CBSE CLASS X

# Science (086)

ANSWER KEY

*AI-generated question paper*

| Code: V2F910 | Questions: 14 | Maximum Marks: 29 | Generated: 2026-06-25 17:35 |
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**SELECTIONS USED**

| | |
|---|---|
| Subject | Science |
| Lessons | 2 Acids, Bases and Salts |
| Level of understanding | Initial understanding |
| Question selection | Curated chapter coverage (~3 questions per section) |
| Model | claude-sonnet-4-6 |

Composition — Difficulty: 6 straightforward · 8 medium | Types: 9 Short · 4 Very short · 1 MCQ

**Q1.** straightforward · initial-understanding · § Introduction **[1]**

What is the colour of litmus solution in a neutral (neither acidic nor basic) solution, and from which type of organism is litmus extracted?

◆ **Acids, Bases and Salts**

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### Model Answer

In a neutral solution, litmus appears **purple** in colour. Litmus is extracted from **lichens**, which belong to the plant division Thallophyta.

Source: Chapter 2, Introduction

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### Explanation

The passage explicitly states: *"Litmus solution is a purple dye, which is extracted from lichen, a plant belonging to the division Thallophyta... When the litmus solution is neither acidic nor basic, its colour is purple."*
Examiners expect both facts — purple colour AND lichen/Thallophyta — for full credit.

**Q2.** straightforward | initial-understanding | § 2.1 UNDERSTANDING THE CHEMICAL PROPERTIES OF ACIDS AND BASES **[3]**

When zinc granules are added to dilute sulphuric acid, a gas is produced. Name the gas and state how you would confirm its identity.

◆ Acids, Bases and Salts

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### Model Answer

The gas produced is **hydrogen ($H_2$)**.

The reaction is:

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

**Test for hydrogen gas:** Bring a burning candle or a lighted matchstick near the mouth of the test tube collecting the gas. If the gas burns with a **pop sound**, it confirms the presence of hydrogen gas.

Source: Chapter 1, Section 1.1.2; Chapter 3, Section 3.2.3

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### Explanation

- **1 mark** for naming the gas (hydrogen).
- **1 mark** for the balanced chemical equation.
- **1 mark** for the correct confirmatory test — examiners specifically want the **pop sound** detail; just saying "it burns" is incomplete and may lose the mark.
- Always write the equation with state symbols if you can, as it shows better understanding.

**Q3.** medium | initial-understanding | § 2.1 UNDERSTANDING THE CHEMICAL PROPERTIES OF ACIDS AND BASES **[3]**

When sodium carbonate reacts with dilute hydrochloric acid, a gas is produced. Name the gas and state what change you would observe when this gas is passed through lime water.

◆ Acids, Bases and Salts

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## Model Answer

**Gas produced:** Carbon dioxide ($CO_2$)

**Reaction:** When sodium carbonate ($Na_2CO_3$) reacts with dilute hydrochloric acid (HCl), carbon dioxide gas is produced along with sodium chloride and water.

$$Na_2CO_3 + 2HCl \rightarrow 2NaCl + H_2O + CO_2 \uparrow$$

**Observation with lime water:** When $CO_2$ is passed through lime water, it turns **milky (white)**. This happens because carbon dioxide reacts with calcium hydroxide to form insoluble calcium carbonate ($CaCO_3$):

$$Ca(OH)_2 + CO_2 \rightarrow CaCO_3 \downarrow + H_2O$$

Source: Chapter 2 (Acids, Bases and Salts); Chapter 1, Section 1.2.1

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## Explanation

- **1 mark** for correctly naming the gas ($CO_2$).
- **1 mark** for the correct observation (lime water turns milky/white).
- **1 mark** for the chemical equation/reason — $CaCO_3$ precipitate forms.
- Always write the equation for the lime water test; examiners expect it.
- The key phrase is **"turns milky"** — not cloudy or white precipitate alone, though both are acceptable. "Milky" is the standard CBSE term.

**Q4.** straightforward | initial-understanding | § 2.1 UNDERSTANDING THE CHEMICAL PROPERTIES OF ACIDS AND BASES **[1]**

Which of the following correctly describes what happens when a base reacts with an acid?

(A) A salt and hydrogen gas are produced.
(B) A salt and water are produced.
(C) Carbon dioxide and water are produced.
(D) Only water is produced, with no salt formation.

A A salt and hydrogen gas are produced.
B A salt and water are produced.
C Carbon dioxide and water are produced.
D The base dissolves without forming any new products.

◆ Acids, Bases and Salts

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### Model Answer

**(B) A salt and water are produced.**

When a base reacts with an acid, neutralisation occurs: Acid + Base → Salt + Water.

### Explanation

This is the neutralisation reaction. The textbook (Chapter 2) clearly states: "Acids and bases neutralise each other to form corresponding salts and water." Option A describes acid reacting with a *metal*; Option C describes acid reacting with metal carbonate/hydrogencarbonate. Students must not confuse these three different types of reactions.

**Q5.** medium | initial-understanding | § 2.2 WHAT DO ALL ACIDS AND ALL BASES HAVE IN COMMON? **[3]**

Glucose and alcohol also contain hydrogen in their molecules, yet they are not considered acids. What must an acid do in water that glucose and alcohol do not, to show acidic properties?

◆ Acids, Bases and Salts

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### Model Answer

An acid must **ionize in water to produce $H^+$ (aq) ions** (hydronium ions, $H_3O^+$). Although glucose and alcohol contain hydrogen, they do not ionize in water and therefore do not release $H^+$ ions. As a result, their solutions do not conduct electricity (the bulb does not glow in the conductivity test), whereas acids like HCl dissociate completely to give $H^+$ and $Cl^-$ ions, which carry the electric current and are responsible for acidic properties.

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

Source: Chapter 2, Section 2.2

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### Explanation

- The examiner wants the key idea: **ionization in water to give $H^+$(aq)/$H_3O^+$ ions** — that's the defining property of an acid.
- Mention the conductivity test evidence (Activity 2.8) to show you understand the experimental basis.
- Include the dissociation equation for full marks.
- Avoid writing that glucose/alcohol "have no hydrogen" — they do; they just don't *release* $H^+$ in solution.

**Q6.** straightforward | initial-understanding | § 2.2 WHAT DO ALL ACIDS AND ALL BASES HAVE IN COMMON? **[1]**

What ion is produced by bases when dissolved in water, and what term is used for bases that are soluble in water?

◆ Acids, Bases and Salts

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### Model Answer

Bases produce **$OH^-$ (hydroxide) ions** when dissolved in water. Bases that are soluble in water are called **alkalis**.

### Explanation

The examiner expects two facts in one line: the ion ($OH^-$) and the term "alkali." Both parts are needed for full credit. Source passage directly states "Formation of $OH^-$(aq) ions in solution is responsible for the basic nature of a substance" and refers to soluble bases as alkalis.

**Q7.** straightforward | initial-understanding | § 2.3 HOW STRONG ARE ACID OR BASE SOLUTIONS? **[1]**

What does the pH scale measure, and what pH value represents a neutral solution?

◆ Acids, Bases and Salts

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### Model Answer

The pH scale measures the concentration of hydrogen ions ($H^+$) in a solution. A pH value of **7** represents a neutral solution.

Source: Chapter 2, Section 2.3

### Explanation

Examiners expect two things: (1) what pH measures — $H^+$ ion concentration — and (2) the exact neutral pH value of 7. Both are needed for full credit even in a 1-mark question. Remember: pH < 7 = acidic, pH > 7 = basic, pH = 7 = neutral.

**Q8.** medium | initial-understanding | § 2.3 HOW STRONG ARE ACID OR BASE SOLUTIONS? **[3]**

A solution has a pH of 3 and another has a pH of 11. Identify which solution is acidic and which is basic, and state which one contains a higher concentration of $H^+$(aq) ions. Give a reason for your answer.

◆ Acids, Bases and Salts

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### Model Answer

The solution with pH 3 is **acidic** (pH < 7), and the solution with pH 11 is **basic** (pH > 7).

The solution with **pH 3 contains a higher concentration of $H^+$(aq) ions**.

**Reason:** According to the pH scale, higher the hydronium ion ($H^+$) concentration, lower is the pH value. Since pH 3 is lower than pH 11, it has a greater concentration of $H^+$(aq) ions. The solution of pH 11 has a higher $OH^-$ ion concentration, making it basic.

*Source: Chapter 2, Section 2.3 – How Strong Are Acid or Base Solutions?*

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### Explanation

- **1 mark** for correctly identifying pH 3 as acidic and pH 11 as basic.
- **1 mark** for stating pH 3 has higher $H^+$ concentration.
- **1 mark** for the reason: inverse relationship between pH value and $H^+$ concentration (lower pH = higher $H^+$).
- Remember the key rule: *pH < 7 → acidic; pH = 7 → neutral; pH > 7 → basic*. Examiners expect you to quote this principle explicitly as your reason.

**Q9.** medium | initial-understanding | § 2.3 HOW STRONG ARE ACID OR BASE SOLUTIONS? **[2]**

Equal concentrations of hydrochloric acid (HCl) and acetic acid ($CH_3COOH$) are taken in separate beakers. How would their pH values compare, and what does this comparison reveal about the strength of the two acids?

◆ Acids, Bases and Salts

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### Model Answer

At equal concentrations, HCl has a **lower pH** than $CH_3COOH$ (acetic acid).

This is because HCl is a **strong acid** — it ionises completely in water, producing more $H^+$ ions. Acetic acid is a **weak acid** — it ionises only partially, producing fewer $H^+$ ions. Since higher $H^+$ concentration means lower pH, HCl has a lower pH than acetic acid at the same concentration.

### Explanation

- Examiners look for two things: (1) stating *which* pH is lower, and (2) linking it to complete vs. partial ionisation (strong vs. weak acid).
- Key phrase from the textbook: *"Acids that give rise to more $H^+$ ions are said to be strong acids, and acids that give less $H^+$ ions are said to be weak acids."*
- Don't just say "HCl is stronger" — explain *why* in terms of $H^+$ ions produced.

Source: Chapter 2, Section 2.3; Chapter 4, Section 4.4.2

**Q10.** straightforward | initial-understanding | § 2.4 MORE ABOUT SALTS **[1]**

What is the chemical name and chemical formula of baking soda?

◆ Acids, Bases and Salts

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### Model Answer

Baking soda has the chemical name **sodium hydrogen carbonate** (or sodium bicarbonate) and its chemical formula is **$NaHCO_3$**.

### Explanation

This is a standard 1-mark factual recall question. Examiners expect both the chemical name and formula. "Sodium bicarbonate" is also accepted, but "sodium hydrogen carbonate" is the IUPAC-preferred name used in the NCERT textbook. Writing just one without the other may cost you the mark.

**Q11.** medium | initial-understanding | § 2.4 MORE ABOUT SALTS **[3]**

When electricity is passed through brine, three useful products are formed. Name the products and state at which electrode each gas is released.

◆ Acids, Bases and Salts

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### Model Answer

When electricity is passed through brine (concentrated NaCl solution), three useful products are formed:

1. **Chlorine gas** – released at the **anode** (positive electrode)
2. **Hydrogen gas** – released at the **cathode** (negative electrode)
3. **Sodium hydroxide (NaOH)** – formed in the solution near the cathode

This process is called the **chlor-alkali process**. The overall reaction is:

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

Source: Chapter 1 (Chemical Reactions and Equations), electrolysis/chlor-alkali process

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### Explanation

- The examiner expects all **three products named** (1 mark each): chlorine, hydrogen, and sodium hydroxide.
- For full marks, state **which gas is at which electrode** — $Cl_2$ at anode, $H_2$ at cathode.
- NaOH is not a gas; it remains in solution, so don't say it is released at an electrode.
- The equation is a bonus but good to include for clarity.

**Q12.** medium | initial-understanding | § 2.4 MORE ABOUT SALTS **[2]**

Copper sulphate crystals are blue, but when strongly heated they turn white. What explains this colour change, and what happens to the colour when a few drops of water are added to the white powder?

◆ Acids, Bases and Salts

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### Model Answer

Copper sulphate crystals contain water of crystallisation ($CuSO_4 \cdot 5H_2O$), which gives them their blue colour. On strong heating, this water is lost (thermal decomposition), forming anhydrous copper sulphate ($CuSO_4$), which is white.

When a few drops of water are added to the white powder, it reabsorbs water and turns blue again, as the hydrated form is restored.

*Source: Chapter 1, Section 1.2.2 Decomposition Reaction*

### Explanation

- The key concept is **water of crystallisation**: its presence = blue; its absence = white.
- Examiners expect you to use the term *anhydrous* for the white powder and mention that heating causes loss of water of crystallisation (a thermal decomposition).
- The reversibility (white → blue on adding water) shows this is not a permanent chemical change — a point worth stating clearly.
- This is a classic 2-mark question: one mark for explaining the blue-to-white change, one mark for the white-to-blue reversal on adding water.

**Q13.** medium | initial-understanding | § 2.4 MORE ABOUT SALTS **[3]**

A white powder hardens when mixed with water and is used in making casts for broken bones.
(i) What is this substance? Write its chemical formula.
(ii) Name the compound it is prepared from, and state what happens when it is mixed with water.

◆ Acids, Bases and Salts

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### Model Answer

**(i)** The substance is **Plaster of Paris**.
Chemical formula: $\mathrm{CaSO_4 \cdot \frac{1}{2}H_2O}$

**(ii)** It is prepared from **Gypsum** ($\mathrm{CaSO_4 \cdot 2H_2O}$). When Plaster of Paris is mixed with water, it rehydrates and sets into a hard solid mass (gypsum is reformed). This property makes it useful for making casts for broken bones.

$$\mathrm{CaSO_4 \cdot \tfrac{1}{2}H_2O + \tfrac{3}{2}H_2O \rightarrow CaSO_4 \cdot 2H_2O}$$

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### Explanation

- Examiners expect the name **Plaster of Paris** with its correct formula (the ½ water of crystallisation is essential — a common error is writing 1H2O).
- For part (ii), naming **Gypsum** as the parent compound earns 1 mark; stating that it **sets hard / reverts to gypsum** on mixing with water earns the remaining mark.
- The equation is a bonus/good practice but the key points are the name, formula, parent compound, and the setting reaction.

**Q14.** medium | initial-understanding | § Group Activity **[2]**

Baking soda solution is added to beetroot extract used as an acid-base indicator. What colour change would you observe, and what does it indicate about the nature of baking soda solution?

◆ Acids, Bases and Salts

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### Model Answer

When baking soda solution is added to beetroot extract, the colour of the extract **changes from red/pink to yellow** (or greenish-yellow).

This colour change indicates that baking soda ($NaHCO_3$) solution is **basic (alkaline) in nature**, as beetroot extract shows a different colour in basic solutions compared to acidic ones.

*Source: Chapter 2, Group Activity — Prepare your own indicator*

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### Explanation

- Beetroot extract acts as a natural acid-base indicator — it gives one colour in acid and a different colour in base.
- Baking soda = sodium hydrogencarbonate ($NaHCO_3$), which is a base.
- Examiners expect **two points**: (1) the colour change observed, and (2) what it tells us about the nature of baking soda solution (i.e., it is basic/alkaline). Each point carries 1 mark.
- Avoid writing that it is a strong base — $NaHCO_3$ is a mild/weak base.



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