CENTRAL BOARD OF SECONDARY EDUCATION

CBSE 2026-27

Science

Subject Code: 086 | Class X

Question Bank – Set 3

Questions in this Booklet

Ch.	Chapter	MCQs	A-R	VSA	SA	LA	CS	All
1	Chemical Reactions and Equations	5	2	3	2	1	1	**14**
2	Acids, Bases and Salts	5	2	3	2	1	1	**14**
3	Metals and Non-metals	5	2	3	2	1	1	**14**
4	Carbon and its Compounds	5	2	3	2	1	1	**14**
5	Life Processes	5	2	4	2	1	1	**15**
6	Control and Coordination	5	2	3	2	1	1	**14**
7	How do Organisms Reproduce?	5	2	3	2	1	1	**14**
8	Heredity	5	2	3	2	1	1	**14**
9	Light – Reflection and Refraction	5	2	4	2	1	1	**15**
10	The Human Eye and the Colourful World	5	2	3	2	1	1	**14**
11	Electricity	5	2	3	2	1	1	**14**
12	Magnetic Effects of Electric Current	5	2	3	2	1	1	**14**
13	Our Environment	5	2	3	2	1	1	**14**
	Total	**65**	**26**	**41**	**26**	**13**	**13**	**184**

MCQs = Multiple Choice; A-R = Assertion–Reason; VSA = Very Short Answer; SA = Short Answer; LA = Long Answer; CS = Case Study / Source-based.

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Answer Key (MCQs and Assertion–Reason) **28**

1. Chemical Reactions and Equations

Multiple Choice Questions (MCQs)

Q1. Study the following chemical reaction: $2\,Na(s) + 2\,H_2O(l) \longrightarrow 2\,NaOH(aq) + H_2(g)$. The reducing agent in this reaction is: [Board 2023 (31/5/1) Q3] **[1]**

(a) Na (b) H_2O (c) NaOH (d) H_2

Q2. Which of the following is an example of a displacement reaction? [Board 2026 (31/3/1) Q17] **[1]**

(a) The combustion of natural gas
(b) The reaction of a reactive metal with dilute acid
(c) The electrolysis of water
(d) The reaction of quick lime with water

Q3. In the redox reaction $MnO_2 + 4\,HCl \longrightarrow MnCl_2 + 2\,H_2O + Cl_2$: [SQP 2022-23 Q2] **[1]**

(a) MnO_2 is reduced to $MnCl_2$ and HCl is oxidised to H_2O
(b) MnO_2 is reduced to $MnCl_2$ and HCl is oxidised to Cl_2
(c) MnO_2 is oxidised to $MnCl_2$ and HCl is reduced to Cl_2
(d) MnO_2 is oxidised to $MnCl_2$ and HCl is reduced to H_2O

Q4. Which of the following is a combination reaction? [CBSE-style] **[1]**

(a) $CaCO_3 \xrightarrow{\Delta} CaO + CO_2$ (b) $2\,H_2O \longrightarrow 2\,H_2 + O_2$
(c) $CaO + H_2O \longrightarrow Ca(OH)_2$ (d) $Zn + 2\,HCl \longrightarrow ZnCl_2 + H_2$

Q5. The products formed when aluminium and magnesium are burnt in the presence of air respectively are: [Board 2025 (31/1/1) Q2] **[1]**

(a) Al_3O_4 and MgO_2 (b) Al_2O_3 and MgO (c) Al_3O_4 and MgO (d) Al_2O_3 and MgO_2

Assertion–Reason

Q6. **Assertion (A):** Reaction of quicklime with water is an exothermic reaction.
Reason (R): Quicklime reacts vigorously with water releasing a large amount of heat. [Board 2023 (31/4/1) Q17] **[1]**

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

Q7. **Assertion (A):** Antioxidants are added to packets of fried snacks that contain oils.
Reason (R): Antioxidants prevent the oxidation of fats and oils that causes rancidity. [CBSE-style] **[1]**

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

Very Short Answer (VSA)

Q8. What happens when aqueous solutions of sodium sulphate and barium chloride are mixed? Give a balanced equation with state symbols, and name and define the type of chemical reaction involved. [SQP 2018-19 Q6] **[2]**

Q9. A clear solution of slaked lime is left exposed to air and slowly turns milky. Explain why a faint white precipitate forms, supported by a chemical equation. [SQP 2022-23 Q21 (adapted)] **[2]**

Q10. Zinc granules are added to dilute sulphuric acid in a test tube. Write the balanced chemical equation and name the type of reaction. [CBSE-style] **[2]**

Short Answer (SA)

Q11. (a) Define the term decomposition reaction. Write one chemical equation each for a decomposition reaction in which energy is supplied in the form of heat, light or electricity.
(b) Decomposition of vegetable matter into compost is considered an exothermic reaction. Why? [Board 2025 (31/2/1) Q27] **[3]**

Q12. A compound X of sodium is used as an antacid and it decomposes on strong heating.
(i) Name the compound X and give its chemical formula.
(ii) Write a balanced chemical equation to represent the decomposition of X.
(iii) Give one use of compound X besides as an antacid. [SQP 2019-20 Q16] **[3]**

Long Answer (LA)

Q13. Classify each of the following reactions as combination, decomposition, displacement or double displacement, giving a reason for each.
(a) $CaO + H_2O \longrightarrow Ca(OH)_2$
(b) $2\,KClO_3 \xrightarrow{\Delta} 2\,KCl + 3\,O_2$
(c) $Zn + CuSO_4 \longrightarrow ZnSO_4 + Cu$
(d) $AgNO_3 + NaCl \longrightarrow AgCl\downarrow + NaNO_3$
(e) $CaCO_3 \xrightarrow{\Delta} CaO + CO_2$ [CBSE-style] **[5]**

Case Study

Case Study: Limekiln Limestone, which is calcium carbonate, is heated strongly in a limekiln to produce a white solid X and a gas Y. The solid X reacts vigorously when water is added slowly, producing a large amount of heat and forming Z, which is used for white-washing walls. The gas Y turns lime water milky. Students performing this experiment must wear safety goggles, because the reaction of X with water is very hot and can splash.

Q14. Answer the following questions based on the above. [CBSE-style] **[4]**

(i) Identify X, Y and Z. [1]

(ii) Write the balanced equation for the heating of limestone and state whether the reaction is endothermic or exothermic. [1]

(iii) Name the type of reaction between X and water, write its equation, and state whether energy is absorbed or released. [2]

OR

(iii) Z reacts with carbon dioxide from air to give a shiny white finish on walls. Name this process and write the equation for the reaction. [2]

2. Acids, Bases and Salts

Multiple Choice Questions (MCQs)

Q1. Fresh milk has a pH of 6. To delay its curdling, a chemical substance is added to it, which is: [Board 2023 (31/5/1) Q4] **[1]**
(a) Sodium carbonate
(b) Baking powder
(c) Sodium hydroxide (caustic soda)
(d) Baking soda (sodium hydrogen carbonate)

Q2. Baking powder is a mixture of: [Board 2026 (31/2/1) Q22] **[1]**

(a) Sodium carbonate + Acetic acid
(b) Sodium carbonate + Tartaric acid
(c) Sodium hydrogen carbonate + Tartaric acid
(d) Sodium hydrogen carbonate + Acetic acid

Q3. When excess of carbon dioxide is passed through lime water, the milkiness disappears because: [SQP 2025-26 Q22] **[1]**
(a) water soluble calcium carbonate converts to water soluble calcium bicarbonate.
(b) insoluble calcium carbonate converts to water soluble calcium bicarbonate.
(c) water soluble calcium carbonate converts to insoluble calcium bicarbonate.
(d) insoluble calcium carbonate converts to insoluble calcium bicarbonate.

Q4. The electrodes of the set-up are separately dipped in each of the following solutions. In which solutions will the bulb glow? (i) Dilute hydrochloric acid (ii) Dilute sulphuric acid (iii) Glucose solution (iv) Alcohol [Board 2023 (31/2/1) Q2] **[1]**
[Figure: A bulb is connected in series with a battery and two electrodes, which are dipped in a test solution kept in a beaker.]
(a) (i) only
(b) (ii) only
(c) (i) and (ii)
(d) (ii), (iii) and (iv)

Q5. Which option correctly gives the parent acid and parent base of calcium carbonate? [Adapted from SQP 2021-22 Term 1 Q8] **[1]**
(a) Parent acid HCl; parent base NaOH
(b) Parent acid H_2CO_3; parent base $Ca(OH)_2$
(c) Parent acid H_3PO_3; parent base $CaSO_4$
(d) Parent acid H_2SO_4; parent base $CaSO_4$

Assertion–Reason

Q6. **Assertion (A):** Baking soda is used in making cakes soft and spongy.
Reason (R): Baking soda decomposes on heating to release carbon dioxide gas, which makes the batter rise. [CBSE-style] **[1]**
(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(b) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).
(c) Assertion (A) is true, but Reason (R) is false.
(d) Assertion (A) is false, but Reason (R) is true.

Q7. **Assertion (A):** An aqueous solution of sodium carbonate is basic in nature.
Reason (R): Sodium carbonate is the salt of a strong base (NaOH) and a weak acid (H2CO3). [CBSE-style] **[1]**
(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(b) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).
(c) Assertion (A) is true, but Reason (R) is false.
(d) Assertion (A) is false, but Reason (R) is true.

Very Short Answer (VSA)

Q8. Write the balanced chemical equation for the reaction of sodium hydroxide with hydrochloric acid, and state the pH of the salt solution formed. [CBSE-style] **[2]**

Q9. What do you observe when a few drops of acetic acid are added to (a) phenolphthalein solution and (b) sodium hydrogen carbonate? (1 mark each) [Adapted from SQP 2017-18 Q22] **[2]**

Q10. Write the chemical formulae of (a) gypsum and (b) Plaster of Paris. [CBSE-style] **[2]**

Short Answer (SA)

Q11. Comment on the following: (i) A bee sting is treated with baking soda paste, whereas a wasp sting is treated with dilute vinegar. (ii) Farmers treat acidic soil with quicklime during tilling. (iii) Marble monuments are conserved by treating them with certain chemicals. [Adapted from SQP 2024-25 Q28(B)] **[3]**

Q12. In the chlor-alkali process, brine is electrolysed. (i) Name the gases formed at the anode and at the cathode. (ii) Write the balanced equation for the process. (iii) Give one use each of chlorine and hydrogen. [CBSE-style] **[3]**

Long Answer (LA)

Q13. (i) Name the compound used for plastering and give its formula. (ii) Write the balanced equation for its preparation from gypsum, stating the condition required. (iii) Write two uses of this compound. OR (b) (i) Name the mild base used for making cakes soft, and give its formula. (ii) Write the equation for its decomposition on heating and explain why the cake becomes soft and spongy. (iii) Write two uses of this compound. [Adapted from Board 2024 (31/5/1) Q34(a)] **[5]**

Case Study

Case Study: Electrolysis of brine When electricity is passed through an aqueous solution of a common salt, a substance Z is produced along with the evolution of gases X and Y. Gas Y burns with a pop sound when a burning matchstick is brought near it, whereas gas X is used for disinfecting drinking water. When X is passed through slaked lime, an insoluble substance A is produced. This is the chlor-alkali process, which is used to manufacture several important chemicals.

Q14. Answer the following questions based on the above. [Adapted from Board 2026 (31/2/1) Q28] **[4]**

(i) Write the names of the gases X and Y. [1]

(ii) Write the balanced chemical equation for the formation of substance Z. [1]

(iii) (i) What happens (I) when a drop of red litmus solution is added to the aqueous solution of Z, and (II) when CO2 gas is passed through ammoniacal aqueous NaCl? [2]

OR

(iii) (ii) Identify the substance A and write the balanced chemical equation for its preparation. [2]

3. Metals and Non-metals

Multiple Choice Questions (MCQs)

Q1. On adding dilute sulphuric acid to a test tube containing a metal X, a colourless gas is produced which burns with a pop sound when a burning match stick is brought near it. Which of the following correctly represents metal X? [Adapted from SQP 2023-24] **[1]**

(a) Sodium (b) Sulphur (c) Copper (d) Silver

Q2. A cable company tests four elements W, X, Y and Z. W: malleable and ductile, conducts electricity, high melting point. X: neither malleable nor ductile, conducts electricity, low melting point. Y: neither malleable nor ductile, conducts electricity, low melting point. Z: malleable and ductile, does not conduct electricity, high melting point. Which elements should the company discard for making electric cables? [Adapted from SQP 2021-22 Term 1] **[1]**

(a) W, X and Y (b) X, Y and Z (c) W, Y and Z (d) X and Z

Q3. Electrical wires made of aluminium: [SQP 2026-27] **[1]**

(a) corrode easily as aluminium is a very reactive metal.

(b) corrode easily because porous flaky aluminium oxide is formed.

(c) do not corrode easily as aluminium oxide forms a protective layer.

(d) do not corrode easily as aluminium is less reactive than metals like sodium, magnesium and zinc.

Q4. Two metals zinc and tin are dissolved separately in definite proportions in molten copper (the primary metal) to obtain two different alloys respectively known as: [Board 2025 (31/2/1)] **[1]**

(a) Bronze and Brass (b) Brass and Solder
(c) Brass and Bronze (d) Solder and Bronze

Q5. The process in which a carbonate ore is heated strongly in a limited supply of air, below its melting point, to convert it into an oxide is called: [CBSE-style] **[1]**

(a) Roasting (b) Calcination
(c) Electrolytic refining (d) Smelting

Assertion–Reason

Q6. **Assertion (A):** Sodium oxide is an amphoteric oxide.
Reason (R): Metal oxides which react with both acids as well as bases are known as amphoteric oxides. [Board 2023 (31/2/1)] **[1]**

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

Q7. **Assertion (A):** Ionic compounds have high melting points.
Reason (R): Strong electrostatic forces hold the oppositely charged ions together in a crystal. [CBSE-style] **[1]**

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

Very Short Answer (VSA)

Q8. Show the formation of the following ionic compounds by transfer of electrons between the combining atoms. [Atomic number: Na = 11, Mg = 12, O = 8, Cl = 17] (i) Sodium oxide (Na_2O).
(ii) Magnesium chloride ($MgCl_2$). [Board 2026 (31/3/1)] **[2]**

Q9. Sodium and potassium are kept immersed in kerosene. Give two reasons why they cannot be kept in the open air or in water. [CBSE-style] **[2]**

Q10. Name a metal that is liquid at room temperature and a non-metal that is a good conductor of electricity. [CBSE-style] **[2]**

Short Answer (SA)

Q11. A student adds iron nails to copper sulphate solution. (a) Write the chemical equation of the reaction.
(b) Name and define the type of reaction.
(c) Name two other metals which can be used in place of iron to show the same type of reaction. [Adapted from Board 2024 (31/5/1)] **[3]**

Q12. Two metal oxides, aluminium oxide and magnesium oxide, are given without labels. Suggest a test to identify and label them. [Adapted from SQP 2024-25 (Q27)] **[3]**

Long Answer (LA)

Q13. (a) Explain the conditions necessary for rusting of iron and write the formula of rust.
(b) Describe three methods of preventing rusting of iron with one example each. [CBSE-style] **[5]**

Case Study

Case Study: Electrolytic refining An electrochemical process is used to refine metals by selectively dissolving and depositing them through electrolysis. It is used for copper, zinc, tin, nickel, silver and gold. In refining copper, a bar of impure copper is made the anode and a thin strip of pure copper is made the cathode. The electrolyte is acidified copper sulphate solution. Pure copper is deposited on the cathode, while insoluble impurities collect below the anode.

Q14. Answer the following questions based on the above. [Board 2026 (31/3/1)] **[4]**

(i) (a) Define anode mud. [1]

(ii) (b) In electrolytic refining of copper, name the anode and the cathode. [1]

(iii) (c) (i) With the help of chemical equations, show the extraction of copper from its ore Cu_2S. [2]

OR

(iii) (c) (ii) Draw a neat and labelled diagram showing the electrolytic refining of copper. [2]

4. Carbon and its Compounds

Multiple Choice Questions (MCQs)

Q1. Which of the following is the correct IUPAC name of $CH_3-CH_2-CH_2-OH$? [CBSE-style] **[1]**

(a) Propanol (b) Propanal (c) Propanone (d) Propanoic acid

Q2. The IUPAC name of the compound obtained by oxidising ethanol with acidified potassium dichromate is: [CBSE-style] **[1]**

(a) Ethanal (b) Ethanoic acid (c) Ethene (d) Ethyl ethanoate

Q3. Substitution reactions are characteristic of: [CBSE-style] **[1]**

(a) saturated hydrocarbons (b) unsaturated hydrocarbons
(c) carboxylic acids (d) alcohols

Q4. The process of converting vegetable oil into vegetable ghee is: [Adapted from SQP 2016-17 (Q1)] **[1]**

(a) Hydrogenation (b) Esterification (c) Substitution (d) Dehydration

Q5. Which of the following is the correct IUPAC name of CH_3-CH_2-CHO? [CBSE-style] **[1]**

(a) Propanal (b) Propanone (c) Propanol (d) Propenoic acid

Assertion–Reason

Q6. **Assertion (A):** There are a large number of compounds with many carbon atoms linked to each other.
Reason (R): The carbon-carbon bond is very strong and stable. [Board 2026 (31/3/1)] **[1]**

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

Q7. **Assertion (A):** Some vegetable oils are healthy.
Reason (R): Vegetable oils generally have long unsaturated carbon chains. [Board 2024 (31/5/1)] **[1]**

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

Very Short Answer (VSA)

Q8. The electronic structures of four elements are: P: 2,6; Q: 2,8,1; R: 2,8,7; S: 2,8,8. (a) Identify which element(s) will form covalent bonds with carbon.
(b) "Carbon reacts with an element in the above table to form several compounds." Give a suitable reason. [SQP 2021-22 Term 2] **[2]**

Q9. What happens to (a) the melting point, and (b) the solubility of compounds as the molecular mass increases within a homologous series? [Board 2025 (31/2/1)] **[2]**

Q10. Write the electron dot structure of CO_2 (carbon dioxide) molecule. [CBSE-style] **[2]**

Short Answer (SA)

Q11. Ethanoic acid and ethanol are kept in two unlabelled bottles in the laboratory. (a) Suggest a chemical test to identify them.
(b) Write the equation for the reaction of ethanoic acid with sodium hydrogen carbonate.
(c) Name the gas evolved and describe how it is tested. [CBSE-style] **[3]**

Q12. What are isomers? "Isomers of the first three members of the alkane series are not possible." Give a reason to justify this statement and draw structures of two isomers of butane, C_4H_{10}. [SQP 2016-17 (Q7)] **[3]**

Long Answer (LA)

Q13. (a) Keerthi thinks that the substitution reaction occurs in saturated hydrocarbons, while Krishi thinks it occurs in unsaturated hydrocarbons. Justify with valid reasoning whose thinking is correct.
(b) "Methane and propane and their homologues are used as fuels." Comment, and draw the electron dot structure of the immediate lower homologue of propane. Give any two characteristics of members of a homologous series.
(c) A mixture of oxygen and ethyne is burnt for welding. Why is a mixture of ethyne and air not used? [SQP 2024-25 (Q34 A)] **[5]**

Case Study

Case Study: The petrol-blending compound An organic compound X with the molecular formula C_2H_6O is used to blend with petrol to reduce the dependence on fossil fuels and lower harmful emissions from cars. It is also used as a solvent in medicines such as tincture iodine, cough syrups and many tonics. Chemists note that X reacts with acetic acid to form a sweet-smelling compound, and that heating X with conc. H_2SO_4 at 170 °C gives an unsaturated hydrocarbon.

Q14. Answer the following questions based on the above. [SQP 2026-27 (Q26 A) adaptation] **[4]**

(i) Name compound X and the next homologue in its series. [1]

(ii) Write the equation for the reaction of X with acetic acid in the presence of conc. H_2SO_4, and name the product. [1]

(iii) What is formed when X is heated with conc. H_2SO_4 at 170 °C? Write the equation, name the type of reaction and state the role of the acid. [2]

OR

(iii) What happens when X reacts with sodium? Write the equation and name the gas evolved. [2]

5. Life Processes

Multiple Choice Questions (MCQs)

Q1. The opening and closing of stomatal pores is regulated by: [SQP 2021-22 Term 1; Board 2023 (31/4/1); Board 2025 (31/2/1)] **[1]**

(a) CO_2 concentration in the stomata
(b) Temperature in the guard cells
(c) O_2 concentration in the stomata
(d) Amount of water in the guard cells

Q2. Lime water turns cloudy in the presence of carbon dioxide, a by-product of respiration. Four set-ups are kept in sunlight for 24 hours. P: a glass tank with a pot of soil and no plant, with lime water inside. Q: a glass tank with a potted plant and lime water. R: a potted plant and lime water placed inside a tank whose walls are painted black, so no light enters. S: a pot of soil with no plant and lime water. In which set-up is lime water expected to be the cloudiest? [SQP 2026-27] **[1]**

(a) P (b) Q (c) R (d) S

Q3. During which of the following stages of the circulation of blood in a normal human being is the oxygenated blood pumped to all parts of the body? [SQP 2024-25] **[1]**

(a) Contraction of the left atrium
(b) Contraction of left ventricle
(c) Relaxation of the right atrium
(d) Relaxation of the right ventricle

Q4. In a set-up to show that carbon dioxide is released during respiration, a chemical X is kept in a vial inside the flask to absorb the carbon dioxide evolved. Name X. [SQP 2022-23] **[1]**

(a) NaOH (b) KOH (c) $Ca(OH)_2$ (d) K_2CO_3

Q5. Plants use a completely different process for excretion as compared to animals. Which one of the following processes is NOT followed by plants for excretion? [SQP 2021-22 Term 1] **[1]**

(a) They can get rid of excess water by transpiration.
(b) They selectively filter toxic substances through their leaves.
(c) Waste products are stored as resins and gums in old xylem.
(d) They excrete waste substances into the soil around them.

Assertion–Reason

Q6. **Assertion (A):** The basic filtration unit in the kidneys, like in the lungs, is a cluster of very thin-walled blood capillaries.
Reason (R): Each capillary cluster in the kidney is associated with the cup-shaped end of a coiled tube called Bowman's capsule. [Board 2026 (31/3/1)] **[1]**

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

Q7. **Assertion (A):** Amphibians can tolerate mixing of oxygenated and deoxygenated blood.
Reason (R): Amphibians are animals with a two-chambered heart. [SQP 2022-23] **[1]**

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

Very Short Answer (VSA)

Q8. What kind of respiration provides more energy, and why? [Board 2026 (31/3/1)] **[2]**

Q9. (A) List the steps for the synthesis of glucose by plants. What special feature is found in desert plants related to this process? [SQP 2024-25] **[2]**

Q10. Name the substances other than water that are reabsorbed during urine formation. What are the two parameters that decide the amount of water that is reabsorbed in the kidney? [SQP 2022-23] **[2]**

Q11. Sometimes while running, athletes suffer from muscle cramps. Why? How is the respiration in this case different from aerobic respiration? [Board 2024 (31/5/1)] **[2]**

Short Answer (SA)

Q12. Explain the processes of aerobic respiration in mitochondria of a cell and anaerobic respiration in yeast and muscle with the help of word equations. [SQP 2019-20] **[3]**

Q13. Complete the pathways showing the breakdown of glucose. Identify the process, site and products of: (a) the first step common to aerobic and anaerobic respiration; (b) aerobic respiration; (c) anaerobic respiration in yeast and in muscle cells. [Adapted from Board 2026 (31/2/1) Q13] **[3]**

Long Answer (LA)

Q14. (a) Design an experiment to demonstrate that carbon dioxide is essential for photosynthesis. Write the observation and conclusion of the experiment. [Board 2024 (31/5/1)] **[5]**

Case Study

Case Study: Food preparation in desert plants The maintenance functions of all living organisms must go on even when they are not doing anything particular. These maintenance processes require energy, which is obtained from the food prepared by autotrophs, called producers. Green plants make food by the process of photosynthesis, and desert plants have a special way of doing it.

Q15. Answer the following questions based on the above. [Board 2025 (31/1/1)] **[4]**

(i) Name and define the process by which green plants prepare food. [1]

(ii) Write the chemical equation involved in the above process. [1]

(iii) (i) State in proper sequence the events that occur in the synthesis of food by desert plants. [2]

OR

(iii) (ii) Explain what happens to the rate of food preparation (I) during cloudy weather and (II) when the stomata are blocked by dust. [2]

6. Control and Coordination

Multiple Choice Questions (MCQs)

Q1. The plant hormone whose concentration stimulates the cells to grow longer on the side of the shoot which is away from light is: [Board 2025 (31/1/1)] **[1]**

(a) Cytokinins (b) Gibberellins (c) Adrenaline (d) Auxins

Q2. Which hormone is secreted by the adrenal medulla during danger and prepares the body for a fight-or-flight response? [CBSE-style] **[1]**

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

Q3. A patient has a dysfunction of the cerebellum. Which of the following activities will be disturbed in this patient? [SQP 2024-25] **[1]**

(a) Salivation (b) Hunger control
(c) Posture and balance (d) Regulation of blood pressure

Q4. A plant shoot bends towards a light source. Which of the following correctly explains this response? [CBSE-style] **[1]**

(a) Cytokinin accumulates on the lighted side and stops cell division there.
(b) Abscisic acid accumulates on the shaded side and promotes cell division.
(c) Gibberellin is destroyed on the shaded side, so the shoot bends towards light.
(d) Auxin accumulates on the shaded side and causes cells there to elongate more.

Q5. Which of the following is an involuntary action? [CBSE-style] **[1]**

(a) Writing a letter (b) Riding a bicycle (c) Heartbeat (d) Reading a book

Assertion–Reason

Q6. **Assertion (A):** Reflex actions are very rapid.
Reason (R): The impulse in a reflex arc is processed in the spinal cord, without waiting for the brain to act. [CBSE-style] **[1]**
(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(b) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).
(c) Assertion (A) is true, but Reason (R) is false.
(d) Assertion (A) is false, but Reason (R) is true.

Q7. **Assertion (A):** Cytokinins promote cell division in plants.
Reason (R): Cytokinins are synthesised in root tips. [CBSE-style] **[1]**
(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(b) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).
(c) Assertion (A) is true, but Reason (R) is false.
(d) Assertion (A) is false, but Reason (R) is true.

Very Short Answer (VSA)

Q8. (A) Which parts of the brain perform certain actions for which we do not have any thinking control? What are such actions called? Give two examples. [SQP 2026-27] **[2]**

Q9. Adapted from the printed question (diagram of a neuron not reproduced). Name the part of a neuron that receives stimuli and carries impulses towards the cell body, and name the part that carries impulses away from the cell body. State the function of each. [Board 2023 (31/5/1); adapted for text-only answer] **[2]**

Q10. A boy eats a large amount of sugar and his blood glucose rises sharply. Describe which gland responds, which hormone it secretes and what effect the hormone has on blood glucose. [CBSE-style] **[2]**

Short Answer (SA)

Q11. The leaves of the touch-me-not plant, when touched, begin to fold up and droop. (a) How is the information communicated in this plant? (b) What enables the plant cells to bring out this response? (c) Differentiate this movement from the movement of tendrils in a pea plant. [Board 2025 (31/1/1)] **[3]**

Q12. Pertaining to the endocrine system, what will you interpret if: (i) you observe a swollen neck in people living in the hills; (ii) over-secretion of growth hormone takes place during childhood; (iii) facial hair develops in boys aged 13? [SQP 2018-19] **[3]**

Long Answer (LA)

Q13. (a) A doctor has advised Sameer to reduce sugar intake and do regular exercise. Which disease is he suffering from? Name the hormone responsible for it and the organ producing it. (3 marks)
(b) Which hormone is present in the areas of rapid cell division in a plant, and which hormone inhibits growth? (2 marks) [SQP 2023-24 (OR part); adapted] **[5]**

Case Study

Case Study: Cognitive changes in a middle-aged person A middle-aged person is facing some cognitive changes in himself. His early symptoms included mild forgetfulness. For example, forgetting where he left his mobile or failing to find words to complete his sentences. He was facing problems in driving a car, climbing up and down the stairs, inserting a plug into an outlet. He slowly developed a sad mood and anxiety.

Q14. Answer the following questions based on the above. [Board 2026 (31/2/1)] **[4]**

(i) What are voluntary actions? [1]

(ii) Which part of the brain is responsible for precision of voluntary actions? [1]

(iii) (i) Explain the role of the medulla. [2]

OR

(iii) (ii) How do animal muscles move? [2]

7. How do Organisms Reproduce?

Multiple Choice Questions (MCQs)

Q1. Fertilisation in the human female normally takes place in the: [CBSE-style] **[1]**

(a) Uterus (b) Vagina
(c) Fallopian tube (oviduct) (d) Ovary

Q2. Bryophyllum produces new plants through: [Board 2025 (31/2/1)] **[1]**

(a) Apical buds formed on the tip of the plant
(b) Vegetative buds produced in the notches of the leaf
(c) Flowers produced in the notches of the branches
(d) Fruits formed on the branches of the plant

Q3. A farmer wants to grow banana plants genetically similar enough to the plants already available in his field. Which one of the following methods would you suggest for this purpose? [SQP 2023-24] **[1]**

(a) Regeneration (b) Budding
(c) Vegetative propagation (d) Sexual reproduction

Q4. Which statement about the placenta is incorrect? [Adapted from Board 2024 (31/5/1)] **[1]**

(a) It is a disc embedded in the uterine wall.
(b) It is connected to the embryo by the umbilical cord.
(c) It has a very small surface area for glucose and oxygen to pass from mother to the embryo.
(d) The embryo gets nutrition from the mother's blood through it.

Q5. In the human male, sperms are stored and acquire the ability to swim in the: [CBSE-style] **[1]**

(a) Seminal vesicle (b) Epididymis (c) Prostate gland (d) Urethra

Assertion–Reason

Q6. **Assertion (A):** Menstruation is the shedding of the uterine lining.
Reason (R): Menstruation occurs when the egg is not fertilised. [CBSE-style] **[1]**

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

Q7. **Assertion (A):** Cross-pollination produces offspring with more variation than self-pollination.
Reason (R): Cross-pollination combines genetic material from two different plants. [CBSE-style] **[1]**

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

Very Short Answer (VSA)

Q8. Mention the four events that occur during binary fission in amoeba. [SQP 2016-17] **[2]**

Q9. Rajesh observed a greenish black powdery mass on a stale piece of bread. (a) Name the organism responsible and its specific mode of asexual reproduction.
(b) Name its vegetative and reproductive parts. [SQP 2021-22 (Term 2)] **[2]**

Q10. State the post-fertilisation changes that lead to fruit formation in plants. [SQP 2023-24] **[2]**

Short Answer (SA)

Q11. Government campaigns give information about AIDS prevention, testing and treatment. (a) To which category of diseases does AIDS belong? Name its causative organism. (b) Which value is the government trying to develop in citizens through such programmes? [SQP 2017-18] **[3]**

Q12. List two functions each of the following parts of the human female reproductive system: (a) ovaries (b) fallopian tubes (c) uterus. [SQP 2016-17] **[3]**

Long Answer (LA)

Q13. Trace the changes that take place in a flower from gamete formation to fruit formation. [SQP 2020-21] **[5]**

Case Study

Case Study: Asexual and sexual reproduction All the reproductive methods of living organisms are broadly categorised into two types: asexual reproduction and sexual reproduction. Asexual reproduction involves a single parent without the formation of gametes, fertilisation or transfer of genetic material. This method is a common means of rapidly increasing the number of offspring under favourable conditions. Many unicellular organisms, fungi and some simple multicellular organisms use this method.

Q14. Answer the following questions based on the above. [Board 2023 (31/2/1)] **[4]**

(i) (a) Name the type of fission that occurs in Leishmania and Plasmodium. [1]

(ii) (b) Write one advantage of the sexual mode of reproduction over the asexual mode. [1]

(iii) (c) Give reasons why: (i) colonies of yeast fail to multiply in water but multiply in sugar solution; (ii) Rhizopus does not grow on a dry slice of bread. [2]

OR

(iii) (c) A student collected water from a dark green pond and saw filamentous structures. Name them and explain how they multiply. [2]

8. Heredity

Multiple Choice Questions (MCQs)

Q1. A pure tall pea plant is crossed with a pure dwarf pea plant. What percentage of plants in the F_1 and F_2 generations, respectively, will be tall? [Adapted from SQP 2022-23] **[1]**

(a) 25%, 25% (b) 50%, 50% (c) 75%, 100% (d) 100%, 75%

Q2. A tall pea plant of unknown genotype is crossed with a pure short (tt) plant. Half of the progeny are tall and half are short. The unknown parent is: [CBSE-style] **[1]**

(a) pure tall (TT) (b) heterozygous tall (Tt)
(c) pure short (tt) (d) either TT or tt

Q3. A recessive trait is expressed in an individual only when: [CBSE-style] **[1]**
(a) the individual has one dominant allele
(b) the individual is heterozygous
(c) both alleles are recessive (homozygous recessive)
(d) the individual is a hybrid

Q4. Pea plants with round and green seeds (RRyy) are crossed with pea plants having wrinkled and yellow seeds (rrYY). The seeds developed by the plants of the F_1 generation will be: [Board 2025 (31/1/1)] **[1]**

(a) 50% round and green (b) 75% wrinkled and green
(c) 100% round and yellow (d) 75% wrinkled and yellow

Q5. A plant with genotype Tt is: [CBSE-style] **[1]**
(a) a pure tall plant
(b) a hybrid plant which shows the tall trait
(c) a pure dwarf plant
(d) a hybrid plant which shows the dwarf trait

Assertion–Reason

Q6. **Assertion (A):** A monohybrid cross between a pure tall (TT) and a pure dwarf (tt) pea plant gives all tall plants in the F_1 generation.
Reason (R): Tallness is dominant over dwarfness in pea plants. [CBSE-style] **[1]**
(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(b) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).
(c) Assertion (A) is true, but Reason (R) is false.
(d) Assertion (A) is false, but Reason (R) is true.

Q7. **Assertion (A):** In humans, if gene B is responsible for black eyes and gene b for brown eyes, then the progeny having gene combinations Bb, bb or BB will have black eyes only.
Reason (R): The black colour of the eyes is a dominant trait. [Board 2023 (31/4/1)] **[1]**
(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(b) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).
(c) Assertion (A) is true, but Reason (R) is false.
(d) Assertion (A) is false, but Reason (R) is true.

Very Short Answer (VSA)

Q8. Fetal cells collected from the amniotic fluid were screened and found to contain an XY pair of sex chromosomes.
(a) What is the sex of the foetus?
(b) How is this prenatal sex determination misused? [Adapted from SQP 2024-25 (Q35 B)] **[2]**

Q9. Explain why a recessive trait does not appear in the F_1 generation but reappears in the F_2 generation. [CBSE-style] **[2]**

Q10. Write the four types of gametes formed by a plant with genotype RrYy. Give the reason why these four types are formed. [CBSE-style] **[2]**

Short Answer (SA)

Q11. (a) Giving two examples, justify the statement that the sex of the offspring in all animals is not always genetically determined.
(b) Differentiate between the sex chromosomes of male and female human beings. [Board 2026 (31/2/1)] **[3]**

Q12. After self-pollination in pea plants with round, yellow seeds, the following types of seeds were obtained by Mendel: round yellow 630; round green 216; wrinkled yellow 202; wrinkled green 64. Analyse the result and describe the mechanism of inheritance which explains these results. [SQP 2020-21] **[3]**

Long Answer (LA)

Q13. Explain the mechanism of sex determination in human beings using a cross between a man and a woman. Why is the mother not responsible for the sex of the child? [CBSE-style] **[5]**

Case Study

Case Study: Ear lobes in a family Figures (a) to (d) show the type of ear lobes in a family: Rahul's father and mother both have free ear lobes, Rahul has attached ear lobes, and his sister Nisha has free ear lobes. Rahul surveyed the ear lobes of his classmates and recorded: males, 36 free and 14 attached; females, 31 free and 19 attached. Use this information to answer the questions. In the genetic constitution, the gene for free ear lobes is F and the gene for attached ear lobes is f.

[Figure: four labelled portraits of Rahul's father (a), Rahul (b), mother (c) and sister Nisha (d), showing free or attached ear lobes.]

Q14. Answer the following questions based on the above. [SQP 2023-24] **[4]**

(i) (a) Which of the two characteristics, free ear lobe or attached ear lobe, appears dominant in this case? Why? [1]

(ii) (b) Is the inheritance of the free ear lobe linked with sex of the individual? Give reason. [1]

(iii) (c) What type of ear lobe is present in the father, mother, Rahul and Nisha? Write the genetic constitution of each. [2]

OR

(iii) Suresh's parents have attached ear lobes. What type of ear lobe will Suresh and his sister Siya have? Give the genetic composition of all of them. [2]

9. Light – Reflection and Refraction

Multiple Choice Questions (MCQs)

Q1. If the power of a lens is -4.0 D, then the lens is a: [SQP 2021-22 Term 1 Q39] **[1]**

(a) concave lens of focal length -50 m
(b) convex lens of focal length $+50$ cm
(c) concave lens of focal length -25 cm
(d) convex lens of focal length -25 m

Q2. An object is placed in front of a convex mirror at infinity. According to the New Cartesian Sign Convention, the sign of the focal length and the sign of the image distance in this case are respectively: [Board 2023 (31/2/1) Q13] **[1]**

(a) Negative and negative
(b) Positive and positive
(c) Negative and positive
(d) Positive and negative

Q3. Both a spherical mirror and a thin spherical lens have a focal length of -15 cm. What type of mirror and lens are these? [SQP 2020-21 Q5] **[1]**

(a) Convex mirror and convex lens
(b) Concave mirror and convex lens
(c) Concave mirror and concave lens
(d) Convex mirror and concave lens

Q4. Refractive indices: glass 1.52, air 1.0003, water 1.333. Arrange the speed of light in these media in decreasing order. [SQP 2021-22 Term 1 Q20] **[1]**

(a) Glass, water, air
(b) Air, water, glass
(c) Water, glass, air
(d) Air, glass, water

Q5. An object is placed between the centre of curvature and the focus of a concave mirror. Which statements are correct? i. The image is virtual. ii. The reflected ray retraces the incident path for every ray. iii. The image is inverted. iv. The focal length of the concave mirror is negative. [Adapted from SQP 2021-22 Term 1 Q44 (statements rewritten from figure)] **[1]**

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

Assertion–Reason

Q6. **Assertion (A):** The apparent depth of a coin in water is less than its real depth.
Reason (R): Light bends away from the normal when it travels from water to air. [SQP 2026-27 Q32] **[1]**

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

Q7. **Assertion (A):** A concave lens always forms a virtual, erect and diminished image of a real object.
Reason (R): A concave lens diverges the refracted rays so that they appear to come from a point on the object side, between the optical centre and the focus. [CBSE-style] **[1]**
(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(b) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).
(c) Assertion (A) is true, but Reason (R) is false.
(d) Assertion (A) is false, but Reason (R) is true.

Very Short Answer (VSA)

Q8. (a) State Snell's law of refraction. (b) Define the refractive index of a medium with respect to another medium, and give its mathematical expression. [SQP 2026-27 Q33] **[2]**

Q9. A student obtained a sharp image of a lighted candle on a screen using a convex lens. He now wants to focus a distant lamp on a faraway pole. In which direction should the lens be moved with respect to the screen? Justify. [SQP 2016-17 Q36] **[2]**

Q10. A real image of a candle flame formed by a lens is three times the size of the flame, and the distance between the lens and the image is 80 cm. At what distance should the candle be placed from the lens? [SQP 2021-22 Term 1 Q43] **[2]**

Q11. A convex lens forms a real, inverted image that is twice the size of the object, and the image is 30 cm from the lens. Find the object distance and the focal length of the lens. [Adapted from SQP 2024-25 Q24 (C)] **[2]**

Short Answer (SA)

Q12. The image of an object formed by a mirror is real, inverted and of magnification $m = -1$. If the image is 30 cm from the mirror, where is the object placed? Find the image position when the object is moved 20 cm towards the mirror. What is the nature of this image? Justify with a ray diagram. [SQP 2018-19 Q11] **[3]**

Q13. (A) In the context of a diverging (convex) mirror, define (i) principal focus and (ii) focal length. Draw a labelled ray diagram. (B) An object of height 10 cm is placed 25 cm from the optical centre of a converging lens of focal length 15 cm. Calculate the image distance and the height of the image. [Board 2023 (31/4/1) Q30] **[3]**

Long Answer (LA)

Q14. (a) An object is placed in front of a convex lens of focal length f at a distance $2f$. Draw a ray diagram to show the image formation and write the magnification. (b) A 2 cm long candle flame, perpendicular to the principal axis, is focused on a white screen by a convex lens of focal length 12 cm. The flame is 16 cm from the lens. Calculate (i) the distance of the image from the lens and (ii) the length of the image. [Board 2023 (31/2/1) Q36] **[5]**

Case Study

Case Study: Spherical mirrors A highly polished surface reflects most of the light falling on it. Plane and spherical mirrors are used in daily life. The reflecting surface of a spherical mirror may be curved inwards or outwards. In a concave mirror, reflection takes place from the inner surface, while in a convex mirror it takes place from the outer surface.

Q15. Answer the following questions based on the above. [Board 2024 (31/5/1) Q39] **[4]**

(i) Define the principal axis of a concave mirror. [1]

(ii) A ray parallel to the principal axis of a concave mirror, after reflection, passes through a point 10 cm from the pole. Find the radius of curvature. [1]

(iii) An object is placed 10 cm from the pole of a convex mirror of focal length 15 cm. Find the position of the image. [2]

OR

(iii) A mirror forms a virtual, erect and diminished image of an object. Identify the mirror and draw a ray diagram for this image formation. [2]

10. The Human Eye and the Colourful World

Multiple Choice Questions (MCQs)

Q1. The change in the focal length of the eye lens to focus the image of objects at different distances on the retina is brought about by the action of [CBSE-style] **[1]**

(a) the cornea (b) the ciliary muscles
(c) the iris (d) the optic nerve

Q2. Danger signals and stop signs are red because [CBSE-style] **[1]**

(a) red light has the shortest wavelength and scatters the most
(b) red light has the longest wavelength among visible colours and is scattered the least, so it remains visible from far away even in fog or dust
(c) red light travels fastest through the atmosphere
(d) our eyes are most sensitive to red colour

Q3. To trace the path of a ray of light through a triangular glass prism, a student observes that the emergent ray has [SQP 2016-17] **[1]**

(a) bent away from the base of the prism
(b) bent towards the base of the prism
(c) moved parallel to the direction of the incident ray
(d) gone perpendicular to the incident ray

Q4. The colour of light for which the refractive index of glass is minimum, is [Board 2024 (31/5/1)] **[1]**

(a) Red (b) Yellow (c) Green (d) Violet

Q5. The image formed by the eye lens on the retina is [CBSE-style] **[1]**

(a) real and inverted, but the brain interprets it as erect
(b) virtual and erect
(c) real and erect
(d) virtual and inverted

Assertion–Reason

Q6. **Assertion (A):** In a glass prism, violet light deviates more than red light.
Reason (R): The refractive index of glass is larger for violet light than for red light. [CBSE-style] **[1]**

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

Q7. **Assertion (A):** Stars twinkle but planets do not twinkle appreciably.
Reason (R): Planets are extended sources of light, so the variations in the amount of light entering the eye from different parts of the planet average out. [CBSE-style] **[1]**

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

Very Short Answer (VSA)

Q8. A diagram of image formation in an eye shows the rays from a nearby object converging behind the retina. (a) Identify the defect of vision shown. (b) List its two causes and suggest a suitable corrective lens. [Board 2023 (31/5/1)] **[2]**

[Figure: schematic eye; rays from a nearby object focus behind the retina instead of on it.]

Q9. Draw the path of a ray of light passing through an equilateral triangular glass prism. Mark on it the angle of incidence and the angle of deviation. [Adapted from SQP 2017-18] **[2]**

[Figure: a triangular prism ABC; an incident ray meets face AB, bends towards the base at the first refraction, travels inside the prism, and emerges from face AC further bent towards the base; the angle between the incident ray and the normal at AB is marked as the angle of incidence, and the angle between the emergent ray and the original incident direction produced backwards is marked as the angle of deviation.]

Q10. Why do stars appear to twinkle at night while the planets, which look like bright points of light, shine with a steady light? [CBSE-style] **[2]**

Short Answer (SA)

Q11. (a) State one important function of each of the following parts of the human eye: (i) retina (ii) pupil. (b) State the role of ciliary muscles in focussing objects at varying distances from the eye. [Board 2023 (31/5/1)] **[3]**

Q12. A person cannot see objects beyond 1.5 m distinctly. The near point of the person's eye is normal (25 cm). (a) Name and define the defect. (b) Calculate the nature and power of the corrective lens required. (c) Draw a ray diagram to show the correction. [CBSE-style] **[3]**

Long Answer (LA)

Q13. (i) What is meant by accommodation of the human eye? (ii) What is the near point of a normal eye and what does it signify? (iii) Name the type of lens used to correct the defect in which a person cannot see distant objects clearly. (iv) Draw a diagram to show how the lens in (iii) helps a person see distant objects clearly. [SQP 2026-27] **[5]**

[Figure: eye with a concave lens placed in front; parallel rays from a distant object are diverged by the concave lens and then focused on the retina by the eye lens.]

Case Study

Case Study: Building a refracting telescope Sumati wanted to see the stars of the night sky. She learned that telescopes made of lenses are called refracting telescopes and those made of mirrors are called reflecting telescopes. She decided to build a refracting telescope and bought two convex lenses, L1 (larger) and L2 (smaller). The larger lens gathers and bends the incoming light, while the smaller lens magnifies the image. Big, thick lenses are more powerful, but heavy lenses are hard to make and hold, and any flaw in their surface spoils the image. To see far away, Sumati needed a big, powerful objective lens.

Q14. Answer the following questions based on the above. [Adapted from SQP 2020-21] **[4]**

(i) What kind of lenses must both L1 and L2 be, and which of the two has the larger focal length? [1]

(ii) If the powers of lenses L1 and L2 are in the ratio 1:4, what is the ratio of their focal lengths $f_1 : f_2$? [1]

(iii) Sumati found that the magnification produced by the eyepiece L2 in her experiment was 3, with the image at 24 cm from the lens. (i) At what distance from L2 was the object placed? (ii) State one advantage of using not-so-thick (thinner) lenses in the telescope. [2]

OR

(iii) (i) A nearby star is viewed through the telescope: state what type of image of the star the objective lens forms. (ii) The human eye can also be thought of as an optical instrument: name the part of the eye that plays the role of the screen. [2]

11. Electricity

Multiple Choice Questions (MCQs)

Q1. A 100 W bulb and a 60 W bulb are connected in parallel across a 220 V supply. Which bulb glows more brightly? [CBSE-style] **[1]**

(a) 100 W bulb (b) 60 W bulb
(c) Both glow equally (d) Brightness cannot be compared

Q2. When a 4 V battery is connected across an unknown resistor there is a current of 100 mA in the circuit. The value of the resistance of the resistor is: [SQP 2019-20 (Q6)] **[1]**

(a) $4\,\Omega$ (b) $40\,\Omega$ (c) $400\,\Omega$ (d) $0.4\,\Omega$

Q3. Two unequal resistances are connected in parallel across a battery. Which quantity is the same for both resistances? [Adapted from SQP 2020-21 (Q9)] **[1]**

(a) Current (b) Potential difference
(c) Power (d) Resistance

Q4. A 2 kW electric heater is connected to a 220 V supply. The current it draws is: [CBSE-style] **[1]**

(a) 0.11 A (b) 9.09 A (c) 2.2 A (d) 440 A

Q5. Which of the following is NOT an ohmic conductor? [CBSE-style] **[1]**

(a) Nichrome wire at constant temperature
(b) Manganin wire at constant temperature
(c) Filament of an electric bulb
(d) Copper wire at constant temperature

Assertion–Reason

Q6. **Assertion (A):** A fuse wire is always connected in parallel with the mainline.
Reason (R): If a current larger than the specified value flows through the circuit, the fuse wire melts. [SQP 2019-20 (Q14)] **[1]**

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

Q7. **Assertion (A):** An ammeter must have a very low resistance.
Reason (R): A low-resistance ammeter, connected in series, does not significantly change the current it is measuring. [CBSE-style] **[1]**

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

Very Short Answer (VSA)

Q8. (A) (i) State Joule's law of heating.
(ii) What happens to the heat produced in a conductor if the resistance is doubled while keeping other variables constant? [SQP 2026-27 (Q34)] **[2]**

Q9. (a) When is the potential difference between two points said to be 1 volt?
(b) State Ohm's law. [Board 2024 (31/5/1) Q36(a)(i) and Q36(b)(i)] **[2]**

Q10. (A) (i) Calculate the power developed in heater X.
(ii) If the resistance of X is double that of Y, calculate the current in heater Y. [SQP 2024-25 (Q25)] **[2]**
[Figure: Heaters X and Y are connected in parallel across a 230 V supply through switches. When both switches are closed the current in heater X is 3.5 A. (Option B: two resistors X and Y are connected either in series or in parallel to the same battery.)]

Short Answer (SA)

Q11. The current I through a resistor for the potential difference V across it is: I = 0.4, 0.8, 1.2, 1.6, 2.0 A and V = 1.2, 2.4, 3.6, 4.8, 6.0 V. Plot a graph between V and I and calculate the resistance of the resistor. [Board 2026 (31/2/1) Q37] **[3]**

Q12. Three cylindrical copper conductors are given: (a) length L, face area A; (b) length $3L$, face area $A/3$; (c) length $L/3$, face area $3A$. Compare the resistance and the resistivity of the three conductors, and justify. [SQP 2018-19 (Q13)] **[3]**

Long Answer (LA)

Q13. (i) State Ohm's law and describe a labelled circuit diagram with which the relationship between current and potential difference across a conductor can be verified.
(ii) Why should an ammeter have a low resistance?
(iii) Two identical resistors of $4\,\Omega$ each are first connected in series and then in parallel. Find the equivalent resistance in each case, and state which combination gives the steeper V–I graph when V is taken on the y-axis. [Adapted from Board 2023 (31/4/1) Q36] **[5]**

Case Study

Case Study: Nichrome coil experiment A student connected a nichrome coil in series with a cell, a key, an ammeter and a rheostat, with a voltmeter across the coil. The coil was kept at constant temperature. She recorded these readings: $V = 2\,\text{V}$ with $I = 0.5\,\text{A}$; $V = 4\,\text{V}$ with $I = 1.0\,\text{A}$; $V = 6\,\text{V}$ with $I = 1.5\,\text{A}$; and $V = 8\,\text{V}$ with $I = 2.0\,\text{A}$.

Q14. Answer the following questions based on the above. [CBSE-style] **[4]**

(i) (i) Find the resistance of the coil from the readings. [1]

(ii) (ii) Name the law verified by these readings and state it. [1]

(iii) (iii) Calculate (a) the heat produced in the coil in 60 s when the potential difference is 8 V. [2]

OR

(iii) (iii) (b) Calculate the power consumed by the coil when the potential difference is 4 V. [2]

12. Magnetic Effects of Electric Current

Multiple Choice Questions (MCQs)

Q1. The frequency of the AC supply in India is 50 Hz. In one second, the current in a household circuit changes its direction how many times? [CBSE-style] **[1]**

(a) 25 (b) 50 (c) 100 (d) 200

Q2. A vertical straight wire carries a steady current upwards. At a point due east of the wire, the magnetic field is directed: [CBSE-style] **[1]**

(a) Due north (b) Due south
(c) Due east (d) Vertically downwards

Q3. The force on a straight current-carrying conductor placed in a magnetic field is maximum when the angle between the current and the field is: [CBSE-style] **[1]**

(a) 0° (b) 30° (c) 60° (d) 90°

Q4. A fuse wire used in a household circuit should be made of a material having: [CBSE-style] **[1]**

(a) High melting point and high resistivity
(b) Low melting point and high resistivity
(c) Low melting point and low resistivity
(d) High melting point and low resistivity

Q5. The magnetic field inside a long straight current-carrying solenoid, away from its ends, is: [CBSE-style] **[1]**

(a) Zero
(b) Uniform
(c) Inversely proportional to the distance from the axis
(d) Stronger at the ends than in the middle

Assertion–Reason

Q6. **Assertion (A):** A current-carrying straight conductor experiences a force when placed perpendicular to the direction of a magnetic field.
Reason (R): The net charge on a current-carrying conductor is always zero. [Board 2023 (31/4/1)] **[1]**

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

Q7. **Assertion (A):** The deflection of a compass needle placed near a current-carrying wire decreases when the current in the wire is increased.
Reason (R): The strength of the magnetic field at a point near the conductor increases on increasing the current. [SQP 2023-24] **[1]**

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

Very Short Answer (VSA)

Q8. An electric kettle is rated 750 W, 220 V. Can this kettle be used in a circuit with a fuse of current rating 3 A? Give a reason. [Board 2025 (31/2/1)] **[2]**

Q9. Write two differences between overloading and short circuit. [CBSE-style] **[2]**

Q10. State the right-hand thumb rule. What happens to the direction of the magnetic field when the current is reversed? [CBSE-style] **[2]**

Short Answer (SA)

Q11. Magnetic field lines of a bar magnet are drawn. Point X is where the lines are closely spaced and point Y is where they are widely spaced. A student says that the field at X is stronger than at Y. (a) Explain with reason whether the student is correct. (b) Redraw the field lines of the bar magnet and mark their direction. [Adapted from SQP 2025-26] **[3]**

Q12. (a) What happens when a bundle of soft iron wires is placed inside the coil of a solenoid carrying a steady current? Name the device obtained and say why it is so called. (b) Draw the magnetic field lines inside a current-carrying solenoid. What does this pattern of field lines indicate? [Board 2024 (31/5/1)] **[3]**

Long Answer (LA)

Q13. (a) (i) State the rule which gives the direction of force acting on a current-carrying conductor placed in a magnetic field. (ii) What is a fuse? Why is it called a safety device? (iii) Why are electrical appliances with metallic bodies connected to the mains through a three-pin plug, whereas an electric bulb is connected with a two-pin plug? (iv) A conductor AB lies perpendicular to a uniform magnetic field directed into the plane of the paper, and current flows from A to B in the plane of the paper (A on the left, B on the right). What is the direction of the force on AB? Name the law you applied. [Board 2026 (31/2/1)] **[5]**

Case Study

Case Study: Magnetic field of a solenoid A solenoid is a long helical coil of wire through which current is passed to create a magnetic field. The field of the solenoid is the superposition of the fields due to each turn. It is nearly uniform inside the solenoid and close to zero outside, and it resembles the field of a bar magnet, with a north pole at one end and a south pole at the other, depending on the direction of current. A researcher plotted the magnetic field (in mT) against the current (in A) for a solenoid. The graph shows that the field increases with current, and that the increase is non-linear at larger currents.

Q14. Answer the following questions based on the above. [Adapted from SQP 2020-21] **[4]**

(i) What type of energy conversion takes place in a current-carrying solenoid? [1]

(ii) What happens if a soft iron bar is placed inside the solenoid? Give reason. [1]

(iii) Which of the following statements about the graph is correct? (I) B is inversely proportional to the current; (II) B is directly proportional to the current; (III) B is directly proportional to the square of the current; (IV) B is independent of the current. Justify. [2]

OR

(iii) Name two factors on which the magnetic field of a solenoid depends. [2]

13. Our Environment

Multiple Choice Questions (MCQs)

Q1. Which are the correct statements related to ozone? (i) Ozone layer helps in increasing the UV radiations reaching earth. (ii) Ozone is a deadly poison. (iii) Ozone layer shields the earth from UV radiations. (iv) Ozone layer prevents UV rays which cause skin cancer. (v) Ozone is formed with the help of chlorofluorocarbons. [SQP 2025-26] **[1]**

(a) (i), (ii), (iii) (b) (ii), (iii), (iv)
(c) (iii), (iv), (v) (d) (i), (iv), (v)

Q2. In a food chain, the energy available to producers is 10^4 J. Assuming 10 per cent transfer at each step, the energy available to the fourth trophic level is: [CBSE-style] **[1]**

(a) 1000 J (b) 100 J (c) 10 J (d) 1 J

Q3. Which of the following is not a role of decomposers in the ecosystem? [SQP 2024-25] **[1]**

(a) Natural replenishment of soil.
(b) Enrichment of oxygen in the atmosphere.
(c) Waste decomposition.
(d) Break-down of dead remains.

Q4. Organisms of a higher trophic level which feed on several types of organisms belonging to a lower trophic level form the: [Board 2026 (31/3/1)] **[1]**

(a) Food web (b) Ecosystem
(c) Ecological pyramid (d) Food chain

Q5. Which of the following is a biodegradable substance? [CBSE-style] **[1]**

(a) Polythene bag (b) Glass bottle (c) Dry leaves (d) Aluminium foil

Assertion–Reason

Q6. **Assertion (A):** Energy flow in an ecosystem is unidirectional.
Reason (R): Energy released as heat at each trophic level cannot be recycled back to the producers. [CBSE-style] **[1]**
(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(b) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).
(c) Assertion (A) is true, but Reason (R) is false.
(d) Assertion (A) is false, but Reason (R) is true.

Q7. **Assertion (A):** Vulture will always have the least amount of pesticides in a food chain.
Reason (R): Vulture occupies the last trophic level and it gets only 10% of energy of the previous trophic level. [SQP 2025-26] **[1]**
(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(b) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).
(c) Assertion (A) is true, but Reason (R) is false.
(d) Assertion (A) is false, but Reason (R) is true.

Very Short Answer (VSA)

Q8. Spraying of pesticide on a cabbage farm: a food chain in the farm is cabbage (plant) → rabbit → snake → owl. What impact will the pesticide have on humans if they occupy the last trophic level? Explain. [SQP 2024-25] **[2]**

Q9. A lot of waste is generated in the neighbourhood. However, almost all of it is biodegradable. What impact will it have on the environment or human health? [SQP 2022-23] **[2]**

Q10. Differentiate between biotic and abiotic components of an ecosystem. Give one example of each. [CBSE-style] **[2]**

Short Answer (SA)

Q11. Why is damage to the ozone layer a cause for concern? What are its causes and what steps are being taken to limit this damage? [SQP 2022-23] **[3]**

Q12. Differentiate between food chain and food web. In a food chain consisting of deer, grass and tiger, if the population of deer decreases, what will happen to the population of organisms belonging to the first and third trophic levels? [Board 2024 (31/5/1)] **[3]**

Long Answer (LA)

Q13. (a) Differentiate between biodegradable and non-biodegradable wastes with one example each.
(b) Describe the harmful effect of accumulated non-biodegradable waste on the environment.
(c) Suggest two methods for managing biodegradable waste at home. [CBSE-style] **[5]**

Case Study

Case Study: Mercury in a lake A factory discharged a small amount of mercury into a lake. Mercury is not broken down in the environment. Algae took up traces of mercury from the water, and the mercury content was then found to be higher in zooplankton, small fish, large fish and fish-eating birds. The food chain was: algae → zooplankton → small fish → large fish → fish-eating bird.

Q14. Answer the following questions based on the above. [CBSE-style] **[4]**

(i) Name the process by which the concentration of mercury increases at successive trophic levels. [1]

(ii) Which organism in this food chain has the highest concentration of mercury? [1]

(iii) Explain why the concentration increases at higher trophic levels. Suggest one way to reduce such pollution. [2]

OR

(iii) Why are there fewer organisms at higher trophic levels? Give two reasons. [2]

Answer Key (MCQs and Assertion–Reason)

Ch. 1: Q1-(a), Q2-(b), Q3-(b), Q4-(c), Q5-(b), Q6-(a), Q7-(a)

Ch. 2: Q1-(d), Q2-(c), Q3-(b), Q4-(c), Q5-(b), Q6-(a), Q7-(a)

Ch. 3: Q1-(a), Q2-(b), Q3-(c), Q4-(c), Q5-(b), Q6-(d), Q7-(a)

Ch. 4: Q1-(a), Q2-(b), Q3-(a), Q4-(a), Q5-(a), Q6-(a), Q7-(a)

Ch. 5: Q1-(d), Q2-(c), Q3-(b), Q4-(b), Q5-(b), Q6-(b), Q7-(c)

Ch. 6: Q1-(d), Q2-(a), Q3-(c), Q4-(d), Q5-(c), Q6-(a), Q7-(b)

Ch. 7: Q1-(c), Q2-(b), Q3-(c), Q4-(c), Q5-(b), Q6-(a), Q7-(a)

Ch. 8: Q1-(d), Q2-(b), Q3-(c), Q4-(c), Q5-(b), Q6-(a), Q7-(d)

Ch. 9: Q1-(c), Q2-(b), Q3-(c), Q4-(b), Q5-(c), Q6-(a), Q7-(a)

Ch. 10: Q1-(b), Q2-(b), Q3-(b), Q4-(a), Q5-(a), Q6-(a), Q7-(a)

Ch. 11: Q1-(a), Q2-(b), Q3-(b), Q4-(b), Q5-(c), Q6-(d), Q7-(a)

Ch. 12: Q1-(c), Q2-(a), Q3-(d), Q4-(b), Q5-(b), Q6-(b), Q7-(d)

Ch. 13: Q1-(b), Q2-(c), Q3-(b), Q4-(a), Q5-(b), Q6-(a), Q7-(d)