

UNIQUE STUDY POINT

By Sumeet Sahu

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Class: X	Subject: Science	Session: 2025-26
Chapter: 02 - Acids, Bases and Salts	Time: 1½ Hours	Max. Marks: 40

General Instructions:

1. All questions are compulsory.
2. This question paper contains 20 questions divided into five sections A, B, C, D and E.
3. Section A contains 10 MCQs of 1 mark each.
4. Section B contains 4 questions of 2 marks each.
5. Section C contains 3 questions of 3 marks each.
6. Section D contains 1 question of 5 marks.
7. Section E contains 2 Case Study Based questions of 4 marks each.

SECTION A - Multiple Choice Questions (1 mark each)

- Q1.** Which of the following is a natural indicator?
- (a) Phenolphthalein
 - (b) Methyl orange
 - (c) Litmus
 - (d) Universal indicator
- Q2.** What colour does red litmus paper turn in a basic solution?
- (a) Remains red
 - (b) Turns blue
 - (c) Turns green
 - (d) Becomes colourless
- Q3.** Which gas is evolved when dilute HCl reacts with zinc granules?
- (a) Oxygen
 - (b) Hydrogen
 - (c) Carbon dioxide
 - (d) Chlorine
- Q4.** The pH of a neutral solution is:
- (a) 0
 - (b) 7
 - (c) 14
 - (d) Less than 7
- Q5.** Which of the following is used to treat indigestion caused by excess acid in the stomach?
- (a) Vinegar
 - (b) Lemon juice

- (c) Baking soda
- (d) Hydrochloric acid

Q6. What is the chemical formula of plaster of Paris?

- (a) $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$
- (b) $\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$
- (c) CaCO_3
- (d) $\text{Ca}(\text{OH})_2$

Q7. When acid rain flows into rivers, it:

- (a) Increases the pH of water
- (b) Decreases the pH of water
- (c) Does not affect pH
- (d) Makes water neutral

Q8. The process of dissolving an acid or base in water is:

- (a) Endothermic
- (b) Exothermic
- (c) Reversible
- (d) Physical change only

Q9. Which of the following salts will give acidic solution in water?

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

Q10. Tooth decay starts when the pH of the mouth becomes:

- (a) More than 7
- (b) Equal to 7
- (c) More than 5.5
- (d) Lower than 5.5

SECTION B - Short Answer Questions (2 marks each)

Q11. What are olfactory indicators? Give one example.

Q12. Why does dry HCl gas not change the colour of dry litmus paper?

Q13. Write the chemical equation for the reaction between sodium carbonate and hydrochloric acid.

Q14. What is meant by water of crystallization? Give one example.

SECTION C - Short Answer Questions (3 marks each)

Q15. Explain why calcium hydroxide is used to neutralize excess acid in soil. What is this process called?

Q16. What happens when electricity is passed through brine? Write the chemical equation and name the process.

Q17. Describe an activity to show that acids conduct electricity in aqueous solution.

SECTION D - Long Answer Question (5 marks)

- Q18.** (a) What is the pH scale? What is the pH range of acidic and basic solutions?
(b) Why is pH important in our daily life? Explain with three examples.

SECTION E - Case Study Based Questions (4 marks each)

Q19. Case Study 1:

Sodium chloride (common salt) is obtained from seawater and rock deposits. It is an important raw material for various chemicals. When electricity is passed through brine (concentrated aqueous solution of NaCl), it decomposes to form sodium hydroxide, chlorine gas, and hydrogen gas. This process is called the chlor-alkali process.

- What are the three products formed in the chlor-alkali process? (1 mark)
- Write the balanced chemical equation for this process. (1 mark)
- Give two uses of chlorine gas produced in this process. (1 mark)
- Why is this process called "chlor-alkali"? (1 mark)

Q20. Case Study 2:

Raju's mother was making pakoras in the kitchen. She added a pinch of baking soda to the batter to make the pakoras crispy. Baking soda is sodium hydrogencarbonate (NaHCO_3). When heated, it decomposes to form sodium carbonate, water, and carbon dioxide. The CO_2 produced makes the pakoras soft and spongy.

- What is the chemical name of baking soda? (1 mark)
- Write the equation for decomposition of baking soda on heating. (1 mark)
- Why are pakoras made soft and spongy by adding baking soda? (1 mark)
- Give one more use of baking soda apart from cooking. (1 mark)

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SECTION A - Answers to MCQs

Ans 1. (c) Litmus

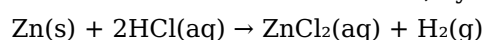
Litmus is a natural indicator extracted from lichen, a plant belonging to the division Thallophyta. Other natural indicators include turmeric, red cabbage, and flower petals of Hydrangea, Petunia, and Geranium.

Ans 2. (b) Turns blue

Red litmus paper turns blue in basic solutions due to the presence of OH^- ions. This is a characteristic property used to identify bases.

Ans 3. (b) Hydrogen

When dilute HCl reacts with zinc, hydrogen gas is evolved:



Hydrogen gas burns with a pop sound when brought near a flame.

Ans 4. (b) 7

A neutral solution has equal concentration of H^+ and OH^- ions, resulting in a pH of exactly 7. Pure water at 25°C is a neutral solution.

Ans 5. (c) Baking soda

Baking soda (sodium hydrogencarbonate) is a mild base that neutralizes excess acid in the stomach, providing relief from indigestion. It is also an ingredient in many antacids.

Ans 6. (b) $\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$

Plaster of Paris is calcium sulphate hemihydrate with the chemical formula $\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$. It is obtained by heating gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$) at 373 K.

Ans 7. (b) Decreases the pH of water

Acid rain has pH less than 5.6. When it flows into rivers, it lowers the pH of river water, making it acidic and harmful for aquatic life.

Ans 8. (b) Exothermic

Dissolving an acid or base in water is a highly exothermic process that releases heat. This is why concentrated acid should always be added to water slowly, never water to acid.

Ans 9. (c) NH_4Cl

NH_4Cl (ammonium chloride) is a salt of weak base (NH_4OH) and strong acid (HCl), so it gives acidic solution in water with pH less than 7.

Ans 10. (d) Lower than 5.5

Tooth enamel (calcium hydroxyapatite) is the hardest substance in the body but gets corroded when pH falls below 5.5. Bacteria in the mouth produce acids from sugar degradation, causing tooth decay.

SECTION B - Answers to Short Answer Questions

Ans 11. Olfactory Indicators

Definition: Olfactory indicators are substances whose odor changes in acidic or basic medium.

Example: Onion and clove oil are olfactory indicators. When onion extract is treated with acid or base, its characteristic smell changes or disappears, helping to identify acidic or basic nature of the substance.

Ans 12. Dry HCl Gas and Litmus Paper

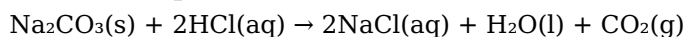
Dry HCl gas does not change the colour of dry litmus paper because:

1. Acids show their acidic properties only in the presence of water
2. HCl produces H^+ ions only when dissolved in water: $HCl + H_2O \rightarrow H_3O^+ + Cl^-$
3. In the absence of water (dry conditions), H^+ ions are not produced
4. Without H^+ ions, acidic properties are not exhibited

Ans 13. Reaction of Sodium Carbonate with HCl

When sodium carbonate reacts with hydrochloric acid, it produces sodium chloride, water, and carbon dioxide gas:

Chemical Equation:



This reaction is used to test for carbonates. The CO_2 gas produced turns lime water milky.

Ans 14. Water of Crystallization

Definition: Water of crystallization is the fixed number of water molecules present in one formula unit of a salt in its crystalline form.

Example: Copper sulphate crystals ($CuSO_4 \cdot 5H_2O$) contain 5 molecules of water as water of crystallization. When heated, blue copper sulphate crystals turn white as water molecules are removed. On adding water again, blue colour reappears.

SECTION C - Answers to Short Answer Questions

Ans 15. Neutralization of Acidic Soil

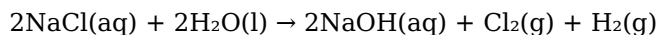
Calcium hydroxide [$Ca(OH)_2$], also called slaked lime, is used to neutralize excess acid in soil because:

1. **Acidic soil** is harmful for plant growth as most plants require a specific pH range
2. $Ca(OH)_2$ is a base that reacts with acids in soil to neutralize them
3. The reaction produces salts and water:
 $Ca(OH)_2 + 2H^+ \rightarrow Ca^{2+} + 2H_2O$
4. This **neutralization** process brings the soil pH to an optimal level for plant growth
5. Other substances like quick lime (CaO) or chalk ($CaCO_3$) can also be used for the same purpose

This process is called **liming** or **neutralization of soil**.

Ans 16. Electrolysis of Brine

When electricity is passed through brine (concentrated aqueous solution of sodium chloride), the following happens:

Chemical Equation:**Products formed:**

- Chlorine gas (Cl_2) - evolved at anode
- Hydrogen gas (H_2) - evolved at cathode
- Sodium hydroxide (NaOH) solution - formed near cathode

Name of process: Chlor-alkali process

(Chlor for chlorine and alkali for sodium hydroxide)

Ans 17. Activity to Show Acids Conduct Electricity

Materials Required: Dilute HCl, distilled water, 6V battery, bulb, switch, two nails, cork, 100 mL beaker

Procedure:

1. Fix two nails on a cork and place the cork in a 100 mL beaker
2. Connect the nails to the two terminals of a 6V battery through a bulb and switch
3. Pour dilute HCl solution in the beaker so that nails are immersed
4. Switch on the current

Observation: The bulb starts glowing, indicating flow of electric current

Conclusion: Acidic solutions conduct electricity because acids dissociate in water to form ions (H^+ and anions). These ions carry electric current through the solution. When tested with distilled water or glucose solution, the bulb does not glow as they don't produce ions.

SECTION D - Answer to Long Answer Question**Ans 18.** pH Scale and Its Importance**(a) pH Scale:**

- pH is a scale for measuring hydrogen ion concentration in a solution
- It stands for 'potenz' (German word meaning power) of hydrogen
- pH scale ranges from 0 to 14
- $\text{pH} = 7$ indicates a neutral solution
- $\text{pH} < 7$ indicates an acidic solution (0-6)
- $\text{pH} > 7$ indicates a basic/alkaline solution (8-14)
- Lower the pH value, higher is the H^+ ion concentration

(b) Importance of pH in Daily Life:**1. pH in Digestive System:**

- Our stomach produces HCl for digestion
- Excess acid causes pain and irritation (acidity)
- Antacids (mild bases like $\text{Mg}(\text{OH})_2$) neutralize excess acid
- pH of stomach should be maintained between 1-3 for proper digestion

2. pH and Tooth Decay:

- Tooth enamel (calcium hydroxyapatite) is corroded when $\text{pH} < 5.5$
- Bacteria in mouth produce acids by degrading sugar and food particles
- These acids lower the pH causing tooth decay

- Using basic toothpaste neutralizes acid and prevents decay
- Best prevention: Clean mouth after eating to maintain pH above 5.5

3. pH and Plant Growth:

- Plants require specific pH range for healthy growth
- Most plants grow well in slightly acidic to neutral soil (pH 6-7)
- If soil is too acidic, quick lime or slaked lime is added
- If soil is too alkaline, organic matter is added
- Wrong pH affects nutrient availability to plants

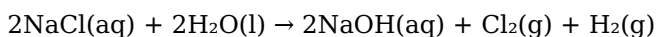
SECTION E - Answers to Case Study Based Questions

Ans 19. Case Study 1 - Chlor-alkali Process

(a) Three products formed:

1. Sodium hydroxide (NaOH) - formed near cathode
2. Chlorine gas (Cl₂) - evolved at anode
3. Hydrogen gas (H₂) - evolved at cathode

(b) Balanced chemical equation:



(c) Two uses of chlorine gas:

1. Used in manufacture of bleaching powder for bleaching cotton, linen, and wood pulp
2. Used in water treatment plants to make drinking water free from germs

(d) Why called "chlor-alkali":

This process is named after its two main products:

- "Chlor" refers to chlorine gas (Cl₂)
- "Alkali" refers to sodium hydroxide (NaOH), which is an alkali

Hence, the name chlor-alkali process

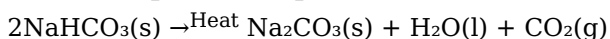
Ans 20. Case Study 2 - Baking Soda

(a) Chemical name:

Sodium hydrogencarbonate (also called sodium bicarbonate)

Chemical formula: NaHCO₃

(b) Decomposition equation:



(Sodium hydrogencarbonate → Sodium carbonate + Water + Carbon dioxide)

(c) Why pakoras become soft and spongy:

When baking soda is heated during cooking, it decomposes to produce carbon dioxide gas (CO₂). This CO₂ gas gets trapped in the batter, creating small bubbles. These bubbles make the pakoras rise, resulting in a soft, spongy, and porous texture. The increased volume makes them light and crispy.

(d) One more use of baking soda:

Baking soda is used as an antacid to neutralize excess acid in the stomach and provide relief from indigestion. Being alkaline in nature, it reacts with stomach acid to form salt, water, and CO₂, thereby reducing acidity.

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