ANSWER KEY & MARKING SCHEME · CBSE CLASS 10

Acids, Bases and Salts

Science · Chapter 2 · 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 gas released when zinc reacts with dilute sulphuric acid. [1 mark]

Ans: Hydrogen gas (H_2).

Q2. State the colour of phenolphthalein in NaOH solution. [1 mark]

Ans: Pink.

Q3. Write the chemical formula of bleaching powder. [1 mark]

Ans: Ca(OCl)Cl (calcium oxychloride).

Q4. What is the pH range of human blood? [1 mark]

Ans: 7.35 to 7.45 (slightly basic).

Q5. Which salt has 10 molecules of water of crystallisation? [1 mark]

Ans: Washing soda — $Na_2CO_3 \cdot 10H_2O$.

Section B — Short answer (5 × 2 = 10)

Q6. Write the balanced equation for the reaction between sodium carbonate and dilute hydrochloric acid. How will you confirm the gas evolved? [2 marks]

Ans: $Na_2CO_3 + 2HCl \rightarrow 2NaCl + H_2O + CO_2\uparrow$. Pass the gas through freshly prepared lime water [$Ca(OH)_2$] — it turns milky due to $CaCO_3$ formation, confirming CO_2.

Q7. Differentiate between a strong acid and a weak acid with one example each. [2 marks]

Ans: Strong acid dissociates almost completely (~100%) in water — e.g. HCl, H_2SO_4. Weak acid dissociates only partially (~1–2%) — e.g. CH_3COOH (acetic acid).

Q8. Why does dry HCl gas NOT turn dry blue litmus red, but turns moist blue litmus red? [2 marks]

Ans: Acidic behaviour requires release of H^+ ions. Dry HCl gas cannot ionise into H^+ in the absence of water. Once moisture is present, HCl dissolves and releases H^+, which turns blue litmus red.

Q9. Explain why an antacid is taken when one suffers from acidity. [2 marks]

Ans: Excess HCl in the stomach drops the pH and causes burning sensation. Antacids (e.g. milk of magnesia, $Mg(OH)_2$) are MILD bases — they NEUTRALISE the excess acid (Acid + Base → Salt + Water), raising the pH back to normal and providing relief.

Q10. Write the chemical name and one use each of (i) baking soda and (ii) washing soda. [2 marks]

Ans: (i) Baking soda — sodium hydrogen carbonate ($NaHCO_3$) — used in cakes as a leavening agent / in antacid tablets. (ii) Washing soda — sodium carbonate decahydrate ($Na_2CO_3 \cdot 10H_2O$) — used to remove permanent hardness of water / in glass and soap industries.

Section C — Long answer (3 × 5 = 15)

Q11. (a) What is the chlor-alkali process? Write the balanced chemical equation. (b) State two uses each of the three products formed. [5 marks]

> **Ans:** (a) Chlor-alkali is the electrolysis of brine (concentrated NaCl solution) to manufacture sodium hydroxide: $2NaCl(aq) + 2H_2O(l) \rightarrow 2NaOH(aq) + Cl_2(g)\uparrow + H_2(g)\uparrow$. Cl_2 at anode, H_2 at cathode, NaOH in solution. (b) NaOH: soap manufacture, paper industry. Cl_2: water treatment, manufacture of PVC/bleaching powder. H_2: fuel, hydrogenation of vegetable oils.

Q12. (a) Define Plaster of Paris and give its chemical formula. (b) Write the equation for its preparation from gypsum, mentioning the temperature. (c) Give any two uses. (d) Why should it be stored in a moisture-proof container? [5 marks]

> **Ans:** (a) Plaster of Paris is calcium sulphate hemihydrate — $CaSO_4 \cdot \frac{1}{2}H_2O$. (b) Prepared by heating gypsum at 100°C: $CaSO_4 \cdot 2H_2O \rightarrow[100°C] CaSO_4 \cdot \frac{1}{2}H_2O + 1\frac{1}{2}H_2O$. (c) Used by doctors for setting fractured bones and by sculptors for making idols, moulds and ornamental ceilings. (d) Moisture would convert it back to gypsum ($CaSO_4 \cdot 2H_2O$), causing loss of its setting property.

Q13. (a) Define pH. Why is the pH of pure water 7? (b) Explain how a change in pH causes (i) tooth decay (ii) damage to crops by acid rain (iii) heartburn in the stomach. (c) Suggest one practical remedy for each. [5 marks]

> **Ans:** (a) $pH = -\log_{10}[H^+]$. In pure water $[H^+] = [OH^-] = 10^{-7}$ M, so pH = 7 (neutral). (b)(i) Sugar left on teeth is converted by bacteria into acid; mouth pH falls below 5.5 and enamel (calcium phosphate) dissolves — tooth decay. Remedy: brush with a slightly basic toothpaste to neutralise the acid. (ii) Rain water with dissolved SO_2/NO_2 has pH below 5.6 — it lowers the soil pH below the crop's tolerance range. Remedy: add slaked lime $Ca(OH)_2$ to the soil. (iii) Excess HCl in the stomach (pH 1–3 drops further) causes heartburn. Remedy: take a mild base — milk of magnesia $Mg(OH)_2$.

★ TOPPER ANSWER TEMPLATES

5 TEMPLATES · MEMORISE THE FORMAT

★ TOPPER TEMPLATE — Chlor-alkali process — 5-mark long answer

A staple 5-mark question in CBSE Class 10 Acids, Bases and Salts.

Step 1 [1 mark]	**Definition**	The chlor-alkali process is the industrial electrolysis of brine (concentrated NaCl solution) to manufacture sodium hydroxide.
Step 2 [1 mark]	**Balanced equation**	$2NaCl(aq) + 2H_2O(l) \rightarrow 2NaOH(aq) + Cl_2(g) + H_2(g)$, with states shown.
Step 3 [2 marks]	**Three products with uses**	NaOH → soap, paper, fibres; Cl_2 → water treatment, PVC, bleaching powder; H_2 → fuel and hydrogenation of oils to vanaspati.
Step 4 [1 mark]	**Electrode labelling**	Cl_2 is liberated at the anode, H_2 at the cathode, and NaOH remains near the cathode — name 'chlor-alkali' = chlorine + alkali.

COMMON LOSS OF MARKS:

- Writing the equation without states (s)/(aq)/(g) — examiners deduct 0.5
- Listing only one use of each product instead of two
- Forgetting to name H2 (writing only NaOH + Cl2)

★ TOPPER TEMPLATE — Plaster of Paris — 5-mark long answer

A frequently-set 5-mark question in CBSE Class 10 salts.

Step 1 [1 mark]	**Chemical name + formula**	Plaster of Paris is calcium sulphate hemihydrate, $CaSO_4 \cdot \frac{1}{2}H_2O$.
Step 2 [2 marks]	**Preparation with equation**	Heat gypsum at 100 °C (373 K): $CaSO_4 \cdot 2H_2O \rightarrow[100°C] CaSO_4 \cdot \frac{1}{2}H_2O + 1\frac{1}{2}H_2O$. Above 100 °C all water is lost and the setting property is destroyed, so temperature must be controlled.
Step 3 [1 mark]	**Two uses**	(i) Doctors set fractured bones in PoP casts; (ii) sculptors and decorators use it for moulds, idols and ceilings.
Step 4 [1 mark]	**Storage reason**	Store in a moisture-proof container — absorbing atmospheric water reconverts it to gypsum and it loses the ability to set.

COMMON LOSS OF MARKS:

- Writing the formula as CaSO4·H2O (missing the ½)
- Skipping the temperature 100°C / 373 K in the preparation
- Not explaining WHY moisture-proof storage matters

★ TOPPER TEMPLATE — Bleaching powder — 3-mark short answer

A common 3-mark question in CBSE Class 10 salts.

Step 1 [1 mark]	**Preparation equation**	Prepared by passing chlorine over dry slaked lime: $Ca(OH)_2 + Cl_2 \rightarrow Ca(OCl)Cl + H_2O$.
Step 2 [1 mark]	**Formula**	Chemical formula is Ca(OCl)Cl — calcium oxychloride.
Step 3 [1 mark]	**Two uses**	(i) Bleaching cotton, linen and wood pulp; (ii) disinfecting drinking water by releasing chlorine.

COMMON LOSS OF MARKS:

- Writing the formula as CaCl2 (that is calcium chloride, a completely different compound)
- Using moist instead of dry slaked lime in the description
- Listing only one use instead of the two asked for

★ TOPPER TEMPLATE — pH and tooth decay — 3-mark short answer

A recurring 3-mark application question in CBSE Class 10.

Step 1 [1 mark]	**Critical pH value**	Tooth enamel (calcium phosphate) begins to dissolve when the mouth pH falls below 5.5.
Step 2 [1 mark]	**Mechanism via bacteria**	Bacteria break down leftover sugar into acids that lower the mouth pH below 5.5 and corrode the enamel — this is tooth decay.
Step 3 [1 mark]	**Remedy with chemistry**	Brushing with a basic (slightly alkaline) toothpaste neutralises the excess acid and restores pH above 5.5, protecting the enamel.

COMMON LOSS OF MARKS:

- Writing pH 7 as critical value (it is 5.5)
- Saying 'sugar dissolves enamel' — the acid produced by bacteria does, not sugar itself
- Omitting the chemistry of the remedy (the neutralising base) — losing the final mark

★ TOPPER TEMPLATE — Acid + metal-carbonate test — 2-mark VSA

A common 2-mark question in CBSE Class 10 reactions of acids.

Step 1 [1 mark]	**Reaction equation**	Dilute HCl on Na_2CO_3 gives brisk effervescence of CO_2: $Na_2CO_3 + 2HCl \rightarrow 2NaCl + H_2O + CO_2\uparrow$.
Step 2 [1 mark]	**Lime-water confirmation**	Passing the gas through lime water turns it milky: $Ca(OH)_2 + CO_2 \rightarrow CaCO_3\downarrow + H_2O$, confirming carbon dioxide.

COMMON LOSS OF MARKS:

- Not balancing the equation
- Not naming/showing the lime-water confirmation reaction
- Not showing the gas-evolution arrow (↑) or the precipitate arrow (↓)

MARKING SCHEME — GENERAL NOTES

- Each balanced equation carries 1 mark. Award 0.5 if states (s)/(l)/(g)/(aq) are missing.
- For named substances, the chemical FORMULA is mandatory — half mark deduction if only the common name is given without formula.
- For pH-based answers, award full credit only if a specific pH value/range is cited (e.g. < 5.5, 7.35–7.45).
- In the chlor-alkali question, list TWO uses per product — give 0.5 for each correct use up to the maximum of 2 marks in that sub-part.
- Penalise factual errors heavily (e.g. PoP written as $CaSO_4 \cdot 2H_2O$ OR bleaching powder written as $CaCl_2$) — these lose the entire formula mark.