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Class X Science — Board PYQ & Important Questions
Chapter-wise CBSE favourites with marking-scheme style answers

CBSE 2026–27 · Subject Code 086 · All 13 chapters · 130 questions · answers sized to marks

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Please read — our honest note to students. These are the questions that CBSE has asked **again and again** in board papers, sample papers and compartment papers over the years, collected chapter-wise. We have **not** printed a year tag against each question, because we could not verify every year with certainty and would rather not mislead you; the wording may differ slightly from the original paper. Answers follow the CBSE marking-scheme style and are checked against the NCERT text, and this material was organised with the help of AI-based tools — if anything looks doubtful, ask your teacher. Where a diagram is needed, we have written **"please refer to the NCERT textbook figure"** and listed the labels, instead of giving you an inaccurate drawing.

📏 How long should your answer be?

Marks	Question type	What the examiner expects
1	MCQ / Assertion–Reason / one-word	Only the option or the fact. No explanation needed.
2	Very short answer	2 clear points (or 1 point + equation / formula). About 30–50 words.

3	Short answer	3 points, or a numerical in steps: Given → Formula → Substitution → Answer with unit. 50–80 words.
4	Case-based	Answer each sub-part separately and briefly; marks are split sub-part-wise.
5	Long answer	5–6 points with diagram / equations / full numerical working. 80–120 words.

Assertion–Reason key: (a) Both A and R true, R explains A · (b) Both true, R does not explain A · (c) A true, R false · (d) A false, R true.

📜 CONTENTS

The Human Eye and the Colourful World

— 10 questions (1, 2, 3, 4 & 5 marks)

Electricity

— 10 questions (1, 2, 3, 4 & 5 marks)

Magnetic Effects of Electric Current

— 10 questions (1, 2, 3, 4 & 5 marks)

Our Environment

— 10 questions (1, 2, 3, 4 & 5 marks)

CHAPTER 1

Chemical Reactions and Equations

Board-favourite questions · Answers by marks

Q1. Which of the following is a combination reaction as well as exothermic? (a) $CaCO_3 \rightarrow CaO + CO_2$ (b) $CaO + H_2O \rightarrow Ca(OH)_2$ (c) $Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$ (d) $2AgCl \rightarrow 2Ag + Cl_2$ **1 M**

(b) — quicklime and water combine to form a single product and release a large amount of heat.

Q2. **Assertion (A):** A chemical equation must be balanced. **Reason (R):** Mass can neither be created nor destroyed in a chemical reaction. **1 M**

(a) Both A and R are true, and R is the correct explanation of A — balancing follows the law of conservation of mass.

Q3. Why should a magnesium ribbon be cleaned before burning in air? Write the balanced equation. **2 M**

- Magnesium forms a layer of **magnesium oxide** on its surface on exposure to air, which prevents burning; cleaning with sandpaper removes it.
- $2Mg(s) + O_2(g) \rightarrow 2MgO(s)$ — burns with a dazzling white flame giving white powder.

Q4. When ferrous sulphate crystals are heated, what is observed? Write the equation and name the type of reaction. **2 M**

- Green crystals turn **brown/reddish-brown** (ferric oxide) and a smell of burning sulphur is observed.
- $2FeSO_4(s) \xrightarrow{\text{heat}} Fe_2O_3(s) + SO_2(g) + SO_3(g)$
- Type: **thermal decomposition**.

Q5. What is a double displacement reaction? Give an example with a balanced equation in which a precipitate is formed. **2 M**

- A reaction in which two compounds **exchange their ions** to form two new compounds.
- $Na_2SO_4(aq) + BaCl_2(aq) \rightarrow BaSO_4(s)\downarrow$ (white ppt.) + $2NaCl(aq)$

Q6. Write balanced equations with state symbols: (a) Lead nitrate solution + potassium iodide solution; (b) heating of lead nitrate. State the colour observed in each. **3 M**

- (a) $Pb(NO_3)_2(aq) + 2KI(aq) \rightarrow PbI_2(s)\downarrow + 2KNO_3(aq)$ — **yellow precipitate** of lead iodide. (Double displacement / precipitation.)
- (b) $2Pb(NO_3)_2(s) \xrightarrow{heat} 2PbO(s) + 4NO_2(g) + O_2(g)$ — **brown fumes** of NO_2. (Thermal decomposition.)
- 1 mark per correct equation, 1 mark for observations.

Q7. Define oxidation and reduction in terms of oxygen and hydrogen. In $ZnO + C \rightarrow Zn + CO$, identify the substance oxidised, reduced, oxidising agent and reducing agent. **3 M**

- **Oxidation**: gain of oxygen or loss of hydrogen. **Reduction**: loss of oxygen or gain of hydrogen.
- Oxidised: **C** (→ CO); Reduced: **ZnO** (→ Zn).
- Oxidising agent: **ZnO**; Reducing agent: **C**.

Q8. What is rusting? State two conditions necessary for it and two methods to prevent it. Write the chemical formula of rust. **3 M**

- Rusting is the corrosion of iron — formation of a reddish-brown flaky substance on its surface.
- Conditions: presence of **air (oxygen)** and **moisture (water)** — both together.
- Prevention: painting / oiling / greasing; **galvanisation** (zinc coating); alloying (stainless steel).
- Rust: **$Fe_2O_3 \cdot xH_2O$** (hydrated ferric oxide).

Q9. (a) Why is the colour of copper sulphate solution changed when an iron nail is dipped in it? (b) 2 g of silver chloride is kept in sunlight — what happens? (c) Why is quicklime used in whitewashing? Write all equations.

5 M

- (a) Iron displaces copper: $Fe(s) + CuSO_4(aq) \rightarrow FeSO_4(aq) + Cu(s)$. Blue solution becomes **light green**; brown copper deposits on nail. [2]
- (b) $2AgCl(s) \xrightarrow{\text{sunlight}} 2Ag(s) + Cl_2(g)$. White AgCl turns **grey**; photolytic decomposition; used in black-and-white photography. [1½]
- (c) $CaO(s) + H_2O(l) \rightarrow Ca(OH)_2(aq)$ + heat; slaked lime applied on walls reacts slowly with CO_2 of air: $Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$, forming a thin **shiny** layer of calcium carbonate after 2–3 days. [1½]

Q10. Case study. A student took a small amount of quicklime in a beaker and slowly added water. The beaker became hot and a hissing sound was heard.

4 M

- (i) Name the product formed and its common name: **calcium hydroxide, slaked lime**. [1]
- (ii) Type of reaction: **combination and exothermic**. [1]
- (iii) Balanced equation: $CaO(s) + H_2O(l) \rightarrow Ca(OH)_2(aq)$ + heat. [1]
- (iv) One more exothermic reaction: burning of natural gas $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$, or respiration. [1]

— End of Chapter 1 —

CHAPTER 2

Acids, Bases and Salts

Board-favourite questions · Answers by marks

Q1. The pH of a solution is 3. When its pH changes to 6, the H^+ ion concentration (a) increases (b) remains same (c) decreases (d) first increases then decreases. **1 M**

(c) decreases — higher pH means fewer H^+ ions (1000 times fewer here).

Q2. Name the acid present in (a) ant sting (b) tomato. **1 M**

(a) **Methanoic acid** (b) **Oxalic acid**.

Q3. Why do HCl and HNO_3 show acidic character in aqueous solution while glucose and alcohol do not? **2 M**

- HCl and HNO_3 dissociate in water to produce **H^+ (H_3O^+) ions**, responsible for acidic character.
- Glucose and alcohol contain hydrogen but **do not ionise** in water to give H^+ ions, so they are not acidic.

Q4. What is tooth decay? How does brushing help prevent it? **2 M**

- Tooth enamel (calcium hydroxyapatite) corrodes when mouth pH falls **below 5.5** due to acids produced by bacteria degrading sugar/food particles.
- Toothpastes are **basic**; they neutralise excess acid and prevent decay.

Q5. What is meant by water of crystallisation? Give an example with formula, and what happens on heating it. **2 M**

- Fixed number of water molecules present in one formula unit of a salt.
- Copper sulphate $CuSO_4 \cdot 5H_2O$ (blue); on heating, it loses water and becomes **white** anhydrous $CuSO_4$; adding water restores blue colour.

Q6. Describe the chlor-alkali process with equation. Give one use of each product. **3 M**

- Electricity passed through **brine** (aqueous NaCl): $2NaCl(aq) + 2H_2O(l) \rightarrow 2NaOH(aq) + Cl_2(g) + H_2(g)$.
- Cl_2 at **anode**, H_2 at **cathode**, NaOH near cathode. Named after chlorine and alkali (NaOH).
- Uses: NaOH — soaps, detergents, degreasing metals; Cl_2 — water treatment, PVC, bleaching powder; H_2 — fuels, margarine, ammonia for fertilisers.

Q7. Baking soda: give its chemical name, formula, how it is made, and two uses. Why does a cake become soft and spongy? **3 M**

- Sodium hydrogencarbonate, $NaHCO_3$; $NaCl + H_2O + CO_2 + NH_3 \rightarrow NH_4Cl + NaHCO_3$.
- Baking powder = baking soda + mild edible acid (tartaric acid). On heating/with water, CO_2 is released: $2NaHCO_3 \rightarrow Na_2CO_3 + H_2O + CO_2 \rightarrow CO_2$ makes the cake rise, soft and spongy.
- Uses: antacid; ingredient of soda-acid fire extinguishers.

Q8. A metal carbonate X reacts with an acid to give a gas which, when passed through lime water, turns it milky. On passing excess gas, the milkiness disappears. Identify the gas and write all equations. **3 M**

- Gas: **carbon dioxide**. Example: $Na_2CO_3 + 2HCl \rightarrow 2NaCl + H_2O + CO_2$.
- $Ca(OH)_2(aq) + CO_2(g) \rightarrow CaCO_3(s)$ (white ppt., milky) $+ H_2O(l)$.
- Excess: $CaCO_3(s) + H_2O(l) + CO_2(g) \rightarrow Ca(HCO_3)_2(aq)$ (soluble — milkiness disappears).

Q9. (a) What is a neutralisation reaction? Give an equation. (b) Explain the importance of pH in: digestion, soil, and bee sting. (c) Why is the pH of acid rain important for aquatic life? **5 M**

- (a) Acid + base → salt + water. $NaOH(aq) + HCl(aq) \rightarrow NaCl(aq) + H_2O(l)$. [1]
- (b) **Digestion**: stomach produces HCl; excess acid causes indigestion — antacids like milk of magnesia ($Mg(OH)_2$) neutralise it. **Soil**: plants need a specific pH range; acidic soil treated with quicklime/slaked lime, basic soil with organic matter. **Bee sting**: injects methanoic acid → rub baking soda (mild base) to neutralise. [3]
- (c) Rain with pH below 5.6 is acid rain; it lowers river water pH, making survival of aquatic life difficult (living organisms survive only in a narrow pH range, 7.0–7.8). [1]

Q10. Case study. Universal indicator shows the following colours for solutions: A – red, B – green, C – dark blue/violet, D – orange/yellow. **4 M**

- (i) Strongest acid: **A** (pH ~1). Strongest base: **C** (pH ~13–14). [1]
- (ii) Neutral: **B** (pH 7) — e.g. pure water / NaCl solution. [1]
- (iii) Increasing pH: **A < D < B < C**. [1]
- (iv) Mixing A and C in suitable amounts gives neutralisation → salt and water. [1]

— End of Chapter 2 —

CHAPTER 3

Metals and Non-metals

Board-favourite questions · Answers by marks

Q1. Which metal is liquid at room temperature, and which non-metal is lustrous? **1 M**

Liquid metal: **mercury**; lustrous non-metal: **iodine**.

Q2. Why is sodium kept immersed in kerosene? **1 M**

Sodium reacts so vigorously with oxygen and moisture that it catches fire when kept in the open; kerosene prevents contact with air and water.

Q3. What are amphoteric oxides? Give two examples with equations. **2 M**

- Metal oxides that react with both acids and bases to give salt and water, e.g. **Al_2O_3, ZnO**.
- $Al_2O_3 + 6HCl \rightarrow 2AlCl_3 + 3H_2O$; $Al_2O_3 + 2NaOH \rightarrow 2NaAlO_2 + H_2O$.

Q4. Why is hydrogen gas not evolved when a metal reacts with nitric acid? Which metals are exceptions? **2 M**

- HNO_3 is a strong **oxidising agent**; it oxidises the H_2 produced to water and itself is reduced to nitrogen oxides.
- Exceptions: **magnesium and manganese** react with very dilute HNO_3 to evolve H_2.

Q5. Show the formation of NaCl and MgO by the transfer of electrons. **3 M**

- Na (2,8,1) $\rightarrow Na^+$ (2,8) + e^-; Cl (2,8,7) + $e^- \rightarrow Cl^-$ (2,8,8); $Na^+ + Cl^- \rightarrow Na^+Cl^-$.
- Mg (2,8,2) $\rightarrow Mg^{2+} + 2e^-$; O (2,6) + $2e^- \rightarrow O^{2-}$ (2,8); $Mg^{2+} + O^{2-} \rightarrow Mg^{2+}O^{2-}$.
- Draw electron-dot structures showing arrows for transfer (refer NCERT figure).

Q6. State three properties of ionic compounds with reasons. **3 M**

- **High melting and boiling points** — strong inter-ionic attraction needs large energy to break.
- **Soluble in water**, insoluble in kerosene/petrol.
- **Conduct electricity in molten state or solution** (ions free to move), not in solid state (ions fixed).
- Hard and brittle solids.

Q7. Describe the reactions of metals with water: sodium, calcium, magnesium, iron. Write equations. **3 M**

- Na with cold water — violent, exothermic, H_2 catches fire: $2Na + 2H_2O \rightarrow 2NaOH + H_2$ + heat.
- Ca — less violent; bubbles of H_2 stick to it so it **floats**: $Ca + 2H_2O \rightarrow Ca(OH)_2 + H_2$.
- Mg — reacts with hot water, floats; Fe — with **steam**: $3Fe + 4H_2O \rightarrow Fe_3O_4 + 4H_2$.

Q8. What is aqua regia? Why are gold and platinum not affected by most reagents? **2 M**

- Freshly prepared mixture of **conc. HCl and conc. HNO_3 in the ratio 3 : 1**; can dissolve gold and platinum.
- Gold and platinum are at the bottom of the reactivity series — very **least reactive** (noble metals).

Q9. (a) Write the reactivity series for K, Na, Ca, Mg, Al, Zn, Fe, Pb, H, Cu, Hg, Ag, Au. (b) Predict: will Cu displace Zn from $ZnSO_4$? will Fe displace Cu from $CuSO_4$? (c) Why do Al and Zn get a protective layer? **5 M**

- (a) K > Na > Ca > Mg > Al > Zn > Fe > Pb > [H] > Cu > Hg > Ag > Au. [2]
- (b) $Cu + ZnSO_4 \rightarrow$ **no reaction** (Cu is less reactive). $Fe + CuSO_4 \rightarrow FeSO_4 + Cu$ — **yes**, Fe is more reactive. [2]
- (c) They react with oxygen to form a thin, strong **oxide layer** that prevents further oxidation (used in anodising Al). [1]

Q10. Case study. Metals such as Cu and Al are used for making wires; Na and K are soft; Ag and Cu are the best conductors of heat; Pb and Hg are poor conductors of heat. **4 M**

- (i) Property of Cu used for wires: **ductility and good electrical conductivity**. [1]
- (ii) Metals that can be cut with a knife: **Na, K (also Li)**. [1]
- (iii) Best conductors of heat: **silver and copper**. [1]
- (iv) Why cooking vessels are made of metals: they are good conductors of heat and have high melting points. [1]

— End of Chapter 3 —

CHAPTER 4

Carbon and its Compounds

Board-favourite questions · Answers by marks

Q1. The number of covalent bonds in propane (C_3H_8) is (a) 10 (b) 11 (c) 8 (d) 9. **1 M**

(a) 10 — 2 C–C bonds + 8 C–H bonds. (General: C_nH_{2n+2} has 3n+1 bonds.)

Q2. Name the functional group in: (a) CH_3COOH (b) CH_3CHO. **1 M**

(a) **Carboxylic acid** (–COOH) (b) **Aldehyde** (–CHO).

Q3. Why does carbon form covalent bonds? Why are carbon compounds poor conductors of electricity? **2 M**

- Carbon has 4 valence electrons; it cannot gain 4 (C^{4-} — nucleus cannot hold 10 electrons) nor lose 4 (C^{4+} — needs huge energy), so it **shares** electrons.
- Covalent compounds do not form ions, so they are poor conductors.

Q4. Draw the electron-dot structures of (a) methane (b) ethene. **2 M**

- (a) CH_4 — C in the centre sharing one pair with each of 4 H atoms (4 single bonds).
- (b) C_2H_4 — two C atoms share **two pairs** (double bond); each C shares one pair with 2 H atoms.
- *Refer NCERT figures for the standard drawing.*

Q5. What is a homologous series? State two characteristics. Write the next homologue of C_2H_5OH. **2 M**

- A series of compounds with the same functional group, in which successive members differ by **$–CH_2–$** (14 u).
- Same general formula; similar chemical properties; gradation in physical properties.
- Next: **C_3H_7OH** (propanol).

Q6. What is catalytic hydrogenation? Give its industrial use. Why are saturated fats harmful? **3 M**

- Addition of hydrogen to unsaturated hydrocarbons in the presence of **nickel / palladium** catalyst: $R_2C{=}CR_2 + H_2 \rightarrow R_2CH{-}CHR_2$.
- Used to convert vegetable oils into **vanaspati ghee** (hydrogenation of oils).
- Animal fats contain saturated fatty acids, which are harmful to health; vegetable oils with unsaturated fatty acids are healthier.

Q7. What is esterification? Write the equation. What is saponification? **3 M**

- Carboxylic acid + alcohol → **ester** (sweet-smelling), in the presence of conc. H_2SO_4: $CH_3COOH + C_2H_5OH \rightarrow CH_3COOC_2H_5 + H_2O$.
- Ester + NaOH → alcohol + sodium salt of acid: $CH_3COOC_2H_5 + NaOH \rightarrow C_2H_5OH + CH_3COONa$. This is **saponification** — used to make soap.

Q8. What happens when ethanol is heated with excess conc. H_2SO_4 at 443 K? Write the equation and state the role of H_2SO_4. **3 M**

- Ethanol is **dehydrated** to form ethene: $CH_3CH_2OH \xrightarrow{\text{hot conc. } H_2SO_4} CH_2{=}CH_2 + H_2O$.
- Conc. H_2SO_4 acts as a **dehydrating agent** (removes water).

Q9. (a) Explain the cleansing action of soap with the help of micelle formation. (b) Why do soaps not work well in hard water? How do detergents overcome this? **5 M**

- (a) A soap molecule has a **hydrophilic (ionic) head** and a long **hydrophobic (hydrocarbon) tail**. In water, tails point inward into the oily dirt and heads outward to water, forming a cluster called a **micelle**. Dirt collects in the centre; micelles form an emulsion and are washed away by water. Draw micelle — refer NCERT. [3]
- (b) Hard water contains Ca^{2+} and Mg^{2+} salts; soap reacts to form insoluble **scum**, wasting soap. [1]
- Detergents (sodium salts of sulphonic acids / ammonium salts) do not form insoluble precipitates with Ca^{2+} and Mg^{2+}, so they work in hard water. [1]

Q10. Case study. Compound A (C_2H_6O) is used as a solvent and in cough syrups. On oxidation with alkaline $KMnO_4$ it forms B ($C_2H_4O_2$), which turns blue litmus red. **4 M**

- (i) A — **ethanol**; B — **ethanoic acid**. [1]
- (ii) CH_3CH_2OH —alk. $KMnO_4$ + heat→ CH_3COOH. $KMnO_4$ is an **oxidising agent**. [1]
- (iii) B + $NaHCO_3$ → CH_3COONa + H_2O + CO_2 (brisk effervescence). [1]
- (iv) 5–8% solution of B in water is **vinegar**; pure B is called glacial acetic acid (freezes in winter). [1]

— End of Chapter 4 —

CHAPTER 5

Life Processes

Board-favourite questions · Answers by marks

Q1. The site of complete breakdown of glucose (aerobic respiration) is (a) cytoplasm (b) mitochondria (c) chloroplast (d) nucleus. **1 M**

(b) mitochondria.

Q2. Name the enzyme in saliva and its action. **1 M**

Salivary amylase — breaks down starch into sugar (maltose).

Q3. Write the three events that occur during photosynthesis. **2 M**

- (i) Absorption of light energy by **chlorophyll**.
- (ii) Conversion of light energy to chemical energy and **splitting of water** into hydrogen and oxygen.
- (iii) **Reduction of CO_2** to carbohydrates.
- $6CO_2 + 12H_2O$ —sunlight, chlorophyll→ $C_6H_{12}O_6 + 6O_2 + 6H_2O$.

Q4. Why is the rate of breathing in aquatic organisms much faster than in terrestrial organisms? **2 M**

- The amount of **dissolved oxygen in water is much lower** than the amount of oxygen in air.
- So aquatic organisms must breathe faster to obtain sufficient oxygen.

Q5. Show the breakdown of glucose by various pathways with a flow chart. **3 M**

- Glucose (6C) —cytoplasm→ Pyruvate (3C) + energy.
- (a) Absence of O_2 (yeast): Pyruvate → Ethanol (2C) + CO_2 + energy.
- (b) Lack of O_2 (our muscle cells): Pyruvate → Lactic acid (3C) + energy — causes cramps.
- (c) Presence of O_2 (mitochondria): Pyruvate → CO_2 + H_2O + **more energy**.
- Energy stored as **ATP**.

Q6. Describe double circulation in human beings. Why is it necessary? 3 M

- Blood passes through the heart **twice** in one complete cycle.
- Pulmonary: right ventricle → lungs (oxygenated) → left atrium. Systemic: left ventricle → body → right atrium (deoxygenated).
- Necessary because it prevents mixing of oxygenated and deoxygenated blood, giving a highly efficient O_2 supply — needed by birds and mammals with high energy needs to maintain body temperature.

Q7. How is urine produced in the nephron? How is the amount of urine regulated? 3 M

- Blood is filtered in the **glomerulus** into **Bowman's capsule** — the filtrate contains glucose, amino acids, salts, water and urea.
- As the filtrate passes through the tubule, useful substances (glucose, amino acids, salts, much water) are **selectively reabsorbed**.
- The remaining urine goes to the collecting duct → ureter → urinary bladder. Amount of water reabsorbed depends on how much excess water is present in the body and how much dissolved waste has to be excreted.

Q8. Explain transport of water and food in plants. 3 M

- **Water**: through **xylem**. Root cells take up ions → concentration difference → water enters root and moves up. **Transpiration pull** (loss of water from leaves) is the main force in daytime.
- **Food**: through **phloem** — translocation, in both directions, from leaves to storage organs.
- Translocation uses energy from **ATP**; sucrose is transferred into phloem, raising osmotic pressure, so water moves in and pushes food to areas of need.

Q9. Draw a labelled diagram of the human alimentary canal and describe digestion in the stomach and small intestine. **5 M**

- **Diagram:** *please refer to the NCERT textbook figure*. Labels: mouth, oesophagus, liver, gall bladder, stomach, pancreas, small intestine, large intestine, anus. [2]
- **Stomach**: gastric glands secrete **HCl** (acidic medium; kills germs), **pepsin** (digests proteins) and **mucus** (protects stomach lining). [1]
- **Small intestine**: bile from liver (makes food alkaline; **emulsifies fats**); pancreatic juice — trypsin (proteins), lipase (fats), amylase (starch). Intestinal juice converts proteins → amino acids, carbohydrates → glucose, fats → fatty acids + glycerol. [1½]
- Absorption by **villi**, which increase surface area. [½]

Q10. Case study. A person's kidneys have failed. The doctor advises haemodialysis. **4 M**

- (i) Functional unit of the kidney: **nephron**. [1]
- (ii) Principle: artificial kidney has long tubes with a **semi-permeable lining**, suspended in dialysing fluid; nitrogenous wastes diffuse out of blood. [1]
- (iii) Difference from a natural kidney: there is **no reabsorption** in dialysis. [1]
- (iv) Main nitrogenous waste in humans: **urea**. [1]

— End of Chapter 5 —

CHAPTER 6

Control and Coordination

Board-favourite questions · Answers by marks

Q1. Which part of the brain maintains posture and balance? — 1 M

Cerebellum.

Q2. Which hormone is called the emergency hormone? — 1 M

Adrenaline (from adrenal glands).

Q3. What is a synapse? How is the impulse transmitted across it? — 2 M

- The gap between the nerve ending of one neuron and the dendrite of the next.
- The electrical impulse at the axon end releases **chemicals**, which cross the gap and start an electrical impulse in the next neuron.

Q4. Why is iodised salt advised in our diet? — 2 M

- Iodine is needed by the **thyroid** gland to make **thyroxine**, which regulates carbohydrate, protein and fat metabolism.
- Deficiency of iodine causes **goitre** (swollen neck).

Q5. What is a reflex arc? Draw a labelled flow chart. Why are reflex arcs formed in the spinal cord? — 3 M

- The pathway of the nerve impulse during a reflex action.
- Receptor → Sensory neuron → Relay neuron (spinal cord) → Motor neuron → Effector (muscle/gland).
- Formed in the spinal cord for a **quick response** — brain's thinking takes time; the spinal cord connects input and output directly. (Refer NCERT figure for the diagram.)

Q6. How do auxins promote the growth of a tendril around a support? / Explain phototropism. **3 M**

- Auxin is synthesised at the shoot tip; it promotes cell elongation.
- When light falls from one side, auxin diffuses to the **shaded side**; cells on that side elongate more → shoot bends **towards light**.
- In a tendril, the part away from the support grows faster than the part in contact → the tendril coils around the support.

Q7. Compare nervous and hormonal mechanisms of control and coordination (three points). **3 M**

- Message: electrical impulse vs chemical (hormone).
- Speed: very fast vs slow.
- Reach: only connected cells vs all cells via blood; short-lived vs long-lasting effect.

Q8. Name the plant hormones responsible for: (a) cell division (b) wilting of leaves (c) stem growth. **3 M**

(a) **Cytokinin** (b) **Abscisic acid** (c) **Gibberellin** (auxin also promotes elongation).

Q9. (a) Draw the structure of a neuron and label its parts. (b) Name the three parts of the hind-brain with one function each. (c) How are the brain and spinal cord protected? **5 M**

- (a) *Refer NCERT figure*. Labels: dendrite, cell body with nucleus, axon, nerve ending. [2]
- (b) Cerebellum — balance/posture; Pons — respiration; Medulla — heartbeat, BP, salivation, vomiting. [2]
- (c) Brain — bony **cranium** + **cerebrospinal fluid** (shock absorber); spinal cord — **vertebral column**. [1]

Q10. Case study. A child's blood sugar level remains high; the child passes urine frequently and feels thirsty. **4 M**

- (i) Disease: **diabetes**. [1]
- (ii) Hormone deficient: **insulin**; gland: **pancreas**. [1]
- (iii) Treatment: insulin injections, controlled diet. [1]
- (iv) Feedback mechanism: rise in blood sugar is detected by pancreatic cells → more insulin; as sugar falls, secretion reduces. [1]

— End of Chapter 6 —

CHAPTER 7

How do Organisms Reproduce?

Board-favourite questions · Answers by marks

Q1. In which of these does multiple fission occur? (a) Amoeba (b) Plasmodium (c) Hydra (d) Planaria. **1 M**

(b) Plasmodium.

Q2. Where does fertilisation take place in human females? **1 M**

In the **oviduct (fallopian tube)**.

Q3. What is the importance of DNA copying in reproduction? **2 M**

- Transfers the blueprint of body design to offspring — maintains characteristic features of the species.
- Slight variations during copying help in survival in changing environments and are the basis of evolution.

Q4. Why is vegetative propagation practised for growing some plants? Give two advantages. **2 M**

- Plants like banana, orange, rose, jasmine have lost the capacity to produce seeds.
- Advantages: early flowering and fruiting; offspring genetically identical — desirable characters preserved.

Q5. Differentiate between self-pollination and cross-pollination. What happens to the ovary and ovule after fertilisation? **3 M**

- Self: transfer of pollen from anther to stigma of the **same flower**. Cross: to the stigma of **another flower** (by wind, water, insects).
- Ovule → **seed**; ovary → **fruit**; zygote → embryo; petals, sepals, stamens shrivel and fall.

Q6. Describe the role of the placenta. What happens if the egg is not fertilised? **3 M**

- Placenta: disc embedded in the uterine wall with **villi** (large surface area). Provides glucose and O_2 from mother to embryo; removes wastes from the embryo to mother's blood.
- If not fertilised, the egg lives about a day; the thickened uterine lining breaks down and comes out as blood and mucus — **menstruation**, every month, lasting about 2–8 days.

Q7. List four methods of contraception. How do oral pills prevent pregnancy? **3 M**

- Barrier (condom), chemical (oral pills), IUCD (copper-T, loop), surgical (vasectomy, tubectomy).
- Oral pills change the **hormonal balance** so that eggs are not released.

Q8. Name the parts of the male reproductive system and state why testes lie outside the abdominal cavity. **3 M**

- Testes (in scrotum), vas deferens, seminal vesicles, prostate gland, urethra, penis.
- Testes lie outside because sperm formation requires a temperature **lower than normal body temperature**.

Q9. (a) Draw a longitudinal section of a flower and label: stigma, style, ovary, anther, filament, ovule. (b) Describe the process of fertilisation in flowering plants. **5 M**

- (a) *Please refer to the NCERT textbook figure (Longitudinal section of flower).* Six correct labels. [3]
- (b) Pollen lands on the stigma → a **pollen tube** grows out of the pollen grain, travels through the style and reaches the ovule in the ovary → male germ cell fuses with female germ cell (egg) → **zygote**. [2]

Q10. Case study. A farmer cut a Bryophyllum leaf and placed it on moist soil; new plantlets grew from the margins. Another farmer used spores of bread mould on a moist slice of bread. **4 M**

- (i) Method in Bryophyllum: **vegetative propagation by leaves** (buds in leaf notches). [1]
- (ii) Bread mould: ***Rhizopus***, reproduces by **spore formation**. [1]
- (iii) Spores survive because they have **thick walls** that protect them until they contact a moist surface. [1]
- (iv) Both are asexual; offspring have very little variation. [1]

— End of Chapter 7 —

CHAPTER 8

Heredity

Board-favourite questions · Answers by marks

Q1. In a monohybrid cross, the F_2 phenotypic ratio is (a) 1:2:1 (b) 3:1 (c) 9:3:3:1 (d) 1:1. **1 M**

(b) 3 : 1.

Q2. What is a gene? **1 M**

A segment of **DNA** that provides information for a protein, and hence controls a characteristic.

Q3. How is the sex of a child determined in human beings? **2 M**

- Mother XX — all eggs X; father XY — half sperms X, half Y.
- X sperm + X egg → XX (girl); Y sperm + X egg → XY (boy). So the **father's** sperm decides the sex; chance is 50 : 50.

Q4. How do Mendel's experiments show that traits may be dominant or recessive? **2 M**

- Tall × dwarf → F_1 all tall: dwarf trait not seen → tall is **dominant**.
- In F_2 dwarf plants reappear (¼) → dwarf trait was present but hidden → **recessive**.

Q5. Show with a cross that traits are inherited independently. **3 M**

- P: Round yellow (RRYY) × Wrinkled green (rryy); gametes RY and ry.
- F_1: RrYy — all round yellow.
- F_2: Round yellow 9 : Round green 3 : Wrinkled yellow 3 : Wrinkled green 1. New combinations appear → round/wrinkled and yellow/green are inherited **independently**.

Q6. A tall pea plant (TT) is crossed with a dwarf plant (tt). Show F_1 and F_2 generations with checkerboard; give phenotypic and genotypic ratios. **3 M**

- F_1: Tt — all tall.
- F_2 (Tt × Tt): TT, Tt, Tt, tt → phenotypic **3 tall : 1 dwarf**; genotypic **1 TT : 2 Tt : 1 tt**.
- Checkerboard: rows T, t; columns T, t.

Q7. How do genes control characteristics? Explain with the example of plant height. **3 M**

- A gene carries information to make a **protein/enzyme**.
- Plant height depends on a **growth hormone**, whose amount depends on the efficiency of an enzyme.
- Efficient enzyme → more hormone → tall plant; altered gene → less efficient enzyme → less hormone → short plant.

Q8. Why did Mendel choose the pea plant? **2 M**

- Many clearly contrasting traits; self-pollinating and easy to cross-pollinate.
- Short life cycle; large number of seeds.

Q9. (a) Explain Mendel's monohybrid cross with a flow chart and state the conclusions. (b) If a trait A exists in 10% of a population and trait B in 60%, which is likely to have arisen earlier? **5 M**

- (a) P (TT × tt) → gametes → F_1 Tt (all tall) → selfing → F_2 3:1 with checkerboard. Conclusions: characters controlled by pairs of factors; one dominant; recessive not lost; each parent contributes one factor. [3½]
- (b) **Trait B** — in asexually/sexually reproducing populations, a variation that arose earlier has had more time to spread, so it is likely to be present in a larger fraction. [1½]

Q10. Case study. A couple has two daughters. Relatives blame the mother for not having a son. **4 M**

- (i) Sex chromosomes of mother: **XX**; father: **XY**. [1]
- (ii) Who decides the sex: the **father** (sperm carrying X or Y). [1]
- (iii) Probability of a son in the next child: **50%** — each pregnancy is independent. [1]
- (iv) So blaming the mother is scientifically wrong. [1]

— End of Chapter 8 —

CHAPTER 9

Light — Reflection and Refraction

Board-favourite questions · Answers by marks

Q1. The mirror used by dentists is (a) plane (b) convex (c) concave (d) any. **1 M**

(c) concave — gives an enlarged image of the teeth.

Q2. The power of a lens is −2 D. Find its focal length and type. **1 M**

f = 1/P = 1/(−2) = **−0.5 m = −50 cm**; **concave** lens.

Q3. Refractive index of diamond is 2.42. What does this mean? **2 M**

- n = c/v = 2.42 → the speed of light in air is **2.42 times** the speed of light in diamond.
- v = 3×10^8 / 2.42 ≈ **1.24×10^8 m/s**.

Q4. Why do we prefer a convex mirror as a rear-view mirror in vehicles? **2 M**

- It always forms an **erect**, diminished image.
- It has a **wider field of view** as it is curved outwards.

Q5. An object 5 cm tall is placed 25 cm in front of a concave mirror of focal length 15 cm. Find the position, nature and size of the image. **3 M**

- **Given:** h = +5 cm, u = −25 cm, f = −15 cm.
- **Mirror formula:** 1/v = 1/f − 1/u = −1/15 + 1/25 = (−5 + 3)/75 = −2/75 → **v = −37.5 cm**.
- **Magnification:** m = −v/u = −(−37.5)/(−25) = −1.5 → h′ = m × h = −1.5 × 5 = **−7.5 cm**.
- **Result:** image 37.5 cm in front of the mirror; **real, inverted, enlarged**, 7.5 cm tall.

Q6. A concave lens has focal length 15 cm. At what distance should an object be placed so that it forms an image at 10 cm from the lens? Find magnification.

3 M

- **Given:** f = −15 cm; image of a concave lens is virtual, on the same side → v = −10 cm.
- **Lens formula:** 1/v − 1/u = 1/f → 1/u = 1/v − 1/f = −1/10 + 1/15 = (−3 + 2)/30 = −1/30 → **u = −30 cm**.
- **m = v/u** = (−10)/(−30) = **+0.33** → virtual, erect, diminished (one-third size).

Q7. State the laws of refraction. Draw the path of a ray through a rectangular glass slab and mark the lateral displacement.

3 M

- (i) Incident ray, refracted ray and normal lie in the same plane.
- (ii) Snell's law: sin i / sin r = constant for a given pair of media and given colour.
- Diagram: *please refer to the NCERT textbook figure*. Mark ∠i, ∠r, ∠e (= ∠i), emergent ray parallel to incident ray, lateral displacement.

Q8. Name the type of mirror used in (a) headlights (b) solar furnaces (c) shaving. Justify.

3 M

- (a) **Concave** — bulb at focus gives a powerful parallel beam.
- (b) **Concave** — concentrates sunlight at the focus to produce heat.
- (c) **Concave** — face between P and F gives an enlarged, erect image.

Q9. (a) Draw ray diagrams for a convex lens when the object is (i) between F_1 and $2F_1$ (ii) between F_1 and O. (b) An object 4 cm high is placed 10 cm from a convex lens of focal length 20 cm. Find the image position, size and nature.

5 M

- (a) *Please refer to the NCERT textbook ray diagrams.* (i) image beyond $2F_2$, real, inverted, enlarged; (ii) image on the same side, virtual, erect, enlarged. [2]
- (b) **Given:** h = +4 cm, u = −10 cm, f = +20 cm.
- 1/v = 1/f + 1/u = 1/20 − 1/10 = (1 − 2)/20 = −1/20 → **v = −20 cm**. [1]
- m = v/u = (−20)/(−10) = **+2**; h′ = 2 × 4 = **8 cm**. [1]
- Image 20 cm on the same side as object; **virtual, erect, enlarged** (magnifying glass). [1]

Q10. Case study. A student places a candle at different distances from a convex lens of focal length 12 cm and obtains a sharp image on a screen each time. **4 M**

- (i) Object at 24 cm ($2F_1$): image at **24 cm ($2F_2$)**, same size, real, inverted. [1]
- (ii) Object at 8 cm: image **cannot** be obtained on screen — virtual. [1]
- (iii) Power of the lens: P = 1/0.12 = **+8.33 D**. [1]
- (iv) To get an enlarged real image, place the object **between 12 cm and 24 cm**. [1]

— End of Chapter 9 —

CHAPTER 10

The Human Eye and the Colourful World

Board-favourite questions · Answers by marks

Q1. The least distance of distinct vision for a normal eye is (a) 25 m (b) 2.5 cm (c) 25 cm (d) 2.5 m. **1 M**

(c) 25 cm.

Q2. Which colour of white light deviates the most through a prism? **1 M**

Violet.

Q3. What is the power of accommodation? How does the eye achieve it? **2 M**

- The ability of the eye lens to adjust its focal length to see near and far objects clearly.
- Ciliary muscles relax (thin lens, longer f) for distant objects and contract (thick lens, shorter f) for near objects.

Q4. Why do stars twinkle but planets do not? **2 M**

- Starlight undergoes continuous **atmospheric refraction**; stars are point sources, so their apparent position and brightness keep changing → twinkling.
- Planets are closer and act as **extended sources**; variations average out → no twinkling.

Q5. Why does the sky appear blue? Why does it appear dark to an astronaut? **3 M**

- Air molecules are smaller than the wavelength of visible light; they **scatter** shorter wavelengths (blue) much more than red.
- The scattered blue light enters our eyes → sky looks blue.
- At very high altitude there is no atmosphere → no scattering → sky appears **dark**.

Q6. Explain the formation of a rainbow. **3 M**

- Rainbow is a natural spectrum seen after rain, opposite to the Sun.
- Water droplets act as tiny prisms: sunlight is **refracted and dispersed** on entering, **internally reflected**, and **refracted again** on coming out.
- Different colours reach the observer's eye from different drops. (Diagram — refer NCERT.)

Q7. A person needs a lens of power −5.5 D for distant vision. Find the focal length and name the defect. **2 M**

- f = 1/P = 1/(−5.5) = **−0.182 m ≈ −18.2 cm**.
- Negative power → concave lens → defect is **myopia**.

Q8. Why is the Sun reddish at sunrise and sunset? Why are danger signals red? **3 M**

- Near the horizon, sunlight passes through a **thicker layer of atmosphere**; most blue light is scattered away; mainly red (longest wavelength) reaches us.
- Red light is **least scattered** by fog or smoke, so it can be seen from a great distance.

Q9. (a) What is myopia? State two causes. (b) Draw diagrams showing (i) the far point of a myopic eye, (ii) the defect, (iii) its correction. (c) A myopic person has far point 80 cm. Find the power of the lens required. **5 M**

- (a) Near-sightedness — can see near objects but not distant ones; image forms in **front of the retina**. Causes: excessive curvature of eye lens; elongation of eyeball. [2]
- (b) *Please refer to the NCERT textbook figures (a, b, c).* Correction with a **concave lens**. [1½]
- (c) The lens must form the image of a distant object at the far point: u = −∞, v = −80 cm → 1/f = 1/v − 1/u = −1/80 → f = −80 cm = −0.8 m → **P = −1.25 D**. [1½]

Q10. Case study. A student passes a narrow beam of white light through a glass prism and sees a band of colours on the screen. He then places an identical inverted prism after the first. **4 M**

- (i) Phenomenon: **dispersion**; band = **spectrum**. [1]
- (ii) Cause: different colours travel at different speeds in glass and bend through different angles. [1]
- (iii) With the inverted prism, light emerging is **white** again — recombination (Newton). [1]
- (iv) Order from the base side: violet is nearest the base (bends most); red is at the top. [1]

— End of Chapter 10 —

CHAPTER 11

Electricity

Board-favourite questions · Answers by marks

Q1. The unit of resistivity is (a) Ω (b) Ω m (c) Ω/m (d) Ω m^2. **1 M**

(b) Ω m.

Q2. How many electrons constitute a charge of 1 coulomb? **1 M**

$n = Q/e = 1 / (1.6 \times 10^{-19}) =$ **6.25×10^{18} electrons**.

Q3. A wire of resistance R is stretched to double its length. What is its new resistance? **2 M**

- Volume constant: l → 2l, so A → A/2.
- $R' = \rho(2l)/(A/2) = 4\rho l/A =$ **4R**.

Q4. Why are alloys used in heating devices instead of pure metals? **2 M**

- Alloys have **higher resistivity** → produce more heat.
- They **do not oxidise (burn) readily** at high temperatures.

Q5. Three resistors of 2 Ω, 3 Ω and 6 Ω. How will you connect them to get (a) 4 Ω (b) 1 Ω? Show calculations. **3 M**

- (a) 3 Ω and 6 Ω in parallel: $R_p = (3 \times 6)/(3 + 6) = 2$ Ω; then in series with 2 Ω → 2 + 2 = **4 Ω**.
- (b) All three in parallel: $1/R = 1/2 + 1/3 + 1/6 = (3 + 2 + 1)/6 = 1$ → **R = 1 Ω**.
- Draw the two circuit arrangements.

Q6. An electric iron consumes 1 kW when heated at the maximum rate and 440 W at the minimum. The voltage is 220 V. Find the current and resistance in each case. **3 M**

- **Max:** $I = P/V = 1000/220 =$ **4.54 A**; $R = V/I = V^2/P = 220^2/1000 =$ **48.4 Ω**.
- **Min:** $I = 440/220 =$ **2 A**; $R = 220/2 =$ **110 Ω**.

Q7. 100 J of heat is produced each second in a 4 Ω resistance. Find the potential difference across it. **2 M**

- $H = I^2Rt \rightarrow 100 = I^2 \times 4 \times 1 \rightarrow I^2 = 25 \rightarrow I = 5$ A.
- $V = IR = 5 \times 4 =$ **20 V**.

Q8. Two bulbs of 100 W and 60 W, both rated 220 V, are connected in parallel to a 220 V supply. Find the total current drawn. **3 M**

- In parallel each gets 220 V, so total power = 100 + 60 = 160 W.
- $I = P/V = 160/220 =$ **0.727 A**.
- (Alternatively $I_1 = 100/220 = 0.455$ A, $I_2 = 60/220 = 0.273$ A; sum ≈ 0.727 A.)

Q9. (a) State Ohm's law. Draw a circuit to verify it and sketch the V–I graph. (b) A 4 Ω, a 6 Ω resistor in parallel are connected in series with a 2.6 Ω resistor and a 12 V battery. Find (i) total resistance (ii) current from the battery (iii) potential difference across the 2.6 Ω resistor. **5 M**

- (a) At constant temperature, $V \propto I$, $V = IR$. Circuit: battery, key, ammeter in series, resistor with voltmeter across it, rheostat (*refer NCERT figure*). V–I graph is a straight line through the origin. [2]
- (b)(i) $R_p = (4 \times 6)/(4 + 6) = 24/10 = 2.4$ Ω; $R_{total} = 2.4 + 2.6 =$ **5 Ω**. [1]
- (ii) $I = V/R = 12/5 =$ **2.4 A**. [1]
- (iii) $V = IR = 2.4 \times 2.6 =$ **6.24 V**. [1]

Q10. Case study. A house uses: 4 bulbs of 40 W for 5 h/day, 2 fans of 80 W for 10 h/day, and a 1000 W geyser for 1 h/day. Rate: ₹6 per unit. **4 M**

- (i) Bulbs: 4 × 40 × 5 = 800 Wh = 0.8 kWh/day. [½]
- Fans: 2 × 80 × 10 = 1600 Wh = 1.6 kWh/day. [½]
- Geyser: 1000 × 1 = 1 kWh/day. Total = **3.4 kWh/day**. [1]
- (ii) For 30 days: 3.4 × 30 = **102 units**; cost = 102 × 6 = **₹612**. [1]
- (iii) 1 kWh = **3.6×10^6 J**. [1]

— End of Chapter 11 —

CHAPTER 12

Magnetic Effects of Electric Current

Board-favourite questions · Answers by marks

Q1. Inside a long solenoid carrying current, the magnetic field is (a) zero (b) decreasing towards the end (c) same at all points (d) increasing towards the end. **1 M**

(c) same at all points (uniform).

Q2. What is the colour of the earth wire insulation? **1 M**

Green.

Q3. Why do two magnetic field lines never intersect? **2 M**

- If they intersected, at the point of intersection the compass needle would point in **two directions** at once.
- This is impossible, as the field has only one direction at a point.

Q4. State the right-hand thumb rule. **2 M**

- Hold the current-carrying straight conductor in the right hand with the thumb in the direction of current.
- The direction in which the fingers wrap around gives the direction of the magnetic field lines.

Q5. State Fleming's left-hand rule. An electron beam enters a magnetic field at right angles. How is the force direction found? **3 M**

- Stretch thumb, forefinger and middle finger of the left hand mutually perpendicular: forefinger → field, middle finger → current, thumb → force.
- For an electron beam, the direction of **current is opposite** to the motion of electrons; apply the rule with that current direction.
- The force is perpendicular to both the field and the direction of motion.

Q6. List three properties of magnetic field lines. **3 M**

- They are closed curves; outside, they go from N to S.
- Crowded where the field is stronger.
- They never intersect.

Q7. What is a solenoid? Draw its field lines. How can it be used to make an electromagnet? **3 M**

- A coil of many closely wound circular turns of insulated copper wire in the shape of a cylinder.
- Field inside is uniform (parallel lines); outside it resembles a bar magnet (*refer NCERT figure*).
- Placing a **soft-iron core** inside and passing current → strong electromagnet.

Q8. What is short-circuiting and overloading? Name two safety devices. **3 M**

- **Short circuit:** live and neutral wires come in direct contact → current rises abruptly.
- **Overloading:** too many appliances in one socket, or supply voltage rises → excess current.
- Safety devices: **electric fuse** and **MCB**; also earthing.

Q9. (a) Draw the magnetic field pattern around a straight current-carrying conductor. How does the field change if (i) current is increased (ii) distance from the wire is increased? (b) Explain the domestic electric circuit with the role of earthing and fuse. **5 M**

- (a) Concentric circles around the wire (*refer NCERT figure*). (i) Field **increases** with current; (ii) field **decreases** with distance. [2]
- (b) Live (red, 220 V), neutral (black), earth (green). Supply 220 V, 50 Hz; meter → main fuse → distribution box; 15 A and 5 A circuits; appliances connected in **parallel**. [1½]
- Earthing: metal body of appliance is connected to earth; leakage current flows to earth → user is protected from severe shock. Fuse: in series; melts on excess current and breaks the circuit. [1½]

Q10. Case study. A student places a compass near a wire and switches on the current; the needle deflects. On reversing the current, the needle deflects the other way. **4 M**

- (i) Conclusion: a current-carrying wire produces a **magnetic field** (Oersted). [1]
- (ii) Reversal of deflection shows the **direction of the field depends on the direction of current**. [1]
- (iii) Rule to find the field direction: **right-hand thumb rule**. [1]
- (iv) Deflection increases if current is increased or the compass is brought closer. [1]

— End of Chapter 12 —

CHAPTER 13

Our Environment

Board-favourite questions · Answers by marks

Q1. Which of these is non-biodegradable? (a) paper (b) cotton (c) plastic (d) vegetable peel. **1 M**

(c) plastic.

Q2. If the producers in a food chain have 10,000 J of energy, how much energy will be available to the secondary consumer? **1 M**

By the 10% law: producers 10,000 J → primary consumer 1,000 J → secondary consumer **100 J**.

Q3. Why is an aquarium called an artificial ecosystem? Why does it need cleaning? **2 M**

- It is made by humans and has biotic and abiotic components interacting.
- It lacks enough **decomposers**, so waste is not broken down → needs cleaning.

Q4. How is ozone formed in the upper atmosphere? Why is its depletion a concern? **2 M**

- $O_2 \xrightarrow{UV} O + O$; $O + O_2 \rightarrow O_3$.
- Ozone shields us from harmful UV rays; its depletion (by CFCs) can cause skin cancer and damage organisms.

Q5. What is biological magnification? Which organism accumulates the highest concentration? **3 M**

- Increase in concentration of non-biodegradable chemicals (like DDT) at each successive trophic level.
- These are absorbed by plants from soil and water and cannot be degraded or excreted, so they accumulate.
- Organisms at the top — **human beings** — get the maximum concentration.

Q6. Why is the flow of energy in an ecosystem unidirectional? Why do food chains have only 3–4 steps? 3 M

- Energy captured by autotrophs does not return to the Sun; energy passed to herbivores does not come back to autotrophs — it moves progressively through trophic levels.
- Only about **10%** passes on at each level; after 3–4 levels very little energy remains to support another level.

Q7. Give two ways each in which biodegradable and non-biodegradable substances affect the environment. Suggest two ways to reduce waste. 3 M

- Biodegradable: decompose and add nutrients to soil; in large quantities can produce foul smell and breed germs.
- Non-biodegradable: persist for long, harm organisms, and enter food chains (biomagnification); choke drains.
- Reduce waste: segregate waste at home; follow the 3 Rs; use cloth/jute bags.

Q8. What are decomposers? What would happen if they were absent? 2 M

- Micro-organisms (bacteria, fungi) that break down dead remains and waste into simple substances.
- Without them, dead bodies and waste would pile up and nutrients would not be returned to the soil.

Q9. (a) What is a food chain? Draw a food chain with four trophic levels and label them. (b) State the 10% law with a calculation. (c) Why is a food web more stable than a food chain? 5 M

- (a) Sequence of organisms in which each eats the one before. Grass (T_1, producer) → Grasshopper (T_2, primary consumer) → Frog (T_3, secondary) → Snake (T_4, tertiary). [2]
- (b) Only about 10% of energy at one trophic level is transferred to the next. E.g. 1,000 J at grass → 100 J grasshopper → 10 J frog → 1 J snake. [2]
- (c) In a food web, each organism has several food sources; if one is removed, others are available → more stable. [1]

Q10. Case study. Indian Railways switched from plastic cups to kulhads, and later to paper cups. **4 M**

- (i) Why plastic cups were replaced: they are **non-biodegradable**. [1]
- (ii) Problem with kulhads on a large scale: loss of **fertile top-soil**. [1]
- (iii) Advantage of paper cups: **biodegradable**, and paper can be recycled. [1]
- (iv) One more alternative: reusable steel/glass cups. [1]

— End of Chapter 13 —

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