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

CHAPTER 2

# Acids, Bases and Salts

pH 7 · $H^+$ $NaHCO_3$

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

12 note blocks + 4 diagrams | 71 practice questions | 3 case studies | 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 Acids and bases – what they are

| Acids | Bases |
|---|---|
| Sour taste | Bitter taste; soapy to touch |
| Turn blue litmus **red** | Turn red litmus **blue** |
| Give $H^+$ ($H_3O^+$) ions in water | Give $OH^-$ ions in water |
| HCl, $H_2SO_4$, $HNO_3$, $CH_3COOH$ | NaOH, KOH, $Ca(OH)_2$, $Mg(OH)_2$, $NH_4OH$ |

- **Alkalis** are bases that dissolve in water (NaOH, KOH). All alkalis are bases, but not all bases are alkalis.

| Source | Acid | Source | Acid |
|---|---|---|---|
| Vinegar | Acetic | Tamarind | Tartaric |
| Orange, lemon | Citric | Tomato | Oxalic |
| Curd (sour milk) | Lactic | Ant, nettle sting | Methanoic |

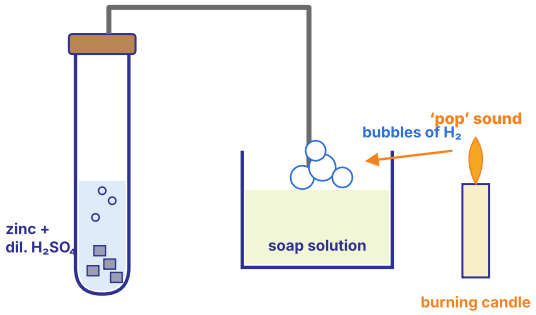
## 2 Indicators

- An **indicator** is a dye that shows by a change of colour or smell whether a substance is acidic or basic. Natural ones also include red cabbage and coloured petals of hydrangea, petunia and geranium.

| Indicator | In acid | In base |
|---|---|---|
| Litmus (from lichen) – natural | Blue → red | Red → blue |
| Turmeric – natural | Stays yellow | Reddish-brown |
| Phenolphthalein – synthetic | Colourless | **Pink** |
| Methyl orange – synthetic | **Red** | Yellow |

- **Olfactory indicators** change **smell**: onion, vanilla essence, clove oil. The smell of onion and vanilla is **lost in a basic solution** but stays in an acidic one – useful for a visually impaired student.
- A turmeric stain on a white cloth turns **reddish-brown** when washed with soap (a base) and turns **yellow** again when rinsed with plenty of water.

## 3 Acids and bases with metals




Zinc and dilute sulphuric acid: the gas is hydrogen

- **Acid + metal → salt + hydrogen gas.**

$$Zn\,(s) + H_2SO_4\,(aq) \longrightarrow ZnSO_4\,(aq) + H_2\,(g)$$

- **Test for hydrogen:** a burning candle (or splinter) near the gas – the gas burns with a **'pop' sound**. Soap bubbles filled with the gas rise up.
- Some metals also react with strong **bases** to give hydrogen, e.g. zinc with sodium hydroxide gives **sodium zincate**. Not all metals do this.

$$2\,NaOH\,(aq) + Zn\,(s) \longrightarrow Na_2ZnO_2\,(aq) + H_2\,(g)$$

## 4 Acids with carbonates and hydrogencarbonates

- **Acid + metal carbonate or hydrogencarbonate → salt + carbon dioxide + water.**

$$Na_2CO_3 + 2\,HCl \longrightarrow 2\,NaCl + H_2O + CO_2$$

$$NaHCO_3 + HCl \longrightarrow NaCl + H_2O + CO_2$$

- **Test for $CO_2$:** pass it through **lime water**; it turns **milky** (white calcium carbonate).

$$Ca(OH)_2\,(aq) + CO_2\,(g) \longrightarrow CaCO_3\,(s) + H_2O\,(l)$$

- With **excess** $CO_2$ the milkiness **disappears**: soluble calcium hydrogencarbonate is formed.

$$CaCO_3\,(s) + H_2O\,(l) + CO_2\,(g) \longrightarrow Ca(HCO_3)_2\,(aq)$$

Limestone, chalk, marble and egg-shells are all forms of calcium carbonate – they fizz with acids.

## 5 Neutralisation; oxides

**Neutralisation:** the reaction of an acid with a base to give a **salt and water**. The effect of each cancels the other.

$$NaOH\,(aq) + HCl\,(aq) \longrightarrow NaCl\,(aq) + H_2O\,(l)$$

- **Metal oxide + acid → salt + water**, so metal oxides are **basic**. Black copper(II) oxide dissolves in dilute HCl and the solution turns **blue-green**:

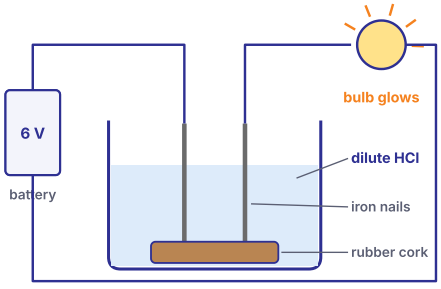
$$CuO\,(s) + 2\,HCl\,(aq) \longrightarrow CuCl_2\,(aq) + H_2O\,(l)$$

- **Non-metal oxide + base → salt + water**, so non-metal oxides are **acidic**:

$$Ca(OH)_2\,(aq) + CO_2\,(g) \longrightarrow CaCO_3\,(s) + H_2O\,(l)$$

| | |
|---|---|
| **Acid + metal** | salt + hydrogen |
| **Acid + carbonate** | salt + $CO_2$ + water |
| **Acid + base / metal oxide** | salt + water |
| **Base + non-metal oxide** | salt + water |

## 6 What is common to all acids and bases?




Testing solutions for conduction

- Solutions of HCl and $H_2SO_4$ make the bulb glow; solutions of **glucose and alcohol do not**. All of them contain hydrogen, but only acids give $H^+$ **ions** in water. The ions carry the current.
- $H^+$ ions cannot exist alone; they join water to form **hydronium ions**:

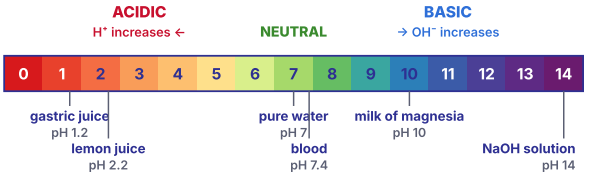
$$HCl + H_2O \longrightarrow H_3O^+ + Cl^-$$

- Bases give **hydroxide ions** in water: $NaOH\,(s) \xrightarrow{H_2O} Na^+\,(aq) + OH^-\,(aq)$
- **Dry HCl gas** does not change the colour of **dry** blue litmus – without water no $H^+$ ions form. Moist blue litmus turns red. (In the activity the gas, made from common salt and conc. $H_2SO_4$, is dried by a guard tube of **calcium chloride**.)
- **Distilled water** does not conduct (no ions); **rain water** conducts because it has dissolved acids (from $CO_2$ and other gases) that give ions.

## 7 Diluting acids and bases

- Strong acids and alkalis are **corrosive** – handle with care. Mixing an acid or a base with water is **highly exothermic** (gives out a lot of heat).
- Always add the **acid to water slowly, with constant stirring**. If water is added to a concentrated acid, the heat may make the mixture **splash out** and cause burns; the glass may also crack from the heat.
- **Dilution** lowers the concentration of ions per unit volume: on diluting an acid, $H_3O^+$ ions per unit volume **decrease**.
- Dissolving more base in a NaOH solution **increases** the $OH^-$ concentration.

## 8 The pH scale – strength of acids and bases




pH of some common substances

- **pH** (p = 'potenz', German for power) measures the $H^+$ ion concentration on a scale of **0 to 14**.
- **pH 7 = neutral**; below 7 = acidic; above 7 = basic. The **more** the $H^+$ ions, the **lower** the pH. As pH rises from 7 to 14, $OH^-$ ions increase.
- **Universal indicator** (a mixture of several indicators) shows different colours at different pH values.
- **Strong acids** give many $H^+$ ions (HCl, $H_2SO_4$, $HNO_3$); **weak acids** give fewer (acetic, citric, carbonic). Likewise strong bases (NaOH, KOH) and weak bases ($NH_4OH$).
- Even a basic solution has some $H^+$ ions; it is basic because it has **more** $OH^-$ **ions than** $H^+$ **ions**.

## 9 pH in everyday life

| | |
|---|---|
| **Our body** | Works within a narrow range, **pH 7.0 to 7.8**. |
| **Acid rain** | Rain with **pH below 5.6**. It lowers the pH of rivers and makes survival of aquatic life difficult. |
| **Soil** | Plants need a particular pH range. A farmer treats **too acidic** soil with **quicklime** (CaO), slaked lime or chalk. |
| **Stomach** | Makes **HCl** for digestion. Too much acid causes pain and irritation (indigestion); an **antacid**, a mild base such as **milk of magnesia** $Mg(OH)_2$, neutralises the excess acid. |
| **Tooth decay** | Starts when the pH in the mouth falls **below 5.5**. Bacteria break down sugar and food bits left in the mouth into acids, which attack **tooth enamel** (calcium hydroxyapatite, the hardest substance in the body). **Toothpastes are basic** and neutralise the extra acid. |
| **Stings** | Bee and ant stings inject **methanoic acid**; rub a mild base such as **baking soda**. A nettle sting is treated by rubbing the leaf of the **dock plant**, which grows nearby. |

Many animals and plants also use chemicals for defence: the stinging hairs of nettle leaves inject methanoic acid.

## 10 Salts and common salt

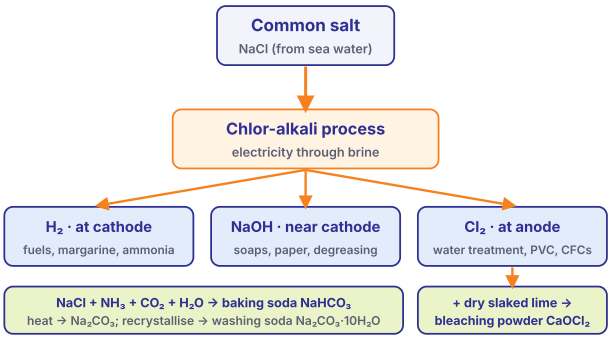
- Salts with the same positive or negative radical form a **family**: NaCl and $Na_2SO_4$ are sodium salts; NaCl and KCl are chloride salts.

| Salt made from | Solution | Example |
|---|---|---|
| Strong acid + strong base | Neutral, pH 7 | NaCl, $KNO_3$, $Na_2SO_4$ |
| Strong acid + weak base | Acidic, pH < 7 | $NH_4Cl$, $CuSO_4$ |
| Weak acid + strong base | Basic, pH > 7 | $Na_2CO_3$, $CH_3COONa$ |

- **Common salt** (NaCl) is made by neutralising HCl with NaOH; it is obtained from **sea water** by evaporation and from deposits of **rock salt** (brown crystals). It is the raw material for NaOH, baking soda, washing soda and bleaching powder.
- **Chlor-alkali process**: electricity is passed through **brine** (sodium chloride solution).

$$2\,NaCl\,(aq) + 2\,H_2O\,(l) \longrightarrow 2\,NaOH\,(aq) + Cl_2\,(g) + H_2\,(g)$$

- Chlorine forms at the **anode**, hydrogen at the **cathode**, and NaOH solution near the cathode. Named **chlor** (chlorine) + **alkali** (sodium hydroxide).




Products of common salt and their uses

### 11 Bleaching powder and baking soda

**Bleaching powder** ($CaOCl_2$, calcium oxychloride) is made by passing chlorine over **dry slaked lime**.

$$Ca(OH)_2 + Cl_2 \longrightarrow CaOCl_2 + H_2O$$

- **Uses:** bleaching cotton and linen (textile industry), wood pulp (paper factories) and washed clothes (laundry); as an **oxidising agent** in industry; **disinfecting drinking water** to make it germ-free.

**Baking soda** ($NaHCO_3$, sodium hydrogencarbonate) is made from sodium chloride, water, carbon dioxide and ammonia.

$$NaCl + H_2O + CO_2 + NH_3 \longrightarrow NH_4Cl + NaHCO_3$$

- A mild, non-corrosive base. On **heating** during cooking:

$$2\,NaHCO_3 \xrightarrow{\text{heat}} Na_2CO_3 + H_2O + CO_2$$

- **Baking powder** = baking soda + a mild edible acid such as **tartaric acid**. On heating or mixing with water, $CO_2$ is given off, which makes bread and cake **rise** – soft and spongy. The acid removes the bitter taste of sodium carbonate.
- **Uses:** baking powder; **antacid**; soda-acid **fire extinguishers**.

### 12 Washing soda, water of crystallisation, Plaster of Paris

**Washing soda** ($Na_2CO_3 \cdot 10\,H_2O$, sodium carbonate decahydrate): heat baking soda to get sodium carbonate, then recrystallise it.

$$Na_2CO_3 + 10\,H_2O \longrightarrow Na_2CO_3 \cdot 10\,H_2O$$

- **Uses:** glass, soap and paper industries; making **borax**; cleaning at home; removing **permanent hardness** of water.
- **Water of crystallisation:** a fixed number of water molecules in one formula unit of a salt. Blue copper sulphate crystals $CuSO_4 \cdot 5\,H_2O$ turn **white** on heating (water lost) and become **blue** again when water is added. Gypsum is $CaSO_4 \cdot 2\,H_2O$.

**Plaster of Paris** ($CaSO_4 \cdot \frac{1}{2}\,H_2O$, calcium sulphate hemihydrate) is made by heating gypsum at **373 K**.

$$CaSO_4 \cdot 2\,H_2O \xrightarrow{373\,K} CaSO_4 \cdot \tfrac{1}{2}\,H_2O + \tfrac{3}{2}\,H_2O$$

- Mixed with water it sets into a **hard mass of gypsum**, so it is stored in a **moisture-proof** container:

$$CaSO_4 \cdot \tfrac{1}{2}\,H_2O + \tfrac{3}{2}\,H_2O \longrightarrow CaSO_4 \cdot 2\,H_2O$$

- **Uses:** plaster for supporting fractured bones; toys; decoration; making surfaces smooth.

## Explain why – quick answers

Common 1- and 2-mark reasons

**Curd is not kept in copper or brass pots** – its acid reacts with the metal and forms harmful compounds.

**Acid is added to water, not water to acid** – the heat given out can make the mixture splash and crack the glass.

**Dry HCl gas does not redden dry litmus** – $H^+$ ions form only in the presence of water.

**A glucose solution does not conduct** – glucose gives no ions in water.

**Rain water conducts but distilled water does not** – rain water has dissolved acids that give ions.

**Lime water turns milky, then clear** – $CaCO_3$ forms first; excess $CO_2$ makes soluble $Ca(HCO_3)_2$.

**Baking soda is rubbed on a bee sting** – the mild base neutralises the methanoic acid.

**Toothpaste is basic** – it neutralises the acid that causes tooth decay below pH 5.5.

**Plaster of Paris is kept moisture-proof** – it takes up water and sets into hard gypsum.

**The milkman adds a little baking soda** – slightly alkaline milk does not turn sour quickly.

**Farmers add quicklime to some fields** – it neutralises the excess acidity of the soil.

**Blue copper sulphate turns white on heating** – it loses its water of crystallisation.

## Exam snapshot

What the board asks, and how to prepare

### SYLLABUS 2026–27

- Acids, bases and salts: definitions in terms of furnishing $H^+$ and $OH^-$ ions; general properties, examples and uses; neutralisation; the pH scale (the logarithm definition is not required); importance of pH in everyday life; preparation and uses of sodium hydroxide, bleaching powder, baking soda, washing soda and Plaster of Paris.

### BOARD WEIGHTAGE

**25** / 80

Chemistry = 25 marks (Section B). Chapters 1–4 share these marks. This chapter got 5 marks in the 2026 paper (two MCQs and a 3-mark question with an OR) and about 5–6 in the 2026–27 sample paper (MCQs, an A–R and part of a 3-mark question). A 4-mark case on salts appeared in 2025.

### MOST ASKED IN BOARD AND SAMPLE PAPERS, 2025–2027 (5 PAPERS CHECKED)

| How often | Question type | Marks | Papers |
|---|---|---|---|
| ★★★ | Acids and bases: indicators, olfactory indicators, acids in nature | 1 | 4 of 5 |
| ★★★ | Reactions of acids and bases; $H^+$ ions; conduction; dilution | 1–5 | 4 of 5 |
| ★★☆ | pH scale, strength, pH in everyday life, pH of salts | 1–5 | 2 of 5 |
| ★★★ | Salts: chlor-alkali, bleaching powder, baking soda, washing soda, PoP, water of crystallisation | 1–5 | 5 of 5 |

### MISTAKES THAT COST MARKS

- Adding water to an acid – always add the **acid to water**, slowly, with stirring.
- Saying phenolphthalein turns pink in acid – it is **colourless in acid** and **pink in base**.
- Thinking a lower pH means a weaker acid – a **lower pH** means **more $H^+$ ions**, a stronger acid.
- Mixing up baking soda ($NaHCO_3$) and washing soda ($Na_2CO_3 \cdot 10\,H_2O$).
- Writing gypsum's formula for Plaster of Paris: PoP is $CaSO_4 \cdot \frac{1}{2}\,H_2O$; gypsum is $CaSO_4 \cdot 2\,H_2O$.
- Forgetting the state symbols, or the excess-$CO_2$ step that turns milky lime water clear again.

### 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 21 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).

A

PART A · NCERT PRACTICE

# NCERT Practice

The ideas of every NCERT activity, in-text question and exercise, asked in new words. Finish every question.

## Acids, bases and their reactions

**A1.** You are given three test tubes with distilled water, an acidic solution and a basic solution, but only red litmus paper. How will you identify each? MUST DO [3]

**A2.** Why should curd and other sour foods not be stored in brass or copper vessels? MUST DO [2]

**A3.** Which gas is usually given off when an acid reacts with a metal? Give an example with an equation, and describe a test for the gas. MUST DO [3]

**A4.** A calcium compound reacts with dilute hydrochloric acid with effervescence. The gas puts out a burning candle. If one product is calcium chloride, write the balanced equation. [2]

**A5.** Write the balanced chemical equations for the reactions of: MUST DO [4]

(i) dilute sulphuric acid with zinc granules
(ii) dilute hydrochloric acid with magnesium ribbon
(iii) dilute sulphuric acid with aluminium powder
(iv) dilute hydrochloric acid with iron filings

**A6.** Crushed egg-shells are added to a solution. A gas is given off which turns lime water milky. What kind of solution is it? Write the equation. [2]

**A7.** What is a neutralisation reaction? Give two examples with equations. MUST DO [3]

**A8.** 10 mL of a sodium hydroxide solution is exactly neutralised by 8 mL of a hydrochloric acid solution. How much of the same acid will neutralise 20 mL of the same NaOH solution? [1]

## Acids and bases in water

**A9.** Hydrochloric acid and nitric acid show acidic properties in water, but solutions of glucose and alcohol do not, though all contain hydrogen. Why? MUST DO [2]

**A10.** Why does an aqueous solution of an acid conduct electricity? [1]

**A11.** Why does distilled water not conduct electricity, whereas rain water does? [2]

**A12.** Why does dry HCl gas not change the colour of dry blue litmus paper? Why do acids not show acidic behaviour without water? MUST DO [2]

**A13.** While diluting an acid, why is it recommended that the acid be added to water and not water to the acid? MUST DO [2]

**A14.** How is the concentration of ions affected when (i) an acid solution is diluted (ii) more base is dissolved in a sodium hydroxide solution? [2]

## pH

**A15.** Solution A has pH 6 and solution B has pH 8. Which has more $H^+$ ions? Which is acidic and which is basic? MUST DO [2]

**A16.** Do basic solutions also contain $H^+$ ions? If yes, why are they basic? How does $H^+$ concentration affect the nature of a solution? [2]

**A17.** Five solutions P, Q, R, S, T have pH 4, 1, 11, 7 and 9. Which is (i) neutral (ii) strongly alkaline (iii) strongly acidic (iv) weakly acidic (v) weakly alkaline? Arrange them in increasing order of $H^+$ concentration. MUST DO [3]

**A18.** Under what soil condition would a farmer treat the soil with quicklime, slaked lime or chalk? [1]

**A19.** Fresh milk has pH about 6. (a) How will the pH change as it turns into curd? (b) A milkman adds a little baking soda to fresh milk. Why? Why does this milk take longer to set as curd? MUST DO [3]

**A20.** How does tooth decay start? How does using toothpaste help? [2]

### Salts

**A21.** What is the common name of $CaOCl_2$? Name the substance that gives this compound when treated with chlorine. [2]

**A22.** Name the sodium compound used for removing permanent hardness of water. [1]

**A23.** What happens when a solution of sodium hydrogencarbonate is heated? Write the equation. MUST DO [2]

**A24.** Write the equation for the reaction of Plaster of Paris with water. Why should Plaster of Paris be stored in a moisture-proof container? MUST DO [3]

**A25.** Give two uses each of washing soda and baking soda. [2]

**A26.** What is the chlor-alkali process? Write the equation and say where each product is formed. MUST DO [3]

## 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 these is a weak acid? [1]

(a) HCl (b) $H_2SO_4$ (c) $HNO_3$ (d) $CH_3COOH$

**B2.** A solution turns red litmus blue. Its pH is most likely: [1]

(a) 1 (b) 4 (c) 5 (d) 10

**B3.** Which salt gives a basic solution in water? [1]

(a) NaCl (b) $Na_2CO_3$ (c) $NH_4Cl$ (d) $KNO_3$

**B4.** The formula of washing soda is: [1]

(a) $NaHCO_3$ (b) $Na_2CO_3 \cdot 10\,H_2O$ (c) $Na_2CO_3$ (d) $CaSO_4 \cdot \frac{1}{2}\,H_2O$

**B5.** Which statement about the pH of our gastric juice is correct? [1]

(a) It is below 7 (b) It is above 7 (c) It is exactly 7 (d) It is exactly 14

**B6.** Consider these statements about $CO_2$: (i) it turns lime water milky (ii) it is an acidic oxide (iii) it puts out a fire (iv) it turns red litmus blue. The correct ones are: [1]

(a) (i) and (ii) only (b) (i), (ii) and (iii)

(c) (ii) and (iv) (d) all four

**B7.** The aqueous solution of which salt turns blue litmus red? [1]

(a) $NH_4Cl$ (b) NaCl (c) $Na_2CO_3$ (d) $CH_3COONa$

**B8.** The chemical formula of gypsum is: [1]

(a) $CaSO_4 \cdot \frac{1}{2} H_2O$ (b) $CaSO_4 \cdot 2\,H_2O$ (c) $CaSO_4$ (d) $CaCO_3$

**B9.** Which of these is an olfactory indicator? [1]

(a) Litmus (b) Turmeric (c) Clove oil (d) Phenolphthalein

**B10.** How many molecules of water of crystallisation are there in one formula unit of blue copper sulphate? [1]

(a) 2 (b) 5 (c) 7 (d) 10

## Short answer

2–3 marks

**B11.** What happens when dilute nitric acid is added to egg-shell? Write the equation and name a test for the gas. [2]

**B12.** An ant sting causes pain and burning. Name the acid injected and suggest a home remedy, giving the reason. [2]

**B13.** Equal lengths of magnesium ribbon are placed in test tube A with dilute HCl and test tube B with dilute acetic acid of the same concentration. In which tube is the fizzing more vigorous, and why? MUST DO [2]

**B14.** Salt A, used in baking, gives salt B on heating, along with a gas C that turns lime water milky. B is used to remove permanent hardness of water. Identify A, B and C and write the equation. MUST DO [3]

**B15.** Blue copper sulphate crystals are heated in a dry boiling tube. What do you see? What happens when a few drops of water are added after cooling? [2]

**B16.** In an industrial process for making sodium hydroxide, a gas X is a by-product. X reacts with dry slaked lime to give Y, used as a bleaching agent. Identify X and Y and write the equation. [2]

C

PART C · BOARD PATTERN

# Board Pattern Practice

Question types from the 2025 and 2026 board papers and the CBSE sample papers. ★★★ = asked in 3 or more of the 5 papers checked · ★★ = 2 papers · ★ = 1 paper.

**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.

## Indicators and acids in nature

★★★ 4 of 5 papers · 1 marks

**C1.** A visually impaired student has to find out whether a solution is acidic or basic. Which indicator should be used? [1]

**(a)** Litmus solution
**(b)** Turmeric paper
**(c)** Vanilla essence
**(d)** Phenolphthalein

**C2.** Which pair of natural source and acid is wrongly matched? [1]

**(a)** Vinegar – acetic acid
**(b)** Tomato – oxalic acid
**(c)** Tamarind – citric acid
**(d)** Curd – lactic acid

**C3.** A few drops of phenolphthalein are added to NaOH solution, and then dilute HCl is added drop by drop until it is in excess. The colour changes from: [1]

**(a)** colourless to pink
**(b)** pink to colourless
**(c)** red to yellow
**(d)** yellow to red

**C4.** ASSERTION–REASON [1]

**Assertion (A):** Onion can be used as an olfactory indicator.

**Reason (R):** The smell of onion cannot be detected in a basic solution but can be detected in an acidic solution.

**C5.** What are indicators? Name one natural and one synthetic indicator and give the colour of each in a basic solution. [2]

## Reactions of acids and bases

★★★ 4 of 5 papers · 1–5 marks

**C6.** Zinc granules are heated with sodium hydroxide solution. The products are: [1]

**(a)** $ZnO + H_2O$
**(b)** $Na_2ZnO_2 + H_2$
**(c)** $Zn(OH)_2 + Na$
**(d)** no reaction takes place

**C7.** Which of these solutions will NOT make the bulb glow in a conduction test? [1]

**(a)** Dilute HCl
**(b)** Glucose solution
**(c)** Dilute sulphuric acid
**(d)** Sodium hydroxide solution

**C8.** ASSERTION–REASON [1]

**Assertion (A):** A concentrated acid must be added slowly to water with constant stirring, and not water to the acid.

**Reason (R):** Mixing an acid with water is a highly exothermic process.

**C9.** ASSERTION–REASON [1]

**Assertion (A):** The gas from zinc and dilute sulphuric acid burns with a 'pop' sound when a burning splinter is brought near.

**Reason (R):** Hydrogen gas is formed in this reaction.

**C10.** In the laboratory preparation of HCl gas, the gas is passed through a guard tube containing calcium chloride. Why? What happens to (i) dry (ii) moist blue litmus paper held in this gas? [2] MUST DO

**C11.** Marble chips react with dilute HCl, and the gas formed is passed through lime water (i) for a short time (ii) for a long time. Write what you see in each case, with equations. [3] MUST DO

**C12.** Black copper(II) oxide is added to dilute hydrochloric acid and stirred. (a) What colour change is seen? (b) Write the equation. (c) What does this show about metal oxides? [3]

## pH and its importance

★★☆ 2 of 5 papers · 1–5 marks

**C13.** The correct increasing order of pH of aqueous solutions of these salts is: [1]

(a) $NH_4Cl < KNO_3 < Na_2CO_3$ (b) $Na_2CO_3 < KNO_3 < NH_4Cl$

(c) $KNO_3 < NH_4Cl < Na_2CO_3$ (d) $NH_4Cl < Na_2CO_3 < KNO_3$

**C14.** Tooth decay starts when the pH in the mouth falls below: [1]

(a) 7.4 (b) 6.5 (c) 5.5 (d) 4.5

**C15.** ASSERTION–REASON [1]

**Assertion (A):** Milk of magnesia is taken to relieve indigestion.

**Reason (R):** Milk of magnesia is a mild base that neutralises the excess acid in the stomach.

**C16.** Three solutions P, Q and R have pH 6, 8 and 9.5. (i) Which is acidic? (ii) Which has the most $H^+$ ions? (iii) Which is the most basic? (iv) Arrange them in increasing order of $H^+$ ion concentration. [2]

**C17.** Explain: (a) a bee sting is treated with baking soda; (b) a farmer adds quicklime to a field; (c) fish in a lake die after acid rain. [3] MUST DO

## Salts from common salt

★★★ 5 of 5 papers · 1–5 marks

**C18.** In the chlor-alkali process, the gas formed at the anode and the product formed near the cathode are: [1]

(a) $Cl_2$ and NaOH (b) $H_2$ and NaOH

(c) $Cl_2$ and HCl (d) $H_2$ and $Cl_2$

**C19.** Which of these salts contains water of crystallisation? [1]

(a) Baking soda (b) Common salt (c) Gypsum (d) Bleaching powder

**C20.** Baking powder is a mixture of baking soda and: [1]

(a) washing soda (b) a mild edible acid such as tartaric acid

(c) common salt (d) Plaster of Paris

**C21.** ASSERTION–REASON [1]

**Assertion (A):** Bleaching powder is used to disinfect drinking water.

**Reason (R):** Bleaching powder gives off chlorine, which kills germs.

**C22.** Write balanced equations for the preparation of (i) bleaching powder (ii) baking soda (iii) Plaster of Paris. MUST DO [3]

**C23.** Why is the electrolysis of brine called the chlor-alkali process? Write the equation and give one use of each product. MUST DO [3]

**C24.** How is washing soda obtained from common salt? Write the equations for each step. [3]

**C25.** Give the chemical name and formula of Plaster of Paris and write the equation for its preparation. [2]

**C26.** A cake made with baking soda alone tastes bitter, but one made with baking powder does not. Explain why baking powder makes the cake soft and spongy and why the bitterness goes. [2]

### Long answer

5 marks

**C27.** (a) Write one balanced equation each for the reaction of an acid with (i) a metal (ii) a metal carbonate (iii) a metal hydrogencarbonate (iv) a base. (b) How will you test the gas formed in (i)? MUST DO [5]

**C28.** (a) Give the chemical name and formula of washing soda and of baking soda. (b) Write the equation for the action of heat on baking soda. (c) Give two uses of each. MUST DO [5]

**C29.** (a) What does the pH scale measure? What do pH 7, below 7 and above 7 show? (b) Solution X has pH 2 and Y has pH 5. Which is the stronger acid? (c) How do pH changes cause tooth decay and indigestion, and how are they treated? [5]

## D

PART D · SECTION B CASE 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 Salt Factory [4]

On an industrial visit, students saw electricity being passed through a strong solution of common salt in large cells. Two gases were collected at the two electrodes, and a solution used to make soap was drained out from near one electrode. One of the gases was led into a chamber of dry slaked lime to make a white powder that the town's water works uses.

(i) Name the gas collected at the anode. [1]

(ii) Name the white powder and write its formula. [1]

(iii) Write the balanced equation for the electrolysis of the salt solution. [2]

OR

(iii) Write the equation for making the white powder, and give two of its uses. [2]

## D2. Case Study · Kitchen Chemistry [4]

Meera spilt some curry on her white shirt. When she scrubbed the yellow stain with soap, it turned reddish-brown; after rinsing with plenty of water it became yellow again. Her mother added a pinch of baking soda to the pakora batter to make the pakoras crisp and fluffy, and stored her lemon pickle in a glass jar, not a copper pot.

(i) Why did the stain turn reddish-brown with soap? [1]

(ii) Why did it become yellow again after rinsing? [1]

(iii) What happens to baking soda on heating? Write the equation and say how it makes the pakoras fluffy. [2]

OR

(iii) Name the acid present in lemon. Why was the pickle not stored in a copper pot? [2]

## D3. Case Study · The Antacid [4]

After a heavy, spicy meal, Arjun had a burning pain in his stomach. The doctor said his stomach was making too much acid and gave him a white liquid called milk of magnesia. The doctor also warned him that sweets eaten late at night, without brushing, lower the pH in the mouth.

(i) Name the acid made in our stomach. [1]

(ii) Is milk of magnesia acidic or basic? Give its approximate pH. [1]

(iii) Write the equation for the reaction of milk of magnesia with the stomach acid, and name the type of reaction. [2]

OR

(iii) How do sweets cause tooth decay, and how does brushing with toothpaste help? [2]

E

PART E · REAL BOARD QUESTIONS

# Board PYQ Index

Real questions from recent Science board papers and CBSE sample 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 |
|---|---|---|---|---|
| ★★★ | **Acids and bases: indicators, olfactory indicators, acids in nature** | 1 | **2026:** 31/1/1 Q18 (olfactory indicator), Q22 (acids in natural sources) · **2025:** OD Set 1 Q6 (acid in tamarind) · **SQP 2024–25:** Q4 (phenolphthalein) · **SQP 2026–27:** Q24 (A–R, onion as indicator) | A1, B9, C1–C5, D2 |
| ★★★ | **Reactions of acids and bases; $H^+$ ions; conduction; dilution** | 1–5 | **2025:** OD Set 1 Q28 OR (reactions of acids) · **2025:** Delhi Set 1 Q2 (drying HCl gas), Q18 (A–R, diluting acid) · **SQP 2024–25:** Q3 (conducting solution), Q17 (A–R, 'pop' test), Q37 (case, reaction chain) · **SQP 2026–27:** Q27 (conduction; lime water) | A2–A14, B1, B6, B11, B13, C6–C12, C27 |
| ★★☆ | **pH scale, strength, pH in everyday life, pH of salts** | 1–5 | **2025:** OD Set 1 Q2 (order of pH of salts) · **SQP 2024–25:** Q28 (pH values; bee sting, quicklime) | A15–A20, B2, B5, B7, B12, C13–C17, C29, D3 |
| ★★★ | **Salts: chlor-alkali, bleaching powder, baking soda, washing soda, PoP, water of crystallisation** | 1–5 | **2026:** 31/1/1 Q27 (chlor-alkali OR baking soda, bleaching powder, PoP) · **2025:** OD Set 1 Q7 (water of crystallisation), Q28 (baking soda) · **2025:** Delhi Set 1 Q37 (case: common salt, washing soda) · **SQP 2024–25:** Q28 (soda chain) · **SQP 2026–27:** Q18 (chlor-alkali), Q20 (water of crystallisation) | A21–A26, B3–B4, B8, B10, B14–B16, C18–C26, C28, D1 |

### PAPERS CHECKED (5)

- 2026 board paper 31/1/1 (Set 1) – first paper with separate Biology, Chemistry and Physics sections
- 2025 board paper, Outside Delhi Set 1
- 2025 board paper, Delhi Set 1
- CBSE Sample Question Paper 2024–25
- CBSE Sample Question Paper 2026–27 (the pattern for your exam)

★★★ = asked in 3 or more of the 5 papers checked · ★★ = 2 papers · ★ = 1 paper. Codes: OD = Outside Delhi. Each paper was read question by question; questions from the 2026–27 Sample Paper after Q20 were checked from a summary of the paper. Download the official papers from cbse.gov.in → Previous Year Question Papers and cbseacademic.nic.in → Sample Question Papers, and solve the exact questions listed.

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 ✓ |
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