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CLASS X · SCIENCE (086) · CHEMISTRY · CBSE BOARD EXAMINATION 2027

CHAPTER 1

Chemical Reactions and Equations

$2H_2 + O_2 \rightarrow 2H_2O$

Chapter Practice Booklet · Questions only · Answers in the separate Answer Booklet

12 note blocks + 20 key equations | 69 practice questions | 3 case studies | 2023–2026 board question index

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STUDENT DETAILS

NAME _____

CLASS & SECTION _____

ROLL NO. _____

BOOKLET STARTED ON _____

CHAPTER TEST SCORE _____ / 20

1

READ THIS FIRST

Chapter Notes

The whole chapter in short-note form: every definition, activity, diagram, formula and reason. Revise from here – you should not need the textbook again.

1 Chemical change and how we know a reaction happened

In a **chemical reaction** the substances (reactants) change into new substances (products) with new properties. A reaction is shown by one or more of these signs:

- change in **state**
- change in **colour**
- **evolution of a gas**
- change in **temperature**
- formation of a **precipitate** (insoluble solid)

THREE KEY ACTIVITIES

Magnesium ribbon burns in air with a dazzling white flame and leaves a white powder, magnesium oxide. Clean the ribbon with sandpaper first to remove the oxide layer; hold it with tongs, away from the eyes.

Lead nitrate + potassium iodide solutions give a **yellow precipitate** of lead iodide.

Zinc + dilute acid gives bubbles of hydrogen and the flask becomes warm.

2 Writing chemical equations

- **Word equation:** magnesium + oxygen → magnesium oxide.
- **Skeletal equation:** formulae, not yet balanced: $Mg + O_2 \longrightarrow MgO$.
- Reactants on the left, products on the right, joined by an arrow. Separate substances with "+".
- Conditions go above or below the arrow: heat (Δ), sunlight, electric current, catalyst, pressure.
- **State symbols:** (s) solid, (l) liquid, (g) gas, (aq) dissolved in water. A gas given off may be shown by ↑ and a precipitate by ↓.

3 Balancing equations

> **Law of conservation of mass:** mass can neither be created nor destroyed in a chemical reaction. So the number of atoms of each element must be the **same on both sides**.

Hit-and-trial method:

1. Write the skeletal equation; count the atoms of each element on both sides.
2. Start with the compound that has the most atoms; balance using coefficients (numbers in front).
3. **Never change a formula or a subscript.**
4. Balance the remaining elements; check every element once more.
5. Add state symbols and conditions.

WORKED EXAMPLE

$Fe + H_2O \longrightarrow Fe_3O_4 + H_2$

Balance O first: $Fe + 4\,H_2O \longrightarrow Fe_3O_4 + H_2$; then H: $Fe + 4\,H_2O \longrightarrow Fe_3O_4 + 4\,H_2$; then Fe:

$3\,Fe\,(s) + 4\,H_2O\,(g) \longrightarrow Fe_3O_4\,(s) + 4\,H_2\,(g)$

4 Combination reactions

> Two or more substances combine to form a **single product**: A + B → AB.

- $2\,Mg + O_2 \longrightarrow 2\,MgO$ · $C + O_2 \longrightarrow CO_2$ · $2\,H_2 + O_2 \longrightarrow 2\,H_2O$
- **Quicklime + water:** $CaO + H_2O \longrightarrow Ca(OH)_2$ + heat. Quicklime reacts vigorously, with a hissing sound, and gives out a lot of heat. The product is **slaked lime**; its solution is used for whitewashing.
- **Why walls turn shiny:** slaked lime slowly reacts with carbon dioxide in the air to form a thin shiny layer of calcium carbonate in 2–3 days: $Ca(OH)_2 + CO_2 \longrightarrow CaCO_3 + H_2O$.

5 Exothermic and endothermic reactions

Exothermic: heat is **given out**.
Endothermic: heat (or light/electrical energy) is **absorbed**.

- **Exothermic:** burning of fuels, e.g. $CH_4 + 2\,O_2 \longrightarrow CO_2 + 2\,H_2O$; quicklime + water; **respiration** $C_6H_{12}O_6 + 6\,O_2 \longrightarrow 6\,CO_2 + 6\,H_2O$ + energy; decomposition of vegetable matter into compost.
- **Endothermic:** most **decomposition reactions** (they need heat, light or electricity to break a compound); photosynthesis.
- Respiration is exothermic because glucose combines with oxygen in our cells and releases energy.

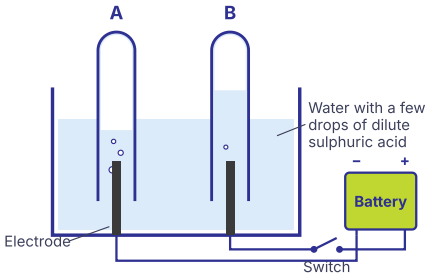
6 Decomposition reactions

A single reactant breaks down into two or more simpler products: AB → A + B. It is the opposite of combination.

Thermal (heat)	$2\,FeSO_4 \xrightarrow{heat} Fe_2O_3 + SO_2 + SO_3$ $CaCO_3 \xrightarrow{heat} CaO + CO_2$ (limestone → quicklime; used to make cement) $2\,Pb(NO_3)_2 \xrightarrow{heat} 2\,PbO + 4\,NO_2 + O_2$ (brown fumes of NO_2)
Electrolytic (electricity)	$2\,H_2O \xrightarrow{electricity} 2\,H_2 + O_2$
Photolytic (light)	$2\,AgCl \xrightarrow{sunlight} 2\,Ag + Cl_2$ white → grey $2\,AgBr \xrightarrow{sunlight} 2\,Ag + Br_2$ used in black-and-white photography

Heating ferrous sulphate: the green crystals ($FeSO_4 \cdot 7\,H_2O$) first lose their water of crystallisation and turn white; then they decompose into a reddish-brown solid (Fe_2O_3) with a smell of burning sulphur.

7 Electrolysis of water



Electrolysis of water: A – hydrogen (cathode, –), B – oxygen (anode, +)

- A few drops of dilute sulphuric acid are added because pure water conducts electricity poorly.
- **Hydrogen** collects at the **cathode** (–) and **oxygen** at the **anode** (+).
- Volume of hydrogen is **double** that of oxygen: $H_2 : O_2$ = **2 : 1 by volume** (because water has 2 H atoms for each O atom). By **mass**, $H_2 : O_2$ = **1 : 8**.
- **Tests:** hydrogen burns with a **pop** sound near a burning splinter; oxygen **relights a glowing** splinter.

8 Displacement reactions

A **more reactive** element displaces a less reactive element from its compound (solution).

- $Fe + CuSO_4 \longrightarrow FeSO_4 + Cu$: blue solution turns **pale green**; the iron nail gets a **brown** coating of copper.
- $Zn + CuSO_4 \longrightarrow ZnSO_4 + Cu$: blue solution becomes colourless. ·
  $Pb + CuCl_2 \longrightarrow PbCl_2 + Cu$
- $Zn + H_2SO_4 \longrightarrow ZnSO_4 + H_2$ (zinc displaces hydrogen from the acid).
- **Reactivity order:** K > Na > Ca > Mg > Al > Zn > Fe > Pb > [H] > Cu > Hg > Ag > Au.
- A less reactive metal cannot displace a more reactive one: Cu + $FeSO_4$ → no reaction.

9 Double displacement and precipitation

Double displacement: two compounds **exchange ions**. If one product is insoluble, it separates as a **precipitate** – a **precipitation reaction**.

- $Na_2SO_4 + BaCl_2 \longrightarrow BaSO_4\downarrow + 2\,NaCl$ – **white** precipitate
- $Pb(NO_3)_2 + 2\,KI \longrightarrow PbI_2\downarrow + 2\,KNO_3$ – **yellow** precipitate
- $AgNO_3 + NaCl \longrightarrow AgCl\downarrow + NaNO_3$ – **white** precipitate
- Neutralisation ($NaOH + HCl \longrightarrow NaCl + H_2O$) is also a double displacement reaction.

10 Oxidation and reduction (redox)

Oxidation = gain of oxygen *or* loss of hydrogen. **Reduction** = loss of oxygen *or* gain of hydrogen. When one substance is oxidised and another reduced in the same reaction, it is a **redox** reaction.

- $2\,Cu + O_2 \xrightarrow{\text{heat}} 2\,CuO$: brown copper turns **black** (copper is oxidised).
- $CuO + H_2 \xrightarrow{\text{heat}} Cu + H_2O$: black turns brown again. CuO is **reduced**, H_2 is **oxidised**.
- $ZnO + C \longrightarrow Zn + CO$: ZnO reduced, C oxidised. · $MnO_2 + 4\,HCl \longrightarrow MnCl_2 + 2\,H_2O + Cl_2$: MnO_2 reduced, HCl oxidised.
- **Oxidising agent** = the substance that gives oxygen (or removes hydrogen); it is itself **reduced**. **Reducing agent** = the substance that takes oxygen (or gives hydrogen); it is itself **oxidised**. In CuO + H_2: oxidising agent CuO, reducing agent H_2.

11 Corrosion

A metal is slowly eaten away by moisture, air, acids etc. around it.

- **Rusting of iron:** reddish-brown flaky layer (hydrated iron(III) oxide, $Fe_2O_3 \cdot x\,H_2O$).
- Silver turns **black** (silver sulphide, Ag_2S); copper gets a **green** coating (basic copper carbonate).
- **Rusting needs both air (oxygen) and water.** Three-tube activity: nails in tap water + air → rust; nails in boiled water under a layer of oil (no air) → no rust; nails in dry air with anhydrous calcium chloride (no water) → no rust.
- **Prevention:** painting, oiling or greasing, galvanising (zinc coating), chrome plating, making alloys such as stainless steel.

12 Rancidity

Fats and oils in food get **oxidised** when left for long, so the food smells and tastes bad.

- **Prevention:** add antioxidants; keep food in airtight containers; refrigerate; keep away from light; **flush packets with nitrogen** (as in chips packets) so there is no oxygen to oxidise the oil.

Equations to memorise

Learn the equation, the type and what you see

Reaction	Balanced equation	Type	What you see / use
Magnesium burns in air	$2\,Mg + O_2 \longrightarrow 2\,MgO$	Combination · oxidation · exothermic	Dazzling white flame, white powder
Quicklime + water	$CaO + H_2O \longrightarrow Ca(OH)_2$	Combination · exothermic	Hissing sound, becomes very hot
Whitewash on walls	$Ca(OH)_2 + CO_2 \longrightarrow CaCO_3 + H_2O$	(shiny layer of $CaCO_3$)	Walls shine after 2–3 days
Natural gas burns	$CH_4 + 2\,O_2 \longrightarrow CO_2 + 2\,H_2O$	Exothermic · oxidation	Heat and light

Reaction	Balanced equation	Type	What you see / use
Respiration	$C_6H_{12}O_6 + 6\,O_2 \longrightarrow 6\,CO_2 + 6\,H_2O$	Exothermic	Energy released in cells
Heating ferrous sulphate	$2\,FeSO_4 \longrightarrow Fe_2O_3 + SO_2 + SO_3$	Thermal decomposition	Green → reddish-brown, burning-sulphur smell
Heating limestone	$CaCO_3 \longrightarrow CaO + CO_2$	Thermal decomposition	Quicklime for cement
Heating lead nitrate	$2\,Pb(NO_3)_2 \longrightarrow 2\,PbO + 4\,NO_2 + O_2$	Thermal decomposition	Brown fumes, yellow residue
Electrolysis of water	$2\,H_2O \longrightarrow 2\,H_2 + O_2$	Electrolytic decomposition	$H_2 : O_2 = 2 : 1$ by volume
Silver chloride in sunlight	$2\,AgCl \longrightarrow 2\,Ag + Cl_2$	Photolytic decomposition	White → grey
Silver bromide in sunlight	$2\,AgBr \longrightarrow 2\,Ag + Br_2$	Photolytic decomposition	Black-and-white photography
Iron nail in copper sulphate	$Fe + CuSO_4 \longrightarrow FeSO_4 + Cu$	Displacement	Blue → pale green, brown coat on nail
Zinc in copper sulphate	$Zn + CuSO_4 \longrightarrow ZnSO_4 + Cu$	Displacement	Blue → colourless
Zinc + dilute sulphuric acid	$Zn + H_2SO_4 \longrightarrow ZnSO_4 + H_2$	Displacement	Bubbles, flask becomes warm
Sodium sulphate + barium chloride	$Na_2SO_4 + BaCl_2 \longrightarrow BaSO_4 + 2\,NaCl$	Double displacement · precipitation	White precipitate
Lead nitrate + potassium iodide	$Pb(NO_3)_2 + 2\,KI \longrightarrow PbI_2 + 2\,KNO_3$	Double displacement · precipitation	Yellow precipitate
Silver nitrate + sodium chloride	$AgNO_3 + NaCl \longrightarrow AgCl + NaNO_3$	Double displacement · precipitation	White precipitate
Copper heated in air	$2\,Cu + O_2 \longrightarrow 2\,CuO$	Combination · oxidation	Brown → black
Hydrogen over hot copper oxide	$CuO + H_2 \longrightarrow Cu + H_2O$	Redox	Black → brown
Aluminium + iron(III) oxide	$Fe_2O_3 + 2\,Al \longrightarrow Al_2O_3 + 2\,Fe$	Displacement · redox · exothermic	Molten iron (welding railway tracks)

Explain why – quick answers

Common 1- and 2-mark reasons

Magnesium ribbon is cleaned before burning – to remove the layer of magnesium oxide so that the metal burns properly.

Silver chloride is kept in dark bottles – light decomposes it into silver and chlorine.

Chips packets are filled with nitrogen – no oxygen is left to oxidise the oil, so the chips do not turn rancid.

Iron gates are painted – paint keeps air and moisture away, so the iron does not rust.

Respiration is exothermic – glucose combines with oxygen in cells and releases energy.

Most decomposition reactions are endothermic – energy is needed to break the reactant into simpler substances.

Acid is added in electrolysis of water – it makes water a good conductor of electricity.

Hydrogen collected is double the oxygen – water has two hydrogen atoms for every oxygen atom.

Copper sulphate solution turns pale green with iron – iron displaces copper and green iron sulphate forms.

Copper does not react with iron sulphate – copper is less reactive than iron, so it cannot displace it.

Ferrous sulphate crystals change colour on heating – they first lose water of crystallisation, then decompose to reddish-brown Fe_2O_3.

Equations must be balanced – to obey the law of conservation of mass – atoms are neither created nor destroyed.

Exam snapshot

What the board asks, and how to prepare

SYLLABUS 2026–27

- Chemical equation, balanced chemical equation and what it tells us.
- Types of reactions: combination, decomposition, displacement, double displacement, precipitation, endothermic and exothermic, oxidation and reduction.
- Effects of oxidation in daily life: corrosion and rancidity.

BOARD WEIGHTAGE

25 / 80

The paper has three sections: Biology 30, **Chemistry 25**, Physics 25. Chapters 1–4 share the 25 Chemistry marks; this chapter usually gives about 4–8 marks: MCQs and Assertion–Reason, plus a 2- or 3-mark question on decomposition, balancing or redox.

MOST ASKED IN BOARD PAPERS, 2023–2026 (11 PAPERS CHECKED)

How often	Question type	Marks	Papers
★★★	Decomposition – thermal, electrolytic, photolytic (heating $FeSO_4$ / lead nitrate, AgCl in sunlight)	1–3	10 of 11
★★★	Balancing and writing chemical equations	1–3	7 of 11
★★★	Displacement, double displacement and precipitation	1–3	7 of 11
★★★	Combination reactions (Mg burning, quicklime + water, copper heated)	1–2	7 of 11
★★★	Exothermic and endothermic reactions	1–2	6 of 11
★★☆	Oxidation, reduction, oxidising and reducing agents	1–3	5 of 11
★★☆	Electrolysis of water (gases, electrodes, ratio)	1–3	5 of 11
★★☆	Signs of a chemical reaction (colour, gas, heat, precipitate)	2–3	3 of 11
★☆☆	Corrosion (rusting activity) and rancidity	1–3	2 of 11

MISTAKES THAT COST MARKS

- Changing a **formula** to balance an equation – change only the coefficients.
- Forgetting state symbols and conditions (heat, sunlight, electricity) when the question asks for them.
- Mixing up **volume** ratio ($H_2 : O_2 = 2 : 1$) with **mass** ratio (1 : 8).
- Naming the oxidising agent as the substance that is oxidised – it is the one that is **reduced**.
- Writing "iron sulphate is blue" – ferrous sulphate solution is **pale green**; copper sulphate is blue.
- Saying all decomposition reactions are exothermic – **most are endothermic**.

HOW TO USE THIS BOOKLET

1. **Day 1:** Read the notes and the key tables; then Part A (NCERT).
2. **Day 2:** Part B (Exemplar) and Part C (board pattern). Do every MUST DO question first.
3. **Day 3:** Part D (case studies) and the real board questions listed in Part E.
4. **Mon 7 Dec (zero period): Chemistry chapter test – 20 marks, 40 minutes.**
5. Check every answer in the **Answer Booklet**. Write each mistake on the My Mistakes page (Part F).

PART A · NCERT PRACTICE

A NCERT Practice

The same ideas as the NCERT activities, in-text and exercise questions, asked in new ways. Finish every question.

Chemical equations

A1. Why should a magnesium ribbon be cleaned with sandpaper before it is burnt in air? State the colour of the flame and of the product. MUST DO [2]

A2. Write balanced chemical equations, with state symbols, for the following: MUST DO [4]

(i) Nitrogen combines with oxygen to form nitric oxide.

(ii) Methane burns in air to give carbon dioxide and water.

(iii) Aluminium reacts with copper(II) chloride solution to give aluminium chloride solution and copper.

(iv) Potassium reacts with water to give potassium hydroxide solution and hydrogen gas.

A3. Balance the following equations: [3]

(i) $Al + O_2 \longrightarrow Al_2O_3$

(ii) $NH_3 + O_2 \longrightarrow NO + H_2O$

(iii) $Pb(NO_3)_2 \longrightarrow PbO + NO_2 + O_2$

(iv) $C_3H_8 + O_2 \longrightarrow CO_2 + H_2O$

(v) $Fe_2O_3 + CO \longrightarrow Fe + CO_2$

(vi) $Na + H_2O \longrightarrow NaOH + H_2$

A4. Why should a chemical equation be balanced? Name the law involved. [2]

A5. Write in words what each equation tells you: [2]

(i) $CaCO_3\,(s) \xrightarrow{\text{heat}} CaO\,(s) + CO_2\,(g)$

(ii) $Zn\,(s) + 2\,HCl\,(aq) \longrightarrow ZnCl_2\,(aq) + H_2\,(g)$

Types of chemical reactions

A6. Quicklime reacts vigorously with water. MUST DO [3]

(i) Name the product and state one use of its solution.

(ii) Write the balanced equation. Is the reaction exothermic or endothermic?

(iii) Why do whitewashed walls become shiny after two to three days? Write the equation.

A7. Give one example each of an exothermic and an endothermic reaction, with balanced equations. Why are most decomposition reactions endothermic? [3]

A8. Classify each reaction as combination or decomposition: [2]

(i) $CaCO_3 \longrightarrow CaO + CO_2$ (ii) $2\,H_2 + O_2 \longrightarrow 2\,H_2O$

(iii) $2\,AgBr \longrightarrow 2\,Ag + Br_2$ (iv) $CaO + CO_2 \longrightarrow CaCO_3$

A9. Name the form of energy needed and write a balanced equation for each decomposition: MUST DO [3]

(i) heating limestone

(ii) silver bromide kept in sunlight

(iii) passing electric current through acidified water

A10. Ferrous sulphate crystals are heated in a dry boiling tube. State two observations, write the balanced equation and name the type of reaction. MUST DO [3]

A11. In the electrolysis of water: (i) why are a few drops of dilute sulphuric acid added? (ii) name the gas collected at each electrode; (iii) in what ratio by volume are they collected? (iv) give a test for each gas. MUST DO [3]

A12. Classify as displacement or double displacement, and complete the equations: [2]

(i) $Zn + CuSO_4 \longrightarrow$ (ii) $Na_2SO_4 + BaCl_2 \longrightarrow$

(iii) $Pb + CuCl_2 \longrightarrow$ (iv) $AgNO_3 + NaCl \longrightarrow$

A13. A zinc strip is kept in blue copper sulphate solution for an hour. State two changes you observe, explain why they happen and write the equation. [2]

A14. What is a precipitation reaction? Explain with two examples, naming the colour of each precipitate. [2]

Oxidation and reduction

A15. Identify the substance oxidised and the substance reduced: MUST DO [2]

(i) $PbO + C \longrightarrow Pb + CO$

(ii) $2\,Mg + CO_2 \longrightarrow 2\,MgO + C$

(iii) $Fe_2O_3 + 3\,CO \longrightarrow 2\,Fe + 3\,CO_2$

(iv) $H_2S + Cl_2 \longrightarrow 2\,HCl + S$

A16. Define oxidation and reduction in terms of oxygen and of hydrogen. What is a redox reaction? Give one example. [3]

A17. A brown metal turns black when heated in air. When hydrogen is passed over the hot black substance, the brown colour returns. Name the metal and the black substance, write both equations and name the type of each reaction. MUST DO [3]

Corrosion and rancidity

A18. Why are iron articles painted? Name two other ways to prevent rusting. [2]

A19. What is rancidity? Give two ways to prevent it. MUST DO [2]

A20. What is corrosion? Give two examples from daily life, naming the colour of the coating formed. [2]

B · Exemplar Practice

PART B · EXEMPLAR PRACTICE

Exemplar-style questions, one step harder. Give a reason with every short answer.

Multiple choice

1 mark each

B1. Which of the following is not a physical change? [1]

(a) Boiling of water (b) Melting of ice
(c) Dissolving salt in water (d) Burning of LPG

B2. The reaction $Fe_2O_3 + 2\,Al \longrightarrow Al_2O_3 + 2\,Fe$ is used to join railway tracks. It is a: [1]

(a) combination reaction (b) double displacement reaction
(c) decomposition reaction (d) displacement reaction

B3. Which of these are exothermic? (i) burning of coal (ii) photosynthesis (iii) respiration (iv) decomposition of calcium carbonate [1]

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

B4. In the reaction $2\,H_2S + SO_2 \longrightarrow 3\,S + 2\,H_2O$, the substance oxidised is: [1]

(a) H_2S (b) SO_2 (c) S (d) H_2O

B5. When acidified water is electrolysed, the gas collected at the anode is: [1]

(a) hydrogen (b) oxygen (c) chlorine (d) nitrogen

B6. Zinc granules are added to dilute sulphuric acid. The products are: [1]

(a) zinc sulphate and hydrogen (b) zinc oxide and water
(c) zinc sulphate and water (d) no reaction takes place

B7. $BaCl_2 + (NH_4)_2SO_4 \longrightarrow BaSO_4 + 2\,NH_4Cl$ is an example of: (i) displacement (ii) precipitation (iii) combination (iv) double displacement [1]

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

B8. Which of the following is a redox reaction? [1]

(a) $CaCO_3 \longrightarrow CaO + CO_2$ (b) $H_2 + Cl_2 \longrightarrow 2\,HCl$
(c) $NaOH + HCl \longrightarrow NaCl + H_2O$ (d) $AgNO_3 + NaCl \longrightarrow AgCl + NaNO_3$

B9. Silver articles turn black after some time because of the formation of: [1]

(a) Ag_2O (b) Ag_2S (c) $AgNO_3$ (d) Ag_2CO_3

B10. A zinc strip is left in copper sulphate solution for an hour. The solution becomes: [1]

(a) dark blue (b) pale green (c) colourless (d) reddish brown

Short answer

2–3 marks

B11. In the electrolysis of water, why is the volume of gas collected in one tube double that in the other? Name the gas collected in the larger amount. [2]

B12. A copper coin is kept in silver nitrate solution. What will you observe after some time? Write the balanced equation. MUST DO [2]

B13. Write balanced equations: [3]

(i) Calcium hydroxide + carbon dioxide → calcium carbonate + water

(ii) Zinc + silver nitrate → zinc nitrate + silver

(iii) Barium chloride + potassium sulphate → barium sulphate + potassium chloride

B14. Classify each change as exothermic or endothermic: (i) burning of LPG (ii) electrolysis of water (iii) decomposition of lead nitrate (iv) respiration. [2]

B15. Identify the reducing agent in each reaction: [2]

(i) $CuO + H_2 \longrightarrow Cu + H_2O$

(ii) $ZnO + C \longrightarrow Zn + CO$

(iii) $PbO + CO \longrightarrow Pb + CO_2$

(iv) $MnO_2 + 4\,HCl \longrightarrow MnCl_2 + 2\,H_2O + Cl_2$

B16. Metal P displaces Q from QSO_4 solution; metal R displaces P from PSO_4 solution; Q does not react with RSO_4 solution. Arrange P, Q and R in decreasing order of reactivity. [2]

B17. Write balanced equations for heating (i) dry ferrous sulphate crystals (ii) lead nitrate (iii) calcium carbonate. Name the type of reaction and give one observation for each. MUST DO [3]

C

PART C · BOARD PATTERN

Board Pattern Practice

Question types from real 2023–2026 Science papers. ★★★ = asked in 6 or more of 11 papers · ★★ = 3–5 papers · ★ = 1–2 papers.

ASSERTION–REASON: HOW TO ANSWER

(a) Both A and R are true, and R is the correct explanation of A.

(b) Both A and R are true, but R is not the correct explanation of A.

(c) A is true, but R is false.

(d) A is false, but R is true.

Decomposition reactions

★★★ 10 of 11 papers · 1–3 marks

C1. When lead nitrate is heated strongly, we observe: [1]

(a) a yellow residue and brown fumes (b) a white residue and a colourless gas

(c) a black residue and brown fumes (d) a green residue and no gas

C2. In the electrolysis of water, the ratio of the volume of oxygen to the volume of hydrogen collected is: [1]

(a) 2 : 1 (b) 1 : 2 (c) 8 : 1 (d) 1 : 8

C3. Silver chloride kept in sunlight turns: [1]

(a) grey (b) white (c) yellow (d) green

C4. ASSERTION–REASON [1]

Assertion (A): Decomposition of vegetable matter into compost is an exothermic reaction.

Reason (R): Most decomposition reactions require energy to take place.

C5. Ferrous sulphate crystals change colour when heated, even before they decompose. Why? Write the equation for their decomposition. [2]

C6. Give one example each of thermal, electrolytic and photolytic decomposition, with balanced equations. Which of these is used in black-and-white photography? MUST DO [3]

Balancing and writing equations

★★★ 7 of 11 papers · 1–3 marks

C7. For the balanced equation $a\,\mathrm{Fe} + b\,\mathrm{H_2O} \longrightarrow \mathrm{Fe_3O_4} + c\,\mathrm{H_2}$, the values of a, b and c are: [1]

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

C8. For the balanced equation $p\,\mathrm{Pb(NO_3)_2} \longrightarrow q\,\mathrm{PbO} + r\,\mathrm{NO_2} + \mathrm{O_2}$, the values of p, q and r are: [1]

(a) 2, 2, 4 (b) 1, 1, 2 (c) 2, 1, 4 (d) 2, 2, 2

C9. Write balanced equations with state symbols: MUST DO [3]

(i) Sodium reacts with water.

(ii) Lead nitrate solution reacts with sodium chloride solution to give a white precipitate of lead chloride.

(iii) Zinc carbonate is heated strongly.

C10. Write the balanced equation for the reaction of zinc with silver nitrate solution and name the type of reaction. [2]

Displacement, double displacement and precipitation

★★★ 7 of 11 papers · 1–3 marks

C11. In which of the following will a reaction take place? [1]

(a) Copper in iron sulphate solution (b) Silver in copper sulphate solution

(c) Iron in copper sulphate solution (d) Copper in zinc sulphate solution

C12. When barium chloride solution is added to sodium sulphate solution, the white precipitate formed is: [1]

(a) NaCl (b) $\mathrm{BaSO_4}$ (c) $\mathrm{BaCl_2}$ (d) $\mathrm{Na_2SO_4}$

C13. The reactions $\mathrm{Pb(NO_3)_2} + 2\,\mathrm{KI} \longrightarrow \mathrm{PbI_2} + 2\,\mathrm{KNO_3}$ and $\mathrm{Na_2SO_4} + \mathrm{BaCl_2} \longrightarrow \mathrm{BaSO_4} + 2\,\mathrm{NaCl}$ are both: [1]

(a) combination reactions

(b) displacement reactions

(c) double displacement and precipitation reactions

(d) decomposition reactions

C14. Explain what a double displacement reaction is, using the equation for barium chloride and sodium sulphate. Which product is the precipitate, and what is its colour? MUST DO [2]

C15. How is a displacement reaction different from a double displacement reaction? Give one balanced example of each. [2]

Combination reactions

★★★ 7 of 11 papers · 1–2 marks

C16. Which of the following is a combination reaction? [1]

(a) $2\,H_2O \longrightarrow 2\,H_2 + O_2$ (b) $CaO + H_2O \longrightarrow Ca(OH)_2$

(c) $Zn + CuSO_4 \longrightarrow ZnSO_4 + Cu$ (d) $NaOH + HCl \longrightarrow NaCl + H_2O$

C17. Which statement about burning a magnesium ribbon in air is not correct? [1]

(a) It burns with a dazzling white flame. (b) A white powder of magnesium oxide forms.

(c) It is a combination reaction. (d) It is an endothermic reaction.

C18. Copper powder heated in a china dish turns black. Name the black substance, write the equation and give two names for this type of reaction. [2]

Exothermic and endothermic reactions

★★★ 6 of 11 papers · 1–2 marks

C19. The burning of natural gas is: [1]

(a) endothermic and a decomposition (b) exothermic and an oxidation

(c) endothermic and a combination (d) exothermic and a decomposition

C20. ASSERTION–REASON [1]

Assertion (A): Respiration is an exothermic process.

Reason (R): During respiration, glucose combines with oxygen in the cells and energy is released.

C21. Why is the decomposition of vegetable matter into compost an exothermic reaction, while the decomposition of calcium carbonate is endothermic? [2]

Oxidation and reduction

★★☆ 5 of 11 papers · 1–3 marks

C22. In the reaction $CuO + H_2 \longrightarrow Cu + H_2O$: [1]

(a) CuO is oxidised (b) H_2 is reduced

(c) CuO is the oxidising agent (d) H_2 is the oxidising agent

C23. In $MnO_2 + 4\,HCl \longrightarrow MnCl_2 + 2\,H_2O + Cl_2$, the substance oxidised is: [1]

(a) MnO_2 (b) HCl (c) $MnCl_2$ (d) H_2O

C24. In $Fe_2O_3 + 2\,Al \longrightarrow Al_2O_3 + 2\,Fe$, identify the substance oxidised, the substance reduced, the oxidising agent and the reducing agent. MUST DO [2]

C25. Define oxidation and reduction in terms of oxygen. For $2\,PbO + C \longrightarrow 2\,Pb + CO_2$, name the substance oxidised and the one reduced, and give one example of oxidation from daily life. [3]

Electrolysis of water

★★☆ 5 of 11 papers · 1–3 marks

C26. In the electrolysis of water, the gas collected at the cathode is: [1]

(a) oxygen (b) hydrogen (c) chlorine (d) carbon dioxide

C27. Why is the volume of gas at one electrode double that at the other during electrolysis of water? Name both gases and give a test for each. MUST DO [3]

Signs of a chemical reaction

★★☆ 3 of 11 papers · 2–3 marks

C28. List four observations that tell us a chemical reaction has taken place. [2]

C29. Give one balanced example of a reaction that shows (i) a change in colour (ii) evolution of a gas (iii) a change in temperature. MUST DO [3]

Corrosion and rancidity

★☆☆ 2 of 11 papers · 1–3 marks

C30. Packets of chips are flushed with: [1]

(a) oxygen (b) hydrogen (c) nitrogen (d) carbon dioxide

C31. Describe an activity with three test tubes to show that both air and water are needed for iron to rust. State what you observe in each tube. MUST DO [3]

Long answer

Section D style · 5 marks

C32. (a) What is a balanced chemical equation, and why must equations be balanced? (b) Write balanced equations with state symbols: (i) aluminium reacts with iron(III) oxide on heating to give aluminium oxide and molten iron; (ii) calcium hydroxide solution reacts with carbon dioxide to give insoluble calcium carbonate and water. (c) Name the type of each reaction in (b). [5]

D

PART D · SECTION E STYLE

Case-Based Questions

Each case carries 4 marks (1 + 1 + 2), as in the case-based questions of the board paper.

D1. Case Study · The Green Crystals [4]

A student heats a few green crystals of salt X in a dry boiling tube. The crystals first turn white. On stronger heating, a reddish-brown solid Y is left and gases with the smell of burning sulphur are given off.

(i) Identify X and Y. [1]

(ii) Why did the crystals turn white first? [1]

(iii) Write the balanced equation for the decomposition of X and name the type of reaction. [2]

OR

(iii) Give one example each, with equations, of a decomposition reaction that uses light and one that uses electricity. [2]

D2. Case Study · Metal Strips in the Lab [4]

A student sets up four test tubes: A – iron nail in copper sulphate solution; B – copper strip in iron sulphate solution; C – zinc strip in iron sulphate solution; D – copper wire in silver nitrate solution. She leaves them for one hour.

(i) In which test tubes will a reaction take place? [1]

(ii) What colour change will she see in test tube A? [1]

(iii) Arrange zinc, iron, copper and silver in decreasing order of reactivity, and write the balanced equation for test tube D. [2]

OR

(iii) Why is there no change in test tube B? Name the type of reaction in A and C. [2]

D3. Case Study · Kitchen Chemistry [4]

Riya notices that her mother's old iron frying pan has reddish-brown patches, her silver anklet has turned black, and an open packet of chips left for a week now smells and tastes stale.

(i) Name the process that forms the reddish-brown layer and give its chemical name. [1]

(ii) What is the black coating on the silver anklet? [1]

(iii) What is rancidity? Give two ways to prevent it. [2]

OR

(iii) State the two conditions needed for rusting and two ways to prevent it. [2]

PART E · REAL BOARD QUESTIONS

E Board PYQ Index

Real questions from the 2023–2026 Science papers, by type. Open the official paper and solve the listed questions.

Frequency	Question type	Marks	Where asked (year: paper code, question number)	Practise here
★★★	**Decomposition (thermal, electrolytic, photolytic)**	1–3	**2026:** 31/1/1 Q19, Q26(c); 31/2/1 Q19; 31/4/1 Q17, Q26(a)(b); 31/5/1 (electrolysis MCQ) · **2025:** 31/1/1 Q1, Q17, Q37(c)(i); 31/1/3 Q7, Q20, Q38(ii); Outside Delhi Set 1 Q1 · **2024:** 31/1/1 Q2 · **2023:** 31/1/1 Q2, Q21(b); 31/4/1 Q27; 31/6/2 Q21; 31/6/3 Q33	A8–A11, B11, B17, C1–C6, C26–C27, D1
★★★	**Balancing / writing equations**	1–3	**2026:** 31/1/1 Q26(b) · **2025:** 31/1/3 Q26; Outside Delhi Set 1 Q27 · **2024:** 31/1/1 Q1 · **2023:** 31/1/1 Q3; 31/4/1 Q2; 31/6/2 Q1	A2–A5, B13, C7–C10, C32
★★★	**Displacement, double displacement, precipitation**	1–3	**2026:** 31/1/1 Q17 · **2025:** 31/1/1 Q27; 31/1/3 Q26(ii), Q33(i); Outside Delhi Set 1 Q5, Q21 · **2024:** 31/1/1 Q27, Q37; 31/2/1 Q5, Q21 · **2023:** 31/1/1 Q17; 31/6/1 Q12; 31/6/3 Q33	A12–A14, B7, B10, B12, B16, C11–C15, D2
★★★	**Combination reactions**	1–2	**2026:** 31/2/1 Q17 · **2025:** 31/1/1 Q2; 31/1/3 Q2, Q6; Outside Delhi Set 1 Q3 · **2024:** 31/1/1 Q21; 31/2/1 Q1 · **2023:** 31/1/1 Q37(a), Q37(c)(i); 31/4/1 Q3, Q17	A1, A6, C16–C18
★★★	**Exothermic and endothermic**	1–2	**2026:** 31/4/1 Q18 · **2025:** 31/1/1 Q17; Outside Delhi Set 1 Q27(C) · **2024:** 31/1/1 Q21; 31/2/1 Q1 · **2023:** 31/4/1 Q17	A6–A7, B3, B14, C4, C19–C21
★★☆	**Oxidation, reduction, redox**	1–3	**2026:** 31/1/1 Q26(a) · **2024:** 31/1/1 Q7; 31/2/1 Q6 · **2023:** 31/1/1 Q27; 31/6/1 Q21; 31/6/2 Q31	A15–A17, B4, B8, B15, C22–C25
★★☆	**Electrolysis of water**	1–3	**2026:** 31/4/1 Q17; 31/5/1 · **2025:** 31/1/1 Q1; Outside Delhi Set 1 Q1 · **2023:** 31/4/1 Q27	A11, B5, B11, C2, C26–C27
★★☆	**Signs of a chemical reaction**	2–3	**2025:** 31/1/1 Q21; 31/1/3 Q25 · **2024:** 31/1/1 Q27 · **2023:** 31/6/1 Q30; 31/6/3 Q33	A1, C28–C29
★☆☆	**Corrosion and rancidity**	1–3	**2026:** 31/4/1 Q26(c) · **2025:** 31/1/1 Q28(a); 31/1/3 Q32(i)	A18–A20, B9, C30–C31, D3

Papers checked (11): 2026 – 31/1/1, 31/2/1, 31/4/1, 31/5/1 (one question seen) · 2025 – 31/1 (sets 1 and 3), Outside Delhi Set 1 · 2024 – 31/1/1, 31/2/1 · 2023 – 31/1/1, 31/4 (Delhi), 31/6 (Outside Delhi). Sets of one code family share most questions, so they count as one paper. **Also in the CBSE Sample Papers:** 2026–27 – Q17 (physical or chemical change), Q22 (antioxidant in food packets), Q29 (redox; OR decomposition) · 2024–25 – Q1 (balancing lead nitrate), Q5 (lead + copper sulphate), Q7 (endothermic example), Q21 (type of reaction). Download the official papers from cbse.gov.in and cbseacademic.nic.in.

F

PART F · YOUR RECORD

My Mistakes

Write down each mistake from this chapter, including the chapter test.

Every wrong answer is a free lesson. Write it here, find the rule you missed, and redo the question after three days. Bring this page to class before the chapter test.

Date	Part & Q No.	What went wrong	Correct rule or method	Redone ✓