विज्ञान
Science

कक्षा / Class X
2025-26

विद्यार्थी सहायक सामग्री
Student Support Material

केन्द्रीय विद्यालय संगठन~Kendriya Vidyalaya Sangathan

संदेश

विद्यालयी शिक्षा में शैक्षिक उत्कृष्टता प्राप्त करना एवं नवाचार द्वारा उच्च - नवीन मानक स्थापित करना केन्द्रीय विद्यालय संगठन की नियमित कार्यप्रणाली का अविभाज्य अंग है। राष्ट्रीय शिक्षा नीति 2020 एवं पी. एम. श्री विद्यालयों के निर्देशों का पालन करते हुए गतिविधि आधारित पठन-पाठन, अनुभवजन्य शिक्षण एवं कौशल विकास को समाहित कर, अपने विद्यालयों को हमने ज्ञान एवं खोज की अद्भुत प्रयोगशाला बना दिया है। माध्यमिक स्तर तक पहुँच कर हमारे विद्यार्थी सैद्धांतिक समझ के साथ-साथ, रचनात्मक, विश्लेषणात्मक एवं आलोचनात्मक चिंतन भी विकसित कर लेते हैं। यही कारण है कि वह बोर्ड कक्षाओं के दौरान विभिन्न प्रकार के मूल्यांकनों के लिए सहजता से तैयार रहते हैं। उनकी इस यात्रा में हमारा सतत योगदान एवं सहयोग आवश्यक है - केन्द्रीय विद्यालय संगठन के पांचों आंचलिक शिक्षा एवं प्रशिक्षण संस्थान द्वारा संकलित यह विद्यार्थी सहायक-सामग्री इसी दिशा में एक आवश्यक कदम है । यह सहायक सामाग्री कक्षा 9 से 12 के विद्यार्थियों के लिए सभी महत्वपूर्ण विषयों पर तैयार की गयी है। केन्द्रीय विद्यालय संगठन की विद्यार्थी सहायक- सामग्री अपनी गुणवत्ता एवं परीक्षा संबंधी सामग्री संकलन की विशेषज्ञता के लिए जानी जाती है और शिक्षा से जुड़े विभिन्न मंचों पर इसकी सराहना होती रही है। मुझे विश्वास है कि यह सहायक सामग्री विद्यार्थियों की सहयोगी बनकर निरंतर मार्गदर्शन करते हुए उन्हें सफलता के लक्ष्य तक पहुँचाएगी।

शुभाकांक्षा सहित ।

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COURSE STRUCTURE CLASS X (2025-26 Time: 03 Hours Marks: 80

Unit No.	Unit	Marks
I	Chemical Substances-Nature and Behaviour	25
II	World of Living	25
III	Natural Phenomena	12
IV	Effects of Current	13
V	Natural Resources	5

Theme: Materials

Unit I: Chemical Substances - Nature and Behaviour

Chemical Reactions and Equations: Chemical reactions, Chemical equation, Balanced chemical equation, types of chemical reactions: combination, decomposition, displacement, double displacement, precipitation, endothermic exothermic reactions, oxidation and reduction.

Acids, Bases and Salts: Acids and Bases – Definitions in terms of furnishing of H+ and OH– ions, identification using indicators, chemical properties, examples and uses, neutralization, concept of pH scale (Definition relating to logarithm not required), importance of pH in everyday life; preparation and uses of Sodium Hydroxide, Bleaching powder, Baking soda, Washing soda and Plaster of Paris.

Metals and Non-metals: Properties of metals and non-metals; Reactivity series; Formation and properties of ionic compounds; Basic metallurgical processes; Corrosion and its prevention.

Carbon and its Compounds: Covalent bonds – formation and properties of covalent compounds, Versatile nature of carbon, Hydrocarbons – saturated and unsaturated Homologous series. Nomenclature of alkanes, alkenes, alkyne and carbon compounds containing functional groups (halogens, alcohol, ketones, aldehydes). Chemical properties of carbon compounds (combustion, oxidation, addition and substitution reaction). Ethanol and Ethanoic acid (only properties and uses), soaps and detergents.

Theme: The World of the Living

Unit II: World of Living

Life processes: 'Living Being'. Basic concept of nutrition, respiration, transport and excretion in plants and animals.

Control and co-ordination in animals and plants: Tropic movements in plants; Introduction of plant hormones; Control and co-ordination in animals: Nervous system; Voluntary, involuntary and reflex action; Chemical co-ordination: animal hormones.

How do organism Reproduce?: Reproduction in animals and plants (asexual and sexual) reproductive health – need and methods of family planning. Safe sex vs HIV/AIDS. Child bearing and women's health.

Heredity: Heredity; Mendel's contribution- Laws for inheritance of traits: Sex determination; brief introduction.

Theme: Natural Phenomena

Unit III: Natural Phenomena

Light – Reflection and Refraction: Reflection of light by curved surfaces; Images formed by spherical mirrors, centre of curvature, principal axis, principal focus, focal length, mirror formula (Derivation not required), magnification. Refraction; Laws of refraction, refractive index.

Refraction of light by spherical lens; Image formed by spherical lenses; Lens formula (Derivationnot required); Magnification. Power of a lens.

The Human Eye and The Colourful World: Functioning of a lens in human eye, defects of vision and their corrections, applications of spherical mirrors and lenses. Refraction of light through a prism, dispersion of light, scattering of light, applications in daily life (excluding colour of the sun at sunrise and sunset).

Theme: How Things Work

Unit IV: Effects of Current

Electricity :Electric current, potential difference and electric current. Ohm's law; Resistance, Resistivity, Factors on which the resistance of a conductor depends. Series combination of resistors, parallel combination of resistors and its applications in daily life. Heating effect of electric current and its applications in daily life. Electric power, Interrelation between P, V, I and R.

Magnetic effects of currents: Magnetic field, field lines, field due to a current carrying conductor, field due to current carrying coil or solenoid; Force on current carrying conductor, Fleming's Left Hand Rule, Direct current. Alternating current: frequency of AC. Advantage of AC over DC. Domestic electric circuits.

Theme: Natural Resources

Unit V: Natural Resources

Our environment: Eco-system, Environmental problems, Ozone depletion, waste production and their solutions. Biodegradable and non-biodegradable substances.

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Chemical Reaction

A chemical reaction is a process in which one or more substances, the reactants, are converted to one or more different substances, **the products**.

***Characteristics of chemical reaction**:

Change in state, Change in colour, Evolution of gas, Change in temperature and Formation of precipitate.

1. Writing a Chemical Equation

Representation of a chemical reaction in terms of symbols and chemical formulae of the reactants and products is known as a chemical equation.

2. Balanced Chemical Equations

The Law of Conservation of Mass states that in a chemical reaction, atoms can't be created or destroyed. This means that the total number of atoms for each element in the starting materials (reactants) must be the same as in the end products, keeping the overall mass the same.

TYPES OF CHEMICAL REACTIONS

1. COMBINATION REACTION **(A+ B ---------->AB)**

A reaction in which a single product is formed from two or more reactants is known as a combination reaction.

Examples: $CaO(s) + H_2O(l) \rightarrow Ca(OH)_2\ (aq) + Heat$

Note: A chemical reaction in which heat is produced or evolved is called **exothermic reaction**. The reaction mixture becomes **HOT**. **(A+ B —--> C + HEAT)**

Examples of Exothermic Reactions

(a) Burning of Coal $C(s) + O_2\ (g) \rightarrow CO_2\ (g)$

(b) Burning of natural gas $CH_4\ (g) + 2O_2\ (g) \rightarrow CO_2\ (g) + 2H_2O\ (g)$

(c) Respiration

When food is digested, it's broken down into simpler form (glucose). This glucose then mixes with oxygen in our cells to produce energy.

(d) Decomposition of vegetable matter into compost.

Note: A chemical reaction in which heat is absorbed, is called **endothermic reaction**. The reaction mixture becomes **COLD.** **(A+ B + HEAT —----> C)**

Example (a) Photosynthesis (b) Evaporation

2. DECOMPOSITION REACTION. **(A—----> B+C)**

A reaction in which a compound splits up into two or more simpler substances is known as decomposition reaction. It can be carried out by applying HEAT, LIGHT OR ELECTRICITY.

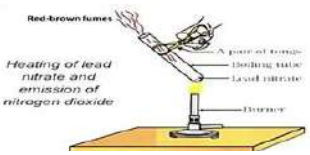
(i)THERMAL DECOMPOSITION (Decomposition reaction using **HEAT**)

$FeSO_4(s)$ + Heat ----> Fe_2O_3 (s) + $SO_2(g)$ + SO_3 (g)

Ferrous sulphate Ferric oxide Sulphur dioxide Sulphur trioxide

$CaCO_3(s)$ + Heat—-> CaO (s) + CO_2 (g)

Calcium carbonate (limestone) Calcium oxide (Quick lime) Carbon dioxide



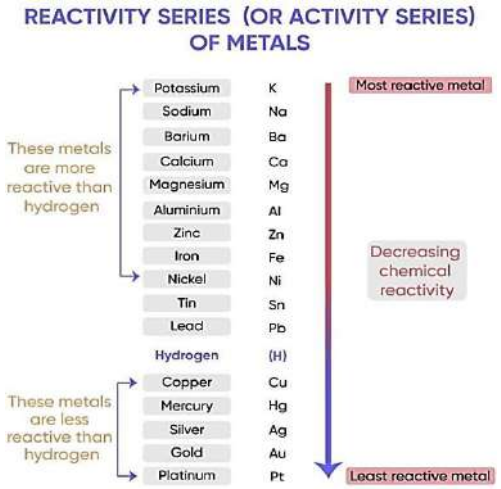
2 $Pb(NO_3)_2$ (s) + Heat --------> 2PbO(s) + $4NO_2$ + O_2

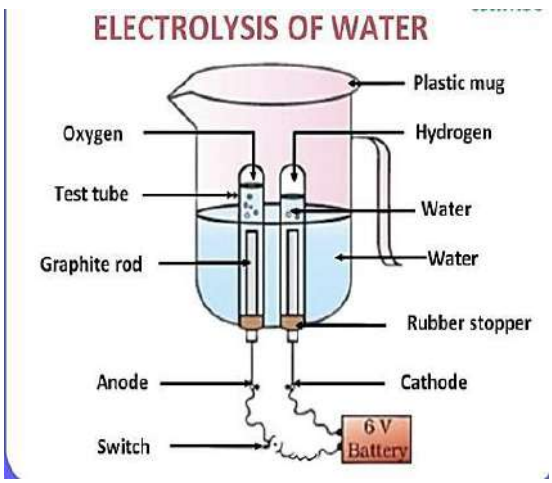
Lead nitrate (Colourless). Lead oxide (Yellow) Nitrogen dioxide (Brown fumes)

$2\ KClO_3\ (s)$ + Heat —----------> $2\ KCl\ (s)$ + $3\ O_2\ (g)$

Potassium chlorate. Potassium chloride

(ii) ELECTROLYTIC DECOMPOSITION (Decomposition reaction using **ELECTRICITY**)





H_2O (l) —----- ----> $2H_2\ (g)$ + $O_2\ (g)$

Water Hydrogen Oxygen

1.Anode is connected to +ve terminal and cathode is connected to -ve terminal of battery.

2.Volume of H_2 gas evolved is twice the volume of O_2.

3.O2 gas is collected at Anode and H_2 gas is collected at Cathode.

$2\ NaCl(l)$ —----------> $2Na\ (s)$ + $Cl_2(g)$

Sodium chloride Sodium Chlorine gas

$2\ Al_2O_3\ (l)$ —----------> $4Al(l)$ + $O_2(g)$

Aluminium oxide Aluminium metal Oxygen gas

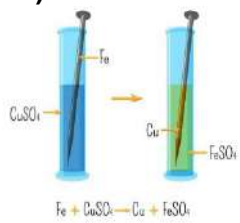
(iii) PHOTO DECOMPOSITION (Decomposition reaction using **LIGHT**)

$2\ AgCl(s)$ —----------> $2Ag\ (s)$ + Cl_2

Silver chloride Silver. Chorine

$2Ag\ Br\ (s)$ —----------> $2Ag\ (s)$ + $Br_2\ (g)$

Silver cromide. Silver Bromine



3. DISPLACEMENT REACTION (A+ BC —--> AC + B)

A reaction in which a more reactive element displaces a less reactive element from its compound

$Fe\ (s)$ + $CuSO_4\ (aq)$ -------> $FeSO_4\ (aq)$ + Cu

Iron. Copper sulphate Iron sulphate Copper

$Zn\ (s)$ + $CuSO_4\ (aq)$ -----> $ZnSO_4\ (aq)$ + $Cu\ (s)$

Zinc Copper sulphate. Zinc sulphate. Copper

4. DOUBLE DISPLACEMENT REACTION (AB+ CD—-> AD + CB)

A reaction in which two compounds react by an exchange of ions to form two new compounds is called double displacement reaction.

$Na_2SO_4\ (aq)$ + $BaCl_2\ (aq)$ ---—----> $BaSO_4(s)$ + $2\ NaCl\ (aq)$

Sodium sulphate Barium shloride. Barium sulphate (White ppt.) Sodium chloride

KI + $Pb(NO_3)_2$ —--------> KNO_3 + PbI_2

Potassium iodide Lead nitrate. Potassium nitrate Lead iodide (Yellow ppt)

5. OXIDATION AND REDUCTION REACTION

REDOX REACTION

OXIDATION= Addition of Oxygen/ Removal of Hydrogen

REDUCTION= Addition of Hydrogen/ Removal of Oxygen

OXIDISING AGENT = Substance which gives oxygen / removes hydrogen
REDUCING AGENT= Substance which gives hydrogen/ removes oxygen
$CuO + H_2$ —-------> $Cu + H_2O$

EFFECTS OF OXIDATION REACTIONS IN EVERYDAY LIFE

The damaging effect of oxidation on metals is studied as **CORROSION** and that on food is studied as **RANCIDITY.**

When an iron object is left in damp air for some time, it gets covered with a reddish-brown flaky substance called **RUST.**

$Fe + O_2 + H_2O$ ----------> $Fe_2O_3 .xH_2O$ Hydrated Ferric oxide **(Rust)**

RANCIDITY: The condition produced by aerial oxidation of fats and oils in food marked by unpleasant smell and taste is called rancidity.

It can be prevented by:

(i) By adding antioxidants to the food containing fats and oils. Examples of antioxidants:
BHA - Butylated Hydroxy Anisole
BHT- Butylated Hydroxy Toluene
(ii) By storing food in air - tight containers.
(iii) By packaging the food containing oil and fat in nitrogen gas.
(iv) By keeping the food in refrigerator.

CHAPTER WISE QUESTION BANK

Multiple Answer Type Question (1 Mark Each)

1.In a double displacement reaction such as the reaction between sodium sulphate solution and barium chloride solution:

a) Exchange of atoms takes place b) Exchange of ions takes place
c) A precipitate is produced. d) An insoluble salt is produced

The correct option is

(a) (b) and (d) (b) (a) and (c) (c) Only (b) (d) (b), (c) and (d)

(Hint : $Na_2SO_4 + BaCl_2$ —-----> $NaCl + BaSO_4$)

2.Which of the following reactions is different from the remaining three?

(a) $NaCl + AgNO_3 \rightarrow AgCl + NaNO_3$ (b) $CaO + H_2O \rightarrow Ca(OH)_2$
(c) $KNO_3 + H_2SO_4 \rightarrow K_2SO_4 + HNO_3$ (d) $ZnCl_2 + H_2S \rightarrow ZnS + 2HCl$

(Hint**:** Identify on the basis of type of reaction)

3. The chemical reaction between Hydrogen sulphide and Iodine to give Hydrogen iodide and Sulphur is given $H_2S + I_2 \rightarrow 2HI + S$.

The oxidising and reducing agents involved in this redox reaction are:

(a) Hydrogen iodide and Sulphur respectively (b) Iodine and Sulphur respectively
(c) Hydrogen sulphide and Iodine respectively (d) Iodine and Hydrogen sulphide respectively

(Hint : OXIDISING AGENT = Substance which gives oxygen / removes hydrogen
REDUCING AGENT= Substance which gives hydrogen/ removes oxygen)

4. In the given balanced equation, the coefficients x, y, z and p respectively are

$x\ Mg_3N_2 + y\ H_2O$ —--> $z\ Mg(OH)_2 + p\ NH_3$

(a) 1,3,3,2 (b) 1,2,3,2 (c) 1,6,3,2 (d) 2,3,6,2

(Hint : Put the coefficient values and check for a balanced chemical equation)

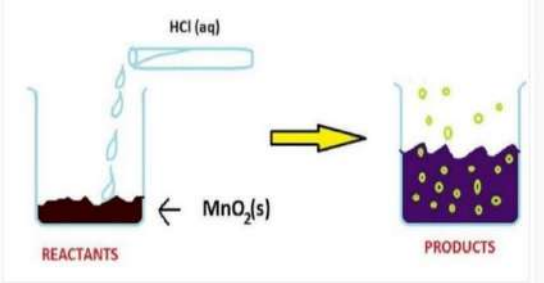
5. Rancidity can be prevented by

(a) Adding antioxidants (b) Storing food in air - tight container
(c) Keeping the food in refrigerator. (d) All of the above

(Hint : The condition produced by aerial oxidation of fats and oils in food marked by unpleasant smell and taste is called rancidity.)

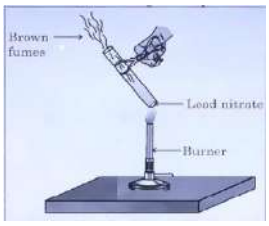
6. Identify the correct statement from the following:

(a) MnO_2 is getting reduced whereas HCl is getting oxidised.
(b) MnO_2 and HCl both are getting reduced.
(c) MnO_2 and HCl both are getting oxidised.
(d) None of the above
(Hint : $MnO_2 + 4HCl$ ------> $2H_2O + Cl_2$)



Assertion & Reason Based Questions (1 Mark Each)

7.Assertion (A): Silver bromide decomposition is used in black and white photography.
Reason (R): Light provides energy for this exothermic reaction.
(Hint : c)



8.Assertion (A) Zinc reacts with sulphuric acid to form zinc sulphate and hydrogen gas and it is displacement reaction.
Reason (R) Zinc reacts with oxygen to form zinc oxide.
(Hint: b)

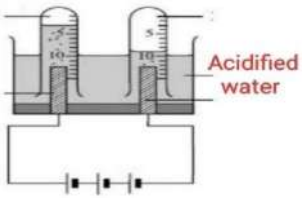
9. **Assertion (A)** Lead nitrate on thermal decomposition gives lead oxide, brown coloured nitrogen dioxide and oxygen gas.
Reason (R): Lead nitrate reacts with Potassium iodide to form yellow ppt of lead iodide and the reaction is double displacement as well as precipitation reaction.
(Hint : b)

10. Assertion (A): Silver articles become black after sometime when exposed to sunlight.
Reason (R) : It is because Silver reacts with carbonates present in the air.
(Hint: c)

Very Short answer Based Question (2 Marks Each)

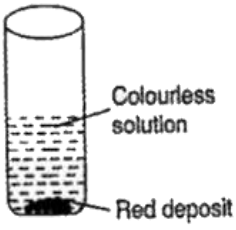
11. You are provided with two containers made up of copper and aluminium. You are also provided with dilute HCl, HNO_3, $ZnCl_2$ and H_2O solutions. In which of the above containers we can keep these solutions? (Hint : Use Reactivity series)

12. Observe the figure and answer the following questions



(i) Why is the volume of gas collected over one electrode double that of gas collected over the other electrode?
(ii) Write the balanced chemical equation for the reaction taking place in the above figure.
(Hint: Refer Electrolysis of water)

13. When few granules of sample X are added to a solution of copper sulphate, the changes observed are shown in the figure.



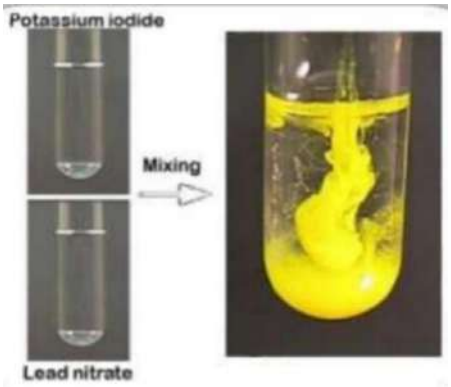
(i) Identify sample X and the red deposit.
(ii) Write the balanced chemical equation for the reaction and also name the type of reaction.
(Hint: Refer reactivity series and colour of metal salt solution)

14. 5 g of ferrous sulphate crystals are heated in a dry boiling tube.
(a) List any two observations.
(b) Name the type of chemical reaction taking place and also write the chemical equation of the reaction
(Hint: Refer decomposition of ferrous sulphate)

15. 2 g of silver chloride is taken in a china dish and the china dish is placed in sunlight for some time. What will be your observation in this case? Write the chemical reaction involved in the form of a balanced chemical equation. Identify the type of the chemical reaction.(Hint : see fig. RHS.)

Short Answer Type Questions (3 Marks Questions)

16. Radhika performed the reaction between Potassium iodide and Lead nitrate and observed a yellow solid.



(i) Which cation and anion is involved in the formation of this solid.

(ii) Give another name for the solid formed.

(iii) Write a balanced chemical equation to represent the above chemical reaction.

(Hint: Refer double displacement reaction)

17. What happens when a piece of

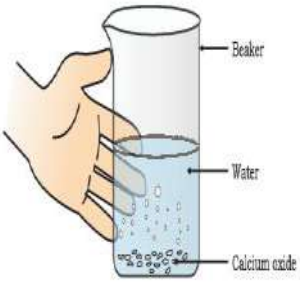
(a) Zinc metal is added to copper sulphate solution?

(b) Aluminium metal is added to dilute hydrochloric acid?

(c) Silver metal is added to copper sulphate solution?

Also, write the balanced chemical equation if the reaction occurs

(Hint : Use Reactivity series to write the products)



18. 1.Rani took solid quick lime in a beaker and added water to it

a) Identify the type of reaction

b) Write the chemical equation of the reaction

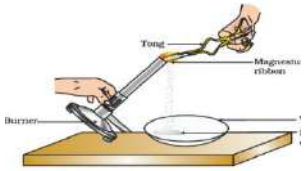
c) Is this reaction is exothermic or endothermic? Justify.

19. Observe the picture and write :-

a) The balance chemical reaction

(b) Name the white ash collected in the china dish.

(c) Which colour of light is produced while burning?



(Long Answer Type Questions 5 Marks Each)

20. A packet containing chips was found damped when kept open for 5 days.

(i) Write the term related with it and how is oxidation involved here.**(2)**

(ii) Mention it's causes. **(1)**

(iii) Suggest two methods for its prevention . **(2)**

(Hint: Prevent contact with air and use substances that delay oxidation.)

21. *Aryan took a few zinc granules in a test tube and added dilute sulphuric acid to it. He noticed the formation of bubbles and felt the test tube becoming warm. He then passed the gas through a soap solution and found that bubbles were formed, which burst with a 'pop' sound.*

(a) Write the balanced chemical equation for the reaction taking place. (1 mark)

(b) What is the identity of the gas formed, and how can it be tested? (2 marks)

(c) What type of reaction is this? Justify your answer. (1 mark)

(Hint: Refer to reactivity series and type of reactions.)

Case Based Questions (4 Marks Questions)

22. *Raghu is a skilled painter. He mixed a white coloured powder, compound X with water. The compound X reacted vigorously with water to produce a compound Y and a large amount of heat. Then, Raghu used the compound Y for white washing the walls. Customer was not satisfied with the work of Raghu as walls were not shining. But Raghu guaranteed him that the walls would shine after 2-3 days and after 3 days of whitewash, the walls became shiny.*

Read the above passage carefully and give the answer to the following questions:

(a) Name a compound X, that Rahul mixed with water. Also write it's common name.

(b) Name a compound Y, that Rahul got after mixing X with water. Also write it's common name.

(c) What type of reaction has occurred here?

(d) Write the chemical reaction responsible for shiny finish of the walls.

(Hint : $CaO + H_2O \rightarrow Ca(OH)_2$ $Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$

INDICATORS	ACID	BASE
Blue litmus paper	Red	No change
Red litmus paper	No change	Blue
China rose (Pink)	Deep Pink (Magenta)	Green
Red cabbage extract (Red)	Red	Green
Turmeric (Yellow)	Pale Yellow	Red
Phenophthalein (Colourless)	Colourless	Pink
Methyl Orange (Orange)	Red	Yellow

CHEMICAL REACTIONS :

1. ACID + METAL —----> SALT + HYDROGEN

$Mg + HCl$—---------> $MgCl_2 + H_2$

2.BASE + METAL —------> SALT + HYDROGEN

$NaOH$ + Zn —-------> Na_2ZnO_2 + H_2

Sodium hydroxide Zinc Sodium zincate. Hydrogen

3.ACID + METAL CARBONATE —----------> SALT + WATER + CARBON DIOXIDE

$Na_2 CO_3 + 2 HCl$ —---------> $2 NaCl + H_2O + CO_2$

$Ca(OH)_2 + O_2$ —--------> $CaCO_3 + H_2O$

On passing excess CO_2 , Calcium hydrogen carbonate is formed which is soluble in water.

$CaCO_3 + H_2O + CO_2$ —-------->$Ca(HCO_3)_2$

4.BASE + METAL CARBONATE/ METAL HYDROGEN CARBONATE —> NO REACTION

5. ACID + METAL HYDROGEN CARBONATE —-> SALT + WATER + CARBON DIOXIDE

$HCl + NaHCO_3$ —--->$NaCl + HCl + CO_2$

6. ACID + BASE —----> SALT + WATER (NEUTRALISATION REACTION)

$HCl + NaOH$ —---->$NaCl + H_2O$

$H_2SO_4 + 2NaOH$ —--------> $Na_2SO_4 + H_2O$

7. ACID + METAL OXIDE —------> SALT + WATER

$HCl + CuO$ —-------> $CuCl_2 + H_2O$

(Metal oxides are basic in nature, so acids react with metal oxides)

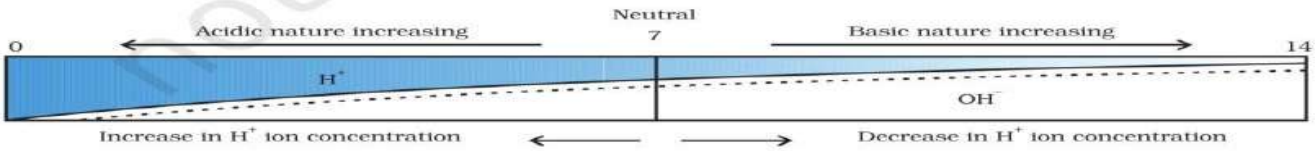
8. BASE + NON - METAL OXIDE —----> SALT + WATER

$Ca(OH)_2 + CO_2$ —---------> $CaCO_3 + H_2O$

(Non - metallic oxides are acidic in nature, so bases react with non - metallic oxides.

How Strong are Acid or Base Solutions?

The strength of an acid or base can be estimated using a universal indicator.



(i) Strong Acids: An acid, which dissociates completely or almost completely in water are strong acids. Examples: HCl, H_2SO_4, and HNO_3.

(ii) Weak Acids: Acid that dissociates only partially when dissolved in water are weak acids. Examples: CH_3COOH, Oxalic acid, and Lactic acid.

(iii) Strong Bases: Strong bases are those which ionize in water completely and produce a large number of hydroxide ions. Example: NaOH, KOH, $Ca(OH)_2$

(iv) Weak Bases: Weak bases are those bases that partially ionize in water and produce a small amount of hydroxide ions. Example: NH_4OH

(v) Alkalis: These are bases that are soluble in water.Example: NaOH, KOH, $Ca(OH)_2$.

*** IMPORTANCE OF pH IN EVERYDAY LIFE**

(i) When pH of rain water is less than 5.6, it is called acid rain.

(ii) Plants require a specific pH range for their healthy growth.

(iii)During indigestion people use bases called antacids. Magnesium hydroxide (Milk of magnesia), a mild base, is often used for this purpose.

(iv) Tooth decay starts when the pH of the mouth is lower than 5.5

(v) Bee-sting leaves an acid which causes pain and irritation.

Sodium chloride has a molecular formula of **NaCl** .

Chemical from common salt

1. Sodium Hydroxide: When electricity is passed through an aqueous solution of sodium chloride (called brine), it decomposes to form sodium hydroxide. The process is called the **chlor-alkali** process because of the products formed– chlor for chlorine and alkali for sodium hydroxide.

$2NaCl(aq) + 2H_2O(l) \rightarrow 2NaOH(aq) + Cl_2 (g) + H_2 (g)$

At anode:Cl_2 is released **At cathode:** H_2 is released

Sodium hydroxide remains in the solution.

2. Bleaching Powder

Bleaching Powder is produced by reacting Cl_2 gas with dry slaked lime $Ca(OH)_2$.

Chemical formula – $Ca(ClO)_2$ or $CaOCl_2$

Preparation – $Ca(OH)_2(aq) + Cl_2(g) \rightarrow Ca(ClO)_2(aq) + CaCl_2 + H_2O(l)$

Uses of Bleaching Powder

*It is used in the laundry for whitening soiled clothes and in the textile industry for bleaching cotton and linen. *It is used as an oxidising agent in many chemical industries.

3. Baking Soda

Sodium bicarbonate, also referred to as **Baking Soda** . This compound is formed by the combination of a sodium cation (Na+) and a bicarbonate anion (HCO_3).

$NaCl + H_2O + CO_2 + NH_3 \rightarrow NH_4Cl + NaHCO_3$

Chemical formula – $NaHCO_3$ When it is heated during cooking:

$2NaHCO_3 \rightarrow Na_2CO_3 + H_2O + CO_2$

Uses of Baking Soda

*For making baking powder, which is a mixture of **baking soda** (**sodium hydrogen carbonate**) and a mild edible acid such as **tartaric acid**.

$NaHCO_3 + H^+ \rightarrow CO_2 + H_2O$ + Sodium salt of acid

Carbon dioxide produced during the reaction can cause bread or cake to rise making them soft and spongy.

***Sodium hydrogen carbonate** is also an ingredient in antacids. Being alkaline, it neutralises excess acid in the stomach and provides relief.

*It is also used in soda-acid fire extinguishers.

4. Washing Soda

Sodium carbonate, also known as **washing soda**. Baking soda can be heated to produce sodium carbonate, which can then be recrystallized to yield washing soda in its hydrated form $Na_2CO_3.10H_2O$. It is also a basic salt with alkaline properties.

$Na_2CO_3 + H_2O \rightarrow Na_2CO_3.10H_2O$

Uses of Washing Soda

*It is used in the glass, soap, and paper industries **;** production of other sodium compounds like borax**;** as a cleaning agent for domestic purposes **and** for removing permanent water hardness.

Are crystals really dry? Water of crystallization is the fixed number of water molecules present in one formula unit of a salt.

Chemical formula for hydrated copper sulphate is $CuSO_4 . 5 H_2O$ Water of crystallization is $5 H_2O$

5. Plaster of Paris: Plaster of Paris is formed by heating gypsum at 373K .

$CaSO_4.2H_2O + \Delta \longrightarrow CaSO_4.\frac{1}{2} H_2O + 1\ 1/2\ H_2O$

Uses of Plaster of Paris

- It is used as plaster for supporting fractured bones in the right position.
- It is used for making toys , material for decoration and for making surfaces smooth.

CHAPTER WISE QUESTION BANK

Multiple Answer Type Questions (1 Mark Each)

1.Select from the following the statement which is true for bases.

(a) Bases are bitter and turn blue litmus red.

(b) Bases have a pH less than 7.

(c) Bases are sour and change red litmus to blue.

(d) Bases turn pink when a drop of phenolphthalein is added to them.

(Hint : (Bases turn phenolphthalein pink.)

2.Study the following table and choose the correct option:

	Salt	Parent Acid	Parent Base	Nature of Salt
a	Sodium chloride	HCl	NaOH	Basic
b	Sodium carbonate	H_2CO_3	NaOH	Neutral
c	Sodium sulphate	H_2SO_4	NaOH	Acidic
d	Sodium acetate	CH_3COOH	NaOH	Basic

(Hint :(CH_3COOH is weak acid and NaOH is strong base. nature of salt will be basic)

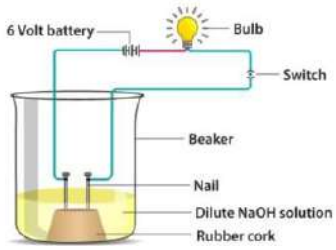
3. During the preparation of hydrogen chloride gas on a humid day, the gas is usually passed through the guard tube containing calcium chloride. The role of calcium chloride taken in the guard tube is to

(a) absorb the evolved gas (b) moisten the gas

(c) absorb moisture from the gas (d) absorb Cl^- ions from the evolved gas

(Hint: To absorb humidity.)

4. In an attempt to demonstrate electrical conductivity through an electrolyte, the following apparatus was set up.



Which among the following statement(s) is (are) correct?

(i) Bulb will not glow because electrolyte is not acidic.

(ii) Bulb will glow because NaOH is a strong base and furnishes ions for conduction.

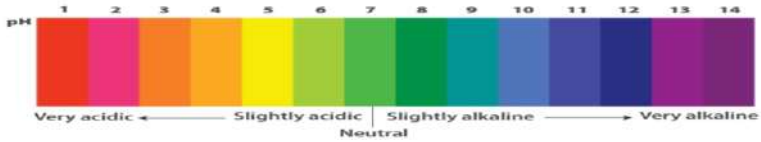
(iii) Bulb will not glow because circuit is incomplete.

(iv) Bulb will not glow because it depends upon the type of electrolytic solution

(a) (i) and (iii) (b) (ii) and (iv) (c) (ii) only (d) (iv) only

(Hint: Refer properties of electrolyte)

5. Equal volumes of hydrochloric acid and sodium hydroxide solutions of same concentration are mixed and the pH of the resulting solution be checked with a pH paper.



What would be the colour obtained?

(a) Red. (b) Yellowish orange (c) Green. (d) Bluish Purple

Hint: see pH table

6. When a small amount of acid is added to water, the phenomena which occur are:

(a) Dilution (b) Neutralisation (C) Formation of H_3O^+ ions (d) Salt formation

The correct statements are:

(a) (A) and (C) (b) (B) and (D) (c) (A) and (B) (d) (C) and (D)

(Hint: Refer release of ions of acidic solution)

Assertion & Reason Based Questions (1 Mark Each)

Following questions consist of two statements–Assertion (A) and Reason(R).Answer these questions selecting the appropriate option given below:

(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true

7. **Assertion (A)**: Ammonium hydroxide is Weak Base

Reason R: Phenolphthalein becomes pink in NH_4OH

(Hint: (b) Both A and R are true but R is not the correct explanation of A

8. Assertion (A): The aqueous solutions of glucose and alcohol do not show acidic character.

Reason: Aqueous solutions of glucose and alcohol do not give H+ ions.

(Hint: a) Both A and R are true and R is the correct explanation of A.

9. Assertion (A): Ammonia solution is an alkali.

Reason (R): Ammonia solution turns blue litmus paper red.

(Hint: c) A is true but R is false.

10.Assertion (A): A salt may be acidic, basic or neutral.

Reason (R): Salts are formed by the neutralization reaction of acids and bases.

(Hint: b) Both A and R are true but R is not the correct explanation of A.

Very Short Answer Based Questions (2 Marks Each)

11. Compare the properties of acids and bases on the basis of chemical nature.

Hint: Any two reactions - with metal, metal oxide, non- metal oxide, metal carbonate

12. How would you distinguish between baking powder and washing soda by heating?

(Hint: $NaHCO_3$, Na_2CO_3)

When washing soda (Na2CO3) is heated it does not produce carbon dioxide.)

13. Rohan want to dilute an acid, but he is confused . Out of the two pictures given below, which one (A or B) shows the correct method of diluting an acid. Justify your answer.

(Hint – The process is highly exothermic. If water is added to a conc. Acid , the heat generated may cause the mixture to splash out and cause severe burns. The glass container may also break due to excessive heating.)

14. Tooth enamel is one of the hardest substances in our body. How does it undergo damage due to eating chocolates and sweets? What should we do to prevent it?

(Hint: When pH of mouth is below 5.5, bacteria in the mouth produce acids by degradation

of sugar and corrode the tooth enamel. It can be prevented by using toothpastes which are basic in nature.)

15. A student adds dilute hydrochloric acid to a test tube containing Sodium carbonate and bubbles are seen forming immediately.

(i) Write the chemical formula of the salt formed and name two other salts produced from this salt.

(ii) Name the gas evolved and describe the method of testing it.

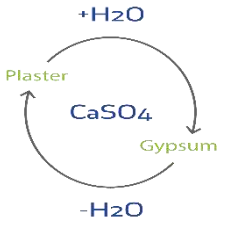
(Hint: Refer text)

Short Answer Type Questions (3 Marks Questions)

16. *When zinc metal is treated with a dilute solution of a strong acid, a gas is evolved, Name the gas evolved. Write the chemical equation of the reaction involved and also write a test to detect the gas formed*.

(Hint: Reaction of acid with metal. When a burning candle is brought near hydrogen gas, it burns with a pop sound.)

17. *A compound which is prepared from gypsum has the property of hardening when mixed with proper quantity of water. Identify the compound. Write chemical equation to prepare the compound. Mention one important use of the compound*.



(Hint: It is used for setting fractured bones.)

18. Write balanced chemical equations for the following statements:

(a) Bleaching powder is kept open in air

(b) Blue crystals of copper sulphate are heated.

(c) Chlorine gas is passed through dry slaked lime.

(Hint: (a) $CaOCl_2 + CO_2$ ——-------> $CaCO_3 + Cl_2$

(b) $CuSO_4 .5H_2O + \Delta$ —------>. $CuSO_4 + 5H_2O$

(c) $Ca(OH)_2(aq) + Cl_2(g) \rightarrow Ca(ClO)_2(aq) + CaCl_2 + H_2O(l)$)

19. Answer the following questions based on the diagram given below:

(i) What is water of crystallization?

(ii) How can you visually tell if copper sulphate crystals contain water of crystallization?

(iii) What happens to copper sulphate crystals when they are heated?

(Hint :(i) Water of crystallization is a fixed number of water molecules that are chemically bound to the ions or molecules in a crystalline structure of a salt.

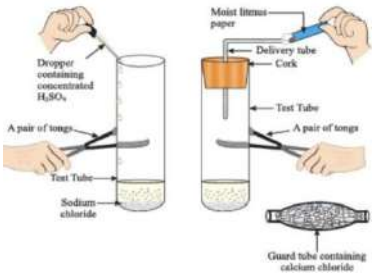
(ii) Dry crystals are blue, indicating the presence of water molecules within the crystal lattice.

(iii) When copper sulphate crystals are heated, they lose their water of crystallization, and the salt turns from blue to white.

(Hint : Refer text)

Long Answer Type Questions (5 Marks)

20. Answer the following questions based on the diagram given :



(i) What chemical reaction is being demonstrated in this experiment?

(Hint:Reaction between concentrated sulphuric acid (H_2SO_4) and sodium chloride, producing hydrogen chloride gas)

(ii) What is the role of the moist litmus paper in the experiment?

(Hint: When the HCl gas comes in contact with the moist blue litmus paper, it turns red, indicating the acidic nature of the gas.)

(iii) Why is a guard tube containing calcium chloride used in the experiment?

(Hint: Calcium chloride is used to absorb any moisture present in the gas, ensuring that dry hydrogen chloride gas is tested.)

(iv) What happens to the sodium chloride in the test tube when concentrated sulphuric acid is added?

(Hint: A chemical reaction occurs, producing hydrogen chloride gas (HCl) and sodium bisulphate ($NaHSO_4$)

(v) Why is a pair of tongs used to handle the test tube in this experiment?

(Hint: The reaction can produce heat, and concentrated sulphuric acid is highly corrosive, so direct contact with the hands should be avoided.)

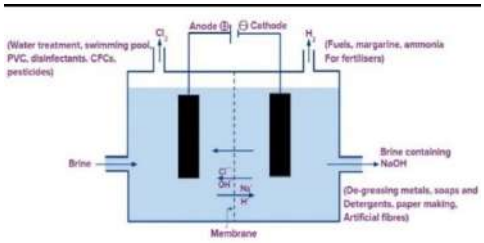
21. Answer the following questions based on the diagram given below:

(i) What are the main products of the chlor-alkali process?

(Hint: Chlorine gas (Cl_2), Sodium hydroxide (NaOH), and hydrogen gas (H_2).)

(ii) How is chlorine gas produced in the chlor-alkali process?

(Hint: Chlorine gas is produced at the anode during the electrolysis of brine.)



(iii) What is the chemical equation for the production of sodium hydroxide in the chlor-alkali process?

electrolysis

Hint:$2NaCl(aq) + 2H_2O(l) \longrightarrow 2NaO\ (aq) + Cl_2\ (g) + H_2\ (g)$

(iv) Why is the chlor-alkali process important in industry?

Hint: Produces key chemicals like chlorine, sodium hydroxide, and hydrogen, which are used in various industrial processes, including water purification, manufacturing of soaps and detergents

.**v)** What is the environmental impact of the chlor-alkali process, and how can it be mitigated?

(Hint :The chlor-alkali process can generate chlorine gas, which is harmful to the environment. To mitigate its impact, modern industrial processes often use membrane cell technology that reduces the release of chlorine gas into the atmosphere.)

Case Based Questions (4 Marks Each)

22.A student found a white crystalline powder at home, commonly used for cooking. He tested its pH and found it to be slightly basic. When he heated it releases a gas that turned lime water milky.

(a) Identify the substance and write the reaction that takes place upon heating. (1 mark)

(b) Why does the gas turn lime water milky? (2 marks)

(c) Why is this substance used as an antacid? (1 mark)

(Hint: (a) The substance is baking soda ($NaHCO_3$).

$2NaHCO_3 + \Delta \rightarrow Na_2CO_3 + H_2O + CO_2\uparrow$

(b) The gas carbon dioxide (CO_2) reacts with lime water ($Ca(OH)_2$) to form calcium carbonate ($CaCO_3$), which appears as a white precipitate.

$Ca(OH)_2 + CO_2 \rightarrow CaCO_3$ (white ppt) $+ H_2O$

(c) It neutralizes excess stomach acid, providing relief from acidity.)

23.A doctor used a white powder to make a cast for a patient's fractured hand. The powder was mixed with water and quickly hardened into a solid. Later, the doctor explained that this substance is commonly used for making molds, sculptures, and smooth wall surfaces.

(a) Identify the substance and write its chemical formula. (1 mark)

(b) Write the chemical reaction that occurs when it is mixed with water. (2 marks)

(c) What is the role of temperature in the formation of this substance? (1 mark)

(Hint:(a) The substance is Plaster of Paris (POP). Chemical formula: $CaSO_4 \cdot ½H_2O$

(b) Reaction with water: $CaSO_4 \cdot ½H_2O + 1½H_2O \rightarrow CaSO_4 \cdot 2H_2O$

(c) POP is formed by heating gypsum at 373K; excess heating makes it anhydrous losing its setting property

PHYSICAL PROPERTIES OF METALS AND NON - METALS

Property	Metals	Non-Metals
1. Lustre	Metals have shining surface.	They do not have shining surface. • Except Iodine.
2. Hardness	They are generally hard. • Except Sodium, Lithium and Potassium which are soft and can be cut with knife.	Generally soft. • Except Diamond, a form of carbon which is the hardest natural substance.
3. State	Exist as solids. • Except Mercury.	Exist as solids or gaseous. • Except Bromine.
4. Malleability	Metals can be beaten into thin sheets. • Gold and Silver are the most malleable metals.	Non-metals are non-malleable.
5. Ductility	Metals can be drawn into thin wires.	They are non-ductile.
6. Conductor of heat & electricity	Metals are good conductors of heat and electricity. • Silver (Ag) and Copper (Cu): Best conductors of heat. • Lead (Pb), Mercury (Hg) poor conductor of heat.	Non-metals are poor conductor of heat and electricity. • Except Graphite.
7. Density	Generally have high density and high melting point. • Except Sodium and Potassium.	Have low density and low melting point.
8. Sonorous	Metals produce a sound on striking a hard surface.	They are not sonorous.
9. Oxides	Metallic oxides are basic in nature.	Non-metallic oxides are acidic in nature.

CHEMICAL PROPERTIES OF METALS AND NON - METALS

(a) REACTION OF METALS WITH OXYGEN

METAL + OXYGEN —---------> METAL OXIDE (BASIC OXIDE)

(i) Metals which react with oxygen at room temperature:

$4Na + O_2 \rightarrow 2Na_2O$; $4K + O_2 \rightarrow 2K_2O$; $4Li + O_2 \rightarrow 2Li_2O$; $2Ca + O_2 \rightarrow 2CaO$

Those metal oxides which are soluble in water are called **Alkalis**.

(ii) Metals which react with oxygen on heating:

$2Mg (s) + O_2 (g) \rightarrow 2MgO (s)$; $4Al (s) + 3O_2 (g) \rightarrow 2Al_2O_3 (s)$

(iii) Metals which react with oxygen on strong heating:

$2Cu (s) + O_2 (g)$ —------> $2CuO (s)$

Au and Ag do not react with oxygen.

(**Those metal oxides which show basic as well as acidic behaviour are known as **Amphoteric oxides.**

When Aluminium oxide behaves as basic oxide

$Al_2O_3 (s) + 6HCl(aq)$ —----------> $AlCl_3 (aq) + H_2O (l)$

When Aluminium oxide behaves as acidic oxide

$Al_2O_3 (s) + 2NaOH(aq)$ —--------> $NaAlO_2 (aq) + H_2O (l)$

Similarly, $ZnO (s) + 2HCl (aq)$ —----------> $ZnCl_2 (aq) + H_2O (l)$

$ZnO (s) + 2NaOH (aq)$ —---------> $Na_2ZnO_2 + H_2O (l)$

(b) REACTION OF METALS WITH WATER

METAL + WATER —> METAL HYDROXIDE + HYDROGEN

METAL + STEAM —> METAL OXIDE + HYDROGEN

(i) Na and K metals react violently with **cold water**. The reaction is exothermic and the hydrogen evolved, immediately catches fire.

$2Na(s) + 2H_2O(l) \rightarrow 2NaOH(aq) + H_2(g)$ + Heat energy

(ii) Ca react less violently with cold water.

The piece of Ca metal starts floating in water because the bubbles of H_2 gas formed stick to the surface of the metal.

$Ca(s) + 2H_2O(l) \rightarrow Ca(OH)_2(aq) + H_2(g)$

(iii) Mg does not react with cold water.

Mg reacts with **hot water** to form Magnesium hydroxide and hydrogen.

$Mg(s) + 2H_2O(l) \rightarrow Mg(OH)_2 (aq) + H_2(g)$
Mg reacts with **steam** to form Magnesium oxide and hydrogen.
$Mg(s) + 2H_2O(g) \rightarrow MgO (s) + H_2(g)$
It also starts floating due to the bubbles of hydrogen gas sticking to its surface.
(iv) Metals like Al , Zn and Fe do not react either with cold or hot water. However, they react with **steam** to form metal oxides and hydrogen.
$2Al(s) + 3H_2O(g)$ —> $Al_2O_3(s) + 3H_2(g)$
$Zn + H_2O (g)$ —-> $ZnO (s) + H_2 (g)$
(v) Metals such as lead, copper, silver and gold do not react with water at all.
**On the basis of reaction with steam,metals in the decreasing order of reactivity:
Mg > Al > Zn > Fe

(c) REACTION OF METALS WITH ACIDS (DILUTE)

METAL + ACID —----> SALT + HYDROGEN

Metals displace hydrogen from dilute acids.
Less reactive metals —- Cu , Hg , Ag and Au don't displace hydrogen from dilute acids.
$2K(s) + HCl (aq) \rightarrow 2KCl(aq) + H_2(g)$ **;;** $2Na(s) + HCl (aq) \rightarrow 2NaCl (aq) + H_2 (g)$
$Ca(s) + 2HCl (aq) \rightarrow CaCl_2(aq) + H_2(g)$ **;;** $Mg (s) + 2HCl (aq) \rightarrow MgCl_2(aq) + H_2(g)$
Note: *Copper (Cu), Silver (Ag), and Mercury (Hg) do not react with dilute acids
**Al metal first react slowly with dil HCl due to the presence of tough protective layer of Aluminium oxide on its surface. But when the thin oxide layer is dissolved in acid, then Al metal reacts rapidly to form Aluminium chloride and hydrogen.
Aqua Regia, (Latin for 'royal water') is a freshly prepared mixture of
Concentrated Hydrochloric acid and Concentrated Nitric acid in the ratio of 3:1.
Although, Gold don't react with either HCl or HNO_3, but a mixture of both (aqua regia) can dissolve gold. Aqua regia is a highly corrosive, fuming liquid.

(d) REACTION OF METALS WITH SOLUTIONS OF OTHER METAL SALTS

METAL A + SALT SOLUTION OF B → SALT SOLUTION OF A + METAL B

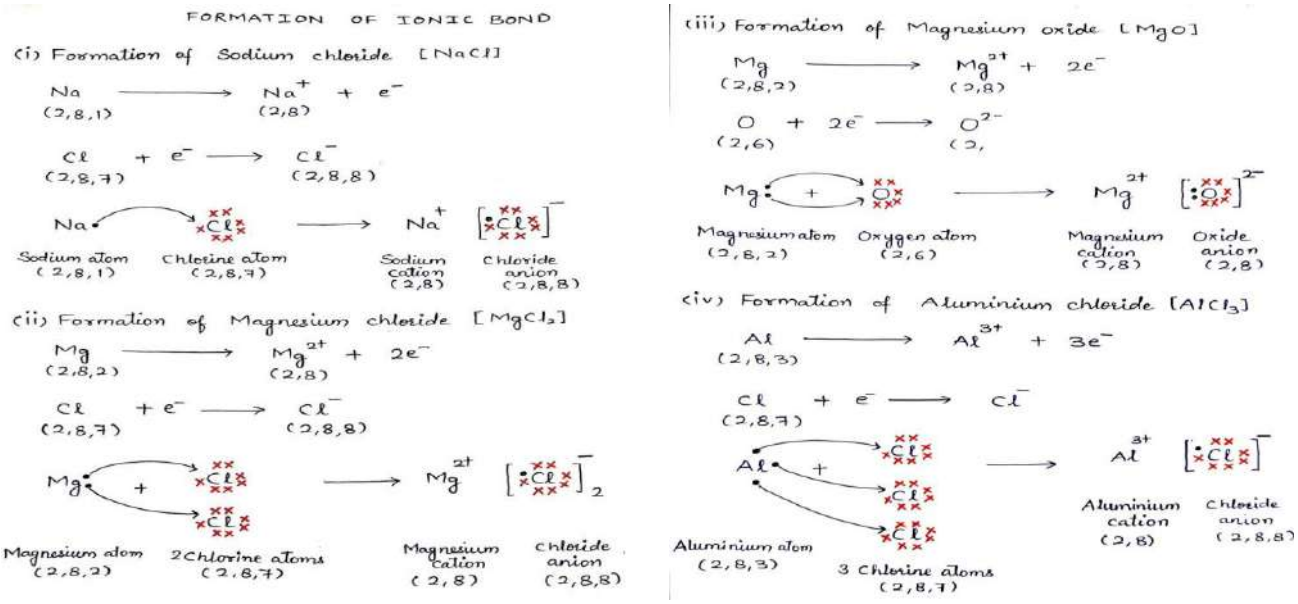
More reactive metal can displace less reactive metal from its compound in solution form.
$Fe (s) + CuSO_4 (aq)$ —----------> $FeSO_4(aq) + Cu (s)$
$Zn (s) + FeSO_4(aq)$ —----------> $ZnSO_4(aq) + Fe (s)$

HOW DO METALS AND NON-METALS REACT?

Reactivity of elements is the tendency to attain a filled valence shell. Atoms of the metals lose electrons from their valence shell to form Cations. Atoms of non-metals gain electrons in the valence shell to form an **Anion**.

PROPERTIES OF IONIC COMPOUNDS

(i) Physical nature: They are solid substances having strong attractive force between the positively and negatively charged ions.
(ii)Melting and Boiling Point: They exhibit high melting and boiling points due to the presence of strong inter-ionic attractions.generally soluble in water but insoluble in solvents like kerosene or petrol.
(iv) Conduction of electricity: When an ionic compound is dissolved in water, the resulting solution contains ions due to which they conduct electricity.
Solid ionic compounds do not conduct electricity because the ions are unable to move due to their fixed arrangement.
When ionic compounds are in the molten state, they can conduct electricity because the heat overcomes the electrostatic forces holding the oppositely charged ions together.

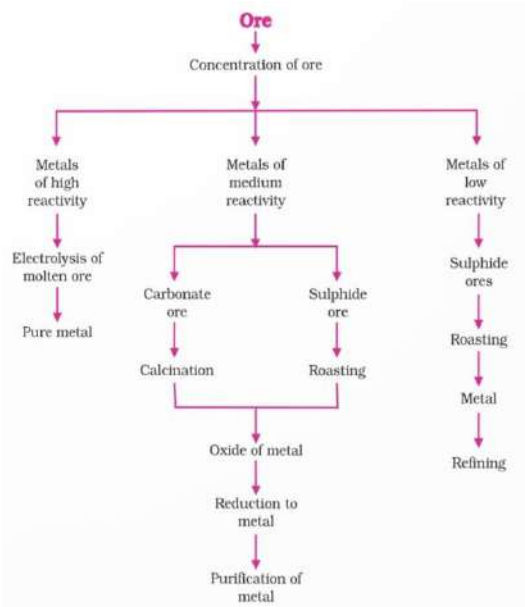


OCCURRENCE OF METALS

The elements or compounds which occur naturally in the earth's crust are called **minerals**. Minerals that contain a very high percentage of particular metal and the metal can be profitably extracted from it, such minerals are called **ores**.

EXTRACTION OF METALS FROM THEIR ORES

Step 1. Concentration of ore / Enrichment of ores.
Step 2. Conversion of concentrated ore into metal.
Step 3. Refining (Purification) of impure metals**.**



1.Concentration of ore / Enrichment of Ore

It refers to the process of removing impurities, such as soil, sand, stone etc. called gangue from mined ores. The processes used are based on the differences between the physical or chemical properties of the gangue and the ore.

2.Conversion of concentrated ore into metal.

(i) Extraction of Highly Reactive Metals

The highly reactive metals K, Na , Ca and Mg are extracted by the electrolysis of their molten chlorides. The pure metal is produced at the cathode and Cl_2 gas is formed at the anode.

$$2NaCl\ (l) \xrightarrow{\text{Electrolysis}} 2Na(s) + Cl_2(g)$$

(Molten)

At Cathode : Al^{3+} + $3e^-$ ——————> Al
Aluminium ions. (From molten Al_2O_3) — Electrons (From cathode) — Aluminium atom (Aluminium metal)

At Anode : $2O^{2-}$ - $4e^-$ ——————> O_2
Chloride ions (From molten Al_2O_3) — Electrons (Given to anode). — Oxygen gas

(ii) Extraction of Moderately Reactive Metals

The moderately reactive metals, Fe, Zn, Pb are commonly found in nature as sulphides or carbonates. Obtaining these metals from their oxides is easier compared to extracting them from sulphides and carbonates.

Roasting is the process in which a sulphide ore is strongly heated in the presence of air to convert it into metal oxide.

$2ZnS(s) + 3O_2 (g) \rightarrow 2ZnO(s) + 2SO_2 (g)$

Calcination is the process in which a carbonate ore is heated strongly in the absence of air to convert it into metal oxide.

$ZnCO_3 (s) \text{---------}> ZnO(s) + CO_2 (g)$

$ZnO(s) + C(s) \rightarrow Zn(s) + CO(g)$

- Reduction of metal oxide with carbon

  $ZnO (s) + C (s) \text{—----------}> Zn(s) + CO (g)$

- Reduction of metal oxide with Aluminium

  $3MnO_2 (s) + 4Al (s) \text{—--------}> 3Mn (l) + 2Al_2O_3 (s) + Heat$

The reduction of a metal oxide to form metal by using Al as a reducing agent is called **thermite reaction (or thermite process).**It is highly exothermic,so the metal is produced in the molten state. $Fe_2O_3(s) + 2Al(s) \rightarrow 2Fe(l) + Al_2O_3(s) + Heat$

(iii) Extraction of Less Reactive Metals

Extraction of Mercury $2HgS(Cinnabar)+3O_2(g)+heat\rightarrow 2HgO +2SO_2(g)$ [Roasting]

$2HgO(s)+heat\rightarrow 2Hg(l)+O_2(g)$

3. Refining of Metals

The process of purifying impure metals is called refining of Metals.

(i) Anode: Impure copper

(ii) Cathode: Strip of pure copper

(iii) Electrolyte: Solution of acidified copper sulphate

On passing the current through the electrolyte, the impure metal from the anode dissolves into the electrolyte.

An equivalent amount of pure metal from the electrolyte is deposited at the cathode.

The insoluble impurities settle down at the bottom of the anode and are called anode mud.

CORROSION

The surface of some metals gets corroded when they are exposed to moist air for a long period. This is called corrosion.

Prevention of Corrosion

The rusting of iron can be prevented by painting, oiling, greasing, galvanizing, chrome plating, anodizing or making alloys.

Galvanization: It is a method of protecting steel and iron from rusting by coating them with a thin layer of zinc.

Alloying: Alloying is done by mixing a metal with other substances, so as to achieve the desired characteristics The electrical conductivity and melting point of an alloy is less than that of pure metals.

Name of Alloy	Composition	Use
Amalgam	Mercury and other metal	Fillings in teeth
Brass	Copper and Zinc	Electrical fittings
Bronze	Copper and Tin	Statues and medals
Solder	Tin and Lead	Welding electrical wires
Stainless steel	Iron ,Nickel and Chromium	Cooking utensils

CHAPTER WISE QUESTION BANK

Multiple Answer Type Question (1 Mark Each)

1. Match the columns on the basis of properties and uses:

	COLUMN A (USE)	COLUMN B (PROPERTY)
1	Copper used in electric wires	Malleability

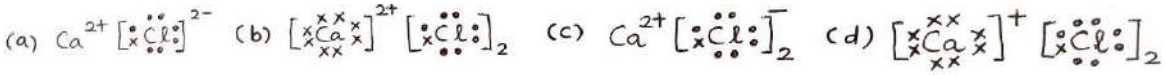
2	Aluminium used for making foils	Ductility and conductivity
3	Non metals not used for utensils	Sonorous
4	Bells made of metals	Poor conductors and brittle

(Hint: Refer text)

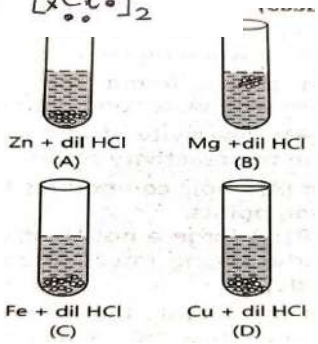
2. The pair(s) which will show displacement reaction is/are:
(i) NaCl solution and copper metal . (ii) $AgNO_3$ solution and copper metal
(iii) $Al_2(SO_4)_3$ solution and magnesium metal (iv) $ZnSO_4$solution and iron metal
(a) (ii) only (b) (ii) and (iii) (c) (iii) and (iv) (d) (i) and (ii)
(Hint : Refer reactivity series of metals)

3.A metal 'X' is used in the thermit process. When 'X' is heated with oxygen, it gives an oxide 'Y', which is amphoteric in nature. 'X' and 'Y' respectively are:
(a) Mn, MnO_2 (b) Al, Al_2O_3 (c) Fe, Fe_2O_3 (d) Mg, MgO
(Hint : Oxides showing both acidic and basic behavior)

4. Which one of the following structures correctly depicts the compound $CaCl_2$?
(Hint: Formation of ionic compounds)



5. The diagram shows the reaction between metal and dil. acid.
Out of the given 4 reactions which one is not possible?
(a). A (b) B (c) C (d) D
(Hint: reaction of metals with acid)



6. Which metal is extracted by electrolytic reduction of its molten ore?
(a). Iron (b) Copper (c) Sodium (d) Zinc
(Hint: Extraction of more reactive metals)

<u>Assertion & Reason Based Questions</u> (1 Mark Each)
Following questions consist of two statements–Assertion (A) and Reason (R).Answer these questions selecting the appropriate option given below:
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true

Assertion & Reason Based Questions (1 Mark Each)

7. Assertion (A) : Different metals have different reactivities with water and dilute acids.
Reason (R): Extraction of a metal from its ore depends on its position in the reactivity series.
(Hint: Chemical properties and extraction of metals)

8.Assertion (A): Metals low in the reactivity serie are very unreactive. The oxides of these metals can be reduced to metals by heating alone.
Reason (R): Cinnabar when heated in air first gets converted into mercuric oxide which is then reduced to mercury on further heating.
(Hint: Extraction of less reactive metals)

9. Assertion: Metals are good conductors of heat .
Reason (R) : Silver and Copper are poor conductors of heat.
(Hint: Conduction of heat by metals)

10. Assertion (A) : Zinc oxide can be reduced to zinc metal on heating with carbon.
Reason (R) : Carbon is less reactive than zinc.
(Hint : Extraction of moderately reactive metal)

Very Short Answer Based Questions (2 Marks Each)

11.

Reaction (i): $2Na\ (s) + 2H_2O\ (l) \longrightarrow 2NaOH\ (aq) + H_2\ (g)$ + Heat energy
Reaction (ii): $Ca\ (s) + H_2O\ (l) \longrightarrow Ca(OH)_2\ (aq) + H_2\ (g)$

(a) In the above reaction (i), the hydrogen produced catches fire immediately whereas with calcium it doesn't. Why?

Hint: Heat evolved in reaction (ii) is not sufficient to catch fire.

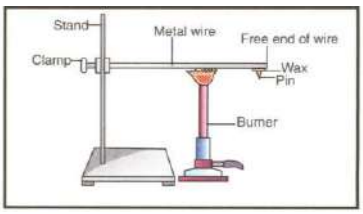
(b) In the reaction (ii), calcium starts floating on the surface of water. Why?

Hint: The bubbles of hydrogen gas formed stick to the surface of metal

12. i)What do you came to know about metals in this experiment?

ii)What do you mean by thermal conductivity? Give some examples of thermal conductors.

iii)Aluminium metal does not melt in the given experiment.Give reason and give two uses of aluminium.



13. A metallurgist heats zinc sulphide in the presence of excess air and notices a white solid forming along with a gas that smells like a burning matchstick.

(i) Identify the white solid and the gas formed also write the chemical reaction involved.

(ii) Which property of zinc makes it suitable to be reduced using carbon?

(Hint : Refer text)

14. You have two beakers 'A' and 'B' containing copper sulphate solution. What would you observe after about 2 hours if you dip a strip of zinc in beaker 'A' and a strip of silver in beaker 'B'? Give reasons for your observations in each case.

(Hint: Reactivity series of metals)

15. Some metals react with acids to produce salt and hydrogen gas. Illustrate it with an example. How will you test the presence of this gas?

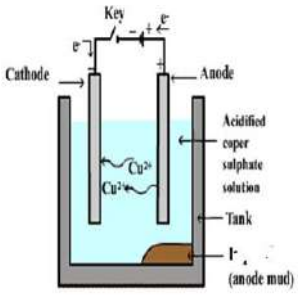
(Hint: Reaction of metals with acids)

Short Answer Type Questions (3 Marks Questions)

16. a)Explain the process of electrolytic refining given in this picture and write the balanced chemical equation for the electrolytic refining.

b) What is anode mud?

(Hint : Refer refining of Metals in the content)



17. Explain the following:

(a) Metals like calcium and magnesium are never found in their free state in nature

(b) Sodium chloride is an ionic compound which does not conduct electricity in solid state, whereas it conducts electricity in molten state as well as in its aqueous solution.

(c) Reactivity of aluminium decreases if it is dipped in nitric acid.

(Hint: Reactivity of metals; Properties of ionic compounds; Formation of oxide layer)

18.(a) Write the electron dot structure for chlorine (At No. 17) and calcium (At No. 20). Show the formation of calcium chloride by the transfer of electrons.

(b) Identify the nature of the above compound and explain the three physical properties of such compounds.

(Hint: Formation of ionic compounds)

19. Your school is planning to install iron benches in the garden area. As a science student:

(i) What suggestions would you give to prevent corrosion of benches?

(ii) Mention one environmental condition that can speed up corrosion.

(iii) How is the corrosion of iron different from that of aluminium?

(Hint : (i) and (ii) -- Refer text

(iii) Corrosion of Fe - Forms rust (reddish-brown flaky iron oxide), Rust is porous and flakes off, exposing more metal , Corrosion continues over time
Corrosion of Al- Forms a thin, hard oxide layer (Al_2O_3) which is protective and stable, preventing further corrosion. Corrosion stops after oxide layer forms.

Long Answer Type Questions (5 Marks)

20.(I) Sharmila mixed Aluminium oxide with Hydrochloric acid and Sodium hydroxide separately in two test tubes. In both cases, she observed salt formation. **(3)**
(i) Identify and explain the type of chemical property shown by aluminium oxide.
(ii) Write the balanced equations for both reactions.
(iii) Explain why aluminium oxide is classified as an amphoteric oxide.
(II) Compound X and aluminium are used to join railway tracks.
Identify the compound X; Name the reaction and write down its reaction. **(2)**

21.(i) Write the steps involved in the extraction of pure metals in the middle of the activity series from their carbonate ores.
(ii) How is copper extracted from its sulphide ore? Explain the various steps supported by chemical equations. Draw labelled diagram for the electrolytic refining of copper.
(Hint: Extraction of metals)

Case Based Questions (4 Marks Each)

22. *Ionic compounds are generally crystalline solids. They have high melting and boiling points due to strong electrostatic forces of attraction between ions. They are soluble in water but insoluble in organic solvents. In solid state, they do not conduct electricity, but in molten or aqueous state, they do.*

1. Which of the following properties is NOT shown by ionic compounds?
(a) High melting point (b) Soluble in kerosene
(c) Conductive in molten state (d) Crystalline structure
2. The high melting point of ionic compounds is due to:
(a) Presence of covalent bonds (b) Weak van der Waals forces
(c) Strong electrostatic force between ions. (d) Their large size
3. What happens to electrical conductivity of an ionic compound when dissolved in water?
4. Name two organic solvents in which ionic compounds are generally insoluble.
(Hint: Refer properties of ionic compounds)

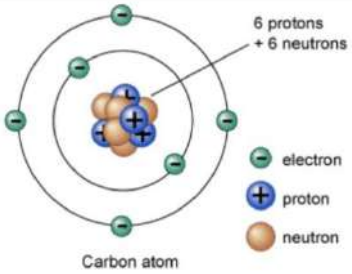
23.*A student, took four metals P, Q, R and S and carried out different experiments to study the properties of metals. Some of the observations were.*
(i) All metals could not be cut with knife except metal R.
(ii) Metal P combined with oxygen to form an oxide M_2O_3 which reached with both acids and bases. (iii) Reaction with water.
P- Did not react either with cold or hot water but reacted with steam
Q-Reacted with hot water and the metal started floating
R- Reacted violently with cold water
S- Did not react with water at all
Read the above passage carefully and give the answers of the following questions.
1. Out of the given metals, the one which needs to be stored used kerosene is:
a. P. b. R. c. 5. d. Q
2. Out of the given metals, the metal Q is:
a. iron. b. zinc. c. potassium. d. magnesium
3. Metal which forms amphoteric oxides is:
a. P. b. Q. c. R d. S
4. The increasing order of the reactivity of the four metals is:
a. P<Q<R<S b. S<R>Q<P c. S<P<Q<R d. P<R <Q<S

BONDING IN CARBON

ATOMIC NO. OF CARBON = 6

ELECTRONIC CONFIGURATION= 2,4

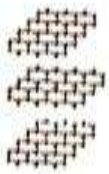
One carbon atom requires 4 e^- to attain noble gas configuration, the valency of C is 4.

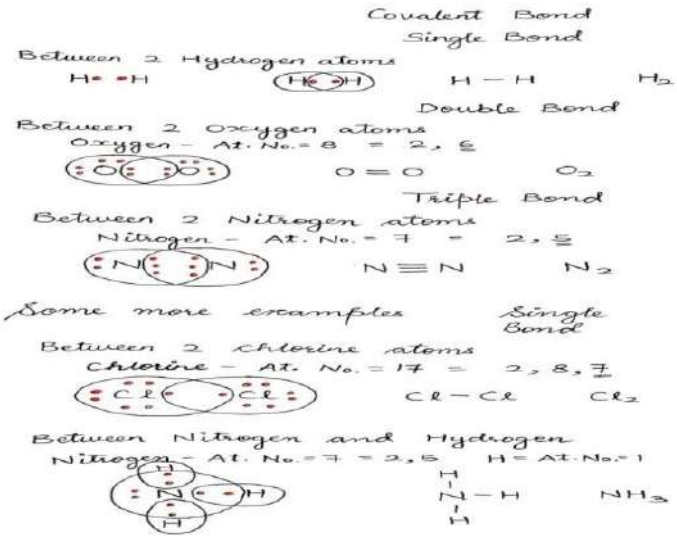


(i) It could not gain $4e^-$ to form C^{4-} anion because the nucleus with 6 Protons will not be able to hold $10e^-$.(4 extra e^-)

(ii) It could not lose 4 e^- to form C cation because a large amount of energy is required to remove $4e^-$.

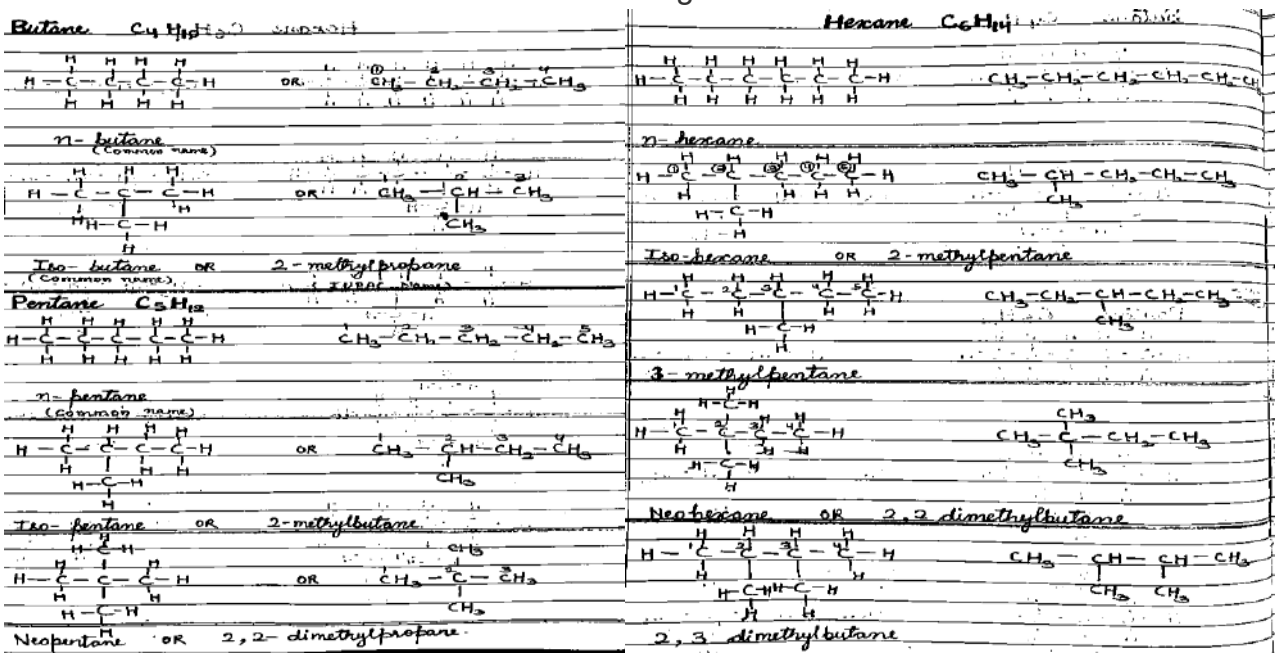
The property of self combination of Carbon atoms to form long chains is called **CATENATION.**

	Graphite	Diamond	Fullerene
Diagram			
Structure	Trigonal planar	Tetrahedral	Spherical
Electrical conductivity	yes	no	no
Thermal conductivity	low	high	high



The property of self combination of Carbon atoms to form long chains is called **CATENATION.**

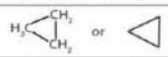
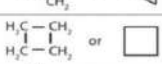
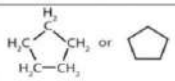
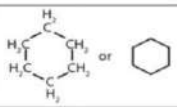
The valency of carbon is 4 , so it is called **TETRAVALENT.** Due to large valency of 4 , a carbon atom can form covalent bonds with a large number of atoms.



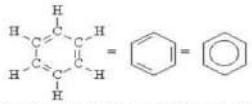
HYDROCARBON

Alkane [C_nH_{2n+2}]	Alkene [C_nH_{2n}]	Alkyne [C_nH_{2n-2}]
Meth + ane = C_1H_4	Meth + ene = C_1H_2	Meth + yne = C_1H_0
Eth + ane = C_2H_6	Eth + ene = C_2H_4	Eth + yne = C_2H_2
Prop + ane = C_3H_8	Prop + ene = C_3H_6	Prop + yne = C_3H_4
But + ane = C_4H_{10}	But + ene = C_4H_8	But + yne = C_4H_6
Pent + ane = C_5H_{12}	Pent + ene = C_5H_{10}	Pent + yne = C_5H_8
Hex + ane = C_6H_{14}	Hex + ene = C_6H_{12}	Hex + yne = C_6H_{10}
Hep + ane = C_7H_{16}	Hept + ene = C_7H_{14}	Hept + yne = C_7H_{12}
Oct + ane = C_8H_{18}	Oct + ene = C_8H_{16}	Oct + yne = C_8H_{14}
Non + ane = C_9H_{20}	Non + ene = C_9H_{18}	Non + yne = C_9H_{16}
Dec + ane = $C_{10}H_{22}$	Dec + ene = $C_{10}H_{20}$	Dec + yne = $C_{10}H_{18}$

Cyclic Hydrocarbons

Name	Molecular Formula	Structural Formula
cyclopropane	C_3H_6	
cyclobutane	C_4H_8	
cyclopentane	C_5H_{10}	
cyclohexane	C_6H_{12}	

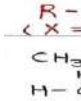
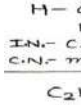
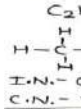
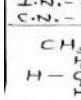
Alkane		Alkyl group	
Molecular formula	Name of alkane	Structural formula	Name of alkyl group
CH_4	Methane	$-CH_3$	Methyl
C_2H_6	Ethane	$-CH_2CH_3$	Ethyl
C_3H_8	Propane	$-CH_2CH_2CH_3$	Propyl



Three common ways to represent Benzene, C_6H_6.

Characteristics of homologous series:

1. Each member of the series differs from the proceeding or succeeding member by one methylene group ($-CH_2$) and hence by a molecular mass of 14 amu.
2. All members of a homologous series contain the same elements and functional group.
3. They are represented by a general molecular formula. Eg: Alkanes, C_2H_{2n+2}.
4. The members in each homologous series show a regular gradation in their physical properties with respect to their increase in molecular mass.
5. The chemical properties of the members of a homologous series are similar.

HALO ALKANE	FUNCTIONAL GROUP: ALCOHOL	ALDEHYDE	KETONE	CARBOXYLIC ACID
$C_nH_{2n+1}-X$ $R-X$ (X = Cl, Br, I)	$C_nH_{2n+1}-OH$ $R-OH$	$C_nH_{2n+1}-CHO$ $R-CHO$ $C_nH_{2n}O$	$C_nH_{2n}O$ $R-C(=O)-R$ $R-C(=O)-R'$	$R-COOH$ $R-C(=O)-OH$
CH_3Cl  I.N.- Chloromethane C.N.- methylchloride	CH_3OH  I.N.- Methanol C.N.- methyl alcohol	$H-CHO$  I.N.- Methanal C.N.- formaldehyde	CH_3COCH_3 I.N.- Propanone C.N.- acetone	$HCOOH$  I.N.- Methanoic acid C.N.- formic acid
C_2H_5Cl I.N.- Chloroethane C.N.- ethylchloride	C_2H_5OH I.N.- Ethanol C.N.- ethyl alcohol	CH_3CHO I.N.- Ethanal C.N.- acetaldehyde	$CH_3COCH_2CH_3$ I.N.- Butanone C.N.- methyl ethyl ketone	CH_3COOH I.N.- Ethanoic acid C.N.- acetic acid
C_3H_7Cl I.N.- Chloropropane C.N.- propylchloride	C_3H_7OH I.N.- Propanol C.N.- propyl alcohol	CH_3CH_2CHO I.N.- Propanal C.N.- propionaldehyde	$CH_3COCH_2CH_2CH_3$ I.N.- Pentanone C.N.- methyl propyl ketone	CH_3CH_2COOH I.N.- Propanoic acid C.N.- propionic acid
CH_3Br I.N.- Bromomethane C.N.- methyl bromide	C_4H_9OH I.N.- Butanol C.N.- butyl alcohol	$CH_3CH_2CH_2CHO$ I.N.- Butanal C.N.- butyraldehyde	$CH_3COCH_2CH_2CH_2CH_3$ I.N.- Hexanone C.N.- methyl butyl ketone	$CH_3CH_2CH_2COOH$ I.N.- Butanoic acid C.N.- butyric acid

CHEMICAL PROPERTIES OF CARBON COMPOUNDS

1. Combustion (or Burning)

The process of burning of a carbon compound in air to give carbon dioxide, water, heat and light, is known as combustion.

$CH_4 + 2O_2$ ——————————> $CO_2 + 2H_2O$ + Heat + Light

2. Oxidation

Oxidation 'means 'controlled combustion'.

Alkaline KMnO4 / Acidified K2Cr2O7 + Heat

$CH_3\text{-}CH_2OH$ ——————————————————> CH_3COOH

3. Substitution

The reaction in which one (or more) hydrogen atoms of a saturated hydrocarbon are replaced by some other. atoms (like chlorine), is called a substitution reaction.

$CH_4 + Cl_2$——————> $CH_3Cl + HCl$ (In the presence of sunlight)

4. Addition

Addition reactions are given by all unsaturated hydrocarbons containing a double bond or a triple bond(alkenes and alkynes).

The addition of hydrogen to an unsaturated hydrocarbon to obtain a saturated hydrocarbon is called hydrogenation. It takes place in the presence of nickel or palladium metals as catalyst and is used to prepare vegetable ghee (or vanaspati ghee) from vegetable oils.

$CH_2{=}CH_2 + H_2$ ——————————————> $CH_3 - CH_3$

Ethanol (Ethyl alcohol) C_2H_5OH CH_3CH_2OH

Physical Properties

- → Colourless
- → Pleasant smell & burning taste
- → Low boiling point 78°C (351°K)
- → Lighter than water
- → Neutral compound (No effect on any litmus solution)

Chemical Properties

1. Combustion
   $C_2H_5OH + 3O_2 \xrightarrow[\text{(Burning)}]{\text{Combustion}} 2CO_2 + 3H_2O$ + Heat + Light
   (Carbon dioxide, Water)
2. Oxidation
   $CH_3CH_2OH + 2[O] \xrightarrow[\text{Acidified } K_2Cr_2O_7 + \Delta]{\text{Alkaline } KMnO_4 /} CH_3COOH + H_2O$
   (Ethanoic acid, Water)
3. Reaction with Sodium
   $2C_2H_5OH + 2Na \longrightarrow 2C_2H_5O^-Na^- + H_2$
   (Sodium ethoxide, Hydrogen)
4. Dehydration
   $CH_3CH_2OH \xrightarrow{\text{Conc. } H_2SO_4 ;\ 170°C} CH_2{=}CH_2 + H_2O$
   (Ethene, Water)
5. Reaction with Ethanoic acid
   $CH_3COOH + C_2H_5OH \xrightarrow{\text{conc. } H_2SO_4} CH_3COOC_2H_5 + H_2O$
   (Ethyl ethanoate)

Ethanoic acid (Acetic acid) CH_3COOH

- → Colourless , Sour taste
- → Smell of vinegar
- → Boiling point 118°C (391°K)
- → Also called glacial ethanoic acid because pure ethanoic acid when cooled freezes to form colourless ice-like solid (which looks like a glacier).

1. Reaction with Sodium carbonate
   $CH_3COOH + Na_2CO_3 \longrightarrow 2CH_3COONa + CO_2 + H_2O$
   (Sodium ethanoate)
2. Reaction with Sodium hydrogen carbonate
   $CH_3COOH + NaHCO_3 \longrightarrow CH_3COONa + CO_2 + H_2O$
   (Sodium ethanoate)
3. Reaction with Sodium hydroxide
   $CH_3COOH + NaOH \longrightarrow CH_3COONa + H_2O$
   (Sodium ethanoate)
4. Reaction with alcohol
   $CH_3COOH + C_2H_5OH \xrightarrow{\text{conc. } H_2SO_4} CH_3COOC_2H_5 + H_2O$
   (Ethyl ethanoate)

* **Denatured alcohol** is ethanol that has been made undrinkable by adding poisonous substances, such as: Methanol,Pyridine,Copper sulphate.

Denaturing alcohol serves several purposes:

It prevents misuse for drinking.

It allows ethanol to be used in industrial applications with lower excise duty.

(** **Vinegar** contains 5 to 8 percent Ethanoic acid)

The reaction of a carboxylic acid with an alcohol to form an ester is called **esterification**.

The alkaline hydrolysis of esters (using alkali like sodium hydroxide) is known as **saponification** (soap making).

$CH_3COOC_2H_5 + NaOH + \Delta$ ——————> $CH_3COONa + C_2H_5OH$

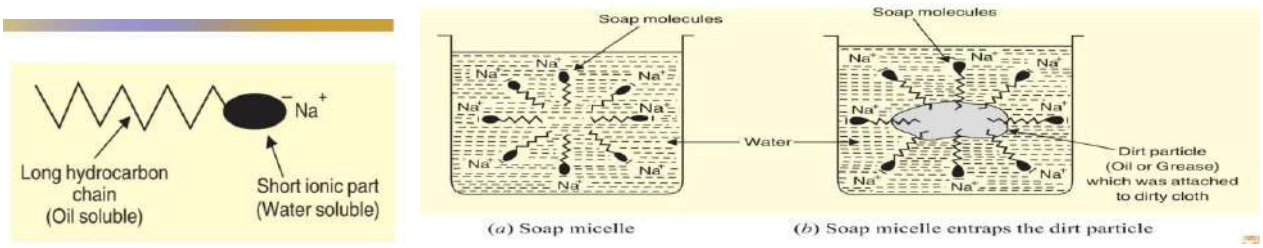
Ehyl ethanoate. Sodium hydroxide. Sodium ethanoate Ethanol

SOAPS AND DETERGENTS

A soap is the sodium salt (or potassium salt) of a long chain carboxylic acid (fatty acid) which has cleansing properties in water.

A soap has a large non-ionic hydrocarbon group and an ionic group, COO^-Na^+ .
Examples
(i) Sodium Stearate, $C_{17}H_{35}COO^-Na^+$
(ii) Sodium Palmitate, $C_{15}H_{31}COO^-Na^+$
Soap is made by heating animal fat or vegetable oil with concentrated sodium hydroxide solution (caustic soda solution).
Fat or Oil + Sodium hydroxide —---------> Soap + Glycerol
(An ester) (An alkali) (Sodium salt of fatty acid)(An alcohol)
Common salt is added to the mixture to make the soap come out of solution.

CLEANSING ACTION OF SOAP



When a dirty cloth is put in water containing dissolved soap, then the hydrocarbon ends of the soap molecules in the micelle attach to the oil or grease particles present on the surface of dirty cloth. The ionic ends of the soap molecules in the micelles attached to water. When the dirty cloth is agitated in soap solution, the oily and greasy particles present on its surface and entrapped by soap micelles get dispersed in water due to which the soap water becomes dirty but the cloth gets cleaned.

The magnesium and calcium salt present in hard water reacts with soap molecules to form an insoluble product called scum. This scum creates difficulty in a cleansing action.

By use of detergent, insoluble scum is not formed with hard water and clothes get cleaned effectively.

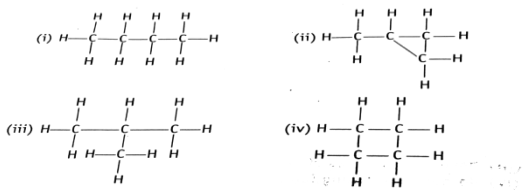
CHAPTER WISE QUESTION BANK

Multiple Answer questions (1 Mark)

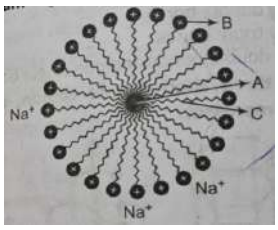
1. The difference in the formula and molecular masses of CH_3OH and C_2H_5OH is
(a) CH_3 and 16u (b) CH_2 and 14u (c) CH_4 and 18u (d) CH_3 and 16u
(Hint: Check difference of no. of C and H atoms and their combined molecular mass **)**

2. The number of covalent bonds in C_4H_{10} is
(a) 12 (b) 13 (c) 14 (d) 10
(Hint: Draw branched structure of C4H10 and count no. of bonds)

3. Which of the following are correct structural isomers of butane (a) (i) and (iii) (b) (ii) and (iv)
(c) (i) and (ii) (d) (iii) and (iv)
(Hint**:** see the fig. attached**)**

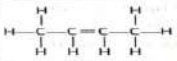
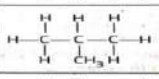
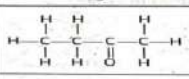
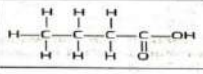


4. Which of the following are correct parts of micelle formation
(a) A=hydrophilic end, B= oil droplet C= hydrophobic end
(b) A= hydrophobic end B= hydrophilic end C= oil droplet.
(c) A= oil droplet, B = hydrophilic end C=hydrophobic end.
(d) A= oil droplet, B= hydrophobic end C=hydrophilic end.
(Hint**:** see the fig. attached**)**



5. Match the compounds given in column (A) with their appropriate structures given in column (B)

(Hint**:** see the table attached**)**

S.No.	Column (A)		Column (B)
A.	Butanone	(i)	
B.	2-Butene	(ii)	
C.	Butanoic acid	(iii)	
D.	2-methyl propane	(iv)	

Codes

	A	B	C	D
a.	(iv).	(i).	(iii).	(ii)
b.	(iii).	(ii).	(iv).	(i)
c.	(iii).	(i).	(iv).	(ii)
d.	(ii).	(iv).	(i).	(iii)

6. Which of the following represents saponification reaction?

(a) $CH_3COONa + NaOH$ ——————> $CH_4 + Na_2CO_3$

(b) $CH_3COOH + C_2H_5OH + H_2SO_4$ ——————> $CH_3COOC_2H_5 + H_2O$

(c) $2CH_3COOH + 2Na$ ——————>$2\ CH_3COONa + H_2$

(d) $CH_3COOC_2H_5 + NaOH$ ——————>$CH_3COONa + C_2H_5OH$

(Hint: Ref- contents**)**

<u>Assertion-Reasoning</u>

Each of these questions contains two statements, Assertion (A) and Reason (R). Each of these questions also has four alternative choices, any one of which is the correct answer. You have to select one of the codes (a), (b), (c) and (d) given below.

(a) Both A and R are true and R is the correct explanation of A

(b) Both A and R are true, but R is not the correct explanation of A

(c) A is true, but R is false

(d) A is false, but R is true

Assertion & Reason Based Questions (1 Mark Each)

7. Assertion (A): Saturated hydrocarbons burn with a blue flame.

Reason (R): Saturated hydrocarbons contain less carbon content, so there is a complete combustion of these compounds.

(Hint: a) Both A and R are true and R is the correct explanation of A

8.Assertion (A): Esterification is a process in which a sweet smelling substance is produced.

Reason (R): When esters react with sodium hydroxide, an alcohol and sodium salt of carboxylic acid are obtained.

(Hint: b) Both A and R are true, but R is not the correct explanation of A

9. Assertion (A): Benzene is a cyclic saturated hydrocarbon.

Reason (R): Carbon compounds in which carbon atoms are arranged in the form of a ring are called cyclic carbon compounds.

(Hint: d) A is false, but R is true

10.Assertion (A): Diamond is a good conductor of electricity.

Reason (R): Each carbon atom is bonded to four other carbon atoms.

(Hint: d) A is false, but R is true

Very Short Answer Based Questions (2 Marks Each)

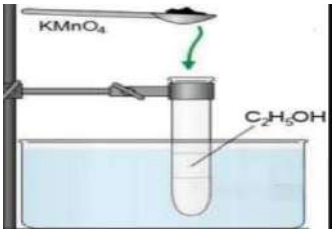
11. Draw the structural isomer of pentane having longest and shortest hydrocarbon chain. Also write their common and IUPAC name.

(Hint**:** Refer isomers of pentane in the text**)**

12. Dhanya heated Ethanol with a compound A in the presence of a few drops of concentrated sulphuric acid and observed a sweet smelling compound B is formed. When B is treated with sodium hydroxide , it gives back Ethanol and compound C. Identify compounds A, B and C .Write the chemical reactions involved and name the reactions.

(Hint : Refer text)

Q13. Observe the experimental setup and write the chemical equation of the reaction. State the role of alkaline $KMnO_4$.



(Hint : Refer chemical properties of Ethanol)

14. Write the name and molecular formula of an organic compound having its name suffixed with '-ol' and having two carbon atoms in the molecule. With the help of a balanced chemical equation indicate what happens when it is heated with excess of conc. H_2SO_4

(Hint**:** Refer chemical properties of Ethanol **)**

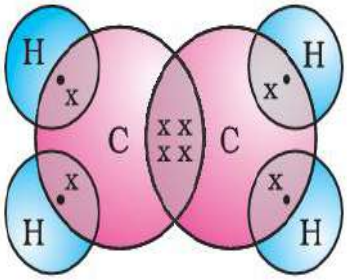
15. Why does carbon form a large number of compounds? Explain with reference to its properties.**(**Hint**:** Refer text **)**

Short Answer Type Questions (3 Marks Questions)

16. A carboxylic acid $C_2H_4O_2$ reacts with an alcohol in the presence of H_2SO_4 to form a compound 'X' . The alcohol on oxidation with alkaline $KMnO_4$, followed by acidification gives the same carboxylic acid,$C_2H_4O_2$ .Write the name and structure of

(a) carboxylic acid, (b) alcohol and (c) the compound 'X' .

(Hint**:** Refer functional group and chemical properties of carbon compounds **)**



17. a) Identify the Hydrocarbon and write its name and molecular formula

b) Draw its bond structure.

c) Is it saturated or unsaturated compound? Justify.

(Hint**:** Refer text **)**

18. An aldehyde as well as ketone can be represented by the same molecular formula say C_3H_6O. Write their structures and name them. Also show covalent bond formation in the next consecutive member of the aldehyde mentioned above.

(Hint**:** Refer text **)**

19. Give reason for the following

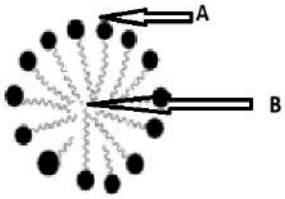
(i) Unsaturated hydrocarbons show addition reactions but not saturated hydrocarbons.

(ii) Carbon only forms covalent compounds.

(Hint**:** Refer text **)**

Case Based Questions (4 Marks Each (1+2+1 in each questions))

20. A teacher demonstrated the cleaning action of soap by dissolving soap solution in water and adding oil droplets..



(a) Identify the type of structure formed by soap in water in the given picture.

(b) Identify the A and B part of the picture?

c) Differentiate between hydrophobic and hydrophilic nature .

(Hint**:** Refer text **)**

21. In a laboratory experiment, students burned methane (CH_4) in the presence of oxygen and observed that carbon dioxide and water were formed with the release of heat and light.

(a) Identify the type of reaction taking place during the combustion of methane.

(b) Write the balanced chemical equation for the combustion of methane.

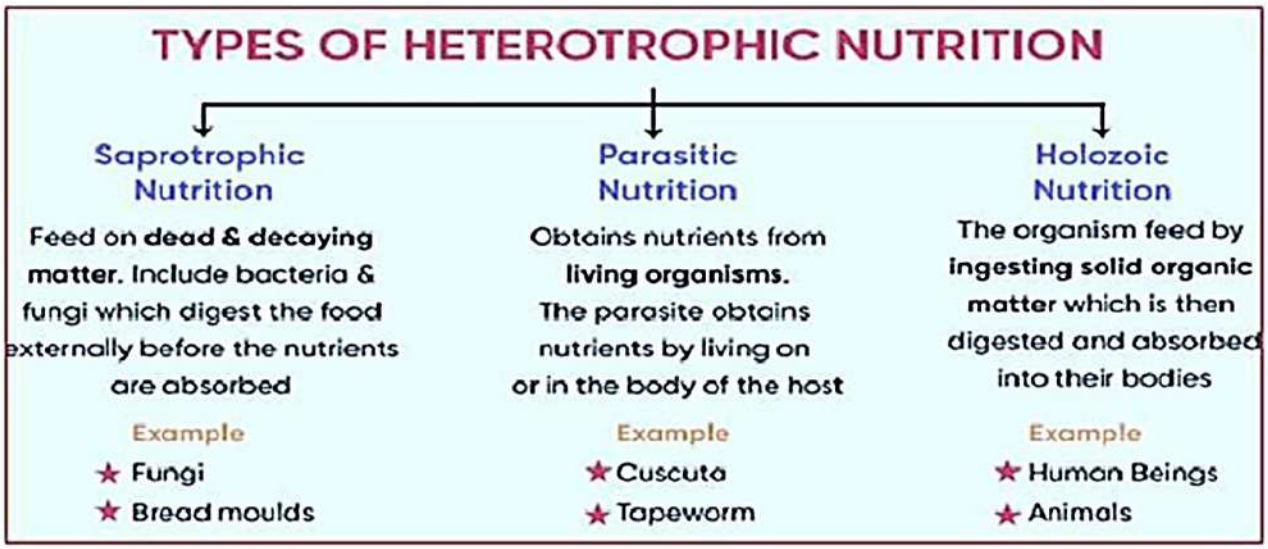
(c) What are the products of incomplete combustion of carbon compounds? (1 mark)

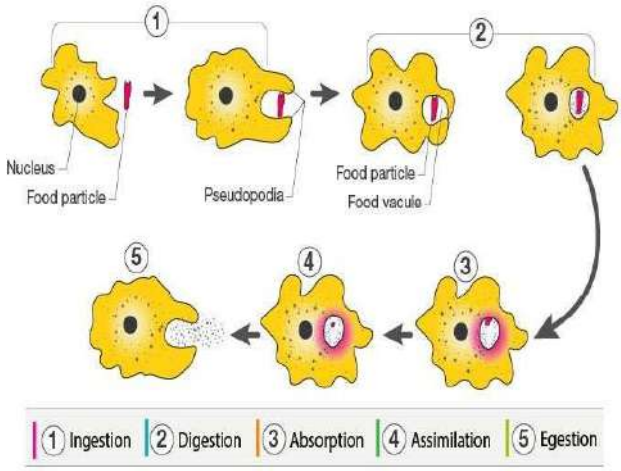
(Hint**:** Refer text

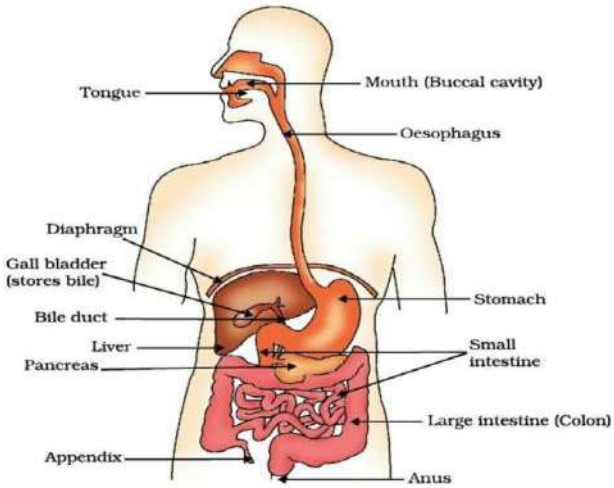
(c) Incomplete combustion produces carbon monoxide (CO) and soot (C), which are harmful pollutants.)

All the vital processes which are required by an organism to servive are called life processes .
Nutrition , photosynthesis , transportation , metabolism , respiration , reproduction , and excretion are important life processes

Nutrition- the process by which an organism takes food and utilizes it , is called nutrition. Nutrients-materials which provide nutrition to organism are called nutrients. Carbohydrates , proteins and fats are the main nutrients and are called macronutrients. Minerals and vitamins are required in small amount and hence are called micronutrients







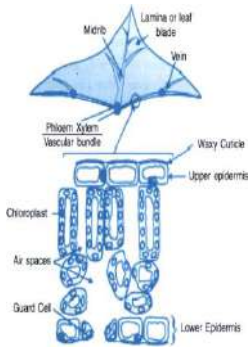
Types of respiration and site

Type	Definition	Site
Aerobic respiration	It occurs in the presence of oxygen	Cytoplasm and Mitochondria
Anaerobic respiration	It occurs in the absence of oxygen.	Cytoplasm
Fermentation	It is a type of anaerobic respiration occurs in a few microorganisms	Cytoplasm

Photosynthesis: The process through which plants prepare their own food is called photosynthesis.

Raw materials required for photosynthesis: sunlight, chlorophyll (a green pigment), CO_2 and water.

Site for photosynthesis: Chloroplast in leaves it contain green pigment called chlorophyll.



Main events occurring during photosynthesis:

1.Absorption of light energy by chlorophyll.

2.Conversion of light energy into chemical energy.

3.Splitting of water into hydrogen and oxygen and reduction of carbon dioxide to carbohydrate.

In photosynthesis plants take CO_2 from atmosphere and water from the soil and convert it into carbohydrate in the presence of sunlight and chlorophyll.

$$6CO_2 + 6H_2O \xrightarrow[\text{CHLOROPHYLL}]{\text{LIGHT}} \underbrace{\underset{\substack{\text{GLUCOSE}\\ \text{(CARBOHYDRATE)}}}{C_6H_{12}O_6} + \underset{\text{(OXYGEN)}}{6O_2}}_{\text{(PRODUCTS OF PHOTOSYNTHESIS)}}$$

HUMAN RESPIRATORY SYSTEM

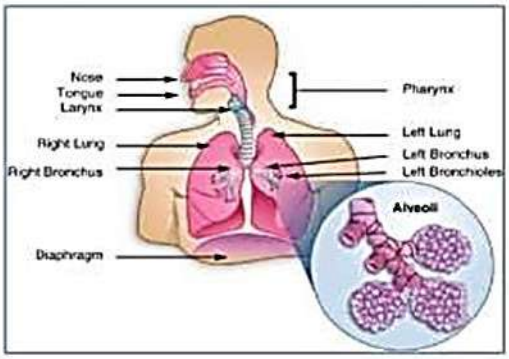
(consists of the nostril, nasal passage, pharynx, larynx, trachea, bronchi, bronchioles, alveoli,diaphragm, and ribcage.)

The inhale of oxygen and exhale of CO2 is known as breathing. Air is taken into body through nostrils

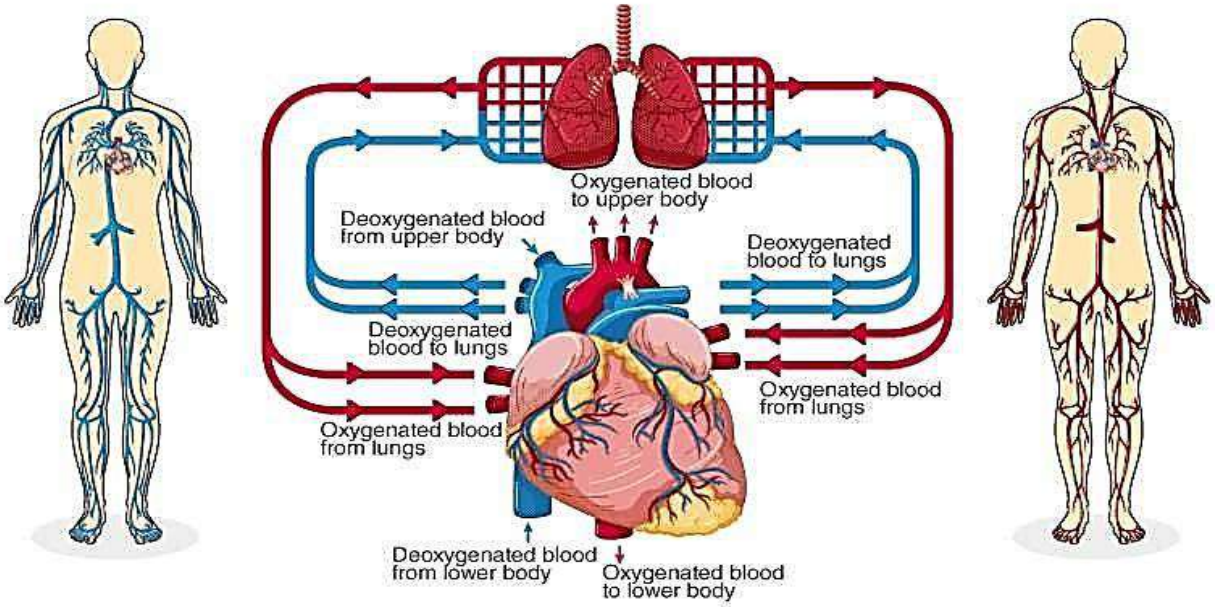
From nostril air passes through the pharynx, larynx, trachea, bronchi, bronchioles and finally alveoli.

At alveoli exchange of oxygen and CO_2 takes place with blood vessels by process of diffusion.

Oxygen enters into blood vessels while CO_2 enters into the alveolar sac. Both oxygen and CO_2 is carried by iron-containing hemoglobin.



HUMAN CIRCULATORY SYSTEM TRANSPORTATION

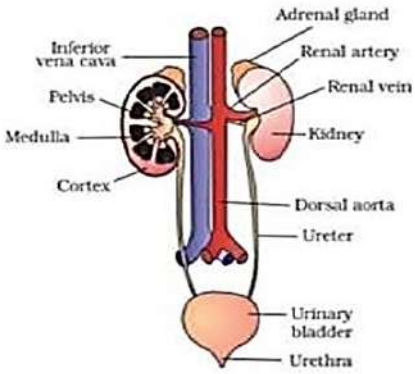


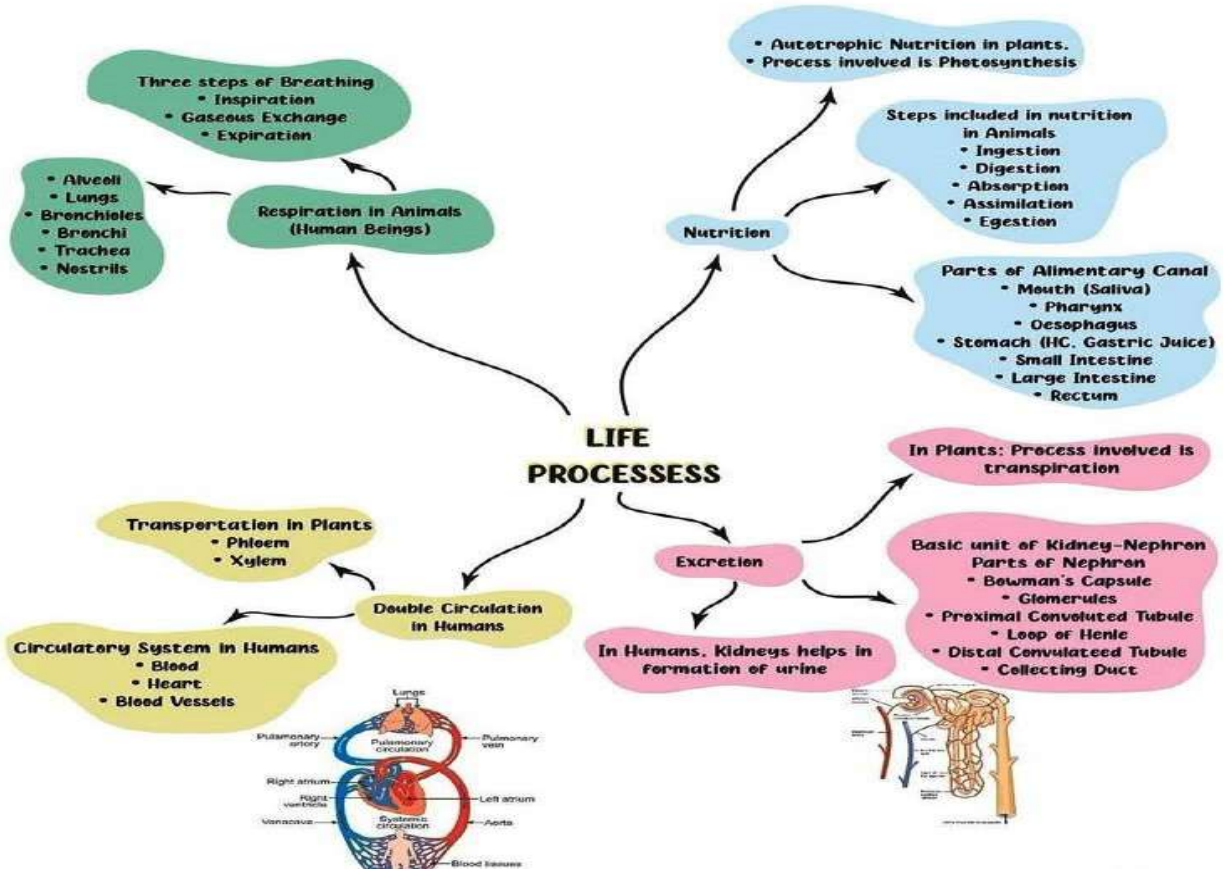
Difference between Arteries and Veins

SrNo	Arteries	Veins
1	An artery carries blood away from heart	A vein carries blood towards the heart
2	An artery is thicker than a vein	A vein is comparitively thinner
3	The Pulmonary artery carries deoxygenated blood	The pulmonary vein carries oxygenated blood
4	Arteries have rigid walls	Veins have comparitively thinner walls
5	Blood flows under pressure through an artery	Blood flow through vein is much calmer
6	Lumen of arteries is narrow	Lumen of veins is comparitively wider

EXCRETION

Excretion	Removal of harmful metabolic wastes from the body
Kidney	Excretory organ of human
Nephron	Structural and functional unit of kidney
Urinary bladder	Store urine
Ureter	Connect urinary bladder with kidney
Hemodialysis	Artificial kidney, a device to remove nitrogenous waste products (urea, uric acid) from the blood.





CHAPTER WISE QUESTION BANK

Multiple Answer Type Question (1 Mark Each)

1.The contraction and expansion movement of the walls of the food pipe is called:

(a) Translocation (b)Transpiration (c) Peristaltic Movement (d) Digestion

(Hint: movement help in swallowing of food)

2.The break down of pyruvate to give carbondioxide, water and energy takes place in
(a) Cytoplasm (b) Mitochondria (c) Chloroplast (d) Nucleus
(Hint: Also known as power house of the cell)
3.Glycolysis process occurs in which part of the cell?
(a) Cytoplasm (b) Nucleus (c) Mitochondria (d) Chloroplast
(Hint: fluid present in the cell)
4.The respiratory pigment in human beings is:
(a) Carotene (b)Chlorophyll (c)Haemoglobin (d) Mitochondria
(Hint: a pigment present in RBC)
5.Which part of nephron allows the selective reabsorption of useful substances like glucose, amino acids, salts and water into the blood capillaries?
(a) Loop of Henle (b)Glomerulus (c)Bowman's capsule (d) Ureter
(Hint: a U shaped long structure)
6.which of the following is the correct path of oxygen in the respiratory system.
(a) Nasal cavity → Trachea → Bronchi → Alveoli (b) Nasal cavity → Bronchi → Trachea → Alveoli
(c) Trachea → Nasal cavity → Bronchi → Alveoli (d) Alveoli → Trachea → Bronchi → Nasal cavity
(Hint: a)

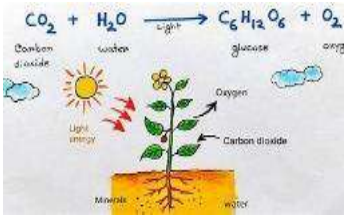
Assertion & Reason Based Questions (1 Mark Each)

Following questions consist of two statements–Assertion(A) and Reason (R).Answer these questions selecting the appropriate option given below:

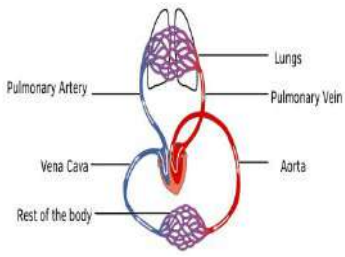
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

7. Assertion(A):Energy is required to carry out different life processes.
Reason(R): Energy is obtained in the form of ATP in the mitochondria
. (Hint:(a) ATP is required in different life processes)
8. Assertion(A):Rings of cartilage are present in the throat,
Reason(R):These ensure that the air-passage does not collapse
(Hint: (a) Cartilaginous rings prevent our neck from collapsing)
9. Assertion(A):The opening and closing of the pore is a function of the guard cells.
Reason(R): Stomatal pores are the site for exchange of gases by diffusion.
(Hint: (a)Water pressure in the guard cell control the function of opening and closing: Stomatal opening is responsible for exchange of gases, w)
10.Assertion(A):The purpose of making urine is to filter out undigested food from intestine
Reason(R): Kidneys filter the waste and produce urine
(Hint: (d)removal of undigested food is function of digestive system and kidney's function is to filterwate product to form urine)

Short answer questions (2 marks Each)



11.Observe the given picture and write what will happen if:
(a)less watering to the plant. (b) stomata get blocked due to dust .
(Hint:effect of rate of photosynthesis increase/decrease)
12.(a) How many chambered heart is there in birds and mammals?
(b) What are the benefits of it?
(Hint: High energy needs in order to maintain their body temperature)



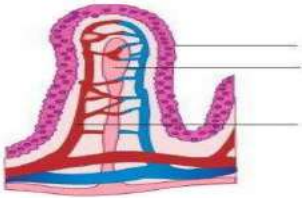
13. (a) Compare the structural features of arteries and veins.
(b) Explain how these differences are related to their functions in the given picture.
(Hint: The wall of arteries are thick and no valves but the wall of veins are thin and have valves)

14. (a) Name the acid produced in given picture..
(b) Explain how it supports the digestive process and protects the body from infections.
(Hint Create acidic medium for action of Pepsin enzyme and kill bacteria)

15. (a) Name the process of digestion of fats.
(b) Why basic medium is required for digestion of fats?
(Hint: Break down of large gloubule fats. Lipase required basic medium)

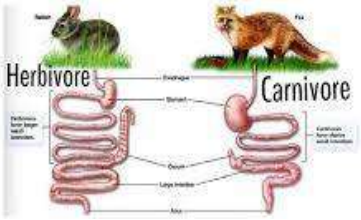
Short Answer Type Questions (3 Marks Questions)

16. (a) What is the role of saliva in the digestive process?
(b) How does saliva help in swallowing food?
(Hint:Saliva contains the enzyme salivary amylase, which breaks down starch into maltose a simpler sugar. It also moistens the food to aid in swallowing.)



17. (a) Identify the picture located in the human intestine?
(b) What is its role in the digestive system?
(Hint:The inner lining of the small intestine has villi, which increase surface area for absorption.)

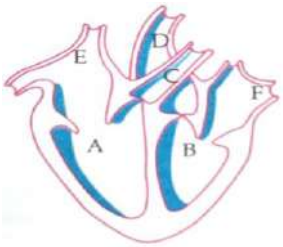
18.Observe the picture carefully and write why do herbivores have longer small intestine than carnivores?
(Hint:Herbivores need a longer small intestine to allow more time for the digestion and absorption of cellulose, which is more difficult to break down.)



19. Ravi experiences muscle cramps after running due to lack of oxygen supply in his muscles.
(a) Name the three pathways through which glucose is broken down in the human body.
(b) Which pathway is followed in Ravi's muscles during intense exercise? Name the end products formed.
(Hint: (a) Pathways: Aerobic respiration, Anaerobic respiration (in muscles), Fermentation (in yeast), (b)During intense activity: Anaerobic respiration in muscles → Lactic acid.)

(Long Answer Type Questions 5 Marks Each)

20. (i) Identify any two parts from the diagram given which carry oxygenated and deoxygenated blood.
(ii) Explain the process of double circulation with the help of a flow chart
(Hint: Refer content

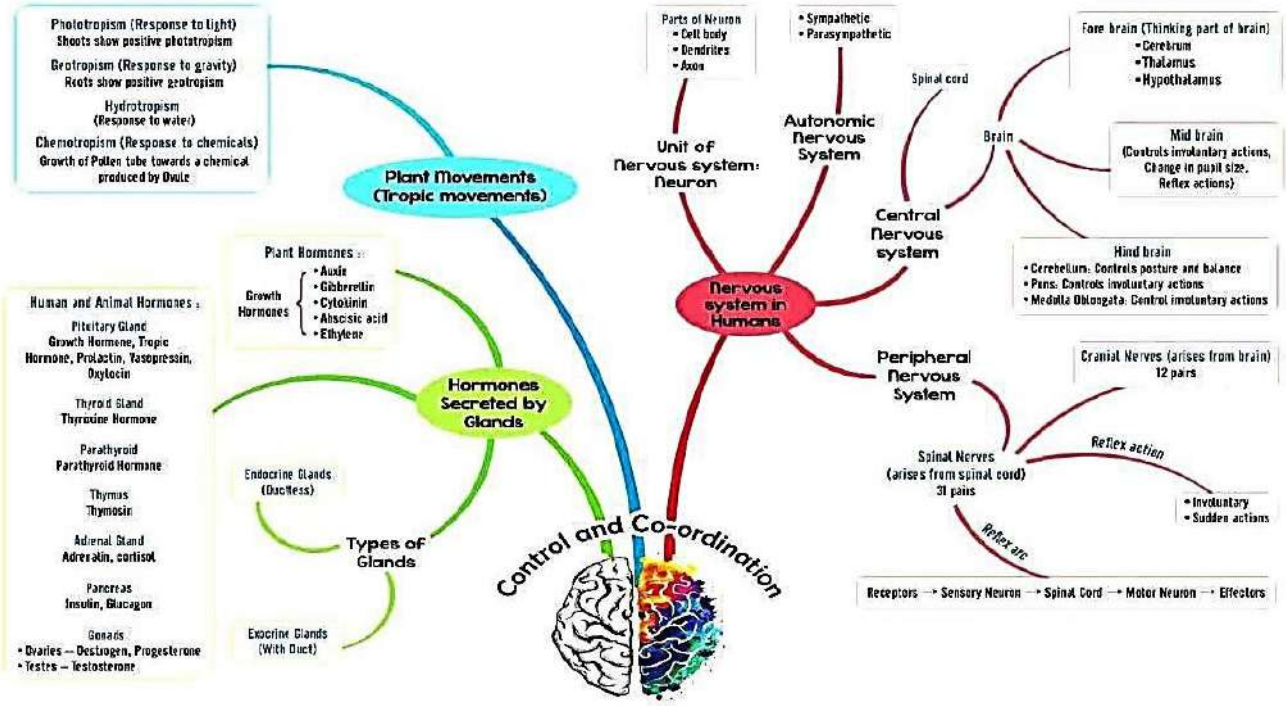


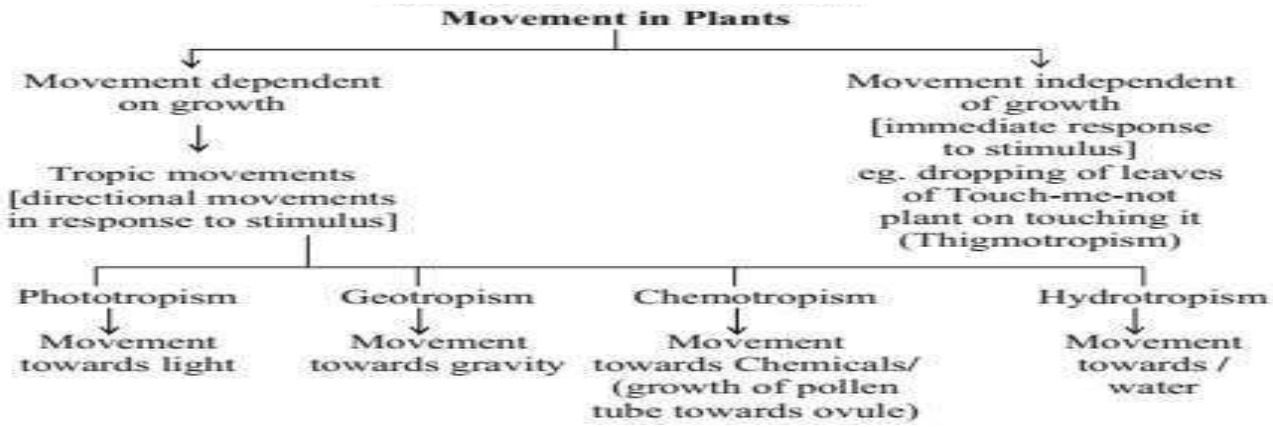
Case Based Questions (4 Marks Questions)

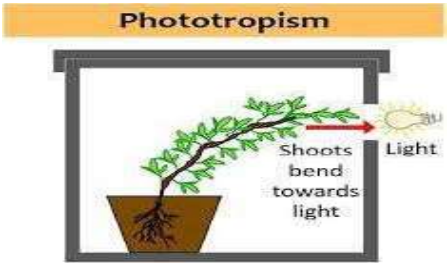
22. Riya, a 14-year-old girl, often complained of stomach pain and bloating after meals. Upon medical examination, it was found that she lacked sufficient bile secretion. Her doctor explained that bile is essential for the digestion of fats.
Questions &Hint Answers:
(a) "Identify the organ responsible for bile production and explain how bile contributes to the process of digestion."?
(Hint: The liver.)
(b)How does bile help in digestion?
(Hint: Bile emulsifies fats, breaking them into smaller droplets, which increases the surface area for the enzyme lipase to act on and digest fats efficiently.)
(c)What life process is being affected in Riya's case?
(Hint: Nutrition specifically digestion).
(d)Name one enzyme that digests protein and mention where it is secreted.
(Hint:Pepsin, secreted in the stomach.)
23.Mr. Sharma, a 52-year-old man, was diagnosed with a blockage in one of his coronary arteries. This was causing reduced blood flow to parts of his heart muscle, leading to chest pain and weakness.

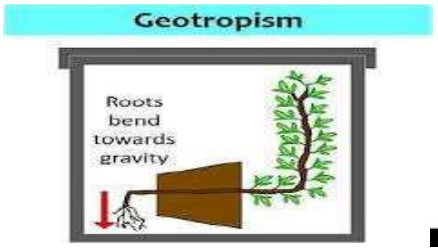
Questions & Answers:
(a)Which life process is affected in Mr. Sharma's case?
(Hint: Transport (circulatory system).
(b) "Explain the function of the coronary arteries and analyze why their proper functioning is essential for the overall health of the circulatory system."?
(Hint: To supply oxygen-rich blood to the heart muscles.
(c)How does reduced blood supply affect the cells in the heart?
(Hint: Cells receive less oxygen and nutrients, leading to pain (angina), weakening, and possible death of heart tissue.
(d)Name the main components of blood that help in transport.
(Hint: Red blood cells (transport oxygen), plasma (carries nutrients and hormones), and platelets (help in clotting).

Concept map









Stimuli :- The changes in the environment to which living organisms respond are called stimuli.

Coordination:-The working together of various organs in an organism to produce a proper response to a stimulus is called coordination.

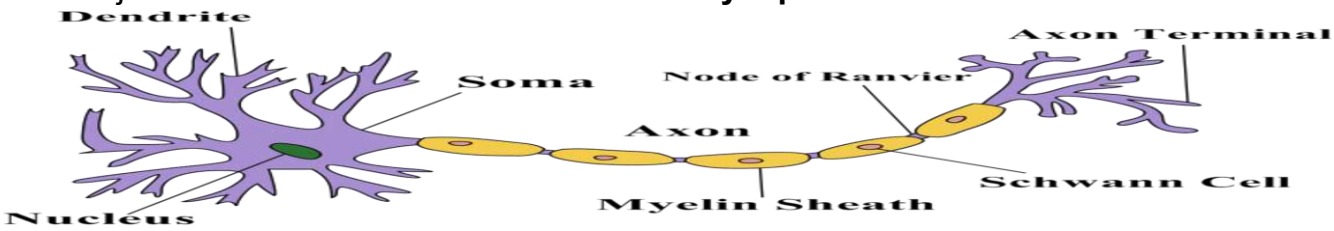
Coordination in animals: In animals control and coordination is done by the nervous system and endocrine system.

Parts of the nervous system:

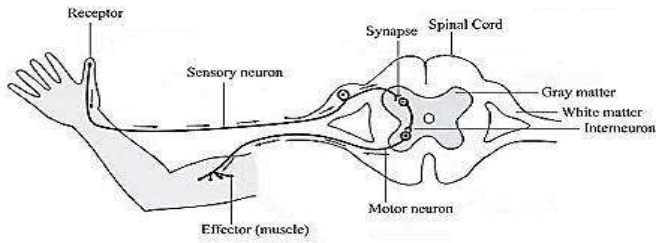
i) **The central nervous system**:-consists of the brain , and spinal cord.

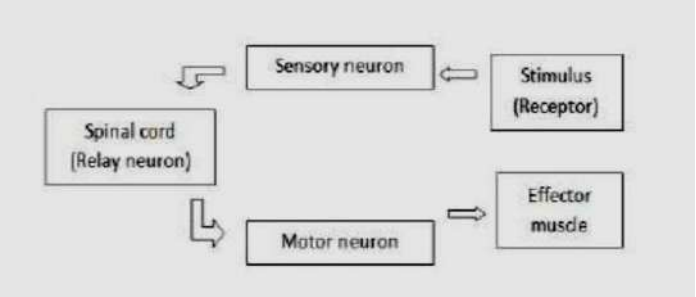
ii) **The peripheral nervous system**:-consists of cranial nerves arising from the brain and spinal nerves arising from the spinal cord.

Nerve cell (Neuron): Neuron is the structural and functional unit of the nervous system. It has a cell body called **cyton** containing a nucleus and cytoplasm.It has several branched structures called **dendrites** .It has a long nerve fibre called **axon** which is covered by a protective covering called **Myelin sheath** .The junction between two neurons is called **synapse**



Brain :-The brain is the main coordinating centre in the human body. It is protected by the cranium. It is covered by three membranes called meninges filled with a fluid called cerebrospinal fluid which protects the brain from shocks. The brain has three main parts.
Fore brain :- consists of the cerebrum and olfactory lobes. It controls voluntary actions like touch, smell, hearing, taste, sight, mental activities like thinking, learning, memory, emotions.
Mid brain :- controls involuntary actions and reflex movements of head, neck, eyes etc.
Hind brain :- consists of cerebellum, pons and medulla.
Cerebellum :- controls body movements, balance and posture.
Pons :- controls respiration.
Medulla :- controls heart beat, blood pressure, swallowing, coughing, sneezing, vomitting etc
Spinal cord :- The spinal cord starts from the brain and extends through the vertebral column.
It carries messages to and from the brain. It also controls reflex actions.
Reflex arc: The pathway of a reflex action is called reflex arc.





Reflex action :-Reflex action is a sudden, unconscious and involuntary response of the effectors to a stimulus. Eg:- We suddenly withdraw our hand if we suddenly touch a hot object.
Coordination in plants :-
In plants control and coordination is done by chemical substances called plant hormones or
phytohormones.
i) **Auxins** :- help in cell division, cell elongation and growth.
ii) **Gibberillins** :- help in growth of stem and branches.
iii) **Cytokinins:**- help in cell division, formation of fruits and seeds.
iv) **Abscisic acid** :- inhibits growth and affects wilting of leaves.
vi) **Ethylene** :- helps in flowering and ripening of fruits.
Movements in plants :-Movements in plants are of two main types.
They are :-**Tropic movements:** are directional movements towards or away from the stimulus and it
depends on growth. They are of different types like Phototropism, Geotropism, Chemotropism,
Hydrotropism etc.

Nastic movements:-are non directional movements which are neither towards or away from the stimulus and it does not depend on growth. Eg: If we touch the leaves of touch me not plant, its leaves fold up and droops down immediately

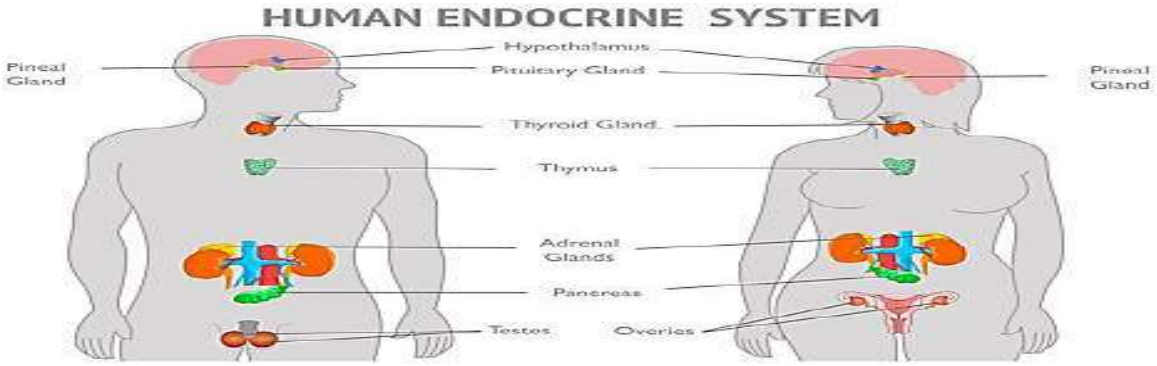
HORMONES IN ANIMALS: Hormones are chemical messengers which are secreted by the ductless endocrine gland into the blood. Hormones control the activity of certain cells and organs. Hormones can be peptides and steroid hormones. Some of the main endocrine glands are the pituitary gland, adrenal gland, thyroid gland, pancreas, testes, ovary etc

Endocrine gland	Hormone	Role
Pituitary gland	Growth Hormone	Stimulate growth and development
Adrenal gland	Adrenaline	Stress hormones (enable to deal with the Stressed) Increase heartbeat & breathing
Thyroid gland	Thyroxine	Regulates metabolism for body growth
Pancreas	Insulin	Regulates blood sugar level
Ovary	Oestrogen	Changes associated with puberty in female
Testes	Testosterone	Changes associated with puberty in male

GOITER- Iodine is necessary for the formation of thyroxin hormone. If Iodine is in low concentration the thyroid gland swells and causes goiter.

GIGANTISM and DWARFISM- Excess secretion of growth hormone from the pituitary gland causes excess growth of the body (gigantism) and less secretion results in dwarfism.

DIABETES- Deficiency of insulin hormone causes diabetes



CHAPTER WISE QUESTION BANK

Multiple Answer Type Question (1 Mark Each)

1. The leaves of mimosa are sensitive to
(a) Light (b) Smell (c) Touch (d) Heat
(Hint: It is also known as touch me not)
2. Reflex actions are mediated through:
(a) Brain (b) Effectors (c) Receptors (d) Spinal cord
(Hint: It is lower part of Central nervous system)
3.Synapse is defined as a:
(a) Gap between two muscle cells (b) Gap between two neurons
(c) Gap between two bones (d) Gap between muscle and bones
(Hint: Space between two neurons)
4. In plants the role of cytokinin is :
(a) Promote cell division. (b) Wilting of leaves
(c) Help in growth of stem (d) Promote the opening of stomata.
(Hint: It helps in enlargement in plant part)
5. Which is not a part of Hind Brain
(a) Medulla oblongata (b) Cerebrum (c) Cerebellum (d) Pons
(Hint : It is used in intellectual thinking)

6.Movement in Mimosa pudica is an example of:

(a) Phototropism (b) Chemotropism (c) Nastic movement (d) Geotropism

(Hint: It is not applicable to light, chemical and gravity)

<u>Assertion & Reason Based Questions</u> (1 Mark Each)

Following questions consist of two statements–Assertion(A) and Reason (R).Answer these questions selecting the appropriate option given below:

(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true

7. **Assertion**: Receptors are the specialized tips of nerve fibers.
Reason: Receptors are present in the sense organs of the animals

(Hint: a) Both A and R are true and R is the correct explanation of A.

8. **Assertion**: Insulin regulates blood sugar levels
Reason: Insufficient secretion of insulin will cause diabetes

(Hint: a) Both A and R are true and R is the correct explanation of A.

9. **Assertion**: The Cyton region of the nerve cell collects information for the brain.
Reason: Nerve cells can either have or lack myelin sheath.

(Hint: d) A is false but R is true

10. **Assertion**: A nerve impulse is an electrochemical event.
Reason: In a nerve impulse there are changes in the resting potential which spreads down the nerve fiber

(Hint: a) Both A and R are true and R is the correct explanation of A.

<u>Very short answer questions</u> (2marks)

11.What is happening in the given picture? Which hormone is responsible for this type of movement?

. (Hint::phototropism, auxin hormone)

12. What are the main components of the nervous system?

(Hint: Brain, spinal cord, nerves)

13. Sohan went to the doctor for treatment doctor told him you have raised blood sugar .

(a) Name the diseases

(b) Name the hormone which is responsible for this diseases.

(Hint: Diabetes and insulin hormone)

14.Name the part of human body in which the adrenal and pituitary glands are located.

(Hint: Adrenal --Above the kidney Pituitary ---Brain)

15. Name two tissues that provide control and coordination in multicellular animals.

(Hint: nervous tissue. endocrinal tissue)

<u>Short answer question (3 marks)</u>

16. What is the need for control and coordination in living organisms?

(Hint: Control and coordination are necessary to maintain internal stability and respond to external changes. It helps organisms to respond to stimuli in an organized manner)

17. Name the hormones secreted by the following endocrine glands and specify one function of each (a) Thyroid (b) Pituitary (c) Pancreas

(Hint: Thyroid ----thyroxine Metabolism of fats carbohydrates and Protein
Pituitary _------growth hormone Regulates growth and development
Pancreas _------insulin Regulating blood sugar level)

18. Observe the human control system in the given picture, write their names and two functions of each.

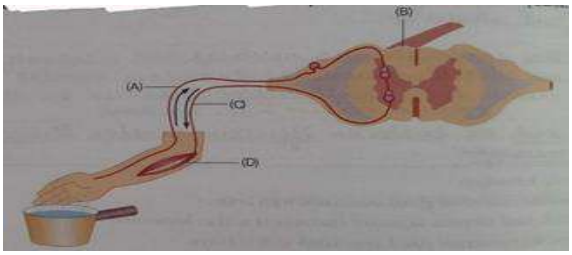
(Hint: nervous and glandular system)

19."Observe a plant growing near a window and explain how it responds to light and gravity. Identify the types of tropic movements involved and describe the role these movements play in the plant's survival."(Hint: Tropic movements are directional responses of plants to environmental stimuli.)

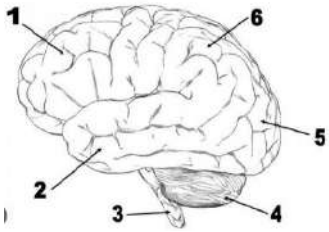
Long answer type question (5 marks)

Type	Stimulus	Example
Phototropism	Light	Shoot bends towards light
Geotropism	Gravity	Roots grow downward
Hydrotropism	Water	Roots grow toward water
Thigmotropism	Touch	Tendrils coil around support

20. (a) Identify the parts A, B, C and D.



(b) Why are reflex actions important?
(Hint: Include receptor, sensory neuron, spinal cord, motor neuron, and effector. Reflex actions are quick and involuntary responses to stimuli.)



21.(a) Identify the parts 1 to 6 in the given diagram.
(b) How cerebrum is different from cerebellum.
(Hint: (a)Refer Human brain diagram, (b) write two differences).

Case study question (4marks)

22. Seema is studying late at night. Suddenly, her room gets dark due to a power cut. She quickly picks up her mobile phone and switches on the flashlight. She notices her pupils dilating to adjust to the darkness.

Q1: Which part of Seema's body detects the absence of light?
(a.)Skin (b) Eyes (c) Ears (d) Nose
(Hint: Organ of sight)

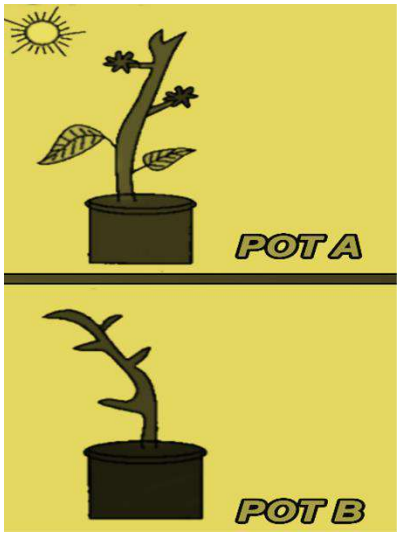
Q2: The response of Seema's pupils dilating in darkness is an example of:
(a) Voluntary action (b) Reflex action (c) Involuntary action (d) Conditional reflex
(Hint: It is also referred as reflex arc)

Q3: Which part of the brain controls the size of the pupil?
(a) Cerebellum (b) Cerebrum (c) Medulla (d) Midbrain
(Hint: It is central part of brain)

Q4: Which division of the nervous system is responsible for adjusting the size of the pupil?
(a) Central nervous system (b) Autonomic nervous system
(c) Peripheral nervous system (d) Skeletal system
(Hint: It is not part Central. Peripheral Skeletal system)

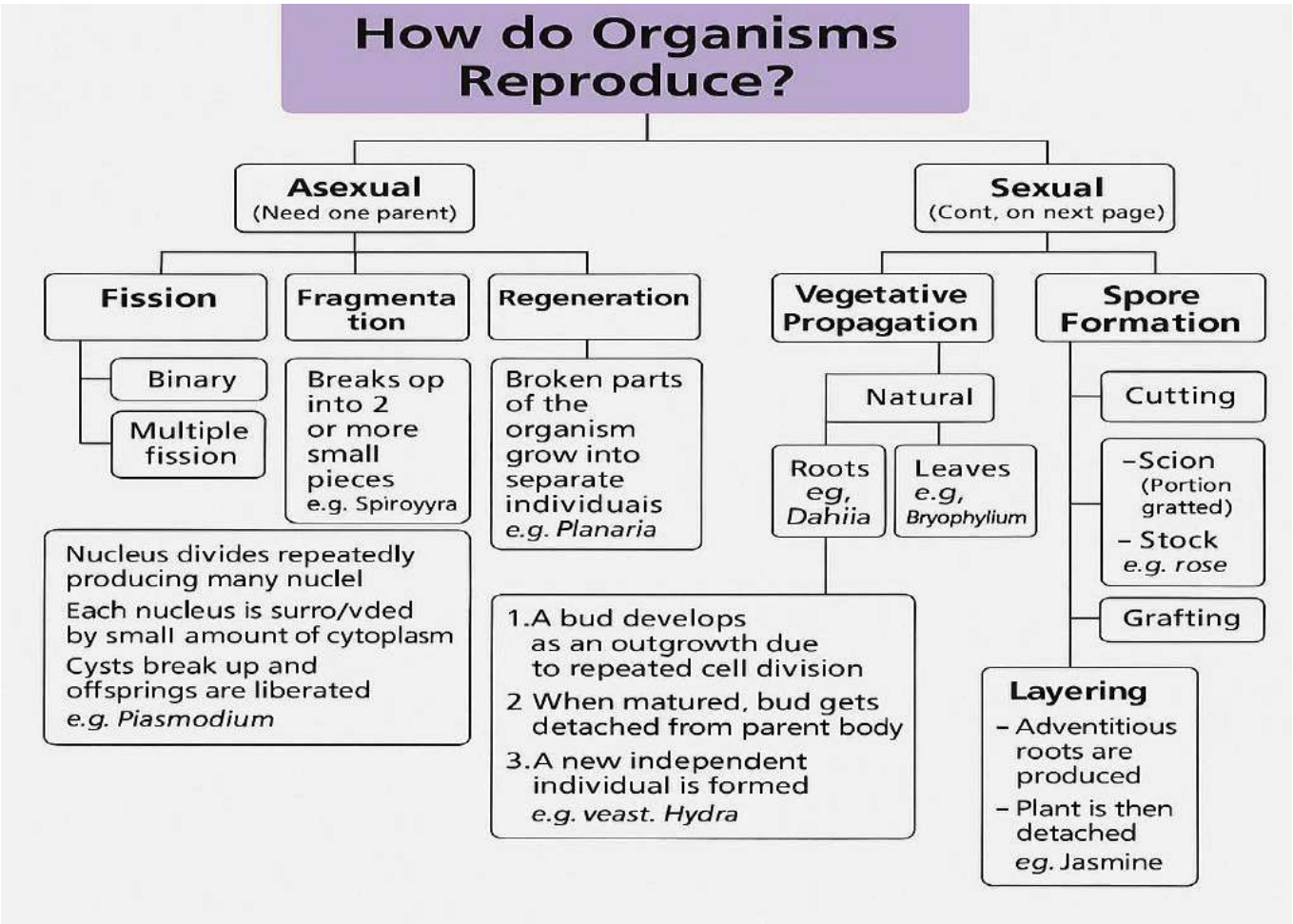
23.*In a school science experiment, students planted bean seeds in two pots. Pot A was placed in a well-lit area near the window, while Pot B was kept in a dark cupboard. Over the next two weeks, the students observed the growth of the plants. The plant in Pot A grew straight and healthy with green leaves, while the plant in Pot B became dull, pale,*

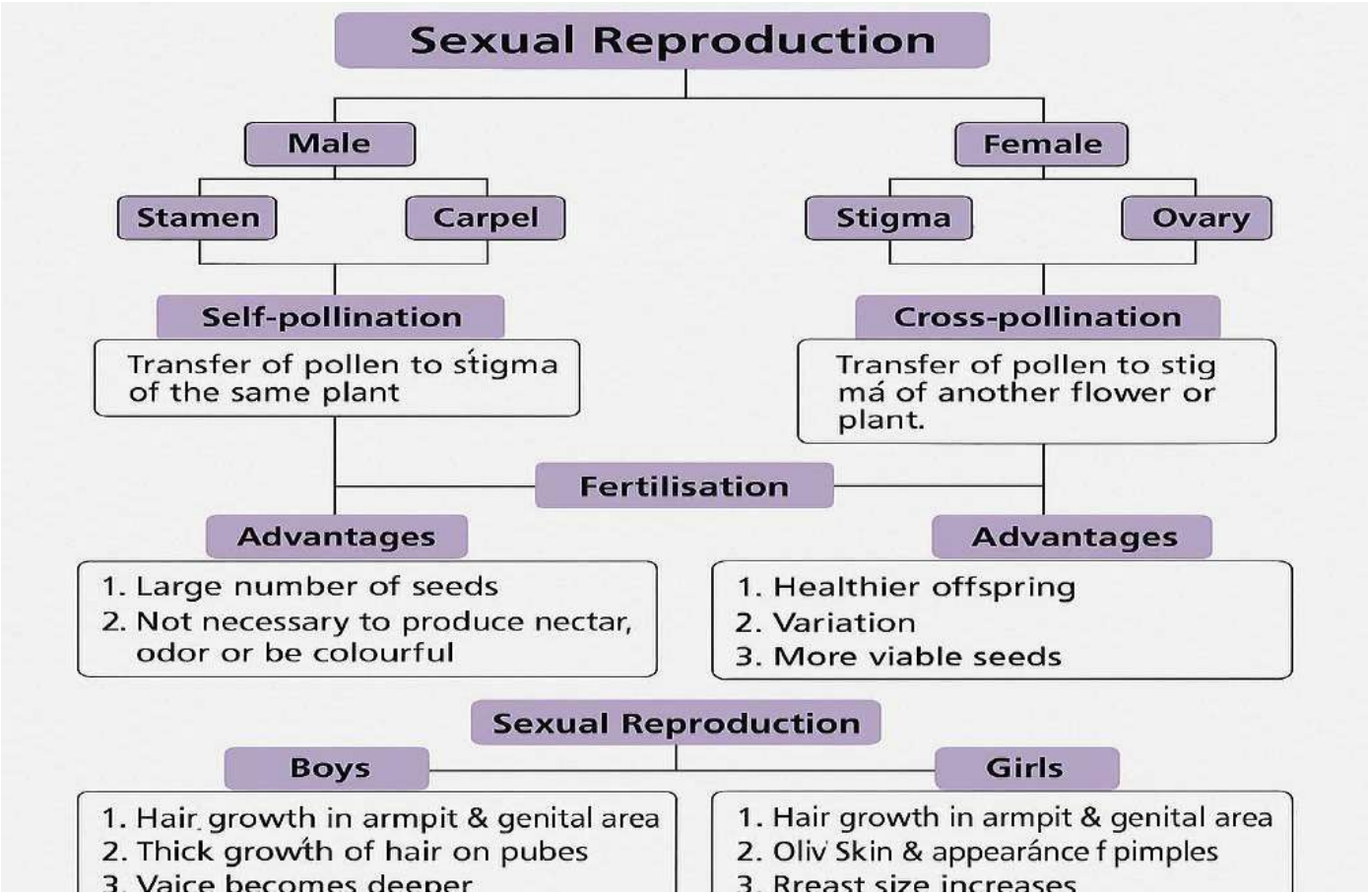
and weak, with small yellow leaves. The students concluded that light plays a crucial role in the healthy growth of plants.

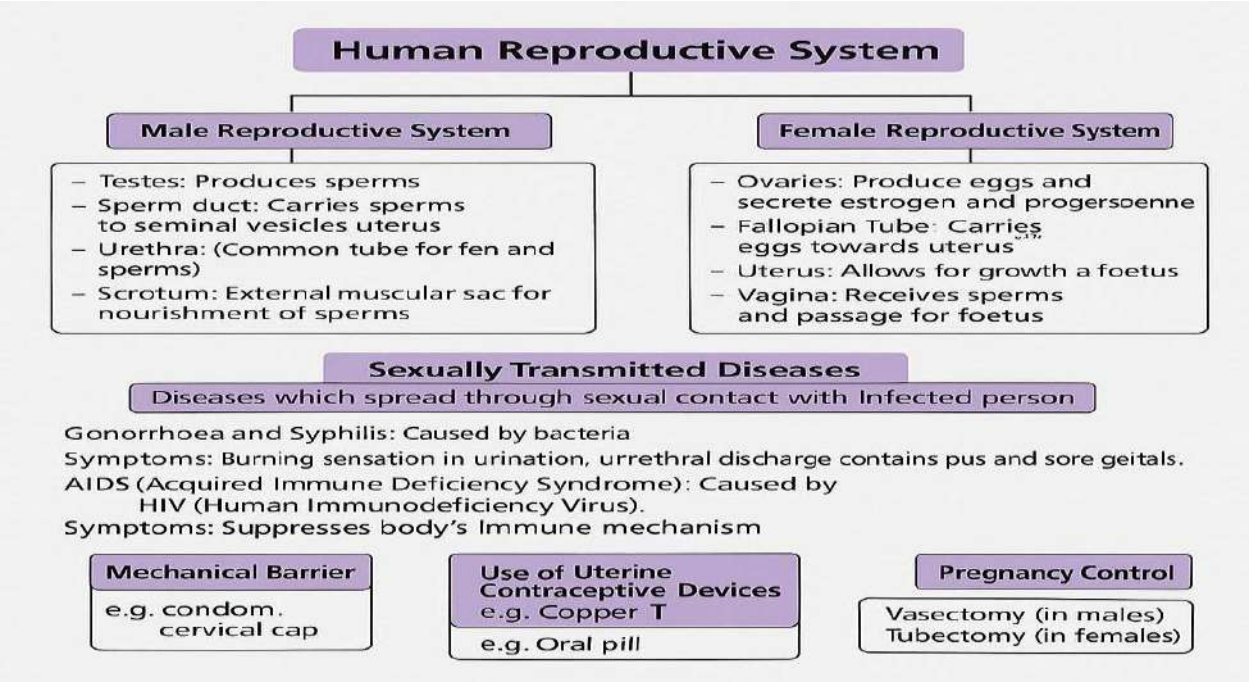


(a) Which tropic movement is shown by plants here?
Hint: Towards light and soil
(b) Name the hormone present at the shoot tip of the plant.
Hint: It leads to apical growth
(c) If Pot A fell, after 1 week in which direction will the shoots start to grow? What can be the reason for this? (Hint: Towards light due to presence of growth hormone.)

Concept map


How do Organisms Reproduce?
Asexual
(Need one parent)
Sexual
(Cont, on next page)
Fission
Fragmenta tion
Regeneration
Vegetative Propagation
Spore Formation
Binary
Multiple fission
Breaks op into 2 or more small pieces e.g. Spiroyyra
Broken parts of the organism grow into separate individuais e.g. Planaria
Natural
Roots eg, Dahiia
Leaves e.g, Bryophylium
Cutting
-Scion (Portion gratted)
- Stock e.g. rose
Grafting
Nucleus divides repeatedly producing many nuclel
Each nucleus is surro/vded by small amount of cytoplasm
Cysts break up and offsprings are liberated
e.g. Piasmodium
1.A bud develops as an outgrowth due to repeated cell division
2 When matured, bud gets detached from parent body
3.A new independent individual is formed
e.g. veast. Hydra
Layering
- Adventitious roots are produced
- Plant is then detached
eg. Jasmine


Sexual Reproduction
Male
Female
Stamen
Carpel
Stigma
Ovary
Self-pollination
Transfer of pollen to stigma of the same plant
Cross-pollination
Transfer of pollen to stig má of another flower or plant.
Fertilisation
Advantages
1. Large number of seeds
2. Not necessary to produce nectar, odor or be colourful
Advantages
1. Healthier offspring
2. Variation
3. More viable seeds
Sexual Reproduction
Boys
Girls
1. Hair growth in armpit & genital area
2. Thick growth of hair on pubes
3. Vaice becomes deeper
1. Hair growth in armpit & genital area
2. Oliv Skin & appearánce f pimples
3. Rreast size increases



CHAPTER WISE QUESTION BANK

Multiple Choice Questions (1 mark each)

1. Which of the following is not a method of asexual reproduction?
(a) Budding (b) Binary Fission (c) Fragmentation (d) Fertilization
(Hint: It is not a method of reproduction)

2. The part of the flower that develops into a fruit is:
(a) Petal (b) Ovary (c) Ovule (d) Anther
(Hint: It is found in reproductive system)

3. Which of the following diseases is not sexually transmitted?
(a) Gonorrhea (b) Syphilis (c) AIDS (d) Tuberculosis
(Hint: It is a lungs disease)

4. What is the correct sequence of reproductive stages in human beings?
(a) Gametes → Zygote → Embryo → Foetus (b) Zygote → Gametes → Embryo → Foetus
(c) Embryo → Zygote → Gametes → Foetus (d) Gametes → Embryo → Zygote → Foetus
(Hint: a)

5. Which of the following statements is incorrect?
(a)Sperms are present in a fluid
(b)Fluid provides nutrition to sperms
(c) Fluid makes easier transportation of sperms
(d) Fluid helps to bind the sperms together
(Hint: It does not support the function of sperm)

6.The embryo in humans gets nutrition from the mother's blood with the help of a special tissue called
(a)Placenta (b)Villi (c)Uterus (d)Womb
(Hint: It helps in the providing nourishment to the foetus)

Assertion & Reason Based Questions (1 Mark Each)

Following questions consist of two statements–Assertion (A) and Reason (R).Answer these questions selecting the appropriate option given below:

(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.

(d) A is false but R is true

7.**Assertion (A):**Spores are unicellular bodies.

Reason(R):The parent body simply breaks up into smaller pieces on maturation.

(Hint- (c) Reason does not support the Assertion

8.**Assertion(A):**Colonies of yeast multiply in sugar solution.

Reason(R): Sugar is made of sucrose which provides energy for sustaining all life activities

(Hint- a) Both A and R are true and R is the correct explanation of A

9. **Assertion (A)**-at puberty in boys, voice begins to crack and thick hair grows on face.

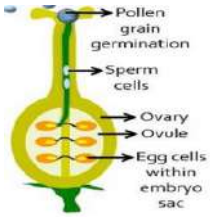
Reason (R)-at puberty, there is decreased secretion of testosterone in boys.

(Hint- c) A is true but R is false.

10. **Assertion (A)**: DNA copying during reproduction is essential.

Reason (R): DNA copying leads to identical offspring without any variation

(Hint- c) A is true but R is false



<u>Very short answer questions</u> (2marks)

Q11.Observe the structure of flower from the environment and explain which parts are responsible for forming the fruit and seed after fertilization?

(Hint: Think about the role of the ovary and Ovules)

Q12 During puberty boys and girls develop distinct physical features known as secondary sexual charecteristics. Identify the hormones responsible for these changes.

(Hint: a Girls Estrogen and progesterone b) Boys: Testosterone.)

Q13 Name the causative organism for the following diseases.

(a) AIDS (b) Warts (c) Gonorrhoea (d) Syphilis

(Hint: (a) Virus (b) Virus (c) bacteria (d) bacteria)

Q14. Explain the role of gonads in the human reproductive system and identify the male and female gonads, including their functions in reproduction and hormone production."

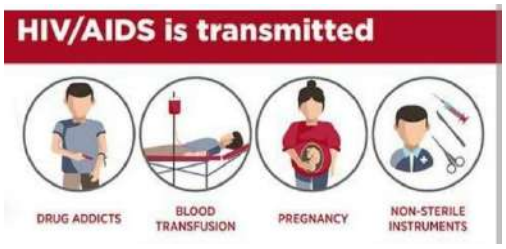
(Hint: Male gonads are testis and female gonads are ovaries.)

Q15 What could be the reasons for adopting contraceptive methods?

(Hint: a For preventing pregnancy b) For preventing STDs)

<u>Short answer question (3 marks)</u>

16. Raghav an employee in MNC was not keeping well for a long time. He underwent a complete medical check-up and was diagnosed as HIV+. He was terminated on account of this condition.



(i) To which category of disease AIDS belong?

(ii) _____ is its causative organism.

(iii) The decision to terminate him from the company

(a) was right as its a communicable disease

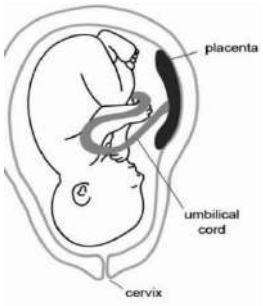
(b) was wrong as its not transmitted from one individual to another

(c) was wrong as it doesn't spread through shaking and mixing with HIV infected individuals

(d) was wrong as it spreads through shaking and mixing with HIV infected individuals

(Hint: Refer to content)

17 Suggest three contraceptive methods to control the size of human population which is essential for the health and prosperity of a country. State the basic principle involved in each.?
(Hint:- Refer contraceptive methods in content)



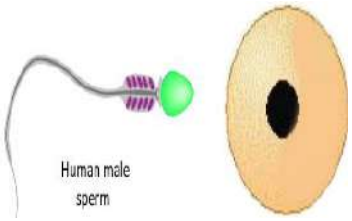
18. Rekha learned during her sister's prenatal check-up that the placenta plays a crucial role in supporting the embryo's development.
(a) Observe the given picture and write how the developing foetus gets nutrition from the mother?
(b) Explain any two major functions of the placenta during pregnancy..
(Hint -: Placenta is a disc like which is embedded in the uterine ;tissue and on mother's side are blood .Role of placenta during pregnancy)

<u>Long answer type question (5 marks)</u>

20.Explain the process of fertilization in plants with the help of neat labelled diagram.
(Hint:-: Formation of pollen tube, movement of male gametes towards the Ovule, fertilisation: fusion of male and female gamete.)
21. (a):- With the help of a diagram showing the different stages of binary fission in Amoeba.
(b):-How do plasmodium and Leishmania reproduce? write one difference in their mode of reproduction.
(c):- Why are budding, fragmentation and Regeneration all considered as asexual type of reproduction?
(Hint -: (a) Hint -: (draw diagram - stages of binary fission in Amoeba)
(b)-:Hint (asexual reproduction)(Leishmania have binary fission and Plasmodium has multiple fission)
(c):-Hint:-(all are a sexual reproduction, single parent, without fertilisation or fusion of gametes)

<u>Case study question (4 marks)</u>

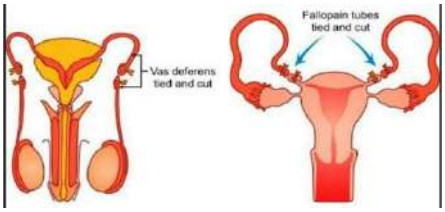
22. A biology teacher explained that human beings reproduce sexually. The male gametes (sperms) are produced in testes, while the female gametes (eggs/ova) are produced in ovaries. Fertilization takes place in the fallopian tube and the zygote develops into an embryo which gets implanted in the uterus.



A. Where does fertilization take place in humans?
(a) Ovaries (b) Uterus (c) Fallopian tube (d) Cervix
(Hint: In tube like structure in female reproductive system.)
B. The organ produces sperms in the male reproductive system?
(a) Penis (b) Testes (c) Prostate gland (d) Urethra
(Hint: It produces testosterone also)
C. What is the role of the uterus in human reproduction?
(a) Produces ova (b) Site of fertilization (c) Implantation and development of embryo
(d) Secretes hormones
(Hint: Site of development of foetus)
D. Which hormone is responsible for the development of secondary sexual characters in females?
(a) Testosterone (b) Estrogen (c) Adrenaline (d) Thyroxine

(Hint: It is produced by ovary)

23.Family planning and awareness about contraceptive methods are important for reproductive health. Some common methods include barrier methods like condoms, surgical methods like vasectomy, and hormonal methods like pills.



A. Which of the following is a barrier method of contraception?

(a) Copper-T (b) Pills (c) Condoms (d) Tubectomy

(Hint: It is external protection)

B. Which method is surgical and used in males to prevent sperm release?

(a) Tubectomy (b) Vasectomy (c) Condom (d) Copper-T

(Hint: It is done internally in males only)

C. What is the main advantage of using contraceptive methods?

(a) Increasing birth rate (b) Preventing diseases only (c) Population control and STD prevention (d) Enhancing fertilization

(Hint: check population and prevent STD)

D. Which method is permanent in females?

(a) Pills (b) Condom (c) Tubectomy (d) Copper-T

(Hint:It is done by doctors using surgical method)

SOME IMPORTANT DIAGRAMS

Fig. Binary fission in *Amoeba*.

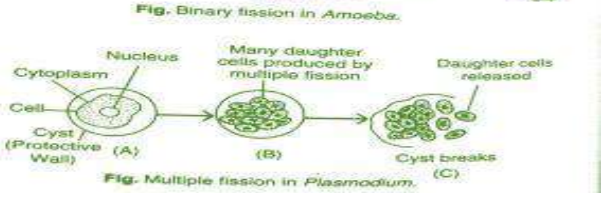


Fig. Multiple fission in *Plasmodium*.

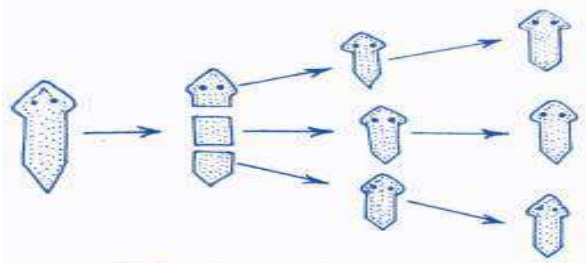


Fig. Regeneration in *Planaria*.

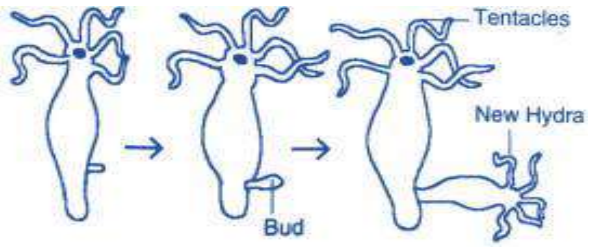


Fig. Budding in *Hydra*.

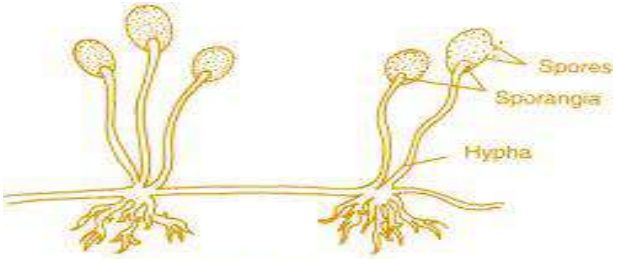
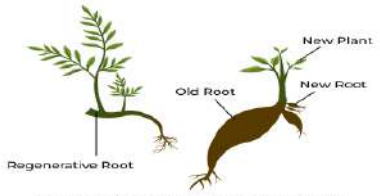
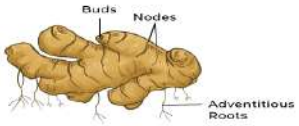


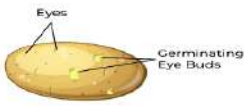
Fig. Spore formation in *Rhizopus*.



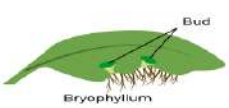
Root propogation (Sweet Potato)



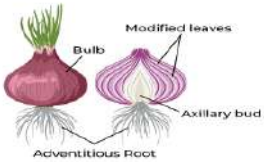
Rhizome (Ginger)



Tuber (Potato)



Leaf Bryophyllum



Bulb (Onion)

Runner (Oxalis)

Sucker (Mint)

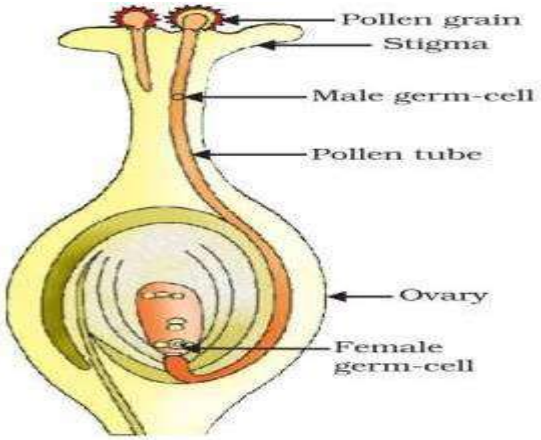


Figure
Germination of pollen on stigma

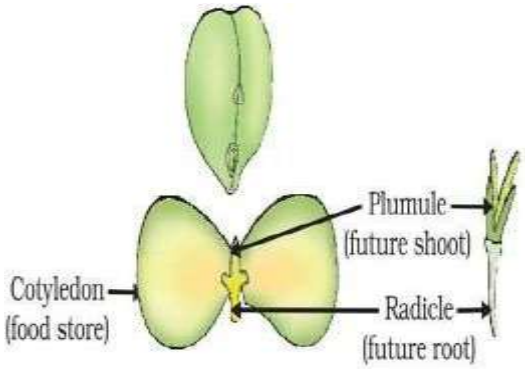


Figure
Germination

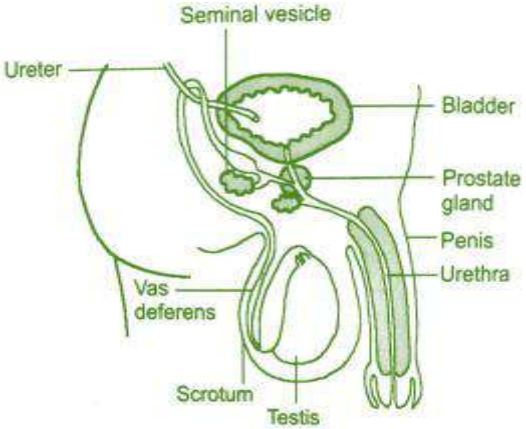


Fig. Diagram of a male reproductive system.

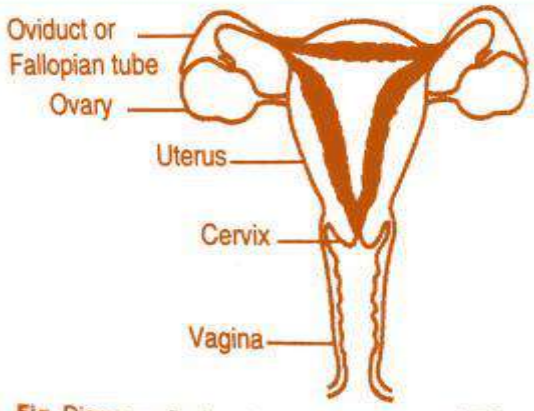


Fig. Diagram of a female reproductive system.

KEY CONCEPT

HEREDITY
Transmission of characters/traita from one generation to another

Variation
Difference in the character/trait shown by individuals of a species during reproduction

Traits
Trait and characteristics that are reliably inherited to next generation

Environmental Varition
Variation due to education, diet, chemicals , environment etc

Genetic variation
in population give rise to mutation (sudden inheritable change in gene),meiosis(reductional division which required for gameteformation) and sexual reproduction(fusion of gametes leading to variation in offspring

Aquired Traits(character)
Characteristics of an organisms that are not inheritable ex-language,art etc.they are not genetically controlled

Inhereted Traits
Characteristic of the organisms that are inherited (caused due to change in DNA)

Rules for inheritance of traits (Mendalism)
studied by G J mendel on pea plant factors (genes) are the carriers oftrait
1.Law of dominance
2.Law of Seegregation
3.Law of Independence

Sex Determination
A mechanism by which sex of new born is determined

Natural Sex Determination
Sex of the child is determined naturally.XY determination eg:humans/drosophila
XO determination eg:insects

Artifical sex Detemination
Modification of species by the process of selective breeding in order to produce a new strain of organism

Gene → Pair → Allele, Allele

Character / Trait

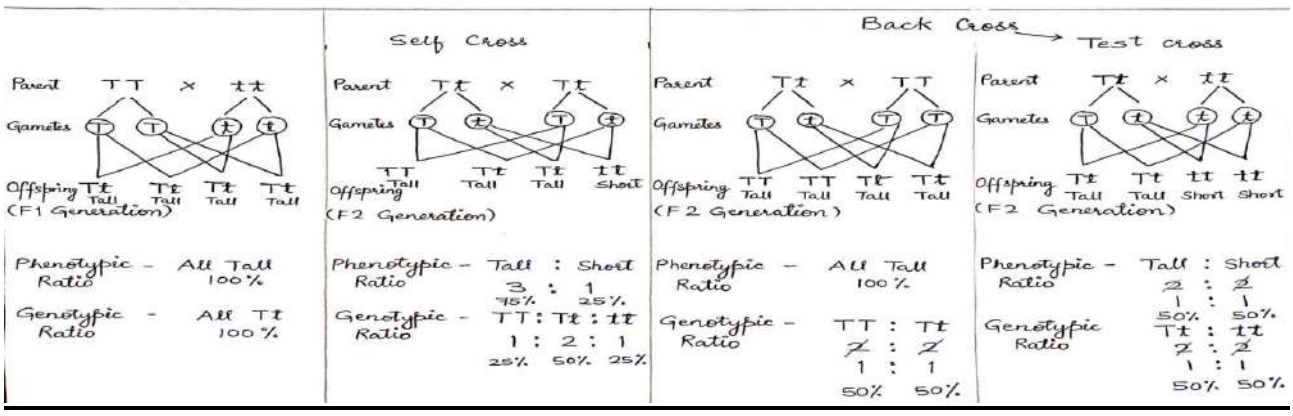
TT	Tt	tt	→ Genotype
Tall	Tall	Short	→ Phenotype

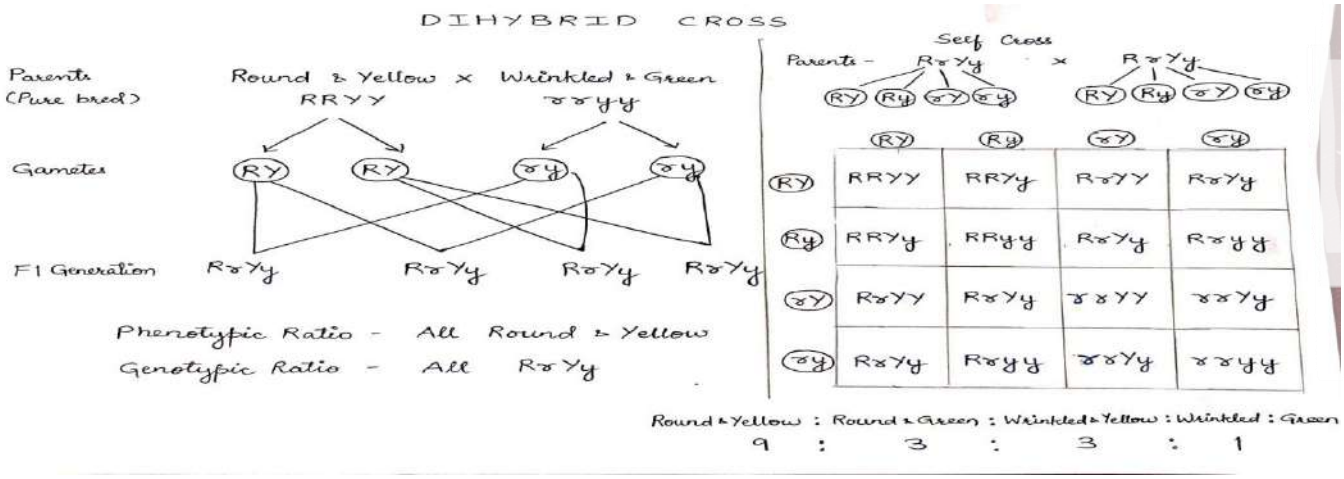
Allele → TT (Homozygous), Tt (Heterozygous), tt (Homozygous)

7 Contrasting characters	Dominant	Recessive
1. Plant height	Tall TT, Tt	Short tt
2. Seed colour	Yellow YY, Yy	Green yy
3. Seed shape	Round RR, Rr	Wrinkled rr
4. Pod colour	Green GG, Gg	Yellow gg
5. Pod shape	Inflated II, Ii	Constricted ii
6. Flower colour	Purple PP, Pp	White pp
7. Flower position	Axial AA, Aa	Terminal aa

Pure bred parents → Homozygous condition

MONOHYBRID CROSS





How do traits get expressed

Cellular DNA (Information source) → For synthesis of Proteins → Works efficiently More Hormone Produced → tallness of plants

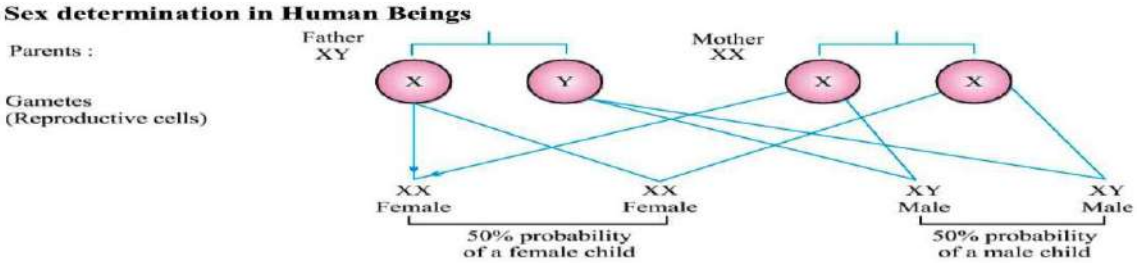
Therefore, genes control characteristics or trait

SEX DETERMINATION

Determination of sex of an offspring.

FACTORS Responsible for Sex Determination

Sex Chromosomes : In human beings, there are 23 pairs of chromosome. Out of these 22 chromosomes pairs are called autosomes and the last pair of chromosome that help in deciding gender of that individual is called sex chromosome.



This shows that half the children will be male and half will be female. All children will inherit an X chromosome from their mother regardless whether they are boys or girls. Thus, sex of children will be determined by what they inherit from their father, and not from their mother.

CHAPTER WISE QUESTION BANK

Multiple Answer Type Question (1 Mark Each)

1. The process where characteristics are transmitted from parent to offspring is called
(a) Variation (b) Heredity (c) Gene (d) Allele
(Hint**:** Think about the biological term that explains how traits pass from one generation to the next.)

2. Exchange of genetic material takes place in
(a) Vegetative reproduction (b)Asexual reproduction
(c)Sexual reproduction (d)budding
(Hint**:** Think about which type of reproduction involves the combination of genetic material from two parents, resulting in genetic variation)

3. The following results were obtained by a scientist who crossed the F1 generation of pure-breeding parents for round and wrinkled seeds

Dominants trait	Recessive trait	No. of F2 offspring
Round seeds	Wrinkled seeds	7524

From these results, it can be concluded that the actual number of round seeds he obtained was:
(a) 1881 (b) 22572 (c) 2508 (d) 5643

(Hint**:** In a monohybrid cross ($F_1 \times F_1$), the typical phenotypic ratio for dominant to recessive traits in F_2 generation is **3:1**.
Use this ratio to find how many out of 7524 offspring are **round** (dominant trait).)
4. In peas, a pure tall plant (TT) is crossed with a pure short plant (tt). The ratio of pure tall plants to pure short plants in F2 generation will be:
(a) 1 : 3 (b) 3 :1 (c) 1 : 1 (d) 2 : 1
(Hint**:** Start by crossing TT × tt to get the F_1 generation (all heterozygous tall, Tt).
Then, cross the F_1 (Tt × Tt) to get the F_2 generation.
Now count **only** the **pure genotypes** — TT (pure tall) and tt (pure short) — not the hybrids.)
5. What will be the number of chromosomes present in each gamete produced by the plants if the palisade cells of a species of plant contain 28 chromosomes in all?
(a) 56 (b) 28 (c) 14 (d) 4
(Hint**:** Palisade cells are **somatic (body) cells**, so they are **diploid** (2n = 28).
Gametes (sperm or egg cells) are **haploid**, meaning they contain **half** the number of chromosomes of body cells)
6. Choose the correct statement from the following codes:
I. Variation in plants are much lesser than human beings.
II. Each trait in child is influenced by only paternal DNA.
III. An individual having two different alleles for the same trait is called hybrid.
IV. Traits that are passed on from parents to their offspring are controlled by genes.
Codes
(a) I, II and III(b) I, III and IV(c) II, III and IV(d) I, II and IV

(Hint**: I:** Think about genetic variation — plants reproduce both sexually and asexually; is their variation really *less* than in humans?
II: Are traits influenced by **only the father's DNA** or by both parents?
III: Is someone with alleles like Tt or Bb (one dominant, one recessive) called a hybrid?
IV: What actually controls inherited traits?)

<u>Assertion-Reasoning</u>
Each of these questions contains two statements, Assertion (A) and Reason (R). Each of these questions also has four alternative choices, any one of which is the correct answer.
You have to select one of the codes (a), (b), (c) and (d) given below.
(a) Both A and R are true and R is the correct explanation of A
(b) Both A and R are true, but R is not the correct explanation of A
(c) A is true, but R is false
(d) A is false, but R is true
1. Assertion: Dominant allele is an allele whose phenotype expresses even in the presence ofanother allele of that gene.
Reason: It is represented by a capital letter, e.g. T.
(Hint**:** b) Both A and R are true, but R is not the correct explanation of A)
2. Assertion: Mendel self-crossed F1 progeny to obtain F2-generation.
Reason: F1 progeny of a tall plant with round seeds and a dwarf plant with wrinkled seeds are all dwarf plants having wrinkled seeds.
(Hint**:** c) A is true, but R is false)
3. Assertion: All the human female gemetes will have only X-chromosome.
Reason: Females are homogametic with two X-chromosomes.
(Hint**:** a) Both A and R are true and R is the correct explanation of A)
4. Assertion: The sex of a child will be determined by chromosome received from the father.
Reason: A human male has one X and one Y-chromosome.
(Hint**:** (a) Both A and R are true and R is the correct explanation of A)

Very short answer question (2marks)

1.If a pure tall plant is crossed with a pure dwarf plant, what will be the height of F1 and F2 generations?

(Hint: In F1 generation, all plants will be tall (heterozygous). In F2 generation, the ratio will be 3 tall:1 dwarf.

2.A hemophilic man marries a normal woman. Will their daughters be carriers or affected? Explain.

(Hint:The daughters will be carriers (XHXh) as they inherit the defective X from their father and a normal X from their mother.

3.A pure-breeding red flowered plant is crossed with a pure-breeding white flowered plant. The F1 generation has all red flowers. In F2 generation, some plants show white flowers. Explain the pattern of inheritance.

(Hint:This shows dominance of the red flower trait over white. The F1 are heterozygous (Rr), and in F2, the ratio of red to white is 3:1.

4.A child has attached earlobes (recessive trait) even though both parents have free earlobes (dominant trait). Explain how this is possible.

(Hint:Both parents are heterozygous (Ee) for the earlobe trait. The child inherited recessive alleles (ee) from both, resulting in attached earlobes.

5.Explain how traits get expressed. Use the example of a tall plant.

(Hint:Traits are expressed through genes on DNA.

Each gene has two alleles.

In a tall plant (Tt or TT), the gene for tallness (T) produces more growth hormone.

Short answer type question (3 marks)

Mother's Genotype: XNXc (Carrier)
Father's Genotype: XNY (Normal)

Punnett Square:

	XN	Xc
XN	XNXN	XNXc
Y	XNY	XcY

1.

Refer to the above cross between a carrier mother (XNXc) and a normal father (XNY):

(a) What are the chances of their sons being colorblind?

(b). What are the chances of their daughters being carriers?

(c.) Explain why colorblindness is more common in males.

(Hint: a)

b). There is a 50% chance that daughters will be carriers (XNXc).

c.) Males have only one X chromosome; the presence of a single recessive allele (Xc) results in the expression of colorblindness. Females have two X chromosomes, so a single recessive allele does not result in the condition.)

Diagram:
(Cross between RrYy × RrYy)

	RY	Ry	rY	ry
RY	RRYY	RRYy	RrYY	RrYy
Ry	RRYy	RRyy	RrYy	Rryy
rY	RrYY	RrYy	rrYY	rrYy
ry	RrYy	Rryy	rrYy	rryy

2.

Question (a) How many phenotypes are observed in the F2 generation?

(b) Write the phenotypic ratio.

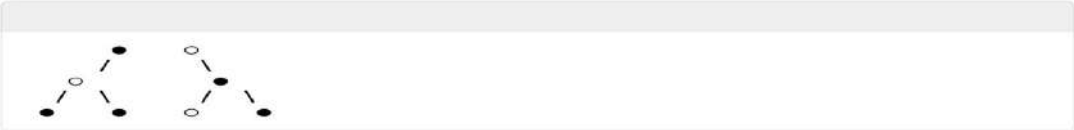
(c) Explain what this cross demonstrates about inheritance.

a) Four phenotypes: round yellow, round green, wrinkled yellow, wrinkled green.

b) Phenotypic ratio: 9:3:3:1.

c) This demonstrates independent assortment of genes.
3.State one difference between dominant and recessive traits with an example.
(Hint:
Dominant trait: Expressed even if one allele is present (e.g., round seeds in pea).
Recessive trait: Expressed only when both alleles are recessive (e.g., wrinkled seeds in pea).

4. Look at the family tree below, showing an inherited trait:

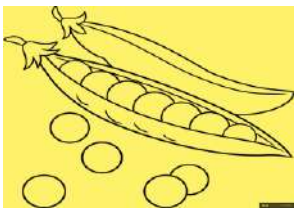


The shaded circles and squares represent individuals with the trait.

a) If this trait is recessive, what can you say about the parents in generation II?
b) Explain why some children have the trait while parents do not.

(Hint:a) Parents in generation II are carriers (heterozygous).
b) Because they each carry one recessive allele, the children can inherit two recessive alleles and express the trait.

<u>Long answer type question (5 marks)</u>

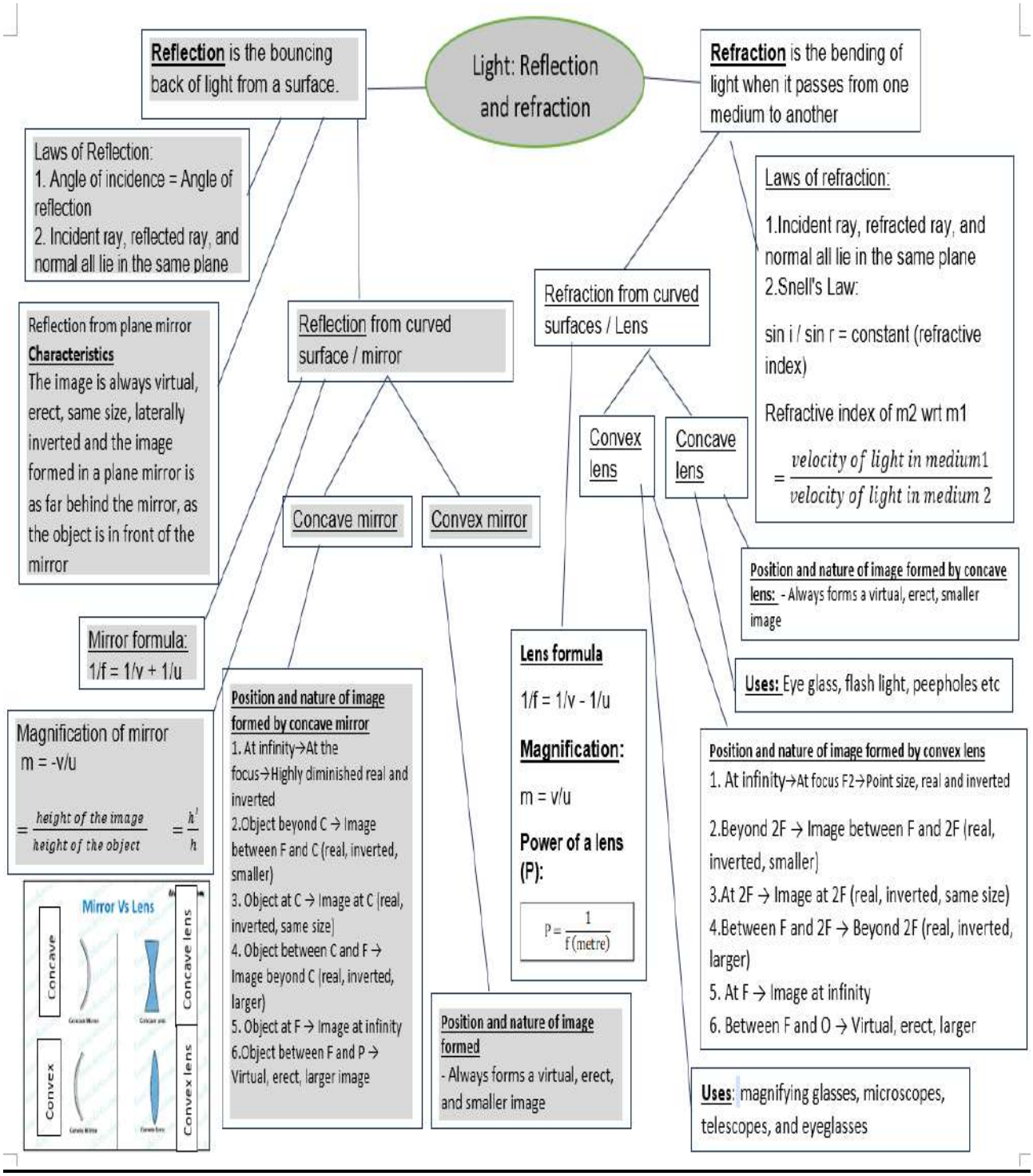


1.Mendel conducted a dihybrid cross with pea plants (seed shape and seed color).
(a) Draw the Punnett square for the cross of round yellow (RRYY) × wrinkled green (rryy).
(b) State the phenotypic ratio of F2 generation.
(c) Name the law Mendel concluded from this cross.
(Hint :Hint:Think of the combinations of RY, Ry, rY, and ry gametes. Recall the 9:3:3:1 ratio and the Law of Independent Assortment.
2.Explain how the principles of heredity can help predict outcomes in genetic crosses.
(a) State Mendel's laws of heredity.
(b) Give an example of a genetic cross and predict the outcome.
(c) How can Punnett squares help in this process?
(Hint:Think of Law of Segregation and Law of Independent Assortment. Use a simple example like Tt x Tt.

<u>Case study question (4marks)</u>

1*. A human family's pedigree chart shows the inheritance of a recessive genetic disorder (shaded shapes indicate affected individuals). The father is normal, and the mother is a carrier for the disorder.*
A).What will be the genotype of the heterozygous parents?
(a) BB (b) Bb (c) bb (d) BBbb
(Hint: Recall that heterozygous means having two different alleles for a trait — one dominant and one recessive.)
B).What is the expected phenotypic ratio of brown to blue-eyed flies in the next generation?
(a) 1:1 (b) 3:1 (c) 1:2:1 (d) 9:3:3:1
(Hint: Consider a simple Mendelian inheritance where brown eye color is dominant over blue eye color. Think about the cross between two heterozygous parents)
C)What is the probability of getting a blue-eyed fly if 100 offspring are produced?
(a) 25% (b) 50% (c) 75% (d) 0%
(Hint: Blue eyes are recessive, so they appear only when the fly inherits two recessive alleles (bb). Think about the offspring ratio from parents who are both heterozygous (Bb).)
D).Which Mendelian law explains the segregation of the two alleles (B and b)?
a) Law of Dominance b) Law of Segregation
c) Law of Independent Assortment d) Law of Variation(Hint: This law states that during the formation of gametes, the two alleles for a trait separate so that each gamete carries only one allele.)
2.*In a pea plant, the allele for green pods (G) is dominant over the allele for yellow pods (g). A heterozygous green pod plant is crossed with a yellow pod plant.*

A).What are the genotypes of the parents?
(a) GG ×gg (b) Gg ×gg (c) GG × GG (d) gg × gg
(Hint: Think about how dominant and recessive alleles combine in parents to produce different offspring genotypes.)
B).What is the expected phenotypic ratio of green to yellow pods in the offspring?
(a) 1:1 (b) 3:1 (c) 9:3:3:1 (d) 1:3
(Hint: Consider a monohybrid cross where green pod color (G) is dominant over yellow pod color (g). Think about the ratio when two heterozygous plants (Gg × Gg) are crossed.)
C).What percentage of offspring will have green pods?
(a) 25% (b) 50% (c) 75% (d) 100%
(Hint: Green pods (G) are dominant over yellow pods (g). If two heterozygous plants (Gg × Gg) are crossed, think about how many offspring will show the dominant green pod trait.)
D).What percentage of offspring will have yellow pods?
a) 0% b) 25% c) 50 d) 75%
(Hint: Yellow pods are recessive (gg). Consider a cross between two heterozygous green pod plants (Gg × Gg) and how many offspring inherit the recessive trait.)
E).Which law applies to the inheritance of pod color?
a) Law of Segregation b) Law of Dominance
c) Law of Independent Assortment d) Law of Variation
(Hint: This law explains how pairs of alleles separate during gamete formation so that each gamete carries only one allele.)



Summary

- Light is a form of energy that enables us to see objects. It travels in a straight line. The chapter covers two main phenomena: Reflection and Refraction.
- **Reflection** is the bouncing back of light from a surface.
- **Refraction** is the bending of light when it passes from one medium to another due to a change in its speed.

- Reflection of Light
- **Laws of Reflection**:
  1. Angle of incidence = Angle of reflection

2. Incident ray, reflected ray, and normal all lie in the same plane
Types:
- Regular Reflection: From smooth surfaces like mirrors
- Diffused Reflection: From rough surfaces

❖ **Characteristics of image formed by a plane mirror:**
The image is always virtual, erect, same size, laterally inverted and the image formed in a plane mirror is as far behind the mirror, as the object is in front of the mirror

Spherical Mirrors

Types: Concave (converging) and **Convex** (diverging)

Important terms:
Pole (P): The pole of spherical mirror is the centre of the mirror.
Center of Curvature (C): The center of curvature of a spherical mirror is the centre of the hollow sphere of glass of which the spherical mirror is a part.
Focus (F): The principal focus of a concave mirror is a point on its principal axis to which all the light rays which are parallel and close to the axis, converge after reflection from the concave mirror
Radius of Curvature (R): It is the radius of the hollow sphere of glass of which the spherical mirror is a part.

Mirror Formula: 1/f = 1/v + 1/u
Magnification (m): magnification $= \frac{-distance\ of\ image}{distance\ of\ object}$ m = -v/u
It can also be expressed as ratio of the height of the image (*h*') to the height of the object (*h*).

$$m = \frac{height\ of\ the\ image}{height\ of\ the\ object} = \frac{h'}{h}$$

Uses:
- Concave: Reflectors, dentist mirrors
- Convex: Rear-view mirrors, vigilance mirror in shops

Refraction of Light

Laws of Refraction:
1. Incident ray, refracted ray, and normal all lie in the same plane
2. Snell's Law: sin i / sin r = constant (refractive index)

Light bends towards the normal in denser medium and away in rarer medium.

Refraction by Lenses
Types: Convex (converging) and Concave (diverging)
Lens Formula: 1/f = 1/v - 1/u
Magnification: *m* = v/u
Power of a lens (P): The ability of a lens to converge or diverge is expressed in term of power of lens. Its **unit** is **Dioptre (D)** It is reciprocal of focal length of lens in metre

$$\mathbf{P = \frac{1}{f\ (metre)}}$$

One dioptre is the power of a lens of focal length of one metre.

Power of combination of lens P =P1 +P2+P3+ ……..

Uses of lens: Spectacles, magnifying glass, cameras, microscopes.

Ray Diagrams Summary

Concave mirror:

Sl.No.	**Position of the object**	**Position of image**	**Size and Nature of image**
(a)	At infinity	At the focus	Highly diminished (point size) real & inverted
(b)	Beyond C	Between F and C	Diminished, real and inverted
(c)	At C	At C	Same size, real and inverted
(d)	Object between C & F	Image beyond C	Enlarged, real and inverted
(e)	Object at F	Image at infinity	Highly enlarged, real and inverted
(f)	Object between F & P	Behind the mirror	Enlarged, Virtual and erect

Convex Mirror:

	Position of the object	Position of image	Size and nature of image
(a)	At infinity	At the focus F, behind the mirror	Highly diminished (point-sized), virtual and erect
(b)	Between infinity and the pole P of the mirror	Between P and F, behind the mirror	Diminished, virtual and erect

Image formed by concave mirror

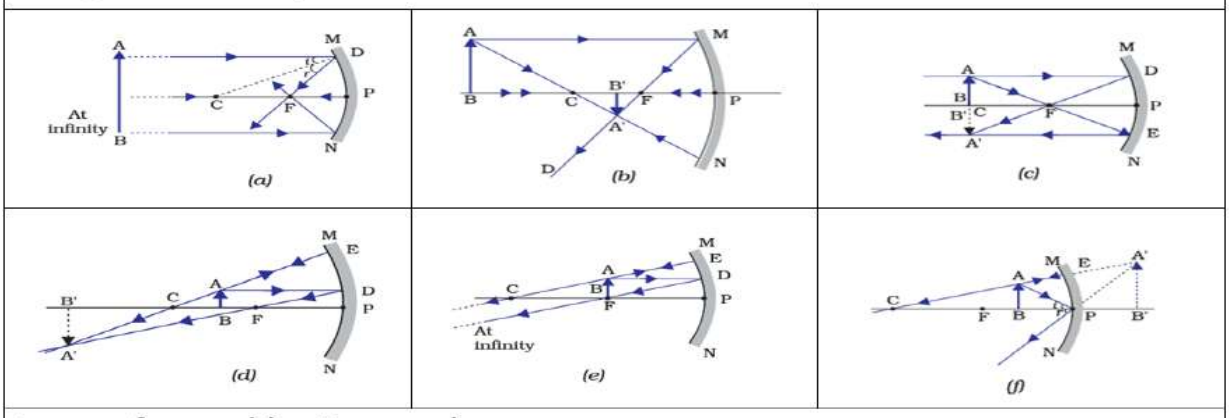
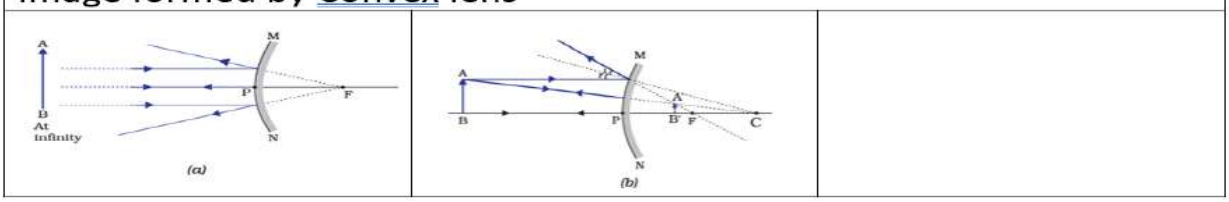


Image formed by Convex lens

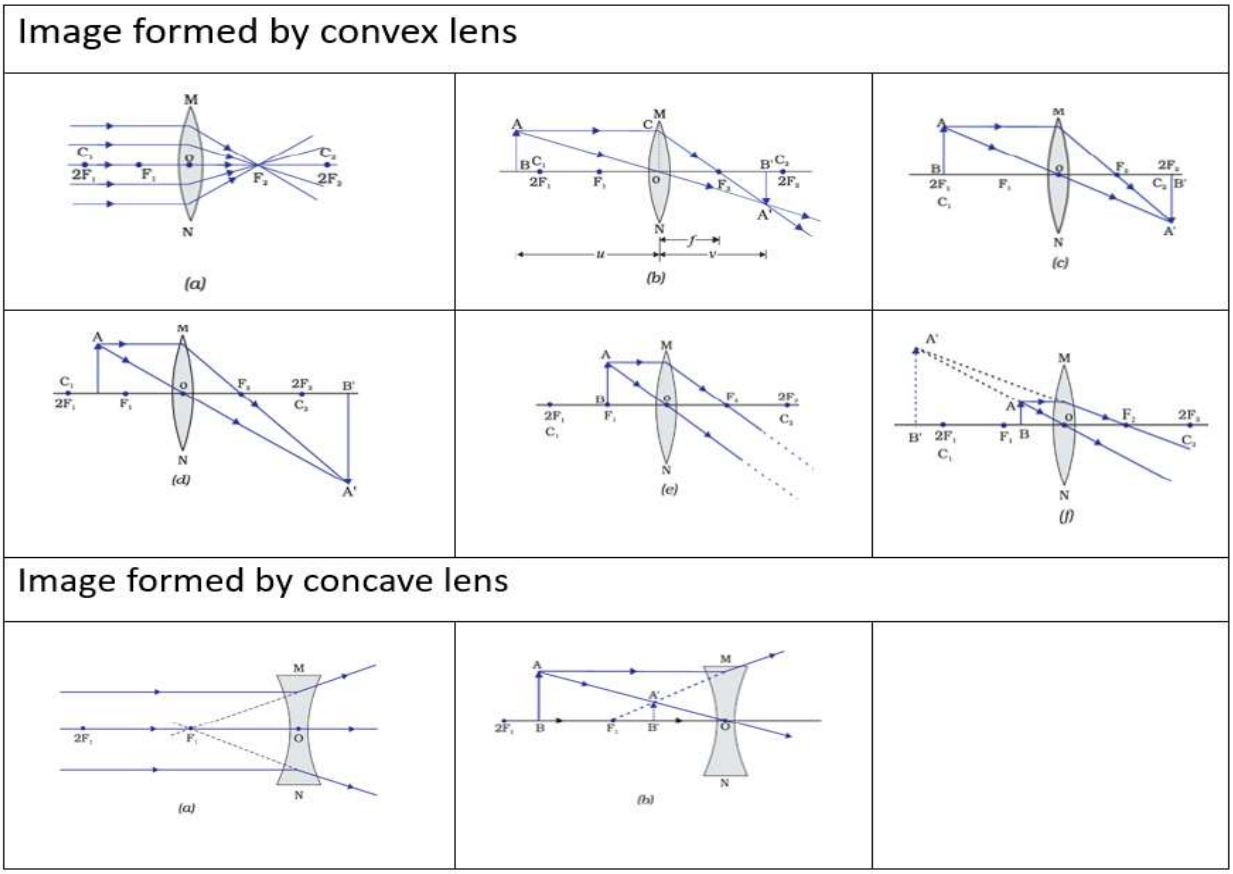


Convex Lens:

Sl. No.	Position of the object	Position of image	Size and nature of image
(a)	At infinity	At focus F2	Highly diminished (point-sized), Real and inverted
(b)	Beyond 2F1	Between F2 and 2F2	Diminished, Real and inverted
(c)	At 2F1	At 2F2	Same size, Real and inverted
(d)	Between F1 and 2F1	Beyond 2F2	Enlarged, Real and inverted
(e)	At focus F1	At infinity	Infinitely large, Real and inverted
(f)	Between focus F1 and optical centre O	On the same side of the lens	Enlarged, **virtual and erect**

Concave Lens:

	Position of the object	Position of image	Size and nature of image
(a)	At infinity	At focus F1	Highly diminished (point-sized), virtual and erect
(b)	Between infinity and the pole P of the mirror	Between focus F1 and optical centre O	Diminished, virtual and erect



CHAPTER WISE QUESTION BANK

Multiple choice questions (1 mark Each)

Q1.A student places a candle 15 cm in front of a concave mirror of focal length 10 cm. Where will the image be formed?

(a) 30 cm behind the mirror (b) 15 cm in front of the mirror
(c) 30 cm in front of the mirror (d) At the focus

(Hint: (Use mirror formula: 1/f = 1/v + 1/u → v = 30 cm)

Q2. A driver notices that the image of a car behind appears smaller and upright in his mirror. What kind of mirror is being used?

(a). Concave (b)Convex
(c). Plane (d) Cylindrical

(Hint: It is a converging mirror)

Q3. A pencil partially dipped in water appears bent. Which of the following explains this phenomenon?

A. Reflection of light C. Dispersion of light
B. Absorption of light D. Refraction of light

(Hint: It is shown by glass slab)

Q4. An optician uses a lens that forms a virtual, erect, and magnified image of letters when reading. What kind of lens is it?

A. Concave lens C. Plane lens
B. Convex lens D. Diverging lens

(Hint: It is a converging lens)

Q5. A ray of light bends more when entering glass than when entering water. What does this tell you about the refractive index?

A. Water has higher refractive index C. Both have equal refractive indices
B. Glass has higher refractive index D. Light travels faster in glass than in water

(Hint: . Glass has higher refractive index)

Q6. Raman uses a lens to focus sunlight onto a piece of paper and it starts to burn. What type of lens is he using?

A. Concave lens
B. Convex lens
C. Cylindrical lens
D. Plane glass

(Hint: It is a converging lens)

Assertion and Reason Questions:

Options:

A. Both A and R are true, and R is the correct explanation of A.
B. Both A and R are true, but R is not the correct explanation of A.
C. A is true, but R is false.
D. A is false, but R is true.

Q7.Assertion (A): A concave mirror can form both real and virtual images.
Reason (R): A concave mirror converges parallel rays to a single point.
(Hint: A Both A and R are true, and R is the correct explanation of A.)

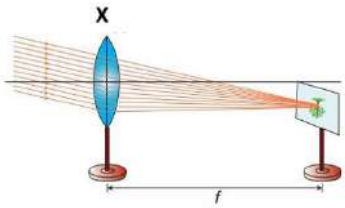
Q8.Assertion (A): The image formed by a convex mirror is always virtual and erect.
Reason (R): A convex mirror diverges rays and they appear to come from a point behind the mirror.
(Hint: A Both A and R are true, and R is the correct explanation of A.)

Q9.Assertion (A): When light enters from air to glass, it bends towards the normal.
Reason (R): Glass is a rarer medium than air.
(Hint: C (Reason is incorrect – glass is a denser medium than air)

Q10.Assertion (A): The magnification produced by a concave mirror is always negative.
Reason (R): The image formed by a concave mirror is always real and inverted.
(Hint: D (Magnification is positive when the image is virtual, so A is false, R is also false sometimes)

Very Short Answer Questions: (2 Marks Each)

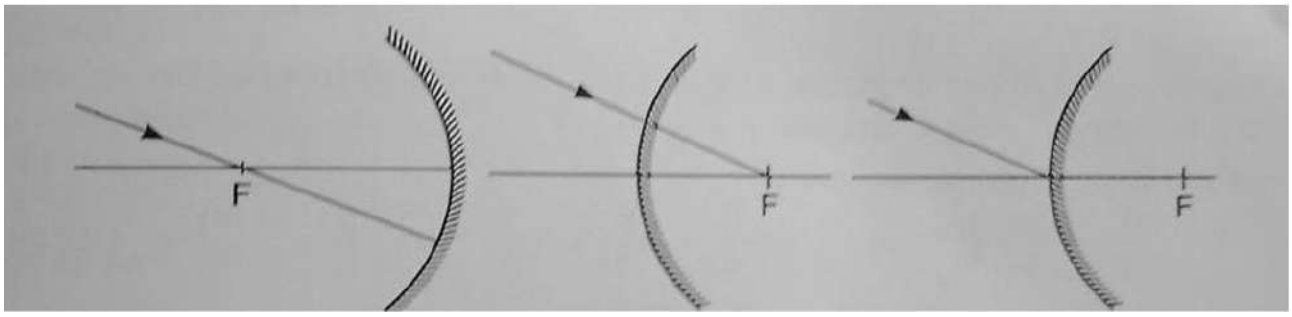
11. Draw a ray diagram showing the path of rays of light when it enters with oblique incidence
(i)from air into water; (ii) from water into air.
(Hint: Refer contents)
12. Write two properties of image formed by a plane mirror?
(Hint: The image is always virtual, erect, same size, laterally inverted and the image formed in a plane mirror is as far behind the mirror, as the object is in front of the mirror)
13. A student determines the focal length of a device X, by focusing the image of a far off object on the screen positioned as shown in the figure below: a. Identify this device X. Explain the nature of the image obtained on the screen.
(Hint:These lens are used in Hypermetropia)



14. Sarita finds out that the sharp image of the window pane of her science laboratory is formed at a distance of 15 cm from the lens. She now tries to focus the building visible to her outside the window instead of the window pane without disturbing the lens.
a) In which direction will she move the screen to obtain a sharp image of the building?
b) What is the approximate focal length of this lens?
(Hint: Refer contents)
15. Find the focal length of a lens of power 2D also write the type of lens.
Hint: P=1/f (metre), +ve sign indicates convex lens and -ve sign indicates concave lens

Short Answer Questions: (3 Marks Each)

16. Complete the following diagram in which a Ray of light is incident on a concave and convex mirror on your answer sheet. Show the path of this Ray after reflection in each case.



17. A candle is kept at a distance of 20cm in front of a concave mirror of focal length 10cm.

(i) Find the position of the image

(ii) Find the magnification also

(Hint hint: Use mirror and magnification formula.

18. During a science exhibition a student wants to project the image of a candle flame on a screen 80 cm in front of a mirror by keeping the candle flame at a distance of 20 cm from its pole.

(i) Which type of mirror should the student use?

(ii) Find the distance between the object and its focus.

(iii) Find the magnification of the image produced.

19. A student of class X placed the object in front of a convex lens at different distance from it and recorded the image distance as per the given data in the following table.

Sl No.	Object distance 'u' in cm	Image distance 'v' in cm
1	-60	+12
2	-30	+15
3	-20	+20
4	-15	+30
5	-12	+60
6	-9	+90

Read the above paragraph and answer the following questions.

(a) Find the focal length of the convex lens.

(b) At which of the position of the object from the lens, image formed by the above convex lens will be real, inverted and magnified.

(c) Can a convex lens can be used a magnifying glass? State the reason.

Long Answer Questions: (5 marks)

20.(a) Draw a ray diagram to show the image formation by a concave mirror when the object is placed between the pole (P)and the focus (F). State the nature, size, and position of the image formed.

(b)An object is placed at a distance of 20 cm from a convex lens of focal length 10 cm. Find the position and nature of the image using the lens formula.

(Hint:

(a)Diagram: (Student should draw a concave mirror with object between P and F)

Image Characteristics:

Nature: Virtual and erect, Size: Enlarged, Position: Behind the mirror

(b)Given:

u = –20 cm, f = +10 cm

Using lens formula:

$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$ $\quad \frac{1}{10} = \frac{1}{v} - \frac{1}{20}$ $\quad \frac{1}{v} = \frac{3}{20}$ $\quad v = 20cm$

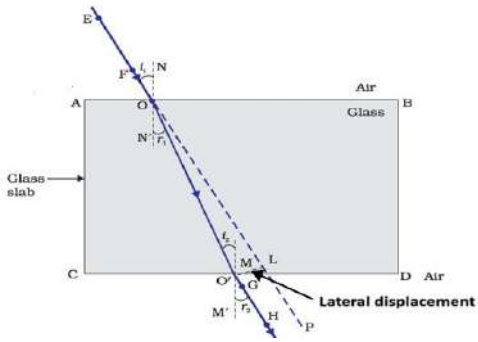
Image Position: 20 cm on the other side of the lens
Nature: Real, inverted, and same size

Q21.A person got his eyes tested by an optician. The prescription for the spectacle lenses to be made reads : Left eye : + 2.50 D Right eye : + 2.00 D
(a) State whether these lenses are thicker in the middle or at the edges.
(b) Find out the focal length of each lens.
(c) Which lens bends the light rays more strongly?
(d) State whether these spectacle lenses will converge light rays or diverge light rays.
Hint: take reference of lens, use formula for power of lens, meaning of power

<u>Case-Based Question</u>

Q22: During an experiment, Meena passes a ray of light through a rectangular glass slab placed on a white sheet. She traces the path of the light ray and notices that the emergent ray is parallel to the incident ray but slightly shifted sideways. This sideways shift is called lateral displacement.

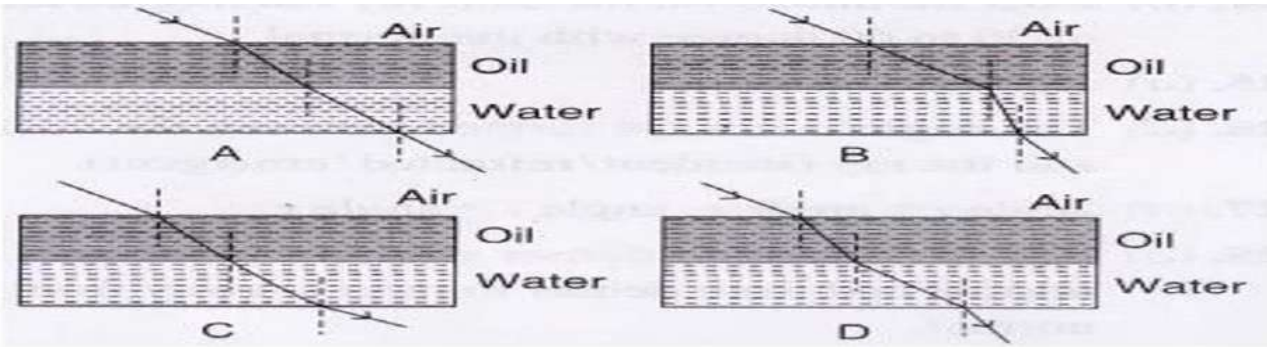
1. What happens to the light ray when it enters the glass slab from air?
2. Why does the emergent ray shift sideways even though it is parallel to the incident ray?
3. What is the name of the angle between the incident ray and the normal at the point of incidence?



Hint :

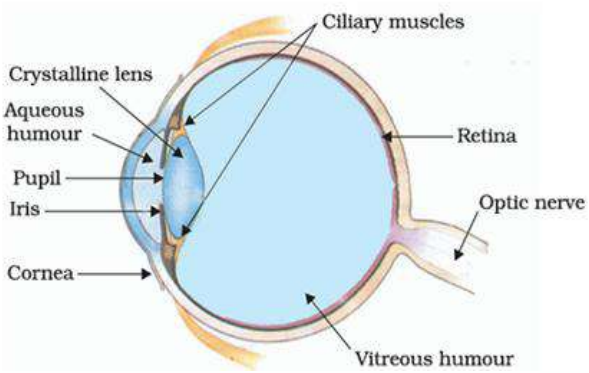
1. The light ray bends towards the normal when it enters the glass slab from air due to refraction.
2. The emergent ray shifts sideways due to refraction at both air-glass and glass-air surfaces. This is called lateral displacement.
3. The angle is called the angle of incidence.

Q23: (a)Choose the correct path of a ray of light passing from air to kerosene oil and from kerosene oil to water is (a)A (b). B (c). C (d). D
(b) State Snell's Law.
(c)Give reason why refractive index has no unit.



Sl No	Parts of eye	Functions
1	Cornea	Refracts light rays
2	Pupil	regulates and controls the amount of light Figure 11.1 The human eye entering the eye
3	Iris	controls the size of the pupil
4	Ciliary muscle	Controls the thickness of lens hence help in accommodation
5	Crystalline lens	Fine adjustment of focal length
6	Retina	Sensory receptors for sight
7	Optic nerve	Transmits electrical impulse to the brain

Structure of human eye



The ability of the eye lens to adjust its focal length is called **power of accommodation**.

Far point and near point of eye: The farthest point that a normal eye can see any object clearly is infinity and the nearest point is 25cm (Least Distance of Distinct Vision or LDDV)

Defects of vision and their correction

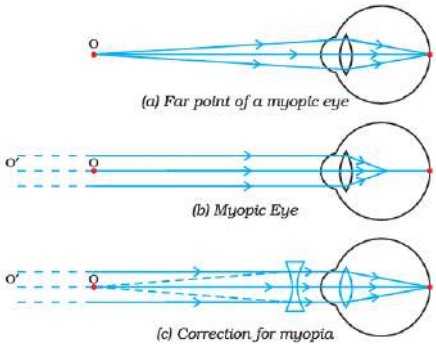
(i) **Myopia (short-sightedness)**: A person can see nearby object clearly but can't see distant object clearly.

Causes (i) excessive curvature of lens or decreased focal length.

(ii) elongation of eye ball

The image is formed in front of retina.

It can be corrected by using concave lens.



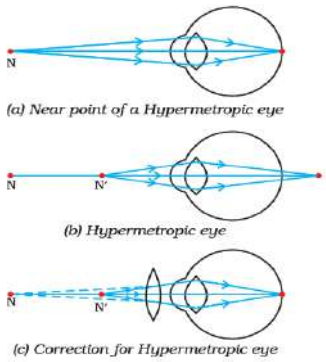
(ii) **Hypermetropia (far-sightedness)**: --A person can see distant object clearly but can't see nearby object clearly.

--Cause: (i) Shortening of eye ball.

(ii) increase in focal length of lens or decrease in power of lens.

--The image is formed behind the lens.

--This defect can be corrected by using convex lens.

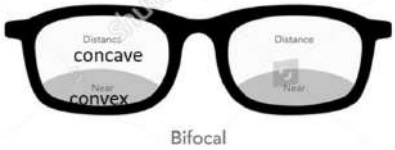


(iii) **Presbyopia** : --This defect is caused during old age.

-- In this defect the ciliary muscles weakens and decreases the power of accomodation and unable to see nearby objects clearly.

--Sometime old people unable to see narby as well as distant object clearly.

--The defect can be corrected by **bifocal lens**.

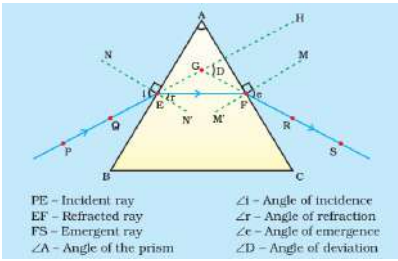


Refraction through Prism:

When a ray of white light passes through a glass prism then it refract twice and deviates from its normal path'

The angle to which it enters the prism is called angle of incidence ( )

The angle to which it deviates from its normal path is called angle of deviation (D).

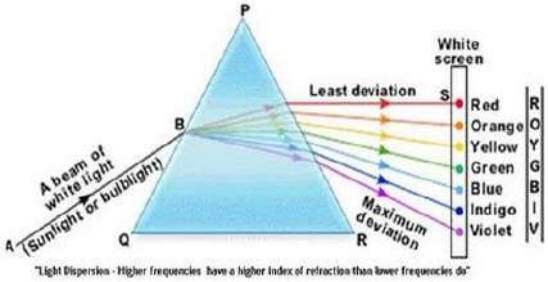


Dispersion of whilte light by a glass prism

When a beam of white light passes through a prism it get refracted twice and finally the white light split into a band of seven colour or visible spectrum. This splitting of light into seven colour is called dispersion of light.

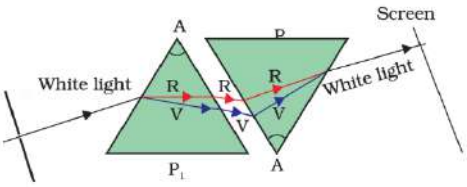
Different colours of light bend through different angles with respect to the incident ray, as they pass through a prism.

The red light bends the least while the violet the most.



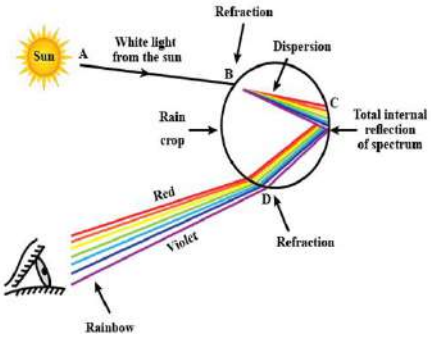
Recombination of the spectrum of white light

Sir Issac Newton tried to find out that whether the spectrum obtained by prism are further split into more colour he kept one prism upright and other inverted and passed white light but he failed to split further instead he found that the seven colour unite to form white light again, which suggest that white light consist of seven colour.

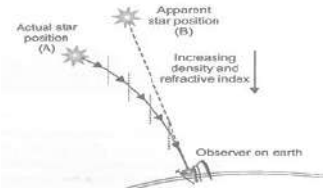


<u>Formation of rainbow</u>

- Rainbow is a band of seven colours or natural visible spectrum which is formed just after the rain shower.
- The suspended tiny water droplets in air act as prism, when light passes through these tiny droplets then it **refracted** and **dispersed** and finally suffers **total internal reflection** results in formation of band of seven colours called rainbow
- Essential condition for observing a rainbow is that observer must stand with his back towards the sun



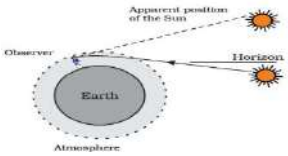
<u>Atmospheric refraction</u> (stars seen higher than they are, advance sunrise and delayed sunset, the sun appears flattened during sunrise and sunset, stars twinkle but planet do not.)



Stars seen higher than they are: Stars are very far away the light coming from space (vacuum, a rare medium) enters into the earth's atmosphere (denser medium) after several refraction the stars appear backward

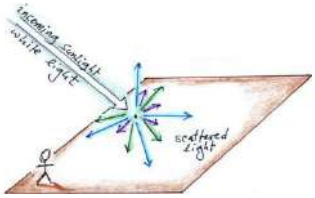
Advance sunrise and delayed sunset

During sunrise and sunset sunlight coming from lower atmospheric density to higher density due to which refraction takes place and light appears to be coming from above the horizon level than the actual position of the sun.



Sun appears flattened during sunrise and sunset: Due to unequally bending of light from lower and upper part of sun during sunrise or sunset, it appears oval.

Stars twinkle but planets do not: Stars are very far away from the earth and act as a point source of light. The light coming from the star reaching our eyes increases and decrease continuously due to earth's atmospheric refraction hence appears twinkling. Whereas planets are closer to the earth and act as large number of point sources. The total variation in the amount of light entering our eye from all the point sized source will average out to zero.



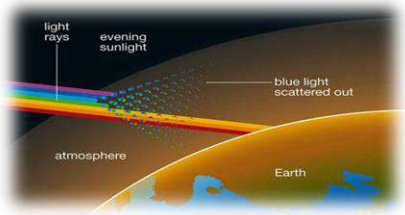
<u>Scattering of light:</u> When a beam of light encounter any suitable size of particle then the particle redirects the direction of light in different direction, which illuminates the surrounding.

The phenomenon of scattering of light by the colloidal particles like smoke, tiny water droplets, suspended particles of dust and molecules of air of atmosphere gives rise to **Tyndall effect.** Ex: Light passing through canopy, dark room with dust, light through colloid.

Why is the colour of the clear Sky Blue?: When sunlight passes through the atmosphere, the fine particles in air scatter the blue colour (shorter wavelengths) more strongly than red. The scattered blue light in atmosphere enters our eyes and sky looks blue.

Why space looks dark for astronauts: The sky appears dark to passengers flying at very high altitudes, due to absence of atmosphere, scattering is not prominent at such heights.

Reddish appearance of the Sun at the sunrise or sunset: Near the horizon light has to travel longer distance and most of the blue light and shorter wavelengths are scattered away by the particles. Therefore, the light that reaches our eyes is of red colour having longer wavelengths which do not scatter completely. This gives rise to the reddish appearance of the Sun during sunrise and sunset.



CHAPTER WISE QUESTION BANK

Multiple Choice Questions (1 Mark Each)

Select and write one most appropriate option.

Q1. An eye specialist suggested his patient to wear a lens of power -0.5D. Which defect of eye the patient was suffering

(a) Hypermetropia (b) Myopia (c) Presbyopia
(b) (d) Astigmatism

(Hint:It is also known as shortedness)

Q2. What is the farthest point up to which the eye can see clearly?

(a) 25 cm (b)1m (c) Infinity (d) 25cm

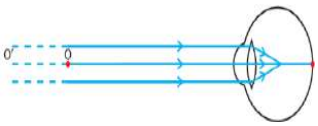
(Hint:No limit)

Q3. Which colour of light deviates the least after passing through a prism

(a) Violet (b) Blue (c) Green (d) red

(Hint:Used for stopping vehicle at traffic)

Q4. Look at the ray diagram of a defective eye and name the defect of the eye



(a) Myopia (b) Hypermetropia (c) Presbyopia
(d) colour blindness

(Hint:It is also known as shortsightedness)

Q5. Which phenomenon of light gives rise to Tyndall effect

(a) Dispersion (c)Scattering
(b) Reflection (d) Refraction

(Hint: It is done by particles of colloid solution)

Q6. Which of the following statement is not correct

(a) Tyndall effect is due to scattering of light
(b) Splitting of light when it passes through a prism is due to dispersion of light
(c) Twinkling of light is due to atmospheric refraction of light
(d) Formation of rainbow is due to reflection of light

(It is seen in the sky after rain)

ASSERTION REASON QUESTIONS

Directions for the question 7 to 10: In each of the questions given below, there are two statements marked as Assertion (A) and Reason (R). Mark your answer as per the codes provided below:

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

Q7. Assertion: When a ray of white light passes through a prism, it split into its seven-colour components

Reason: Different colours of light bend through different angles with respect to the incident ray, as they pass through a prism.

Ans: (a) Both A and R are true and R is the correct explanation of A.

Q8. Assertion: Hypermetropia is due to increase in focal length of eye lens.

Reason: Due to increase in focal length the rays coming from the object meet before retina.

Ans hint: due to increase in focal length the rays meet or image is formed behind the retina.

Q9. Assertion: Planets twinkle but stars do not.

Reason: Twinkling of stars is due to atmospheric refraction

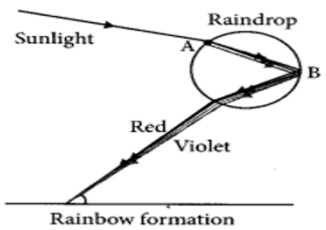
Hint: Twinkling of stars is due to atmospheric refraction

Q10. Assertion: The colour of the sun looks reddish during sunrise and sunset

Reason: The red colour has longest wavelength and scatter less in the atmosphere and able to reach to the observer's eye

Hint: (a) Both A and R are true and R is the correct explanation of A

Very Short Answer Questions (2 Marks Each)



Q11. A rainbow is a natural spectrum caused by dispersion of sunlight by tiny water droplets, present in the atmosphere.
Name the phenomenon that takes place at Point A and point B.

Q12. Archana's grandfather is not able to see the distant objects as well as nearby objects clearly.

(i) From which defect of eye, he is suffering from.
Hint: Presbiopia

(ii) What is the cause of this defect and what type of spectacle can correct this defect.
Hint: Bifocal lens

Q13. Gautam's doctor advised him to wear spectacle of power 4D.

(i) Calculate the focal length of the lens of the spectacle.
Hint: P=1/f

(ii) From which defect of eye he is suffering from.
Hint: +ve sign indicates convex lens and -ve sign indicates concave lens

Q14. Why it takes some time to see objects clearly when we enter a dark room from bright sunny day outside?

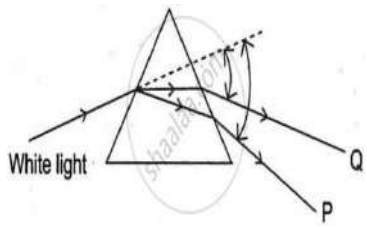
Hint: Accommodation of eye

Q15. Why stars appear twinkling but planets do not?

Hint: Atmospheric refraction

Short Answer questions: (3 Marks Each)

Q16. In the given diagram a beam of white light passed through a glass prism which split into band of seven colours with lower colour P and upper colour Q



(i) Name the phenomena.
Hint: Dispersion of light

(ii) State the colour P and Q.
Hint: Acronym VIBGYOR

(iii) Why do different colours bend at different angles when it passes through prism?
Hint: Refractive index of the prism material varies with the wavelength of light

Q17. Draw the path of light ray passing through a prism and label the angle of incident and angle of deviation
Hint: Refer to content

Q18. Name the phenomena involved in the formation of rainbow. What are the essential conditions for the formation of rainbow?
Hint: A natural spectrum, phenomena involved are refraction, dispersion and total internal reflection, Essential condition: observer must stand with his back towards the sun.

Q19. Write the expression for power of a lens. State its unit. What does its sign '+ve' and '– ve' indicate?
Hint: The ability of a lens to converge or diverge, p=1/f,unit- Dioptre (D), +ve sign indicates convex lens and -ve sign indicates concave lens.

Long Answer Questions: (5 marks Each)

Q20. (a) "A lens can form a magnified erect image as well as magnified inverted image of an object placed in front of it". State the nature of this lens and draw ray diagrams to justify the above statement. Mark the positions of O,F and 2F in the diagram

(b) With the help of labelled ray diagram show
(i) Myopic eye
(ii) Correction to myopia using suitable lens

Hint: Refer to contents

Q21. A person uses spectacles of focal length of – 4m. (Answer any five question)

(i) Name the defect of vision he is suffering from
Hint: The negative sign in the focal length (-4m) indicates that the person has myopia (short-sightedness) and uses a concave lens to correct their vision.

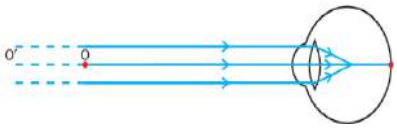
(ii) What type of lens is required to correct this defect ?

(iii) Hint: The negative sign in the focal length (-4m) indicates that the person has myopia (short-sightedness) and uses a concave lens to correct their vision.

(iv) What are the causes of of development of this defect ?
Hint:decreased focal length /elongation of eye ball

(v) What will be the power of the lens?
Hint:P=1/f(metre)

(vi) Draw a ray diagram of this defective eye.



Case based question:

Q22. Mr. Backson, a 55-year-old man, experiences difficulty seeing clearly, especially for reading. He is fade up by blurry vision at close distances, while distant objects appear relatively better. After examination, his eye doctor diagnosed that his eye lens has become less flexible and opaque.

Questions:

22.1. Based on Mr. Backson's symptoms and the doctor's findings, what eye condition is he likely experiencing?

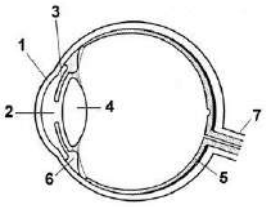
Hint: less flexibility and opaque lens is the symptom of cataract

22.2. According to the condition identified in question 1, Where does the light focus in the eye ?
Hint: In hypermetropia the rays meet beyond retina

22.3. Describe the role of the lens in the process of vision.
Hint: refraction takes place through lens and converge light

22.4. What is the remedial option for Mr Backson condition?
Hint: removal of cause of opacity or replacement of lens

Q23. Observe the given diagram of structure of eye and answer the questions based on it.



1. Name the parts 1,2,3 and 4 of the eye structure given above
   Hint: (1) maximum refraction takes place (2) Allows amount of light to enter into eyes
   (3) gives colour to eye (4) fine adjustment of image
2. From which part of eye maximum refraction takes place name that part also. (Hint: It is outermost part of eye)
3. What is the nature of the image formed at retina of the eye? (Hint:Real, inverted and smaller than the object)
4. Define power of accommodation. Which part of eye is responsible for this function?
   (Hint: The ability of the eye to focus both near and distant objects, by adjusting its focal length,)

Electricity is a form of energy used to run various electric appliances like fan, television, bulb, heater, motor etc.

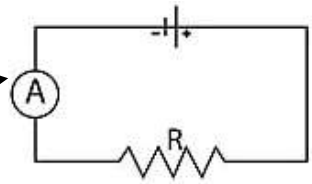
Electric current: Electric current is the rate of flow of charge through any conductor $I = \frac{Q}{t}$

Unit of current is Ampere, Smaller unit of current $1mA = 10^{-3}A$ $1\mu A = 1.6 \times 10^{-6}A$

1 ampere is equivalent to flow of 1 coulomb charge in 1 second

One coulomb charge $= 6 \times 10^{18}$ electrons

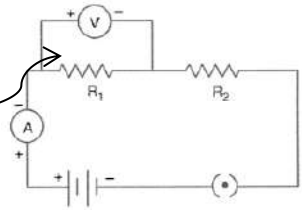
An electron possesses –ve charge of $= 1.6 \times 10^{-19}C$



Ammeter A device used to measure current, it is always connected in series of the circuit

Electric potential: The electric potential at appoint in an electric field is defined as the work done in moving a unit positive charge from infinity to that point.

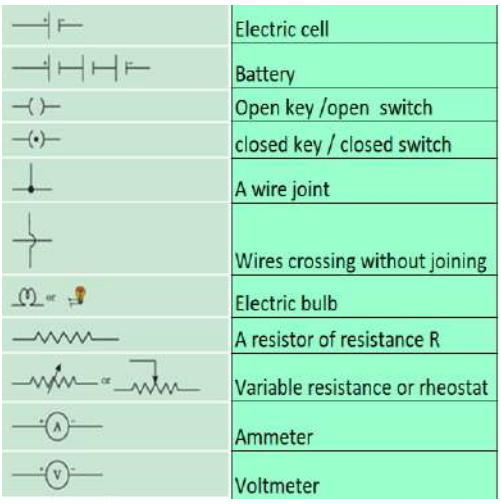
Potential difference: The difference in electric between two points is known as potential difference the two points. Its unit is Volt (V)



Voltmeter: A device used to measure voltage. It is always connected in parallel to the circuit

Electric circuit: The path of electric charges/ current. The symbolic representation of any electric circuit is called **circuit diagram.**

Symbols of some imp. Components of electric circuit



Ohm's law states that electric current flowing through a metallic wire is directly proportional to the potential difference (V) across its ends provided its temperature remains the same

$V = IR$ (R is constant called Resistance)

Resistance: Resistance is a property of a conductor to resist flow of charge through it. Its SI unit is **Ohm (Ω)**

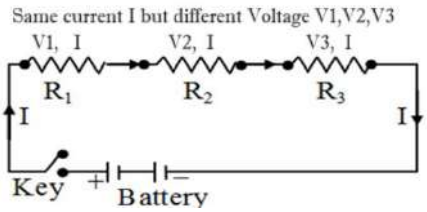
Rheostat: A variable resistors is a component which allows changing of resistance in a circuit keeping the voltage same.

Factors effecting resistance: Length (l), Area of cross section (A), and Resistivity ρ (Rho)

$R \propto l$, $R \propto 1/A$ Combining the two we will get Therefore $R = \rho \frac{l}{A}$ ρ is the constant of proportionality and is called electrical resistivity.

Resistance of a system of resistors

Resistance in series



$R = R_1 + R_2 + R_3 + \ldots$ .. .

Note: In series connection current remain same but voltage differs.

Advantage of series connection: Switches, fuse, cells of batteries are connected in series.

Disadvantage: Series Wiring is "ALL or NONE" type wiring.

High supply voltage are needed if we need to add more load in the series circuit

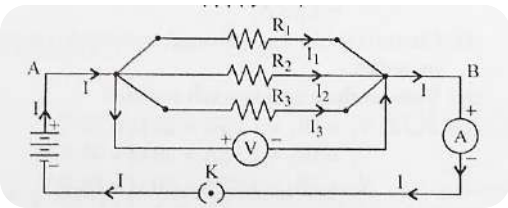
Difference between resistance and resistivity

Resistance	Resistivity
Resistance of a conductor is the obstruction offered by the conductor in the flow of current through it	Resistivity is the property of the material due to which it offers resistance
depends upon its material, temp, length and area of cross section.	depends only on its material, temp
variable quantity.	constant for any material
S.I. unit Ohm (Ω)	S.I. unit Ohm metre (Ωm)

Resistance in parallel

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R2} + \frac{1}{R3}$$

Note: In parallel connection Voltage (V)remain same but Current (I) varies



Advantage of parallel connection:

Appliances are independent from others.

More loads can be added without voltage drop,

Disadvantages: more current needed if we add more appliances, parallel wiring need more cables, wiring is complex.

Heating effect of electric current: Heat is caused due to collision of electrons in any current carrying conductor, more current-more electron-more collision- more heat, more resistance -more collision-more heat, long time collision- more heat

Joules law of heating: This states that **heat produced** (H)in a circuit is directly proportional to the square of current flowing I^2, resistance (R) for current and time (t)for which current flows**.**

$H=I^2Rt$ $\quad$ $\boldsymbol{Variants\ of\ formula}$ $\quad$ $H=\frac{V^2}{R}t$ $\quad$ $H=VQ$ $\quad$ $H=VIT$

Electric power: SI unit: Watt (W) other unit Volt Ampere (VA)

The rate of doing work is power. This is also the rate of consumption of energy.

Power$=\frac{work\ done}{Time\ taken}$ $\quad$ $P=\frac{w}{t}$ $\quad$ $=\frac{V\times I\times t}{t}$ Joules $\quad$ (V=W/Q, W=VQ, Q=It)

The power P is given by $\mathbf{P}=\boldsymbol{V}\times\boldsymbol{I}$

or $\quad$ $P=I^2R=\frac{V^2}{R}$

One watt is the power consumed by a device that carries 1 A of current when operated at a potential difference of 1 V. Thus,

1 W = 1 volt × 1 ampere = 1 V A

CHAPTER WISE QUESTION BANK

Multiple Answer Type Question (1 Mark Each)

Q1. The equivalent resistance in series combination is:

(a) smaller than the largest resistance.

(b) larger than the largest resistance.

(c) smaller than the smallest resistance.

(d) larger than the smallest resistance.

Hint: R=R+R2+R3+ ….

Q2. If R1 and R2 are the resistances of filaments of a 400W and a 200W lamp, designed to operate on the same voltage, then :

(a) R1 = R2 (b) R2= 2R1 (c) R2= 4R1 (d) R1= R2

Hint: Use ratio of $P=V^2/R$

Q3. What are the essential requirements of a heater filament?

(a) high resistivity, low melting point.

(b) low resistivity, low melting point.

(c) high resistivity, high melting point .

(d) low resistivity , high melting point .

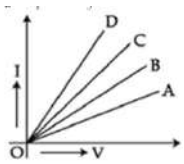
Hint: Resistance to current in a conductor provides heat, excess heat may melt the conductor

Q4. A bulb of resistance of 80 ohms draws a current of 0.5A. What is the voltage across it?

a) 40 V b) 60 V c) 70 V d) 75 V

Hint: V=IR

Q5. Study the V-I graph for four conductors A, B, C, and D having resistance R_A, R_B, R_C, and R_D respectively and which one of the following relations is true for these conductors.



a. $R_A > R_B > R_C > R_D$

b. $R_A < R_B < R_C < R_D$

c. $R_A = R_B = R_C = R_D$

d. $R_A = R_B < R_C < R_D$

Hint:IαV, I=1/R

Q6.The resistance of a conductor in a circuit depends on
(a)Length b) Area of cross section c) Material d) All of the above
Hint: $R = \rho \frac{l}{A}$

Assertion Reason Question

Assertion&Reason Based Questions (1 Mark Each)

Following questions consist of two statements–Assertion(A) and Reason (R).Answer these questions selecting the appropriate option given below:

(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

Q7. **Assertion (A):** A thick wire has less resistance than a thin wire of the same material and length.
Reason (R): Resistance is inversely proportional to the cross-sectional area.
Answer**:** A
Hint: $R = \rho \frac{l}{A}$

Q8**. Assertion (A):** A fuse is always connected in parallel with the main circuit.
Reason (R): A fuse is used to prevent overloading in a circuit.
Answer**:** D
Hint:(A fuse is always connected in series.)

Q9. **Assertion (A):** Electric current is a scalar quantity.
Reason (R): It has magnitude but no direction.
Answer: C
Hint: Current always flow from positive to negative terminal in a circuit irrespective of position of circuit

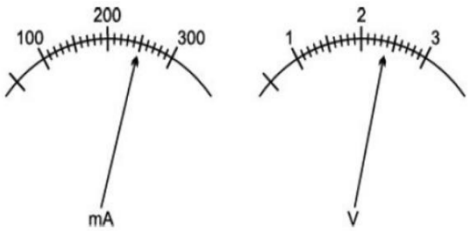
Q10. **Assertion (A):** Copper is a better conductor of electricity than nichrome.
Reason (R): Copper has lower resistivity than nichrome.
Answer: A
Hint: Copper has lower resistivity than nichrome

Short Answer Questions(2 marks each)

Q11. A wire having 4 ohm resistance and 10cm length is stretched to 20cm. What will be its new resistance.
Hint: Use $R = \rho \frac{l}{A}$ by doubling the length the cross section will become A/2
Q12. List the factors on which resistance of a wire depends.
Q13. State Ohm's law. An electric bulb draws 1.2A current at 6.0V. find the resistance of the bulb.
Hint: Ohm's law V=IR, Use formula V=IR Ans 5Ω
Q14. Give two point difference between Resistance and resistivity.
Hint: Refer to the content
Q15.Why Nichrome is used as a heating elements?
Hint: Nichrome has high resistivity and melting point, it does not react with O_2

Short Qnswer Questions (3 Marks each)

Q16. The current flowing through a resistor connected in a circuit and the potential difference developed across its ends are as shown in the diagram by milliammeter and voltmeter readings respectively



(a) What are the least counts of these meters?
(b) What is the resistance of the resistor
Hint Count the marking reading of Ammeter and voltmeter

Q17.(i)Calculate the percentage change in a resistive circuit, if the current is increased to two times.
(ii) A 5Ω resistor is connected across a battery of 6 volts. Calculate
The current flowing through the resistors
The energy that dissipates as heat in 10s.
Hint: (i) H=I2Rt (ii) (a) I=V/R Ans: 1.2A (b) H=I2Rt Ans 72J

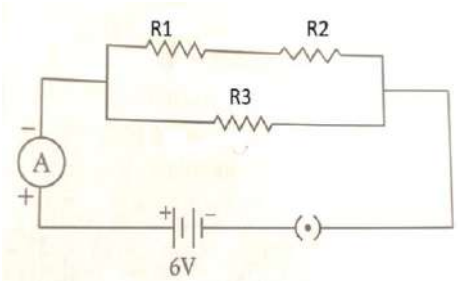
Q18. (i) What is power? What is its SI unit?

(ii) An electric motor takes 5 A from a 220 V line. Determine the power of the motor and the energy consumed in 2 h.

Hint: (i)Rate of doing work, unit: watt (W), (ii) P=VI, E=Pt

Q19.In the given circuit the value of R1= 10 Ω, R2= 50 Ω and R3 =30 Ω . Find the total resistance of the circuit and current flowing through the ammeter.

Hint: Use formula of resistance in series and parallel and V=IR for current



Long Answer Question (5 Marks Each)

Q20. (i) Draw a circuit diagram with a lamp of 20 Ω resistance and a conductor of 4 Ω resistance connected in series with a 6V battery source, an ammeter and a closed key (K) and then calculate

(ii) The current through the circuit

(iii) The potential difference across the bulb and conductor of 4 Ω resistance

(iv)Power of the bulb.

Q21. (a) State the commercial unit of electrical energy and find its SI unit.

(b) The current through a resistor is made three times its initial value. Calculate how it will affect the heat produce in the resistor.

(c) Find the increase in the amount of heat generated in conductor if another conductor of double resistance is connected in the circuit keeping all other factors unchanged.

Hint: Use: KWh 3.6×10^6J, Use formula $H=I^2Rt$

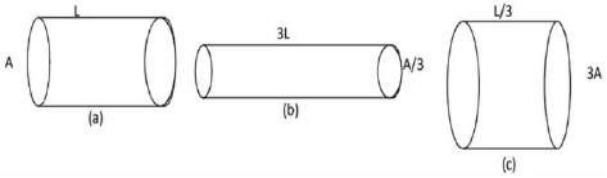
Case Based Questions (4 Marks Each)

Q22. Rita uses an electric iron rated 220 V, 1000 W to iron clothes every day for 1 hour. She wants to know how much energy the iron consumes and how much it costs her if the electricity rate is ₹6 per unit.

1. What is the current drawn by the iron?
   Hint: Use P=VI
2. How much energy does the iron consume in 1 hour?
   E=Pt
3. Calculate the cost of electricity for one day.
   Cost=E @rate
4. What will be the cost of electricity if Rita uses it for 30 days?
   Cost=E for one day @rate ×30

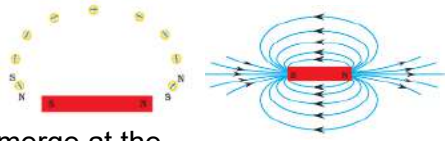
Q23. The figure below shows three cylindrical copper conductors along with their face areas and lengths. Which has greater resistance?

(b) What will happen if we double the length of part (b) given in the picture without disturbing its other parameters



Magnetic Effects Of Electric Current

An electric current-carrying conductor behaves like a magnet. It is one of the effects of electricity.
Magnetic field and field lines: A magnetic field is the region surrounding a magnet, in which the force of the magnet can be detected.
Magnetic field is a vector quantity as it has both direction and magnitude. The direction of the magnetic field is taken to be the direction in which a north pole of the compass needle moves inside it.
The **unit of magnetic field strength** is **Oersted** named to honor the scientist Hans Christian Oersted

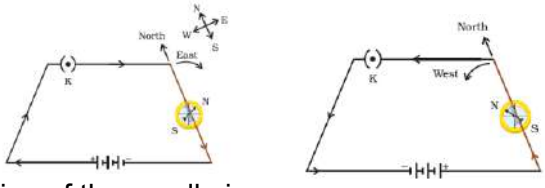


Magnetic field lines: Magnetic field lines are path along which a hypothetical free north pole of a magnet tends to move toward south pole
It is taken by convention that the field lines emerge from north pole and merge at the south pole

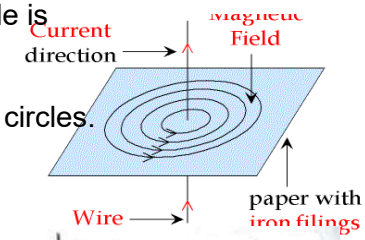
Properties of magnetic field lines

- Magnetic field lines are closed curves.
- They emerges from North and merge into South pole.
- Inside the magnet, the direction of the field lines are from south to north pole
- Magnetic field lines never intersect each other. If they did, it would mean that at the point of intersection, the compass needle would point towards two directions, which is not possible

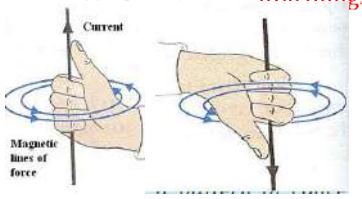
Magnetic field due to current carrying conductor: *An electric current through a metallic conductor produces a magnetic field around it.*



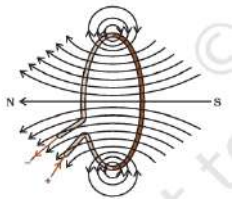
If a magnetic compass is placed near a conductor carrying current (wire), the needle is deflected. This shows that a conductor carrying current has a magnetic field around it.
If the direction of the current is from north to south, the deflection of the magnetic needle is towards the east.
#If the direction of the current is from south to north, the deflection of the needle is towards the west.



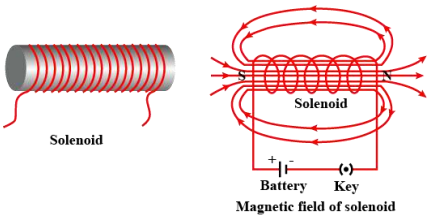
Magnetic Field due to a Current through a Straight Conductor:
The magnetic field around a current carrying straight conductor is in concentric circles.
The direction of the magnetic field around a conductor is given by the **Right Hand Thumb Rule.**
It states that ' If a current carrying conductor is held in the right hand such that the thumb points in the direction of current, then the fingers wrapped around the conductor shows the direction of the magnetic field '.



Magnetic field due to a current through a circular loop :- When current is passed through a circular conductor (loop) the magnetic field produced is in the form of concentric circles around the conductor. Towards the centre the arcs of the circles become larger and appears as straight line.
Solenoid: A solenoid is a circular coil of wire in the shape of a cylinder.

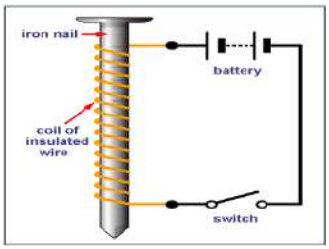


Magnetic field due to current in a solenoid: When current flows through a solenoid, it behaves like a bar magnet. The ends of the solenoid behaves like the North and South poles of a magnet.



Factors on which the strength of the magnetic field of solenoid depends:

(i) Strength of the current.
(ii) The number of turns of the coil.
(iii) radius of coil
(iv) Material of core of the solenoid.

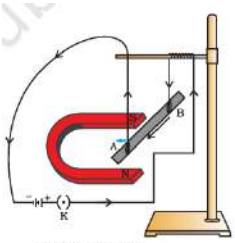


Electromagnet: A strong magnetic field inside a solenoid can be used to magnetise a piece of magnetic material like a soft iron when placed inside the coil. Such a magnet is called an electromagnet.

Force on a current carrying conductor in a magnetic field:

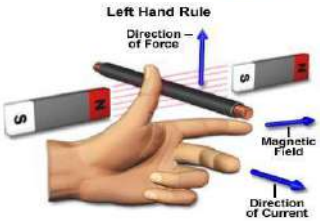
A.M.Ampere suggested that if a current carrying conductor produces a magnetic field and exerts a force on a magnet, then a magnet should also exerts a force on a current carrying conductor.

The direction of force can be found out by Fleming's left hand rule.



Fleming's Left Hand Rule.

It states that ' If we hold the thumb, fore finger and middle finger of the left hand perpendicular to each other such that the fore finger points in the direction of magnetic field, the middle finger points in the direction of current, then the thumb shows the direction of force (motion) of the conductor.



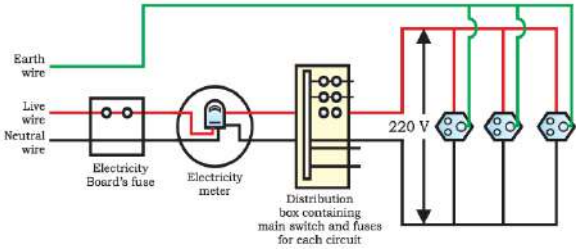
Domestic electric circuit: Electric power to homes is supplied through the mains. It has two wires. One is a live wire (positive wire) with red insulation and the other is a neutral wire (negative wire) with black insulation. The potential difference between the two wires is 220V. The earth wire with green insulation is connected to a metal plate kept in the ground.

Two separate circuits are used.

-One is of 15A for appliances with high power rating like geysers, air conditioners etc.

-The other is of 5A for fans, bulbs etc.

The different appliances are connected in parallel so that every appliance gets equal voltage and even if one is switched off the others are not affected



The appliances having metallic body like electric iron, refrigerators etc., their metallic body is connected to the earth wire so that if there is leakage of current, it passes to the earth and prevents electric shock.

Electric fuse

- It is safety device
- used in series
- It is a wire having high resistance and low melting point.
- If excess current flows through the circuit, the fuse wire melts and breaks the circuit.
- Fuse wire is made of Lead (Pb) and tin (Sn).

Overloading :-

Overloading is caused due to increase in voltage, or if the live wire and neutral wire comes in contact or if too many appliances are connected to a single socket. It results in overheating of the wires and can cause damage to the circuit and appliances.

Short circuit :- Short circuit is caused when the live wire and neutral wire comes in contact and the current suddenly increases in the circuit. It causes spark, fire and damage to the circuit and appliances.

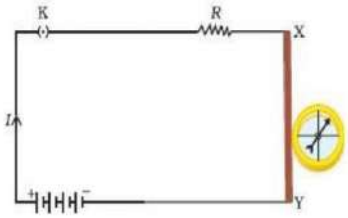
CHAPTER WISE QUESTION BANK

Multiple Answer Type Question (1 Mark Each)

Q1. A student places a compass near a straight current-carrying conductor. She notices that the needle deflects. What can be concluded from this observation?

(a) The conductor becomes hot
(b) The conductor emits radiation
(c) The current produces a magnetic field
(d)The current produces an electric field

Hint:(Any current carrying conductor behaves as a magnet).



Q2. A magnetic field is produced around a current-carrying wire. The direction of the magnetic field can be determined using:

(a) Fleming's Left-hand Rule (b)Right-hand Thumb Rule
(c) Faraday's Law (d)Newton's Third Law

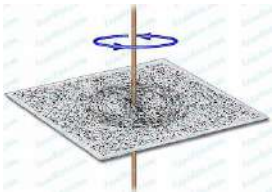
Hint: (b)

Q3. Two identical circular coils are placed near each other, carrying current in the same direction. What will be the net magnetic field at the center of the coils?

(a) Zero, because the fields cancel out
(b) Double, because the fields reinforce each other
(c) Infinite, due to mutual inductance
(d) Unchanged, as each field is independent

Hint**:** (magnetic field will add up)

Q4. In an experiment, iron filings are sprinkled around a current-carrying wire and form concentric circles. What does this pattern show?



(a) Electric field lines are circular
(b) Gravitational field around a conductor
(c) Magnetic field lines are circular around the wire
(d) There is no field around the wire

Hint**::** (magnetic field lines always arrange in circular rings)

Q5. Which of the following appliances uses the magnetic effect of electric current?

(a) Electric heater
(b) Table fan
(c) Microwave oven
(d) Electric bell

Hint**::** (electromagnetic effects)

Q6. If the direction of current in a solenoid is reversed, what happens to the polarity of its magnetic field?

(a) It remains the same
(b) The solenoid stops producing a magnetic field
(c) The polarity of the magnetic field is reversed
(d) The magnetic field becomes zero

Hint**:** (direction of magnetic field depends upon the direction of current)

<u>Assertion Reason Questions</u>

Choose the correct option:

(a) Both A and R are true, and R is the correct explanation of A.
(b) Both A and R are true, but R is not the correct explanation of A.
(c) A is true, but R is false.
(d) A is false, but R is true.

Q7. Assertion (A): Magnetic field lines do not intersect each other.
Reason (R) At the point of intersection, the compass needle would point in two directions, which is not possible
Hint**:**: (a) Both A and R are true, and R is the correct explanation of A.

Q8. Assertion (A): A fuse in a circuit prevents damage to the appliances and the circuits due to overloading.
Reason (R): Overloading occurs when the live wires and the neutral wire come into direct contact.
Hint**:**: (b) Both A and R are true, but R is not the correct explanation of A

Q9. Assertion (A): When a current is switched on in a circuit with a wire, a magnetic compass placed near it gets deflected.
Reason (R): A current-carrying wire produces a magnetic field.
Hint**::** (a) Both A and R are true, and R is the correct explanation of A.

Q10. Assertion (A): Strength of magnetic field increases with the number of turns in a solenoid.
Reason (R): Each turn of the solenoid adds to the magnetic field produced.
Hint**::** (a) Both A and R are true, and R is the correct explanation of A.

<u>Short Answer Question (2Marks)</u>

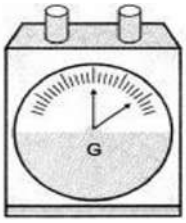
Q11. Q1. Manish places a magnetic compass near a current-carrying straight conductor and observes deflection in the needle.
a) What does this observation indicate about the relationship between electricity and magnetism?
b) Name the scientist who discovered this phenomenon.
Hint: a) current-carrying conductor produces a magnetic field around it.
b) Hans Christian Oersted.

Q12. A student uses Fleming's Left-Hand Rule to determine the direction of force on a wire placed in a magnetic field.
a) Which physical quantities are represented by the three fingers of the left hand?
b) What is the use of this rule?
Hint**:**a) Thumb – Force (motion), Forefinger – Magnetic field, Middle finger – Current.
b) To determine the direction of force on a current-carrying conductor in a magnetic field.

Q13. When is the force experienced by a current carrying conductor placed in a uniform magnetic field?

(a) Maximum (b) Minimum

Hint: perpendicular and parallel respectively



Q14. Observe the following image and answer the following questions i. What is the name of the instrument ii. What is the use of this instrument?

Q15. Why two magnetic field lines do not intersect each other?

Hint: The needle of north pole of compass can not show two direction at a point at a time.

Short Answer Questions (3 marks)

Q16 Metallic electrical appliances are connected to the mains through a three pin plug, whereas electrical bulb with two pin plug.

(a) Why do electrical appliances are connected to the mains through a three pin plug?

Hint: the third pin is earthing connected to the ground

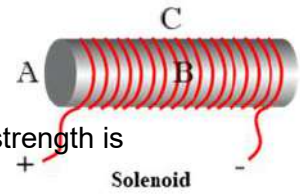
(b) What is the function of a fuse in domestic circuit.

Hint: It is a safety device

Q17. (a) An electrician wants to connect an immersion rod, a bulb and a fan simultaneously. How should these gadgets be connected with the main line. Justify your answer with two reasons.

(c) Which gadgets he will connect with 15A and 5A wiring.

Q18. In the given current carrying solenoid



(i) Draw magnetic field lines.

Hint: Refer content

(ii) Explain giving reason that at which point among A, B and C, the field strength is maximum and at which point it is minimum.

Hint: The density of field lines are minimum at C and maximum at B (B>A>C)

Q19. (i)Draw the pattern of magnetic field lines due to a magnetic field through and around a current carrying circular loop.

Hint: refer content, Topic magnetic field through circular loop

(iii) Name and state the rule to find out the direction of magnetic field inside and around the loop.

Hint: Refer content

Long Answer Questions (5 marks)

Q20.(i) Describe a solenoid?

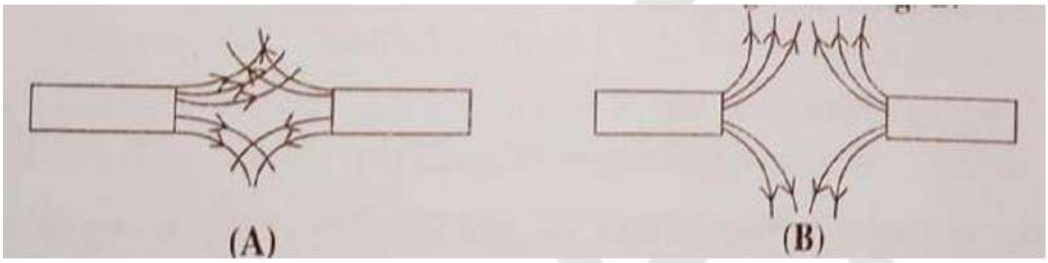
(ii) Draw magnetic field lines in (a) a current carrying solenoid and (b) a permanent magnet

(iii) What are the difference between magnetic field lines between a current carrying solenid and a permanent magnet?

Q21.(a) Magnetic field lines are shown in Fig A and Fig B. Select the figure that represents the correct pattern of correct lines. Give reason for your answer.

(b) Name the poles of the magnets facing each other.

(c) Draw complete magnetic field lines around a bar magnet.



Case base Questions (4 Marks)

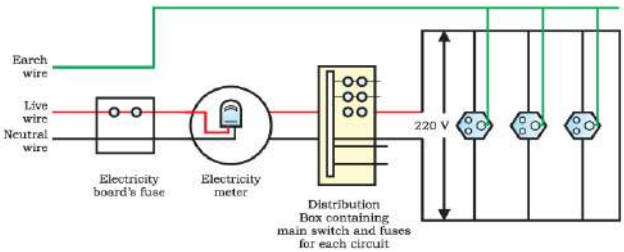
Q22. *House fuses play a pivotal role in ensuring the safety and functionality of home electrical infrastructure and appliances. It acts as a protective device which is designed to interrupt the flow of electric currents which can restrict and prevent any overload when a short circuit happens in the house. This is the measure which prevents potential damage which can cause serious accidents or even death*

So every house has a house fuse, and they are the very essential components of an electrical system. They have a metal wire that is in a protective case. The main function of this is to

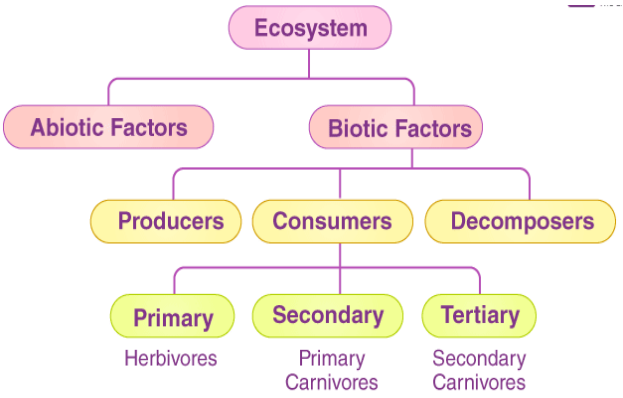
safeguard by breaking all the circuit if any fault happens in any appliance by the flow of too much current by overloading, and protecting the wire and appliances. This type of fuse is also very helpful in reducing the risk of fire damage and any dangerous incidents that can happen due to an electrical shock.

(a) What is a fuse? Why it is connected in series of positive line of circuit?
Hint: It is a safety device, in series, it becomes part of the circuit's path, when excessive current passes through, it becomes too high, the fuse melts stopping the flow of current.
(b) How it play its role in electrical circuit?
Hint: Refer hint of above question
(c) What type of wire is used for fuse? What are the characteristics of fuse wire?
Hint: An alloy

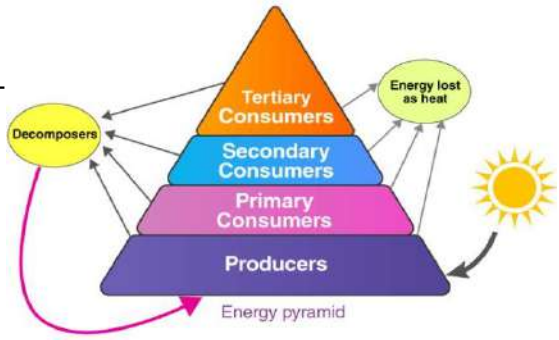
Q23. *In our homes, we receive supply of electric power through a main supply (also called mains), This supply, usually with red insulation cover, is called live wire (or positive). Another wire, with black insulation, is called neutral wire (or negative). In our country, the potential difference between the two is 220 V. At the metre-board in the house, these wires pass into an electricity meter through a main fuse. Through the main switch they are connected to the line wires in the house. These wires supply electricity to separate circuits within the house. Often, two separate circuits are used, one of 15 A current rating and other of 5 A current rating.. The earth wire, which has insulation of green colour, is usually connected to a metal plate deep in the earth near the house.*



(a) Why two separate circuits are there in house electrical wiring? Explain.
Hint: to use different powered appliances
(b) What is the function of earth wire in electrical appliances?appliances
Hint: Provide safety from getting shock form any leakge of current in
(c) Can we use a 1500W heater in a domestic circuit of having 5A fuse.
Hint: Calculate current using I=V/R if it is less than 5A then yes if more than 5A then No



Ecosystem :The ecosystem comprises all the biotic and abiotic factors interacting with one another in any given area.
Biotic components include all living organisms such as plants, animals, microorganisms and humans, etc.
Abiotic components include sunlight, temperature, air, wind, rainfall, soil and minerals, etc. E.g. pond ecosystem, grassland ecosystem, etc.
Mode of nutrition in animals and plants
Autotrophic and Heterotrophic are the two modes of nutrition in living organisms. Plants and some bacteria are autotrophic as they make their own food. Animals, fungi and some bacteria are heterotrophic as they derive their food from other organisms.
Saprophytes and decomposers Saprophytes feed on dead and decaying material, For example, fungi and microorganisms, bacteria, worms, slugs, and snails
Functions of Saprophytes:They absorb nutrients from dead and decaying plants and animal parts.
Functions of Decomposers break down the organic matter or waste material and release nutrients into the soil. They break down the complex organic matter into simpler substances.
Abiotic components : Non-living chemical and physical components of the environment like the soil, air, water, temperature, etc.
Biotic components Living organisms of the environment like plants, animals, microbes and fungi.
Trophic levels :It refers to the various levels in a food web as per the flow of energy. The different trophic levels are –



1st	Producers
2nd	Primary consumers (herbivores)
3rd	Secondary consumers (primary carnivores)
4th	Tertiary consumers(Sec carnivores)
5th	Quaternary consumers (Ter. Carnivores)
6th	Decomposers

PYRAMID OF TROPHIC LEVELS:

- Is a graphical representation.
- Can be the pyramid of numbers, the pyramid of biomass or the pyramid of energy.
- All the pyramids start with producers.

a) **Pyramid of numbers**: gives the number of organisms present at each trophic level. It can be upright or inverted.
b) **Pyramid of biomass:** gives the biomass of each trophic level and could be upright or inverted.
c) **Pyramid of energy:** is always upright as it shows the flow of energy from one trophic level to the next trophic level.

Law of conservation of energy :Energy can neither be created nor destroyed; rather, it transforms from one form to another.

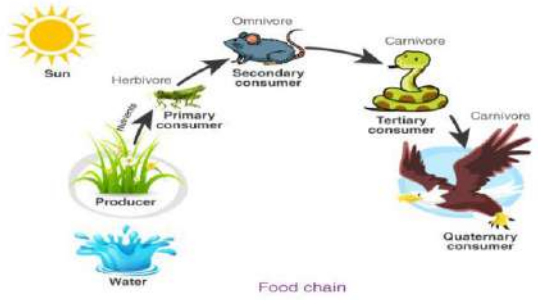
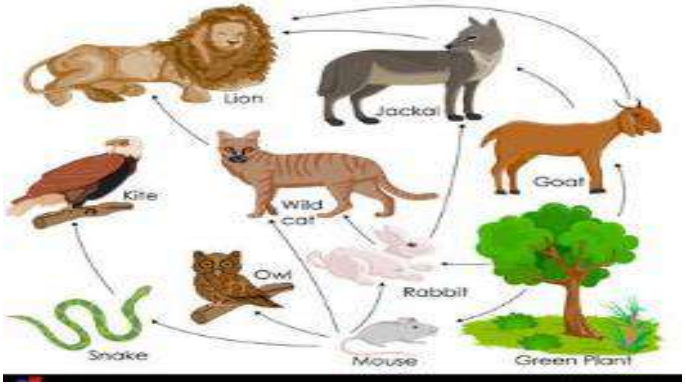
In biological systems, it gets passed from one organism to another across trophic levels.
To know more about the Law of conservation of energy

Energy flow

Transfer of energy from one trophic level to another depicting its direction and amount.

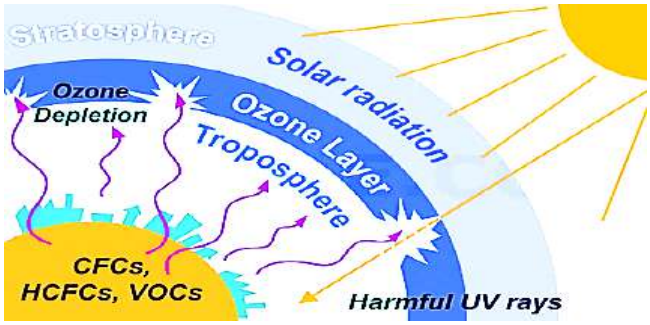
- Can be represented by the pyramid of energy.

In any food chain, only 10% of the energy is transferred from one trophic level to another.
To know more about Energy Flow in Ecosystem

FOOD CHAIN	FOOD WEB
A series of organisms each dependent on the next as a source of food.	Is formed by interconnections of different food chains. Is a graphical representation of 'Who eats Whom' in an ecosystem
	

Ozone layer: The ozone layer protects the earth from the sun's ultraviolet (UV) radiation. CFCs released into the atmosphere react chemically with ozone molecules and are depleting the layer.

Advantages of the Ozone Layer
Cancer and cataract protection
Environmental and ecosystem protection



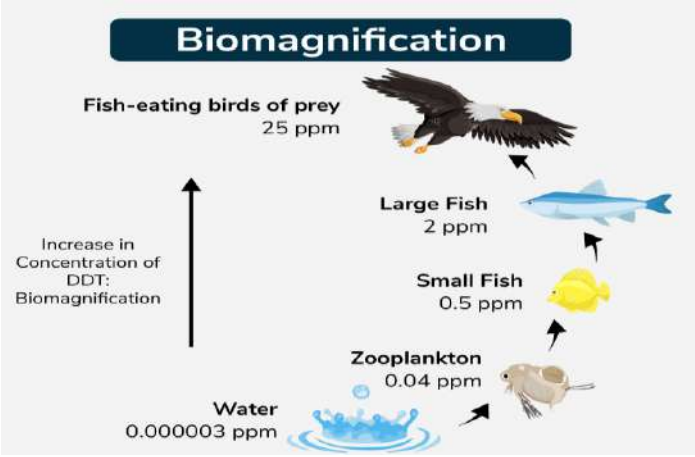
Cause of Ozone layer depletion:

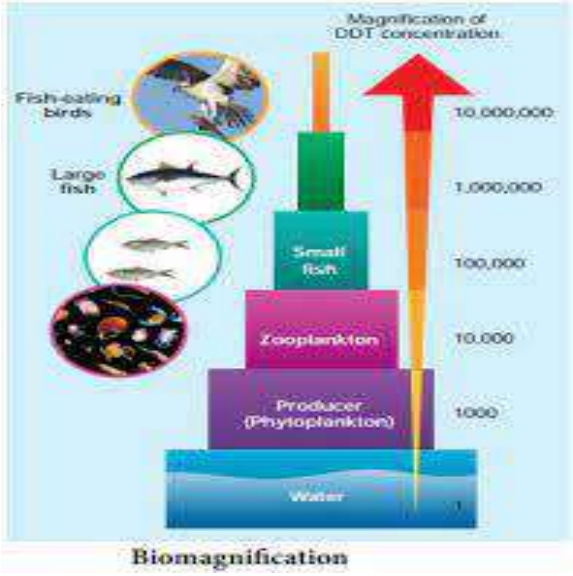
The primary cause of ozone layer depletion is the release of man-made chemicals, particularly those containing chlorine and bromine, into the atmosphere. These chemicals, such as chlorofluorocarbons (CFCs) and halons, break down ozone molecules in the stratosphere, reducing the layer's ability to block harmful ultraviolet radiation.

Garbage management: Involves all the activities and actions required to manage waste from its inception to its final disposal.

Ensures environmental best practices are followed along with proper monitoring and regulation. Steps involved:

1. Segregation of waste
2. Collection
3. Transport
4. Treatment
5. Processing & Recycling
6. Disposal



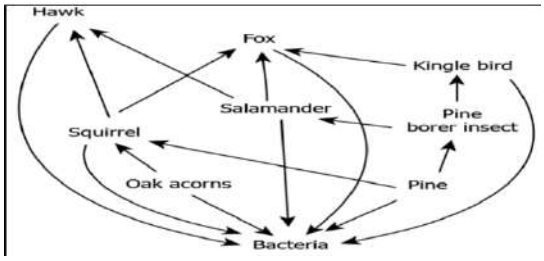


Biomagnification: It is the increase in the concentration of contaminants as they move up each trophic level in a food chain.

CHAPTER WISE QUESTION BANK

Multiple Answer Type Question (1 Mark Each)

1.What is the role of decomposers in an ecosystem?
(a) They do not break down the organic compounds.
(b) They convert inorganic materials to an organic compound
(c) They convert organic material into inorganic forms
(d) They convert inorganic material into simpler forms
(Hint: it convert organic material into simple forms**)**



2) Which is correct as per above food web.
(a) Fox feeds on hawk obtain energy.
(b) Hawk feeds on oak acorn to obtain energy.
(c) Squirrel feeds on pine borer to obtain energy.
(d) Salamander feeds on pine borer to obtain energy.
Hint: Analyse the picture

3. Ozone is formed by a combination of free oxygen atoms along with oxygen molecules. How can free oxygen atoms be formed at higher levels of the atmosphere?
(a) by splitting molecular oxygen into free oxygen atoms in the presence of high energy ultraviolet radiations.
(b) by splitting the molecular oxygen into free oxygen atoms in the presence of low energy ultraviolet radiations.
(c) by combining two free oxygen atoms in the presence of low energy ultraviolet radiations.
(d) by combining two free oxygen atoms in the presence of high energy ultraviolet radiations.
(Hint: it is process of splitting the molecular oxygen into free oxygen atoms)

4. From most to the least favoured, select the order of the waste management hierarchy:
(a) Prevention - Reuse - Disposal – Recycle (b) Prevention - Recycle - Reuse - Disposal
(c) Prevention - Disposal - Reuse – Recycle (d) Prevention - Reuse - Recycle – Disposal
(Hint: **d)**

5. Excessive exposure of humans to ultraviolet rays result in
(a) Damage to immune system and Skin cancer
(b) diabetes
(c) Damage to lungs
(d) Peptic ulcers

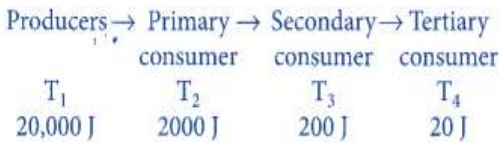
(Hint: **Causes skin cancer)**
6. Which of the following is not an example of abiotic factors?
(a) Light (b) Plant (c) Heat (d) Temperature
(Hint: It green in colour)

Assertion & Reason Based Questions (1 Mark Each)

Following questions consist of two statements–Assertion(A) and Reason(R).Answer these questions selecting the appropriate option given below:
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true
7.Assertion : Greater number of individuals are present in lower trophic levels.
Reason : The flow of energy is unidirectional
(Hint :a) Both A and R are true and R is the correct explanation of A.
8. Assertion: Ozone layer is getting depleted at upper atmosphere and it is a serious cause of concern.
Reason: CFC reacts with ozone and breaks it.
(Hint :a) Both A and R are true and R is the correct explanation of A.
9.Assertion : Polythene bags and plastic containers are non-biodegradable substances.
Reason : They can be broken down by microorganisms in natural simple harmless substances.
(Hint: d) A is false but R is true
10.Assertion: Accumulation of harmful chemicals is higher in case of organisms at higher trophic level.
Reason: Food chain normally limited to 3 or 4 trophic level.
(Hint: c) A is true but R is false.

Very Short answer Based Question (2 Marks Each)

11.List two biotic components of a biosphere.
(Hint : Two biotic components of a biosphere are:
(i) Producers – Include organisms which can produce their food using simple inorganic compounds, e.g., all green plants, blue green algae (cyanobacteria).
(ii) Consumers – Include organisms which are unable to synthesise their food, therefore, utilise materials and energy stored by the producers or eat other organisms, e.g., all the animals.)
12.In a food chain, if 10,000 joules of energy is available to the producer, how much energy will be available to the secondary consumer to transfer it to the tertiary consumer?
Hint :According to ten percent law, 10% of the energy of producer will be available to primary consumer, and 10% of this energy will be available to secondary consumer and so on.
13. Give an example to illustrate that indiscriminate use of pesticides may result in the degradation of the environment
(Hint : Pesticides are the chemicals used to kill plant and animal pests. They are non-biodegradable and toxicants.)
14 Which organism of this food chain will have the highest concentration of non- biodegradable chemicals?
(Hint :Hawk is the top consumer of the food chain, so, it will have high concentration of non- biodegradable chemicals)

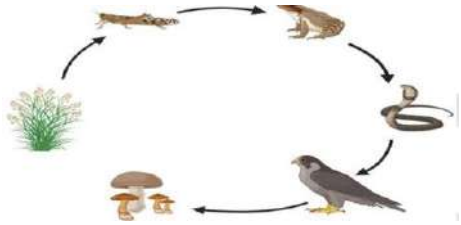


15. Calculate the amount of energy available to the organisms at the fourth trophic level. If the energy available to the organisms at the second trophic level is 2000 J
(Hint : See Flow chart----->

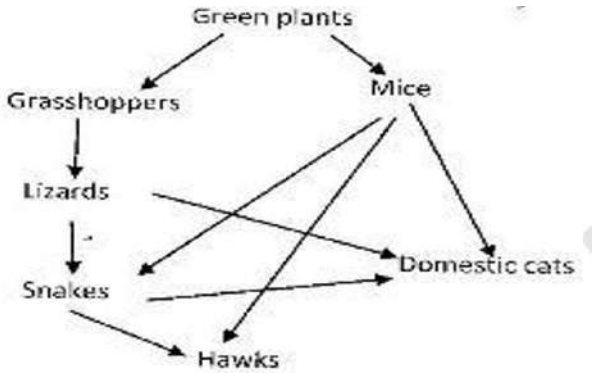
Short Answer Type Questions (3 Marks Each)

16.Draw a food chain with 4 tropic level having eagle at the top.
(Hint: See table of Food chain)
17..Why are bacteria and fungi called decomposers?

Hint: They Clean our surroundings
18..List any two advantages of decomposers to the environment?
(Hint: Work as cleaning agents, Turn nitrates to Nitrites.)
19a) What is the relation shown in the figure called?
b) Assign the trophic level to the secondary consumer.
c) If the number of frogs shown in the food chain is suddenly reduced, then what can be different effects on the food chain?



(Long Answer Type Questions 5 Marks Each)
20. (a) Explain the role of UV radiation in formation of ozone layer.
(Hint . It initiates the chemical reactions that convert oxygen molecules into ozone (O3) in the stratosphere)
(b) Mention the reaction involved in the above question.
(Hint : Common types of chemical reactions include decomposition, combination, combustion, neutralization, single displacement, double displacement, precipitation, and redox reactions)
(c) Why is excessive use of CFCs a cause of concern for our environment?
(Hint :They damage the ozone layer)
21.(a)Which organism has the largest variety of predators in the food web?
(b). Name secondary consumers in the food web
(c). Suggest three ways in which the ecosystem would be affected of there was a prolonged drought.



Case Based Questions (4 Marks Each)
22.*A lake is found fully covered with algae and scum. The water from this lake is used by people living nearby it for their household purposes. It is also found that many children are suffering from diarrhea and muscle cramps. As a precaution the doctor advises them not to drink water from the lake, and if at all they use it, it should be boiled and cooled.*
(a)What is the reason for the overgrowth of algae in the lake.
(Hint :Factors like too much sunlight and excess nutrients can lead to issues with floating algae growth.)
(b) What change will come to the quality of water when it is boiled and cooled?
(Hint ;Boiling and cooling water primarily kill the microorganisms)
(c). How can we remain free from diarrhoea?
(Hint: Diarrhea is characterized by loose, watery stools; taking healthy diet).

23. *Green plants capture about 1% of the solar energy incident on the earth to carry out the process of photosynthesis. A part of this trapped energy is used by plants in performing their metabolic activities and some energy is released as heat into the atmosphere. When these green plants are eaten up by herbivores, the chemical energy stored in the plants is transferred to these animals. These animals (herbivores) utilise some of this energy for metabolic activities and some energy is released as heat while the remaining energy is stored in their body. This process of energy transfer is repeated till top carnivores. In an ecosystem, transfer of energy follows 10 percent law, i.e,,* ***only 10 percent of the energy is transferred to each trophic level from the lower trophic level****.*
(a) What percentage of energy is captured by the plants from the sun?
(Hint: 1%)
(b) Which component is present in the first level of food chain? Why?
(Hint: Green in colour)
(c) Explain by the help of a food web the process of biomagnification.
(Hint: Accumulations of chemicals. Ref. Food web diagram.)

MAX.MARKS: 80 **SUB: SCIENCE** **MAX. TIME: 3HRS**

General Instructions:

- ***i.*** *This question paper consists of 39 questions in 5 sections.*
- ***ii.*** *All questions are compulsory. However, an internal choice is provided in some questions. A student is expected to attempt only one of these questions.*
- ***iii.*** *Section A consists of 20 objective type questions carrying 1 mark each.*
- ***iv.*** *Section B consists of 6 Very Short questions carrying 02 marks each. Answers to these questions should be in the range of 30 to 50 words.*
- ***v.*** *Section C consists of 7 Short Answer type questions carrying 03 marks each. Answers to these questions should be in the range of 50 to 80 words.*
- ***vi.*** *Section D consists of 3 Long Answer type questions carrying 05 marks each. Answer to these questions should be in the range of 80 to 120 words.*
- ***vii.*** *Section E consists of 3 source-based/case-based units of assessment of 04 marks each with sub-parts.*

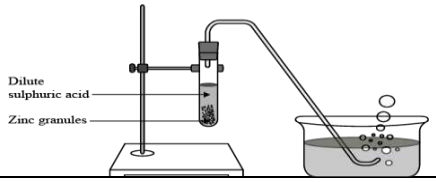
SECTION A

1. Which one of the following reactions is categoriged as thermal decomposition reaction?
(a) $2H_2O(l) \rightarrow 2H_2(g) + O_2(g)$ b) $2AgBr(s) \rightarrow 2Ag(s) + Br_2(g)$.
(c) $2AgCl(s) \rightarrow 2Ag(s) + Cl_2(g)$. d) $CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$

. On heating the white crystals of lead nitrate, the following observations were made. Which of these observations are not correct?
$2Pb(NO_3)_2(s) \rightarrow 2PbO(s) + 4NO_2 + O_2(g)$
i.Evolution of reddish-brown fumes of nitrogen dioxide gas.
ii.Crackling sound during the process of heating.
. Pink residue of lead oxide.
. Water molecules can be seen trickling on the side of the test tube.
iii and iv (b) i and ii
) i and iv (d) ii and iii

. When zinc reacts with sodium hydroxide, the product formed is:
(a) Sodium oxide (b) Sodium zincate
(c) Zinc hydroxide (d) Zinc oxide

. Study the diagram given below and identify the gas formed in the reaction.
Carbon di-oxide which extinguishes the burning candle.
) Oxygen due to which the candle burns more brightly.
Sulphur dioxide which produces a suffocating smell.
) Hydrogen which while burning produces a popping sound.



. Oxide of Potassium are reduced by?
(a) Heat alone (b) Carbon
(c) Aluminium (d) Electrolytic reduction

Q6The correct electron dot structure of a water molecule is:
(a) $H \cdot O \cdot H$ (b) $H \cdot O \cdot H$
(c) $H \cdot O \cdot H$ (d) $H \cdot O \cdot H$

Q7.Thin-walled blood vessels are called:
(a) Aorta (b) Capillaries
(c) Arteries (d) vena cava

Q8.The opening and closing of stomata depend upon:
(a) Oxygen (b) Temperature
(c) Carbon Dioxide (d) Water in guard cells

Q.9.Which is also called ‘emergency gland’?

(a) Pituitary gland (b) Thyroid
(c) Pancreas (d) Adrenal

The correct sequence of organs in the male reproductive system for the transport of sperm is
(a) Testis → vas deferens → urethra (b) Testis → ureter → urethra
(c) Testis → urethra → ureter (d) Testis → vas deferens → ureter

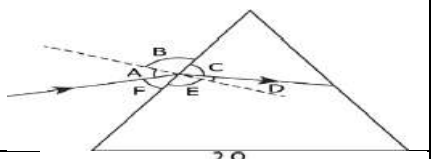
Convex lens focuses a real, point sized image at focus, the object is placed
a) At focus (b) Between F and 2F (c) At infinity (d)At 2F

Q.12. A person went for a medical check-up and found that the curvature of his eye lens was increasing.Which defect is he likely to suffer from?

a) Myopia (b) Cataract
(c) Presbyopia (d) Hypermetropia

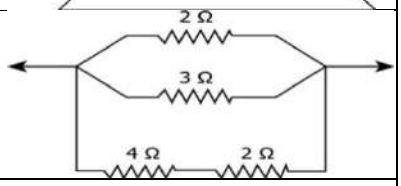
When a straight conductor is carrying current:
There are circular magnetic field lines around it
There are magnetic field lines parallel to the conductor
There are no magnetic field lines
None of the above

Q.14.The image shows a light ray incident on a glass prism.
The various angles are labelled in the image. Which angle shows the angle of incidence and angle ofrefraction, respectively?



A and D (b) B and E
(c) C and F (d) D and F

Q.15.The image shows a combination of 4 resistors.
What is the net resistance between the two points in the circuit?



(a) 0.5 Ω (b) 1.0 Ω
(c) 1.5 Ω (d) 2.0 Ω

Q.16.Which of the following is responsible for the depletion of the ozone layer
CFCs (b) Oxygen (c) SO_2 (d) CO_2

Question No. 17 to 20 consist of two statements – Assertion (A) and Reason (R). Answer thesequestions selecting the appropriate option given below:
Both A and R are true, and R is the correct explanation of A.
Both A and R are true, and R is not the correct explanation of A.
A is true but R is false.
A is false but R is true.

Q.17.Assertion (A): Ammonia is a base.
Reason (R): It does not contain OH^- ions. It can donate a lone pair of electron.

Q.18.Assertion (A): Ionic compounds conduct electricity in molten city.
Reason (R): Movement of ions in the solid state is not possible due to their rigid structure.

Q.19.Assertion (A): sun appears red during sunrise and sunset.
Reason (R): Scattering of light is directly proportional to the wavelength.

Q.20.Assertion (A): Blood and Lymph both are circulatory fluid.
Reason (R): Blood flows in both direction but lymph flows in one direction

SECTION B

Q.21.Why are detergents better cleansing agents than soaps? Explain.
Write the main functions of the following:
(a) sensory neuron
(b) cranium
(c) vertebral column
(d) motor neuron.

Q.22.Reproduction is one of the most important characteristics ‘of living beings. Give two reasons insupport of the statement.

Q.23.How is the sex of the child determined in human beings? Explain with flow chart.

Q.24.A current of 10 A flows through a conductor for two minutes.
(i) Calculate the amount of charge passed through any area of cross section of the conductor.
(ii) If the charge of an electron is 1.6 × 10-19 C, then calculate the total number of electrons flowing.

Q25.A compass needle is placed near a current carrying straight conductor. State your observation for the following cases and give reasons for the same in each case.
Magnitude of electric current is increased.

The compass needle is displaced away from the conductor

26.(a) Draw a solenoid. Suggest reasons for the deflection of the magnetic needle with reference to the flow of current in the solenoid.. 1+1=2 marks
(b)How is the amount of current change the deflection of the needle of the magnetic compass?.

SECTION C

Q27.Complete and balance the following chemical equations:

(i) $NaOH + H_2SO_4 \rightarrow Na_2SO_4 + H_2O$

(ii) $BaCl_2 + H_2SO_4 \rightarrow BaSO_4 + HCl$

(iii) $HNO_3 + Ca(OH)_2 \rightarrow Ca(NO_3)_2 + H_2O$

Q28.A salt X is formed, and gas is evolved when ethanoic acid reacts with sodium hydrogen carbonate. Name the salt X and the gas evolved. Describe an activity and draw the diagram of the apparatus to prove that the evolved gas is the one you have named. Also, write a chemical equation of the reactioninvolved.

Q29.(a) Draw a neat diagram of a neuron and label (i) dendrite and (ii) axon.
(b) Which part of the human brain is-

(i) The main thinking part of the brain?

(ii) Responsible for maintaining the posture and balance of the body?

Q30.What is multiple fission? How does it occur in an organism? Explain briefly. Name one organismwhich exhibits this type of reproduction.

Q31.(a) Why did Mendel carry out an experiment to study inheritance of two traits in garden pea?

(b) What were his findings with respect to inheritance of traits in F1 and F2 generation?

(c) State the ratio obtained in the F2 generation in the above-mentioned experiment.

Q32.State and explain Ohm's law. Define resistance and give its SI unit. What is meant by 1 ohmresistance? Draw V-I graph for an ohmic conductor and list its two important features.

Q33.(a) State three factors on which the strength of magnetic field produced by a current carrying solenoid depends.
(b) Draw circuit diagram of a solenoid to prepare an electromagnet.

SECTION D

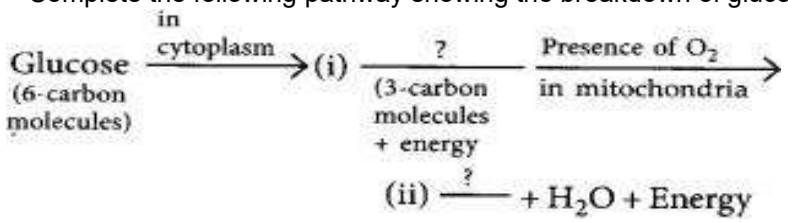
Q34.What is water of crystallization? Write the common name and chemical formula of a commercially important compound which has ten water molecules as water of crystallization. How is this compoundobtained? Write the chemical equation also. List any two uses of this compound.

Q35.Why is nutrition necessary for the human body?
What causes movement of food inside the alimentary canal?
Why is small intestine in herbivores longer than in carnivores?
What will happen if mucus is not secreted by the gastric glands?
Or

(a) In the process of respiration, state the function of alveoli.

(b) Rate of breathing in aquatic organisms is much faster than that in terrestrial organisms. Give reasons.

(c) Complete the following pathway showing the breakdown of glucose.



Q36.a) Define focal length of a spherical lens.

(b) A divergent lens has a focal length of 30 cm. At what distance should an object of height 5 cm from the optical centre of the lens be placed so that its image is formed 15 cm away from the lens?Find the size of the image also.

(c) Draw a ray diagram to show the formation of image in the above situation.

SECTION E

Q.37. A displacement reaction is one in which one element of a compound is replaced by another element. For example, when a strip of Zn is placed is aqueous CuSO2 (blue), it does not take long for the displacement reaction to form metallic copper and colourless ZnSO4 solution. In double displacement reactions, two reacting compounds exchange their corresponding ions and form two new compounds. For example, double

displacement reaction takes place when aqueous solutions of barium chloride and sodium sulphate are mixed together; barium sulphate and sodium chloride are formed.

(a) The reaction, Zn + 2HCl → ZnCl2 + H2 is an example of?

(b) Which metallic spoon can be used to stir lead nitrate solution?

(c) What happens during a displacement reaction? **OR**

d) A strip of copper was placed in a beaker containing zinc sulphate solution. What can we observe the next day?

Q.38.Atmospheric refraction is the phenomenon of bending of light on passing through earth's atmosphere. As we move above the surface of earth, density of air goes on decreasing. Local conditions like temperature etc. also affect the optical density of earth's atmosphere. On account of atmosphericrefraction, stars seen appear higher than they actual are; advanced sunrise; delayed sunset, oval appearance of the sun at sunrise and sunset; stars twinkle, planets do not.

a)Due to atmospheric refraction, what happens to apparent length of the day?

b)Apparent position of the star appears raised due to?

c)The sun appears oval shaped or flattened due to?

OR

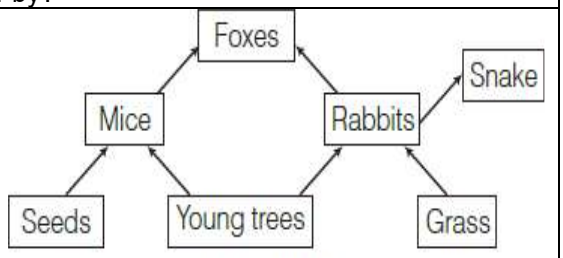
(d)Twinkling of stars and non-twinkling of planets is accounted for by?

Q39.Food web is the interconnection of different food chains, which correlate at various trophic levelsoperating in an ecosystem.

How many food chains are present in the given food web?

How much percentage of energy is less at each trophic level?

If all the foxes are killed due to a disease, what will be your observations about food web?



Food web

OR

(d)Name the organism in which accumulation of toxic non-biodegradable substances is the lowest

SOLUTIONS

1. (d) CaCO3(s) → CaO(s) + CO2(g). 1 MARK
2. (b) i and ii 1 MARK
3. (b) Sodium zincate 1 MARK
4. (d) Hydrogen which while burning produces a popping sound. 1 MARK
5. (d) Electrolytic reduction 1 MARK
6. (c) $H \cdot O \cdot H$ CORRECT ONE 1 MARK
7. (b) capillaries 1 MARK
8. (d) Water in guard cells 1 MARK
9. (d) Adrenal 1 MARK
10. (a) Testis → vas deferens → urethra 1 MARK
11. (c) At infinity 1 MARK
12. (a) Myopia 1 MARK
13. (a) There are circular magnetic field lines around it 1 MARK
14. (a) A and D 1 MARK
15. (b) 1.0 Ω 1 MARK
16. (a) CFCs. 1 MARK
17. (b) Both A and R are true, and R is not the correct explanation of A 1 MARK
18. (b) Both A and R are true, and R is not the correct explanation of A 1 MARK
19. (b) Both A and R are true, and R is not the correct explanation of A 1 MARK
20. (c) A is true but R is false. 1 MARK
21. Detergents are better cleansing agents- properties. 2 MARKS

22.(a) Sensory neuron. The sensory neurons transmit impulses.

(b) Cranium: The bones of cranium or brain box protect the brain from mechanical injury.

(c) Vertebral column: Major function of the vertebral column is protection of the spinal cord and carries the weight of the upper body.

(d) Motor neuron: The dendrites of these neurons synapse with axons of interneurons in central nervous system. They transmit impulses from central nervous system towards effectors (muscles or glands). The latter respond to stimuli. 1/2X 4=2 MARKS

23. • it is essential for existence and continuity of a species.

• it helps to pass genetic information to next generation.

• it brings variations in next generation which is the basis for 2 marks.

24. Correct explanation with flow chart. 2 marks

25. Given that: I = 10 A, t = 2 min = 2 × 60 s = 120 s

(i) Amount of charge Q passed through any area of cross-section is given by I = Qt or Q = I × t ∴ Q = (10 × 120) A s = 1200 C

(ii) Since, Q = ne

where n is the total number of electrons flowing and e is the charge on one electron

∴ 1200 = n × 1.6 × 10-19

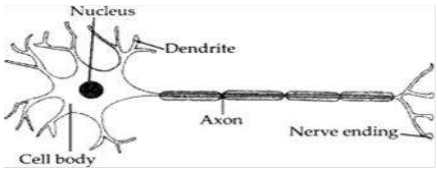
or n = 12001.6×10−19 = 7.5 × 1021 1+1=2 marks

26. (a) As the amount of magnetic field strength is directly proportional to the amount of current, so the deflection of compass needle increases. 1+1=2 marks

(b) Since magnetic field strength at a point is inversely proportional to the distance from the wire. Hence deflection of compass decreases when it is displaced away from the conductor.

27. Balanced chemical equations . 1+1+1=3 marks

28. The salt X is sodium ethanoate (CH3COONa), and the evolved gas is carbon dioxide (CO2).
Take a test tube and add ethanoic acid (CH3COOH). Add sodium bicarbonate (NaHCO3) to the acid, close the test tube's mouth with a cork, and attach a delivery tube.
Take lime water in another test tube and attach it to the delivery tube. The lime water turns milky. This indicates that the evolved gas is carbon dioxide.
Ca(OH)2 + CO2 → CaCO3 + H2O
The milkiness is due to the formation of CaCO3. 1+1+1=3 marks
Reaction Involved: CH3COOH + NaHCO3 → CH3COONa + H2O + CO2 (g)



29. (a) Diagrammatic representation of a neuron is as follows: 1+1+1=3 marks

(b) (i) Forebrain includes cerebrum, olfactory lobes and diencephalon, is the main thinking part of the brain.

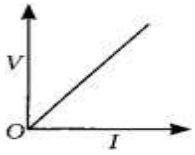
(ii) Cerebellum, part of hindbrain is responsible for maintaining the posture and balance of the body

30.Multiple fission refers to the process of asexual reproduction in which many individuals are formed from a single parent. This method of reproduction occurs in unfavourable conditions. The unicellular organism develops a protective covering called cyst, over the cell. The nucleus of the cell divides repeatedly producing many nuclei. Later on, each nucleus is surrounded by small amount of cytoplasm and many daughter cells are produced within the cyst. When conditions are favourable the cyst breaks and small offspring are liberated. This type of reproduction is seen in some protozoans, e.g., malarial parasite (Plasmodium). 3 marks

(a) Mendel carried out crosses with two traits to see the interaction and basis of inheritance between them. In a dihybrid cross given by Mendel, it was observed that when two pairs of characters were considered each trait expressed independent of the other.

b) For example, a cross between round yellow and wrinkled green parents.
In F1 generation, all plants are with round yellow seeds. But in F2 generation, we find all types of plants : Round yellow, Round green, Wrinkled yellow, Wrinkled green.F2 generation ratio : Round-yellow = 9 : Round- green = 3 : Colour of stem in F1 progeny Wrinkled- yellow = 3 : Wrinkled-green = 1
1+1+1+=3 marks

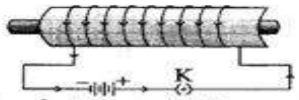
32. It states that the potential difference V, across the ends of a given metallic wire in an electric circuit is directly proportional to the current flowing through it, provided its temperature remains the same. Mathematically, V = RI
where R is resistance of the conductor.



Resistance : It is ihe properly of a conductor lo resist the How of charges through it. Its SI unit is ohm (Ω). If the potential difference across the two ends of a conductor is 1 V and the current through it is 1 A, then the resistance R, of the conductor is 1 ohm (1 Ω). lvolt
1 ohm = 1volt1ampere
V-I graph for an ohmic conductor can be drawn as given in figure.
Important feature of V-I graph are:

(i) It is a straight line passing through origin.

(ii) Slope of V-I graph gives the value of resistance of conductor slope = R = VI
1+1+1=3 marks



An electromagnet-A current-carrying solenoid coil which is used to magnetise steel rod inside it.

33. (a) Strength of magnetic field produced by a current carrying solenoid depends upon the following factors:

- number of turns in the coil ; amount of current flowing through it; radius of coil
- Material of core of the solenoid.

(b) A strong magnetic field produced inside a solenoid can be used to magnetise a piece of magnetic material, like soft iron, when placed inside the coil. The magnet so formed is called an electromagnet.

34. Water of crystallization: Crystals of some salts contain certain amount of associated water. The water associated with the crystal (or molecule) of any salt is called water of crystallisation. The hydrated salt is known as washing soda which is sodium carbonate containing 10 molecules of water of crystallization, i.e., it is sodium carbonate decahydrate. Its molecular formula is Na2CO3.10H2O.
It can be obtained by heating baking soda followed by recrystallisation from its aqueous solution.

$$2NaHCO_3 \xrightarrow{heat} Na_2CO_3 + CO_2 + H_2O$$
$$Na_2CO_3 + 10H_2O \longrightarrow Na_2CO_3.10H_2O$$

Uses of sodium carbonate:

(i)For the manufacture of glass, soap, papers and chemicals like caustic soda (NaOH), borax, etc.

(ii)For washing purposes (laundry works) 1x5= 5 marks

35. a) Human body continuously require energy for their life activities like respiration, circulation, excretion, etc. Energy is required even we are sleeping because a number of biological processes keep on occurring. All these processes require energy and this energy is obtained from nutrition. Nutrition is also needed for growth and repair of human body.

(b) The wall of alimentary tract contains muscles which can contract and expand alternately. The movement of the walls of food pipe is called peristaltic movement. The peristaltic movement moves the partially digested food in all the digestive organs throughout the alimentary canal.

(c) Herbivores eat plants which is rich in cellulose. Cellulose takes longer time for complete digestion by the enzymes present in symbiotic bacteria. Therefore, they have longer small intestine. Carnivores, feed on flesh which is easier to digest and do not contain cellulose also.

(d) Gastric glands secrete HCl, mucus, rennin and pepsin enzymes. Mucus protects the inner lining of stomach from the action of HCl and enzymes. In the absence of mucus, there would be erosion of inner lining of stomach leading to acidity and ulcers.

Or

(a) Functions of alveoli are :i)They increase the surface area for exchange of gases.

(ii) The thin walls of alveoli facilitate rapid exchange of oxygen and carbon dioxide between alveolar air and blood.

(b) Aquatic animals like fishes obtain oxygen from water present in the dissolved form through their gills. The amount of dissolved oxygen is quite small as compared to the amount of oxygen in the air. Therefore, to obtain required oxygen from water, aquatic animals have to breathe much faster than the terrestrial organisms.

36. a) Distance between the optical centre and the focus of the lens is known as the focal length of the lens.

(b) Given f = -30 cm, v = -15 cm, h = 5 cm From the lens formula,

$$\frac{1}{v}-\frac{1}{u}=\frac{1}{f} \Rightarrow \frac{-1}{15}-\frac{1}{u}=\frac{-1}{30}$$

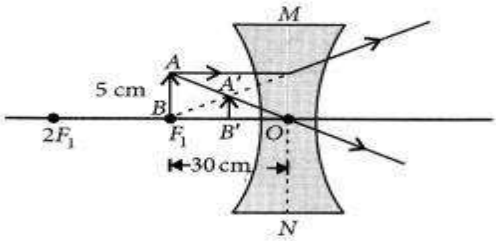
$$\Rightarrow \frac{-1}{u}=\frac{-1}{30}+\frac{1}{15}=\frac{-1+2}{30}=\frac{1}{30} \Rightarrow u=-30\text{ cm}$$

Object should be placed 30 cm from the optical centre.Also m = h′/h = v/u ⇒

h’ = h(v/u) or h’ = 5 × −15/−30 = 2.5 cm

Size of image formed is 2.5 cm 1+2+2=5 marks

(c)



37. a) Displacement reaction. b) Silver spoon c) One element of a compound is replaced by another element.

OR

d) The copper strip remained as it was since copper is less reactive than zinc and hence can't displace zinc from its solution. 1+1+2=4 MARKS

38. (a) Due to atmospheric refraction, apparent length of the day increases by 4 minutes.

(b) Apparent position of the stars appears raised due to atmospheric refraction.

(c) Atmospheric refraction OR

(d) Refraction of light. 1+1+2= 4 MARKS

39. (a) six (b) 90 % (c) There will be no direct predator of rabbits and mice, hence the number of rabbits and mice will increase in the given ecosystem, which will disturb its balance. 1+1+2=4 MARKS

(d) Seeds, young trees, grass.

SECTION-A

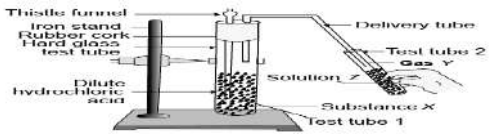
Select and write the most appropriate option out of the four options given for each of the questions 1-20.

Q1. Which of the following oxide(s) is/are soluble in water to form alkalis?

i) Na_2O. (ii) SO_2. (iii) K_2O. iv) NO_2

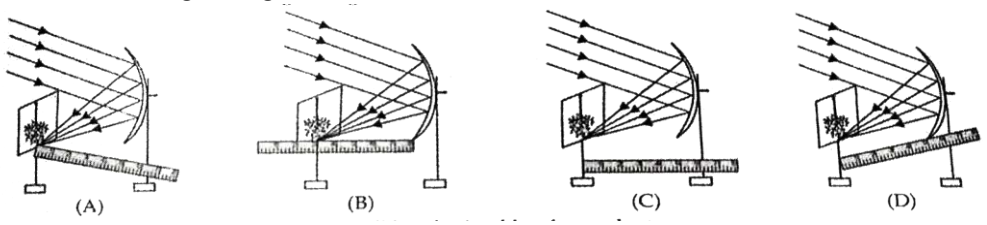
a) (i) only. b). (i) and (iii) c) (ii) and (iv) d) (iii) only

Q2.Study the experimental set up shown in given figure and choose the correct option from the following:



	X	Y	Change observed in test tube -2 containing $Ca(OH)_2$ solution
A)	K_2CO_3	Cl Gas	No change
B)	$KHCO_3$	CO_2 Gas	No change
C)	$KHCO_3$	H_2 Gas	Turns milkey
D)	K_2CO_3	CO_2 Gas	Turns milkey

Q3. Four students A, B, C and D performed the Experiment to determine the focal length of a concave mirror by obtaining the image of a distant tree on a screen. They measured the distances between the screen and the mirrors shown in the diagrams given below:-



The correct value of image will be obtained by:-

a)A b) B c) C d) D

Q4.Consider the pH value of the following acidic samples:-

S.NO	SAMPLE	pH value
1	Lemon Juice	2.2
2	Gastric Juice	1.2
3	Vinegar	3.76
4	Dil. Acetic acid	3.0

.The decreasing order of their H^+ ion concentration is

a) 3 >4>1> 2 b) 2>1> 3> 4 c) 2> 1> 4 >3 d) 3 >4 >2 >1

Q5.Select from the following the statement which are true for bases.

a) Bases are bitter and turns blue litmus red.

b) Bases have pH less than 7.

c) Bases are sour and change red litmus to blue.

d)Base turns pink when a drop of phenolphthalein is added to them

Q6..Potassium reacts with water to form X & Y..Choose the correct balance equation from the following;-

			X	Y
a)	K	H_2O →	KOH	H_2
b)	K	$2H_2O$ →	K_2OH	$2H_2$
c)	2K	$2H_2O$ →	2KOH	H_2
d)	K	$2H_2O$ →	K_2OH	$2H_2$

Q 7.Which among the following is not an amphoteric oxides?

a) Al2O3 b) HgO c) PbO d) SnO

Q8.Which of the following salts don't have water of crystallization?

i) Bleaching Powder ii) Plaster of Paris

iii) Washing Soda iv) Baking Soda

a) (ii) and iv) b) (i) and (iii) c) (ii) and (iii) d) (i) and (iv)

Q9.The length of small intestine in deer is more longer as compared to the length of small intestine of a tiger. The reason is

a) Mode of intake of food. b) Type of food consumed

c) Presence or absence of villi in intestines. d) Presence of digestive enzymes

Q10. Which of the following is not a digestive enzyme contained in the pancreatic juice?

i). Lipase ii). Hydrochloric acid iii). Mucus iv). Trypsin

a) (i) and (ii) b) (i) and (iv) c) (ii) and (iii) d) (i) and (iii)

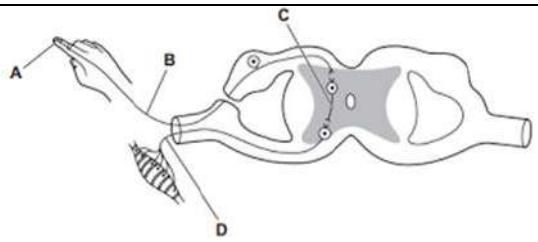
Q11. Which one is possible progeny in F2 generation of pure breed tall with round seed and short plant with wrinkled seed ?

A) Tall plant with round seed B) Tall plant with wrinkled seed
C) short plant with round seed D) all

Q12. Choose the correct option,

a) In a synapse, chemical signal is transmitted from dendritic end of one neuron to axonal end of another neuron.
b) In a synapse, chemical signal is transmitted from Axon to cell body of the same neuron.
c) In a synapse, chemical signal is transmitted from Cell body to axonal end of the same neuron.
d) In a synapse, chemical signal is transmitted from Axonal end of one neuron to dendrite end of another neuron.

Q13. Identify labels A,B,C,and D and select the correct option.



a) A- Receptor, B-Sensory neuron. C-Relay neuron, D - Motor neuron
b) A- Central Nervous System, B- Electrical impulse C- Sensory neuron, D- Motor neuron
c) A- Central Nervous System, B- Motor neuron, C- Sensory neuron, D- Electrical impulse
d) A-Neuromuscular junction, B- Cell body , C-Sensory neuron, D-Motor neuron

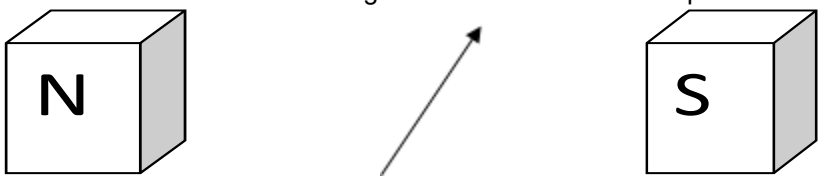
Q14.There is a wire of length L and cross section area A. Which of the following have least resistance?

a) Length doubled, Area half b)Length tripled, area doubled
c) Length halved , area doubled d) the original wire.

Q15. Magnification produced by a rare view mirror fitted in vehicles:

a) Is more than 1 b) Is equal to 1
c) Is less than 1 d) Depends upon the position of object in front of it.

Q16. A current flows in a horizontal wire running between south and north pole of a two magnets



The force on the wire due to the magnetic field is directed towards:-

a) south b) North
c) downwards d) upwards.

Q. No. 17 to 20 are Assertion - Reasoning based questions.
These consist of two statements - Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:
a) Both A and R are true and R is the correct explanation of A
b) Both A and R are true and R is not the correct explanation of A
c) A is true but R is false
d) A is False but R is true

Q17. **Assertion:** Chips manufacturers usually flush bags of chips with gas such as nitrogen.
Reason: Nitrogen gas prevents the oil and fats of the chips from being oxidized.

Q18. **Assertion:** Burning of natural gas is endothermic process.
Reason: Methane gas combine with oxygen to produce carbon dioxide and water.

Q19. **Assertion:** Mendel chose a number of varieties of garden pea as plant material for his exp
Reason: Garden pea has contrasting characters and is bisexual.

Q20. **Assertion**: Relative strength of magnetic field is shown by the degree of closeness of field lines.
Reason: The direction of magnetic field at a point is taken to be the direction in which a magnetic compass needle points.

SECTION -B

Q21. (a) Show by a diagram the transfer of electrons between the atoms in the formation of $AlCl_3$. Write symbols of cation and anion present in $AlCl_3$
(b) Name the solvent in which ionic compounds are generally soluble.

Q22 . (a) Give the constituents of baking powder.
(b) Why cake or bread swells on adding baking powder?. Write chemical equation.

Q23. With the help of suitable diagrams, explain the various steps of budding in Hydra.

Q24 a)Name the term used for the traits that are exhibited externally?
b)What is the phenotypic ratio of a dihybrid cross in F2 generation?

Q25. What will happen if we kill all the organisms in one trophic level in a food chain? Explain by giving suitable example.

Q26. A bulb is rated 5V ; 500 mA. Calculate the rated power and resistance of the bulb.

SECTION -C

Q27. A 4 cm tall object is placed perpendicular to the principal axis of a convex lens of focal length 24 cm. The distance of the object from the lens is 16 cm. Find the position, size and nature of the image formed, using the lens formula. OR

(a) When a concave mirror is held towards the sun and its sharp image is formed on a piece of carbon paper for some time, a hole is burnt in the carbon paper. For this, what should be the distance between the mirror and the carbon paper?

(b) What is the distance between the pole and focal point of a spherical mirror called?

(c) The focal length of a mirror is 15 cm. What is its radius of curvature?

Q28 Give the functions of the following hormones:-

a) Cytokines b) Abscisic Acid c) Ethylene

Q29. (a) What is catenation ? what are the allotropes of carbon?

(b) What happens when ethanol is treated with sodium metal? State the behaviors of ethanol in this reaction.

(c) Draw the structure of cyclohexane

Q30. (a) Write the correct sequence of steps followed during journey of oxygen rich blood from lung to various organs of human body.

Q31. Explain the process of formation of ozone as well as its 2 causes of depletion.

Q32. a) Show the angle of deviation of a glass prism along with angle of incidence and refraction.

b) Show dispersion of white light through glass Prism.

OR

a) What is critical angle of a glass slab?

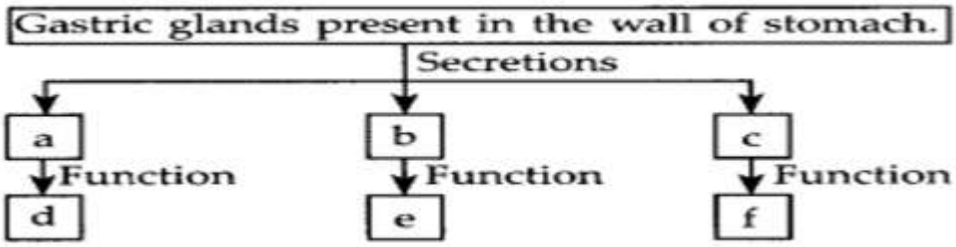
b) Show the diagrammatic representation of critical angle of glass slab.

Q33. A 6 ohm resistance is double on itself. Calculate the new resistance of the wire

SECTION –D

Q34 a) What are Villi? Write one function?

b) Complete the following flow chart of digestion of food in intestine by pancreatic juices from “a” to “f”, as per the given instructions.



(h) Rhizopus individuals do not grow on a dry slice of bread.

35. a) Define Esterification and Saponification . Give their reactions also.

b) What is micellels ? Write the cleaning actions of soap with proper explanation

OR

a) a)What is Water of crystallization?

b)i), What happens when sodium bicarbonate is heated?

b)ii)What happens on heating gypsum at 373 k ?

Q36. Explain with diagram the deflection shown by the current carrying conductor..

CASE BASED QUESTIONS

Q37.

(a) Give one example of each :- reproduction shown by binary fission & Multiple fission.

(b) Why sexual reproduction has greater rate survival ?

(c) What is the basis of energy in yeast for sustaining all life activities ?

OR

(a) What does Moist bread slice offers to the bread moulds & what does dry slice of bread gives to spores ?

Q38. A displacement reaction is one in which one element of a compound is replaced by another element. For example, when a strip of Zn is placed is aqueous CuSO4 (blue), it does not take long for the displacement reaction to form metallic copper and colourless ZnSO4 solution. In double displacement reactions, two reacting compounds exchange their corresponding ions and form two new compounds. For example, double displacement reaction takes place when aqueous solutions of barium chloride and sodium sulphate are mixed together; barium sulphate and sodium chloride are formed

(a) The reaction, $Zn + 2HCl \rightarrow ZnCl_2 + H_2$ is an example of.

(b) Which metallic spoon can be used to stir lead nitrate solution?

(c) (i) What does the given reaction indicates ?

$$Cu + 2AgNO_3 \rightarrow Cu(NO_3)_2 + 2Ag$$

(ii) A strip of copper was placed in a beaker containing zinc sulphate solution. What can we observe the next day?

Or

(c) What happens during a displacement reaction?

Q39. The rainbow is an example of the dispersion of sunlight by the water drops in the atmosphere. This is a phenomenon due to combined effect of dispersion refraction and reflection of sunlight by spherical water droplets of rain. The conditions for observing a rainbow are that the sun should be shining in one part of the sky (say near western horizon) while it is raining in the opposite part of the sky (say eastern horizon). An observer can, therefore, see a rainbow only when his back is towards the sun.

a) Why rainbow is formed ?

(b) Why rainbow cannot to seen on the moon?.

(c) How many rainbows can be formed?

Or

(c) Which colour is at the bottom of primary rainbow?

SOLUTIONS

SECTION-A (1X20=20 Marks)

1. B) 2. D) 3. C) 4. C) 5 D) 6. A) 7. B) 8. D) 9. B
10 C) 11. D) 12. D). 13.A) 14.C) 15. C) 16. D) 17.A) 18.D)
19.A) 20.B)

SECTION –B (2X6=12)

21. (a) Corrcet diagram, cations Al 3+ anions Cl - b) Water

22 . (a) Sodium Hydrogen Carbonate and Tartaric Acid

(b) Release of CO2 gas, NaHCO3------□Na2CO3 + CO2 + H2O

23. Correct diagram and steps.

24. a) phenotype b) 9:3:3:1

25. The organism in preceding trophic level will increase and organism in succeeding trophic level will decrease / any suitable explanation..

26. Power = VXI= 5VX500/1000A =2.5 W

Resistance= V/I =5V/0.005A = 1000 Ohm

SECTION -C (3X7=21Marks)

27. Given - f=+24cm,u=−16cm , 1

Here-,u=-16cm f=24cm,

From lens equation f=−16×24−16+24=−48cm ,

-ive sign shows that image will be formed on the same side of lens , where the object is placed .

Now linear magnification m=I/O=v/u=−48/−16=+3 ,

or I=3×4=12cm (given O=4cm) ,

since m=+ive and m>1 ,therefore image will be virtual ,erect and magnified

1

OR

(a) The name given to the distance between the mirror and the carbon paper is the focal length.

(b) The distance from the pole to the focal point is called the focal length (f).

(c) 30cm.

28 a) Cytokinins promote cell division and increase cell expansion during the proliferation and expansion stages of leaf cell development, 1

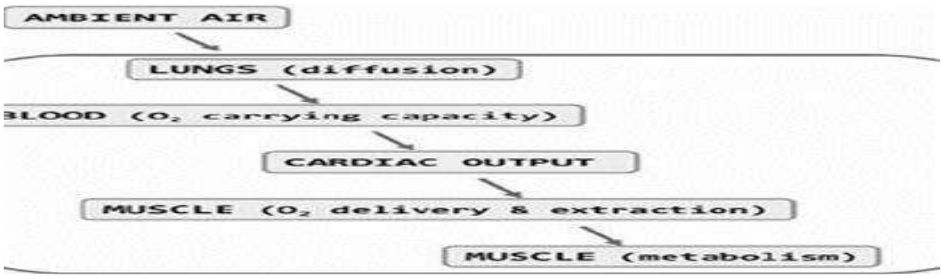
b) Abscisic acid (ABA) regulates various aspects of plant physiology, including promoting seed dormancy and adaptive responses to abiotic and biotic stresses 1

c) Ethylene acts as a significant hormone that regulates and mediates complex cycles in plants, regarding their growth and development, 1

29. (a) Catenation is the self-linking of atoms of an element to create chains and rings. Diamond and graphite.1

(b) If a small piece of sodium is dropped into ethanol, it reacts steadily to give off bubbles of hydrogen gas and leaves a colorless solution of sodium ethoxide: CH3CH2ONa. 1

30. (a) Once in the bloodstream, oxygen gets picked up by the hemoglobin in red blood cells. This oxygen-rich blood then flows back to the heart, which pumps it through the arteries to oxygen-hungry tissues throughout the body

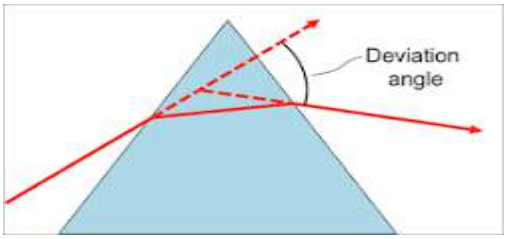


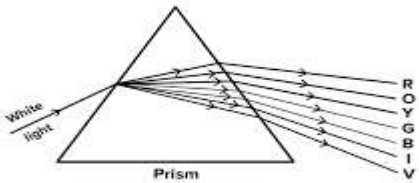
31.$O_2 \xrightarrow{\text{Uv rays}} O + O$. 1+2

$O+O_2 \rightarrow O_3$

Use of CFCs / When chlorine and bromine atoms come into contact with ozone in the stratosphere, they destroy ozone molecules. One chlorine atom can destroy over 100,000 ozone molecules before it is removed from the stratosphere. Ozone can be destroyed more quickly than it is naturally created./any other reason.

32. a) 1+2

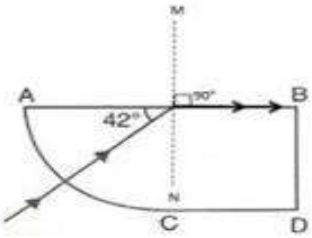




Dispersion of white light

OR

a) The angle of incidence for which the angle of refraction is 90 degrees is called as the critical angle.

b) 

33. The following relationship explains it.

R=ρLA

Where ρ is the resistivity of the material.

Given: Resistance R=6 ohms

As we saw above

R=ρLA.....(1)

The wire is doubled by folding so,

Area (A)=2A Then the length will be (L)=L2

The new resistance will be: Rnew=ρL22A ⇒Rnew=ρL4A

By equation (1)

we can simplify the above equation as

Rnew=R4

∴Rnew=64=1.5 ohms

SECTION –D (5x3=15 Marks)

34 a) Villi are finger like projection.

The helps in absorbing nutrients from digested food in intestine. 2

b)

a---(amylase)----→ digests --d (starch into sugar) /carbohydrates 3

b---(lipase)--------→ digests ---e (fats)

c----(trypsin)----→ digests ---f (proteins)

35. a) In the esterification reaction, a carboxylic acid reacts with an alcohol to form a sweet-smelling compound known as esters. In the saponification reaction, an ester undergoes alkaline hydrolysis to form a salt of carboxylic acid and an alcohol .

$CH_3COOC_2H_5+NaOH \rightarrow CH_3COONa+C_2H_5OH$. 2.5

b) with structure of micelles. The cleansing action of soaps and detergents is due to their capacity to reduce the surface tension of water, emulsify oil or grease, and retain it in suspension in water. Soaps and detergents have this potential due to their structure.

$CH_3COOH + C_2H_5OH \rightleftharpoons$ conc . H_2SO_4 $CH_3COOC_2H_5 + H_2O$ 2.5

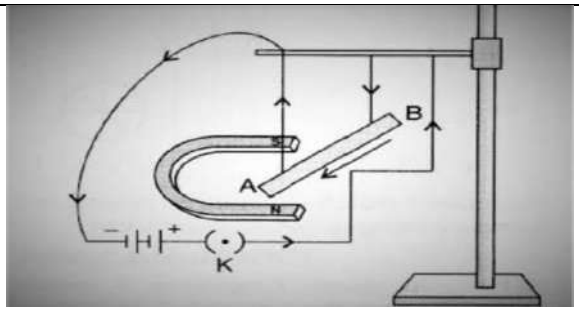
OR

a) a)Water of crystallization is the amount of water molecules which are present in one formula unit of salt

b)i), sodium bicarbonate starts to break down into three compounds, forming sodium carbonate (Na_2CO_3), water (H_2O) and carbon dioxide (CO_2). 2.5

b)ii)Heating gypsum at 373 k results in loss of water of crystallization, forming plaster of Paris. 2.5

36. Correct explanation with diag.. 3+2



SECTION – E (4X3=12)

CASE BASED QUESTIONS

37. (a) Leishmania - binary & Plasmodium-multiple 2

(b) Greater survival rate for sexual reproduction due to more variations 1

(c) Because sugar provides energy for sustaining all life activities in yeast. 1

OR

(c) Moist bread slice offers both moisture and nutrients to the bread moulds where as dry slice of bread gives nutrients to spores but not moisture.

38.

(a) Ans. Displacement reaction. 1

(b) Ans. Silver. 1

(c) Ans. (i) Copper is more reactive than silver 2

(ii) The copper strip remained as it was.

OR

(c) Ans. A displacement reaction occurs when a more reactive element displaces a less reactive element from a compound that contains the less reactive element. After a displacement reaction, the less reactive element is now pure and left uncombined

39. a)Ans. A rainbow is formed when light is refracted, dispersed and suffers total internal reflection. 2

b) Ans There is no rain in the moon. 1

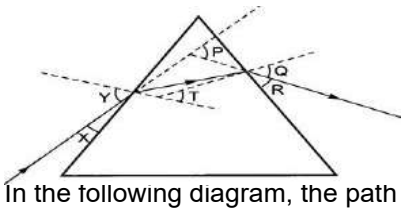
c) Ans. Primary and secondary. 1

OR

c) Ans violet colour is at the bottom

Section-A

Question 1 to 16 are multiple choice questions. Only one of the choices is correct. Select and write the correct choice as well as the answer to these questions.

1.	Gustatory receptors are able to detect:- a) Touch b) Smell c) light d) Taste	**1**
2.	Solid calcium oxide reacts vigorously with water to form calcium hydroxide accompanied by the liberation of heat. From the information given above it may be concluded that this reaction is:- a) Endothermic and pH of the solution is more than 7. b) Exothermic and pH of the solution is 7. c) Endothermic and pH of the solution is 7. d) Exothermic and pH of the solution is more than 7.	**1**
3.	The strength of magnetic field inside a long current carrying straight solenoid is a) More at the ends than at the centre b) Minimum at the middle c) Same at all points d) Found to increase from one end to the other	**1**
4.	Amongst the following group of materials the group which contains only biodegradable materials is:- a) Polythene, Soap, Wool c) Plastic, Leather, Grass b) Glass, Aluminium, Neem Leaves d) Wood, Leather , Paper	**1**
5.	The image formed by a concave mirror of focal length 25 cm is real and of magnification -1. In this case the distance between the objet and its own image is:- a) 50 cm b) zero c) 25 cm d) 100 cm	**1**
6.	 In the following diagram, the path of a ray of light passing through the glass prism is shown. In this figure the angle of incidence, the angle of emergence and the angle of deviation are-: a) X, R and Q b)X, R and P c) Y, Q and P d)Y, T and Q	**1**
7.	A hydrocarbon which contains two C-C single bonds and one C=C double bond is: a) Ethene b) Benzene c) Butene d) Propene	**1**
8.	Decomposers are not included in the food chain. The correct reason for the same is because decomposers:- a) Act at every tropic level of the food chain. b) Do not breakdown organic compounds. c) Convert organic material to inorganic forms. d) Release enzymes outside their body to convert organic material to inorganic forms.	**1**
9.	An element X reacts with O2 to give a compound with a high melting point. This compound is also soluble in water. The element 'X' is likely to be :- a) Iron b) Carbon c) calcium d) silicon	**1**
10.	Solder is an alloy of : a) Cu and Zn b) Pb and Sn c) Pb, Sn and Zn d) Al and Sn	**1**
11.	Which of the following statements about the given reaction are correct? 3Fe(s) + 4H2O (g) □Fe3O4(s) + 4H2 (g) i) Iron metal is getting oxidized. ii) Water is getting reduced. iii) Water is acting as a reducing agent. iv) Water is acting as an oxidising agent. a) i, ii and iii b) i , ii and iv c) iii and iv d) ii and iv	**1**
12.	The maximum resistance of a network of five identical resisters of 1/5 ohm each can be :- a) 1 ohm b) 0.5 ohm c) 0.25 ohm d) 0.1 ohm	**1**

13. In plants, A stomata closes when: **1**

i) It needs CO_2 for photosynthesis.
ii) It does not need CO_2 for photosynthesis.
iii) Water flows into the guard cells.
iv) Water flows out of the guard cells.

a) Only ii b) ii and iii c) i and iv d) ii and iv

14. Walking in a straight line and riding a bicycle are the activities which are possible due to a part of the brain. Choose the correct location and name of this part from the given table:- **1**

	Part of brain	Name
a	Fore brain	Cerebrum
b	Mid brain	Hypothalamus
c	Hind brain	Cerebellum
d	Hind brain	Medulla

15. Select from the following the conditions responsible for the rapid spread of bread mould on a slice of bread:- **1**

i) Formation of large number of spores.
ii) Presence of moisture and nutrients in bread.
iii) Low Temperature
iv) Presence of hyphae

a) i and ii b) ii and iv c) Only ii d) ii and iii

16. If homozygous tall plant cross with heterozygous tall plant, What will be the percentage of tall and dwarf in their offspring? **1**

a) 75 tall and 25 dwarf c) 100 tall and no dwarf
b) 25 tall and 75 dwarf d) 50 tall and 50 dwarf

Question No. 17 to 20 consist of two statements –
Assertion (A) and **Reason** (R). Answer these questions by selecting the appropriate option given below:

A. Both A and R are true, and R is the correct explanation of A.
B. Both A and R are true, and R is not the correct explanation of A.
C. A is true but R is false.
D. A is false but R is true..

17. Assertion (A) : Magnetic field lines never intersect each other. **1**
Reason (R) : The magnetic lines arise from north pole to south pole of the magnet..

18. Assertion (A) : Ozone (O_3) is a molecule formed by the three atoms of oxygen. Reason (R) : Ultraviolet sunlight breaks apart an oxygen molecule to form two separate oxygen atoms. Then each oxygen atom combines with oxygen molecule to form ozone. **1**

19. Assertion (A) : In human, there is a complex respiratory system. Reason (R) : Human skin is permeable to gases. **1**

20. Assertion (A) :After white washing the walls, a shiny white finish on walls is obtained after two to three days. **1**
Reason (R) : Calcium oxide reacts with carbon dioxide to form calcium hydrogen carbonate which gives shiny white finish.

Section-B

Question No. 21 to 26 are very short answer questions

21. *Attempt either option A or B.* **2**

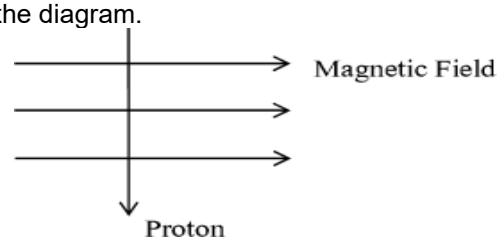
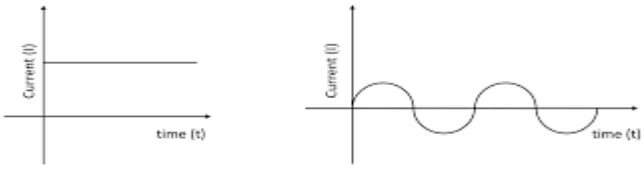
A.
List the role of each of the following in our digestive system:-
a) Mucus b) Trypsin

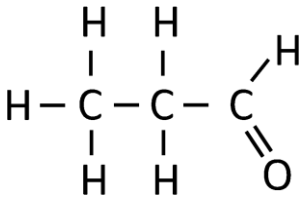
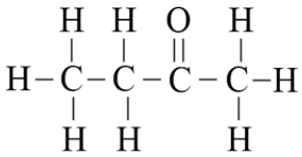
OR

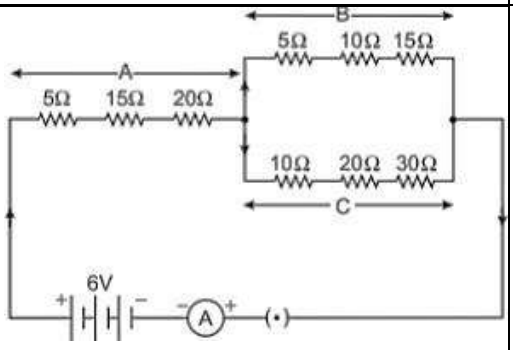
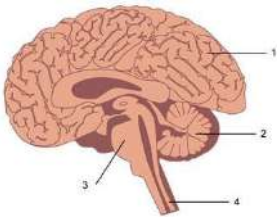
B.
Name the following :
a) The three carbon molecule that is formed due to break down of glucose during respiration.
b) The nitrogenous waste that is removed from the blood in our kidneys.

22. Translate the following statements into chemical equations and balance them. **2**
a) Hydrogen sulphide gas burns in air to give water and sulphur dioxide.
b) Silver bromide on exposure to sunlight decomposes into Silver and Bromine.

23. What is Placenta? Explain its function in humans. **2**

24.	*Attempt either option A or B.* A. Draw a labelled ray diagram to show the path of a ray of light incident obliquely on one face of a glass slab. Show the angle of incidence, the angle of emergence and the lateral displacement. **OR** B. If the image formed by mirror for all positions of the object placed in front of it always virtual and diminished. State the type of mirror. Draw a ray diagram in support of your answer.	**2**
25.	Draw the structure of the following compounds indicating the functional group present in each a) Propanol b) Butanoic acid	**2**
26.	Why do we need to clean aquarium but not a pond? Explain.	**2**
	SECTION C **Question No. 27 to 33 are short answer questions**	
27.	(a) A non metal X exists in two different forms Y and Z. Y is the hardest natural substance whereas Z is a good conductor of electricity. Identify Y and Z. (b) Show the electron dot structures of the formation of CaO and $MgCl_2$.	**3 (1+2)**
28.	*Attempt either option A or B.* A. List the important products of the chlor-alkali process. Write one important use of each product. **OR** B. In one of the industrial processes used for manufacture of sodium hydroxide, a gas X is formed as by product. The gas X reacts with lime water to give a compound Y which is used as a bleaching agent in chemical industry. Identify X and Y and write the chemical reactions involved.	**3**
29.	*Attempt either option A or B.* A. (a) State (i) right-hand thumb rule, and (ii) Fleming's left-hand rule. (b) Using Fleming's left-hand rule determine the direction of force experienced by a proton, which enters vertically downwards in a uniform magnetic field acting horizontally from west to east as shown in the diagram.  **OR** **B.**  (a) (b) i) Name the type of current in two cases with one difference between them. ii) What is the frequency of current in case (b) in India.	**3 (2+1)**
30.	Write the difference between two kinds of blood vessels present in Human beings. Write minimum three points of each type	**3**
31.	State the cause of dispersion of white light by a glass prism. How did Newton using two identical glass prisms, show that white light is made of seven colours? Draw the ray diagram in support of above activity.	**3**
32.	(a) Why did Mendel choose garden pea plant? Write two reasons. (b) How do Mendel's experiment show that traits are inherited independently? Explain it.	**3 (1+2)**

33.	(a) Draw a schematic diagram of a circuit consisting of a battery of four 1.5V cells, a 5 ohm register, 10 ohm and 15 ohm resistors in a series connection with ammeter and volt meter across 10 ohm resistors. (b) Find the electric current passing through the circuit. (c) What is the potential difference across 10 ohm resistors?	**3 (1+1+1)**
	Section-D Question No. 34 to 36 are long answer questions.	
34	*Attempt either option A or B.* A. (a) Why sexual reproduction is considered advantageous over asexual reproduction? (b) What happens to different parts of the flower after fertilisation? (c) Draw neat diagram of a germinating seed and label the part which:- i) Store food ii) Forms root iii) Forms shoot. **OR** **B.** Testes in male human reproductive part perform dual functions. Explain it. Describe the role of prostate gland and seminal vesicle in human male reproductive system. (d) Name the surgical method in male human being to prevent the pregnancy and write its mechanism.	**5**
35.	Attempt either option A or B. A. (a) Upper part of a convex lens is covered with a black paper.draw a ray diagram to show the formation of image of an object placed at 2F from such a lens. Mention the position and nature of the image formed. State the observable difference in the image obtained if the lens is uncovered. Give reason to justify your answer. (b) An object is placed at a distane of 30 cm from the optical centre of a concave lens of focal length 15 cm. Use lens formula to determine the distance of the image from the optical centre of the lens. OR B. (a) A student has focused the image of an object on a white screen of concave mirror. The length of the object is 10 cm, Focal length of the mirror is 12cm and the distance of the object from the mirror is 18 cm. Calculate the following:- i) Distance of the image from the mirror. ii) Length of the image. (b) If the distance between the mirror and the object is reduced to 10 cm, then what would be observed on screen? Draw a ray diagram to justify your answer for this situation.	**5**
36.	Attempt either option A or B. A. (a) Identify the functional groups present in the following carbon compounds and name the compounds. i)  ii)  (b) How can you get back alcohol from ester? Write the name of the reaction with its equation. (c) Name the reaction which is used to convert vegetable oil to vanaspati ghee in industry. Write the equation. OR B. (a) Describe the cleansing action of soap with proper diagram. (b) Write the major three difference between soap and detergent.	5
	Section – E **Question No. 37 to 39 are case-based/data -based questions**	
37.	Nisha observed that the bottoms of cooking utensils were turning black in colour while the flame of her stove was yellow in colour. Her daughter suggested cleaning the air holes of the stove to get a clean, blue flame. She also told her mother that this would prevent the fuel from getting wasted. a)Identify the reasons behind the sooty flame arising from the stove. b)Can you distinguish between saturated and unsaturated compounds by burning them? Justify your	**4**

	answer. c)Why do you think the colour of the flame turns blue once the air holes of the stove are cleaned? OR d)What could the probable reasons for the wastage of fuel?	
38	Study the above electric circuit in which the resisters are arranged in three arms A,B and C and answer the following questions. a) Calculate the equivalent resistance of the connection of B and C arms . b) What will be the reading show in Ammeter? Attempt either subpart c or d. C)What would be the reading of ammeter if the arm B is removed from the circuit? OR d)What will be the potential difference across the A arm?  	**4**
39.	Spinal cord is a cylindrical structure. It begins in continuation with the medulla oblongata of brain and extends downwards upto early part of lumbar region. Internally the spinal cord possesses a narrow fluid filled cavity called central canal. Spinal cord is enclosed in vertebral column or backbone which protects it. Attempt either subpart a or b. a) How is the brain protected against injuries and shocks? OR b) Label the following parts:- Any two with their function each of the part.  c) Write one difference between reflex action and walking. d) Name one important endocrine gland present inside the brain which is known as master gland. Write the function of its secreting hormone	**4**

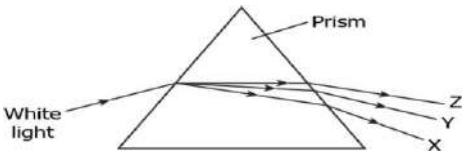
Q.N.	SECTION-A Question 1-16 are multiple choice questions. Only one of the choices is correct. Select and write the correct choice as well as the answer to these questions.	Marks
Q1.	$MnO_2 + xHCl \rightarrow MnCl_2 + yH_2O + zCl_2$ In order to balance the above chemical equation, the values of x,y and z respectively are (a) 6,2,2 b)4,1,2 c)4,2,1 d)2,2,1	1
Q2.	Few drops of aqueous solution of NH_4Cl are put on universal indicator paper. The paper turns pink. Study the following table and choose the correct option:	1

Options	Nature of salt	Parent acid and base	Range of pH
(a)	Acidic	Weak acid and strong base	Less than 7
(b)	Basic	Weak acid and strong base	More than 7
(c)	Acidic	Strong acid and weak base.	Less than 7
(d)	Basic	Strong acid and weak base.	Equal to 7

a) a b) c c) d d) b

Q3. The image shows the dispersion of the white light in the prism. What will be the colours of the X, Y and Z? — 1

(a) X: red; Y: green; Z: violet
(b) X: violet; Y: green; Z: red
(c) X: green; Y: violet; Z: red
(d) X: red; Y: violet; Z: green



Q4. The atomic number of three elements X, Y and Z are 16, 12 and 10 — 1

(a) Y and Z are metals
(b) Y and X are non-metals
(c) X is a non -metal and Y is a metal
(d) Y is a non-metal and Z is a metal

Q5. Which of the following is not a role of decomposers in the ecosystem? — 1

(a) Natural replenishment of soil
(b) Enrichment of oxygen in atmosphere
(c) Waste decomposition
(d) Break-down of dead remains

Q6. A student adds lead and silver to two different test tubes containing an equal amount of copper sulphate solution. The student observes that the colour of the solution in the test tube with lead changes. What explains the change in the colour of the solution? — 1

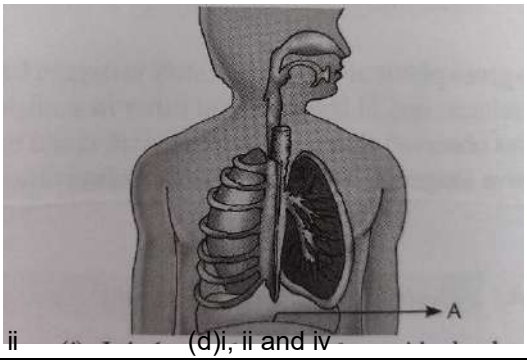
(a) A displacement reaction takes place as lead replaces copper from the solution.
(b) A combination reaction takes place as lead combines with sulphate in the solution.
(c) A decomposition reaction takes place as copper dissociates from sulphate in the solution.
(d) A double displacement reaction takes place as copper dissociates from sulphate and lead combines with sulphate in the solution.

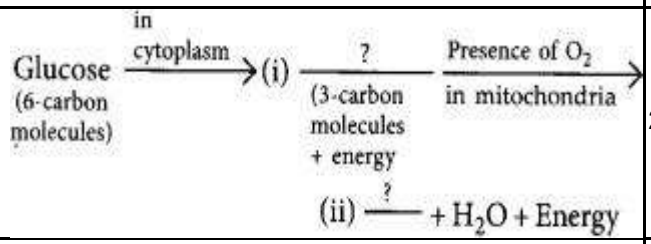
Q7 Concentrated H2SO4 is diluted by adding — 1

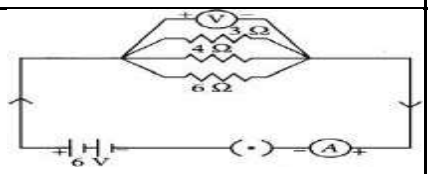
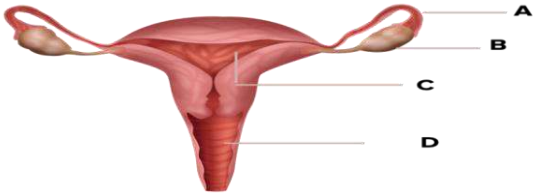
(a) Water to acid with constant stirring
(b) Acid to water with constant stirring
(c) Water to acid followed by base
(d) Base to acid followed by cold water.

Q8 Which of the following options is correct for obtaining pure copper in the process of electrolytic refining of copper? — 1

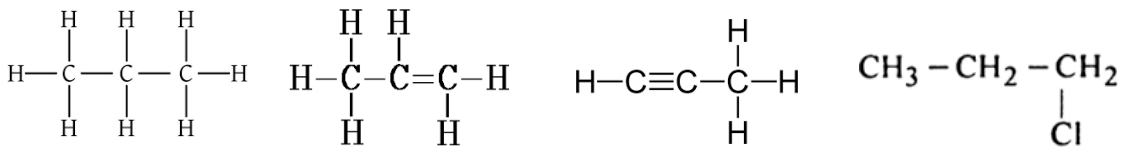
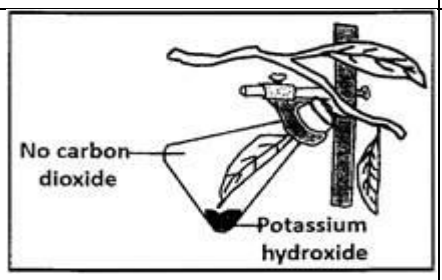
(a) When current is passed, pure copper from the anode deposits to the cathode.
(b) When current is passed, pure copper from the anode deposits in the electrolytic solution.

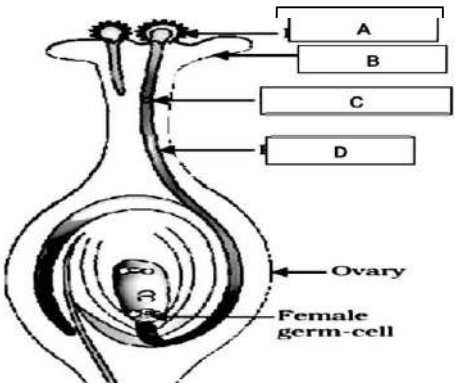
	(c) When current is passed, pure copper from the electrolytic solution deposits at the anode. (d) When current is passed, pure copper from the electrolytic solution deposits at the cathode.	
Q9.	Silver article turns black when kept in the open air for few days due to formation of (a) AgS (b)Ag2S (c)AgSO4 (d)H2S	1
Q10.	Sphincter muscles are present at the exit of: (a) Stomach and small intestine (b)Stomach and anus (c)Small intestine and large intestine (d) Oesophagus and stomach	1
Q11.	If 100 J energy is available at the producer level in a food chain then the energy available to the secondary consumer will be: (a)10 J (b)0.1 J (c)1 J (d)0.01 J	1
Q12.	An object is placed at a distance of 40cm in front of a concave mirror of a focal length of 20 cm. The image produced is: (a) virtual and inverted (b) real and erect (c) real, inverted and of the opposite size as that of the object (d) real, inverted and of the same size as that of the object.	1
Q13.	Which of the following options shows the transport of oxygen to the cells correctly? (a) Lungs →pulmonary vein →left atrium →left ventricle →aorta → body cells (b) Lungs →pulmonary vein →right atrium →right ventricle → aorta → body cells (c) Lungs →pulmonary artery →left atrium → left ventricle → vena cava →body cells (d) Lungs →pulmonary artery →right atrium → right ventricle→ vena cava →body cells	1
Q14.	How will information travel within a neuron? (a) Dendrite -> cell body -> axon -> nerve ending (b) Dendrite -> axon -> cell body -> nerve ending (c) Axon -> dendrite -> cell body -> nerve ending (d) Axon -> cell body -> dendrite -> nerve ending	1
Q15.	Two pea plants, one with round and yellow seeds (RR YY) and another with wrinkled and green (rryy) seeds, produce F_1 progeny that have round and yellow (RrYy) seeds. When F_1 plants are self-pollinated, the F_2 progeny will have a new combination of characters. Choose the new combinations from the following: (i) Round, yellow (ii) Round, green (iii) Wrinkled, yellow (iv) Wrinkled, green (a) (i) and (ii) (b)(i) and (iv) (c)(ii) and (iii) (d)(i) and (iii)	1
Q16.	Which of the following statements are correct in reference to the role of 'A'(shown in the given diagram) during a breathing cycle in human beings? i. It helps to decrease the residual volume of air in lungs. ii. It flattens as we inhale. iii. It gets raised when we inhale iv. It helps the chest cavity to become larger.  (a) ii, iv (b)iii, iv (c)i, ii (d)i, ii and iv	1
	Question No 17-20 consist of two statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below: (a) Both A and R are true and R is the correct explanation of A. (b) Both A and R are true but R is not the correct explanation of A. (c) A is true but R is false. (d) A is false but R is true	
Q17	**Assertion:** The aqueous solutions of glucose and alcohol do not show acidic character. **Reason:** Aqueous solutions of glucose and alcohol do not give H+ ions	1

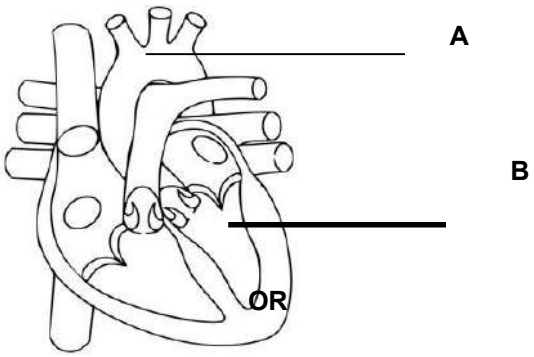
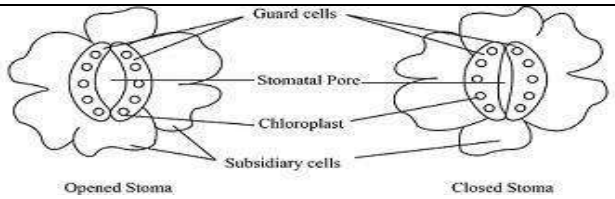
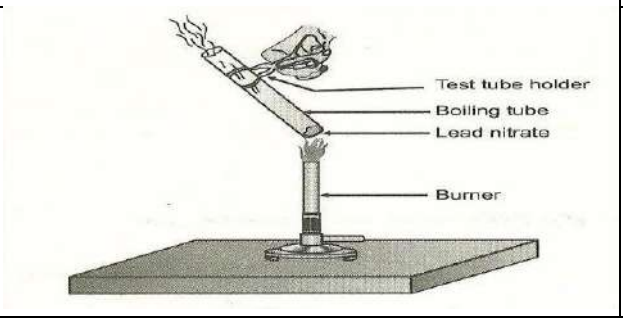
Q18.	**Assertion:** Sex of a child is determined by the chromosome received from mother. **Reason:** Mother has two sex chromosomes- X and X	1
Q19.	**Assertion:** Virtual images are always erect. **Reason:** Virtual images are formed by diverging lens only.	1
Q20.	**Assertion:** There is a greater number of individuals at the lower trophic levels of an ecosystem. **Reason:** The length and complexity of food chains vary greatly.	1
	SECTION-B	
Q21.	A metal nitrate 'A' on heating gives a metal oxide along with evolution of brown coloured gas 'B' and a colourless gas, which helps in burning. Aqueous solution of 'A' when reacts with potassium iodide, forms a yellow precipitate. (a) Identify A and B (b) Name the types of both reactions involved.	2
Q22.	(a) Complete the following pathway showing the breakdown of glucose:  (b) State the function of trachea in the process of respiration.	2
Q23.	In the process of digestion of food in human beings, two protein digesting enzymes are secreted. Name the enzymes and mention the nature of the medium required for their action. **OR** How are pH maintained in the stomach and in the small intestine?	2
Q24.	An object is placed at a distance of 12 cm in front of a concave mirror of radius of curvature 30 cm. List four characteristics of the image formed by the mirror.	2
Q25.	Draw a schematic diagram of a circuit consisting of a battery of 12 V , a combination of two resistors of 3 Ω and 6 Ω in parallel connected with a resistor of 4 Ω in series , a plug key and an ammeter, all connected in series.**OR** Justify the following statements: (a) Electrical appliances are connected in parallel with the mains instead of connecting them in series. (b) Tungsten is used exclusively for filament of electric lamps.	2
Q26.	Construct a food chain showing four trophic levels. Which of these will have the highest concentration of harmful chemicals? Name the phenomenon involved.	2
	SECTION C	
Q27.	A chemical compound 'X' is used in glass industry. It is used for removing hardness of water. (a) Identify 'X' (b) Write its chemical name and chemical formula. (c) How is the compound obtained from brine? Write the equations involved. **OR** During electrolysis of brine solution, a gas 'G' is liberated at anode. When this gas is passed through slaked lime, a compound 'C' is formed which is used for disinfecting drinking water. (a) Identify 'G' and 'C'. (b) Write chemical name and chemical formula of 'C'. (c) Write the chemical equation involved.	3
Q28.	(a) Write the electron dot structures of Potassium and Chlorine. (b) Show the formation of the compound KCl by transfer of electrons. (c) State any two properties of this compound.	3
Q29.	(a) Write the name and the function of upper chambers of the human heart. (b) Why is the separation of oxygenated and deoxygenated blood essential in mammals and birds?	3
Q30.	A green stemmed rose plant denoted by GG and a brown stemmed rose plant denoted by gg are allowed to undergo a cross with each other. (a) What is the colour of stem in their F_1 progeny? (b) Find the percentage of brown stemmed plants in F_2 progeny, if plants are self pollinated. (c) Based on the findings of this cross, what conclusion can be drawn?	3

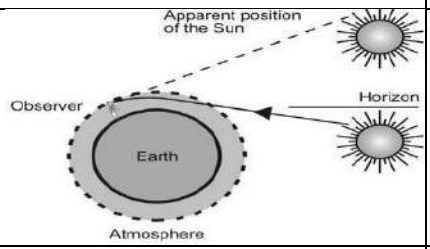
Q31.	A person is unable to see the objects clearly beyond 80cm. (a) Name the defect of vision he is suffering from. What is the nature of the lens required for correction of this defect? (b)Find the focal length and power of the lens.	3
Q32.	In the given circuit diagram calculate (i) the total effective resistance of the circuit. (ii) the current through each resistor. (iii) Total current in the circuit.  	3
Q33.	(a) What is solenoid? (b) State two factors on which the magnetic field of a solenoid depends. (c) Mention two differences between the magnetic field produced by a solenoid and that produced by a bar magnet.	3
	SECTION-D	
Q34.	An organic compound 'A' with two carbon-atoms, on heating with concentrated H_2SO_4 forms a compound 'B' which on the addition of hydrogen in presence of Ni forms compound 'C'. Give name and molecular formula compounds 'A', 'B' and 'C'. and write the chemical equations of the reactions involved. **OR** A compound C (molecular formula, $C_2H_4O_2$) reacts with Na metal to form a compound R and evolves into a gas which burns with a pop sound. Compound C on treatment with an alcohol A in the presence of an acid forms a sweet-smelling compound S (molecular formula, $C_3H_6O_2$). On addition of NaOH to C, it also gives R and water. S on treatment with NaOH solution gives back R and A. Identify C, R, A, and S and write down the reactions involved.	5
Q35.	Describe 2 birth control methods with examples. Which 3 contraceptive method helps to prevent STDs? **OR** (a) Label the parts of the female reproductive system in the following figure. (b) In which part of the female reproductive system fertilization of egg takes place? (c) Write the function of the part 'B' (d) Mention the part where implantation of embryo takes place.  	5
Q36.	(a) State the factors on which resistance of a conductor depend. (any two) (b) Resistance of a conductor of length 'l' and area of cross section 'A' is 'R' Ohm. What would be the new resistance of the conductor if its length is doubled and area of cross section is halved? (c) How can three resistors of resistances 2 Ω, 3 Ω and 6 Ω be connected to give a total resistance of (i) 4 Ω (ii) 1 Ω? **OR** (a) State the Joule's law of heating. Write its mathematical expression. (b) An electric heater of resistance 8 Ω draws 15 A from the service mains 2 hours. Calculate the rate at which heat is developed in the heater. (c) How much current will an electric iron draw from a 220 V source if the resistance of its element when hot is 55 ohms? Calculate the power of the electric iron when it operates on 220 volt.	5
	SECTION-E	
Q37.	A brain is displayed at the Allen Institute for Brain Science. The human brain is a 3-pound (1.4-kilogram) mass of jelly-like fats and tissues—yet it's the most complex of all known living structures The human brain is more complex than any other known structure in the universe. This spongy mass of fat and protein is made up of two overarching types of cells—called glia and neuron. Neurons are notable for their branch-like projections called axons and dendrites, which gather and transmit electrochemical signals.	4 1+1 +2

	Different types of glial cells provide physical protection to neurons and help keep them, and the brain, healthy.Together, this complex network of cells gives rise to every aspect of our shared humanity. We could not breathe, play, love, or remember without the brain. A.Which part of the brain processes the information from the sense organs? B.How is our brain protected? C. In which part of brain medulla is located? What is its function? **OR** D. Ram was studying in his room. Suddenly he smells something burning and sees smoke in the room. He rushes out of the room immediately. Was Ram's action voluntary or involuntary? Why?	
Q 38 .	The spherical mirror forms different types of images when the object is placed at different locations. When the image is formed on screen, the image is real and when the image does not form on screen, the image is virtual. When the two reflected rays meet actually, the image is real and when they appear to meet, the image is virtual. A concave mirror always forms a real and inverted image for different positions of the object. But if the object is placed between the focus and pole, the image formed is virtual and erect. A convex mirror always forms a virtual, erect and diminished image. A concave mirror is used as doctor's head mirror to focus light on body parts like eyes, ears, nose etc., to be examined because it can form erect and magnified image of the object. The convex mirror is used as a rear view mirrors in automobiles because it can form an small and erect image of an object. A. Paheli is using a mirror and finds her image to be erect every time. What type of mirror is she likely using? B. A child is standing in front of a magic mirror. He finds the image of his head bigger, the middle portion of his body of the same size and that of the legs smaller. What would be the combination for the magic mirror at the top and bottom? C. The image formed by a spherical mirror is real, inverted and its magnification is -2. If the image is at a distance of 30 cm from the mirror, where is the object placed? **OR** D. If the image formed by mirror for all positions of the object placed in front of it is always virtual and diminished, state the type of the mirror. Where are such mirrors commonly used and why?	4 1+1 +2
Q39.	A series of organic compounds having same functional group, with similar or almost identical chemical characteristics in which all the members can be represented by the same general formula and the two consecutive members of the series differ by $-CH_2$ group or 14 mass unit in their molecular formulae is called a homologous series. For example, all the members of alcohol family can be represented by the general formula, $C_nH_{2n+1}OH$ where, n may have the values 1, 2, 3, ... etc. The various members of a particular homologous series are called homologues. The physical properties such as density, melting point, boiling point, solubility, etc. of the members of a homologous series show almost regular variation in ascending or descending the series. A. All the members of one homologous series have same general formula. What is the general formula for the series of alkenes? B. State two features of the members of a homologous series. C. Name the functional group in the following compounds: (a)CH_3CHO (b) CH_3COOH **OR** D. Name the third member of the homologous series: i. alkanes ii. alkynes Write molecular formula of each.	4 1+1 +2

	Section- A **Questions 1 to 16 are multiple choice questions. Only one of the choices is correct. Select and write the correct choice as well as the answer to these questions.**	
1	Out of the following statements, which is correct for the given chemical reaction? **$ZnO + CO \longrightarrow Zn + CO_2$** a) ZnO is being oxidized b) CO is being reduced c) CO_2 is being oxidized d) ZnO is being reduced	1
2	Baking powder is a mixture of: a) Sodium carbonate and Acetic acid b) Sodium carbonate and Tartaric acid c) Sodium hydrogen carbonate and Tartaric acid d) Sodium hydrogen carbonate and Acetic acid	1
3	From the following reactions which one is considered to be endothermic reaction: a) Decomposition of vegetable matter into compost. b) Decomposition of calcium carbonate to form quick lime and carbon dioxide. c) Burning of a candle d) Process of respiration.	1
4	Identify the following unsaturated hydrocarbons given below?  **(i)** a) (i) and (ii) **(ii)** b) (i) and (iv) **(iii)** c) (iii) and (iv) **(iv)** d) (ii) and (iii)	1
5	Identify the aim of given experiment?  a) To prove that sun light is essential for photosynthesis b) To prove that carbon dioxide is essential for photosynthesis c) To prove that water is essential for photosynthesis d) To prove that chlorophyll is essential for photosynthesis.	1
6	What are the final products of proteins, carbohydrates and fats respectively in human digestion a) (i) Amino acids, (ii) glucose and (iii) fatty acids b) (i) Amino acids, (ii) glucose, (iii) fatty acids and glycerol c) (i) Glucose, (ii) fatty acids and glycerol, (iii) amino acids d) (i) Sugar, (ii) amino acids, (iii) fatty acids and glycerol	1
7	An aqueous solution 'A' turns phenolphthalein solution pink. On addition of an aqueous solution 'B' to 'A', the pink colour disappears. Which of the following statement is true for solution 'A' and 'B'? a) 'A' is strongly basic and 'B' is a weak base. b) 'A' is strongly acidic and 'B' is a weak acid. c) 'A' has pH greater than 7 and 'B' has pH less than 7. d) 'A' has pH less than 7 and 'B' has pH greater than 7.	1

8	Generally, non-metals are not lustrous. Which of the following non-metal is lustrous? a) Sulphur b) Bromine c) Phosphorous d) Iodine	1
9	An object is positioned 30 cm away from a convex mirror with a focal length of 15 cm. At what distance the image is formed from the pole: a) +20cm from the pole b) -10cm from the pole c) +10cm from the pole d) + 60cm from the pole	1
10	Name the plant hormone that acts as a growth inhibitor and is also responsible for causing leaf wilting. a) Abscisic acid b) Cytokinin c) Auxin d) Gibberellin	1
11	Which statement shows interaction of an abiotic component with a biotic component in an ecosystem? a) A mouse fighting with another mouse for food. b) An earthworm making a burrow in the soil. c) A grasshopper feeding on a leaf. d) Rainwater running down into the lake.	1
12	Galvanization is a method of protecting Iron from rusting by coating with a thin layer of: a) Gallium b) Aluminium c) Zinc d) Silver	1
13	What type of energy is transferred from one trophic level to the next in a food chain? a) Heat energy b) Light energy c) Mechanical energy d) Chemical energy	1
14	Identify the type of plant movements from the pictures given below, i) ii) a) i) Thi c) i) Hydrotrophism ii) Phototrophism d) i) Phototrophism ii) Thigmotrophism	1
15	A cross between a tall plant (TT) and dwarf plant (tt) resulted in progeny that were all tall plants as: a) Tallness is the dominant trait b) Shortness is the dominant trait b) c) Tallness is the recessive trait d) Height of plant is not governed by gene t or t	1
16	a)Identify the following parts A, B, C, D from the given picture  a) A- Stigma, B- Style, b) A- Pollen grain , B- Stigma, C- Male germ cell , D- Pollen tube c) A- Pollen grain , B- Style, C- Male germ cell , D- Pollen tube A- Pollen grain , B- Style, C- Pollen tube , D- Stigma	

	Q.no 17 to 20 are Assertion and Reason based questions. **These consist of two statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:** **a)** Both (A) and (R) are true, and (R) is the correct explanation of (A) **b)** Both (A) and (R) are true, and (R) is not the correct explanation of (A) **c)** (A) is true but (R) is false **d)** (A) is False but (R) is true	
17	**Assertion (A):** The extraction of metals from their sulphide ores cannot take place without roasting of the ore. **Reason (R):** Roasting converts sulphide ores directly into metals.	1
18	**Assertion(A):** Most of the plants close their stomata at night. **Reason(R):** Closing of stomata helps to conserve water as large amount of water evaporates from the leaves.	1
19	**Assertion(A):** The rainbow is a natural spectrum of sunlight in the sky. **Reason(R):** Rainbow is formed in the sky when the sun is overhead and water droplets are also present in air.	1
20	**Assertion(A):** Higher the Refractive index of the medium, lesser will be the speed of light in that Medium. **Reason(R):** Refractive index is inversely proportional to the speed of light	1
	Section – B Question **No. 21 to 26 are very short answer questions**	
21.	a) What are the benefits of having a four-chambered heart in birds and mammals? b) Name the following parts in the given picture  a) Why is there a difference in the rate of breathing between aquatic organisms and terrestrial organisms? Explain. b) Name the respiratory pigment present in the Human blood.	2
22	a) State two functions of stomata. b) How do guard cells regulate the opening and closing of stomatal pore?  	2
23	Observe the given picture and answer the questions that follow: a) Name the type of chemical reaction that takes place in the above given experiment and Name the products formed during the reaction. b) Write balanced chemical equation for the reaction.  	2

24	A student has focused the image of an object of height 3cm on a white screen using a concave mirror of focal length 12cm. If the distance of the object from the mirror is 18cm, find the values of the following: a) Distance of the image from the mirror. b) Height of the image.	2
25	What is the difference between food chain and food web. Draw a simple aquatic food chain.	2
26	a) Why is the tungsten used exclusively as filament for almost all electric lamps? b) Why are the conductors of electric heating devices, such as bread-toasters and electric irons, made of an alloy rather than a pure metal? **OR** a) How does the resistance of a wire vary with its area of cross-section? b) Why Copper and Aluminium wires are usually used for electricity transmission?	2
	Section – C **Question No. 27 to 33 are short answer questions**	
27	a) What is the first step in the breakdown of glucose during aerobic and anaerobic respiration? Where does it take place? b) ATP is called the energy currency of the cell. Why? c) What is meant by "residual volume of air" in a breathing cycle?	3
28	(a) Why did Mendel carry out an experiment to study inheritance of two traits in garden pea plant? (b) In a following cross between two heterozygous Round seeds Rr x Rr, What will be the phenotypic ratio and genotypic ratio obtained in F1 generation?	3
29	Give reasons: a) Pickles are not stored in tin metal container. b) Ionic compounds are poor conductor of electricity in solid state. c) Carbonate and sulphide ores are usually converted into oxides during the process of extraction. **OR** a) What is thermite reaction? Write balanced chemical equation for the reaction involved. b) Name the substance that are getting oxidized and reduced in the thermite reaction.	3
30	a) Identify the natural phenomenon shown in the picture given below. b) Explain with the help of the above labelled diagram that why the position of the star is seen by us is not in its true position. 	3
31	a) Define water of crystallization. b) Give the chemical formula for two compounds as example. c) How can it be proved that the water of crystallization makes a difference in the state and colour of the compounds?	1 1 1
32	a) State Ohm's Law. b) Two wires A and B of same material, having same lengths and diameters 0.2 mm and 0.3 mm respectively, are connected one by one in a circuit. Which one of these two wires will offer more resistance to the flow of current in the circuit? Justify your answer.	3
33	What is a solenoid? When does a solenoid behave as a magnet? Draw the pattern of the magnetic field produced inside it showing the directions of the magnetic field lines.	3
	Section – D Question **No. 34 to 36 are long answer questions**	

34	a) An electrical device of resistance R is connected across a source of voltage V and draws a current I. Derive an expression for power in terms of current and resistance. b) Two electric bulbs rated 100 W, 220 V and 60 W, 220 V are connected in parallel to an electric mains of 220 V. Find the current draws by the bulbs from the mains. **OR** a) Define Power and state its SI unit. b) A torch bulb is rated 5V and 500 mA. Calculate its i) Power ii) Resistance iii) Energy consumed when it is lighted for 2 ^{1} hours 2	5
35	a) Name the following parts in human female reproductive system. i) That produces egg ii) Where fusion of egg and sperm takes place iii) Where zygote is implanted b) Name and explain any two methods of contraception **OR** a) Why is fertilization not possible without pollination? b) State the post-fertilization changes that lead to fruit formation in plant. c) Write any two advantages of vegetative propagation.	5
36	a) i) Identify A, B, C and D **A** $\xrightarrow{\text{Alkaline } KMnO_4}$ **B** **A** + Na(s) $\longrightarrow$ $CH_3CH_2ONa + H_2(g)$ **B** + C_2H_5OH $\xrightarrow{\text{Conc. } H_2SO_4}$ $CH_3COOC_2H5 + H_2O$ **B** + NaOH $\longrightarrow$ **C** **B** + Baking soda $\longrightarrow$ $CH_3COONa + H_2O$ + **D** (Colourless gas) ii) What is Saponification? Write its Equation. iii) What change will Ram observe if he adds, soap solution to red and blue litmus paper? **OR** b) A compound 'X' on heating with excess conc. sulphuric acid at 443 K gives an unsaturated compound 'Y'. 'X' also reacts with Sodium metal to evolve a colourless gas 'Z'. Identify 'X', 'Y' and 'Z'. Explain the chemical equation involved in the formation of 'Y' and also Write the role of Sulphuric acid in the reaction.	2 2 1
	Section – E **Question No. 37 to 39 are Case Study based questions with 2 to 3 short sub-parts. Internal Choice is provided in one of these sub-parts.**	
37	**Read the following passage and answer the questions that follow.** When various members of a class of organic compounds, like alkanes, alkenes and alkyne which can be represented by a general formula and have same functional group are arranged in order of increasing molecular weights, they are found to differ from each other by a fixed group of atoms. They are said to form a homologous series. All members of a particular homologous series can be represented by the same general formula. For example, alkanes can be represented by the general formulae C_nH_{2n+2}. Similarly, alkenes and alkynes series of homologues can be represented by the general formulae C_nH_{2n} and C_nH_{2n-2} respectively.	2 + 2

a) i) What is the difference in the molecular formula of any two consecutive members of a homologous series of organic compounds?

ii) From the given below compounds find the compounds that belong to same homologous series?

CH_4, C_4H_6, C_3H_6, C_5H_8

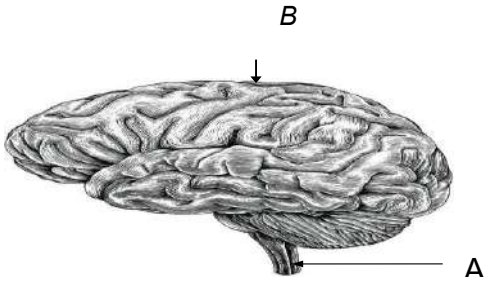
b) Write the next homologue of each of the following:

i) C_2H_4 ii) C_4H_6

OR

b) What are structural isomers? Give an example.

38 **Study the given figure of human brain and answer the questions that follow:** 2 + 1 + 1



a) State the role of the spinal cord in reflex action.

OR

a) State the functions of cerebellum.

b) What is the function of the fluid filled in the brain?

c) Name the parts A and B.

39 **Read the following passage and answer the questions that follow.** 1 + 1 + 2

A student took three convex lenses of different focal lengths and performed the experiment to see the image formation by placing an object at different distances with these lenses as shown in the following table

Case No.	Object distance	Focal length I
	40 cm	20 cm
II	25 cm	15 cm
III	20 cm	30 cm

a)List two properties of the image formed in **Case I.**

b)In which one of the cases given in the table, the lens will form virtual image?

c)Name the type of lens used by dentists. Give reason why do they use such type of lens.

OR

d) Find the power of the lens used in **Case I**.

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