ANSWER KEY & MARKING SCHEME · CBSE CLASS 10

Chemical Reactions and Equations

Science · Chapter 1 · 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 — Very Short Answer (1 mark each, 4 Qs)

Q1. Write the chemical formula of rust. ***[1 mark]***

Ans: $Fe_2O_3 \cdot xH_2O$ (hydrated iron(III) oxide). The 'xH_2O' is essential.

Q2. What does the symbol Δ written over an arrow in a chemical equation indicate? ***[1 mark]***

Ans: Heat is supplied / required for the reaction (thermal decomposition condition).

Q3. Name one substance which on decomposition gives oxygen gas. ***[1 mark]***

Ans: Water (electrolysis: $2\ H_2O \rightarrow 2\ H_2 + O_2$) OR hydrogen peroxide ($2\ H_2O_2 \rightarrow 2\ H_2O + O_2$).

Q4. Why is photosynthesis considered an endothermic reaction? ***[1 mark]***

Ans: Energy is absorbed from sunlight to drive the reaction ($CO_2 + H_2O \rightarrow$ glucose $+ O_2$). Without continuous energy input, the reaction stops.

Section B — Short Answer I (2 marks each, 3 Qs)

Q5. What is rancidity? Mention any two ways to prevent it. ***[2 marks]***

Ans: Rancidity is the oxidation of fats and oils in food in the presence of atmospheric oxygen, producing an unpleasant smell and taste. Two ways to prevent it: (i) packing food in airtight containers OR refrigerating; (ii) adding antioxidants (BHA, BHT) OR flushing the pack with an inert gas like nitrogen.

Q6. Distinguish between a displacement and a double-displacement reaction with one example each. ***[2 marks]***

Ans: Displacement: a more reactive element displaces a less reactive one from its compound — e.g. $Fe + CuSO_4 \rightarrow FeSO_4 + Cu$. Double displacement: two compounds exchange ions — e.g. $Na_2SO_4 + BaCl_2 \rightarrow BaSO_4\downarrow + 2\ NaCl$.

Q7. Why are decomposition reactions sometimes called the opposite of combination reactions? Give one example of each. ***[2 marks]***

Ans: Combination joins reactants into one product ($CaO + H_2O \rightarrow Ca(OH)_2$). Decomposition breaks a single compound into multiple products ($CaCO_3 \rightarrow CaO + CO_2$). Structurally they are inverse processes; energetically, combination usually releases energy while decomposition usually absorbs it.

Section C — Short Answer II (3 marks each, 3 Qs)

Q8. Balance the equation: $Fe + H_2O \rightarrow Fe_3O_4 + H_2$. Also state the type of reaction. ***[3 marks]***

Ans: Balanced: $3\ Fe(s) + 4\ H_2O(g) \rightarrow Fe_3O_4(s) + 4\ H_2(g)$. Check: Fe = 3 = 3, H = 8 = 8, O = 4 = 4 ✓. Type: displacement (Fe is more reactive than H, so it displaces hydrogen from water; the reaction is also a redox).

Q9. In the reaction $CuO + H_2 \rightarrow Cu + H_2O$, identify (a) the substance oxidised, (b) the substance reduced, (c) the oxidising agent, and (d) the reducing agent. ***[3 marks]***

Ans: (a) H_2 is oxidised (gains O → H_2O). (b) CuO is reduced (loses O → Cu). (c) Oxidising agent = CuO (it oxidises H_2 by donating its O). (d) Reducing agent = H_2 (it reduces CuO by taking its O).

Q10. What is corrosion of iron called? Write the balanced chemical equation and state any two methods of prevention. ***[3 marks]***

Ans: Corrosion of iron is called rusting. Equation: $4\ Fe(s) + 3\ O_2(g) + xH_2O(l) \rightarrow 2\ Fe_2O_3 \cdot xH_2O(s)$ (rust = hydrated iron(III) oxide). Prevention (any two): (i) Painting / oiling — physical barrier blocking moisture and oxygen. (ii) Galvanisation — sacrificial zinc coating that oxidises preferentially. (iii) Alloying — stainless steel (Fe + Cr + Ni) is intrinsically corrosion-resistant.

Section D — Case Study / Long Answer (4-5 marks each, 2 Qs)

Q11. When a strip of zinc is dipped in copper(II) sulphate solution, a reaction takes place. (a) Write the balanced equation. (b) Why does the blue colour of the solution fade? (c) Identify the type of reaction. (d) What change is observed on the zinc strip? Justify using the reactivity series. ***[5 marks]***

> **Ans:** (a) $Zn(s) + CuSO_4(aq) \rightarrow ZnSO_4(aq) + Cu(s)$. (b) Cu^{2+} ions (which gave the blue colour) get reduced to copper metal and leave the solution; the remaining $ZnSO_4$ is colourless/pale green, so the blue fades. (c) Displacement reaction (also a redox). (d) A reddish-brown deposit of copper appears on the zinc strip, and the zinc gradually thins. Justification: in the reactivity series Zn sits ABOVE Cu, so Zn (more reactive) displaces Cu (less reactive) from its salt — the reverse ($Cu + ZnSO_4$) does not occur.

Q12. Read the passage and answer: Mr Sharma left a freshly-fried plate of samosas open on the kitchen table overnight. By morning, the samosas had developed a foul, bitter taste. The shop next door uses puffed nitrogen-flushed packaging for its packets of namkeen and never reports such complaints. (a) Name the process responsible for the change in taste of Mr Sharma's samosas. (b) Why does it happen? Give the chemical explanation. (c) Explain how nitrogen-flushed packaging at the shop prevents this. (d) State one other domestic method of prevention besides nitrogen-flushing. ***[6 marks]***

> **Ans:** (a) Rancidity. (b) Fats and oils in the samosas reacted with atmospheric oxygen overnight (slow oxidation), producing compounds that smell and taste unpleasant. (c) Nitrogen is an inert gas — flushing the packet with N_2 displaces O_2. With no oxygen present, the oxidation of fats cannot occur, so the fried food stays fresh. (d) Any one: (i) refrigeration — low temperature slows the oxidation rate; (ii) airtight containers — limit access of atmospheric O_2; (iii) adding antioxidants (BHA / BHT) that get oxidised preferentially.

★ TOPPER ANSWER TEMPLATES

3 TEMPLATES · MEMORISE THE FORMAT

★ TOPPER TEMPLATE — 3-mark question: 'Balance the following equation and identify the type of reaction.'

2017, 2018, 2019, 2020, 2022, 2023 — extremely common

Step 1 *[1 mark]*	**Count atoms each side**	Identify the most complex compound, count atoms of each element on left vs right. Write the count clearly: 'LHS: Fe = 1, H = 2, O = 1' etc.
Step 2 *[1 mark]*	**Adjust coefficients (never subscripts)**	Place coefficients in front of formulas to equalise atom counts. Balance most-complex compound first, then H, then O. Show the balanced equation with state symbols: $3 Fe(s) + 4 H_2O(g) \rightarrow Fe_3O_4(s) + 4 H_2(g)$.
Step 3 *[1 mark]*	**Identify reaction type with justification**	State the type and ONE-line justification: 'Type — Displacement (Fe is more reactive than H, displaces hydrogen).' Without the justification, only half the mark is awarded.

COMMON LOSS OF MARKS:

- Missing state symbols (s)(l)(g)(aq) — 0.5 mark deducted per CBSE marking scheme.
- Calling it 'combination' because there are 2 reactants — combination needs a SINGLE product.
- Forgetting to actually write the balanced equation (showing only the working without the final answer).

★ TOPPER TEMPLATE — 3-mark question: 'In the reaction [given], identify the substance being oxidised and the substance being reduced. Also name the oxidising and reducing agents.'

Annual since 2017

Step 1 *[1 mark]*	**Identify gain/loss of O or H**	Track oxygen and hydrogen movement. In $CuO + H_2 \rightarrow Cu + H_2O$: CuO LOSES oxygen → CuO is reduced. H_2 GAINS oxygen → H_2 is oxidised.
Step 2 *[1 mark]*	**Name the species being oxidised and reduced**	'H_2 is oxidised to H_2O' and 'CuO is reduced to Cu'. Be explicit — naming the PRODUCT is part of the answer.
Step 3 *[1 mark]*	**Identify the agents (the OTHER species)**	Oxidising agent — the substance that GETS REDUCED (= CuO). Reducing agent — the substance that GETS OXIDISED (= H_2). Common student error: writing the wrong direction. Tip: 'agent does the OPPOSITE of what its name suggests'.

COMMON LOSS OF MARKS:

- Reversing oxidising and reducing agents (–1 mark, very common).
- Missing the product side ('CuO is reduced' without saying 'to Cu' — 0.5 mark).
- Forgetting to mention BOTH oxidation and reduction in the same reaction (which is the definition of redox).

★ TOPPER TEMPLATE — 3-mark question on rusting / corrosion: cause + balanced equation + prevention.
2017, 2019, 2020, 2023

Step 1 *[1 mark]*	**Define corrosion + name conditions**	'Corrosion is the slow oxidation of metal surfaces when exposed to moisture and atmospheric oxygen. Iron rusts; copper develops green carbonate; silver tarnishes black.' Both moisture AND air are necessary — say it explicitly.
Step 2 *[1 mark]*	**Write the rusting equation with hydrated formula**	'4 Fe(s) + 3 O_2(g) + xH_2O(l) → 2 Fe_2O_3·xH_2O(s) (rust)'. Mention the rust formula is HYDRATED iron(III) oxide. Bare Fe_2O_3 loses half a mark.
Step 3 *[1 mark]*	**Two prevention methods + mechanism**	Any TWO of: (i) painting/oiling — physical barrier preventing air/moisture contact; (ii) galvanisation — sacrificial zinc coating that oxidises before iron; (iii) alloying — stainless steel (Fe + Cr + Ni) is intrinsically corrosion-resistant. Name + 1-line mechanism per method.

COMMON LOSS OF MARKS:

- Bare Fe_2O_3 instead of Fe_2O_3·xH_2O (–0.5 mark).
- Naming a prevention method but not its mechanism (–0.5 mark each).
- Writing 'iron + oxygen' without mentioning water as the second necessary condition.

MARKING SCHEME — GENERAL NOTES

- Balanced equation worth half the marks of any Q that requires one — partial balance gets 0 marks (it is or isn't balanced).
- State symbols (s)(l)(g)(aq) required for full marks on equation questions — half-mark deduction if missing.
- Rust formula must include the hydration: bare Fe_2O_3 loses 0.5 marks every time.
- Reaction-type identification needs the type + a one-line justification — type alone gets half marks.
- For redox: identifying species but not naming agents (or vice versa) caps at 2/3 marks on a 3-mark question.