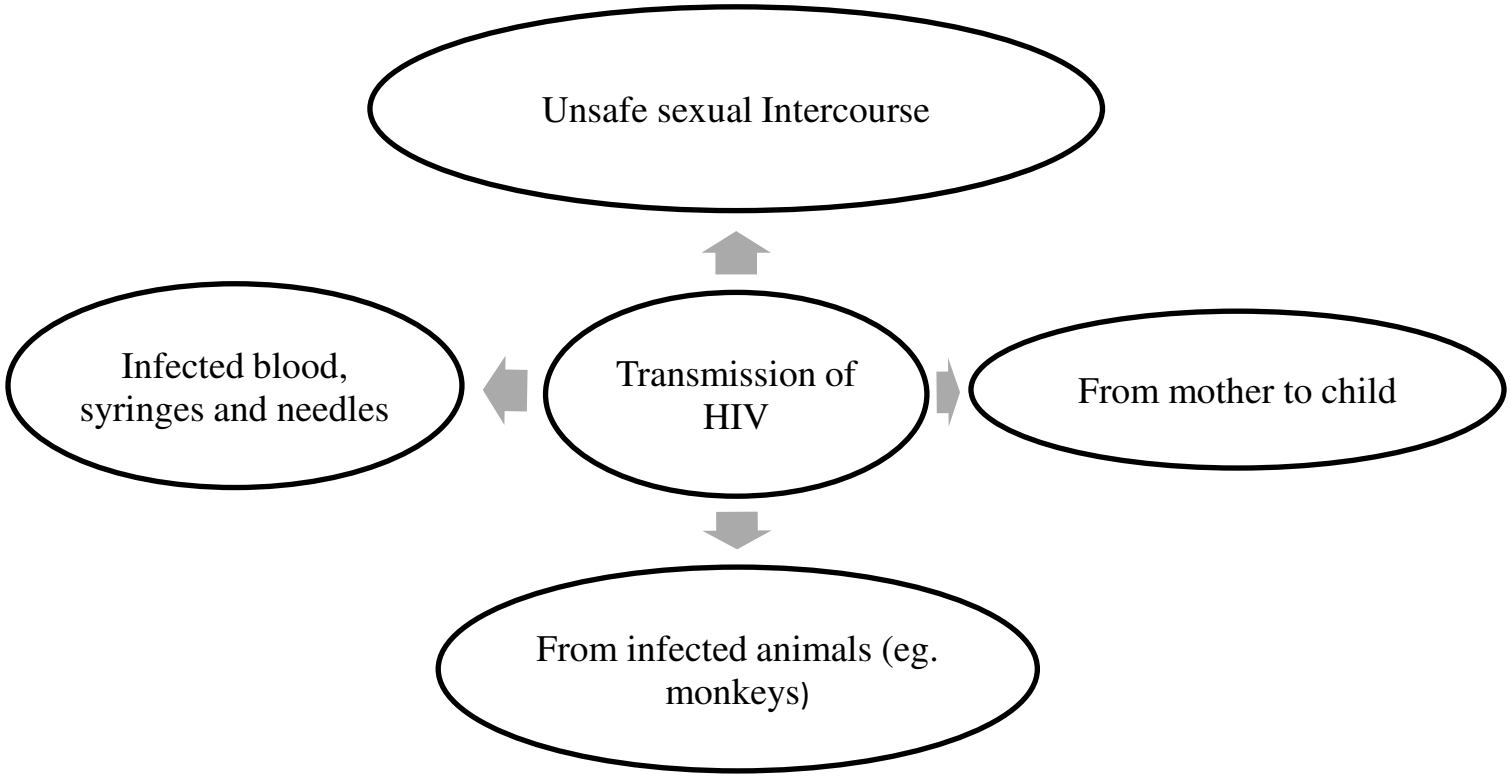


Causes of active transmission of sexually transmitted diseases, especially inwomen-

1) Presence of microorganisms in the vagina for a long time
2) Symptoms appearing late
3) Underdeveloped vaginal mucus

HIV - AIDS

AIDS - Acquired Immunodeficiency Syndrome
Transmission - HIV – Retrovirus
(Human Immunodeficiency Virus)
T-lymphocytes decrease, leading to loss of disease resistance.



MUST DO QUESTIONS

Q2. What is the genetic material of retrovirus?
(a) DNA (b) Protein (c) RNA (d) Lipid
Ans (c) RNA **Q1.** Which of the following is used as a male contraceptive device?
(a) Vasectomy (b) Tubectomy (c) Copper-T (d) Hypophysectomy
Ans (b) Tubectomy (Hypophysectomy)

Q3. Which of the following is not a sexually transmitted disease (STD)?
(a) Syphilis (b) Gonorrhea (c) AIDS (d) Goiter
Ans: (d) Goiter

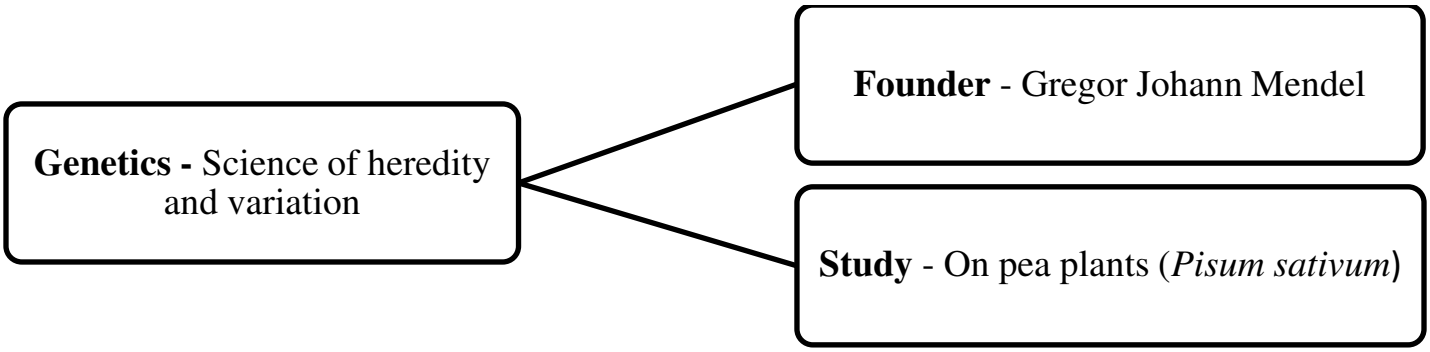
Q4. How is HIV/AIDS not spread?
(a) Unsafe sexual contact (b) Infected blood
(c) From infected mother to her child (d) From kissing and hugging
Ans:(d) From kissing and hugging

Q5. Fill in the blanks:
i) HIV virus affects _____ cells.
ii) To prevent the spread of HIV infection, _____ therapy is available.
Ans: i) T-lymphocytes ii) Antiretroviral

Q6. What happens when the human female egg is not fertilized?
Ans.The thick wall of the uterus spontaneously breaks down and comes out in the form of blood.

Chapter 25
Heredity

Heredity:- Transmission of common traits from parents to offspring



Mendel's Principles of Inheritance

- **Segregation of factors for a trait in gametes**:
  Example: Separation of tallness and dwarfism in pea plants.
- **Dominant trait** - The trait that appears in the next generation.
- **Recessive trait** - The trait that does not appear in the next generation.

Mendel's Laws

1.Law of Dominance 2. Law of Segregation 3. Law of Independent Assortment

Chromosome and Gene

Chromosome (Present in the nucleus of the cell)

- Present in pairs (2n)
- Made of DNA + Protein
- A single chromosome is present in bacteria (nucleoid).

Human Chromosomes

1. 46 chromosomes (23 pairs)
2. A pair of homologous chromosomes are those with genes received from one parent (one from the father, one from the mother).
3. 23 pairs of chromosomes

22 pairs → Autosomes 23rd pair → Sex chromosomes (XX Female, XY male)

Gene (Unit of Heredity) - Segments of DNA molecule

DNA Fingerprinting

- DNA testing for identification of a specific individual
- DNA obtained from - hair, blood, semen, nails, etc.
- Dr. Har Gobind Khorana - Synthesis of man-made genes

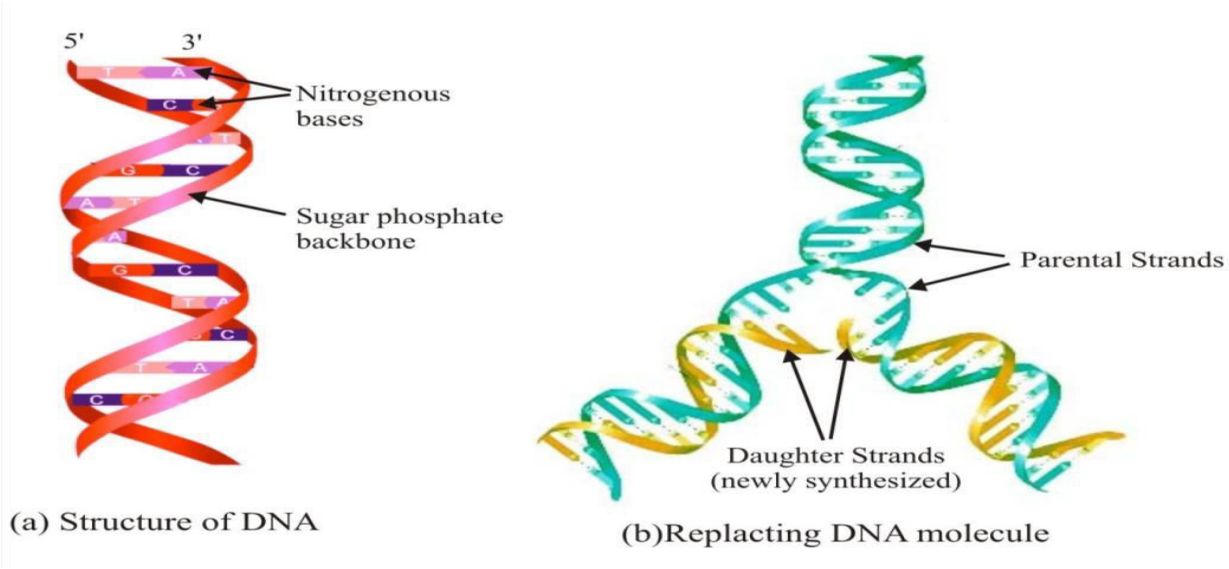
DNA Molecule (Polynucleotide)

1. A nitrogenous base (Adenine, Guanine, Cytosine, Thymine)
2. A deoxyribose sugar
3. A phosphate group

DNA Replication - Formation of new DNA by copying DNA

Main steps of DNA replication:-

i. Unwinding of both strands with the help of enzymes.
ii. A DNA polymerase enzyme catalyzes the formation of a new DNA strand.
iii. Form a double helix.
iv. Two identical RNA molecules converting into chromatin and attaching via the centromere.



(a) Structure of DNA

(b)Replacting DNA molecule

MUST DO QUESTIONS

Q1. Which plant did Mendel choose for his experiment?

a) Pea b) Cabbage c) Mustard d) Potato

Ans: a) Pea

Q2. Which of the following is the unit of heredity?

a) Gene b) Chromosome c) Protein d) Nucleus

Ans. a) Gene

Q3. Fill in the blanks:

i) The number of chromosomes in humans is _____.
ii) The father of heredity is _____.
iii) The scientist discovered that _____.
iv) The factors of Mendel are called genes with the help of _____.

Ans. (i) 46 (ii) Gregor Mendel (iii) Sutton (iv) DNA

Q4. State the three main steps of DNA replication.

Ans. Unwinding of double helix.

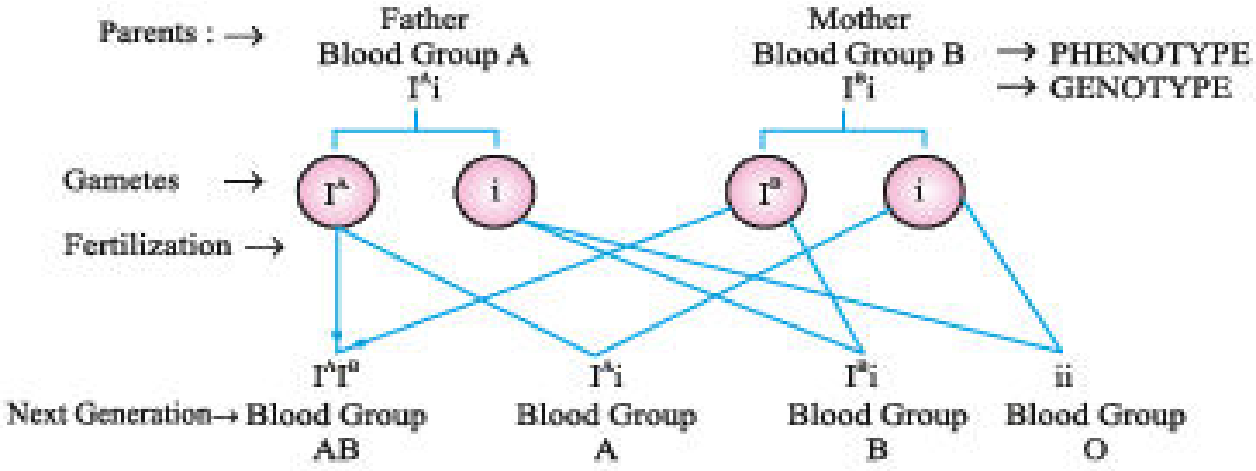
- Formation of new molecules of DNA complimentary to each DNA strand
- Winding of one new and one parental DNA strand

Q5. Mention any two specific characteristics of chromosomes.
Ans. (i) present in pairs, (ii) Seen only during cell division,
(iii)Present in fixed number etc.

Q6. On which traits did Mendel study in pea plants?
Ans .1. Height of the stem 2. Seed color 3. Pod shape
4. Seed shape 5. Flower position 6.Podcolor
7. Flower color

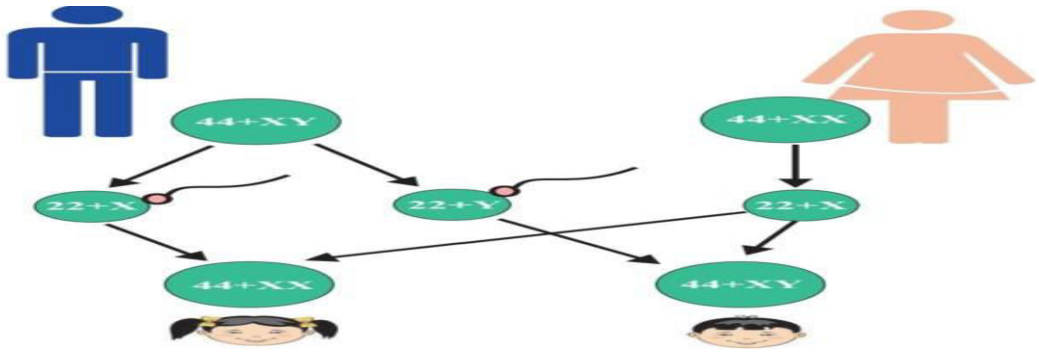
Inheritance of Blood Groups in Humans:
There are 4 blood groups in humans - A, B, AB, and O, whose expression throughout the species is done by 3 genes (alleles) which are I^A, I^B and i. In a human, only two genes (alleles) are found for blood group. The phenotype and genotype of these groups are given in the following table.

Phenotype / Blood Group	Genotype
A	I^AI^A; I^Ai
B	I^BI^B; I^Bi
AB	I^AI^B
O	Ii



Sex determination in humans - Depends on sex chromosomes.

Male XY Female XX



The probability of having a boy or a girl is 50:50. Sex is determined by the chromosome received from the father.

Genetic Disorders - Due to changes in DNA
1. Thalassemia - Autosomal Recessive Disorder
i) Inability to produce normal hemoglobin.
ii) Both genes responsible for producing hemoglobin are defective.
iii) The patient requires frequent blood transfusions.
2. **Hemophilia -** X-linked Recessive Disorder
i) Caused by a defect in a single gene on the X chromosome.
ii) Blood clotting does not occur.
3. Color Blindness - X-linked Recessive Disorder
i) Absence of pigments necessary for color vision.
ii) Defective gene located on the X chromosome.
iv) The disorder is passed from mother to son.

Human Genome Project -Mapping of different genes
Provides information and assists in the treatment of genetic defects.

Genetic Engineering - Recombinant DNA Technology

- Genetic modification in an organism.
- Transferring a gene from one species to the genome of another species.
- Transfer through bacteria and viruses.

MUST DO QUESTIONS

Q1. What will be the blood group of a child whose genetic combination is I^A I^B?
Ans: AB
Q2. Name the therapy in which a defective gene is replaced by a normal gene.
Ans: Gene replacement therapy

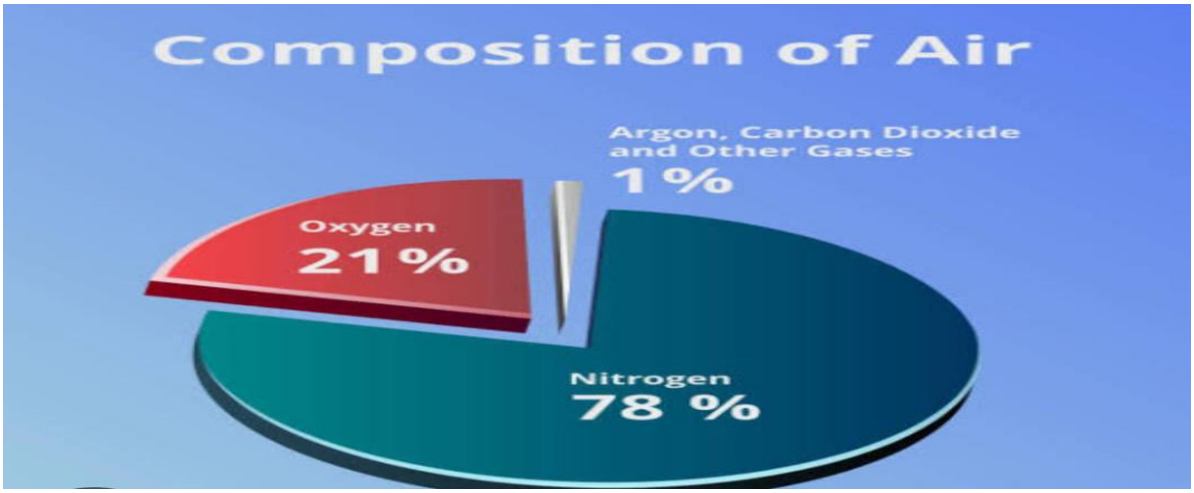
Q3. Fill in the blanks:
i) An organism genetically modified with foreign genes is called a _____
ii) A virus that attacks bacteria is called a _____
iii) The safe blood group for an unknown transfusion is_____.
Ans. (i) transgenic organism or GMO (ii) bacteriophage (iii) O

Q4. Which of the following genetic disorders is autosomal?
(a) Hemophilia (b) Color blindness (c) Thalassemia (d) None of these
Ans: (c) Thalassemia

Q5 Why is Hemophilia mostly found in boys?
Ans: This is because it is an X-linked genetic disorder, which is an inherited disorder of the X chromosome (multiplication).

Q6. What is meant by Gene Replacement Therapy?
Ans: With the help of this therapy, a defective or affected gene is replaced with a normal gene.

Chapter-26
Air and Water



Importance of Various Components of Air

Oxygen (O_2):Uses	**Nitrogen (N_2):Uses**	**Carbon Dioxide (CO_2): Uses**
1.Respiration	**1.**Main component of protein	**1.**Photosynthesis
2.Combustion	2. To control the rate of combustion	**2**. Preservation
3. In medicine		**3**. In fire extinguishing
4.In the steel industry		**4**.Carbonated beverages (like soda, cola)
5.In cutting and welding **Harmful Effect:** Corrosion	**Harmful Effect:** suffocation	**Harmful Effect:** Greenhouse gas

Evaporation: Water changing into vapor

Formation of Clouds: By condensation of water vapor

RainProcess:Evaporation → Condensation → Cloud Formation → Rain

Dew Point: The temperature at which water vapor condenses into water droplets after condensation.

Humidity: The amount of moisture in the atmosphere.

Relative Humidity: To express the amount of moisture present in the air as a percentage.Instrument for measuring humidity**: Hydrometer** (Hygrometer)

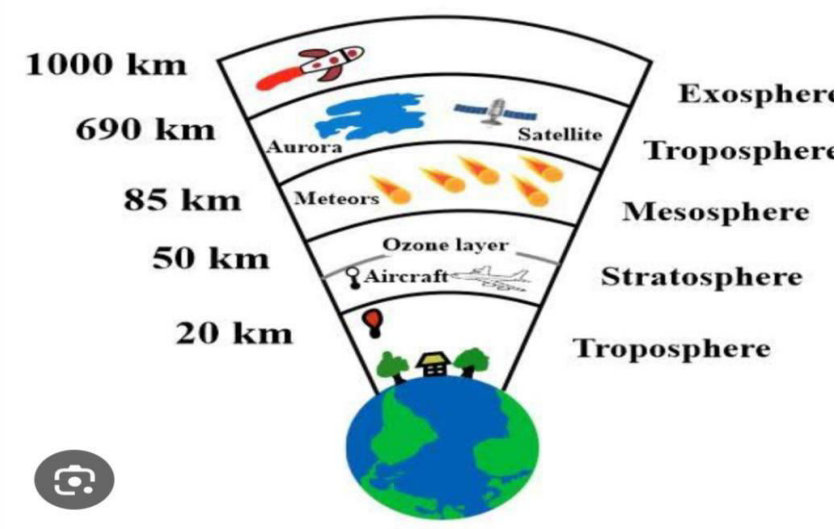
Change in Atmospheric Pressure with Altitude

At higher altitudes: Air density decreases → Atmospheric pressure decreases

Example: Nosebleeds at high altitudes

Instrument for measuring atmospheric pressure: **Barometer**

Atmosphere: Layer of air around the Earth.



Layers of the Atmosphere

Air Pollution: Harmful gases, dust, and smoke in the air.

Air pollutants:

Primary Pollutants: Directly released into the atmosphere. Examples: Smoke from motor vehicles, CO, CO_2, SO_2, NO, NO_2, etc.

Secondary Pollutants: Formed by reactions of primary pollutants.

Examples: Ground-level Ozone (O_3), H_2SO_4, HNO_3, Smog, etc.

MUST DO QUESTIONS

Q1.Which of the following are the main components of air?

(a) CO_2 and H_2O (b) N_2 and O_2 (c) CO_2 and He (d) H_2O and Xe

Ans. (b) N_2 and O_2

Q2. What are greenhouse gases?

(a) Those that reflect sunlight. (b) Those that increase the Earth's temperature.

(c) Those that cool the atmosphere. (d) Those that purify the atmosphere.

Ans. (b) Those that increase the Earth's temperature.

Q3. Acid rain is caused by?

(a) SO_2 and NO (b) CO (c) CH_4 (Methane) (d) O_3 (Ozone)

Ans. (a) SO_2 and NO

Q4.Answer the following questions:

(i) Name the greenhouse gases (ii) Chemicals responsible for ozone depletion.

Ans(i) CO_2 , CH_4 , N_2 O, Water Vapor (ii) CFC, CCl_4

Q5.Why is oxygen essential for life? What would happen if there were no oxygen in the air?

Ans: Oxygen is essential for the respiration of plants and animals. If there were no oxygen, life would not be possible, and living beings would die.

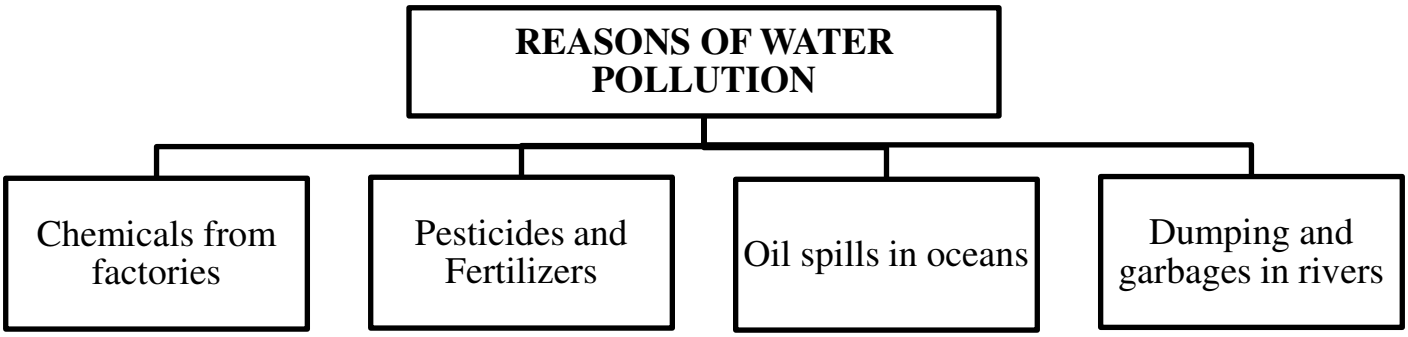
WATER: Earth is surrounded by 3/4 part of water.

Sources of Water	**Purification of Water:**	**Uses of Water:**
1. Rainwater	**1.**By sedimentation	**1.**Universal solvent
2. Well water	**2.** By filtering	**2.** For drinking and cooking
3. River and Seawater	3.By boiling 4. By chlorination	3. for cleaning

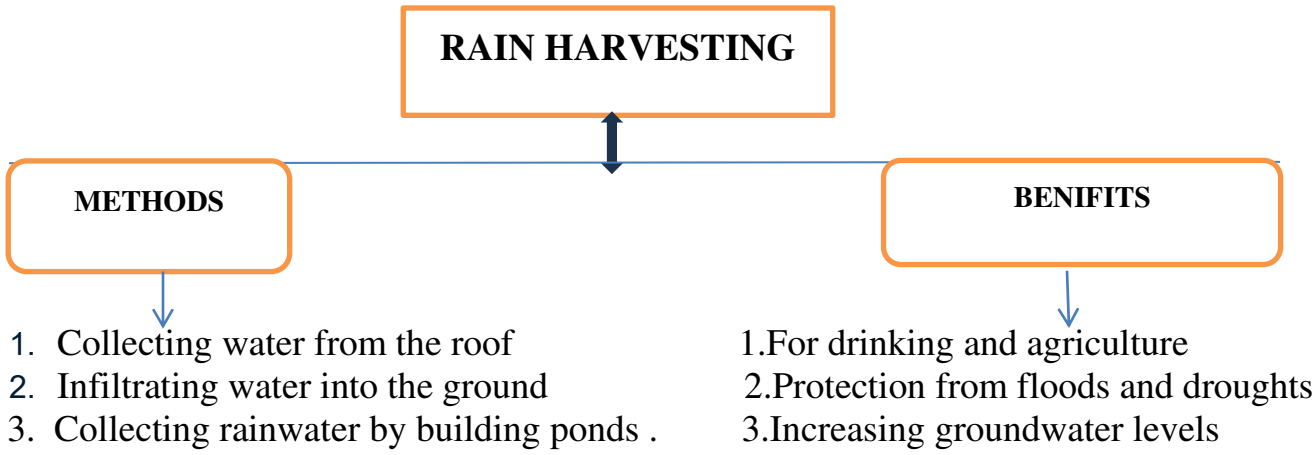
HARD WATER	**SOFT WATER**
1. Contains high amount of mineral salts. 2. Does not form lather with soap.	1. Contains low amount of mineral salts. 2. Forms lather with soap

Hardness of Water

Permanent Hardness	**Temporary Hardness**
1. Hardness that cannot be removed by boiling.	1.Hardness that can be removed by boiling
2. Reason: Salts like Sulfate (SO_4^{2-}), Chloride (Cl^-).	2.Bicarbonate salts (e.g., $Ca(HCO_3)_2$, $Mg(HCO_3)_2$).
3. Methods to remove hardness: a)Washing soda method b)RO filter c)ion exchange	3.Methods to remove hardness: a)Boiling b)Soda-lime method (Clark's process)



Rainwater Harvesting: Collecting and Utilizing Rainwater



MUST DO QUESTIONS

Q1. Why is water called the universal solvent?

Ans: Due to the polar nature of water, it dissolves most solutes.

Q2. Due to what property are water droplets spherical?

Ans: Due to surface tension.

Q3. By what process does water reach different parts of plants from the soil?

Ans: Capillary action.

Q4. At what temperature does water contract?

Ans: From 0°C to 4°C.

Q5. In extremely cold conditions, aquatic animals do not die even in a frozen lake. Explain the reason.

Ans: During extreme cold, only the upper surface of the lake freezes, but the water below remains liquid, which allows aquatic animals to survive.

Chapter -27
Metals and Non-metals

Properties of Metals and Non-metals:-

Physical Properties	Metals	Non-Metals
Malleability and Ductilily	Metals are malleable. They can be beaten into thin sheets. They are also ductile and can be drawn into wire (except a few metals like Na, K etc.)	Non-metals are neither malleable nor ductile. For e.g. coal, (carbon) and sulphur
Metallic Lusture	All the metals show metallic lusture.	They do not show any metallic lusture.
Hardness	Metals are generally hard	Non-metals are soft in comparison to metals
Physical state	They exist in solid and liquid states	Non-metals exist in solid, liquid and gaseous states.
Sonorous	Metals are sonorous and produce characteristic metallic sound when struck (e.g school bell)	They are non sonorous
Density	High density	Low density
Electrical conductivity	Good conductor of electricity	Bad conductor of electricity

Category	Definition	Example
Metals	Ability to donate electrons	e.g., Iron, Aluminum, Copper (R, Al, Cu), Gold
Non-metals	Ability to accept electrons	e.g., Carbon, Oxygen, Nitrogen (C, O, N)

MUST DO QUESTIONS:

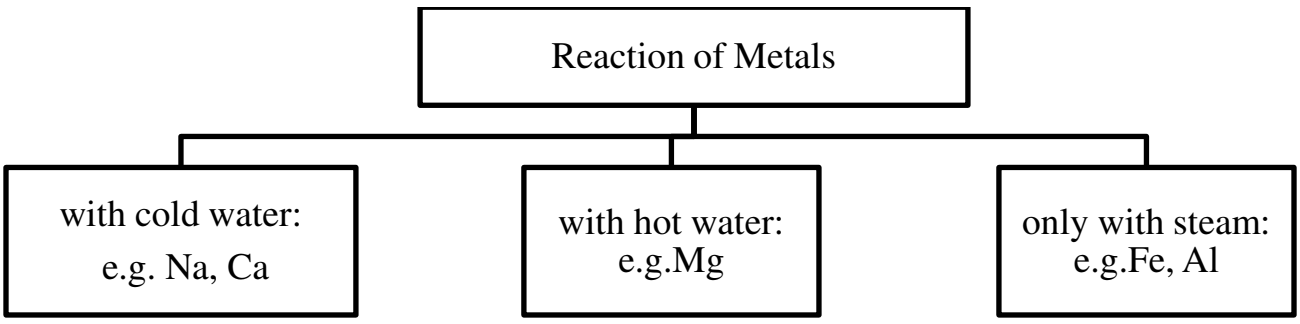
Q.1 Name the metals found in a free state.
Ans: Gold, Silver

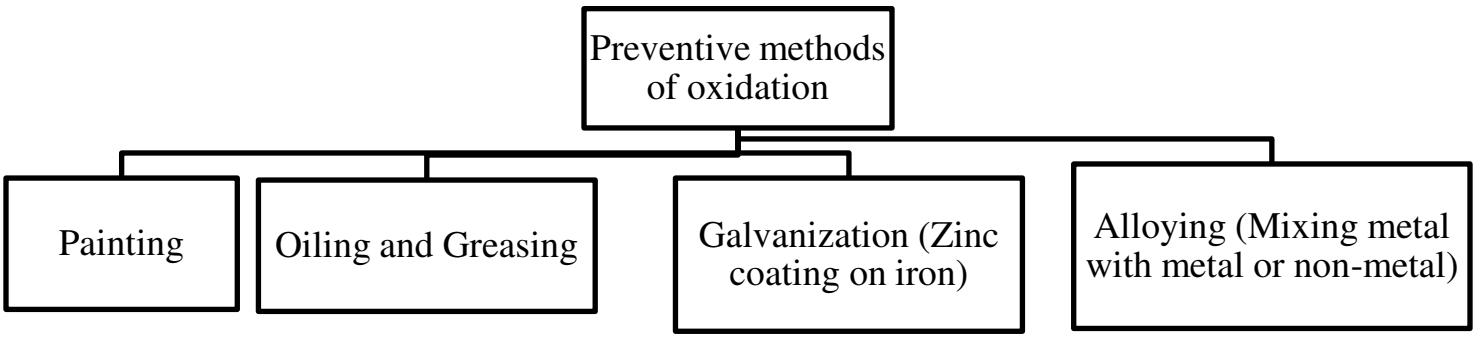
Q. 2 Name the non-metal that is a good conductor of heat?
Ans. Graphite

Q.3 Generally, metals are hard. Name a metal as soft as wax?
Ans: Sodium (Na)

Chemical Properties of Metals

Reaction with	Example
Oxygen	e.g., $4Na(s) + O_2\ (g) \rightarrow 2Na_2\ O(s)$
Water	$2Na + H_2\ O \rightarrow 2NaOH + H_2$ (s) (l) (aq) (g)
Acid	$Zn + H_2\ SO_4 \rightarrow ZnSO_4 + H_2$ (s) (aq) (aq) (g)
Base	$Zn + 2NaOH(aq) \rightarrow Na_2\ ZnO_2 + H_2$





Corrosion Conditions: (a) Moisture (b) Oxygen

Example: $4Fe(s) + xH_2O + 3O_2 \rightarrow 2Fe2O3xH_2O$ (Brown Rust)

MUST DO QUESTIONS

Q.1 Write the formula of rust.
Ans. $Fe_2\ O_3\ .xH_2\ O$
Q.2 Name the metal oxide that reacts with both acid and base.
Ans. $Al_2\ O_3$
Q3. Which non-metal is in liquid state at room temperature?
a) Bromineb) Phosphorusc) Sulfurd) Iodine
Ans. (a)Bromine
Q4. Which oxide is not acidic?
a) COb) CO_2 c) SO_2 d) SO_3
Ans. (a) CO
Q. 5 Classify the elements in the table below as metal or non-metal:

Atomic Number	Element	Metal	Non-metal
9	X	—	—
12	Y	—	—
16	Z	—	—

Ans. X = Non-metal Y = Metal Z = Non-metal

Q.7 Complete and balance the following equations:

(1) $Mg\ (s) + H_2\ SO_4\ (aq) \rightarrow$

(II) $Fe\ (S) + H_2\ O\ (Steam) \rightarrow$

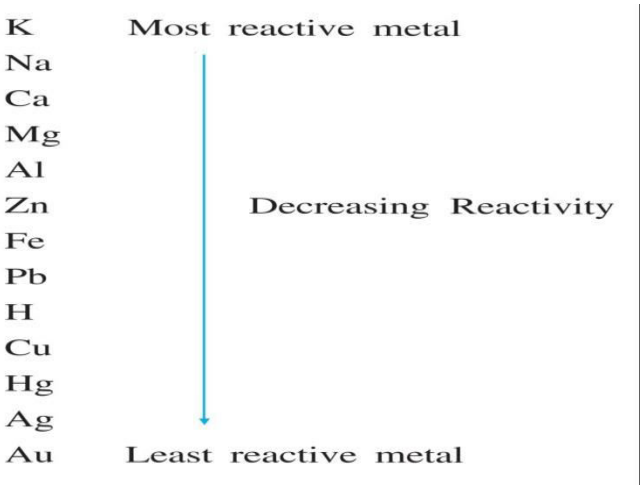
(III) $Na\ (s) + H_2\ O\ (l) \rightarrow$

Ans:(1) $Mg\ (s) + H_2\ SO_4\ (aq) \rightarrow MgSO_4\ (aq) + H_2\ (g)$

(II) $3Fe\ (s) + 4H_2\ O\ (Steam) \rightarrow Fe_3\ O_4\ (s) + 4H_2\ (g)$

(III) $2Na\ (s) + 2H_2\ O\ (l) \rightarrow 2NaOH\ (aq) + H_2\ (g)$

Reactivity Series - Arrangement of metals according to their decreasing reactivity.



MUST DO QUESTIONS

Q.1 If copper (II) sulfate solution is kept in an iron vessel, what will happen?
Ans: After some time, a hole will appear in the iron vessel.
$CuSO_4\ (aq) + Fe\ (s) \rightarrow FeSO_4\ (aq) + Cu\ (s)$
Iron = More reactive Copper = Less reactive

Q.2 What will happen if silver nitrate solution is kept in a copper vessel?
Ans.$2AgNO_3\ (aq) + Cu\ (s) \rightarrow Cu(NO_3)_2\ (aq) + 2Ag\ (s)$
A hole will appear in the copper vessel.
Copper = More reactive.

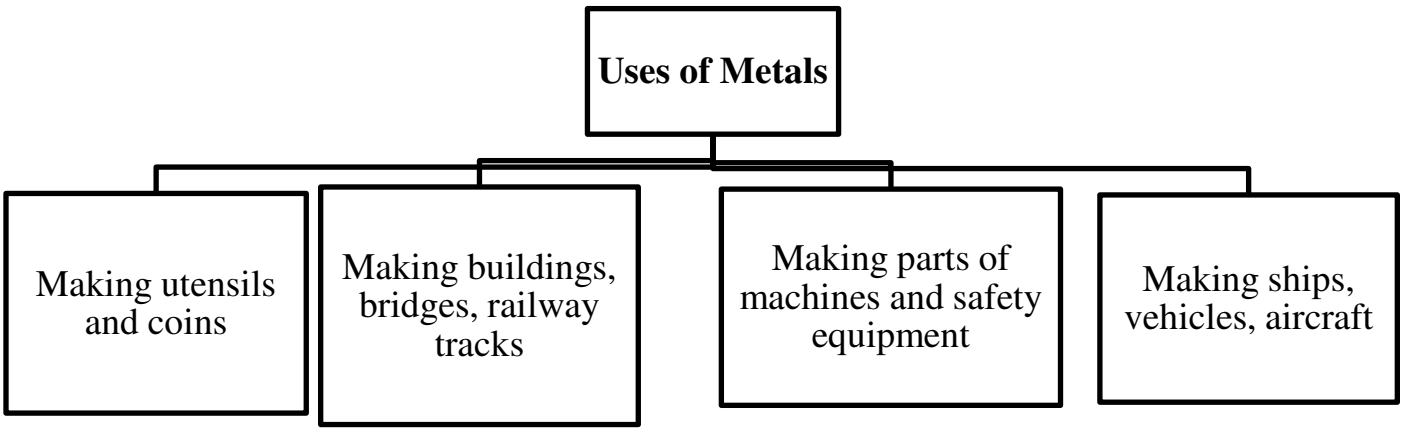
Q. 3 Describe the reaction of Magnesium with hot water.
Ans. $3\ Mg\ (s) + H_2\ O\ (l) \rightarrow Mg(OH)_2$ Magnesium Hydroxide

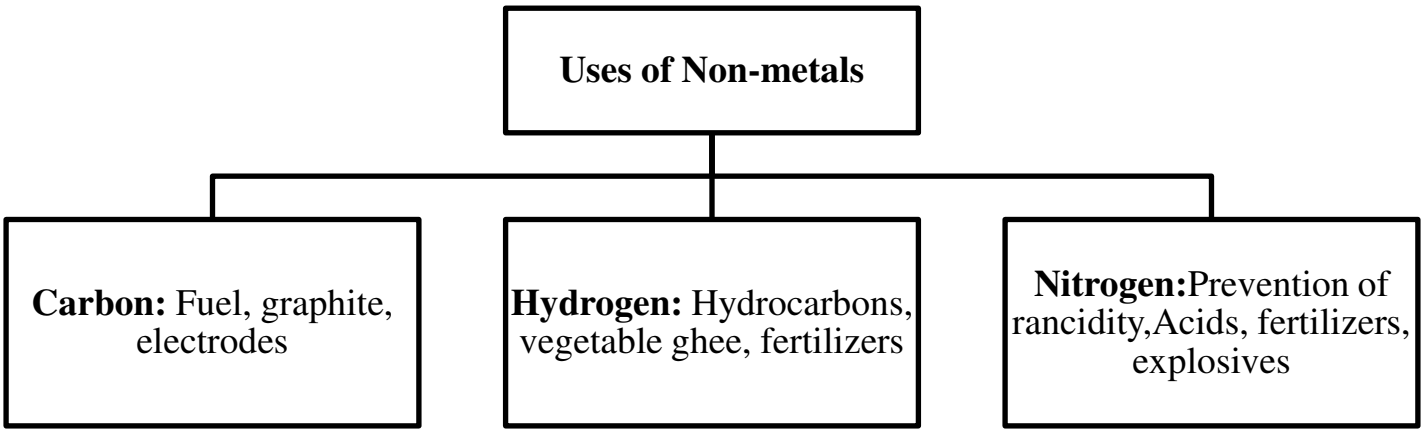
Q. 4 Write the equation for the reaction that occurs when zinc granules are added to copper sulphate.
Ans. $Zn\ (s) + CuSO_4\ (aq) \rightarrow ZnSO_4\ (aq) + Cu\ (s)$

Q.5 A metal reacts with oxygen to form an oxide that turns red litmus blue. This oxide is soluble in dilute hydrochloric acid. Identify the element in the form of a metal or a non-metal.
Ans. Since the element turns red litmus blue, the oxide is basic. It reacts with dilute acid. Basic oxide is formed by metal. Therefore, the element is a metal.

Q.6 Distinguish between Calcination and Roasting.

Calcination	**Roasting**
① Heating the ore in the absence or limited supply of air	① Heating the ore in the presence of air
② For Carbonate and Hydroxide ores.	② For Sulfide ores.
Example: $2ZnCO_3\ (s)$ --(Heat)--> $2ZnO\ (s) + CO_2\ (g)$	Example: $2ZnS\ (s) + 3O_2\ (g)$ --(Heat)--> $2ZnO\ (s) + 2SO_2\ (g)$





MUST DO QUESTONS

Q.1 Which of the following non-metals is used in agriculture for the prevention of fungus?
(a) Phosphorus (b) Sulphur (c) Iodine (d) Nitrogen
Ans: (b) Sulfur

Q.2 Which metal is NOT used in making batteries?
(a) Zn (b) Pb (c) Hg (d) Na
Ans: (d) Na

Q.3 Balance the following equations:(i) Al_2O_3 (s) + ?→ $NaAlO_2$ + H_2O (l)

(ii) CaO (s) + ? → $Ca(OH)_2$

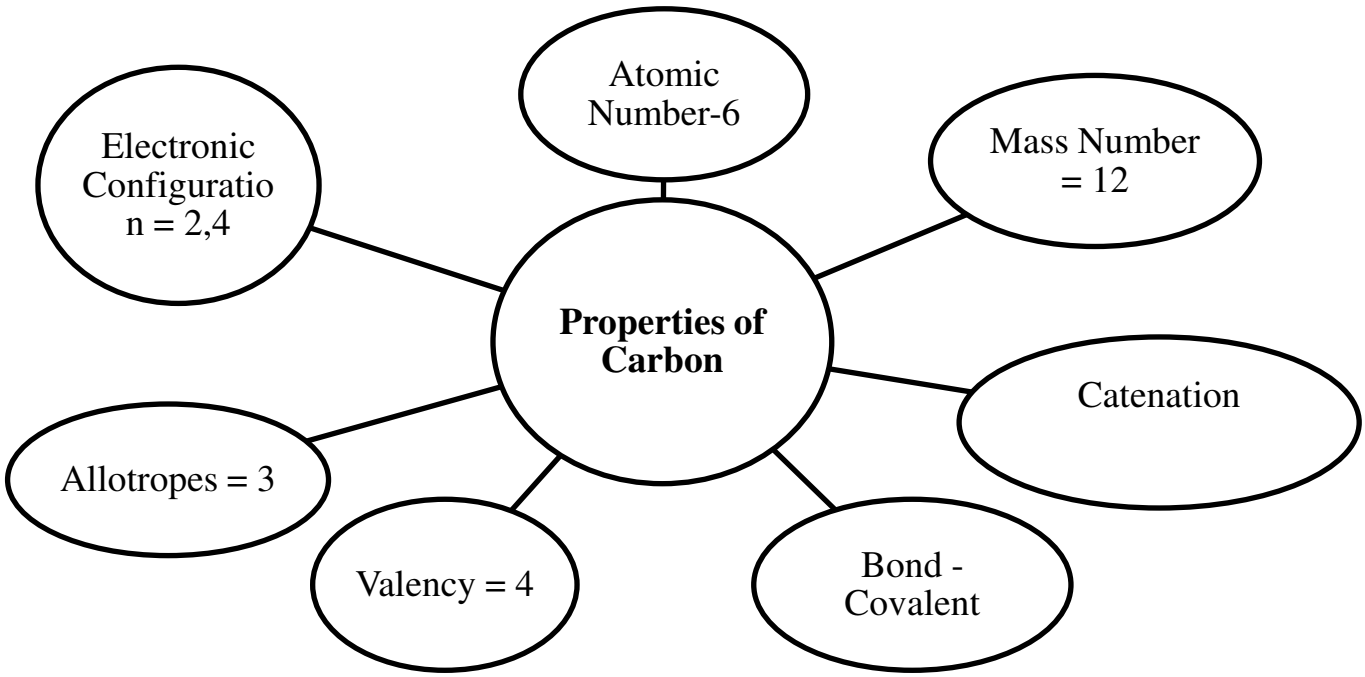
(iv) Sn (s) + ? → Na_2SnO_3 + ?

Ans. (i) Al_2O_3 (s) + 2NaOH → $2NaAlO_2$ (aq) + H_2O (l)

(ii) CaO (s) + H_2O (l) → $Ca(OH)_2$

(v) Sn (s) + 2NaOH → Na_2SnO_3 + H_2 (g)

Chapter-28
Carbon and its Compounds



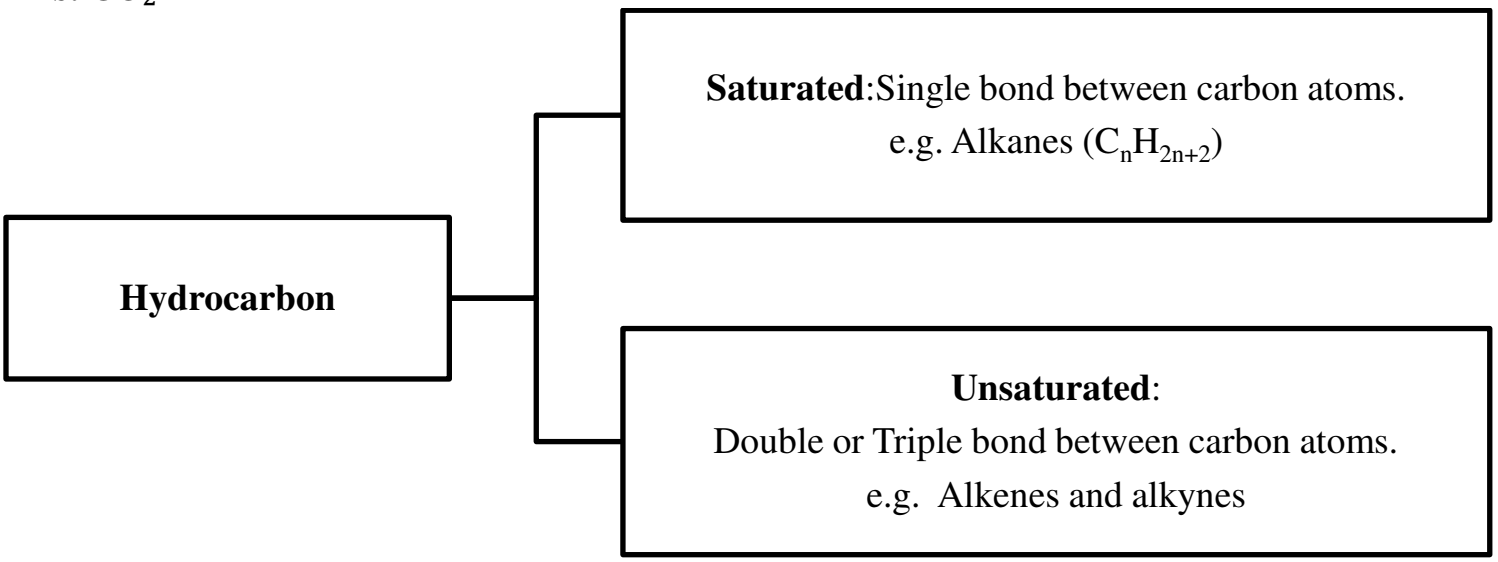
Allotropes of Carbon:-

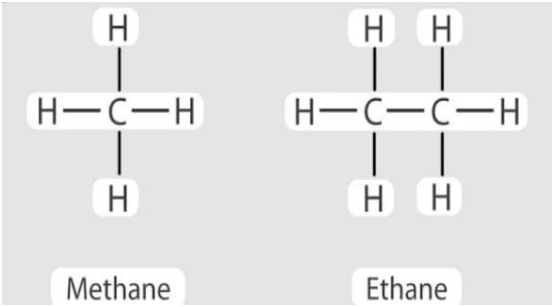
DIAMOND	**GRAPHITE**	**FULLERENE**
① Very hard substance	① Soft, Black and slippery.	① Medium
② Bad conductor of electricity.	② Good conductor of electricity.	② Medium.
③ Each Carbon atom linked to four other Carbon.	③ Each carbon atom linked to three other carbon.	③ Closed Structures like a football.

④ Uses - Jewellery, cutting and grinding of other hard materials, Drilling of rocks.	④ Uses - Pencil leads, lubricant, Electrode.	④ Medicine distribution.

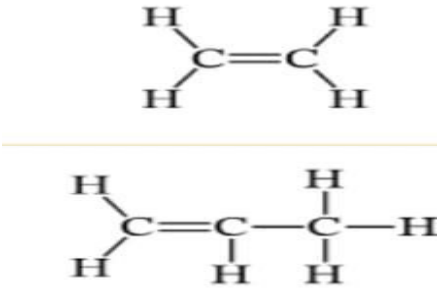
MUST DO QUESTIONS

Q1. What is the valency of Carbon?
Ans. 4
Q2.How many electrons are needed by a Carbon atom to complete its octet?
Ans.4
Q3. Each Carbon atom is linked to how many carbon atoms in - (i) Diamond (ii) Graphite.
Ans - (i) 4 (ii) 3.
Q4. Why does diamond have a high melting point?
Ans: A large amount of heat energy is required to break the three-dimensional network of covalent bonds.
Q5. Why is graphite a good lubricant?
Ans: Weak bonding forces between layers of carbon atoms in graphite allow them to slide over each other.
Q6. What is dry ice?
Ans: Solid CO_2
Q7. Name the gas which is a major contributor to the greenhouse effect?
Ans: CO_2

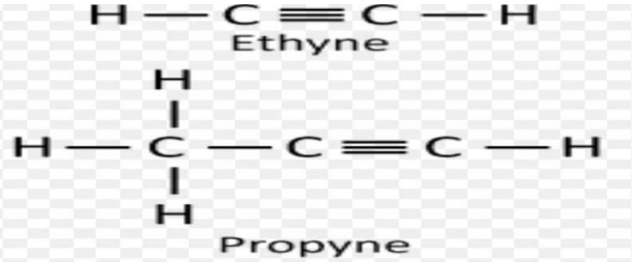




Methane and Ethane



Ethene and Propene



Ethyne and Propyne

Alkyl group	Derived from Alkane	Name of Alkyl group
$-CH_3$	methane	methyl
$-C_2H_5$	ethane	ethyl
$-C_3H_7$	propane	propyl
and so on		

Naming of alkyl groups

No. of carbon atoms	Name of the Alkene	Molecular formula
2	ethene	C_2H_4
3	propene	C_3H_6
4	butene	C_4H_8
5	pentene	C_5H_{10}
And so on		

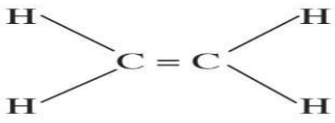
Homologous series of alkenes

No. of carbon atoms	Name of the Alkyne	Molecular formula
2	ethyne	C_2H_2
3	propyne	C_3H_4
4	butyne	C_4H_6
5	pentyne	C_5H_8

Homologous series of alkynes

MUST DO QUESTIONS

Q1.Write the names of simplest alkene and alkyne?



Ethene

Ans- Alkene - C_2H_4
Alkyne - C_2H_2

Q2.Give IUPAC Name of Compounds :-

(a) CH_3 -CH-CH_2 -CH_3
|
CH_3

(b) CH_3 -CH-CH-CH_3
‖
CH_3 CH_3

Ans. (a) 2-Methylbutane (b) 2,3-Dimethylbutane

Q3.Name the alkane which has 6 carbon atoms?

Ans. $C_6 H_{14}$ (Hexane)

Q4. The molecular formula of 5th member of Homologous Series of alkane is :-
(a) $C_5 H_{10}$ (b) $C_6 H_{12}$ (c) $C_6 H_{14}$ (d) $C_5 H_{12}$
Ans.(b) $C_5 H_{12}$.

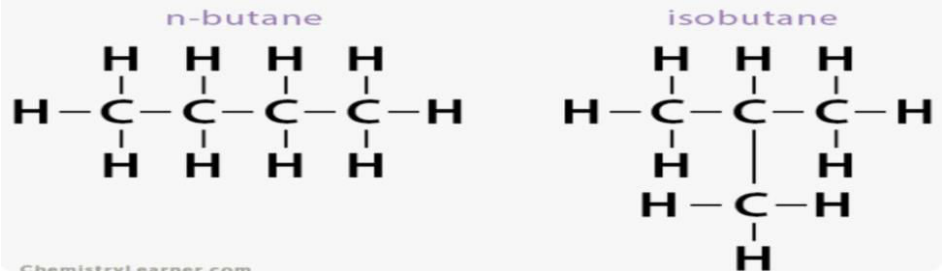
ISOMERISM : Organic Compounds having same molecular formula but different arrangement of carbon atoms. Their Physical and chemical properties are different.

FUNCTIONAL GROUP :- An atom or a group of atoms which is responsible for characteristic properties of a compound.

MUST DO QUESTIONS

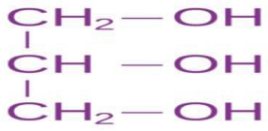
Q1.Write the isomers of Butane?

Ans.



Q2.What is wood alcohol?
Ans. $CH_3 OH$ (Methanol)

Q3. What is Glycerin? Which functional group is present in it?

Ans. 

1,2,3-Propanetriol
Functional Group: Hydroxyl

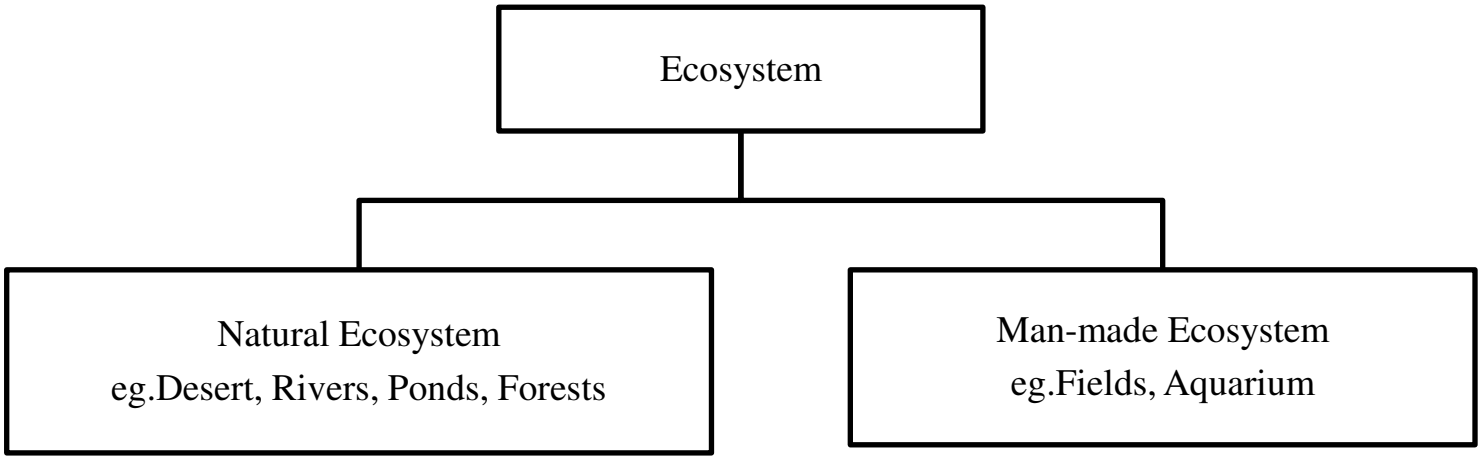
Q4. Which acid is present in vinegar?
Ans. CH_3 COOH (Acetic acid)

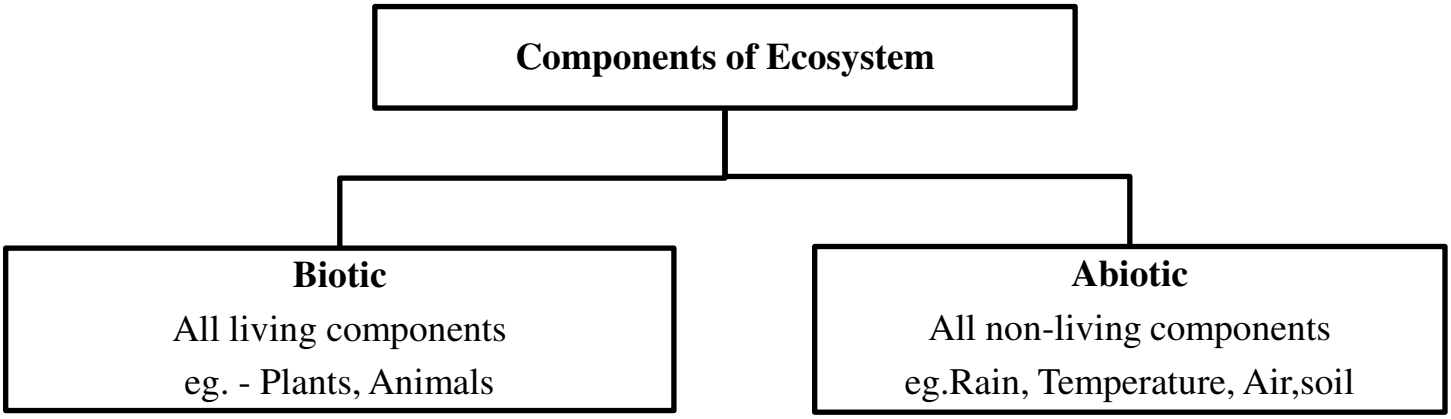
Q5. Give IUPAC Name of following compound:
(a) C_2 H_5 OH (b) HCHO (c) CH_3 $COCH_3$ (d) CH_3 -CH=CH_3
(e) CH_3 -CH=CH-CH_3
Ans. (a) Ethanol (b) Methanal
(c) Propanone (d) Prop-1-ene
(e) But-2-ene

Q6. Name the functional group present in the following compound:
(a) C_2 H_5 OH (b) CH_3 $COCH_3$ (c) HCHO (d) CH_3 Cl
(e) CH_3 COOH
Ans. (a) Alcohol (b) Ketone (c)Aldehyde (d) Haloalkanes
(e) Carboxylic Acid

Chapter -29
Natural Environment

Ecosystem:-A biological environment consisting of all organisms living in a particular area as well as non living physical components with which the organisms interact.



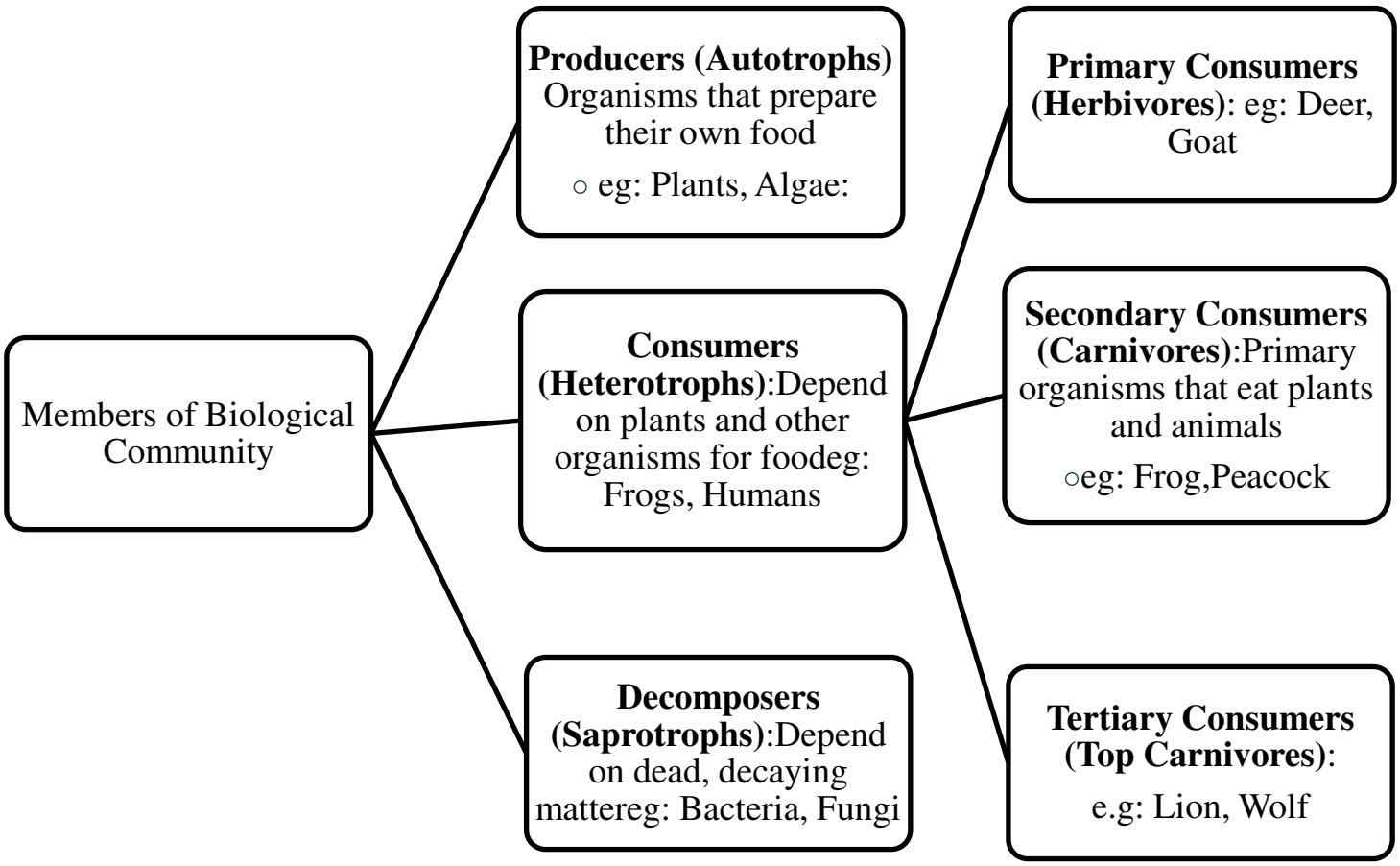


MUST DOQUESTIONS

Q1. Which ecosystem is not a man-made ecosystem?
(a) Garden (b) Field (c) Forest (d) Aquarium
Ans: (c) Forest
Q2. Which of the following is not a biotic component of the ecosystem?
(a) Carnivore (b) Omnivore (c) Detritivore (d) Temperature
Ans: (d) Temperature

Q3. What is an ecosystem? Name its various components?
Ans: An ecosystem is a natural system in which all living and non-living environments together form a unit. Components of an ecosystem are biotic and abiotic components.

Biological Community: -

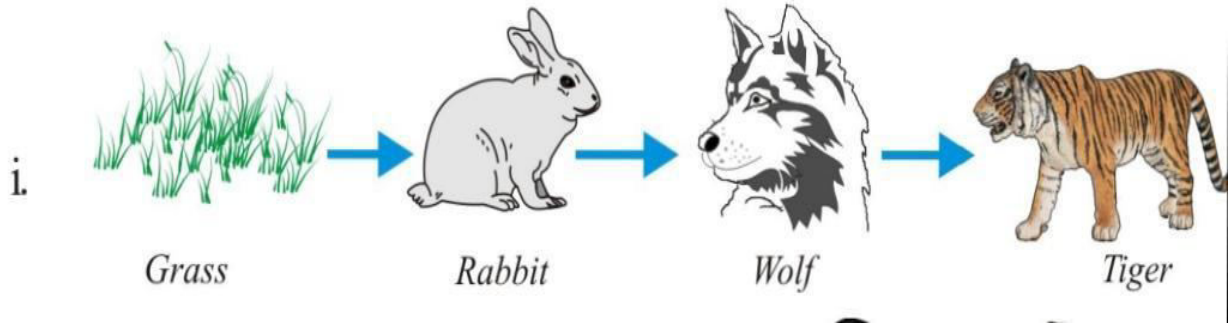


Food Chain and Food Web:-

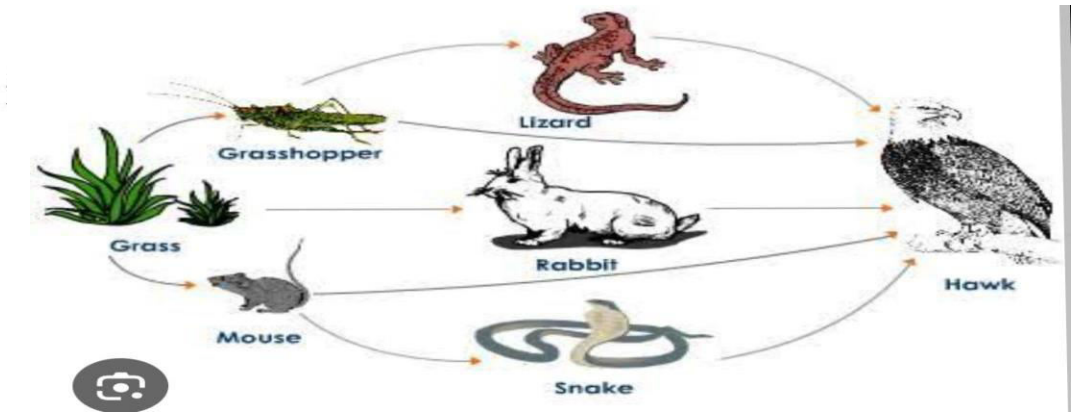
Food Chain- Represent transfer of energy and nutrients from one organisms to another creating linear pathway in an ecosystem.

e.g: Grass → Deer → Lion

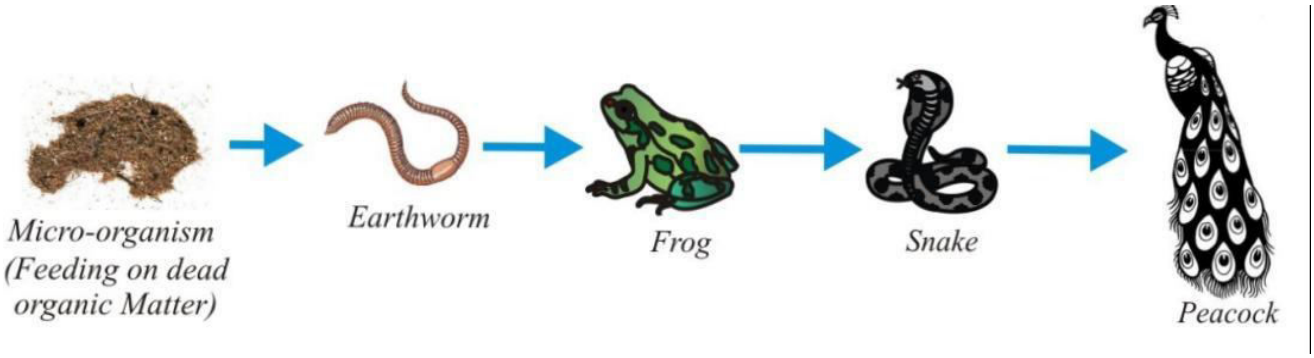
(a) Food chain in Terrestrial Ecosystem.



b)Food chain in Aquatic Ecosystem:-



c) Detritus food chain: -



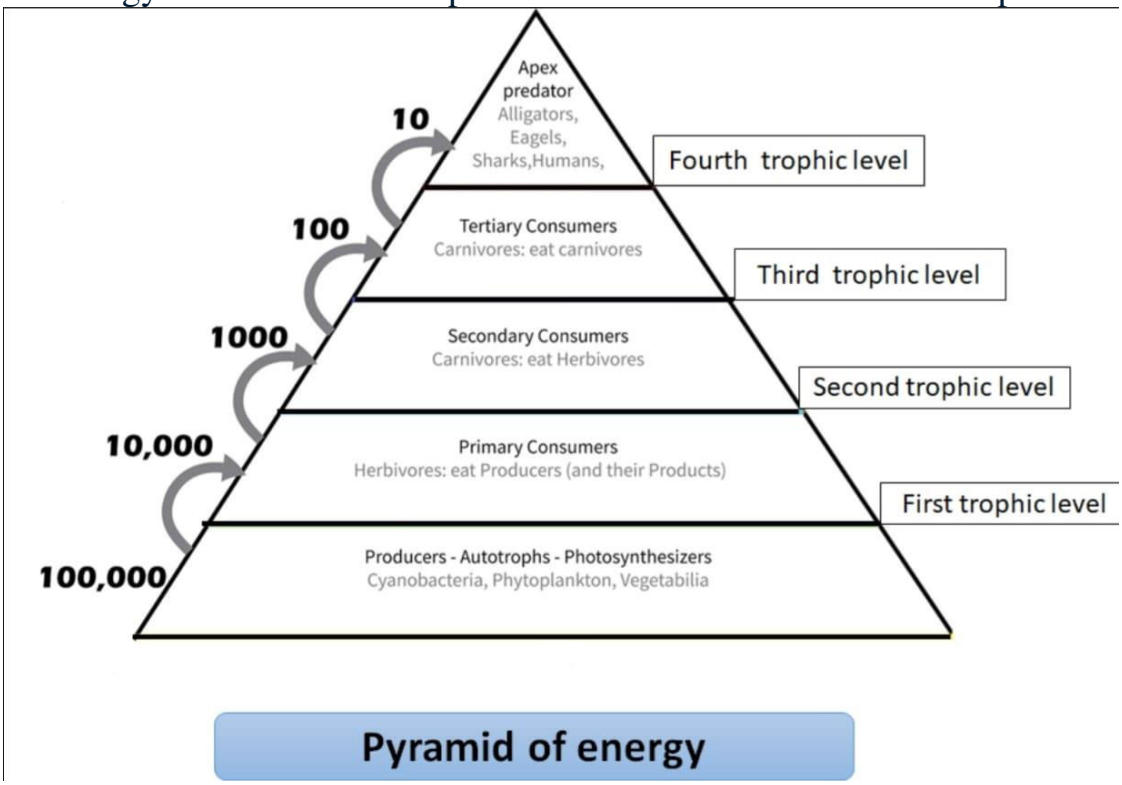
Importance of Food Chain and Food Web

1.Maintaiin ecological balance

To understand the feeding relationships among the organisms.

Understanding of energy flow and nutrient cycling in an ecosystems

Food Web - Group of various interlinking or connected food chains.
Energy Flow: Transfer of energy from one trophic level to another trophic level**.** Only 10% of the energy flows from one trophic level to the next consecutive trophic level.



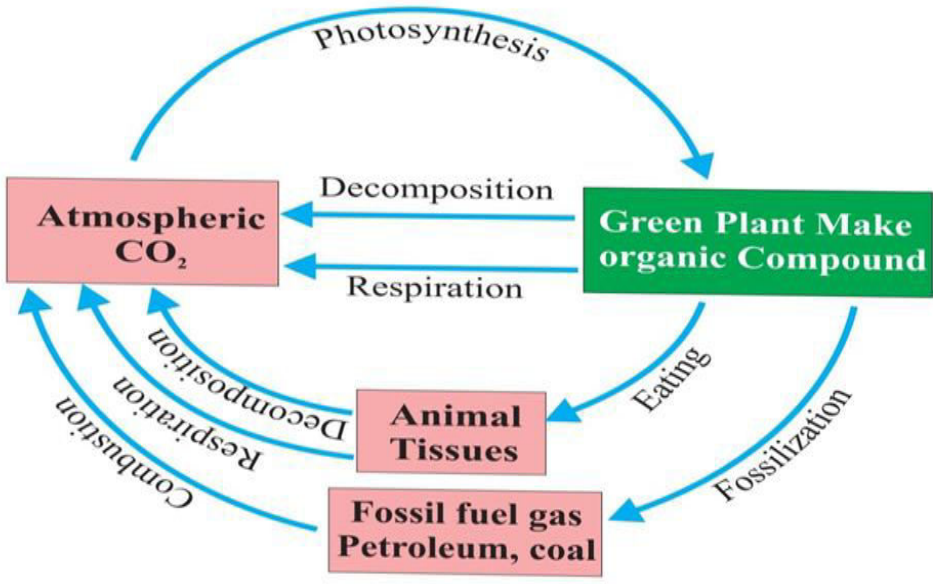
Pyramid of energy

MUST DO QUSTONS

Q1. In a food chain, what flows among the following?
(a) Respiration (b) Energy (c) CO_2 (d) None of these
Ans. (b) Energy
Q2. Who among the following is a secondary consumer?
(a) Deer (b) Wolf (c) Human (d) Cow
Ans. (c) Human
Q3. In which direction does energy flow in an ecosystem?
(a) All directions (b) Only one direction (c) Both directions (d) All of the above
Ans. (b) Only one direction
Q4. Why does the amount of energy decrease when moving from one trophic level to the next**?**
Ans**:** Because most of the energy is spent in various biological processes. Only 10% of the energy reaches the next level.
Q5. Why are there a maximum of 4-5 levels in a food chain?
Ans: There won't be enough energy left for higher trophic levels and not realistic in nature as organisms have multiple options to feed upon.

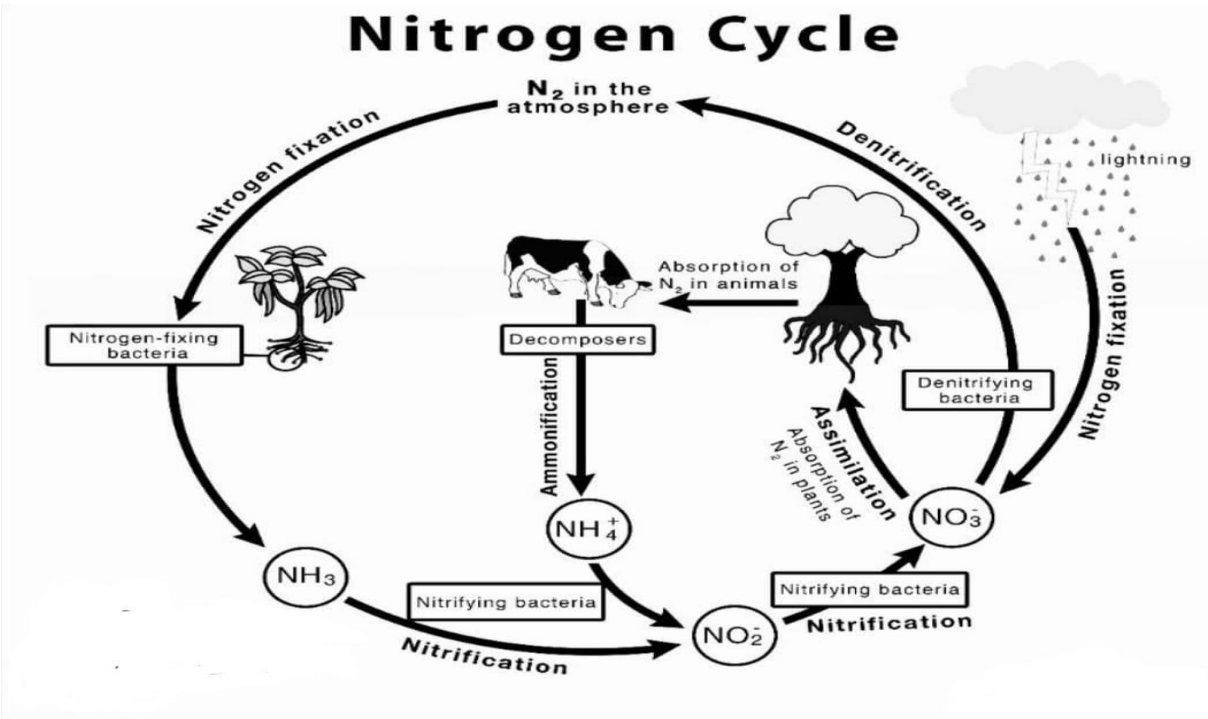
Biogeochemical or Nutrient Cycle:- Cyclic process where essential element or compound like Carbon, Nitrogen circulate through living and non living components of biosphere.

a) Carbon Cycle:-

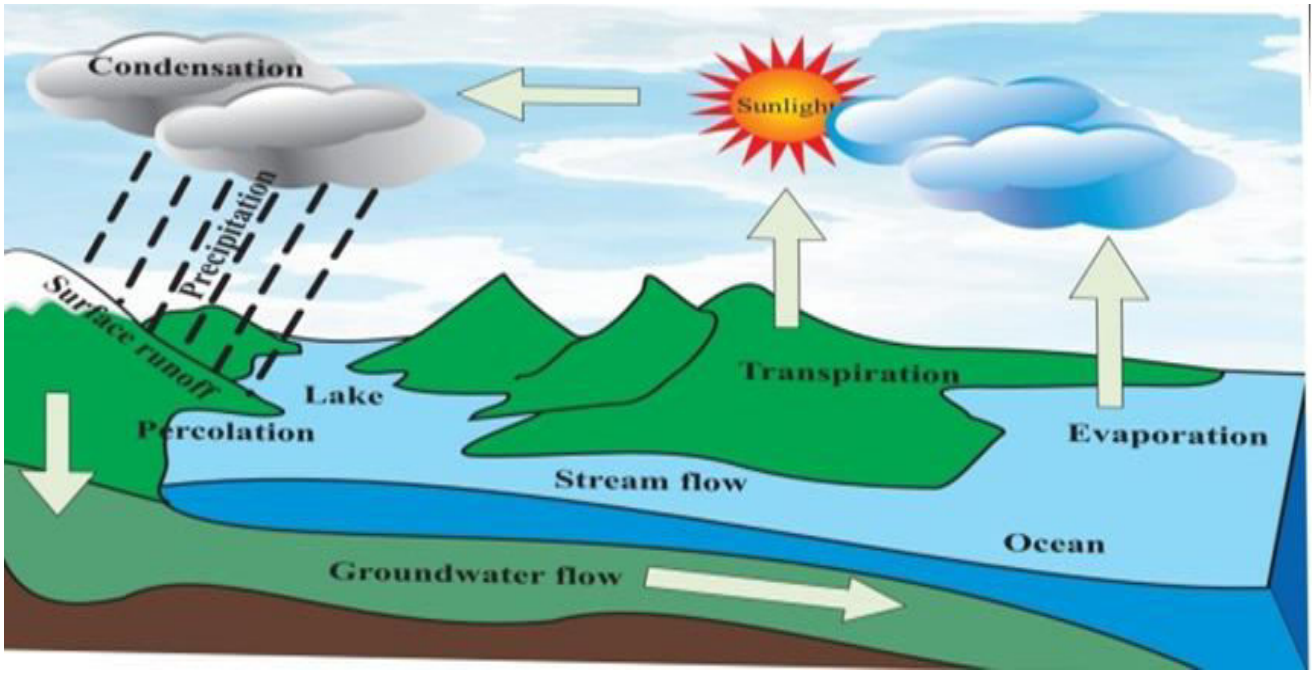


Carbon cycle

b)Nitrogen cycle:-



c)Water Cycle:-



MUST DO QUESTIOS

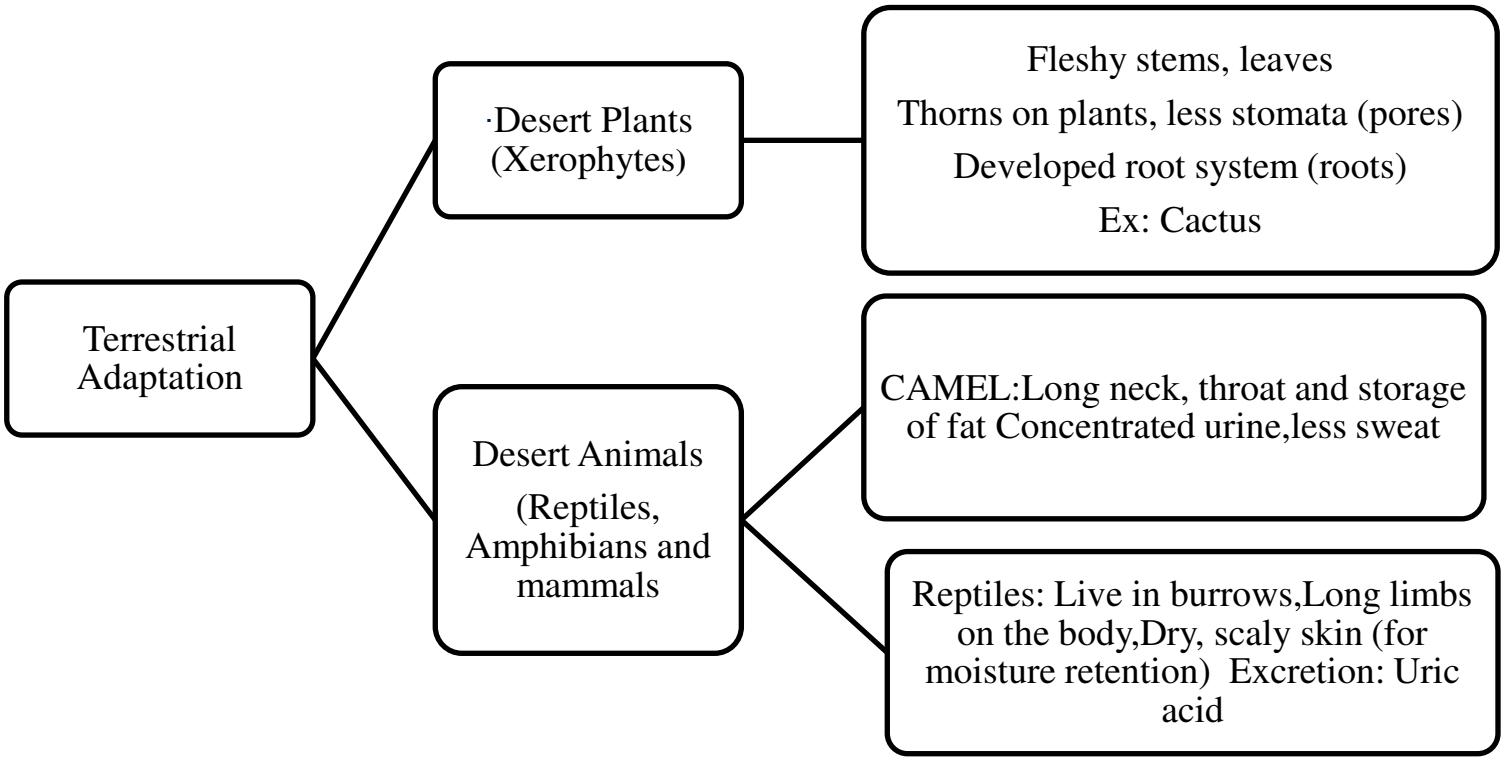
Q1. Which bacteria is found in roots of leguminous plants?
a) Nitrobacter b) Azotobacter c) Rhizobium d) Pseudomonas
Ans. (c) Rhizobium

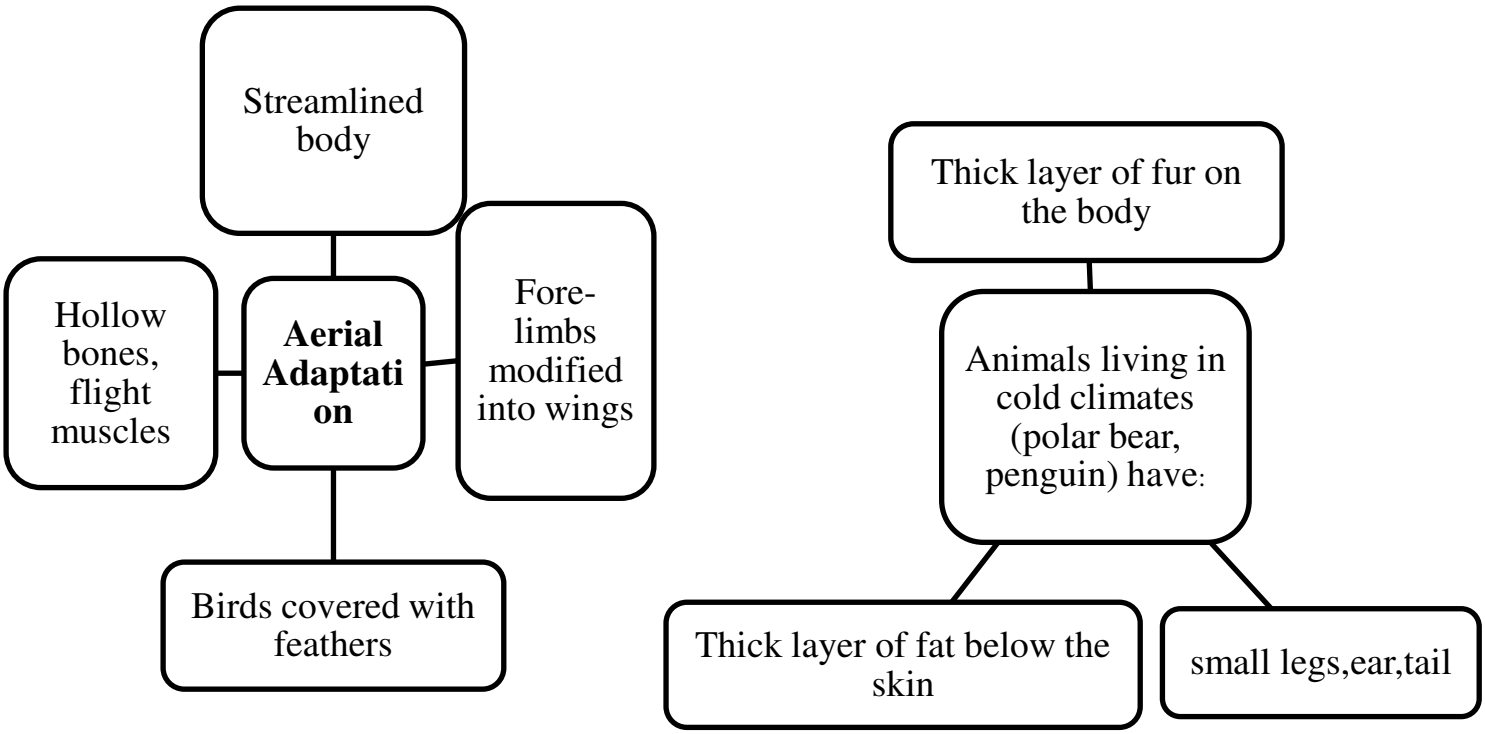
Q2. Rhizobium is an important bacterium?
a) Nitrifying b) Denitrifying c) Nitrogen-fixing d) Ammonifying
Ans.(c) Nitrogen-fixing

Q3. How do animals contribute to atmospheric carbon dioxide?
Ans.Respiration, Decomposition

Q4. What is the function of Pseudomonas and Clostridium in the nitrogen cycle?
Ans.They perform denitrification in Nitrogen cycle.

Adaptation in Organisms: Helping features for living beings in specific regions.





AQUATIC ADAPTATIONS	
AQUATIC PLANTS(HYDROPHYTES)	**AQUATIC ANIMALS**
1. Underdeveloped root system (roots) 2. Leaves thin and narrow 3. Stem long, thin, spongy 4. Layer of wax on the plant's leaves 5. Ex- Hydrilla, Water Lily	1. Smooth and scale-less body 2. Webbed feet (duck) 3. Fins in fish for swimming and changing direction 4. Flat tail (rudder) 5. Crane (Stork): long legs and neck 6. Blubber under the skin (thermal insulation) 7. Gills for respiration 8. Eyes on top of the head, transparent eyelids 9. Nostrils for breathing when they come to surface for breathe in air. Eg. Dolphin, whale

MUST DO QUESTONS

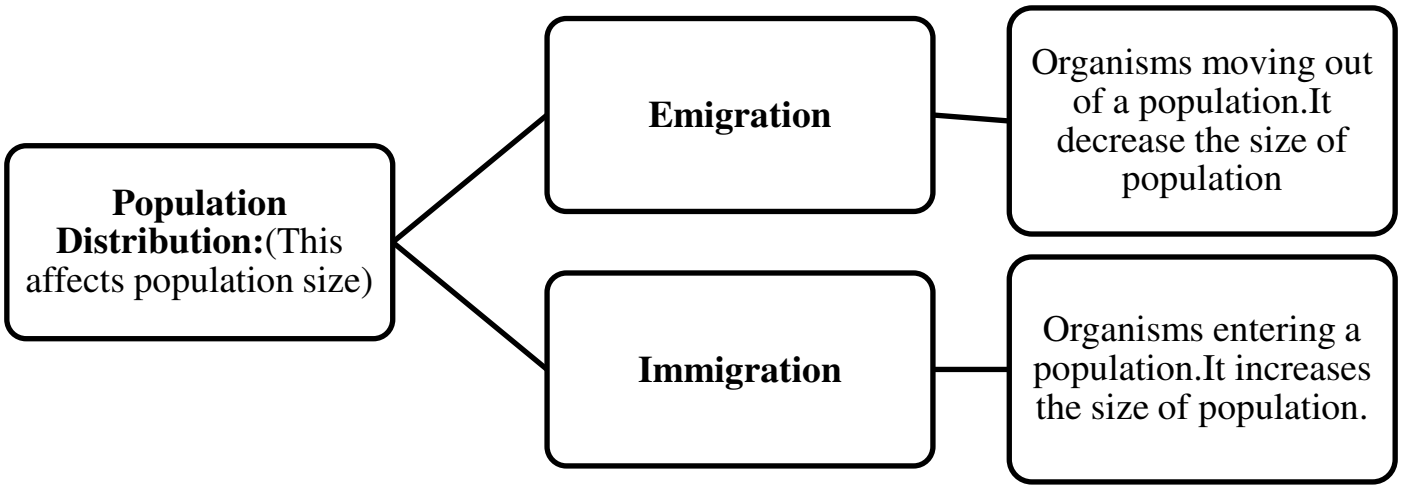
Q1. Which of the following statements is true regarding adaptations in aquatic plants?
a) Submerged root system b) Thin and narrow leaves
c) Waxy layer on the surface of leaves d) All of the above
Ans. (d) All of the above

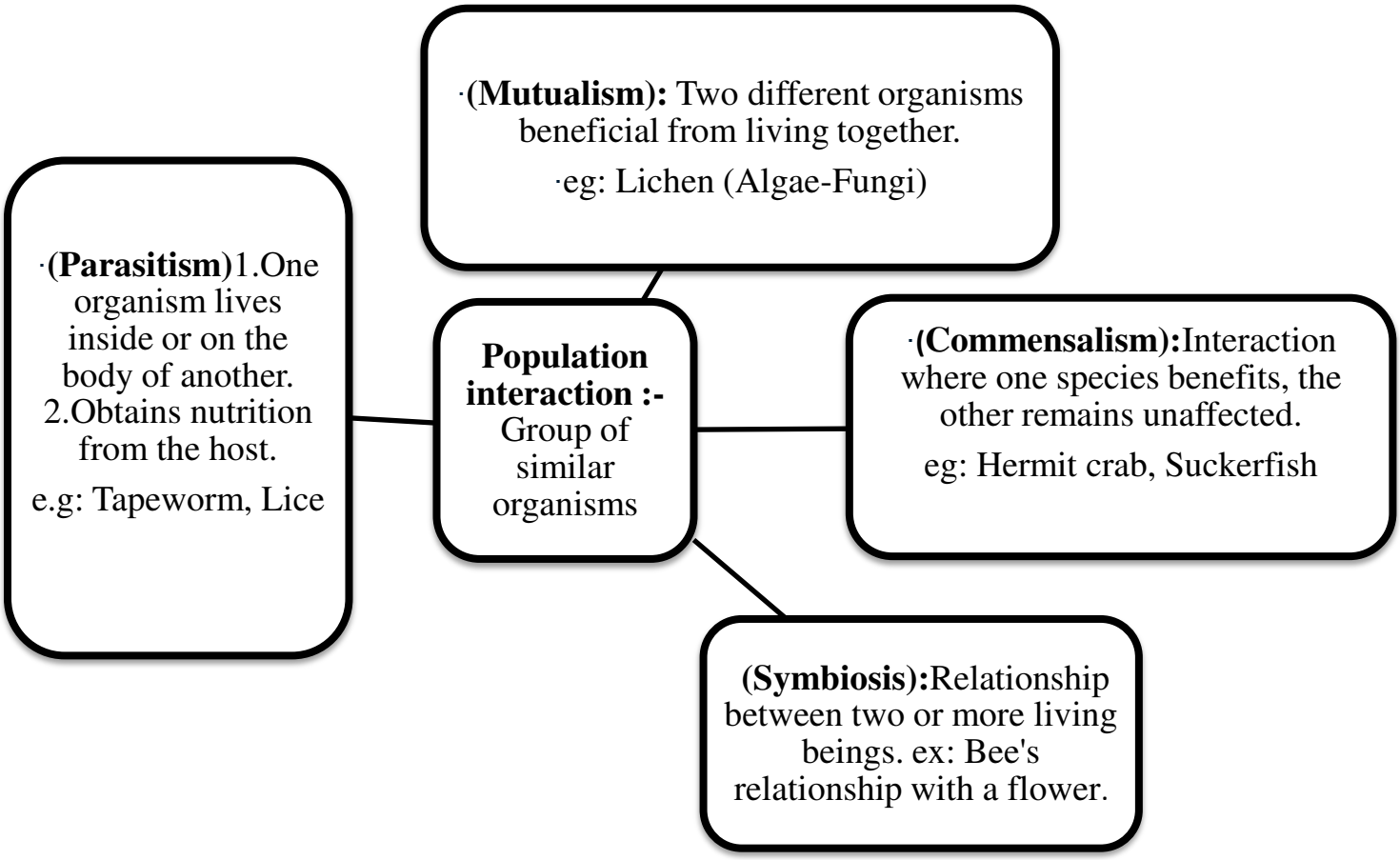
Q.2 What is stored in the hump of a camel?
a) Food b) Water c) Fat d) None of these
Ans. (a) Food

Q3. What are the helpful features for swimming in aquatic animals (fish)?
Ans. Streamlined body, flattened tail, slippery body.

Q4. Why do water lily leaves have a waxy layer?
Ans. The waxy layers prevent water from sticking to the leaves, which prevents the plant from rotting.

Q5. How does a penguin survive in a cold climate?
Ans: Adaptation likethick layer of dense feathers, small flippers to prevent heat loss.

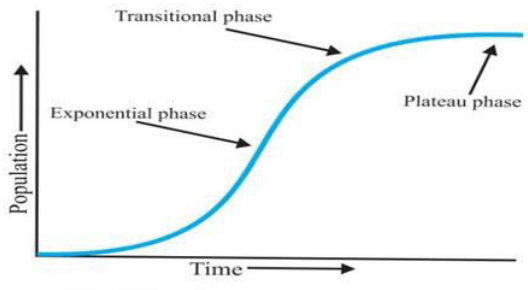




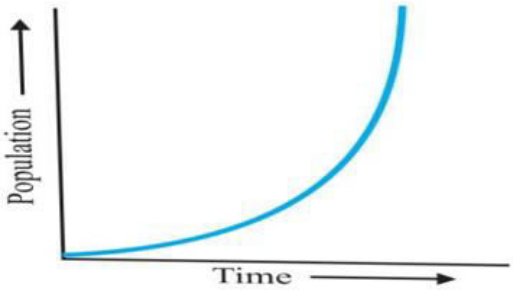
Carrying Capacity: - Maximum population that the environment can sustain for an indefinite period.

GROWTH CURVE:-

S-shaped (Logistic growth)	J-shaped (Exponential growth)
Initial slow growth, followed by rapid increase, then a leveling off to a stable level.	Rapid, Accelerating growth no upper limit.



S shaped curve



J shaped curve

MUST DO QUESTIONS

Q1. Which of the following organisms is parasite?
a) Hermit Crab b) Lichen c) Tapeworm d) Housefly
Ans.(c) Tapeworm

Q2. Which of the following can be reasons for population growth?
a) Birth Rate b) Immigration c) Both (a) and (b) d) Emigration
Ans. (c) Both (a) and (b)

Q3. What is Population Explosion?
Ans. A sudden increase in population in areas with abundant resources.

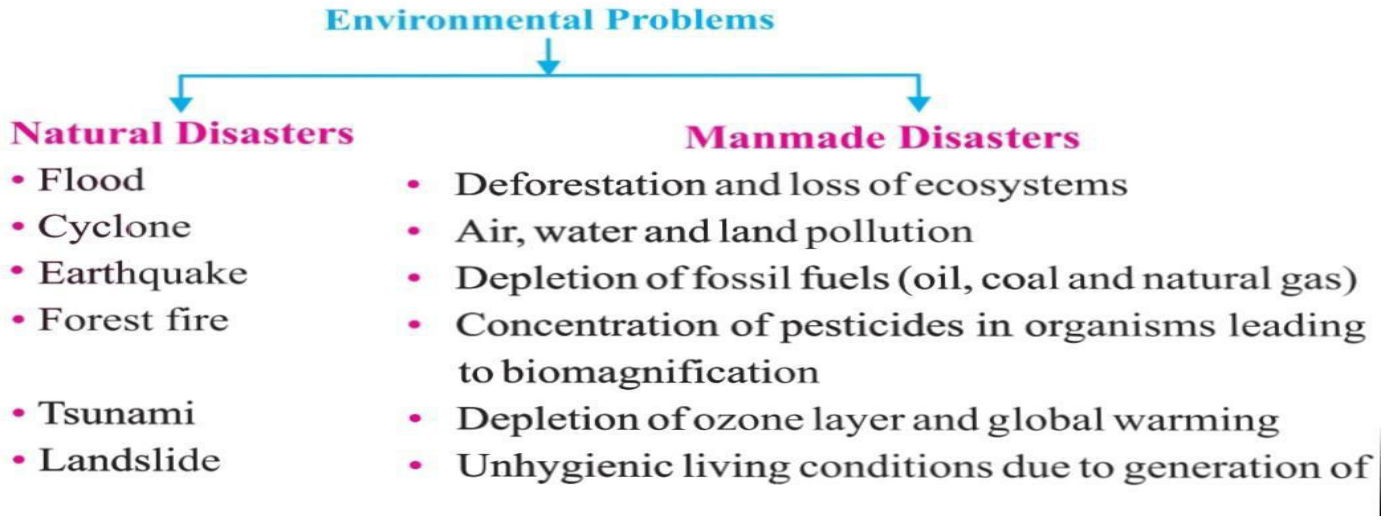
Q4. How do different species in lichen benefits each other?
Ans: Lichen is a symbiotic relationship between algae and fungi.

- Algae prepares food.
- Fungus provides water, minerals, and shelter to algae.

Q5. Name factors affecting populations size?
Ans. Birth rate, death rate, immigration, and emigration.

Chapter 30
Human Impact on the Environment

Environmental Problems



Natural Disasters and Their Impact on the Environment

1.Flood:- A state of Excessive water flow

- Excessive rainfall causing water logging in rivers, lakes, and canals.
- Encroachment on the natural flow of rivers.

Measures for Safety and Management

- Removing encroachments near river banks.
- Regular cleaning of water channels and reservoirs.
- Construction of flood-resistant buildings.

2.Cyclone: An atmospheric vortex that rotates around a low-pressure area.

- This affects agriculture, animals, infrastructure, and the environment.

Measures for Safety and Management

- Construction of cyclone-resistant buildings.
- Storing extra food and water in advance.

3. Earthquake: Sudden vibration occurring on the Earth's surface.

Seismograph: Instrument for measuring the intensity of an earthquake.

Unit for measuring earthquake intensity**: Richter Scale.**

Measures for Safety and Management

- Construction of earthquake-resistant buildings.
- Stay away from windows, electrical wires, trees, etc.

4.Forest Fire

Burning of forest due to human interference

Measures and Management for Prevention

- Do not leave burning things in the forest.
- Do not enter the forest when there is a fire.

5. Tsunami
Explosive volcanic eruption, landslide or volcanic eruption causing displacement of water in a large reservoir.

6. Landslide:- Slipping down of rocks, soil or debris from hilly slopes.
Causes of Landslide: Deforestation, excessive rainfall, dynamite blasts, construction work.

7. Cloudburst:- In a very short time excessive rainfall leading to a flood-like situation.

MUST DO QUESTIONS

Q.1 Which of the following is not a natural disaster?
(a) Flood (b) Cyclone (c) Deforestation (d) Earthquake
Ans. c) Deforestation

Q.2 What instrument is used to measure the intensity of an earthquake?
(a) Hydrometer (b) Thermometer (c) Seismograph (d) Lactometer
Ans. c) Seismograph

Q.3.Write the name of the Indian Tsunami Early Warning Centre.
Ans. INCOIS - Indian National Centre for Ocean Information Services.

Q.4 What is a natural disaster?
Ans. The origin of environmental problems caused by natural factors. Examples: Tsunami, flood, etc.

Q.5 What are the two cyclone seasons in India?
Ans. i)Pre monsoon (April-May) ii) Post monsoon (October-December)

Impact of human population on environment
1. Deforestation: Large-scale cutting of forests for:
i) For growing crops and grazing animals
ii) For fulfilling the demand for wood and paper iii) For setting up industries
Measures and Management for Prevention

- **i)** **Reforestation**: Planting new trees
- **ii)** **Silviculture**: Growing woody plants soon after the forest is removed.

2. Pollution: Undesirable change occurring in the environment
(a) Air Pollution: Decrease in air quality due to contamination of pollutants.
(b) Water Pollution: Direct or indirect discharge of pollutants into water source.

Some major water pollutants and their side-effects

Type of pollutant	Examples	Sources	Effects
Infectious agents	Bacteria, viruses, and other parasites	Human and animal excreta	Water-borne diseases
Organic chemicals	Pesticides, detergents, oil	Agricultural, industrial and domestic waste	Biomagnifications
Inorganic chemicals, fertilizers	Acid, alkalis, metals, salts	Industrial waste, household cleaning agents, surface runoff	Water unfit for drinking
Radioactive materials	Uranium, thorium, iodine	Mining and processing of ores, power plants, natural sources	Genetic disorders

Pollutant	Sources	Cause	Effect
Nitrates, phosphates, ammonium salts	Agricultural fertilizers, sewage, manure	Plant nutrients	Eutrophication
Animal waste and plant residues	Sewage, paper mills, food processing wastes	Oxygen deficiency	Death of aquatic animals
Heat	Power plants and industrial cooling	Thermal discharge	Death of fish
Oil slick	Leakage from oil ships	Petroleum	Death of marine life due to non-availability of dissolved oxygen

Major disturbances in ecosystem due to water pollution

Eutrophication:-

- In water, the growth of green algae increases due to the rise in nutrients like nitrates and phosphates.
- Decrease in dissolved oxygen in water.

Biomagnification:-

- The concentration of harmful non-biodegradable chemicals increases from one trophic level to the next.
- Ex.: Increasing DDT in water and the body of pelican birds.

Water → Algae → Fish → Pelican birds(Top consumer)

0.2 ppm → 77 ppm → 500-600 ppm → 1700 ppm

c) Soil Pollution / Land Pollution:-

- Decrease in soil quality due to pollutants released from domestic, industrial, and agricultural sources.

d) NOISE Pollution:- Undesirable Sound

- Unit for measuring sound intensity - Decibel (dB)

Sources of Noise Pollution:

i) Industrial activities ii) Means of transport iii) Firecrackers, Loudspeakers

Effects of Noise Pollution

i) Decrease in hearing ability, headache ii) Irregularity in blood pressure and heart rate iii) Insomnia

Prevention and Management of Noise Pollution

i) Keep the volume of sound sources under permissible units.

ii) Plant trees around road side as they are efficient noise absorber.

MUST DO QUESTION

Q.1 Which organism is at the top of the food chain in bio magnification?

a) Human b) Fish c) Goat d) Cow

Ans. a) Human

Q.2 What is the minimum intensity of sound audible to the human ear?

a) 80 dB b) 20 dB c) 10 dB d) 120 dB

Ans. c) 10 dB

Q.3 Fill in the blanks.

i)Reforestation can be aided by _____ and _____.

ii) The mixing of undesirable substances in the environment is called _____.

iii) Radioactive substances are _____ and Thorium.

iv) The concentration of _____ in the bodies of top consumers is higher.

v) Soil erosion can be prevented by _____.

Ans. i) forestation, Silviculture ii) Pollution iii) Uranium iii)DDT v) Afforestation

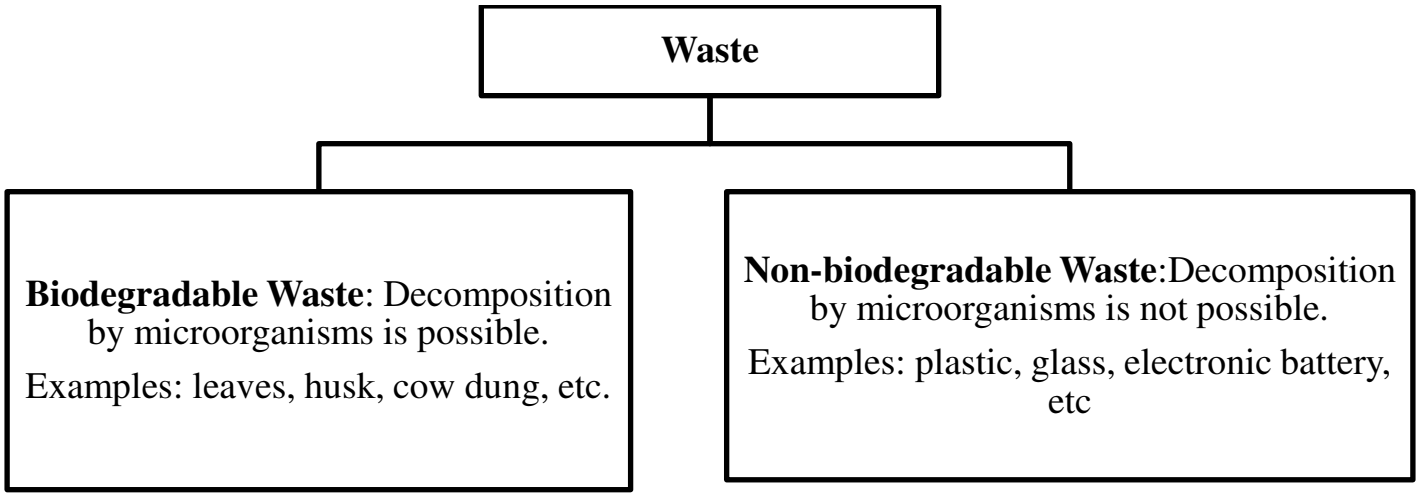
Q. 4 Write down the environmental problems caused by the overexploitation of natural resources.

Ans. i) Deforestation and loss of ecological balance. ii) Air, water, and soil pollution. iii) Biomagnifications. iv) Depletion of the ozone layer.

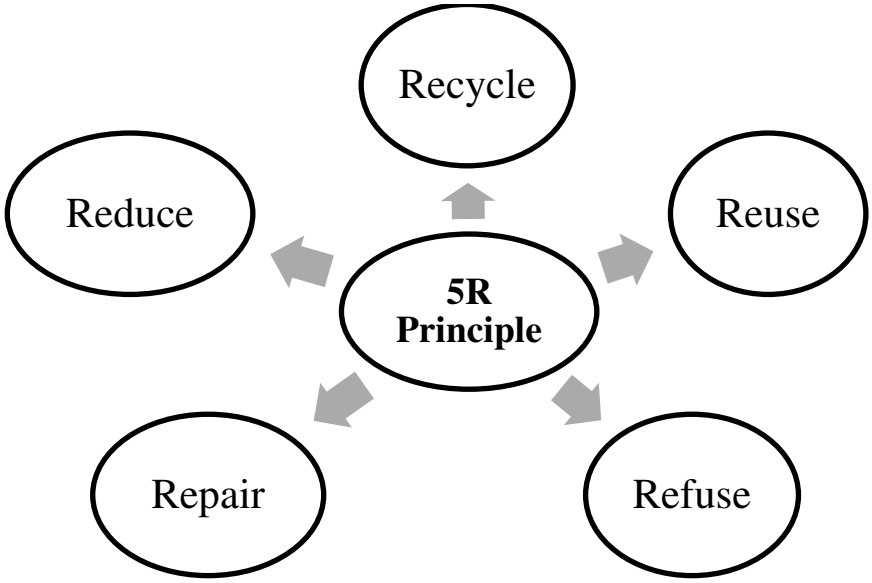
Q.5 What can be the consequences of forest cutting?

Ans. i) Decrease in rainfall ii) Soil erosion and desertification iii) Increase in temperature iv) Increase in CO_2 levels

Waste and its Management



Radioactive waste: takes a long time to decompose.
Incineration: Burning of waste after separating recyclable materials.
5R Principle :



Global Environmental Problems:-

- **Ozone Hole:** Thinning of ozone layer is called ozone hole.
- **Ozone Layer Depletion:** Most responsible for depletion:- **CFCs**
- **Prevention of Ozone Layer Depletion**

i.) Reducing the consumption of CFC by adopting alternating technologies
ii.) Reduced use of aerosol spray cans.

- **Global Warming - Greenhouse Effect**

Greenhouse: A glass chamber where the inside temperature is higher than the outside.
Factors responsible for Greenhouse Effect: CO_2 , CH_4 , and N_2 O, etc.

- **Effects of Global Warming**

i) Melting of glaciers and rise in sea level
ii) Unpredictable weather pattern
iii) Decrease in crop production
iv) Interference with the hatching of eggs in certain fish

Photochemical Smog:

i) Soot suspended in the air from burning sulphur-containing fuels
ii) Reduced visibility due to smog

PAN Smog: Photochemical smog is called PAN smog due to the formation of Peroxyacetyl Nitrate (PAN) and Ozone.

Acid Rain: i)Caused when nitrogen oxide,SO_2 in the atmosphere reacts with H_2O to produce acids.

i) pH-4.5, Harmful to aquatic life
ii) Damage to crops and forests, Causes asthma in humans
iii) Damage to buildings and monuments

MUST DO QUESTIONS

Q. 1 Which of the following is a non-biodegradable waste?
a) Cow dung b) Glass c) Husk d) Wood
Ans. b) Glass

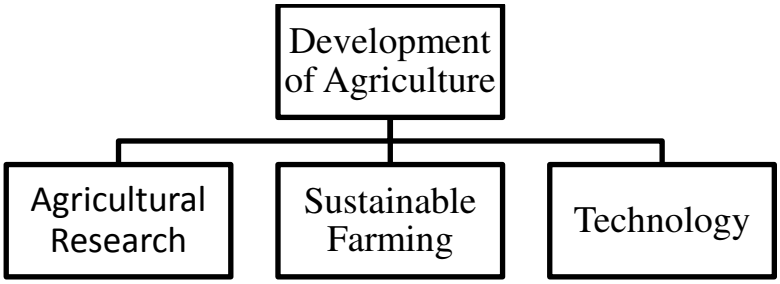
Q. 2 Which gas is responsible for ozone depletion and the greenhouse effect?
a) CO_2 b) CH_4 c) N_2 O d) All of the above
Ans. d) All of the above

Q. 3 When warm air in the atmosphere traps a layer of cold air near the ground, this phenomenon is called:
a) Thermal Inversion b) Global Warming c) Incineration d) Biomagnification
Ans. a) Thermal Inversion

Q.4 Name two photochemical oxidants?
Ans. a) PAN b) Ozone

Chapter-31
Food Production and Animal Husbandry

Development of Agriculture and Green Revolution



Green Revolution: - A major improvement in crop and food grain production in Indian agriculture. **Founder**- Dr. M. S. Swaminathan

Principles and Methods of Crop Production

Agricultural Science: Crop Production and Farm Management

Methods of Crop Production: -

(a)Crop Rotation: Growing crops in a pre-determined sequence at a particular time in a field is called crop rotation.

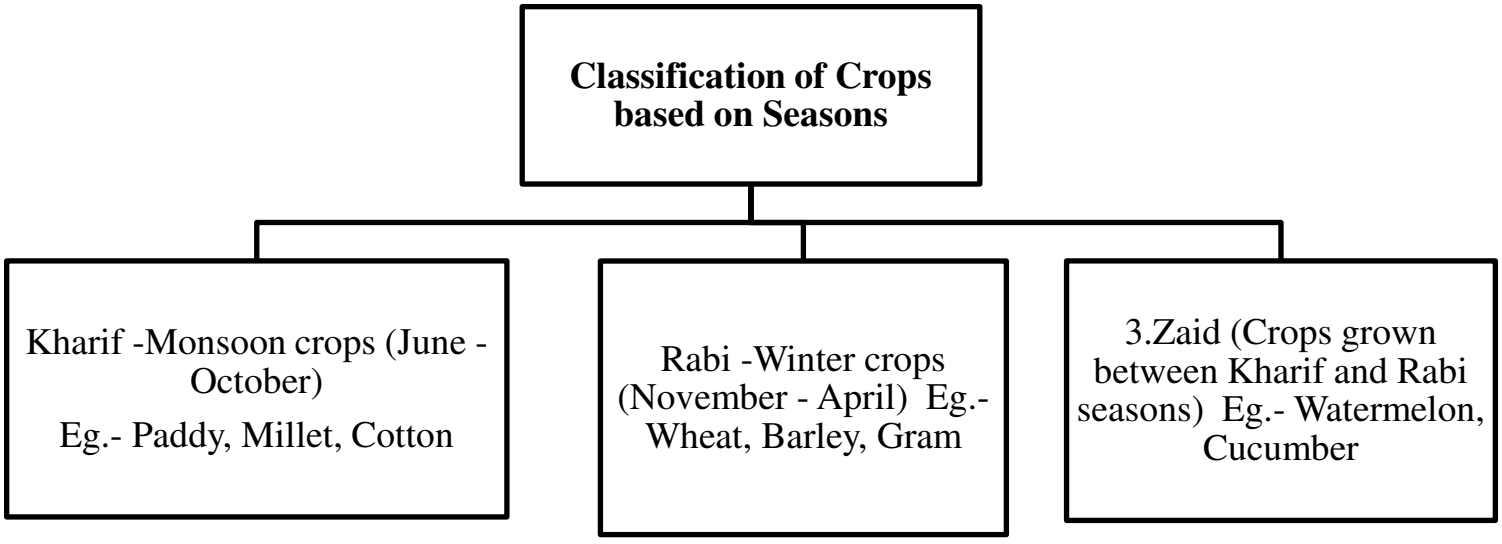
Eg.: First paddy then gram.

(b)Mixed Farming: Growing two or more crops simultaneously in the same field.

Such as: Wheat and Mustard

Advantages: - i) Benefit of two crops at the same time.ii) Maintaining soil fertility.

(c)Multiple Cropping: Growing two to four crops on the same land in the same year in same field.



(d) Organic Farming / Organic Agriculture

- Farming without chemicals
- Use of organic manure

Horticulture: Cultivation of fruits and vegetables

Advanced Agricultural Practices:

- ❖ Making the soil suitable for cultivation
- ❖ Use of treated seeds
- ❖ Care of small crop plants
- ❖ Weeding
- ❖ Use of food and fertilizers (Macro and Micro nutrients)
- ❖ Use of plant growth regulating chemicals
- ❖ Irrigation - Drip irrigation
- ❖ Harvesting of crops

MUST DO QUESTIONS

Q1. The government mission promoting horticulture is:
a) National Green Mission b) National Food Security Mission
c) National Horticulture Mission d) National Crop Mission
Ans c) National Horticulture Mission

Q 2.Which among the following is not included in the production of organic manure:
a)Paddy straw b) Fallen leaves c)Chemical substance d)Animal dung
Ans c)Chemical substance

Q.3 Write the principles of crop production.
Ans principles of crop production : -

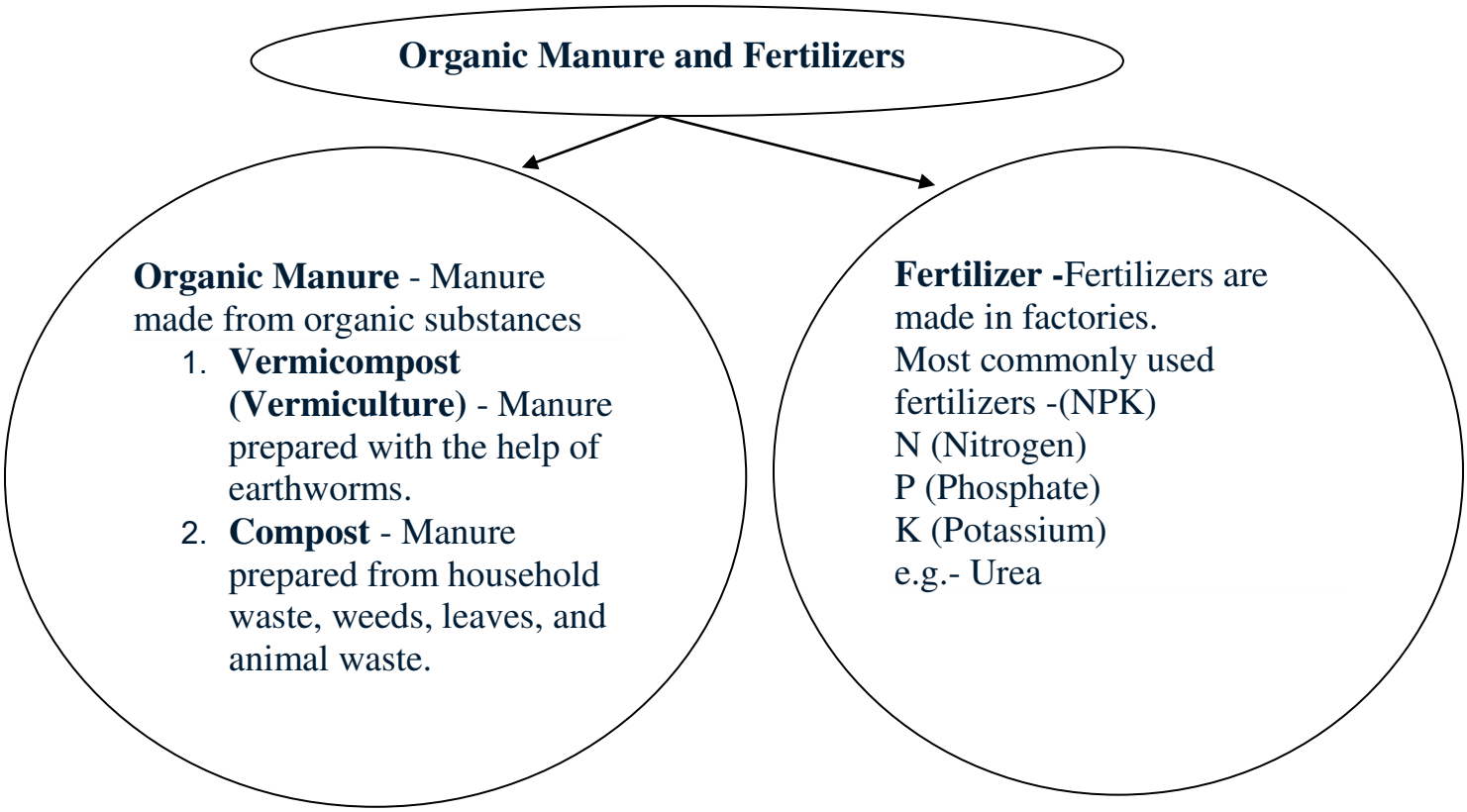
- Maintaining soil fertility and productivity.
- Use of healthy seeds
- Proper management of fertilizer and water
- Use of crop rotation
-

Q.4 State the benefits of crop rotation.
Ans.benefits of crop rotation:-

- Maintaining soil nutrient levels
- Preventing soil erosion
- Weed, pest, and disease control
- Regular income throughout the year

Q.5 Which are the plant growth regulating chemicals/hormones?
Ans: Auxin , Gibberellin, Cytokinine and Abscisic acid

Organic Manure and Fertilizers - All natural substances that maintain soil fertility



Protecting crops from weeds, insects, pests and diseases:-

- **Weed Control** - Protecting crops from unwanted plants like Xanthium, Parthenium.
- **Weedicide Chemical** - N.C.P.A., (2,4D)

Grain Storage

Protecting grains from pests, rodents, fungi and bacteria.

Methods of Safe Grain Storage:

i. Drying ii. Maintenance of storage containers iii. Chemical treatment

MUST DO QUESTIONS

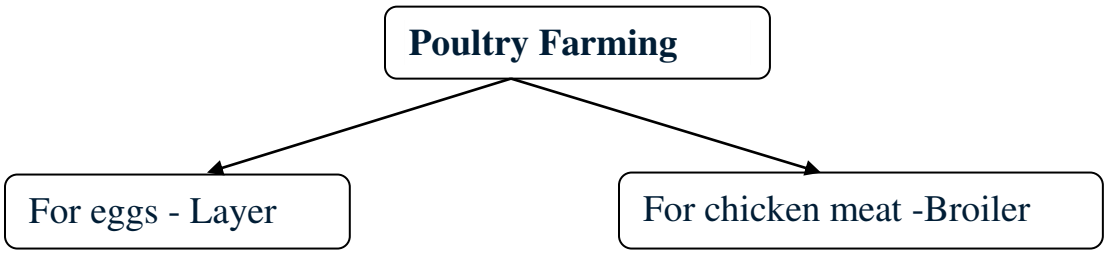
Q1.Who is called the farmer's friend?
Ans .Earthworm

Q 2.Which weed causes allergies and diseases like asthma in the body?
Ans .Parthenium

Q3. Write the difference between organic manure and fertilizer.
Ans:

Organic Manure	**Fertilizer**
1. Organic matter	1. Inorganic substance
2. Made from natural substances	2. Made from chemical substances
3. Nutrients in less quantity	3. Nutrients in excessive quantity
4. Prepared cheaply and easily in fields	4. Expensive and prepared in factories

Animal Husbandry - Scientific rearing of animals.
Milk-yielding animals - Production of animals yielding more milk through cross-breeding.



Fisheries and Aquaculture:-

Marine Fisheries	**Inland Fisheries**
Salt water fish farming Examples: Tuna, Sardine	Fish in fresh water like ponds, lakes, rivers Examples: Rohu, Catla

Agricultural Biotechnology Preparing new products from cells, tissues and organs in the laboratory

Tissue/Cell Culture

- Cultivating cells/tissues by placing them in a nutrient solution in a beaker or test tube.
- For the conservation of rare or endangered plant species.

Plant Genetic Engineering

- Transfer of specific genes or DNA into desired plants.
- Example: Genetically modified potato (protein + starch)

Food Security -Timely and easy availability of food

Factors determining food security:- 1.Availability of food 2. Accessibility of food

3. Capacity to afford food expenses

Buffer Stock - Storage of surplus grain (e.g., wheat, rice) by the Food Corporation of India for adverse times.

Public Distribution System (PDS)

Ensuring access to grain for the poor.

MUST DO QUESTUON

Q1. Which of the following is an example of inland fisheries in the world?

a) Rohu b) Mackerel c) Ena d) Sardine

Ans. a)Rohu

Q2. For what purpose is layer hen farming done?

a) Meat b) Eggs c) a & b both d) None of these

Ans: b) Eggs

Q3. What is integrated fish farming?

Ans: Fish farming by farmers along with paddy cultivation.

Q4. Explain the efforts being made at the national level regarding food security in the country and clarify why food security is essential in the national interest today.

Ans: Objectives of food security:

i) Access to food for every individual. ii) Storage of food for difficult times.

Q5. Name any two programs launched with the aim of food security and poverty eradication.

Ans: i) Mid Day Meal Scheme ii) Annapurna Scheme

Chapter -32
Health and Hygiene

Health:- Health is the ability of a person to function fully and efficiently in physical, mental and social aspects.

Indicators of Physical Health:-
i) Weight and height should be age appropriate ii) No bad breath from the mouth
iii) Proper hunger and sleep

Indicators of Mental Health:-
i) Feelings, desires, ambitions and perceptions should be balanced
ii) Being sensitive to the needs of others

Indicators of Social Health:-
Healthy interpersonal relationships ii) Fulfilling one's duties towards society

Personal Health:

1. Keeping oneself healthy and disease-free
2. Balanced diet:A diet containing carbohydrates, protein, fat, vitamins, minerals and fiber
3. Maintaining personal hygiene
4. Clean food and water
5. Cooking food with care
6. Regular exercise
7. Sleeping and waking up at regular times and resting
8. Staying away from intoxicating substances.

Community Health:-Efforts by common people and private institutions to prevent diseases.
For example:

i) Proper disposal of waste.
ii) Promotion of health services.
iii) Providing mid-day meals for school children.

MUST DO QUESTIONS

Q.1 What is the energy requirement of an active adolescent girl?
a) 1400 calories b) 1600 calories c) 2000 calories d) 1900 calories
Ans:c) 2000calories

Q.2 Which component is essential for body growth and repair?
a) Fat b) Protein c) Carbohydrate d) Vitamin
Ans:b) Protein

Q.3 Write any four ways to maintain personal health.
Ans:1) Regular bowel habits2) Washing hands before eating food
3) Regular exercise4) Regular bathing

Disease:- Obstruction in the normal functioning of the body

Infectious Diseases:-Disease that can transfer from a infected person to a healthy individual.

Direct: i)Direct contact with a sick person ii) From infected mother to fetus

Indirect: i)Through contaminated items used by the infected person like bed, towel, etc.
ii) Through vectors like flies, mosquitoes.

Some common communicable diseases:

S. No.	**Name of disease, its causative agent & mode of transmission**	**Symptoms**	**Prevention & Treatment**
1.	**Amoebiasis** caused by: *Entamoeba histolytica* a protozoan parasite infecting large intestine **Transmission:** • by air; by house fly and cockroaches that may carry the pathogen from the infected person's stool to food/water and thereby contaminate it.	Abdominal pain, constipation, cramps, stools with mucous and blood.	**Prevention:** • Washing hands before eating and after defecation. • Proper sanitary disposal faecal matter • Personal hygiene • Washing fruits and vegetables before eating. **Treatment:** • Antibiotics (on doctors prescription)
2.	**Ascariasis** caused by: *Ascaris lumbricoides* (round worm). That resides in the small intestine. Transmission: Eggs of the parasite come out along with the faeces of the infected person and contaminate soil, water, plants etc. A healthy person gets infected in the same manner as he/she gets infected for amoebiasis. Why do you think it is more common in children?	Muscular pain, internal bleeding, impaired digestion, colic pain and blockage of intestinal passage. In children, may lead to retarded physical and mental growth.  *Male and female ascariasis*	**Prevention:** • Same as Amoebiasis, **Treatment:** • Antihelminthic drugs (doctor's prescription).

3.	**Malaria Caused by:** *Plasmodium.* It complete its lifecycle in two hosts, human and mosquito. **Transmission:** By the bite of an infected female *Anopheles* mosquito. Malarial parasites multiply within the red blood corpuscles (RBCs) of human blood and increase to enormous numbers. So the RBCs rupture and the toxin produced by the parasite is released in the blood.	• Shivering and high fever which occurs at regular intervals accompanied by headache and nausea. • Fever may last for 6-10 hrs. After the fever sweating starts and the temperature falls.  *Bite of infected mosquit's*	**Prevention:** • Eradication of mosquitoes and their larvae by use of kerosene/larvae eating fish • Don't allow water to accumulate in the surrounding areas. • Sleep under mosquito nets. • Use mosquito repellents at night. • Cover doors and windows with wire mesh. **Treatment:** • Anti malarial drugs (on doctor's prescription)
4.	**Filariasis /Elephantiasis is caused by:** *Wuchereria bancrofti*, another worm similar to *Ascaris.* **Transmission:** Bite of the female *Culex* mosquito.	• Fever in the initial days, the parasites reside in the lymph vessels and cause chronic inflammation of the organs , specially in lower limbs resulting in enormous swelling of the limbs.	**Prevention:** • Same as Malaria. **Treatment:** • Medicines on doctor's prescription 
5.	**Dengue fever** (break bone fever) caused by a virus Transmission: by the bite of a female mosquito *Aedes.*	• Abrupt high fever, • severe headache and pain behind the eye muscles and joints, loss of appetite, rashes over chest and upper limbs. • Symptoms may turn into haemorrhagic fever causing bleding from mouth, gums and skin. • Burning mouth, severe stomach pain and frequent vomiting with or without bleeding.	**Prevention:** • Same as malaria and filariasis. However aedes **Treatment** • doctor to be consulted. mosquito is active during day time and breeds in fresh water. Therefore clothes which cover the arms and legs protect from during day time
6.	**Influenza** (flu) is a viral infection of the respiratory tract. **Transmission :**through direct or indirect contact including infected droplets. These viruses mutate all the time and as a result different strains of influenza virus exist. Our immune system needs to fight each new strain in order to provide protection against the virus. You might have heard of H5N1 (bird flu virus) and	Fever (100°F to 103°F), sore throat, cough, sneezing, running nose, headache, body pain, fatigue.  *Drop Infection*	**Prevention:** • The infected person should cover their mouth and nose when they cough or sneeze. • The infected person should avoid public places. • Vaccination. **Treatment:** • Patients should take plenty of fluids. • Medicine prescribed by the physician.
7.	**Tuberculosis (T.B.)** **Caused by** bacteria *Mycobacterium tuberculi.* It affects bones, lymph node and most frequently the lungs. **Transmitted** by inhaling "droplets of patients present in their sputum, cough and sneeze.Requires prolonged contact with the patient and therefore is common in crowded and poor living conditions.	Persistent low grade fever and cough. Blood in sputum. Weight loss, chest pain, excessive fatigue, night sweating, poor appetite. 	**Prevention:** • BCG vaccine at birth • Patient suffering from T.B. should be kept isolated and given proper medication. • Clothes and utensils used by TB patient should be regularly disinfected. **Treatment**: • Regular course of antibiotics as prescribed by the doctor. Treatment is for 6-8 months.
			• Directly Observed Treatment under Supervision (DOTS) is an effective way of treatment

Ways to prevent infectious diseases:-

i) Consumption of balanced diet ii) Personal and environmental hygiene

iii) Timely vaccination

Non-infectious diseases:-Diseases that do not spread from a infected person to a healthy individual. Examples – Hypertension, diabetes, obesity.

Immunity:-The body's ability to fight from diseases.

Innate Immunity
Ability to fight diseases from birth. Ex - Skin and mucous membranes

Acquired Immunity
Immunity developed through vaccination and by the body itself. Ex - Vaccination - DPT, BCG, etc.

Acquired immunity:-	
Active Immunity	Passive Immunity
Develops after some time.	Immediate immunity
Host develops antibody against pathogens	Readymade antibodies are given

Primary First Aid:-

Vaccine	Age				
	Birth	6 weeks	10 weeks	14 weeks	9-12 months
Primary vaccination					
BCG against T.B	✓				
Oral polio	✓	✓	✓	✓	
DPT against Diphtheria, Pertussis, Tetanus		✓	✓	✓	
Measles					✓
Booster Doses					
DPT + Oral polio	16 to 24 months				
DT	5 years				
Tetanus toxoid (TT)	At 10 years and again at 16 years				
Vitamin A	9, 18, 24, 30 and 36 months				
Pregnant women					
Tetanus toxoid :1st dose	As early as possible during pregnancy				
2nd dose	1 month after 1st dose				
Booster	Within 3 years				

National immunization schedule in India for children up to the age of 24 months and pregnant women

Primary Aid:-Treatment given to an injured person before medical attention.

1. **Shock:-**Primary Treatment
    - Lay the victim down and raise their legs.
    - Keep the victim calm.

2. Excessive Bleeding

- Apply a sterilized disinfected cloth or bandage on the wound or injury.

3. Nosebleed (Epistaxis)

- Make the victim sit up.
- Apply a cold compress on the nose.

4. Dehydration

- Give the victim small sips of ORS or a salt-sugar solution.

5. Animal Bite

- Wash the bitten area with clean water.
- Get a rabies injection if bitten by a dog.

6. Burns

- Pour cold water on the burnt area immediately to reduce pain and tissue damage.
- If severely burnt, take them to the hospital immediately.

7. Bone Fracture

- Keep the affected limb stable.
- Support the fractured bone by applying a splint or brace.

Substance Abuse (Addiction):-Substance use for pleasure rather than medicinal purpose

S. No.	Drugs	Used as
1.	Narcotics eg. opium, morphine, brown sugar and smack (obtained from poppy plant)	Analgesics and sedatives and pain killers.
2.	Cocaine(from leaves of cocoa plant) and amphetamines	Sense of euphoria and increased level of energy. Can you now guess why some sport persons abuse drugs?
3.	Barbiturates/Benzodiazepines	Sedative and tranquilizers. Produce a feeling of calmness and relaxation
4.	Alcohol	Depressant of the nervous system. Changes the perception and the state of mind.
5.	Cannabinoids (hallucinogens) like LSD (From ergot fungus)and bhang, ganja, charas and hashish(obtained from *Cannabis* plant)	Alter thought, feeling and perception, produce pleasing excitement. Affect the cardiovascular system

Some common drugs:

Drug Abuse:-When a person becomes addicted to substance use.
Effects of Drug Abuse:-Long-term physical and mental harm caused by substance abuse.
Modern Techniques for Disease Diagnosis:-

(1) Radiography (X-ray)
1) In this technique, images of highly effective solids (bones) are obtained using electromagnetic waves or X-rays.
2) This technique is used to detect tumors in the lungs, osteoporosis (hollowing of bones), and rickets.
(2) Ultrasound Imaging or Sonography
1) In this technique, waves of 1 to 15 MHz are used.
2) With this technique, images of the body part under investigation or the structure of the body are obtained.
3) This technique provides information about tumor growth and fetal growth and structure.
3. M.R.I (Magnetic Resonance Imaging)
i) With this technique, imaging of soft tissues like muscle, cartilage, nerves, tendons, and blood vessels is possible.
ii) A powerful magnet creates a magnetic field, and the protons in the body absorb energy from this field, which is then used to obtain an image on a computer.
iii) Brain imaging is possible using M.R.I.

MUST DO QUESTIONS

Q1) What is the name of the mosquito that carries malarial parasite?
a) Male Anopheles b) Male Aedes c) Female Aedes d) Female Anopheles
Ans: d) Female Anopheles

Q2) Which of the following is a non-communicable disease?
a) Flu b) TB c) High blood pressure d) Covid
Ans : c) High blood pressure

Q3) Brain imaging is possible by ____?
a) Sonography b) M.R.I c) X-ray d) Photography
Ans: b) M.R.I

Q4) By whom is Filariasis spread, and why is it called Elephantiasis?
Ans: The carrier of Filariasis is the Ascaris worm. In this disease, the patient's legs swell up like an elephant's, hence it is called Elephantiasis.

Q.5) What are Fomites?
Ans: They are inanimate objects that transmit pathogens from one person to another.
Eg.- utensils, bed, etc. used by a sick person.

Q.6) What is Droplet Infection?
Ans: When a patient coughs, sneezes, or spits, droplets containing pathogens are expelled from their mouth and infects the healthy individual.
Eg. - Common cold, whooping cough, etc.

Q.7) Write the difference between Carrier and Vector.
Ans :

Carrier	**Vector**
Organisms like flies carry pathogens from one place to another or contaminate food and water. Ex- flies	Organisms like mosquitoes carry pathogens inside their bodies and spread diseases. Ex: Female Anopheles mosquito

Q.8) Fill in the blanks in the following table:

Method of Infection	Disease
I. Droplet infection	----------
II. By bite of infected Aedes mosquito	----------
III. contamination food and water	----------
IV. By bite of female Anopheles mosquito	----------

Ans. I) T.B II) Filariasis III) Amoebiasis IV) Malaria

SAMPLE PAPER-1

Science and Technology

Q1) Which of the following is not a correct pair?

(a) Time – Second (b) Temperature - Kelvin

(c) Mass – Gram (d) Current - Ampere

Q2) Which sub-atomic particle has the least mass?

(a) Neutron (b) Proton (c) Electron (d) None of the above

Q3) Who proposed the modern Periodic law?

(a) Mendeleev (b) Newland (c) Henry-Mosley (d) Dobernier.

OR

Which element is placed in group 17 and period 3?

(a) Chlorine (b) Fluorine (c) Bromine (d) Iodine

Q4) Which element is most likely to form a covalent bond?

(a) Na (b) Mg (c) Cl (d) Ca

Q5) Baking soda is chemically known as

(a) Sodium Carbonate (b) Sodium Bicarbonate

(c) Sodium Hydroxide (d) Calcium Carbonate.

Q6) A force of 10N is applied on a body of mass 2 kg. What is its acceleration?

(a) 5 m/s^2 (b) 10 m/s^2 (c) 20 m/s^2 (d) 0.2 m/s^2

Q7) The mass of an object on the Moon is 10 kg. What is its weight on the moon (g=1.63 m/s^2)?

(a) 16.3 N (b) 98 N (c) 10 N (d) 1.63 N

Q8) If a body is displaced by 5m under a force of 10N, the work done is:

(a) 2J (b) 50J (c) 15J (d) 5J

Q9) Which of the following always forms a virtual, erect, and diminished image?

(a) Concave mirror (b) Convex Mirror (c) Plane mirror (d) Concave lens

Q10) Resistance of a conductor depends on:

(a) Length (b) Cross-sectional area (c) Material (d) All of above

Q11) Inside a solenoid, the magnetic field lines are:

(a) Circular (b) Irregular (c) Straight and parallel (d) Diverging

Q12) The site of Photosynthesis in plants is:

(a) Mitochondria (b) Cytoplasm (c) Chloroplast (d) Chromoplast

OR

Enzyme present in saliva is -

(a) Amylase (b) Pepsin (c) Trypsin (d) Lipase

Q13) The hormone responsible for metabolism and growth is:

(a) Insulin (b) Thyroxine (c) Estrogen (d) Testosterone

Q14) The type of reproduction that involves Only one parent is called:-

(a) Sexual reproduction (c) Asexual reproduction

(b) Vegetative reproduction (d) Fertilization

Q15) In human beings, sex is determined by-

(a) Sex chromosomes (X and Y) (b) Environment

(c) Blood Group (d) X chromosomes

Q16) Which of the following non-metals is essential for combustion?

(a) Nitrogen (b) Carbon (c) Oxygen (d) Hydrogen

OR

Which non-metal is used in the purification of water?

(a) Oxygen (b) Chlorine (c) Sulphur (d) Iodine

Q17) Which of the following is an unsaturated hydrocarbon?

(a) Methane (b) Propane (c) Butene (d) Ethene

Q18) Match column - I statements with the right option of Column - II -

Column I	Column II
(i) Measurement of Temperature	(a) Galvanometer.
(ii) Measurement of electric Current	(b) Beam Balance.
	(c) Thermometer.
	(d) Stopwatch.

Q19.) Complete the following and attempt any three parts from four:

(i) Rust is chemically.....

(ii) …....is the most reactive metal among sodium, calcium and magnesium.

(iii) The gas evolved when metal reacts with acid is…...

(iv) The metal which is the best conductor of electricity is.....

Q20.) Write True (T) for correct statement and False (F) for Incorrect Statement - (Attempt any two parts from following question)

(i) Water (H_2 O) is a Covalent compound.

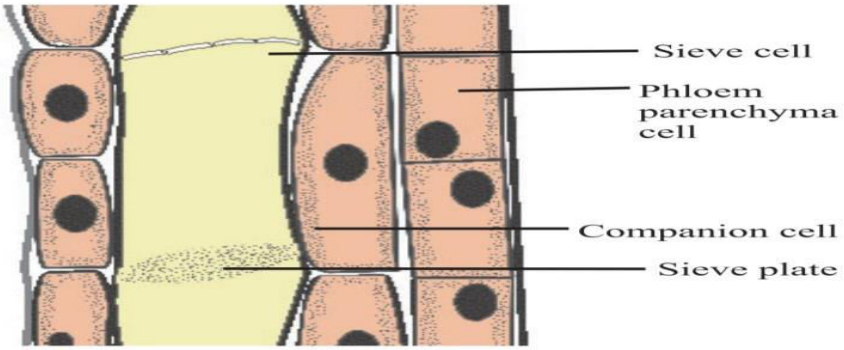
(ii) Carbon tetrachloride (CCl_4) is an ionic compound.

(iii) Ionic Bonds are strong and need high energy to break.

(iv) Covalent compounds conduct electricity in water.

Q21) Read the Passage and answer the following ques-

Plants transport water and minerals from roots to leaves via xylem, driven by transpiration and capillary action and food from leaves to other parts through phloem, a process known as translocation.



(i) What is translocation?

(ii) What are two main types of vascular tissues responsible for transport in plants?

Q22 Read the passage and answer the following questions:

HIV is a virus that attacks the immune system and can develop into AIDS if left untreated. It spreads through specific bodily fluids. While there is no cure, effective antiretroviral therapy can control the virus.

(i) Write the full form of AIDS.

(ii) What is the treatment for HIV?

Q23) Mark True (T) for correct statement and False (F) for incorrect statement. (Attempt any two parts from following questions (i) to (v))

(i) Lithium, Sodium and Potassium belong to the same group.

(ii) Atomic size increases from left to Right in a period.

(iii) Non-metals are found on the left side of the periodic table.

(iv) Group 18 elements are inert gases.

(v) Elements in the same period have the same number of shells.

Q24) Match Column-I with the right option of Column-II.

Column-I	**Column-II**
(1) HCl	(a) Soap to touch
(2) NaOH	(b) Common acid in lab
	(c) Found in vinegar
	(d) Common salt

Q25) Fill in the Blanks.

Attempt any two parts from the following questions (i) to (v).

(i) Plants take in _____ and release _____ during photosynthesis.

(ii) The _____ disturbs the balance of the ecosystem.

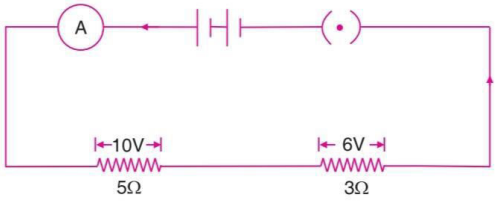
(iii) The percentage of nitrogen in the atmosphere is about _____.

(iv) The interaction between living and non-living components forms an _____.

Q26) Write True (T) for correct statements and False (F) for incorrect statements. (Attempt any two parts from the following question (i) to (iv)).
(i) A balanced ecosystem has interdependence among all organisms.
(ii) Soil erosion improves the fertility of land.
(iii) Aquatic ecosystems exist only in ocean.
(iv) Deforestation affects biodiversity.

Q27) Read the passage carefully and attempt any two parts from the following ques. (i)to(10).
Acceleration due to gravity is the acceleration a freely falling object gains due to a massive body's gravitational pull like Earth's, and it is directed towards the planet's center. Its average value on Earth's surface is 9.8 m/s^2, which is independent of the falling object's mass, shape, or density. The magnitude of 'g' depends on the planet's mass and radius, decreasing with height above the surface and increasing with depth inside the planet.
(I) The direction of acceleration due to gravity is always towards the:
(a) North Pole (b) center of Earth (c) Equator (d) Top of the sky
(II) What is the value of 'g' on Earth's surface?
(a) 0 m/s^2 (b) 32 m/s^2 (c) 9.8 m/s^2 (d) 80 m/s^2
(III) When a body is thrown up, the force of gravity is:
(a) zero (b) Positive (c) Negative (d) Negligible
(IV) If the mass of an object is 1 kg, the force with which the Earth attracts it is equal to its weight, which is approximately:
(a) 9.8 N (b) 1 N (c) 6.67×10^{-11} N (d) 9.8 m/s^2

Q28. Read the passage and answer the questions that follow (I) to (VII). Attempt any five parts from the following (I) to (VII).



(i) Value of total Resistance in circuit –
(a) 16 Ω (b) 12 Ω (c) 6 Ω (d) 8 Ω

(ii) Reading of Ammeter -
(a) 3A (b) 2A (c) 5A (d) 4A
(iii) Value of current flowing through the 3Ω resistor
(a) 5A (b) 8A (c) 6A (d) 2A
(iv) In a series connection of resistors, what happens to the current across each resistor?
(a) Increases (b) Decreases (c) Remains the same (d) None
(v) What is the equivalent resistance of a series combination of three resistors R_1 , R_2 , R_3 ?
(a) $R_1 + R_2 + R_3$ (b) $R_3 = 1/R_1 + 1/R_2 + 1/R_3$
(c) $R_3 = R_1 R_2 / (R_1 + R_2)$ (d) $R_3 = R_1 + R_2 + R_3$

(vi) Which of the following domestic appliance is connected in series?

(a) Decorative lights (b) Fuses (c) Resistance Box (d) Domestic appliance

(vii) Which of the following instrument is connected in series?

(a) Voltmeter (b) Ammeter (c) Both a and b (d) Neither A nor B.

Q29) Write the Balanced Chemical equation for the following statements:

(a) Aluminium reacts with Hydrochloric acid to form Aluminium Chloride and Hydrogen

(b) Iron reacts with Copper sulphate to form Iron sulphate and Copper

OR

What is a redox Reaction? Give one example.

Q30) Write the molecular formula and draw the structures of the following compounds:

(a) Ethanol (b) Acetic acid

Q31) Write any two postulates of Dalton's atomic theory.

OR

Name the experiment that proved the presence of the nucleus. Who performed it? What was used in it?

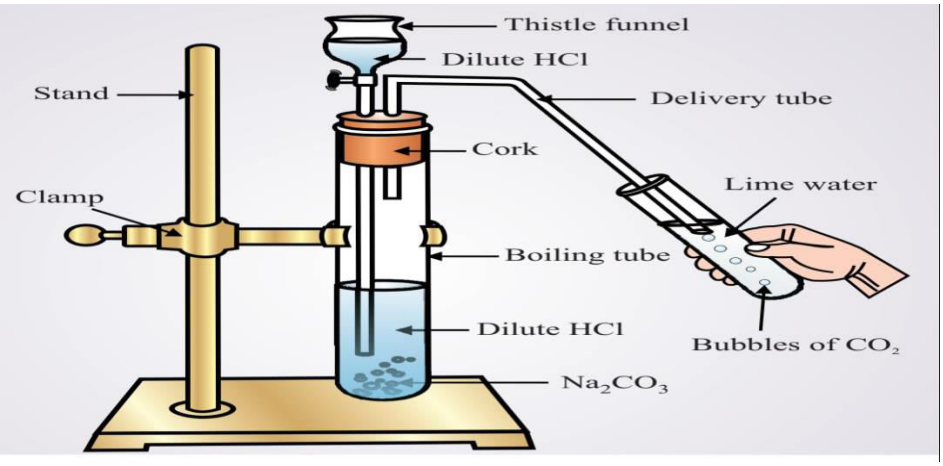
Q32) Why does baking soda $NaHCO_3$ react with acids to produce carbon dioxide gas?

Q33) What is an electromagnet? What is the advantage of using a soft iron core in an electromagnet?

OR

What is a solenoid? Describe the magnetic field produced by it. How does it resemble a bar magnet?

Q34. Define: (i) Dominant trait (ii) Recessive trait



Q35

(a) Write a chemical reaction between a metal carbonate and hydrochloric acid.

(b) Which gas is released during this reaction?

(c) Write a reaction to confirm the presence of this gas?

OR

Name the constituents of Plaster of Paris. Why is Plaster of Paris preferred in orthopedics?

Q36. Describe three ways in which human activities contribute to water pollution.

Q37. What is the mass of an object whose weight is 49 N? (Given g = 9.8 m/s^2)

OR

A stone is dropped from the top of a tower 45m high. What is its velocity when it hits the ground?(Given g = 10 m/s²)

Q38 Label the diagrams of Female Reproductive system.

OR

Name any three endocrine glands in the human body and write their functions.

Q39) What is the role of the following in reproduction -

(a) Ovary (b) Uterus (c) Oviduct

Q40) Why are forests important for the natural environment? Give three reasons.

Q41) What human activities contribute to Climate Change?

Q42(a) Draw the ray diagram for the image formation in convex lens where object is placed at

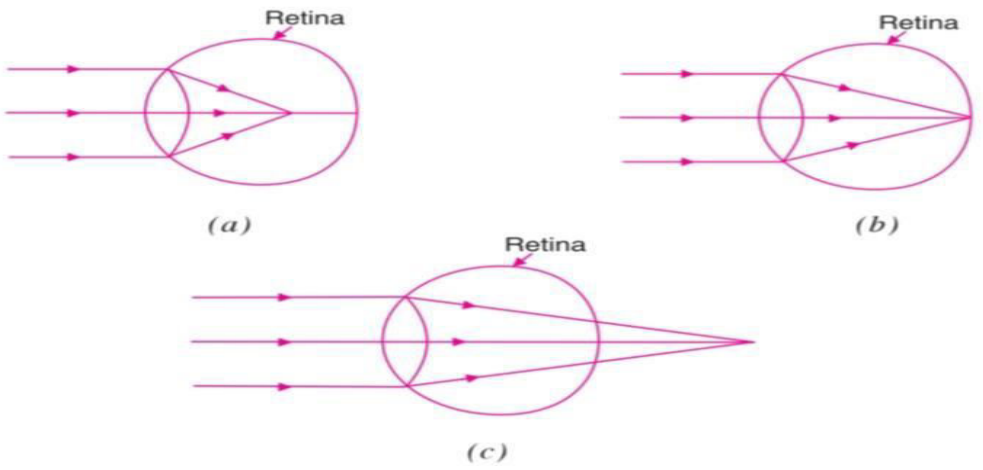
(i) F (ii) Between f and 2f (iii) Beyond F.

(b) Name the type of lens which always produces virtual image.

(c) Write two uses of - Concave mirror.

OR

(a) Identify the eye having defective vision from the following diagrams. Write the type of defect in vision, How this defect can be removed?



(b) Draw diagrams of the following lens - Double Convex, Double Concave.

Q43 (c) Define the following and give one example of each:

(a) Alkali metal (b) Halogen (c) Noble gas (d) Metalloid

(e) Transition element

OR

Q44 (a) The Modern Periodic table has been evolved through the early attempts of Dobereiner, Newland and Mendeleev. List one advantage and one limitation of all three attempts.

(b) Define atomic number 'Z' of an element.

(c) State modern Periodic Law.

Answer Key-1

1. (b) Mass - grams
2. (c) Electron
3. (c) Henry - Mosley or (a) Chlorine
4. (c) Cl
5. (b) Sodium bicarbonate
6. (a) 5 m/s²
7. (a) 16.3 N
8. (b) 50 J
9. (b) Convex Mirror
10. (d) All of above
11. (c) Straight and parallel
12. (c) Chloroplast or (a) Amylase
13. (b) Thyroxine
14. (c) Asexual reproduction.
15. (a) Sex Chromosomes (X and Y)
16. (c) Oxygen or (b) Chlorine
17. (d) Ethene
18. (i) c ; (ii) a
19. Ans: (i) Iron oxide (ii) Sodium (iii) Hydrogen (iv) Silver
20. (i) True (ii) False (ii) True (iv) False.

21) (i) Transportation of food from leaves to other parts of plants.
(ii) Xylem, Phloem.

22 (i) AIDS - Acquired Immuno Deficiency Syndrome.
(ii) Antiretroviral Therapy.

23) (i) True (ii) False (iii) False (iv) True(v) True.

24) (1)-b;(2)-a

25. (i) CO_2, O_2 (ii) Deforestation (iii) 78%(iv) Ecosystem.

26.) (i) True .(ii) False (iii) False (iv) True

27. (i)(b) Center of Earth (ii) (c) 9.8 m/s^2 (iii) (c) Negative (iv) (a) 9.8 N.

28 (i)8Ω (ii)(c) 5A (iii) (a)5A (iv) (c) Remains the same
(v) (a) Rs = R1 + R2 + R3(vi) (b) Fuse(vii) (b) Ammeter

29. (a) $2Al + 6HCl \rightarrow 2AlCl_3 + 3H_2$
(b) $Fe + CuSO_4 \rightarrow FeSO_4 + Cu$

OR

A Redox reaction involves both oxidation (loss of electrons) and reduction (gain of electrons).
Example: $CuO + H_2 \rightarrow Cu + H_2O$

30 (a) Chemical formula - C_2H_5OH

$H_3C - CH_2 - OH$

(b) Chemical formula = $CH_3\ COOH$

31.(a) All matter is made up of tiny particles called atoms.

(b) Atoms of a given element are identical in mass and properties.

OR

Experiment: Alpha particle scattering experiment.

Performed by: Ernest Rutherford.

Used: Thin gold foil and alpha particles.

32. Baking soda is a salt of a weak acid (carbonic acid) and a strong base. When it reacts with a stronger acid, CO_2 is released.

$NaHCO_3 + HCl \rightarrow NaCl + CO_2 + H_2O$

33. An electromagnet is a magnet made by passing electric current through a coil wrapped around a soft iron core.

A soft iron core increases the strength of the magnetic field and quickly loses magnetism when current is switched off, making it ideal for a temporary magnet.

OR

A solenoid is a long coil of many circular loops of wire placed side by side.

The magnetic field inside a solenoid is uniform and strong, and outside, it is like that of a bar magnet.

Similarity with bar magnet:

- Has north & south poles.
- Field lines are closed curves from north to south.

34)**1) Dominant Trait:** A trait that is expressed even if only one copy of the gene is present.

Example: Tallness in pea plants (T)

Recessive Trait: A trait that is expressed only when both gene copies are recessive.

Example: Dwarfness in pea plants (t)

35)(a) $Na_2CO_3(s) + 2HCl(aq) \rightarrow 2NaCl(aq) + H_2O(l) + CO_2(g)$

(b) CO_2

(ii) $Ca(OH)_2(aq) + CO_2(g) \rightarrow CaCO_3(s) + H_2O(l)$

OR

Constituents of POP (Plaster of Paris):Calcium sulphate hemihydrate

1) Calcium (Ca^{2+}) 2) Sulphur (S) 3) Oxygen (O_2) 4) Water (H_2O)

POP is used in orthopedics because:

1) It sets quickly and becomes hard, providing support.

2)It is lightweight and can be molded easily.

3)It is non-toxic and safe to use on skin.

36. 1.Dumping industrial waste into rivers.

2.Sewage discharge into water bodies without treatment.

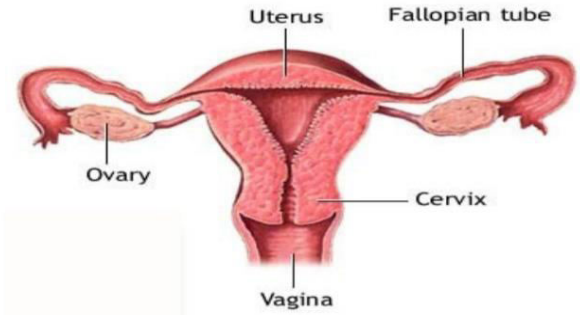
3.Use of chemical fertilizers that get washed into rivers and lakes.

37Weight (W) = Mass (m) x Acceleration due to gravity (g)
W = 49 N, g = 9.8 m/s², m = ?
m = W / g = 49 N/ 9.8 m/s^2
m= 5 Kg

OR

Initial velocity (u) = 0 m/s
Height (displacement), s = 45 m
Acceleration due to gravity, g = 9.8 m/s²
Final Velocity, v = ?
$v^2 = u^2 + 2gs$
$v^2 = 0^2 + 2 \times 9.8 \times 45$
$v^2 = 882$
$v = \sqrt{882}$
v = 29.7 m/s

38



OR

1. **Thyroid Gland** - Produces thyroxine - regulates metabolism.
2. **Pancreas** - Produces insulin - controls blood sugar level.
3. **Adrenal gland** - Produces adrenaline - helps in fight-or-flight response.

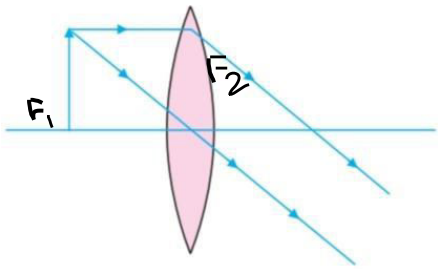
39(a) Ovary - Produces eggs and female hormones (estrogen, progesterone).
(b) Uterus - Place where the embryo implants and develops into a foetus.
(c) Oviduct (Fallopian tube) - Site of fertilization.

40.1Purify air by absorbing carbon dioxide and releasing oxygen.
2Prevent soil erosion and maintain soil fertility.
3Provide habitat for wildlife and maintain biodiversity.

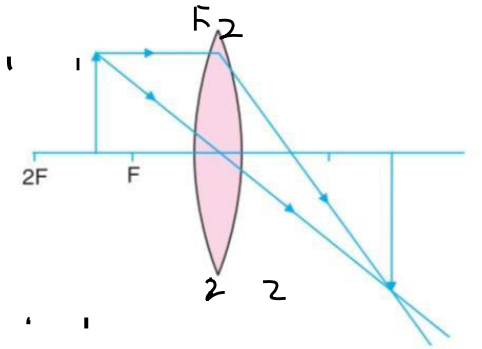
41. 1.Burning of coal, petrol and diesel increased greenhouse gases like CO_2
2. Deforestation reduces the absorption of CO_2 by plants
3.Industrialization and urbanization release pollutants, warming the planet.

42(a)

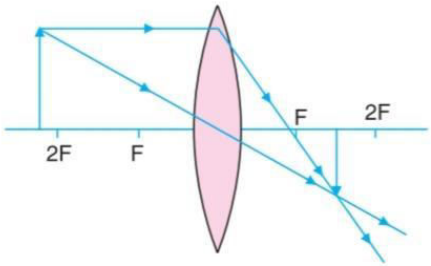
(i)



(ii)



(iii)



b) Concave lens.

(c) (i) As a reflector in searchlight, headlight of motor car.

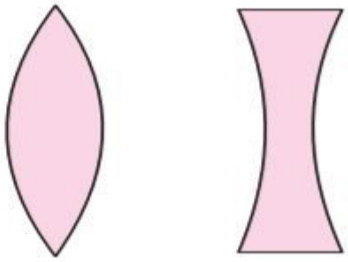
(ii) In reflecting telescopes etc.

OR

(a) (i) Shortsightedness, it can be removed by using a diverging lens.

(ii) No defect

(iii) Long sightedness, it can be removed by using a converging lens.



Convex or double convex *Concave or double concave*

(b)

Ans 43:

(a) Alkali metal: Group 1 elements, Highly reactive metals. E.g. Sodium (Na)

(b) Halogens: Group 17 elements, Highly reactive non-metals. E.g. Chlorine (Cl)

(c) Noble gas: Group 18 elements with fully filled outer shells, inert. E.g. Neon (Ne)

(d) Metalloid: Elements with both metallic and non-metallic properties. E.g. Silicon (Si)

(e) Transition element: Element in the center of the periodic table (Groups 3-12) with partially filled d-orbitals. Example: Iron (Fe)

OR

Ans (a) Mendeleev:

Advantage: Predict properties for elements that had not yet been discovered. He was able to predict the properties of these elements (like eka-aluminium, eka-silicon) with great accuracy.

Limitation: Position of Hydrogen and Isotopes.

Dobereiner:- **Advantage:** Relationship between the properties of elements and their atomic masses. For Li (7), Na (23), and K (39):7+39/2=23

- **Limitation:** It could not be applied to all known elements.

Newlands

- **Advantage:** Shows a periodic pattern in elements arranged in increasing order of atomic masses.
- **Limitation:** Applicable up to Calcium.

(b) The number of protons present in the nucleus of an atom of that element.

(c) The Physical and chemical properties of elements are the periodic function of their atomic numbers.

SAMPLE QUESTION PAPER-2

Science and Technology

Q1. The Physical Quantity which has the unit kgm/s^2

(a) Pressure (b) Force (c) Work (d) Power

Q2. Who discovered the nucleus of an atom?

(a)J.J. Thomson (b) Niels Bohr (c) Ernest Rutherford (d) James Chadwick

Q3. How many periods are there in the modern periodic table?

(a) 7 (b) 8 (c) 9 (d) 6

OR

What happens to metallic character down a group?

(a)Increases (b) Decreases (c) Remains the same (d) First increases then decreases

Q4. Which of the following is an example of an ionic compound?

(a)H_2 O (b) NaCl (c) Cl_2 (d) CH_4

Q5. Tooth decay starts when pH of mouth falls below -

(a) 7 (b) 6.5 (c) 5.5 (d) 4

Q6. The inertia of an object depends on -

(a) Volume (b) Weight (c) Mass (d) Speed

Q7. An object is thrown upward. At the highest point, its:

(a) Velocity is maximum (b) Acceleration is zero

(c) Velocity is zero (d) Force is maximum

Q8.A man carries a bag on his head and walks horizontally. The work done is:

(a) Maximum (b) Minimum (c) Zero (d) Infinite

Q9. In refraction, the incident ray, refracted ray, and normal all lie:

(a) In different planes (b) In the same direction

(c) In the same plane (d) Parallel to each other

Q10. The device used to measure current is:

(a) Voltmeter (b) Galvanometer (c) Ammeter (d) Ohmmeter

Q11. An electric motor converts:

(a) Mechanical energy to electrical energy

(b) Electrical energy to mechanical energy

(c) Magnetic energy to light energy

(d) Heat energy to Kinetic energy

Q12. The Vascular tissue in plants that transports water is:
(a) Phloem (b) Cambium (c) Xylem (d) Cortex
OR
The excretory unit of the kidney is:
(a) Nephron (b) Neuron (c) Ureter (d) Alveoli

Q13. Insulin is secreted by -
(a) Pituitary gland (b) Thyroid gland (c) Pancreas (d) Adrenal gland

Q14. The site of fertilization in human females is -
(a) Ovary (b) Uterus (c) Fallopian tube (d) Vagina

Q15. Chromosomes are made up of -
(a) Proteins only (b) DNA only (c)RNA only (d) DNA and Proteins

Q16.Which of these metals is the most reactive?
(a) Gold (b) Iron (c) Sodium (d) Silver
OR
$Fe + CuSO_4 \rightarrow FeSO_4 + Cu$
Which type of this reaction is?
(a) Displacement Reaction(b) Double Displacement
(c) Combination Reaction(d) Decomposition Reaction
Q17. Which of the following is a saturated hydrocarbon?
(a) Ethene (b) Ethyne (c) Benzene (d) Ethane
Q18. Match column-A/I statement with the right option of Column-B

Column-I	**Column-II**
(i)Thermometer	(P)Measures time
(ii) Stopwatch	(Q) Measures mass
(iii)Ammeter	(R) Measures current
(iv) Weighing machine	(S)Measures temperature

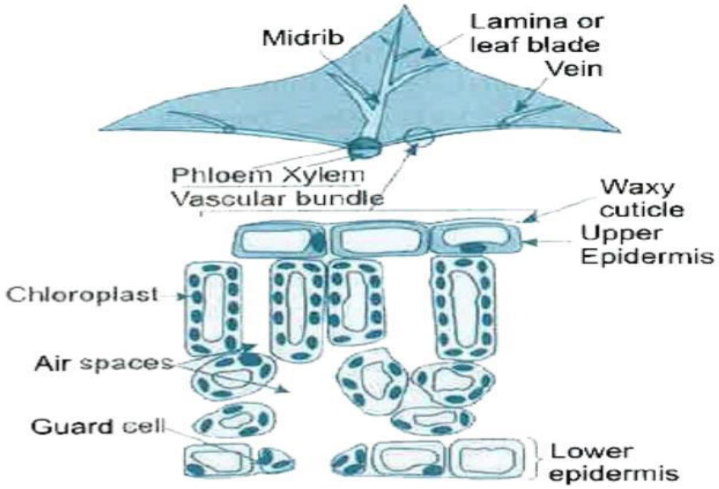
Q19. Complete the following sentence by given options below.
[Attempt any 2 parts from the following]
(Phosphorus, Oxygen, high, Copper Carbonate)
(i) _____ is used in the manufacture of matchsticks and fireworks.
(ii) A non-metal essential for life and respiration is _____.
(iii) Metals have _____ melting and boiling points.
(iv) The green coating on copper is due to the formation of _____.
Q20.Write True (T) for correct statements and False (F) for incorrect statements.
[Attempt any 2 parts from the following (i) to (iv)]
(i) Ionic bonds are formed by transfer of electrons.

(ii) Covalent bonds are formed between metals and non -metals.
iii) An atom becomes more stable by completing its octet.
(iv) A molecule of Oxygen (O_2) has a covalent bond.

Q21. Answer question numbers (a) and (b) on the basis of your understanding of the following paragraph and the related studied concept.

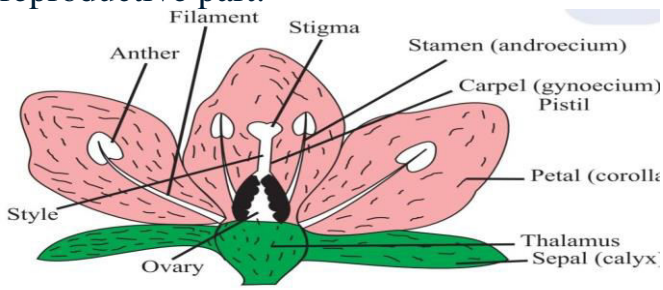
If you carefully observe a cross-section of a leaf under the microscope shown in Fig., you will notice that microscope some cells contain green dots. These green dots are cell organelles called chloroplasts which contain chlorophyll.

(a) What is the role of these dots that contain chlorophyll?
(b) What is the role of air spaces?



Q22. Read the passage and answer the following questions -

The flower may be unisexual when it contains either stamen or pistil or bisexual when it contains both stamens and pistil. Stamen is the male reproductive part and produces pollen grains that often stick to our hands if we touch the stamen of a flower. Pistil is the female reproductive part.



(a) What is the male reproductive part?
(b) What is the color of Pollen grains?

Q23. Write True (T) for correct statement and False (F) for incorrect statement

[Attempt any two Parts from the following (i to v)]

(i) The atomic number of an element is equal to the number of protons.
(ii) Metalloids have properties of both metals and non-metals.
(iii) Group-17 elements are called halogens.
(iv) Atomic size increases down the group.
(vi) Potassium is smaller in size than sodium.

Q24. Match column-I with the right option of column-II

Column-I	Column-II
(i) Acid + Metal	(P) pH less than 7
(ii) Acidic solution	(Q) Hydrogen gas
	(R) pH more than 7
	(S) CO_2 gas

Q25. Fill in the blanks.

[Attempt any two Parts from the following (i to iv)]

(i) The domain of life where living organisms exist is called the _____.

(ii) Soil is the _____ layer of the Earth's surface which supports life.

(iii) The movement of tectonic plates occurs in the _____.

(iv) _____ vegetation grows without the help of humans.

Q26.Write true(T) for correct statements and false(F) for incorrect statements :

(i) Decomposers convert dead plants and animals into useful nutrients.

(ii) The atmosphere is composed only of Oxygen and Carbon-dioxide.

(iii) Rivers and lakes are part of the hydrosphere.

(iv) Abiotic components include animals and plants.

Q27.Read the passage carefully.

There is no atmosphere on the moon. This is because gas molecules need a certain amount of force of attraction to be retained on a heavenly body. The force of attraction of the moon is less than the required force, hence no atmosphere can exist.

Attempt any two questions from the following:

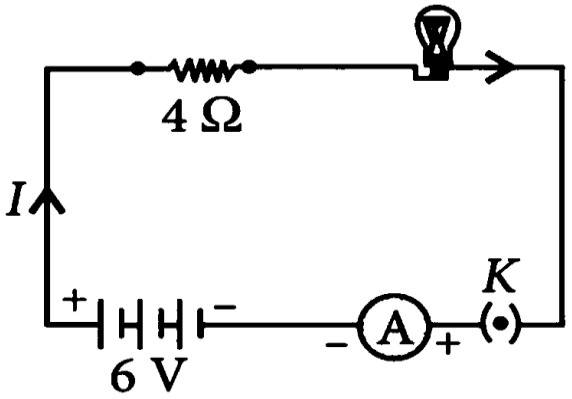
(i) If the weight of an object is 60 N on earth, what is its weight on the moon?

(ii) If I go from Earth to the Moon, will my weight change?

(iii) What is the value of 'g' on the moon compared to earth?

Q.28 Read the passage and answer the questions that follow it (i to vii).

Given below is the circuit diagram to study:



Attempt any five parts from the following questions (i) to (vii).
(i) The following symbol in the circuit diagram represents:
(a) Resistance (b) Rheostat (c) Transformer (d) Voltage
(ii) In the circuit diagram, the resistances are connected in -
(a) in series (b) in parallel (c) in mixed combination (d) in no particular combination.
(iii) And the total resistance of the circuit
(a) 2Ω (b) 4Ω (c) 24Ω (d) 12Ω
(iv) Find the current through the circuit is -
(a) 0.25A (b) 0.50A (c) 1A (d) 4A
(v) Which one of the following is the unit of resistance?
(a) Volt (b) Ampere (c) Ohm(Ω) (d) Joule
(vi) Which one of the following is the SI unit of Power?
(a) Joule (b) Volt (c) Watt (d) Second
(vii) What does 'I' represent in this circuit?
(a) Voltmeter (b) Ammeter (c) Current (d) Resistance

Section –B

Q29. Write the balanced chemical equation for the following statements:
(a) Zinc reacts with hydrochloric acid to form Zinc chloride and hydrogen gas.
(b) Calcium reacts with water to form Calcium hydroxide and hydrogen gas.

OR

Q29. What is rancidity? Mention any two ways by which rancidity can be prevented.

Q30. Write the molecular formula and draw the structures of the following compounds:
(i) Ethanoic Acid (ii) Propanol
(ii)

Q31. What was the major improvement Bohr made over Rutherford's model?

OR

According to Bohr's model, why do electrons not fall into the nucleus?

Q32. Why does acid rain cause damage to buildings and monuments?

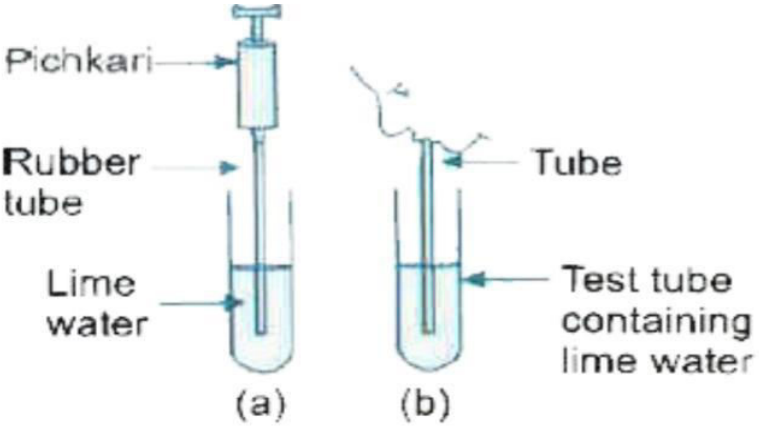
Q33. State Fleming's Left-Hand Rule. What does it help us find?

OR

What will happen to the magnetic field if the current in the conductor is reversed?

Q34. Define the terms:
(i) Evolution (ii) Chromosomes

Q35. (i) Look at the activity given below and answer the questions that follow it:



(*a*) Air being passed into lime water with a pichkari/syringe,
(*b*) air being exhaled into lime water

(a) What does the "pop" sound indicate during the experiment?
(b) Which type of reaction is this?
(c) Write another example of this type of reaction?

OR

(ii) Name the constituents of Bleaching Powder. Write any two uses of Bleaching Powder.

Q36. What is ozone depletion? What are its causes and effects?

Q37.(i)The radius of the earth is about 6370 km.An object of mass 30 kg is taken to a height of 230 km above the surface of earth.
(a) What is the mass of the body?
(b) What is the acceleration due to gravity at this height?
(c) What is the weight of the body at this height?

OR

(ii) An object is thrown vertically upward with an initial velocity of 30 m/s. Find:(a) The maximum height it will reach.
(b) The time taken to reach that height. (Take g = 9.8 m/s^2)

Q38.(i) With the help of a line diagram, show the chromosomal basis of sex determination in humans.

OR

Explain the role of the Pituitary gland. Why is it called the "master gland"?

Q39. Explain the role of the Placenta during pregnancy. Write their functions?

Q40. How do human activities disturb the natural environment? Give three examples?

Q41. How does deforestation by humans affect the environment?

Q42.(i) (a) What is meant by the power of a lens? Write its SI unit.

(b)A student uses a lens of focal length 40 cm and another of -20cm. Write the nature and power of each lens.

OR

(ii) Define the following terms in the context of a diverging mirror.
(a) Principal focus (b) Focal length
Draw a labelled ray diagram to illustrate your answer.

Q43.(i)Properties of the elements are given below. Where would you locate the following elements in the periodic table?
(a) A soft metal stored under kerosene.
(b) An element with variable (more than one) valency stored underwater.
(c) An element which is tetravalent and forms the basis of organic chemistry.
(d) An element which is an inert gas with atomic number 2.
(e) An element whose thin oxide layer is used to make other elements corrosion resistant by anodising.

OR

(ii) An element 'X' belongs to the 3rd period and group 16 of the Modern Periodic Table.
(a) Determine the number of valence electrons and the valency of 'X'.
(b) Name the element 'X' and state whether it is metallic or non-metallic.
(c) Give two examples of metalloids.

Answer Key-2

1. (b) Force
2. (c) Ernest Rutherford
3. (a) 7 or (a) Increases
4. (b) NaCl
5. (c) 5.5
6. (c) mass
7. (c) Velocity is zero
8. (c) zero
9. (c) In the same plane
10. (c) Ammeter
11. (b) Electrical energy to mechanical energy
12. (c) Xylem or (a) Nephron
13. (c) Pancreas
14. (c) Fallopian tube
15. (d) DNA and Proteins
16. (c) Sodium or (a) Displacement Reaction
17. (d) Ethane
18. (i) - (S); (ii) - (P) ; (iii)-(R); (iv)-(Q)

19. (i) Phosphorus (ii) Oxygen (iii) high (iv) Copper Carbonate
20. (i) True (ii) False (iii) True (iv) True
21. (a) These dots containing chlorophyll are the sites for capturing sunlight resulting in its activation.

(b) Air spaces just behind the lower epidermis contain CO_2 from outside and remove H_2O from inside the cells

22. (a) Stamen (b) Yellow

23. (i) True (ii) True (iii) True (iv) True (v) False

24. (i)-Q ; (ii)-P

25. (i) Biosphere (ii) Uppermost

(iii) Lithosphere (iv) Natural

26. (i) True (ii) False (iii) True (iv) False

27. (i) Wg = 60kg

Wm = 1/6 ×Wg

=1/6×60 =10N

(iii) Yes

(iii) 1/6 (Compare to earth)

28. (i) (a) Resistance

(ii) (d) is no particular combination

(iii) (b) 4Ω

(iv) (b) 0.50A

(v) (c) Ohm (Ω)

(vi) (c) Watt

(vii) (c) Current.

29. (i) (a) $Zn + 2HCl \rightarrow ZnCl_2 + H_2$

(ii) $Ca + 2H_2O \rightarrow Ca(OH)_2 + H_2$

OR

(ii) The process in which taste & smell of food gets spoiled is called rancidity.
Prevention from oxidation/ rancidity:
(i) Food should be kept in airtight container in refrigerator.
(ii) Antioxidants are added to fatty acids to prevent oxidation.

30. (i) CH_3 COOH
(ii) CH_3 CH_2 CH_2OH
(31) Bohr introduced the idea of stable energy levels, avoiding the collapse of electrons into the Nucleus.

OR

Because electrons revolve in discrete energy levels without losing energy. Only when they change orbital, they absorb or emit energy in quantized form.
(32) Acid rain contains sulphuric and nitric acids which react with calcium carbonate in marble or limestone of buildings, causing corrosion and damage.
(33) Fleming's Left Hand Rule: If forefinger, middle finger, and thumb of the left hand are held mutually perpendicular.
Forefinger → Magnetic field
Middle finger → Current
Thumb → Force of motion.
It helps us find the direction of force in current carrying conductor placed in magnetic field.

OR

If the direction of the current is reversed, the direction of the magnetic field also reverses.
(34) (i) Evolution → The gradual development of living organisms over generations.
(ii) Chromosomes → Thread-like structure found in the nucleus of cells that carry genes.
(35) (i)(a) It indicates the presence of Hydrogen gas.
(b) Combination Reaction:
$Ca(OH)_2 + CO_2 \longrightarrow CaCO_3 + H_2O$

OR

(i) Constituents of Bleaching Powder($CaOCl_2$): Ca, O, Cl
Uses:(i) for bleaching clothes(ii) As a disinfectant
36.Ozone depletion is the thinning of the ozone layer in the atmosphere.
Causes: Release of CFCs (Chlorofluorocarbons) from ACs, refrigerators, sprays.
Effects: Harmful UV rays reach Earth, causing skin cancer, eye damage, etc.
37.(a) Mass = 30 kg (mass is constant)
(b) Distance of the body from the centre of earth
= 6370 + 230 km
= 6600 km ⇒ 6.6×10^6 m
$g = GMe/R^2$
$g = 6.673 \times 10^{-11} \times 5.98 \times 10^{24} / (6.6 \times 10^6)^2$
$g = 9.16\ m/s^2$
(1) Weight = mg
= 30 Kg x 9.8 m/s^2
= 294 N

OR

(ii) Given: u = 30 m/s
V = 0 m/s (at max height)
$g = 9.8\ m/s^2$

(a) h = ?

$v^2=u^2 + 2as$ (a=g and here g is negative)

$v^2 = u^2 - 2gh$

$0 = (30)^2 - 2 \times 9.8 \times h$

$0 = 900 - 19.6h$

$h = 900 / 19.6 \Rightarrow h = 45.92$ m (approx)

(a) t = ?

v=u +at (a=g and here g is negative)

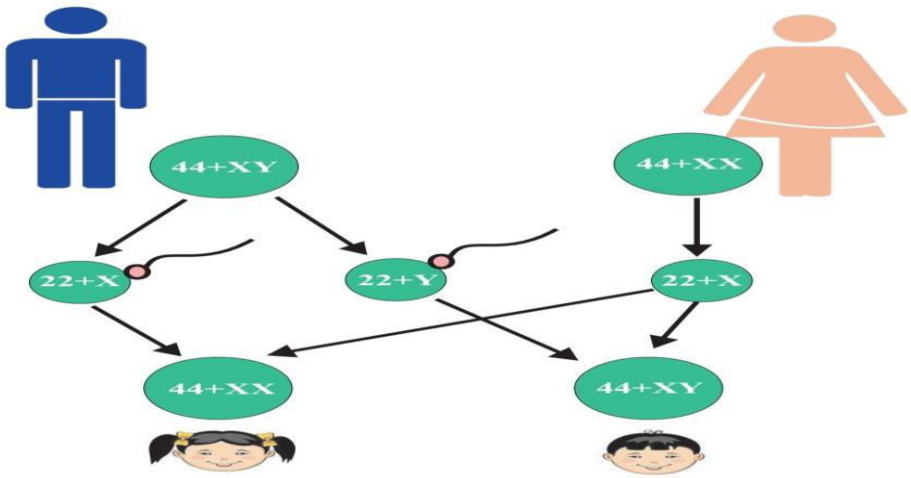
v= u - gt

0 = 30 - 9.8t

t = 30 / 9.8

t = 3.06 seconds (approx)

(38)



OR

(ii) Role: It controls endocrine glands by secreting hormones like GH, TSH, FSH.

It is called "Master gland" because it regulates the activity of all other endocrine glands.

(39) Placenta is a special tissue that connects the mother's blood with the foetus blood.

Functions:

(i) Supplies Oxygen and nutrients to the embryo.

(ii) Removes waste products from foetus.

(40) (i) Deforestation: Cutting trees destroys habitats and caused soil erosion.

(ii) Pollutions: factories and vehicles pollute air, water and soil.

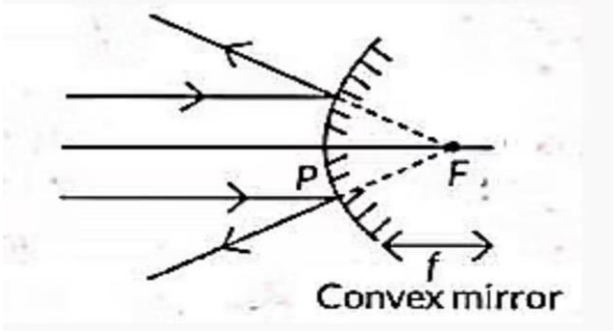
(iii) Overuse of Resources: Excessive use of water, coal and petroleum cause resource depletion.

(41) (i) Loss of biodiversity as animals and plants lose their natural habitat.

(ii) Leads to soil erosion and reduces soil fertility.

(iii) Increase carbon dioxide in the air, contributing to global warming.

(42) (a) It is the ability of a lens to converge or diverge light rays passing through it. S.I unit of power of a lens is- Dioptre (D).
(b) Power of I lens:
f = +40 cm (Convex lens)
P = 100/f
= 100/40 = +2.5D.
Power of II lens
F_2 = -20 cm(concave mirror)
P_2 = 100/-20
=-5D
Nature: Lens I: Converging
Lens II: Diverging
(ii)For a Diverging Mirror (Convex Mirror):
(a) Principal Focus: It is the point on the principal axis where rays incident parallel to the principal axis appear to diverge after reflection.
(b) Focal Length: The distance between the pole of the mirror and the principal focus is called focal length.
Diagram of Convex Mirror



43.(a) Sodium(b) Phosphorus(c) Carbon(d) Helium(e) Aluminium

OR

(iv) (a) X' belongs to 3rd period = 3 energy shells.
16th group → 6 valence electrons.
∴ Electronic configuration of X = 2,8,6Valency = 8-6 = 2.
(b) Element X = Sulphur(non-metal)
(c) Silicon, Germanium

Sample Question Paper-3
Science and Technology

Q1.1N is equal to

a) $kgms^{-1}$ b) $kgms^{-2}$ c) gms^{-1} d) $kgms^{-2}$

Q2. Isotopes have same number of:

a) Atomic mass b) Proton c) Shell d) neutron

Q3.In the modern periodic table, elements are arranged on the basis of their:

a) Atomic mass b) Atomic number

c) Ionization energy d) Electron affinity

OR

Which of the following is an alkali metal?

a) Flourine b) Chlorine d) Lithium d) Sulphur

Q4 A bond formed between a metal and a non-metal is called -

a) covalent bond b) Ionic bond c) Metallic bond d) Isotopic bond

Q5. Which of the following is used to treat indigestion caused by excess acid?

a) Vinegar b) lemon juice c) Baking Soda d) Salt

Q6. A Force can change the

a) shape of an object b) speed of an object c) direction of motion d) All of the above

Q7. If the distance between two object is doubled, the gravitation force becomes

a) Half b) one-fourth c) Double d) four times

Q8. Kinetic energy depends on -

a) Mass b) velocity c) Both mass and velocity d) Height

Q9. The image formed by a plane mirror is-

a) Real and inverted b) real and erect c) virtual and inverted d) virtual and erect

Q10. If resistance is doubled and current is halved, the power becomes-

a) Same b) Doubled c) Halved d) one-fourth

Q11. Which of the following will increase the strength of an electromagnet?

a) decrease current b) using a wooden core

c) increasing the number of turns d) increase resistance.

Q12. Site of respiration in the cell is:

(a) Ribosome (b) Chloroplast (c) Mitochondria (d) Cytoplasm

OR

The respiration in yeast is:

(a) Aerobic (b) Anaerobic (c) Both a and b (d) None

Q13. The Part of the Brain responsible for Balance and Posture is:

(a) Cerebrum (b) Medulla (c) Cerebellum (d) Hypothalamus

Q14.Which of the following is not a method of asexual reproduction?

(a) Budding (b) Fragmentation (c) Pollination (d) Spore formation

Q15. Who is known as the Father of Genetics?

(a) Darwin (b) Lamarck (c) Hentel Watson (d) Mendel

Q16 Which metal is liquid at room temperature?

(a) Sodium (b) Mercury (c) Aluminium (d) Copper

OR

Which non-metal is used in making fertilizers?

(a) Nitrogen (b) Sulphur (c) Carbon (d) Hydrogen

Q17 The allotropes of Carbon include

a) Diamond and graphite

b) Coal and copper

c) Diamond and zinc

d) Iron and steel

Q18 Match the following Column-I statements is with the right options of

Column-I	Column-II
i) SI unit of Temperature	P) Kilogram
ii) SI unit of electric current	Q) Second
	R) Kelvin
	S) Ampere

Q19.complete the following sentence by given options below

(Attempt any two parts of the following questions)

(Mercury, ductility, chlorine, good)

i) Metals are generally _____ conductors of heat and electricity.

ii) _____ is the only metal that is liquid at room temperature.

iii) The property of metals to be drawn into wires is called _____.

iii) _____ a non-metal used in the disinfection of water.

Q20. Write True (T) for correct statement and False (F) for incorrect statement. (Attempt any two parts of the from below)

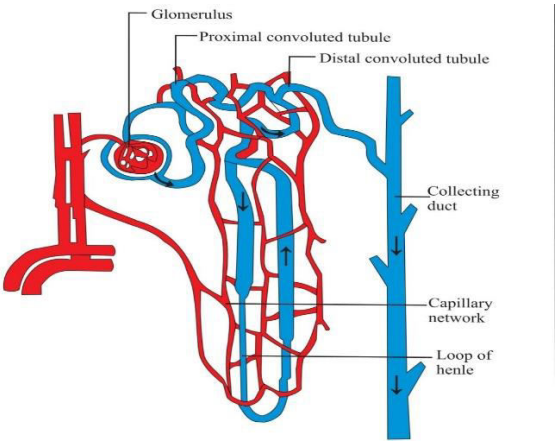
i) Atoms combine to achieve stable electronic configuration.

ii) In NaCl, sodium and chlorine share electrons.

iii) A single covalent bond involves two electrons.

iv) covalent bonds are formed only between metals.

Q21. Filtration and reabsorption are two important functions of excretion. Blood get filtered. The RBCs and proteins do not filtered. They remain in bloodstream.



1) Which of the following is structural & functional unit of kidney?

a) Neuron b) Nephron c) Heart d) None of these

2) Which is not the function of kidney?

a) excrete nitrogenous waste

b) osmoregulation

c) transfer the blood back to heart

d) keep the normal mineral balance in blood

Q22. In flowering plants, sexual reproduction occurs through pollination, where pollen grains from the anther are transferred to the stigma. Fertilization takes place in the ovary, leading to the formation of seeds and fruits. The male gamete is carried by the pollen tube to fuse with the female gamete (egg) inside the ovule.

i) what forms after fertilization in flowering plant?

a) Roots and stem b) Flower & leaves

c) Fruit and seed d) Stigma & anther

b) Flower & leaves

ii Where does the fertilization takes place.?

a) Ovary b) Stigma

c) Filament d) Stamen

Q23. Write True (T) for correct statement and False (F) for incorrect statement.

[Attempt any two parts from the following questions (i to v)]

i) Elements in the same group show gradual change in properties.

ii) Metals are usually placed on the right side of the periodic table.

iii) Helium has two electrons in its outermost shell.

iv) The periodic table is divided into metals, metalloids, and non-metals.

v) Mendeleev's table was arranged according to atomic number.

Q24 Match column-2 formula with the right option - II…

Column-I	**Column-II**
i) H_2 SO_4	P) salt
ii) NH_4 Cl	Q) Base
	R) King of chemicals
	S) Aqua regia

Q 25 Fill in the blanks. Attempt any two parts from the following questions (i to iv).

i) All _____ and _____ are part of biotic environment.

ii) Air, water and soil are examples of _____ components.

iii) The blanket of air surrounding the Earth is called _____.

iv) Landforms like mountains and plateaus are part of _____.

0.26 Write True (T) for correct statement and False (F) for incorrect statements. [Attempt any two parts from the following questions (i to iv)]

i) The biosphere includes all living organisms on Earth.

ii) Soil is a non-living component of the environment.

iii) Producers are organisms that consume other organisms.

iv) The ozone layer protects us from harmful ultra-violet rays.

Q27. Read the passage carefully.

If we throw a coin and feather from any height & released the air, they both will fall to the ground together, this acceleration is called acceleration due to gravity (g). It is same for any mass at a given place. Mathematically

$F = mg$;$mg = GmM/r^2$

$g = GM/r^2$Where m is the mass of object, r is the distance between the objects.

i) What is the value of 'g'?

a) 12 ms^{-2} b) 9.8 ms^{-2} c) 16 ms^{-2} d) 8 ms^{-2}

ii) Which factor does NOT affect the value of g on the surface of the Earth?

a) mass of object b) Radius of Earth

c) Location on Earth (e.g. poles or equator) d) mass of the Earth

iii) What happens when a coin and a paper ball & are dropped in vacuum?

a) coin reaches first b) paper ball reaches first

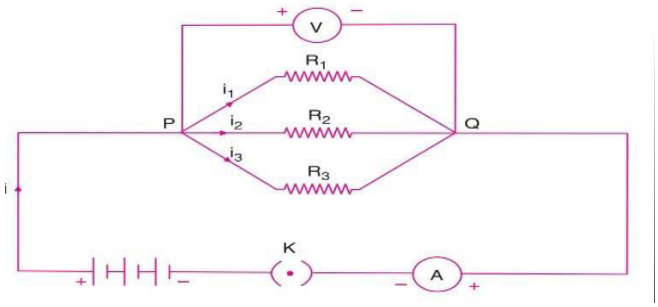
c) Both fall at the same speed and time d) Both float in the air.

iv)An object of mass 2kg is dropped near the surface of the Earth. Calculate the force acting on it due to gravity. (Given g = 9.8 $m.s^{-2}$)

a) 20 N b) 16 N c) 21.6 N d) 19.6 N

Q28. Read the passage and answer the questions that follow it (i to vii).

Given below is the circuit diagram to study relationship between voltage and current. Attempt any five parts from following questions (i) to (vii).



i) In parallel circuit, the total current (i) in the main circuit is

a) Equal to the current in the first branch b) The average of currents in each branch

c) Sum of the currents in all branches d) Zero if one branch is open.

ii) Which one of the following sets includes devices that are used in electrical circuits for their safety?

a) Switch, tester and fuse b) Switch, fuse and MCB

c) Switch, fuse and LED d) MCB, Switch and Tester

iii)According to Ohm's law, current through resistor R, is

a) I = V.R. b) I = V/R c) $I = V.R_1$ d) $I = V/R_2$

iv)Which one of the following is the unit of potential difference.

a) Joule/coulomb b) Volt/coulomb c) Ampere/second d) ohm meter

v) Which one of the following is the SI unit of electrical energy?

a) Volt ampere b) Kilowatt hour c) Watt second d) Joule

vi) In a parallel connection combination, if one branch gets disconnected, what happens to the total current.

a) It becomes zero b) It remains unchanged c) It decreases d) It increases

vii) If total current in a parallel circuit is 3A and current in two of the branches are 1A and 0.5A. What is the current in the third branch?

a) 0.5A b) 1.5A c) 2.5A d) 3A

Q29. Write the balanced chemical equation for the following statements

a) Magnesium reacts with hydrochloric acid to form magnesium chloride and hydrogen gas.

b) Potassium reacts with water to form Potassium hydroxide and hydrogen gas?

OR

What is a double displacement reaction? Write a balanced chemical equation for This.

Q30 Write the molecular formula and draw the structures of the following compounds.

i) methanal ii) Butanoic acid

Q31. What were the main observations of the gold foil experiment conducted by Rutherford.

OR

What is the major drawback of Thomson's Model?

Q32 Why does tooth enamel get damaged by acid? Name the preventive method?

Q33 Draw the magnetic field lines around a bar magnet. Mention any two properties of field lines.

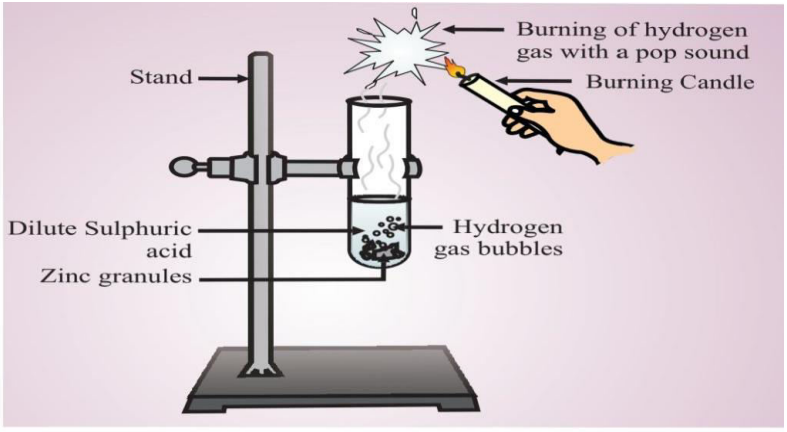
OR

What is a Solenoid? Draw a Sketch to show the magnetic field pattern produced by a current carrying solenoid.

Q34. Define the terms

i) Heredity ii) Genetic Engineering

Q35. Look at the activity given below and answer the following questions.



a) Write a chemical reaction between zinc granules and sulphuric acid?

b) Which gas is released during this reaction?

c) What is observed when a burning candle is brought near the mouth of the Test tube?

OR

Write the chemical formula, name and formula of washing soda? How can we obtain washing soda? Write two used of washing soda.

Q36 a) What is Smog?

b) How photochemical smog is formed?

c) Write the constituents of photochemical smog.

Q37) Define Archimede's principle, and write the factors affecting it.

Write two applications based on this principle.

OR

A ball is thrown vertically upwards and rises to a height of 122.5m. Calculate ($g = 9.8\ m/s^2$):

i) the velocity with which the ball was thrown upwards, and

ii) the time taken by the ball to reach the highest point.

Q38. Draw the sketch of internal structure of spinal cord and nervous pathway in spinal reflex and label the following parts:

a) Gray matter b) White matterc) Spinal nerve d) Effector muscle

OR

a) Name the hormone released by the Pituitary gland.

b) Write the causes of dwarfism.

c) Write the causes of Gigantism.

Q39. What is vegetative propagation? Give two examples of plants that reproduce this way.

Q40 a) Define Growth curves.

b) Explain two types of Growth curves with diagram.

Q41i) State Eutrophication.

ii) Eutrophication is caused by which nutrients and how it leads to oxygen shortage to water animals.

Q42 i) a) State Reflection of light and draw a diagram to illustrate this.

b) Write the Laws of reflection of light.

c) Differentiate between Regular reflection and Diffused reflection.

OR

ii) a) Define Refraction of light.

b) Write the law of refraction and give formula of refractive index in a medium.

c) Define presbyopia and how it can be corrected?

Q43 Part of the modern periodic table is given below where the atomic numbers of the elements of Group A and Group B are given in the parentheses:

Group A	Group B
H (1)	P (15)
Mg (12)	He (2)
Ne (10)	O (8)
Na (11)	Cl (17)

i) a) Write a noble gas where outermost shell has 2 electrons?

b) element essential for respiration.

c) Which of the element from Group A combine with chlorine to form salt.

d) Write two examples of metals from group A.

e) Give the electronic configuration of chlorine atom.

f) What is the total number of shells in the atom of H.?

ii) a) How and why does metallic character vary in a group from top to bottom?

b) Why do elements of the same group have similar properties?

OR

iii) a) Write four main features of Mendeleev's Periodic Table.

b) Write the Merits of Mendeleev's Periodic classification.

c) Which elements are found in the place of eka-silicon and eka-boron.

Answer key-3

1.b) $kgms^{-2}$
2. b) Proton
3. b) Atomic number or (c)Lithium
4. b) Ionic bond
5.c) Baking Soda
6. d) All of the above
7. b) one-fourth
8. c) Both mass and velocity
9. d) Virtual and erect
10. d) one-fourth
11. c) increasing the number of turns
12. c) Mitochondria or b) Anaerobic
13. c) Cerebellum
14. c) Pollination
15. d) Mendel
16. b) Mercury or a) Nitrogen
17. a) Diamond and Graphite
18. i)-R; ii)-S
19. i) Good, Mercury, ductility, chlorine
20. i) True ii) False iii) True iv) False
21. i) b) Nephron ii) c) transfer the blood back to heart
22. i) c) Fruit and seed ii) a) ovary
23. i) → True, ii) → False, iii) → True, iv) → True, v) → False
24. i) → R, ii) → P
25. i) plants, animals, ii) Abiotic iii) atmosphere iv) Lithosphere
26. i) True, ii) True, iii) False, iv) True
27. i) b) 9.8 m/s^2 ii) a) mass of the object
iii) Both fall at the same speed and time iv) d) 19.6N

28. i) e) sum of the current in all branches
ii) b) Switch, fuse and MCB
iv) b) I=V/R
v) a) Joule / Coulomb
vi) d) Force
vii) c) It decreases
vii) b) 1.5A
29. a) $Mg + 2HCl \rightarrow MgCl_2 + H_2$, b) $K + H_2O \rightarrow KOH + H_2$

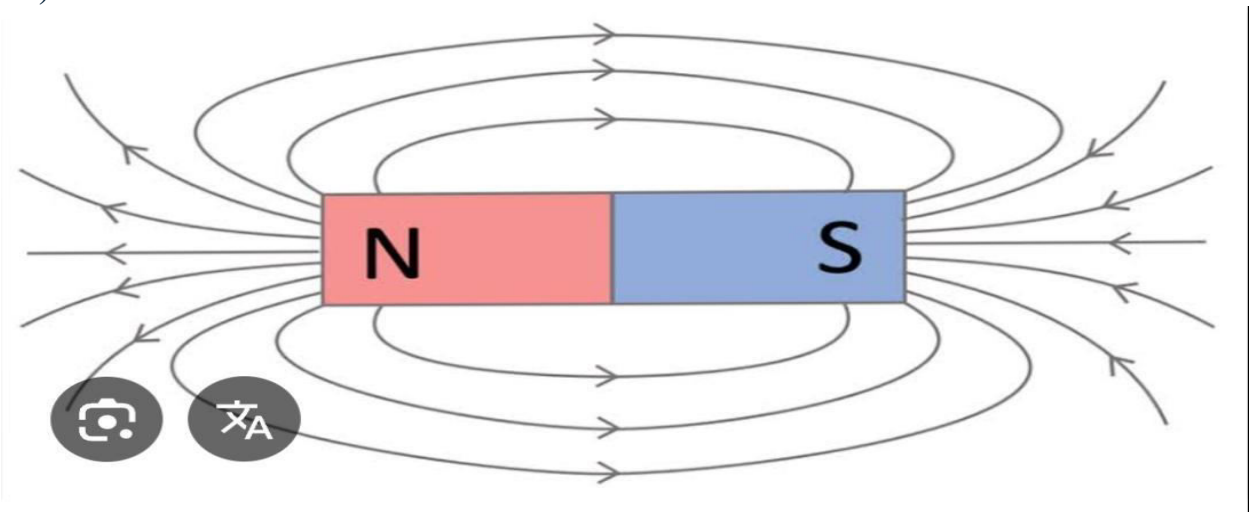
OR

Double displacement Reaction: Reaction where two ionic compounds in aqueous solution exchange their to form new compounds.
30. i) HCHO (Methanal), ii) $CH_3\ CH_2\ CH_2\ COOH$ (Butanoic acid)

31. i) Most alpha particles passed through the foil without deflection. ii) Some were deflected at small angles. iii) A few particles bounced back almost directly.

OR

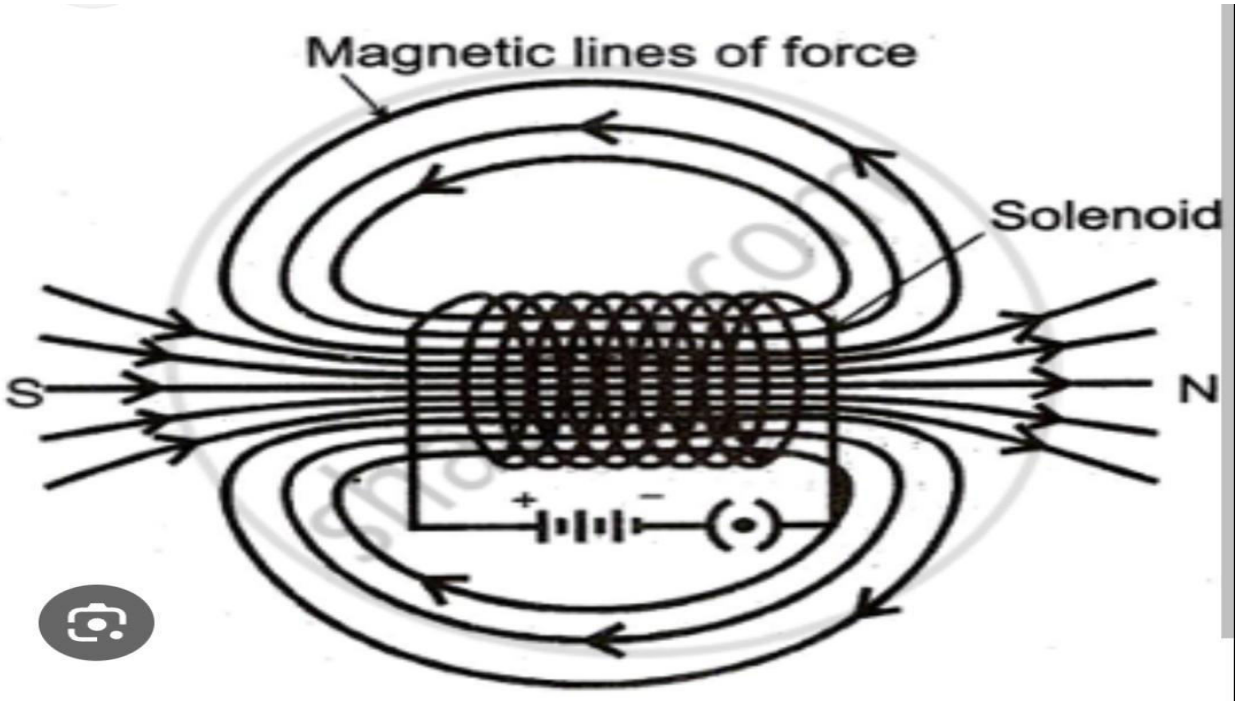
It could not explain the results of Rutherford's alpha particle experiment
32) Teeth enamel is made of calcium phosphate. Which reacts with acid (from food or bacteria); and gets corroded.
Preventive method → use basic substances like toothpaste to neutralize the acid.
33)



Properties:
i) Field lines emerge from the north pole and enter the south pole.
ii) They never intersect each other.

OR

A solenoid is a coil of wire wound into a tightly packed helix, typically around a cylindrical core. When an electric current passes through the wire, it generates a magnetic field within and around the coil.



Ans-34 i) Heredity - Passing down of characters from Parents to offspring.
ii) Genetic Engineering - Direct manipulation of an organism's genes using recombinant DNA technology to introduce new traits.
35. a) $Zn + H_2 SO_4 \rightarrow ZnSO_4 + H_2$
b) Hydrogen gas
c) When the burning candle is brought near the mouth of the test tube the gas in, the test tube burns with a "pop sound.

OR

Chemical name of washing soda - Sodium Carbonate decahydrate
Formula = $Na_2 CO_3 .10 H_2 O$
Formation: $Na_2 CO_3$ can be obtained by heating baking soda and its recrystallisation gives washing soda.
uses of washing soda :-
i) for removing permanent hardness of water
ii) cleansing agent for domestic purpose
36. a) Smog is a combination of fog, smoke and fumes released by mills and factories, homes and automobiles.

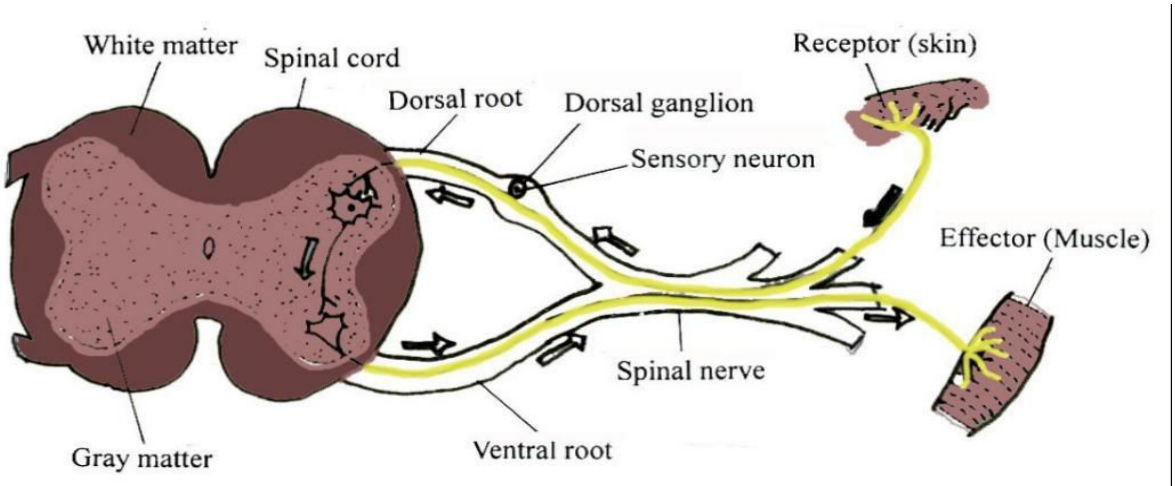
b) When sunlight falls on stagnant air under low humid conditions in the presence of pollutants such as SO_2 soot, NO_2 and hydrocarbons, photochemical smog is formed
c) PAN and ozone.

37. Archimedes's Principle → When a body is immersed fully or partially in a fluid, it experiences an upward force that is equal to the weight of the fluid displaced by it.
Factors affecting it:-
i) density of the fluid
ii) volume of the body immersed in the fluid
Applications
i) designing ships and submarines
ii) making of Hydrometer, lactometer

OR

Distance travelled(s) = 122.5 m
Final velocity = v = 0 ms^{-1}
Acceleration due to gravity g = 9.8 ms^{-2}
i) $v^2 = u^2 + 2gs$
$0 = u^2 + 2(-9.8\ ms^{-2}) \times 122.5$ m
For upward motion g is taken as negative
$-u^2 = (-2) \times 9.8 \times 122.5\ m^2s^{-2}$
$u^2 = 2401\ m^2s^{-2}$
$u = 49\ ms^{-1}$
Thus velocity with which the ball was thrown upward is 49 ms^{-1}
ii) $v = u + gt$
$0 = 49\ ms^{-1} + (9.8\ ms^{-2}) \times t$
t = 49 / 9.8 S
t = 5 Second
Time taken = 5 Second

38.



OR

a) Growth hormone , TSH,ACTH etc.
b) Deficiency (hypoactivity) of growth hormone (GH) & Somatotropic Hormone (STH) secreted by pituitary gland cause Dwarfism
c) excessive secretion or hyperactivity causes Gigantism
39. Vegetative propagation is an asexual method of reproduction in which new plants grow from vegetative parts like stem, root or leaf.
Examples - 1. Potato (stem tuber)

1. Bryophyllum (leaf buds)

40. Growth curves - The growth of a population can be expressed in the form of a mathematical expression called the Growth curve.
Two types of Growth curves are
1) S-shaped growth curve shows population growth over time when resources are limited.
S-shaped - a small number of organisms first enters to an unoccupied area, the growth is slow first. Reproduction takes place after a certain period of time.
2)J-shaped growth curve - It describes a situation in which the population growth continues & in an exponential form. There is a sudden increase in mortality & population crash.

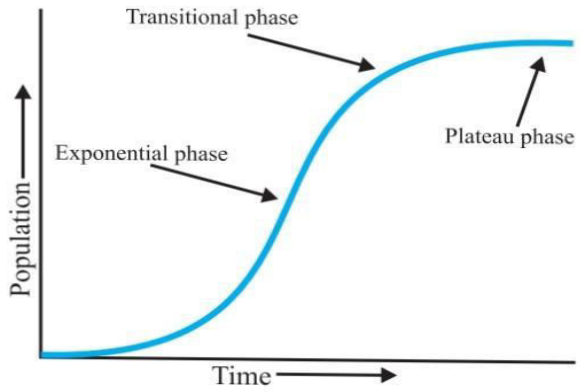


Fig. 29.16 S-shaped curve

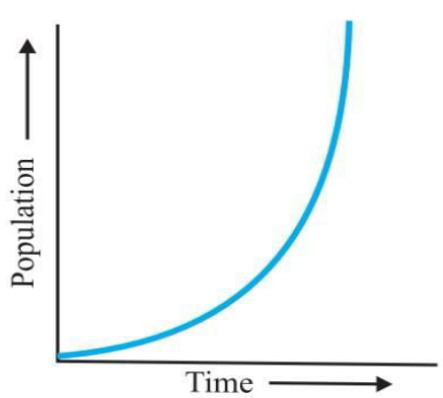
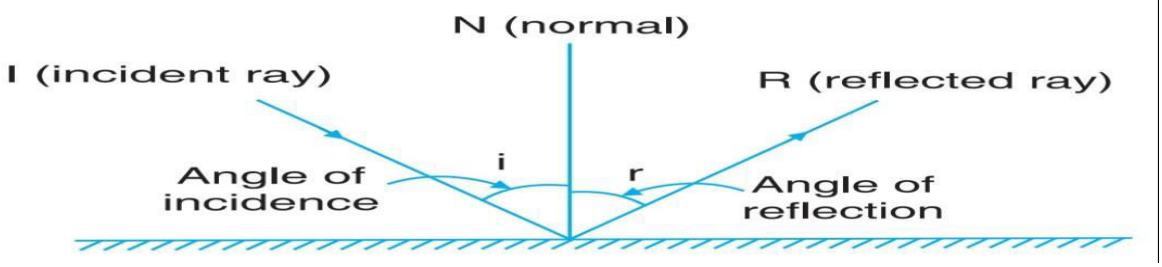


Fig. 29.17 J-shaped curve

41. i) Eutrophication - Increase of nutrients like nitrogen and phosphorus from human activities in water that triggers extreme growth of algae (algae bloom) and aquatic plants.
ii) Eutrophication is caused by enrichment of nutrients as - Nitrates and Phosphates.
The fast growth of algae leads to depletion of dissolved oxygen in water so, aquatic animals die of oxygen shortage.
42. i) a) The bouncing back of light after falling on any surface is called Reflection of light.



b) Laws of reflection of light
i) Incident ray, reflected ray and the normal at the point of incidence, all lie in the same plane.
ii) ∠i = ∠r

OR

i) Refraction of light - The phenomenon of bending of light is called refraction of light.
ii) Laws of refraction
a) First law - Incident ray, refracted ray and the normal at the point of incidence all lie in the same plane.
b) Second law - It follows Snell's law
Refractive index (n) = sine of angle of incidence / sine of angle of refraction
n = Sin i / Sin r
c) Presbyopia - In this defect both near and far object are not clearly visible. This can be corrected by using a bifocal lens (upper side - concave lens, lower side - convex lens).
43. a) He (2) , b) O (8), c) Na (11)
d) Mg and Na ,e) Cl -> 2,8,7 f) one
ii) a) on moving from top to bottom in a group, along with the atomic numbers of the elements. Their metallic properties also increase, because as the size of atoms increases, the tendency to lose electrons increases, while non-metallic properties decrease.
b) because they have the same number of valence electrons.

OR

a) Main features of Mendeleev's Periodic Table
i) elements are arranged in rows & column
ii) Horizontal rows are called periods, there are six periods & vertical columns are called groups there are Eight Groups.
iii) Properties of elements in a given period Show regular graduation from left to right.
iv) All the elements present in a particular group are chemically similar in nature.
b) Merits of Mendeleev's Periodic classification
i) classification of all elements
ii) correction of atomic masses
iii) prediction of new elements
iv) Valency of elements
c) eka silicon → Germanium(Ge)
eka - Boron → Scandium(Sc)

Sample Question Paper-4
Science and Technology

Q1. 1st unit of Power is
a) ms^{-1} b) $kgms^{-1}$ c) $kgms^{-2}$ d) kgm^2s^{-3}

Q2.Which of the following is correct for an atom?
a) electrons are in the nucleus (b) Protons revolve around the nucleus
c) Nucleus contains protons and neutrons (d) Neutrons are negatively charged

Q3. According to the Newland's law of octaves, every eighth element has properties similar to the
a) First element b) Third element c) Fourth element d) Second element

OR

How many groups are there in modern periodic table?
a) 7 b) 8 c) 18 d) 10

Q4. Chemical bonds are formed due to -
a) Exchange of protons b) Transfer or sharing of electrons
c) Addition of neutrons d) Atomic mass difference

Q5.A substance that turns blue litmus to red is likely to be
a) Neutral b) Acidic c) Basic d) salt

Q6 What is the momentum of a 5kg object at 2 m/s?
a) 7 kg m/s b) 10 kg m/s c) 0.4 kg m/s d) 12 kg m/s

Q7. The gravitational force between two objects will become zero if -
a) Distance is doubled b) Mass is reduced to half
c) If their masses are zero d) equal to its mass

Q8.A body falls freely under gravity. Its total mechanical energy -
a) Increases b) remains constant c) Decreases d) Becomes zero

Q9. In refraction through a glass prism slab, the emergent ray is -
a) Bent towards the normal b) bent away from the normal
c) Parallel to the incident ray d) Reflected back

Q10. 1 kilowatt-hour (kWh) is equal to -
a) 1000 J b) 3600 J c) 36 J d) 3.6×10^6J

Q11. The magnetic field lines around a straight current carrying conductor are -
a) Straight line b) elliptical c) concentric circles d) irregular

Q12. Which of the following organs helps in Osmoregulation and excretion in humans?
(a) Heart (b) Lungs (c) Kidneys (d) Liver

OR

In aerobic respiration, the end products are –

(a) CO_2 and alcohol (b) Lactic acid
(c) CO_2 and H_2O (d) Glucose and oxygen

Q13. Which of the following carries messages from sense organs to the Brain?
(a) Motor neuron (b) Sensory neuron (c) Relay neuron (d) Interneuron

Q14 .Which hormone is produced by the ovary?
(a) Testosterone (b) Estrogen (c) Insulin (d) Thyroxine

Q15. Which of the following determines the Sex of a child in humans?
(a) X chromosome of mother (b) Y chromosome of father
(c) X chromosome of father (d) None of these

Q16. Which of the following is a non-metal but is lustrous?
(a) Sulphur (b) Phosphorus (c) Iodine (d) Oxygen

OR

Which of the following is not an alloy?
(a) Brass (b)Bronze (c) Steel (d) Zinc

Q17 Which of these is called wood alcohol?
a) C_2H_5OH (Ethanol) b) CH_3OH (Methanol)
c) CH_3CHO (Ethanal) d) $CH_3CH(OH)$-COOH (Lactic acid)

Q18. Match column-I statement with the right option of column-II

COLUMN-I	COLUMN-II
(i) Light Intensity	(P) Kelvin
(ii) Temperature	(Q) Kilogram
	(R) Candela
	(S) Mole

Q19. Complete the following sentence by given option below. [Attempt any 2 parts from the following (i to iv)] [malleable, Displacement, Galvanization, Sodium]
(i) The process of coating iron with zinc is called --------- .
(ii) A reaction in which a more reactive metal replaces a less reactive metal is called ---------- reaction.
(iii) Metals are ------ that is, they can be beaten into sheets.
(iv)---------- is a soft metal that can be cut with a Knife.

Q20. Write True (T) for correct and False (F) for incorrect statement - [Attempt any two parts from the following (i to iv)]

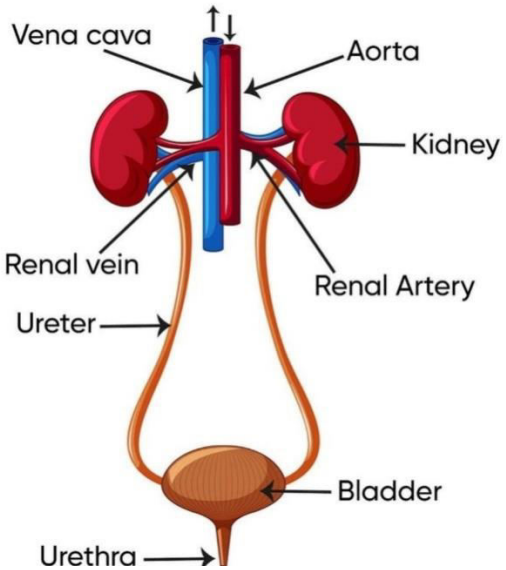
(i) Covalent compounds have low melting and boiling points.

(ii) Sodium donates one electron to form Na^+ ion.

(iii) A chlorine atom gains one electron to form Cl^- ion.

(iv) Covalent bonds involve transfer of electrons.

Q21. Read the passage and answer the questions that follow it –
The excretory system is a crucial biological system that rids the body of waste products and excess substances, maintaining internal balance. This system is composed of kidneys, ureters, bladder, and urethra.



(i) Write the structural and functional unit of the Kidney?
(ii) Write the function of kidneys?
Q22. Read the passage and answer the question that follow it –
The female reproductive system produces eggs and hormones, supports fertilization and gestation, and enables the birth of offspring. Key organs include the ovaries, which release eggs and produce estrogen and progesterone; fallopian tubes, where fertilization occurs; and the uterus, where the egg implants and a fetus develops.
(i) What hormones are involved in the female reproductive system?
(ii) Write the primary organs of the female reproductive system?
Q23. Write True (T) for correct statement and False (F) for incorrect statement.
(Attempt any two parts from the following questions (i) to (v))
(i) Mendeleev classified elements based on increasing atomic number.
(ii) Modern periodic table is based on atomic number.
(iii) All elements in the same group have the same number of valence electrons.
(iv) Noble gases are placed in group.
(v) Periods are the vertical columns of periodic table.
Q24. Match column I formula with the right option of column- II

COLUMN-I	COLUMN-II
(i) NaOH	(P) Acid
(ii) HCl	(Q) Salt
	(R) Base
	(S) Gas

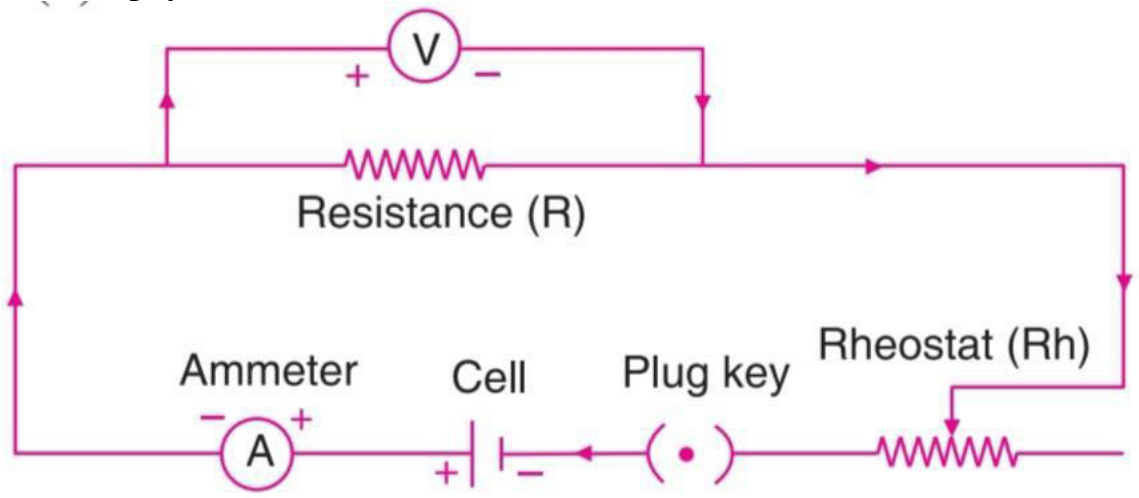
Q25. Fill in the blanks.

1. Water covers about _____ of the Earth's surface.
2. The _____ is a narrow zone where land, water and air interact.
3. The _____ is the ultimate source of energy for all living beings.
4. The atmosphere contains gases like _____, _____ and Argon.
5.

Q26. Write true (T) for correct statement and false (F) for incorrect statements.
(Attempt any two parts from the following question (i) to (v))
(I) All ecosystems are man-made.
(II) Air pollution does not affect the natural environment.
(III) Water, air and sunlight are abiotic components.
(IV) Carnivores eat both plants and animals.

Q27 . Read the passage carefully and attempt any two parts from the following:
Mass is a fundamental measure of the matter an object contains and its resistance to acceleration while weight is force of gravity acting on that mass, which varies depending on the strength of local gravitational field.
(i) Does an object's mass change if it is moved to a different planet?
(ii) What is the formula for weight?
(iii) Write two factors on which weight of an object depends.
(v) Define mass.

Q 28. Read the passage and answer the questions that follow it (i) to (vii).
Attempt any five parts from following questions. Ohm's Law states that the current (I) through a conductor is directly proportional to the voltage (V) across its ends, provided temperature and other physical conditions remain constant.



(i) What is the formula for Ohm's Law?

(ii) What is the SI unit of resistance?

iii)What is the SI unit of electric current?
(iv) What will be the current if voltage is 0V across a resistor?
v) If resistance is 5 ohms and the current is 2A, what is the voltage?
(vi) Which physical quantity is calculated using V/I?
(vii)What does 'V' represent in Ohm's Law?

Q29. (i) Write the balanced chemical equation for the following statements:
(a) Iron reacts with copper sulphate to form iron sulphate and copper.
(b) Aluminium reacts with hydrochloric acid to form Aluminium chloride and hydrogen.
(ii) Why do we apply paint on iron articles?

Q30. Write the molecular formula and draw the structure of the following compounds:
(i) Lactic Acid (ii) Formic Acid

Q31. What are the two main features of Bohr's atomic model that corrected Rutherford's model?

OR

How does Bohr's model explain atomic stability?

Q32. Why are acids not stored in metal containers?

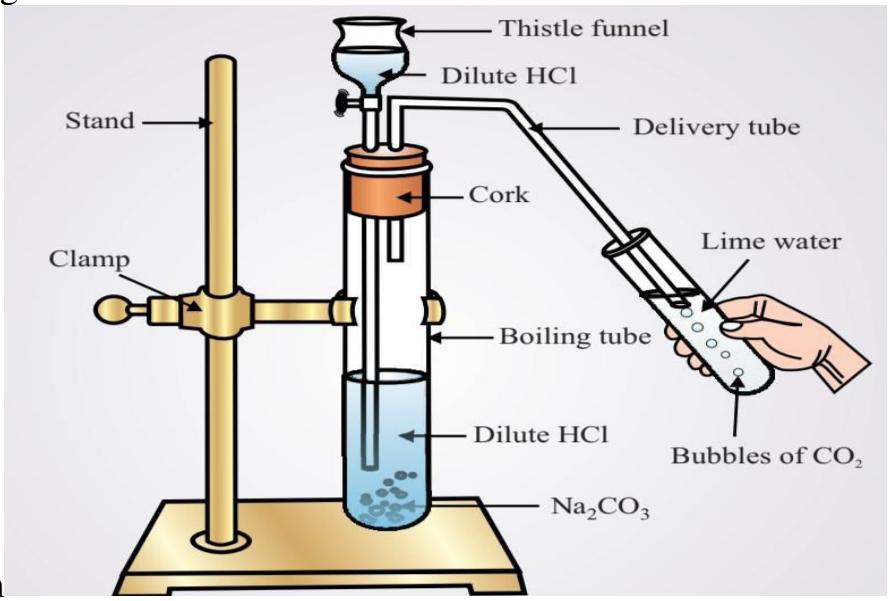
Q33. Why does a magnetic compass needle get deflected when placed near a current-carrying wire?What happens to the magnetic field when current in a conductor is increased?

OR

Who discovered the magnetic effect of electric current? What are the applications of magnetic effect of electric current?

Q34. Define terms:
(i) Heredity (ii) Gene

Q35. (i) Write a chemical reaction between a metal hydrogen carbonate and hydrochloric acid?
(ii) Which gas is released during the reaction?



(iii) Write a reaction to confirm the presence of this gas?

OR

What is chemical name and formula of common salt? How is it obtained?

Q36. Explain three harmful effects of deforestation on the environment.

Q37. The mass of earth is6×10^{24} kg and that of the moon is7.4×10^{22} kg. If the distance between the earth and moon is3.84×10^{8} m, calculate the force exerted by the earth on the moon. G =6.7×10^{-11} Nm^2Kg^{-2}

OR

A body is immersed in a liquid. If the liquid displaced by the body weighs 1 N then what is the buoyant force acting on the body?

Q38. Draw diagram of a neuron (nerve cell) and label its parts.

OR

Name the hormone released by thyroid gland. What is its function in our body?Define: Hyperthyroidism, Hypothyroidism

Q39.Name the gland associated with the following functions:

(a) Regulates blood sugar level

(b) Prepares body for emergency situations.

(c) Controls growth and development.

Q40.What is an ecosystem? Explain any two types of ecosystems with examples.

Q41. What is biomagnification? What are common causes? And examples?

Q42. Write laws of reflection of light. Write four characteristics of image formed by a plane mirror.

OR

Define the term magnification as referred to spherical mirror.

If a concave mirror forms a real image 40cm from its pole when the object is placed at a distance of 20cm from its pole, find the focal length of the mirror.

Q43.(a) State the Modern Periodic Law.

(b) How are elements arranged in Modern Periodic Table?

(c) What are the trends observed across a period (left to right) in:

(i) Atomic size.

(ii) Metallic Character

(iii) Non-metallic character

OR

An element 'X' belongs to the 3rd period and Group 17 of modern periodic table.

(a) Write its electronic configuration.

(b) State its valency.

(c) What is the nature of its oxide?

Answer key-4

Ans-1 d) kgm^2s^{-3}
Ans-2 c) Nucleus contains protons and neutrons.
Ans-3 a) First elementor c) 18
Ans-4 b) Transfer or sharing of electrons
Ans-5 b) Acidic
Ans-6 b) 10 kgm/s
Ans-7 c) If their masses are zero
Ans-8 b) remains constant
Ans-9 c) Parallel to the incident ray
Ans-10 d) 3.6×10^6 J
Ans-11 c) concentric circles
Ans-12 c) Kidneys or c) CO_2 & H_2O
Ans-13 b) Sensory neuron
Ans-14 b) Estrogen
Ans-15 b) Y chromosome of Father
Ans-16 c) Iodine or d) Zinc
Ans-17 b) CH_3OH (Methanol)
Ans-18 (i) (R) Candela (ii) (P) Kelvin
Ans-19 (i) Galvanization (ii) Displacement (iii) Malleable (iv) Sodium
Ans-20 (i) True (ii) True (iii) True (iv) False
Ans-21 (i) Nephron (ii) To filter blood by removing waste, toxins
Ans-22 (i) Estrogen , Progesterone
(vi) Ovaries , uterus and hormones
Ans-23 (i) False (ii) True (iii) True (iv) True (v) False
Ans-24 (i) (R) Base (ii) (P) Acid
Ans-25 (i) 71% (ii) Biosphere (iii) Sun (iv) Nitrogen, oxygen
Ans 26. (i) False (ii) False (iii) True (iv) False
Ans 27. (i) No (ii) w=mg (iii) mass and gravity (iv) Amount of matter an objectcontains
Ans 28(i) V=IR
(ii) Ohm (Ω)
(iii) Ampere (A)
(iv) 0A (Zero current)
(v) V=IR = 2x5 = 10 volts
(vi) Resistance
(vii) Voltage or potential difference
Ans 29.i) (a) $Fe(s) + CuSO_4(aq) \rightarrow FeSO_4(aq) + Cu(s)$
(b) $2Al + 6HCl \rightarrow 2AlCl_3 + 3H_2$
ii) to prevent rust by stopping the contact of iron with air and moisture.
Ans 30. (i) CH_3-CH(OH)-COOH (ii) HCOOH

Ans 31. (i) Electrons revolve in fixed circular orbits called energy levels or shells without radiating energy.

OR

(ii) Energy is absorbed or emitted only when an electron jumps between these energy levels. Since electrons stay in a fixed energy level, they do not spiral into the nucleus.

Ans 32. Because acids react with metals to produce hydrogen gas and salt, which can damage the container and cause hazards.

Ans 33. The current-carrying wire produces a magnetic field that interacts with the magnetic field of the compass needle causing it to deflect.

When the current increases, strength of magnetic field around conductor also increases.

OR

Hans Christian Ørsted discovered the magnetic effects of electric current.

Application of magnetic effects of electric current:

1. Electric Bell
2. Electromagnets
3. Electric motors, cranes.

Ans 34. The Heredity - The passing of traits from parents to offspring.

Genes - Units of heredity made of DNA that control traits. They are present on Chromosomes.

Ans35:(i) $NaHCO_3$ (s) + HCl(aq) → NaCl(aq) + H_2 O(l) + CO_2 (g)↑

(ii) CO_2 (iii) $Ca(OH)_2$ (aq) + CO_2 (g) → $CaCO_3$ (s) + H_2 O(l)

OR

Chemical Name - Sodium Chloride

Formula - NaCl

Manufacturing - Obtained from sea water by the process of evaporation. Sea water is collected in shallow ponds and allowed to evaporate in sunlight. Crystals of NaCl are left behind.

Ans 36.1) Loss of biodiversity - Animals lose their natural habitat.

2) Soil Erosion - Roots of trees hold soil, cutting trees leads to erosion.

3) Climate change - Fewer trees means more CO_2 , which causes global warming.

Q37. The mass of the earth $(m_1)=6\times10^{24}kg$

The mass of the moon, $(m_2)=7.4\times10^{22}kg$

Distance between the earth and moon ,$r=3.84\times10^{8}m$

$G=6.7\times10^{-11}Nm^2kg^{-2}$

The force exerted by the moon is -

$F=Gm_1m_2/r^2$

$=6.7\times10^{-11}Nm^2kg^{-2}\times6\times10^{24}kg\times7.4\times10^{22}kg/(3.84\times10^{8}m)^2$

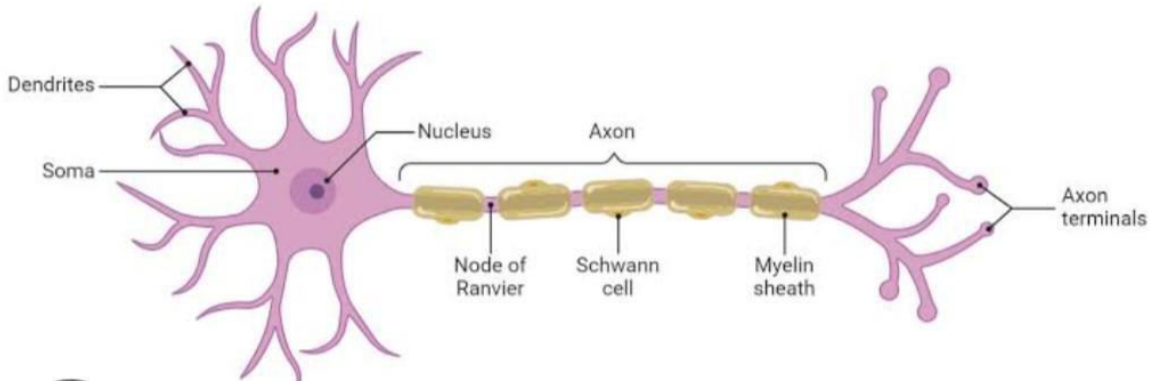
$=2.01\times10^{20}N$

OR

The weight of liquid displaced by the body = 1N

From Archimedes' Principle = Buoyant force is equal to weight of the displaced fluid.

Therefore, the buoyant force acting on the body = 1N



Nerve cell

OR

Hormones released by Thyroid gland: Thyroxine(T3,T4).
Hyperthyroidism: Production of excessive amounts of T3 and T4 hormones.
Hypothyroidism: Production of less amount of T3 and T4 hormones .

Ans 39. (a) Pancreas - secretes insulin(b) Adrenal gland - Secretes adrenaline
(b) Pituitary gland - secretes growth hormone (GH)

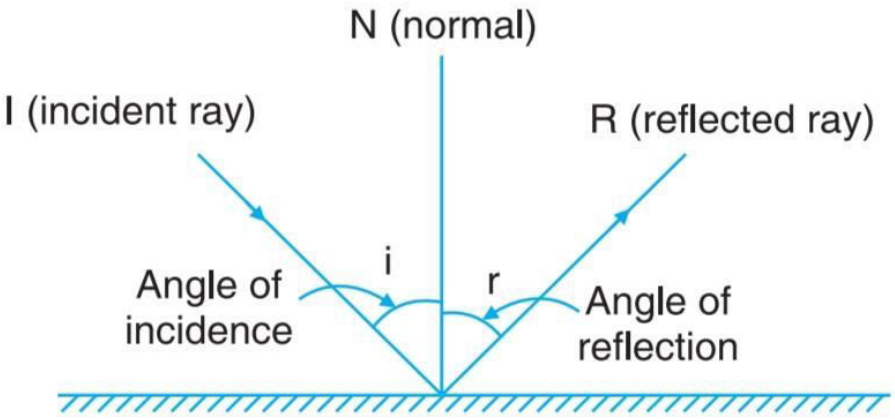
Ans 40. – Ecosystem – System formed by interaction between living organisms and their physical environment in a particular area.
Types of ecosystem –

1. **Natural Ecosystem**: – occurs naturally. Example – Forest, Pond, Desert.
2. **Artificial ecosystem**: – Created by humans. Example – Garden, Aquarium.

Ans 41. – Biomagnification – Increases in the concentration of toxic substances in at each successive trophic level in a food chain.
Common cause – Pesticides (DDT), Industrial pollution, Heavy metals in aquatic ecosystem.

Ans 42. – Laws of reflection –

1. The incident ray, the reflected ray and the normal to the surface at the point of incidence all lie in the same plane.
2. The angle of incidence (i) is always equal to the angle of reflection.
3. $\angle i = \angle r$



Characteristics of image formed by a plane mirror –

1. Virtual and erect image.
2. Image is same size as the object.
3. Laterally inverted image.
4. Distance if image behind mirror is same as the distance of object in front of mirror.

OR

42. (ii) Magnification - It is the ratio of the size of the image to the size of the object.
For concave mirror:
u = -20cm
v = -40cm
Using mirror equation:
1/f = 1/v + 1/u
1/f = 1/(-40) + 1/(-20)
1/f = (-1 - 2)/40
1/f = -3/40
f = -40/3 cm =-13.3cm (approx.)
Ans. 43. (a) Modern Periodic Law - The physical and chemical properties of elements are a periodic function of their atomic numbers.
(b) Elements are arranged in increasing order of atomic numbers.

- The table has 7 periods (Horizontal rows).
- 18 Groups (Vertical columns).

(c) (i) Atomic size - Decreases from left to right(ii) Metallic character - Decreases from left to right.
(iii) Valency/Non-Metallic character - Increases from left to right .
(a) Element X is Chlorine (Cl)
Electronic configuration -2, 8, 7
(b) Valency = 1
(c) Nature of oxide = Acidic.

Sample Question Paper-5
Science and Technology

Q1.SI unit of pressure –
(a) kg (b) m (c) pascal (Pa) (d) newton

Q2.Who proposed the Planetary model of the atom?
(a) Niels Bohr (b) Rutherford (c) Pascal (d) Newton

Q3. On what basis did Mendeleev classify the element-
(a) Dobereiner (b) Mass number (c) Atomic Mass (d) Number of electrons

OR

Which group in the periodic table contains Nobel gases?
(a) Group 1 (b) Group 2 (c) Group 17 (d) Group 18

Q4.In covalent bonding, what happens to electrons?
(a) Electrons are transferred. (b) Electrons are unaffected
(c) Electrons are shared (d) None of above

Q5.Which acid is found in lemon juice?
(a) Acetic acid (b) Tartaric acid (c) Citric acid (d) Oxalic acid

Q6. The rate of change of velocity is called –
(a) Speed (b) Momentum (c) Acceleration (d) Displacement

Q7.What happens to the weight of a body when taken to the moon?
(a) Increases (b) Remains the same (c) Decreases (d) Becomes zero

Q8. Formula for kinetic energy is -
(a) 1/2 mv (b) mv^2 (c) 1/2 mv^2 (d) mgh

Q9.QWhich type of mirror is used in car's rear-view mirror?
(a) Concave (b) Plane (c) Convex (d) Cylindrical

Q10. What is the resistance of a 100W, 220V electric bulb?
(a) 220 (b) 484 (c) 100 Ω (d) 200 Ω

Q11.Which rule gives the directions of the magnetic field around a conductor?
(a) Right-hand thumb rule (b) Fleming's left hand rule
(c) Faraday's law (d) Joule's law

Q12. The mode of nutrition in fungi is_____.
(a) Autotrophic (b) Saprophytic (c) Parasitic (d) Insectivorous

OR

Anaerobic respiration in muscles produces:
(a) Alcohol (b) Lactic acid (c) Glucose (d) Carbon monoxide

Q13. Reflex actions are controlled by
(a) Cerebrum (b) Spinal cord (c) Medulla (d) Cerebellum

Q14.Which part of the flower produces pollen –
(a) Ovary (b) Anther (c) Stigma (d) Petal

Q15.The unit of heredity is
(a) Chromosome (b) DNA (c) Gene (d) Ribosome

Q16. Which gas is released when a metal reacts with an acid?
(a) Oxygen (b) Hydrogen (c) Nitrogen (d) Carbon dioxide
OR
Which metal is used for galvanizing iron?
(a) Zinc (b) Copper (c) Lead (d) Silver

Q17. Which functional group is present in Alcohols?
(a) –COOH (b) –OH (c) –CHO (d) $-NH_2$

Q18. Match Column I statement with the right option of

Column I	Column II
(i) SI unit of length	P. Stopwatch
(ii) SI unit of temperature	Q. Kelvin
	R. Ampere
	S. Meter

Q19.Complete the following sentence by given options, below
[Attempt any 2 Parts from the following (i to iv)]
(Metal, Iodine, basic, acidic)
i. The element which is hard and has a high melting point is usually a _____
ii. _____ is a non metal that is lustrous
iii. Metal forms _____ oxides when reacted with oxygen.
iv. Non-metals form _____ oxides when reacted with oxygen.

Q20.Write TRUE(T) for correct statements and FALSE (F) for incorrect statements.
[Attempt any two parts from following questions (i to iv)]
i. Covalent bonding is found in organic compounds.
ii. An ion is always electrically neutral.
iii. Nitrogen (N_2) forms a triple Covalent bond.
iv. Ionic compounds have high melting points.
Q21.Read the passage and answer the questions (i) and (ii)
The human circulatory system is a vital transport system in the body that helps in the movement of substances such as oxygen, carbon dioxide, nutrients and waste materials. It consists of: A centrally located muscular pump called the Heart, Blood vessels Arteries Veins and Capillaries.
Answer the following questions:
(i) The blood vessels that carry blood from the heart are termed as _____ and those that bring blood from various parts of the body to the heart are termed as _____.
(ii) Name the thin structures that allow the exchange of materials between blood and tissues.

Q22. Read the passage and answer the questions (i) and (ii) that follow:
Asexual reproduction is the process by which a single parent reproduces offspring without the in unicellular organisms like Amoeba, as well as in some multicellular organisms like Hydra and Planaria. The various types of asexual reproduction include binary fission, budding, spore formation and regeneration.
(i) Which organism reproduces by binary fission?
(A) Hydra (B) Amoeba (C) Planaria (D) Mushroom
(ii) Budding is a mode of reproduction found in:
(A) Paramecium (B) Hydra (C) Amoeba (D) Bacteria

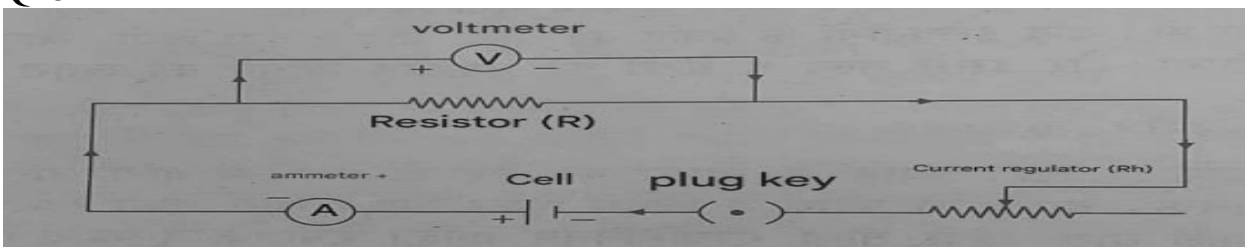
Q23.Write TRUE(T) for correct statement and FALSE (F) for incorrect statement,
[Attempt any two Parts from the following questions (i to v)]
i. Mendeleev left gaps for undiscovered element –
ii. The modern periodic table has 7 groups and 18 periods –
iii. Atomic size decreases as we go down a group. –
iv. Valency of elements in group I is 1.
v. Fluorine is more reactive than Iodine –

Q24.Match Column I formula with the right option of column II

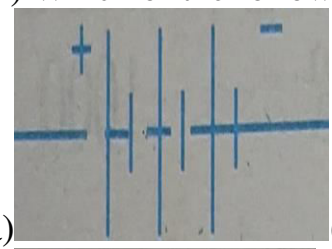
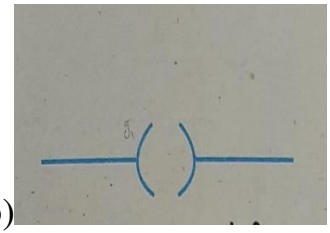
Column I	Column II
i. Litmus	P. Turns pink in base
ii. Baking Soda	Q. Acid/Base
	R. Indicator
	S. $NaHCO_3$

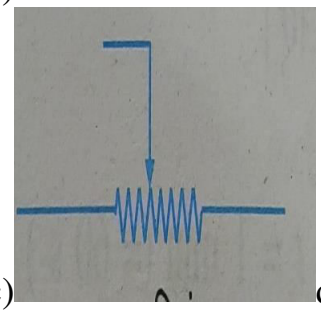
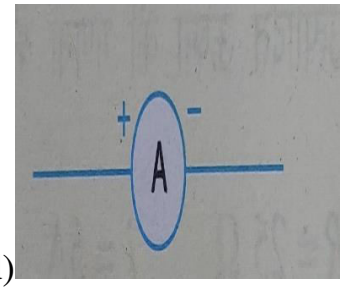
Q25.Fill in the blanks:-
Attempt any two parts from the following
questions (i to iv)
i. The solid outermost layer of the earth is called the ____.
ii. The thin layer of air that surrounds the earth is known as the ____.
iii. The zone of life on earth is called the ____.
iv. The natural environment includes both biotic and ____ components.
Q26 Write TRUE (T) for Correct Statement and FALSE (F) for incorrect statements.
[Attempt any two parts from the following questions (i to iv)]
(i) Animals that eat only plants are called herbivores.
(ii) The lithosphere is the gaseous layer around Earth.
(iii) Reuse and recycling help in environmental conservation.
(iv) Ecosystem includes both biotic and abiotic components.
Q27.Read the following passage carefully and answer question any two from (i to iv)
According to Newton's Universal Law of Gravitation, every object in the universe attracts every other object with a force. This gravitational force is directly proportional to the product of their masses and inversely proportional to the square of the distance between them. It is given by the formula:
$F=Gm_1m_2/r^2$
Where F = Gravitational Force
G = Universal Gravitational Constant
$=6.67\times10^{-11}Nm^2/kg^2$
m_1m_2 = masses of two objects
r = distance between the objects
i).Answer the following question:
What happens to the gravitational force of, if the distance between two objects is doubled?
(A) It becomes four times (B) It becomes half
(C) It becomes one-fourth (D) It remains the same
ii) The gravitational force between two objects depends on:
(A) their color (B) their masses and distance between them
(C) their shapes (D) their temperature
iii) What is the nature of gravitational force?
(A) Repulsive (B) Attractive
(C) sometimes attractive, sometimes repulsive (D) Magnetic
iv) The value of the universal gravitational constant (G) is:
(A) 9.8 m/s^2
(B) 6.67×10^{-11} $N\ m^2/kg^2$
(C) 1.6×10^{-19} $N\ m^2/kg^2$
(D) 3×10^8 m/s

Q28



In the circuit diagram, the voltmeters connected:
(A) In series (B) In Parallel (C) In mixed combination (D) In no particular combination.
(II) Which of the following represents a rheostat in a circuit?

(a)  (b) 

(c)  d) 

(III) Which of the following sets includes only safety devices used in household electrical circuits?
(A) Switch, tester, fuse (B) Voltmeter, ammeter, tester
(C) Fuse, switch, bulb (D) MCB, switch, voltmeter

(IV) What is the role of a rheostat in an electric circuit?
(A) Measure current (B) Control voltage
(C) Vary resistance (D) Act as a fuse

Q29.Write the balanced chemical equation for the following statement.
a. Methane burns in oxygen to form Carbon dioxide and oxygen
b. Sodium Carbonate reacts with hydrochloric acid to give sodium chloride, Carbon dioxide and water.

OR

What is a decomposition reaction?
Give one example.
Q30.Write the molecular formula and draw the structures of the following compounds.
(i) Ethanol (ii) Acetic acid

Q31.Write any two postulates proposed by Niels Bohr in Bohr's Model of atom.

OR

What were the main observations of the gold foil experiment conducted by Rutherford?

Q32.Why does dry HCl gas not change the color of dry litmus paper, but moist HCl does?

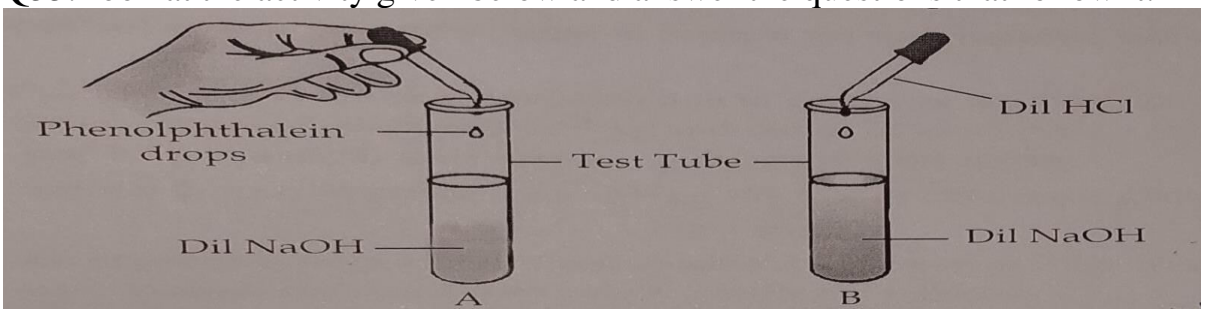
Q33.State two factors on which the strength of magnetic field due to a solenoid depends.

OR

How can you determine the direction of the magnetic field around a current-carrying conductor?

Q34.Define the terms
Homologous chromosomes (ii) Evolution.

Q35.Look at the activity given below and answer the questions that follow it.



(a) What colour change will you observe in test tube A?
(b) What would happen in test test tube B?
(c) What is the process occurring in test tube B called as?

OR

Name the constituents of baking powder. Why is baking powder used but not used baking soda in the bakery?

Q36.What is global warming? Mention any two causes and one effect:

Q37.i)Calculate the value of acceleration due to gravity of the earth i.e. 'g'. Given: Mass of earth = $6x10^{24}$ kg and radius of earth = 6.4 x 10^{6} kg.

OR

(ii) An object falls from a height and reaches the ground in 0.5 s. Let g = 10 m s^-2
(a) What is the speed with which it stikes to the ground?
(b) What is the average speed during the 0.5 s?
(c) What is the height from the ground from which it was dropped?

Q38.What is a reflex arc? Draw a neat and labeled diagram of the reflex arc. Explain its components.

OR

What is diabetes? Name the gland and hormone related to it.

Q39.What are the functions of the following
(a) Testes
(b) Vas deferens
(c) Urethra

Q40.How do human activities disturb the natural environment? Give three examples.

Q41.How does urbanization affect the natural environment?

Q42.i (a) Draw diagrams of the following lenses: Double Convex, Plano Convex, Double Concave, Convexo Concave

(b) Draw diagrams showing the following:

- Myopic eye
- Hypermetropic eye
- Relaxed eye

Q43. i) Part of the Modern Periodic table is given below where the atomic numbers of the elements of Group 'A' and 'B' are given in the Parentheses:

Group 'A'Group 'B'
N(7)O(8)
P(15)S(16)
As(33)Se(34)
Sb(51)Te(52)

(a) Give the electronic configuration of 'S'
(b) Write the number of Valence electrons in the atom 'P'
(c) What is the total number of shells in the atom of 'O'
(d) Arrange the elements of Group - B in the increasing order of their atomic size.
(e) State whether 'Se' is a metal or non-metal.
(f.) Out of N, O, P and S which has the biggest atom in size?
(ii) (a) Which group contains halogen?
(b) Why are noble gases placed in Group 18?

OR

(iii) (a) State one advantage of the modern periodic table.
(b) What is the basis of classification in Mendeleev's periodic table?
(c) What is the trend of atomic size across a period.

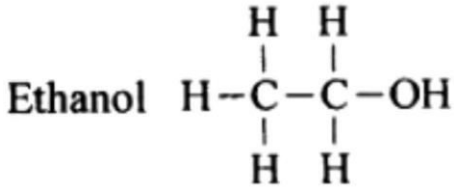
Answerkey-5

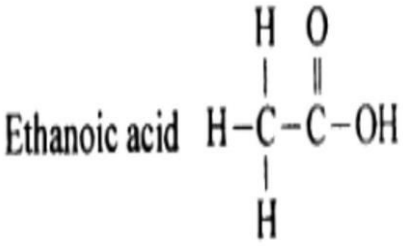
1.(c) Pascal
2.(a) Niels Bohr
3.(C) Atomic Mass OR (d) Group 1
4.(C) Electrons are shared
5.(c) Citric acid
6.(c) Acceleration
7.(c) Decreases
8.(C) ½ mv2
9.(C) Convex
10.(b) 484Ω
11.(a) Right hand thumb rule
12.(b) Saprophytic or (b) Lactic acid
13.(b) Spinal cord
14.(b) Anther
15.(c) Gene
16.(b) Hydrogen or (a) Zinc
17.(b) -OH
18.(i)- S, (ii) - Q
19.(i)Metal (ii)Iodine (iii) Basic (iv) Acidic
20(i) True (ii) False (iii) True (iv) True
21.(i) Arteries, veins (ii) Capillaries
22.(i) B-Amoeba (ii) B-Hydra
23.(i) True (ii) False (iii) False (iv) True (v) True
24.(i)R(Indicator) (ii)S ($NaHCO_3$)
25.(i) Lithosphere (ii) Atmosphere (iii) Biosphere(iv) Abiotic
26.(i) True (ii) False (iii) True (iv) True
27.(i) (C) It becomes one fourth
ii)(B) Their masses and distance between the
iii.(B) Attractive (W) (B) 6.67×10^{-11} Nm^2/kg^2
28.(i)-B (ii) C (iii) A (IV) C
29.(i) (a) $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$
(b) $Na_2CO_3 + 2HCl \rightarrow 2NaCl + H_2O + CO_2$

OR

- A decomposition reaction is a reaction where a single compound breaks down into two or more simpler substances. Ex. $CaCO_3$ (s) → CaO(s) + CO_2 (g)

30.(i) (ii)





31.(i) Electrons revolve around the nucleus in specific stable orbits without radiating energy
(ii) Electrons can jump between orbits by absorbing or emitting energy.

OR

(i) Most alpha particles passed through the foil without deflection
(ii) Some were deflected at small angles
(iii) A few particles bounced back almost directly.

32.Dry HCl gas does not release H^+ ions in the absence of water, so it does not show acidic properties.
Moist HCl dissolves in water to form H^+ ions, which turn blue litmus red, indicating acidity.

33 i. Number of turns per unit length of the solenoid (More turns = stronger field)
ii. Current passing through the solenoid (more current = stronger field)

OR

By using the Right Hand Thumb Rule: If the thumb points in the direction of current, the curled finger shows the direction of the magnetic field lines.

34.i. Homologous chromosomes - Homologous Chromosomes are pairs of chromosomes that have the same structure and carry the same genes but possibly different alleles.
ii. Evolution -Evolution is a biological process of change in heritable traits of population over successive generations .

35.i. (a) Pink (b) Colourless (c) Neutralisation

OR

Baking powder = baking soda + tartaric acid (weak edible acid)
Baking soda requires acidic ingredient for chemical to reaction to activate.

36.Global Warming is the rise in Earth's average temperature.
Causes: (i) Burning of fossil fuels.
(ii) Deforestation
Effect: Melting of glaciers, which causes sea level rise.

37.

$$g = G\frac{M}{R^2}$$
$$= \frac{6.7 \times 10^{-11} Nm^2 kg^{-2} \times 6 \times 10^{24} kg}{(6.4 \times 10^6 m)^2}$$
$$= 9.8 ms^{-2}$$

or

a. Use the first equation of motion

$$v = u + gt$$
$$v = 0 + (10 ms^{-2})(0.5 s)$$
$$v = 5 ms^{-1}$$

b. Average speed $= \frac{u+v}{2}$

$$= \frac{0 ms^{-1} + 5 ms^{-1}}{2}$$
$$= 2.5 ms^{-1}$$

c. The height

$$h = ut + \frac{1}{2} gt^2$$
$$h = 0 + \frac{1}{2} (10 ms^{-2})(0.5 s)^2$$
$$h = 1.25 m.$$

38.A reflex arc is the neural pathway followed during reflex action. It is the route taken by nerve impulses during a reflex action.
Stimulus → Receptor → Sensory Neuron → Spinal cord →Motor Neuron→Effector - (Muscle)

OR

Diabetes is a condition where the blood sugar level becomes too high.

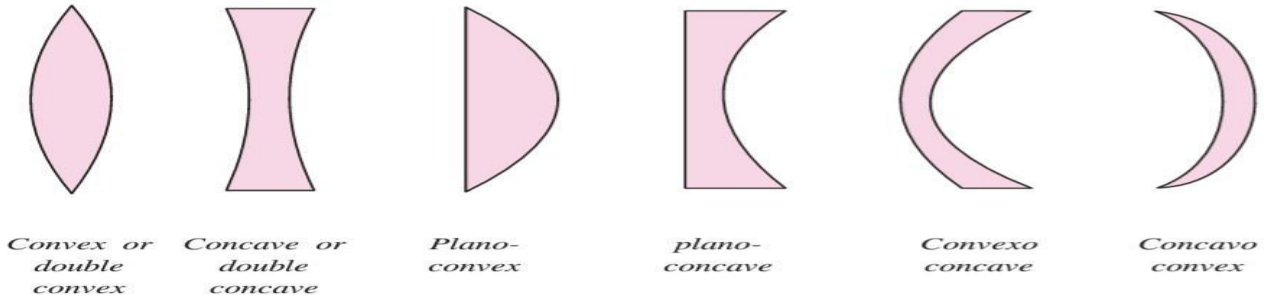
- It is caused due to lack of insulin.
- Related Gland - Pancreas
- Hormone - Insulin

39.(a) Testes: Produce sperms and make hormone
(b) Vas deferens: Carries sperm from testes to urethra.
(c) Urethra: Common passage for sperm and urine to exit the body

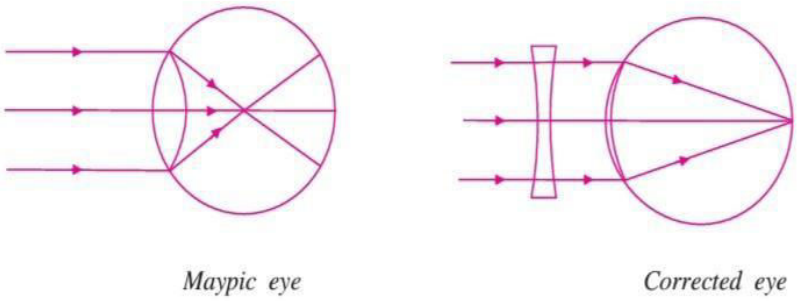
40.1. Deforestation: Cutting trees destroys habitats and causes soil erosion.
2.Pollution: Factories and vehicles pollute air, water and soil.
3.Overuse of Resources: Excessive use of water, coal and petroleum, causes resource depletion.

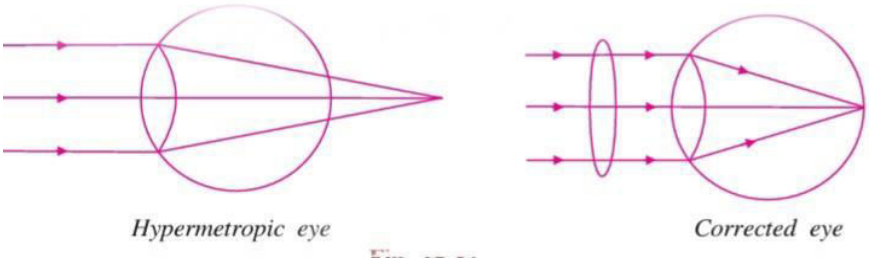
41.1. Loss of green cover due to building construction.
2.Overextraction of groundwater leading to water scarcity.
3.Increased waste generation and pressure on natural resources.

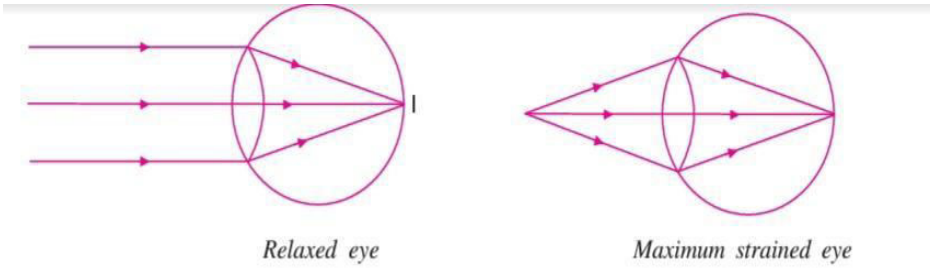
42.(i) (a)



b.







43(i) (a) S - 2,8,6
(b) P - 2,8,5 valence electron – 3,5
(c) O - 2,6 Number shells - 2
(d) O < S < Se <Te
(e) Non metal
(f) S has the biggest atom in size.
(ii) (a) Group-17
(b) Because they have a complete valence Shell

OR

(a) It organizes elements based on atomic numbers allowing for easier prediction of Chemical properties. (b) Atomic mass (c) Decreases.