

PRACTICE PAPER 01 (2026-27)
CHAPTER 02: ACIDS, BASES AND SALTS
(STEP-BY-STEP SOLUTIONS)

SUBJECT: SCIENCE

MAX. MARKS : 40

CLASS : X

DURATION : 1½ hrs

General Instructions:

- (i) All questions are compulsory.
- (ii) This question paper contains **20** questions divided into five Sections A, B, C, D and E.
- (iii) **Section A** comprises 10 MCQs and Assertion-Reason questions of **1 mark** each. **Section B** comprises 4 Very Short Answer questions of **2 marks** each. **Section C** comprises 3 Short Answer questions of **3 marks** each. **Section D** comprises 1 Long Answer question of **5 marks**. **Section E** comprises 2 Case Study Based questions of **4 marks** each.
- (iv) There is no overall choice. Internal choice is provided in Section E.
- (v) Use of calculators is not permitted.

SECTION - A

Questions 1 to 10 carry 1 mark each.

1. A solution turns blue litmus red. Its pH is most likely to be

- | | |
|--------|-------|
| (a) 12 | (b) 9 |
| (c) 7 | (d) 3 |

Solution:

Ans: (d) 3

- Turning blue litmus red shows the solution is acidic. Acidic solutions have pH less than 7; only 3 fits.

2. A metal compound 'X' reacts with dilute hydrochloric acid with brisk effervescence. The gas evolved turns lime water milky. 'X' is most likely

- | | |
|---------------------|-----------------------|
| (a) Sodium chloride | (b) Calcium carbonate |
| (c) Zinc | (d) Copper(II) oxide |

Solution:

Ans: (b) Calcium carbonate

- A gas that turns lime water milky is CO₂. Metal carbonates react with acids to give salt + CO₂ + water.



- Zinc would give H₂; CuO gives no gas; NaCl does not react.

3. Which of the following can be used as an olfactory indicator?

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

Solution:

Ans: (c) Clove oil

- Olfactory indicators change their **odour** in acidic or basic medium (onion, vanilla, clove oil). The others change colour.

4. 15 mL of a sodium hydroxide solution is completely neutralised by 10 mL of a given hydrochloric acid solution. The volume of the same acid needed to neutralise 30 mL of the same NaOH solution is

- (a) 5 mL (b) 10 mL
(c) 20 mL (d) 45 mL

Solution:

Ans: (c) 20 mL

- The volume of NaOH is doubled (15 mL → 30 mL), so double the acid is needed: $2 \times 10 \text{ mL} = 20 \text{ mL}$.

5. The number of molecules of water of crystallisation in one formula unit of gypsum is

- (a) $\frac{1}{2}$ (b) 2
(c) 5 (d) 10

Solution:

Ans: (b) 2

- Gypsum is $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$. ($\frac{1}{2}$ is Plaster of Paris, 5 is blue vitriol $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$, 10 is washing soda.)

6. Tooth decay starts when the pH of the mouth falls below

- (a) 7.8 (b) 7.0
(c) 6.5 (d) 5.5

Solution:

Ans: (d) 5.5

- Tooth enamel (calcium hydroxyapatite) is corroded when the pH in the mouth drops below 5.5 due to acids made by bacteria from sugar.

7. Two drops of phenolphthalein are added to dilute NaOH solution, and then dilute HCl is added drop by drop until it is in excess. The colour change observed is

- (a) pink to colourless (b) colourless to pink
(c) red to blue (d) yellow to pink

Solution:

Ans: (a) pink to colourless

- Phenolphthalein is pink in basic solution. As HCl neutralises the NaOH and then becomes excess, the solution is no longer basic, so it turns colourless.

8. Which one of the following pairs of natural source and the acid present in it is **incorrectly** matched?

- (a) Tamarind – Tartaric acid (b) Tomato – Oxalic acid
(c) Curd – Lactic acid (d) Orange – Acetic acid

Solution:

Ans: (d) Orange - Acetic acid

- Orange contains **citric acid**. Acetic acid is found in vinegar.

In the following questions 9 and 10, a statement of Assertion (A) is followed by a statement of Reason (R). Mark the correct choice as:

- (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.

9. Assertion (A): Dry hydrogen chloride gas does not change the colour of dry blue litmus paper.

Reason (R): Hydrogen chloride produces H^+ ions only in the presence of water.

Solution:

Ans: (a)

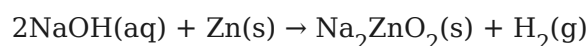
- Both are true. Without water HCl cannot release $\text{H}^+(\text{aq})$ ions, so it shows no acidic behaviour; R correctly explains A.

10. Assertion (A): Zinc granules react with warm sodium hydroxide solution to liberate hydrogen gas.

Reason (R): All metals react with bases to produce hydrogen gas.

Solution:

Ans: (c)



- (A) is true (sodium zincate and H_2 form). (R) is false: such reactions are not possible with all metals.

SECTION - B

Questions 11 to 14 carry 2 marks each.

- 11.** (a) While diluting concentrated sulphuric acid, why must the acid be added to water and not water to the acid?
(b) How does the concentration of hydronium ions (H_3O^+) change when an acid solution is diluted?

Solution:

(a) Mixing a concentrated acid with water is **highly exothermic**. If water is added to the acid, the heat produced at one spot can make the mixture **splash out and cause burns**, and the glass container may crack from local heating. Adding acid slowly to water with stirring spreads the heat safely. [1]

(b) On dilution the number of H_3O^+ ions per unit volume **decreases**, so the concentration of hydronium ions falls (and pH rises towards 7). [1]

- 12.** A farmer tests the soil of his field and finds its pH to be 4.5.

- (a) Is the soil acidic or basic? Justify.
- (b) Name two substances he could add to correct the soil, and state the principle involved.

Solution:

(a) pH 4.5 is less than 7, so the soil is **acidic**. [$\frac{1}{2}$ + $\frac{1}{2}$]

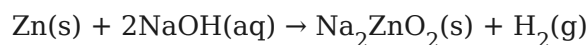
(b) Any two: **quick lime (CaO), slaked lime [$\text{Ca}(\text{OH})_2$], chalk (CaCO_3)**. [$\frac{1}{2}$]

Principle: these basic substances **neutralise** the excess acid in the soil, raising its pH to suit plant growth. [$\frac{1}{2}$]

13. Write balanced chemical equations for the following and name the salt formed in each case:
- (a) Zinc granules are warmed with sodium hydroxide solution.
- (b) Copper(II) oxide is added to dilute hydrochloric acid. Also state the colour of the solution formed.

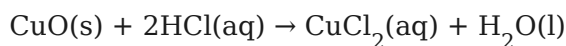
Solution:

(a)



Salt: **sodium zincate**. Check: Zn 1 = 1, Na 2 = 2, O 2 = 2, H 2 = 2. [1]

(b) Metal oxide + acid $\rightarrow$ salt + water. Skeletal: $\text{CuO} + \text{HCl} \rightarrow \text{CuCl}_2 + \text{H}_2\text{O}$; two Cl on RHS $\rightarrow$ 2HCl.



Salt: **copper(II) chloride**; the solution turns **blue-green**. [1]

14. (a) A honey-bee sting causes pain and irritation. What is the nature of the substance left by the sting, and how can the pain be relieved?
- (b) Name the acid injected by the stinging hair of nettle leaves. What is the likely nature of the dock leaf used as a traditional remedy?

Solution:

(a) The bee-sting leaves an **acid**. Applying a mild base such as **baking soda** neutralises the acid and relieves the pain. [1]

(b) Nettle stings inject **methanoic acid**. The dock leaf must be **basic** in nature, since it neutralises the acid. [$\frac{1}{2} + \frac{1}{2}$]

SECTION - C

Questions 15 to 17 carry 3 marks each.

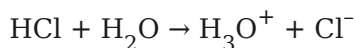
15. About 1 g of solid sodium chloride is taken in a dry test tube and concentrated sulphuric acid is added. The gas evolved is tested first with dry blue litmus paper and then with moist blue litmus paper.
- (a) Name the gas evolved. What change is seen in each litmus paper?
- (b) What do you conclude about the acidic character of this gas?
- (c) Write the equation showing how this gas forms hydronium ions in water.

Solution:

(a) The gas is **hydrogen chloride (HCl)**. Dry blue litmus: **no change**. Moist blue litmus: **turns red**. [1]

(b) HCl gas shows acidic behaviour **only in the presence of water**. Without water, H^+ ions cannot separate from HCl molecules, so dry HCl is not acidic. [1]

(c)



H^+ ions cannot exist alone; they combine with water to form hydronium ions, H_3O^+ . [1]

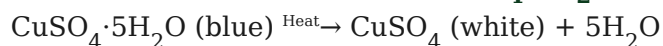
16. A few crystals of copper sulphate are heated in a dry boiling tube.

- (a) What change in colour is observed? What else do you notice inside the tube?
- (b) Define water of crystallisation. Write the formula of hydrated copper sulphate.
- (c) What happens when 2-3 drops of water are added to the heated sample? Why?

Solution:

(a) The **blue** crystals turn **white**, and **water droplets** appear on the cooler upper part of the tube. [1]

(b) Water of crystallisation is the **fixed number of water molecules present in one formula unit of a salt**. Hydrated copper sulphate: **$\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$** . [$\frac{1}{2} + \frac{1}{2}$]



(c) The **blue colour returns**, because the white anhydrous salt takes up water again and becomes hydrated copper sulphate. [1]

17. (a) How is Plaster of Paris obtained from gypsum? Write the chemical equation.

- (b) Write the equation for the reaction of Plaster of Paris with water.
- (c) Why should Plaster of Paris be stored in a moisture-proof container? Give one use of it.

Solution:

(a) Gypsum is heated at **373 K**; it loses part of its water of crystallisation to form calcium sulphate hemihydrate.



[1 mark]

(b)



[1 mark]

(c) In contact with moisture it combines with water and **sets into hard gypsum**, becoming useless. Use: supporting fractured bones / making toys and decorative materials / making surfaces smooth. [$\frac{1}{2} + \frac{1}{2}$]

SECTION - D

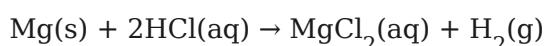
Question 18 carries 5 marks.

- 18.** (a) What are strong and weak acids? Equal lengths of magnesium ribbon are added to test tube A containing hydrochloric acid and test tube B containing acetic acid of the same amount and concentration. In which test tube will fizzing be more vigorous, and why?
(b) Give the chemical name and formula of baking soda. Write the equation for what happens when it is heated during cooking. Explain how baking powder makes a cake soft and spongy, and give one other use of baking soda.

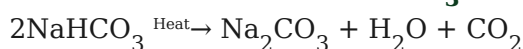
Solution:

(a) Strength of an acid depends on the number of H^+ ions it produces. **Strong acids** give more H^+ ions in solution (e.g. HCl); **weak acids** give fewer (e.g. CH_3COOH). [1]

Fizzing is **more vigorous in test tube A**. HCl is a strong acid, so it supplies more H^+ ions to react with magnesium and release hydrogen faster. [1]

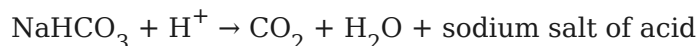


(b) Baking soda is **sodium hydrogencarbonate, $NaHCO_3$** . [$\frac{1}{2}$]



[1 mark]

Baking powder = baking soda + tartaric acid (a weak edible acid). On heating or mixing with water:



The CO_2 released makes the cake **rise**, so it becomes soft and spongy; tartaric acid removes the bitter taste of sodium carbonate. [1]

Other use (any one): ingredient in **antacids** / in **soda-acid fire extinguishers**. [$\frac{1}{2}$]

SECTION - E (Case Study Based Questions)

Questions 19 and 20 carry 4 marks each.

19. Read the passage and answer the questions that follow.

Common salt is an important raw material for many chemicals of daily use. When electricity is passed through an aqueous solution of sodium chloride, called *brine*, it decomposes. One gas is given off at the anode, another gas at the cathode, and an alkaline solution collects near the cathode. All three products are useful: one of the gases is passed over dry slaked lime to make a powder used to disinfect drinking water.

(a) Name the process described and explain why it is given this name. **(1)**

(b) Name the gases liberated at the anode and at the cathode. **(1)**

(c) Write the balanced chemical equation for the electrolysis of brine. Write the equation for the preparation of the disinfecting powder and give its common name. **(2)**

OR

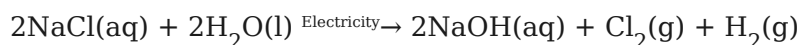
(c) Sodium carbonate is obtained by heating baking soda. How is washing soda obtained from it? Write the equation and give two uses of washing soda. **(2)**

Solution:

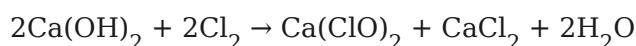
(a) Chlor-alkali process – named after its products: *chlor* for chlorine and *alkali* for sodium hydroxide. [1]

(b) Anode: chlorine (Cl₂); cathode: hydrogen (H₂). [$\frac{1}{2}$ + $\frac{1}{2}$]

(c)



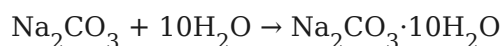
[1 mark]



Common name: **bleaching powder**. [1]

OR

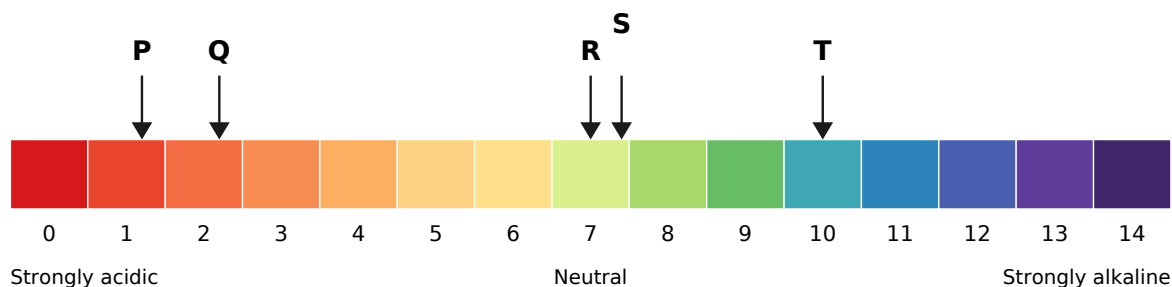
(c) Washing soda is obtained by **recrystallisation** of sodium carbonate:



[1 mark]

Uses (any two): in glass, soap and paper industries; manufacture of borax; domestic cleaning agent; removing permanent hardness of water. [$\frac{1}{2}$ + $\frac{1}{2}$]

20. A student tested five samples with universal indicator and marked their approximate pH on the scale below. **P** – gastric juice, **Q** – lemon juice, **R** – pure water, **S** – human blood, **T** – milk of magnesia.



- (a) Which sample has the highest concentration of hydrogen ions? Give a reason. **(1)**
 (b) Arrange P, R, S and T in increasing order of hydrogen ion concentration. **(1)**
 (c) Why is sample T taken by a person suffering from indigestion? Write the balanced equation for the reaction involved. **(2)**

OR

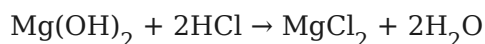
- (c) Our body works within the pH range of 7.0 to 7.8. When is rain called acid rain, and how does it affect aquatic life? **(2)**

Solution:

(a) P (gastric juice). It has the lowest pH (about 1), and the lower the pH, the higher the hydrogen ion concentration. [1]

(b) Higher pH means lower H^+ concentration. pH order: T (10) > S (7.4) > R (7) > P (1.2).
 Increasing order of H^+ concentration: **T < S < R < P**. [1]

(c) During indigestion the stomach produces too much hydrochloric acid, causing pain and irritation. Milk of magnesia, $Mg(OH)_2$, is a **mild base (antacid)** that neutralises the excess acid. [1]



[1 mark]

OR

(c) Rain water with **pH less than 5.6** is called acid rain. [1]

When it flows into rivers it **lowers the pH of river water**; living organisms survive only in a narrow pH range, so survival of aquatic life becomes difficult. [1]