ANSWER KEY & MARKING SCHEME · CBSE CLASS 10

Metals and Non-metals

Science · Chapter 3 · Use this with the Board Paper · Companion to Quick Drill

HOW TO USE

Attempt the Board Paper first (closed-book, full time). Then come here. For 2-mark+ questions, compare your answer to the model. For 3-4 mark questions, also consult the **Topper Templates** below — these show the exact step-by-step structure that scores full marks per CBSE marking-scheme conventions.

MODEL ANSWERS · BOARD PAPER

Section A — Objective (5 × 1 = 5)

Q1. Name the only metal that is in liquid state at room temperature. [1 mark]

Ans: Mercury (Hg).

Q2. Write the chemical formula of rust. [1 mark]

Ans: Hydrated iron(III) oxide — $Fe_2O_3 \cdot xH_2O$.

Q3. Name one non-metal that is a good conductor of electricity. [1 mark]

Ans: Graphite (an allotrope of carbon).

Q4. Which metal is stored under kerosene oil and why? [1 mark]

Ans: Sodium (Na) — to prevent contact with moist air, with which it reacts violently.

Q5. Give the composition of brass. [1 mark]

Ans: Brass = Copper (70%) + Zinc (30%).

Section B — Short answer (5 × 2 = 10)

Q6. Write the balanced chemical equation for the reaction of iron with copper sulphate solution. State your observation. [2 marks]

Ans: $Fe(s) + CuSO_4(aq) \rightarrow FeSO_4(aq) + Cu(s)$. The blue colour of the $CuSO_4$ solution fades to pale green ($FeSO_4$) and a reddish-brown deposit of copper appears on the iron nail.

Q7. Distinguish between ROASTING and CALCINATION, giving one example each. [2 marks]

Ans: Roasting — heating a SULPHIDE ore in PRESENCE of excess air to give the oxide: $2ZnS + 3O_2 \rightarrow 2ZnO + 2SO_2$. Calcination — heating a CARBONATE ore in ABSENCE of air to give the oxide: $ZnCO_3 \rightarrow ZnO + CO_2$.

Q8. State the two conditions necessary for the rusting of iron. Name any one method to prevent it. [2 marks]

Ans: Conditions: (i) presence of OXYGEN (air), (ii) presence of MOISTURE (water). Both are required simultaneously. Prevention: GALVANISATION — coating iron with a layer of zinc which corrodes preferentially and protects the iron.

Q9. Why do ionic compounds have HIGH melting and boiling points? [2 marks]

Ans: Ionic compounds consist of oppositely charged ions held together by strong electrostatic forces of attraction in a giant lattice. A large amount of energy is required to overcome these forces and separate the ions, hence high melting and boiling points.

Q10. Write balanced chemical equations to show that Al_2O_3 is amphoteric. [2 marks]

Ans: Al_2O_3 reacts as a BASE with acid: $Al_2O_3 + 6HCl \rightarrow 2AlCl_3 + 3H_2O$. Al_2O_3 reacts as an ACID with alkali: $Al_2O_3 + 2NaOH \rightarrow 2NaAlO_2 + H_2O$. Hence Al_2O_3 is AMPHOTERIC.

Section C — Long answer (3 × 5 = 15)

Q11. **(a) State the reactivity series of metals (any 8 metals in correct order). (b) Using the series, explain why (i) sodium is stored under kerosene, (ii) copper does not react with dilute HCl, (iii) iron displaces copper from copper sulphate. Support (iii) with a balanced equation.** **[5 marks]**

> **Ans:** (a) K > Na > Ca > Mg > Al > Zn > Fe > (H) > Cu > Hg > Ag > Au — decreasing reactivity. (b)(i) Na is so reactive that it catches fire with moisture in air; kerosene keeps moisture and oxygen away. (ii) Cu lies BELOW H in the series; it cannot displace H^+ from HCl, so no reaction. (iii) Fe is ABOVE Cu, so it displaces Cu^{2+} from solution: $Fe(s) + CuSO_4(aq) \rightarrow FeSO_4(aq) + Cu(s)$. The blue colour fades; brown Cu deposits on the nail.

Q12. **(a) Define an ore. (b) Describe the extraction of zinc from zinc blende (ZnS) in three steps with balanced equations: concentration → conversion to oxide → reduction. (c) Name the method used to refine the impure zinc obtained.** **[5 marks]**

> **Ans:** (a) An ORE is a mineral from which a metal can be EXTRACTED profitably. (b) Step 1 — Concentration of ZnS by froth flotation. Step 2 — Roasting: $2ZnS(s) + 3O_2(g) \rightarrow 2ZnO(s) + 2SO_2(g)$. Step 3 — Reduction by carbon: $ZnO(s) + C(s) \rightarrow Zn(l) + CO(g)$. (c) Refining is done by ELECTROLYTIC REFINING — impure Zn anode, pure Zn cathode, $ZnSO_4$ electrolyte; pure Zn deposits on the cathode and impurities collect as anode mud.

Q13. **(a) What is CORROSION? Name the type of corrosion of iron and write its chemical equation. (b) Describe three methods of preventing corrosion of iron, with the chemistry behind each.** **[5 marks]**

> **Ans:** (a) Corrosion is the slow chemical attack on a metal surface by atmospheric agents (O_2, moisture, acid gases). In iron it is called RUSTING: $4Fe + 3O_2 + xH_2O \rightarrow 2Fe_2O_3{\cdot}xH_2O$ (hydrated iron(III) oxide, the flaky red-brown rust). (b) Three methods: (i) GALVANISATION — iron is coated with zinc; Zn is more reactive and corrodes first (sacrificial protection). (ii) PAINTING / OILING — a physical barrier prevents air and moisture from reaching the iron surface. (iii) ALLOYING — iron is converted to STAINLESS STEEL (Fe + Cr + Ni + C); the Cr/Ni form a passive oxide layer making the alloy virtually rust-proof.

★ TOPPER ANSWER TEMPLATES

5 TEMPLATES · MEMORISE THE FORMAT

MARKING SCHEME — GENERAL NOTES

- Each balanced equation carries 1 mark. Award 0.5 if states (s)/(l)/(g)/(aq) are missing.
- For reactivity series, full mark is given only if at least 8 metals are listed in the CORRECT order. Award proportional credit for partial sequences.
- Distinguishing roasting vs calcination requires BOTH the type of ore AND the air condition — half mark for each. No example = 0.5 deduction.
- Rust formula MUST include $\cdot xH_2O$ (hydrated form). Writing Fe_2O_3 alone loses 0.5 mark.
- For extraction questions, all THREE step-equations are mandatory. Skipping the refining step in a 5-mark question loses 1 mark.