CENTRAL BOARD OF SECONDARY EDUCATION

CBSE 2026-27

Science

Subject Code: 086 | Class X

Question Bank – Set 1

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	4	2	1	1	**15**
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**	**42**	**26**	**13**	**13**	**185**

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. In order to balance the following chemical equation, the values of the coefficients x and y respectively are: $x\,Pb(NO_3)_2 \xrightarrow{Heat} 2\,PbO + y\,NO_2 + O_2$ [Board 2023 (31/2/1) Q3; SQP 2024-25 Q1] **[1]**

(a) 2, 4 (b) 2, 2 (c) 2, 3 (d) 4, 2

Q2. The correct balanced chemical equation showing an exothermic reaction in which natural gas burns in air is: [Board 2025 (31/2/1) Q1] **[1]**

(a) $CH_4 + O_2 \longrightarrow CO_2 + 2\,H_2O$
(b) $CH_4 + 2\,O_2 \longrightarrow 2\,CO_2 + 2\,H_2O$ + Energy
(c) $CH_4 + 2\,O_2 \longrightarrow CO_2 + 2\,H_2O$
(d) $CH_4 + 2\,O_2 \longrightarrow CO_2 + 2\,H_2O$ + Energy

Q3. Reema took 5 mL of lead nitrate solution in a beaker and added approximately 4 mL of potassium iodide solution to it. What would she observe? [SQP 2021-22 (Term 1) Q1] **[1]**

(a) The solution turned red.
(b) Yellow precipitate was formed.
(c) White precipitate was formed.
(d) The reaction mixture became hot.

Q4. Which of the following equations represent redox reactions, and what are the values of p and q in these equations? Equation 1: $Fe_2O_3(s) + 2\,Al(s) \longrightarrow Al_2O_3(s) + p\,Fe(l)$ + heat Equation 2: $2\,C_4H_{10}(g) + 13\,O_2(g) \xrightarrow{\Delta} 8\,CO_2(g) + q\,H_2O(g)$ [SQP 2025-26 Q17] **[1]**

(a) Only equation 1 is a redox reaction, p = 1 and q = 3
(b) Both equations 1 and 2 are redox reactions, p = 2 and q = 4
(c) Only equation 2 is a redox reaction, p = 2 and q = 10
(d) Both equations 1 and 2 are redox reactions, p = 2 and q = 10

Q5. The balanced chemical equation showing reaction between quicklime and water is: [Board 2023 (31/5/1) Q2] **[1]**

(a) $2\,CaO + H_2O \longrightarrow 2\,CaOH + H_2$ + Heat
(b) $CaO + H_2O \longrightarrow Ca(OH)_2 + H_2$ + Heat
(c) $CaO + H_2O \longrightarrow Ca(OH)_2$ + Heat
(d) $2\,CaO + 3\,H_2O \longrightarrow 2\,Ca(OH)_3 + O_2$ + Heat

Assertion–Reason

Q6. **Assertion (A):** In the reaction $ZnO + C \longrightarrow Zn + CO$, ZnO undergoes reduction.
Reason (R): Carbon is a reducing agent that reduces ZnO to Zn. [Board 2023 (31/5/1) 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):** Silver bromide decomposition is used in black and white photography.
Reason (R): Light provides energy for this exothermic reaction. [SQP 2022-23 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.

Very Short Answer (VSA)

Q8. What is observed when aqueous solutions of potassium iodide and lead nitrate are mixed together? Name the type of reaction and write the chemical equation for the reaction that occurs. [Board 2023 (31/2/1) Q21] **[2]**

Q9. In the reaction $CuO + H_2 \longrightarrow Cu + H_2O$, identify the oxidising agent and the reducing agent, and state whether it is a redox reaction. [CBSE-style] **[2]**

Q10. Classify each of the following as exothermic or endothermic, and justify briefly.

(a) $CaCO_3 \xrightarrow{\Delta} CaO + CO_2$

(b) $C + O_2 \longrightarrow CO_2$ [CBSE-style] **[2]**

Short Answer (SA)

Q11. (a) Define a double displacement reaction.
(b) Write the chemical equation of a double displacement reaction which is also a (i) neutralisation reaction and (ii) precipitation reaction. Give justification for your answer. [Board 2023 (31/5/1) Q27] **[3]**

Q12. 2 g of green-coloured crystals of ferrous sulphate are heated in a dry boiling tube. Name the type of chemical reaction taking place. Write the balanced chemical equation for the reaction. Is this an exothermic or an endothermic reaction? [Board 2026 (31/3/1) Q26] **[3]**

Long Answer (LA)

Q13. (I) Alisha says the formation of ammonia from nitrogen and hydrogen is a reduction reaction. Drishti says both rusting of iron and formation of ammonia are redox reactions. Bhushan says rusting of iron is an oxidation reaction. Who do you agree with, and why?
(II) Identify the error(s) in each equation and rewrite it correctly: (i) $MgCl_2 + AgNO_3 \longrightarrow AgCl_2 + MgNO_3$
(ii) $Al + H_2SO_4 \longrightarrow Al_2SO_4 + H_2O$ [SQP 2026-27 Q29 (option A)] **[5]**

Case Study

Case Study: Rusting in different test tubes Ravi placed three iron nails in three test tubes. Tube A had only dry air. Tube B had boiled water covered with a layer of oil. Tube C had moist air with a pinch of common salt. He left the set-up for one week. The nail in tube C was covered with a reddish-brown flaky layer, while the nails in tubes A and B remained shiny. Rusting is a process in which iron reacts with oxygen and water to form hydrated iron(III) oxide, and it is an everyday effect of oxidation.

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

(i) In which test tube did rusting occur fastest, and why? [1]

(ii) Write the balanced equation for rusting of iron, with x as the number of water molecules. [1]

(iii) Identify the substance oxidised and the substance reduced in rusting, and explain why the nail in tube B did not rust. [2]

OR

(iii) Name one method of preventing rusting of iron and explain how it works. [2]

2. Acids, Bases and Salts

Multiple Choice Questions (MCQs)

Q1. When sodium bicarbonate reacts with dilute hydrochloric acid, the gas evolved is: [Board 2023 (31/4/1) Q1] **[1]**
(a) Hydrogen; it gives a pop sound with a burning match stick
(b) Hydrogen; it turns lime water milky
(c) Carbon dioxide; it turns lime water milky
(d) Carbon dioxide; it blows off a burning match stick with a pop sound

Q2. A metal carbonate reacts with a solution X which forms a salt, water and a gas Y. What are X and Y? [Board 2026 (31/2/1) Q18] **[1]**
(a) X - Sodium hydroxide, Y - Carbon dioxide
(b) X - Sodium hydroxide, Y - Hydrogen
(c) X - Hydrochloric acid, Y - Carbon dioxide
(d) X - Hydrochloric acid, Y - Hydrogen

Q3. Consider the following reactions: (i) Dilute hydrochloric acid reacts with sodium hydroxide. (ii) Magnesium oxide reacts with dilute hydrochloric acid. (iii) Carbon dioxide reacts with sodium hydroxide. It is found that

in each case: [Board 2025 (31/1/1) Q4] **[1]**

(a) Salt and water is formed (b) Neutral salts are formed
(c) Hydrogen gas is formed (d) Acidic salts are formed

Q4. Sodium hydroxide is termed an alkali while ferric hydroxide is not because: [Board 2023 (31/4/1) Q5] **[1]**
(a) Sodium hydroxide is a strong base, while ferric hydroxide is a weak base.
(b) Sodium hydroxide is a base which is soluble in water, while ferric hydroxide is insoluble in water.
(c) Sodium hydroxide is a strong base while ferric hydroxide is a strong acid.
(d) Both are strong bases, but sodium hydroxide is more soluble in water than ferric hydroxide.

Q5. Select from the following salts those which may be used to prepare the hard water required for an experiment. A. $CaSO_4$ B. Na_2SO_4 C. $CaCl_2$ D. K_2SO_4 E. $NaHCO_3$ F. $MgCl_2$ [SQP 2016-17 Q27] **[1]**

(a) A, B and D (b) A, C and F (c) B, D and E (d) C, E and F

Assertion–Reason

Q6. **Assertion (A):** A dilute solution of hydrochloric acid conducts electricity.
Reason (R): Hydrogen chloride dissociates into H+ and Cl- ions in water, and these ions carry the electric current. [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):** Milk of magnesia is used as an antacid.
Reason (R): Milk of magnesia is a suspension of magnesium hydroxide in water. [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 few drops of phenolphthalein are added to a dilute solution of sodium hydroxide, and a pink colour is produced. What will be the colour of the final mixture when excess of HCl is added to it? Justify. [SQP 2018-19 Q22] **[2]**

Q9. Two solutions M and N give red and blue colours respectively with universal indicator. (i) In which solution is the hydrogen ion concentration more? Justify. (ii) If M and N are mixed and the mixture turns green on testing with universal indicator, what is the nature of the salt formed? Justify. [Board 2023 (31/5/1) Q21(b)] **[2]**

Q10. Three unknown solutions A, B and C have pH values 6, 8 and 9.5 respectively. (a) In which solution is the concentration of hydronium ions maximum? (b) Arrange the solutions in increasing order of H+ ion concentration. [Adapted from SQP 2024-25 Q28(A)(iii)] **[2]**

Short Answer (SA)

Q11. "pH has great importance in our daily life." Explain this statement by giving three examples. [SQP 2017-18 Q13] **[3]**

Q12. (i) Suggest a safe procedure for diluting a concentrated acid. (ii) Name the salt formed when sulphuric acid is added to sodium hydroxide, and state its pH. (iii) Dry HCl gas does not change the colour of dry blue litmus paper. Why? [Adapted from Board 2023 (31/4/1) Q28] **[3]**

Long Answer (LA)

Q13. (i) Match the pH values 1, 7, 10 and 13 to gastric juice, brine, milk of magnesia and aqueous NaOH respectively, giving reasons. (ii) Amit and Rita added baking soda to their cake batter. Explain the role of baking soda with a balanced reaction. [Adapted from SQP 2020-21 Q34] **[5]**

Case Study

Case Study: Salt from the sea Seawater contains many salts dissolved in it. Common salt is separated from these salts, and it is also mined as rock salt. Common salt is an important raw material for many chemicals used in daily life. When brine, a concentrated solution of common salt, is electrolysed, several useful substances are obtained. Baking soda is also made from common salt. When baking soda is strongly heated, it gives a compound that is used to remove the permanent hardness of water.

Q14. Answer the following questions based on the above. [Adapted from Board 2025 (31/1/1) Q37] **[4]**

(i) Write the balanced chemical equation for the electrolysis of brine. [1]

(ii) List two uses of any one product obtained during the electrolysis of brine. [1]

(iii) (i) Identify the substances A and B, and write the equation for the reaction that occurs when A is heated. [2]

OR

(iii) (ii) Define water of crystallisation, and give two examples of salts that contain it. [2]

3. Metals and Non-metals

Multiple Choice Questions (MCQs)

Q1. When zinc reacts with sodium hydroxide, the product formed is: [Board 2023 (31/2/1); Board 2026 (31/3/1)] **[1]**

(a) Na_2O (b) ZnO (c) Na_2ZnO_2 (d) $Zn(OH)_2$

Q2. A magnesium ribbon is dropped into a test tube containing dilute hydrochloric acid. It starts floating on the surface. Which statement gives the correct reason for the floating? [Adapted from SQP 2021-22 Term 1] **[1]**

(a) Magnesium is lighter than dilute hydrochloric acid.
(b) Magnesium reacts with dilute hydrochloric acid to produce H_2 gas which helps it float.
(c) Magnesium reacts with dilute hydrochloric acid to produce N_2 gas which helps it float.
(d) Magnesium reacts with dilute hydrochloric acid to produce CO_2 gas which helps it float.

Q3. The electronic configurations of three elements are: X = 2, 8, 7; Y = 2, 8, 2; Z = 2, 8. Which statement is correct? [SQP 2024-25] **[1]**

(a) Y and Z are metals. (b) Y and X are non-metals.
(c) X is a non-metal and Y is a metal. (d) Y is a non-metal and Z is a metal.

Q4. A metal ribbon X burns in oxygen with a dazzling white flame forming a white ash Y. The correct description of X, Y and the type of reaction is: [Board 2023 (31/4/1)] **[1]**

(a) X = Ca; Y = CaO; Type of reaction = Decomposition
(b) X = Mg; Y = MgO; Type of reaction = Combination
(c) X = Al; Y = Al_2O_3; Type of reaction = Thermal decomposition
(d) X = Zn; Y = ZnO; Type of reaction = Endothermic

Q5. A student notices that her silver jewellery turned dull and had a grey-black coating over it after wearing for a few months. What results in the change in colour of the silver metal? [Board 2026 (31/2/1)] **[1]**

(a) The polish over the jewellery was removed after wearing for a few months.
(b) The jewellery comes in contact with air, moisture and acids and corrodes.
(c) Dust particles over the jewellery change its colour.
(d) Its colour changes due to rusting.

Assertion–Reason

Q6. **Assertion (A):** Rusting of iron is endothermic in nature.
Reason (R): As the reaction is slow, the release of heat is barely evident. [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.

Q7. **Assertion (A):** Aluminium is a reactive metal, yet aluminium utensils and wires resist corrosion for a long time.
Reason (R): A thin, adherent layer of aluminium oxide forms on its surface and protects the metal beneath. [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) Silver is recovered from silver nitrate solution by using copper metal. Name the type of reaction and write the chemical equation involved.
(b) Name the method used for refining silver. [Board 2025 (31/2/1)] **[2]**

Q9. A magnesium ribbon is added to dilute hydrochloric acid. (a) Write the balanced chemical equation.
(b) Name the gas evolved and describe its test. [CBSE-style] **[2]**

Q10. Metals such as sodium, potassium, calcium and magnesium are never found in the free state in nature. Give two reasons. [CBSE-style] **[2]**

Short Answer (SA)

Q11. The reaction $3\,MnO_2(s) + 4\,Al(s) \longrightarrow 3\,Mn(l) + 2\,Al_2O_3(s) + \text{Heat}$ is used to extract manganese. (a) Give a reason why it is known as a thermite reaction.
(b) Identify the substance oxidised and the substance reduced.
(c) Give a reason why aluminium is preferred in thermite reactions. [SQP 2023-24] **[3]**

Q12. (a) Explain the formation of calcium chloride with the help of electron dot structures. [Atomic numbers: Ca = 20, Cl = 17]
(b) Why do ionic compounds not conduct electricity in the solid state but conduct in the molten and aqueous states? [Adapted from SQP 2020-21 (Q32)] **[3]**

Long Answer (LA)

Q13. (a) What is the reactivity series? How does it help in predicting the relative activities of metals?
(b) Suggest the chemical processes used for obtaining a metal from its oxides for metals in the middle of the reactivity series and for metals at the top. Support your answer with one example each. [SQP 2017-18 (Q20)] **[5]**

Case Study

Case Study: Heat conduction in metals Aavya and Vihan want to compare how well metals conduct heat. They fix rods of aluminium, silver, copper, iron and zinc, all of equal length and thickness, to a central point. A small candle is fixed at the far end of each rod. The central point is heated with a burner and the time taken for each candle to drop is noted. The results show that silver takes about 10 seconds, copper 15 seconds, aluminium 30 seconds, zinc 50 seconds and iron 60 seconds. A gold rod, which conducts heat better

than aluminium but not as well as copper, is also considered.

[Figure: Five metal rods of equal length and thickness are fixed to a central point heated by a burner; each rod carries a candle at its far end. A bar graph titled Time taken for the candle to drop shows silver 10 s, copper 15 s, aluminium 30 s, zinc 50 s and iron 60 s.]

Q14. Answer the following questions based on the above. [Adapted from SQP 2026-27 (Q28)] **[4]**

(i) On the basis of the graph, which metal is the best conductor of heat? [1]

(ii) If one rod were made of gold, the time for its candle to drop would be: (i) 15 s (ii) 20 s (iii) 35 s (iv) 10 s. Choose the correct value and justify. [1]

(iii) If the length of all the rods is increased by 20 per cent without any change in thickness, will the time for the candles to drop be affected? Explain. [2]

OR

(iii) If one rod is thicker than the others but of the same length, how would the time for its candle to drop change? Explain. [2]

4. Carbon and its Compounds

Multiple Choice Questions (MCQs)

Q1. Manjeet wants to wash clothes, but the water available is hard. He compares the action of soap and detergent in hard water. Soap forms scum in hard water while a detergent easily produces lather. Which inference is correct? [SQP 2026-27] **[1]**

(a) Ca^{2+} and Mg^{2+} ions in hard water react with soap forming insoluble compounds, whereas detergents do not form such insoluble salts.
(b) Soap is acidic and detergents are basic, so detergents work better in hard water.
(c) Soap reacts with Na^{+} ions in hard water to form scum, while detergents do not react with Na^{+} ions.
(d) Detergents form lather easily because they are ionic compounds and react with Ca^{2+} and Mg^{2+} ions.

Q2. The molecular formula of the 4th member of the homologous series of alcohols is: [CBSE-style] **[1]**

(a) $C_4H_{10}O$ (b) C_3H_8O (c) C_4H_8O (d) $C_3H_{10}O$

Q3. Soap was added to three beakers containing distilled water, a sodium chloride solution and a calcium chloride solution, and each mixture was shaken. In which beaker(s) will scum form along with the least lather? [CBSE-style] **[1]**

(a) Distilled water only (b) Sodium chloride solution only
(c) Calcium chloride solution only (d) All three beakers

Q4. The number of electrons shared between the two carbon atoms in an ethyne molecule is: [Adapted from Board 2023 (31/2/1)] **[1]**

(a) 6 (b) 3 (c) 10 (d) 4

Q5. In the preparation of soap from an oil or fat, sodium chloride is added to the reaction mixture because it causes: [SQP 2016-17] **[1]**

(a) complete saponification (b) complete hydrolysis
(c) complete neutralisation (d) complete precipitation of the soap

Assertion–Reason

Q6. **Assertion (A):** C_4H_8, C_4H_6 and C_4H_{10} are members of the same homologous series.
Reason (R): C_4H_8, C_4H_6, C_3H_4, C_3H_6, C_2H_4, C_2H_2 are unsaturated hydrocarbons. [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.

Q7. **Assertion (A):** When a small piece of sodium is dropped into ethanol, a gas is released that burns with a pop sound.
Reason (R): Sodium reacts with ethanol to give sodium ethoxide and hydrogen gas. [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. Give a test that can be used to confirm the presence of carbon in a compound. With a valency of 4, how is carbon able to attain noble gas configuration in its compounds? [SQP 2020-21] **[2]**

Q9. A student adds about 5 mL of ethanoic acid to a test tube containing a pinch of sodium hydrogen carbonate. What is observed? Write the chemical equation. [CBSE-style] **[2]**

Q10. From an experiment to study the properties of ethanoic acid: (a) Name the substance which on addition to ethanoic acid produces CO_2 gas and give the equation.
(b) How is CO_2 gas tested in the laboratory? [SQP 2018-19 (Q23)] **[2]**

Short Answer (SA)

Q11. An organic compound X (C_2H_6O) is used to blend with petrol and as a solvent in medicines such as tincture iodine, cough syrups and tonics. (a) Draw the electron dot structure of X.
(b) Write the name and formula of the next homologue of X.
(c) Write the reaction of X with acetic acid to form a sweet-smelling substance. [SQP 2026-27] **[3]**

Q12. (a) Why is the conversion of ethanol to ethene a dehydration reaction?
(b) What role does conc. H_2SO_4 play in it?
(c) Write the equation. [CBSE-style] **[3]**

Long Answer (LA)

Q13. (a) State two main reasons for carbon forming a very large number of compounds.
(b) Give reasons why carbon forms compounds (i) mainly by covalent bonding, (ii) having low melting and boiling points.
(c) Write chemical equations for what happens when (i) a piece of sodium is added to ethanol, (ii) ethanoic acid reacts with sodium hydroxide. [SQP 2016-17 (Q19)] **[5]**

Case Study

Case Study: The quiz hints In a chemistry quiz, the quiz master gives the following hints about two mystery substances A and F: (i) Substance C is used as a preservative. (ii) C has two carbon atoms and is obtained by the reaction of A in the presence of alkaline potassium permanganate followed by acidification. (iii) Misuse of A in industries is prevented by adding methanol, benzene and pyridine to A. (iv) F is formed on heating A in the presence of conc. sulphuric acid. (v) F reacts with hydrogen gas in the presence of nickel and palladium catalysts.

Q14. Answer the following questions based on the above. [SQP 2023-24 (Q37)] **[4]**

(i) Give the IUPAC names of A and F. [1]

(ii) Illustrate with a chemical equation the change A to C. [1]

(iii) Name the chemical reactions which occur in steps (ii) and (v). Identify the compounds formed in these steps if A is replaced by its next homologue. [2]

OR

(iii) Write the chemical equation for the change A to F and name the role of conc. H_2SO_4 in this change. [2]

5. Life Processes

Multiple Choice Questions (MCQs)

Q1. Which of the following options indicates the products formed after breakdown of glucose in our muscle cells when there is lack of oxygen? [SQP 2025-26] **[1]**

(a) Ethanol + carbon dioxide + energy
(b) Lactic acid + energy
(c) Lactic acid + carbon monoxide + energy
(d) Carbon dioxide + water + energy

Q2. A student was given the following characteristics of anaerobic respiration in humans: (i) location: muscle cell; (ii) condition: requires presence of O_2 and CO_2; (iii) end product: 3-carbon molecules. Which of these characteristics is or are related to anaerobic respiration? [Board 2026 (31/3/1)] **[1]**

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

Q3. Select the group in which all organisms have the same mode of nutrition. [SQP 2025-26] **[1]**

(a) Cuscuta, yeast, legumes, leeches and tapeworm
(b) Cactus, ticks, lice, leeches and cow
(c) Cuscuta, ticks, lice, leeches and tapeworm
(d) Cactus, grass, lice, lion and tapeworm

Q4. Generally food is broken down and absorbed within the body of organisms. In which of the following organisms is it done outside the body? [SQP 2023-24] **[1]**

(a) Amoeba (b) Mushroom (c) Paramoecium (d) Lice

Q5. In which of the following groups of organisms does blood flow through the heart only once during one cycle of passage through the body? [SQP 2021-22 Term 1] **[1]**

(a) Rabbit, parrot, turtle
(b) Frog, crocodile, pigeon
(c) Whale, Labeo, penguin
(d) Shark, dog fish, sting ray

Assertion–Reason

Q6. **Assertion (A):** Muscle cells accumulate lactic acid during heavy exercise.
Reason (R): When oxygen supply is insufficient, pyruvate is converted into lactic acid in muscle cells. [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):** The inner walls of the small intestine have finger-like projections called villi which are rich in blood.
Reason (R): These villi have a large surface area to help the small intestine in absorbing digested food. [Adapted from Board 2023 (31/4/1) Q19] **[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) Due to narrowing of the bile duct, the bile secretion from the liver to the small intestine was obstructed. How will the process of digestion be affected? [SQP 2026-27] **[2]**

Q9. (A) How many chambers are there in the heart of (i) fishes and (ii) humans? How is mixing of oxygenated and deoxygenated blood prevented in the human body? [SQP 2025-26] **[2]**

Q10. Bile juice does not have any digestive enzyme but still plays a significant role in the process of digestion. Justify the statement. [SQP 2020-21] **[2]**

Q11. Write one specific function each of the following organs in relation with excretion in human beings: (i) renal artery; (ii) urethra; (iii) glomerulus; (iv) tubular part of nephron. [Board 2023 (31/4/1)] **[2]**

Short Answer (SA)

Q12. Explain the ways in which glucose is broken down in the absence of oxygen. [SQP 2017-18] **[3]**

Q13. (a) (i) What is the first step in the breakdown of glucose during aerobic and anaerobic respiration? Where does it take place? (ii) ATP is called the energy currency of the cell. Why? (iii) What is meant by residual volume of air in a breathing cycle? [Board 2023 (31/2/1)] **[3]**

Long Answer (LA)

Q14. (A) Birds and mammals have a four-chambered heart, while fishes have a two-chambered heart. (I) Which heart is present in birds and mammals, and how are they able to maintain their body temperature? Give reasons. (II) Which heart is present in fishes, and how does circulation of blood take place in them? [Adapted from SQP 2026-27 Q16 (hearts figure converted to text)] **[5]**

Case Study

Case Study: Energy from breakdown of carbohydrates All living cells require energy for various activities. This energy is available by the breakdown of simple carbohydrates, either using oxygen or without using oxygen. During a 400 m race, the blood lactic acid level of an athlete was measured. It peaked at the end of the race, when the muscles had run short of oxygen, and then fell during recovery. The athlete's breathing rate also increased during the race.

Q15. Answer the following questions based on the above. [Adapted from SQP 2020-21 Q17] **[4]**

(i) Name the process by which energy is obtained in higher plants and animals: breathing, tissue respiration, organ respiration or digestion of food. [1]

(ii) Lactic acid was produced in the athlete during the race. Which process explains this: aerobic respiration, anaerobic respiration, fermentation or breathing? [1]

(iii) Compare the energy supplied by aerobic and anaerobic respiration during a sprint, and justify your answer. [2]

OR

(iii) Why does an athlete breathe heavily after a sprint? [2]

6. Control and Coordination

Multiple Choice Questions (MCQs)

Q1. Which of the following is a correct combination of function and part of the brain? [SQP 2025-26] **[1]**

(a) Posture and balance: Cerebrum
(b) Salivation: Medulla in midbrain
(c) Hunger: Pons in hindbrain
(d) Blood pressure: Medulla in hindbrain

Q2. In a synapse, the chemical signal is transmitted from: [Board 2026 (31/3/1)] **[1]**

(a) Dendritic end of one neuron to axonal end of another neuron.
(b) Axon to cell body of the same neuron.
(c) Cell body to axonal end of the same neuron.
(d) Axonal end of one neuron to dendritic end of another neuron.

Q3. Which part of a neuron receives stimuli and carries impulses towards the cell body? [CBSE-style] **[1]**

(a) Axon (b) Myelin sheath (c) Dendrite (d) Axon terminal

Q4. In plants the role of cytokinin is: [Board 2023 (31/4/1)] **[1]**
(a) Promote cell division.
(b) Wilting of leaves.
(c) Promote the opening of stomatal pore.
(d) Help in the growth of stem.

Q5. Which hormone is secreted by the thyroid gland, and whose deficiency in the diet causes goitre? [CBSE-style] **[1]**
(a) Insulin, due to lack of iodine
(b) Thyroxine, due to lack of iodine
(c) Adrenaline, due to lack of iodine
(d) Growth hormone, due to lack of iodine

Assertion–Reason

Q6. **Assertion (A):** A shoot bends towards a source of light.
Reason (R): Auxin accumulates on the shaded side of the shoot and promotes cell elongation there. [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):** Blood thyroxine level is controlled by a feedback mechanism.
Reason (R): The pituitary gland changes its secretion of TSH according to the level of thyroxine in the blood. [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) Name the part of the brain responsible for the following: (i) maintaining posture and balance; (ii) beating of the heart; (iii) thinking; (iv) regulation of blood pressure. [Board 2023 (31/4/1)] **[2]**

Q9. Plants show tropic movements and nastic movements. Differentiate a tropic movement from a nastic movement with one example of each. [CBSE-style] **[2]**

Q10. Define a synapse. Why is the transmission across a synapse chemical in nature? [CBSE-style] **[2]**

Short Answer (SA)

Q11. Name the hormone released and the gland which secretes it in human beings during scary situations. How does the body respond to enable it to deal with the situation? [Board 2023 (31/2/1)] **[3]**

Q12. Draw and explain how the nerve cells help in transmission of impulses. [SQP 2025-26] **[3]**

Long Answer (LA)

Q13. (a) Name the hind-brain region which controls involuntary actions such as blood pressure and salivation. Name the region which controls precision of voluntary movements and balance, and state the region in which both lie.
(b) "Both overproduction and underproduction of growth hormone lead to disorders in the body." Explain. [SQP 2017-18; adapted] **[5]**

Case Study

Case Study: Blood glucose and diabetes A 52-year-old man, Patient X, visited a clinic. His blood glucose test showed a fasting level above the normal range and a level far higher than normal two hours after a meal. The doctor explained that his body does not produce enough of a hormone that helps cells take up glucose from the blood. He was advised to reduce sugar in his diet, eat more fibre and exercise regularly. The doctor also explained that the disease is managed by careful control of diet, exercise and, when needed, the hormone itself.

Q14. Answer the following questions based on the above. [SQP 2019-20; adapted] **[4]**

(i) Infer the disease from the blood glucose data. [1]

(ii) Identify the hormone whose deficiency causes this disease. [1]

(iii) Which diet would you recommend to the affected patient? Give a reason. [2]

OR

(iii) Name the gland that secretes insulin and the hormone which raises blood glucose secreted by its alpha cells. [2]

7. How do Organisms Reproduce?

Multiple Choice Questions (MCQs)

Q1. The number of chromosomes in parents and offsprings of a particular species undergoing sexual reproduction remains constant due to: [Board 2023 (31/4/1)] **[1]**
(a) Doubling of chromosomes after zygote formation.
(b) Halving of chromosomes after zygote formation.
(c) Doubling of chromosomes before gamete formation.
(d) Halving of chromosomes at the time of gamete formation.

Q2. A flower has stamens but no carpels. Such a flower is: [CBSE-style] **[1]**
(a) Bisexual (b) Unisexual (male)
(c) Unisexual (female) (d) Neither male nor female

Q3. Identify the type of tropic movement that is responsible for the movement of the pollen tube towards an ovule. [Board 2026 (31/2/1)] **[1]**
(a) Hydrotropism (b) Geotropism (c) Chemotropism (d) Phototropism

Q4. The male gamete of an apple plant has seventeen chromosomes. What is the number of chromosomes in the female gamete and in the cells of the adult plant respectively? [SQP 2026-27 (4th option added; OCR gave three)] **[1]**
(a) 17, 17 (b) 17, 34 (c) 34, 34 (d) 34, 17

Q5. Which of the following is NOT a feature of asexual reproduction? [CBSE-style] **[1]**
(a) It involves a single parent.
(b) Offspring are genetically identical to the parent.
(c) It involves the fusion of male and female gametes.
(d) It can produce many offspring rapidly under favourable conditions.

Assertion–Reason

Q6. **Assertion (A):** Asexual reproduction produces offspring that are genetically identical to the parent.
Reason (R): Asexual reproduction involves only one parent and does not involve the fusion of gametes. [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):** Probability of survival of an organism produced through sexual reproduction is more than that of an organism produced through asexual mode.
Reason (R): Variations provide advantages to individuals for survival. [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. In a mustard crop, field A produced plants showing only the parental trait over consecutive generations, whereas in field B most offspring showed variation. What are the probable reasons for these? [SQP 2021-22 (Term 2)] **[2]**

Q9. In a flowering plant, summarise the events that take place after fertilisation. [SQP 2018-19] **[2]**

Q10. Plasmodium and Leishmania differ in the manner in which they reproduce. Name and explain the reproductive process taking place in each of them. [Board 2024 (31/5/1)] **[2]**

Short Answer (SA)

Q11. Explain with the help of labelled diagrams the development that takes place in each of the three pieces when the body of Planaria is cut into three parts. Name this process and give an example of another organism that shows it. [SQP 2016-17] **[3]**

Q12. Explain how each of the following prevents pregnancy: (a) condom (b) Copper-T (c) oral contraceptive pills. [CBSE-style] **[3]**

Long Answer (LA)

Q13. (a) Draw the diagram of the female reproductive system and mark: (i) the part where a block is created surgically to prevent fertilisation, (ii) the part where Copper-T is inserted, (iii) the part inside which a female condom can be placed.
(b) Why do more and more people prefer to use condoms? What is the principle behind the use of condoms? [SQP 2018-19] **[5]**
[Figure: Outline of the human female reproductive system showing ovary, fallopian tube, uterus, cervix and vagina, to be drawn and labelled by the candidate.]

Case Study

Case Study: Pollination in flowers Pollination is an important process in sexual reproduction of plants. It is essential because it brings pollen to the stigma, which makes fertilisation possible. Pollinating agents can be wind, water, insects and birds. Insects are attracted to flowers by bright colours, scent and nectar, and in doing so they carry pollen from one flower to another. Several changes take place in the flower after fertilisation has occurred, and these changes lead to the formation of seeds and fruits.

Q14. Answer the following questions based on the above. [Board 2024 (31/5/1)] **[4]**

(i) (a) Write the main difference between self-pollination and cross-pollination. [1]

(ii) (b) Name the part of the flower which attracts insects for pollination. What happens to this part after fertilisation? [1]

(iii) (c) (i) Define fertilisation. What is the fate of the ovules and the ovary after fertilisation? [2]

OR

(iii) (c) (ii) In a germinating seed, which parts are known as the future shoot and future root? Mention the function of the cotyledon. [2]

8. Heredity

Multiple Choice Questions (MCQs)

Q1. The genotype of a green-stemmed tomato plant is GG and that of a purple-stemmed tomato plant is gg. A hybrid obtained from a cross between these two plants is self-pollinated to obtain the F_2 progeny. What will be the ratio of GG, Gg and gg in this F_2 progeny? [Board 2026 (31/2/1)] **[1]**

(a) 2 : 1 : 1 (b) 3 : 1 : 0 (c) 1 : 1 : 2 (d) 1 : 2 : 1

Q2. In a monohybrid cross between a pure tall and a pure short pea plant, the F_1 plants are self-pollinated. The phenotypic ratio of tall : short in the F_2 generation is: [CBSE-style] **[1]**

(a) 1 : 1 (b) 3 : 1 (c) 1 : 2 : 1 (d) 9 : 3 : 3 : 1

Q3. In human beings, the sex of a child is determined by: [CBSE-style] **[1]**

(a) the X chromosome inherited from the mother
(b) the chromosome (X or Y) inherited from the father
(c) the number of autosomes
(d) the environment of the uterus

Q4. In a cross between two heterozygous tall plants (Tt $\times$ Tt), the probability of getting a tall offspring is: [CBSE-style] **[1]**

(a) 1/4 (b) 1/2 (c) 3/4 (d) 1

Q5. A gene is best defined as: [Adapted from SQP 2016-17] **[1]**

(a) a functional segment of DNA that carries information for a particular trait
(b) a protein molecule that is present only in the nucleus
(c) a chromosome that determines the sex of an individual
(d) the outer covering of a chromosome

Assertion–Reason

Q6. **Assertion (A):** Sex of the children will be determined by what they inherit from their mother.
Reason (R): Women have XX sex chromosomes. [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.

Q7. **Assertion (A):** A recessive trait always appears in the F_1 generation.
Reason (R): A recessive allele is not expressed in the presence of a dominant allele. [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. Mendel crossed a pure tall pea plant (TT) with a pure short pea plant (tt) and obtained all tall plants in the F_1 generation.
(a) What is the gene combination present in the plants of the F_1 generation?
(b) Give reason why only tall plants are observed in the F_1 progeny. [Board 2023 (31/2/1)] **[2]**

Q9. State Mendel's law of independent assortment and explain it with an example from a dihybrid cross. [CBSE-style] **[2]**

Q10. The gene for red hair is recessive to the gene for black hair. A child inherits the gene for red hair from the mother and the gene for black hair from the father. Show the genotypes of the parents and the child, and the hair colour of the child, using a flow chart. [Adapted from SQP 2016-17] **[2]**

Short Answer (SA)

Q11. Mendel crossed pure tall pea plants (TT) with pure short pea plants (tt) and obtained F_1 progeny. When the F_1 plants were self-pollinated, F_2 progeny were obtained.
(a) What did the F_1 progeny look like? Give their gene combination.
(b) Why could the gene for shortness not be expressed in the F_1 progeny?
(c) Write the ratio of the plants obtained in the F_2 progeny and state the conclusion that can be drawn from this experiment. [Board 2024 (31/5/1)] **[3]**

Q12. How do Mendel's experiments show that traits may be dominant or recessive? [SQP 2017-18] **[3]**

Long Answer (LA)

Q13. Explain a monohybrid cross between a pure tall plant (TT) and a pure short plant (tt), showing the F_1 and F_2 generations with a Punnett square. State the law of segregation that explains the results. [CBSE-style] **[5]**

Case Study

Case Study: Sex determination in human beings In some families, either rural or urban, females are tortured for giving birth to a female child. They do not seem to understand the scientific reason behind the birth of a boy or a girl. In fact the mother is not responsible for the sex of the child, and it has been genetically proved that the sex of a newborn is determined by what the child inherits from the father. Scientists have shown that the father's sex chromosomes decide the sex of the child, and that this is a chance event for every pregnancy.

Q14. Answer the following questions based on the above. [Board 2023 (31/5/1)] **[4]**

(i) (a) State the basis on which the sex of a newborn baby is determined in humans. [1]

(ii) (b) Why is the pair of sex chromosomes called a mismatched pair in males? [1]

(iii) (c) Give two examples of organisms in which the sex is not genetically determined. [2]

OR

(iii) A couple has four daughters. What is the probability that their fifth child will be a boy? Justify your answer. [2]

9. Light – Reflection and Refraction

Multiple Choice Questions (MCQs)

Q1. Which mirror is used by a dentist to examine a small cavity in a patient's tooth? [SQP 2021-22 Term 1 Q17] **[1]**

(a) Convex mirror (b) Plane mirror
(c) Concave mirror (d) Any spherical mirror

Q2. An object is placed in front of a convex mirror. Its image is formed: [SQP 2023-24 Q13] **[1]**
(a) at a distance equal to the object distance in front of the mirror
(b) at twice the distance of the object in front of the mirror
(c) half the distance of the object in front of the mirror
(d) behind the mirror and its position varies according to the object distance

Q3. From the following options, choose the one which gives negative magnification greater than one: [Board 2026 (31/2/1) Q30] **[1]**
(a) Concave mirror; nature of image real
(b) Concave mirror; nature of image virtual
(c) Convex mirror; nature of image real
(d) Convex mirror; nature of image virtual

Q4. Name the part of a lens through which a ray of light passes without suffering any deviation. [SQP 2020-21 Q6] **[1]**
(a) Principal focus (b) Pole
(c) Optical centre (d) Centre of curvature

Q5. The refractive index of flint glass is 1.65 and that of alcohol is 1.36, both with respect to air. The refractive index of flint glass with respect to alcohol is: [SQP 2021-22 Term 1 Q46] **[1]**
(a) 1.21 (b) 0.82 (c) 1.50 (d) 2.24

Assertion–Reason

Q6. **Assertion (A):** A convex mirror always forms an image behind it and the image formed is virtual.
Reason (R): According to the sign convention, the focal length of a convex mirror is positive. [SQP 2024-25 Q19] **[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 convex mirror is used as a rear-view mirror in vehicles.
Reason (R): A convex mirror always forms a virtual, erect and diminished image, which gives a wider field of view. [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 concave mirror has a focus 10 cm from its pole. A 2 cm candle flame is placed 20 cm in front of the mirror on its principal axis. Find where a screen should be placed to get a sharp image, and the size of the image. [SQP 2016-17 Q4] **[2]**

Q9. How is a virtual image formed by a convex lens different from a virtual image formed by a concave lens? Under what conditions does each form a virtual image? [Board 2023 (31/5/1) Q30(c)] **[2]**

Q10. Consider a ray of light passing through a rectangular glass slab for different angles of incidence. (a) When light goes from air into glass, which is greater: angle of incidence or angle of refraction? (b) State the conditions when no bending of light occurs at a refracting surface. [SQP 2018-19 Q27] **[2]**

Q11. The refractive indices of media A, B and C are 1.6, 1.8 and 1.5 respectively. (a) A ray goes from A into B. Does it bend towards or away from the normal? (b) When a ray goes from B into C, in which medium is the speed of light larger? [CBSE-style] **[2]**

Short Answer (SA)

Q12. A student has to project a three times magnified image of a candle flame on a wall. Name the type of lens required. If the candle flame is 6 m from the wall, find the focal length of the lens. [SQP 2016-17 Q16] **[3]**

Q13. Rohit wants an erect image of an object using a converging (concave) mirror of focal length 40 cm. (a) Specify the range of distance where the object can be placed in front of the mirror. Justify. (b) Draw a ray diagram for image formation in this case. (c) State one use of the mirror based on this image formation. [SQP 2022-23 Q30] **[3]**

Long Answer (LA)

Q14. (i) A lens produces a magnification of -0.5. Is it a converging or diverging lens? If its focal length is 6 cm, draw a ray diagram showing the image formation. (ii) A thin laser beam directed through a convex lens along a particular direction continues along the same direction after passing through it. State the reason and draw a ray diagram. [SQP 2019-20 Q30] **[5]**

Case Study

Case Study: DSLR camera lens A digital single-lens reflex (DSLR) camera uses a convex lens to form a real, inverted image of an object on its sensor. A photographer uses a lens of focal length 50 mm for a close-up photograph, so the image is formed 60 mm behind the lens. Later the photographer photographs a flower placed 150 mm from the lens; the flower is 80 mm tall and its image on the sensor is 20 mm tall.

Q15. Answer the following questions based on the above. [SQP 2025-26 Q38 (DSLR part; adapted)] **[4]**

(i) What type of lens is used in the DSLR camera? [1]

(ii) Calculate the object distance for the close-up photograph, given that the image is formed 60 mm behind a lens of focal length 50 mm. [1]

(iii) Calculate the focal length of the lens used for the flower photograph. [2]

OR

(iii) A lens used in a flashlight forms an image 10 cm away on the same side as an object placed 20 cm in front of it. Calculate the focal length of the lens and state its type. [2]

10. The Human Eye and the Colourful World

Multiple Choice Questions (MCQs)

Q1. Choose the correct option which explains the reason for us to perceive the day sky as blue. [SQP 2025-26] **[1]**
(a) As sunlight passes through the atmosphere, shorter wavelengths, such as blue, are scattered more than other colours
(b) The sky appears blue because all colours are scattered equally, but blue light is stronger and more visible to the human eye
(c) The blue colour of the sky is due to longer wavelengths like red and orange scattering more than shorter wavelengths
(d) The atmosphere contains blue-coloured particles that give the sky its blue appearance

Q2. A person cannot see objects beyond 2 m distinctly but can read a book held at 25 cm comfortably. The defect of vision and the corrective lens respectively are [CBSE-style] **[1]**

(a) Myopia and concave lens (b) Hypermetropia and convex lens
(c) Presbyopia and bifocal lens (d) Myopia and convex lens

Q3. When we enter a dark room coming from outside bright sunlight, immediately the things inside the room do not appear clear to our eyes. This is because [SQP 2019-20] **[1]**

(a) pupils do not open at all in the dark
(b) pupils take time to adjust
(c) light travels slower in a dark room
(d) pupils open very quickly in the dark

Q4. A narrow beam of white light passes through a triangular glass prism with its refracting edge at the top, so that the spectrum formed on a screen is arranged vertically (from top to bottom) by increasing deviation. Which colour appears third from the top of the spectrum, and what does this tell us about its deviation? [Adapted from SQP 2021-22 Term 1] **[1]**
(a) Red; it is deviated the least
(b) Yellow; it is deviated more than orange but less than green
(c) Green; its deviation is less than that of blue but more than that of yellow
(d) Violet; it is deviated the most

Q5. A ray diagram shows refraction of white light through a glass prism: of the two emergent rays, ray 1 is bent much more than ray 2 with respect to the incident direction. The correct option for the colours of rays 1 and 2 is [Board 2026 (31/3/1)] **[1]**
(a) Ray 1: Blue; Ray 2: Red
(b) Ray 1: Green; Ray 2: Yellow
(c) Ray 1: Red; Ray 2: Violet
(d) Ray 1: Violet; Ray 2: Red

Assertion–Reason

Q6. **Assertion (A):** A person suffering from myopia cannot see the distant objects clearly.
Reason (R): A converging lens is used for the correction of a myopic eye as it can form real as well as virtual images of the objects placed in front of it. [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):** The path of a beam of light becomes visible when it passes through a colloidal solution of fine particles in water.
Reason (R): Fine colloidal particles scatter the light in all directions, and this scattered light reaches our eyes. [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) When and where does a rainbow appear in the sky? (b) Draw a labelled ray diagram to show the formation of a rainbow. [Board 2023 (31/2/1)] **[2]**
[Figure: raindrops dispersing sunlight; a ray enters a drop, refracts and disperses, reflects internally once at the back of the drop, and refracts again on emerging, reaching the observer's eye; red emerges at about 42 degrees and violet at about 40 degrees to the incident direction.]

Q9. The power of a corrective lens is -2.5 D. Name the lens, determine its focal length in cm, and state for which eye defect an optician would prescribe this lens. [Board 2025 (31/1/1)] **[2]**

Q10. In a diagram, white light passes through a prism and splits into its component colours; two of the emergent rays are marked, one deviated less (call it P) and one deviated more (call it Q). Name the phenomenon and identify which of the two lights P and Q has the higher wavelength. [SQP 2022-23] **[2]**
[Figure: a prism dispersing white light; the less-deviated emergent ray is marked P and the more-deviated emergent ray is marked Q.]

Q11. Sunlight reaching the Earth is white, yet the Sun looks reddish when it is low in the sky and white when it is

high in the sky. Explain whether this difference is caused by refraction or by scattering, and which colour is removed most effectively when the Sun looks red. [CBSE-style] **[2]**

Short Answer (SA)

Q12. (a) What is the fundamental difference between hypermetropia and myopia in terms of the optical experience of a person? (b) A diagram shows a special case of an eye defect in which the rays from a nearby point meet behind the retina. (i) Name the defect. (ii) State one cause. (iii) Explain with reason whether a concave lens can be used to correct this defect. [SQP 2024-25] **[3]**

[Figure: schematic eye; rays from a nearby object converge behind the retina (image behind retina), indicating hypermetropia.]

Q13. A diagram shows an eye defect in which the rays coming from a distant object are converged by the eye lens before they reach the retina. (a) Name the eye defect and state where the image is formed with respect to the retina. (b) List two causes of this defect. (c) With the help of a diagram, show how this defect of vision is corrected. [Board 2026 (31/3/1)] **[3]**

[Figure: schematic myopic eye; parallel rays from a distant object converge in front of the retina; correction: a concave lens before the eye diverges the rays so that the eye focuses them on the retina.]

Long Answer (LA)

Q14. (a) What is meant by the term 'power of accommodation'? Name the component of the eye that is responsible for the power of accommodation. (b) A student sitting at the back bench in a class has difficulty in reading the blackboard. What could be his defect of vision? State two possible causes of this defect. Explain the method of correcting this defect with the help of a ray diagram, and describe how the image forms on his retina when he is seated at (i) the back seat and (ii) the front seat. [SQP 2018-19] **[5]**

[Figure: two ray diagrams of a myopic eye: (i) parallel rays from the board converge in front of the retina; (ii) correction with a concave lens before the eye diverging the rays so they focus on the retina.]

Case Study

Case Study: Spectrum on the screen A student allowed a narrow beam of white light from the Sun to enter a dark room through a small aperture and placed a glass prism in its path so that the beam fell on the face AB of the prism. A screen S was placed on the other side of the prism, facing face AC. On turning the prism slowly, a beautiful band of colours was obtained on the screen: it is the spectrum of sunlight. The student notices that the red end of the band is near the top of the screen and the violet end near the bottom, and that the violet rays are bent noticeably more than the red rays.

[Figure: narrow beam of white light incident on face AB of a glass prism; a screen S placed on the other side facing face AC shows a vertical band of seven colours.]

Q15. Answer the following questions based on the above. [Adapted from Board 2025 (31/2/1)] **[4]**

(i) Name the phenomenon due to which the prism splits the incident white light into a band of colours. [1]

(ii) State the reason for getting a band of seven colours in the above case. [1]

(iii) Explain, with the help of a labelled ray diagram, an experimental arrangement to show the recombination of the spectrum of white light. [2]

OR

(iii) Draw a labelled ray diagram to show the formation of a rainbow. [2]

11. Electricity

Multiple Choice Questions (MCQs)

Q1. The correct way to connect an ammeter and a voltmeter in an electric circuit is: [Board 2026 (31/3/1); Board 2023 (31/2/1)] **[1]**

(a) Ammeter in parallel and voltmeter in series
(b) Ammeter and voltmeter both in parallel
(c) Ammeter in series and voltmeter in parallel
(d) Ammeter and voltmeter both in series

Q2. Two LED bulbs of 12 W and 6 W are connected in series. If the current through the 12 W bulb is 0.06 A, the current through the 6 W bulb will be: [Board 2023 (31/4/1)] **[1]**

(a) 0.04 A (b) 0.06 A (c) 0.08 A (d) 0.12 A

Q3. A plastic-insulated wire has diameter d and length l. A decrease in the resistance of the wire would be produced by an increase in the: [SQP 2022-23 (Q15)] **[1]**

(a) length l of the wire (b) diameter d of the wire
(c) temperature of the wire (d) thickness of the plastic insulation

Q4. Three resistors of $2\,\Omega$, $3\,\Omega$ and $5\,\Omega$ are connected in series. Their equivalent resistance is: [CBSE-style] **[1]**

(a) $10\,\Omega$ (b) $3.33\,\Omega$ (c) $30\,\Omega$ (d) $0.1\,\Omega$

Q5. Which expression is NOT a form of electric power? [CBSE-style] **[1]**

(a) VI (b) I^2R (c) V^2/R (d) V/I

Assertion–Reason

Q6. **Assertion (A):** The heat produced in a conductor is directly proportional to the square of the current through it.
Reason (R): According to Joule's law, $H = I^2Rt$ for a conductor of resistance R. [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):** A 100 W bulb glows more brightly than a 60 W bulb when both are connected in parallel across a 220 V supply.
Reason (R): At a given voltage the bulb of higher power has lower resistance and dissipates more power. [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) A wire of resistance R is cut into three equal parts. If these three parts are joined in parallel, calculate the total resistance of the combination so formed. [Board 2025 (31/1/1) Q25; SQP 2023-24 (Q25)] **[2]**

Q9. Name and define the physical quantity determined by the slope of the V–I graph of an ohmic conductor. State its SI unit. [Board 2023 (31/5/1) Q36(b)] **[2]**

Q10. A copper wire has a length of 2 m, cross-sectional area $0.5\,\text{mm}^2$ and resistivity $1.7 \times 10^{-8}\,\Omega\,\text{m}$. Calculate the resistance of another wire of the same material and area whose length is twice that of this wire. [Adapted from SQP 2025-26 (Q36, VI alternative)] **[2]**

Short Answer (SA)

Q11. Two lamps, one rated 100 W at 220 V and the other 200 W at 220 V, are connected (i) in series and (ii) in parallel to the 220 V mains. Find the current drawn in each case. [SQP 2018-19 (Q12)] **[3]**

Q12. (i) State the law that explains the heating effect of current, with its mathematical expression.

(ii) List the factors on which the resistance of a conductor depends. [SQP 2023-24 (Q32)] **[3]**

Long Answer (LA)

Q13. A conductor has resistance R, length L, thickness d and resistivity ρ. (i) The conductor is cut into four equal parts. What will be the new resistivity of each part? Why?
(ii) Find the resistance of the four parts when connected (a) in parallel and (b) in series.
(iii) For a given voltage, which combination consumes more power, and why? [SQP 2019-20 (Q29)] **[5]**

Case Study

Case Study: Heating near a refrigerator Swati, a Class 10 student, observes that when she passes close to the refrigerator in her kitchen, she feels the heat, although the things kept inside the refrigerator are cool.

Q14. Answer the following questions based on the above. [Adapted from Board 2026 (31/2/1) Q38] **[4]**

(i) (a) Describe the cause of heating in the above-mentioned case. [1]

(ii) (b) A current I flows through a resistor of resistance R when the potential difference across it is V. Applying Ohm's law, write the formula for the heat produced by the resistor in time t. [1]

(iii) (c) (i) Write any two practical applications of the heating effect of electric current. [2]

OR

(iii) (c) (ii) Define the commercial unit of electric energy and express it in joules (J). [2]

12. Magnetic Effects of Electric Current

Multiple Choice Questions (MCQs)

Q1. Which of the following correctly describes the magnetic field pattern around a long straight wire carrying current? [SQP 2022-23; Adapted from SQP 2020-21] **[1]**
(a) Straight lines perpendicular to the wire
(b) Straight lines parallel to the wire
(c) Radial lines originating from the wire
(d) Concentric circles centred around the wire

Q2. An electric kettle consumes 1 kW of electric power when operated at 220 V. The minimum rating of the fuse wire to be used with it is: [Board 2023 (31/5/1)] **[1]**
(a) 1 A (b) 2 A (c) 4 A (d) 5 A

Q3. A positively charged particle moves due east in a uniform magnetic field directed due north. The force on the particle is: [CBSE-style] **[1]**
(a) Vertically upwards (b) Vertically downwards
(c) Due north (d) Due south

Q4. Long-distance transmission of electric power uses alternating current mainly because: [CBSE-style] **[1]**
(a) AC has a higher average current than DC
(b) AC can be stepped up to a high voltage by a transformer, which reduces the current and heat loss in the lines
(c) DC cannot flow through long wires
(d) AC does not heat the transmission wires

Q5. Overloading of a household circuit can happen when: [CBSE-style] **[1]**
(a) Too many high-power appliances are switched on together on a single socket
(b) A fuse of correct rating is used in the circuit
(c) The earth wire is connected to the metallic body of an appliance
(d) A single low-power bulb is switched on

Assertion–Reason

Q6. **Assertion (A):** No two magnetic field lines are found to cross each other.
Reason (R): The compass needle cannot point towards two directions at the point of intersection of two magnetic field lines. [Board 2023 (31/2/1); Board 2023 (31/5/1); Board 2025 (31/1/1)] **[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):** 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] **[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. Two fuse wires, A and B, have current ratings of 2 A and 5 A respectively. Which one would you use with a 1000 W, 220 V room heater? Justify your choice. [Adapted from SQP 2024-25] **[2]**

Q9. Why is the metallic body of an electric iron connected to the earth wire? State the advantage. [CBSE-style] **[2]**

Q10. Name the two factors on which the magnetic field of a solenoid depends and state how each affects it. [CBSE-style] **[2]**

Short Answer (SA)

Q11. (a) Explain the meaning of overloading of an electrical circuit. (b) List two possible causes of overloading in household circuits. (c) Write one preventive measure to avoid overloading of domestic circuits. [Board 2023 (31/2/1)] **[3]**

Q12. (a) Draw the magnetic field pattern of a current-carrying solenoid and mark its north and south poles. (b) How can the north pole of the solenoid be found using the right-hand thumb rule? [CBSE-style] **[3]**

Long Answer (LA)

Q13. (A)(i) Explain why in household circuits only the fuse is connected in series with all the other appliances, while all the appliances are connected in parallel with each other. (ii) An electric heater of power 1500 W and a fan of power 500 W are connected in parallel to a 220 V supply. A fuse rated for 10 A protects the circuit. (a) Calculate the total current drawn by the heater and the fan. (b) Determine whether the 10 A fuse is appropriate for this circuit or whether it will blow. [Adapted from SQP 2025-26] **[5]**

Case Study

Case Study: Automatic door-locking system A school has installed an automatic electromagnetic door-locking system at the main entrance. The locking mechanism uses a solenoid controlled by a switch at the security desk. When current flows through the solenoid, it creates a magnetic field strong enough to pull an iron bolt, unlocking the door. When the switch is turned off, the magnetic field disappears and a spring pushes the bolt back, locking the door.

Q14. Answer the following questions based on the above. [SQP 2026-27] **[4]**

(i) Why is an iron core kept inside the solenoid in this locking mechanism? [1]

(ii) How can the magnetic poles of this solenoid be determined? [1]

(iii) If the current in the solenoid is increased from 1 A to 2 A, explain how the magnetic effect changes and its effect on unlocking the door. [2]

OR

(iii) If the source of current is fixed, how can the magnetic field in the solenoid be increased? [2]

13. Our Environment

Multiple Choice Questions (MCQs)

Q1. In 1987, an agreement was formulated by the United Nations Environment Programme (UNEP) to freeze the production of "X" to prevent depletion of "Y". "X" and "Y" respectively referred to here are: [SQP 2023-24] **[1]**

(a) Ozone; CFCs (b) CFCs; UV rays
(c) CFCs; Ozone (d) UV rays; Diatomic oxygen

Q2. Which of the following limits the number of trophic levels in a food chain? [Board 2026 (31/2/1)] **[1]**

(a) Availability of water (b) Deficient food supply
(c) Decrease in energy at higher levels (d) Pollution in air

Q3. A network of interconnected food chains in an ecosystem is called a: [CBSE-style] **[1]**

(a) Biosphere (b) Biome (c) Food web (d) Habitat

Q4. The percentage of solar energy which is not converted into food energy by the leaves of green plants in a terrestrial ecosystem is about: [Board 2025 (31/1/1)] **[1]**

(a) 1% (b) 10% (c) 90% (d) 99%

Q5. Which of the following organisms acts as a decomposer in a pond ecosystem? [CBSE-style] **[1]**

(a) Frog (b) Algae (c) Water lily (d) Bacteria

Assertion–Reason

Q6. **Assertion (A):** If the lions are removed from a food chain it will not affect the food chain, however if the plants are removed from a food chain it will disturb the ecosystem.
Reason (R): Plants are producers who can make food using sunlight, while lions are consumers. [SQP 2024-25] **[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):** Greater number of individuals are present in lower trophic levels.
Reason (R): The flow of energy is unidirectional. [SQP 2020-21 (Q15 alternative)] **[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. DDT was sprayed in a lake to regulate breeding of mosquitoes. How would it affect the trophic levels in the following food chain associated with a lake? Justify your answer. Plankton $\rightarrow$ Small fish $\rightarrow$ Large fish $\rightarrow$ Hawk. [SQP 2021-22 Term2] **[2]**

Q9. (i) Chlorofluorocarbons (CFCs) have been linked to depletion of the ozone layer. In 1987, the United Nations Environment Programme (UNEP) succeeded in making an agreement. State this agreement.

(ii) What is the role of ozone in our atmosphere? [Board 2026 (31/3/1)] **[2]**

Q10. Excessive use of chemicals and pesticides in agriculture adversely affects the environment. Justify this statement. [Board 2025 (31/1/1)] **[2]**

Short Answer (SA)

Q11. How is ozone both beneficial and damaging? How can depletion of the ozone layer be prevented? [SQP 2018-19] **[3]**

Q12. Explain how some harmful chemicals enter our bodies through the food chain. Why is the concentration of these harmful chemicals found to be maximum in human beings? [Board 2023 (31/2/1)] **[3]**

Long Answer (LA)

Q13. (a) Name one biotic and one abiotic component of a pond ecosystem, and explain how the pond is a self-sustaining system.
(b) Describe the role of producers, consumers and decomposers in the pond ecosystem. [CBSE-style] **[5]**

Case Study

Case Study: Pond food chain In a pond, algae are eaten by insect larvae. The larvae are eaten by small fish, and small fish are eaten by large fish. A student estimated that the algae store 10000 J of energy. Assume that only 10% of the energy is transferred to the next trophic level at each step.

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

(i) Identify the producer in this food chain. [1]

(ii) Name the trophic level of the large fish. [1]

(iii) Calculate the energy available to the large fish, and explain why it is so small compared with the algae. [2]

OR

(iii) Why are food chains rarely longer than four or five trophic levels? Justify. [2]

Answer Key (MCQs and Assertion–Reason)

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

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

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

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

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

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

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

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

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

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

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

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

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