

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 turns phenolphthalein solution pink?
- (a) Lemon juice
 - (b) Vinegar
 - (c) Sodium hydroxide solution
 - (d) Hydrochloric acid
- Q2.** The reaction between an acid and a base is known as:
- (a) Displacement reaction
 - (b) Neutralization reaction
 - (c) Decomposition reaction
 - (d) Combination reaction
- Q3.** What is the colour of copper sulphate crystals?
- (a) White
 - (b) Blue
 - (c) Green
 - (d) Yellow
- Q4.** Which of the following solutions will have pH greater than 7?
- (a) Lemon juice
 - (b) Milk of magnesia
 - (c) Vinegar
 - (d) Gastric juice
- Q5.** The chemical name of washing soda is:
- (a) Sodium chloride
 - (b) Sodium carbonate

- (c) Sodium hydroxide
- (d) Sodium bicarbonate

Q6. Which acid is present in ant sting?

- (a) Acetic acid
- (b) Citric acid
- (c) Methanoic acid
- (d) Lactic acid

Q7. When carbon dioxide is passed through lime water, it turns milky due to formation of:

- (a) Calcium carbonate
- (b) Calcium oxide
- (c) Calcium hydroxide
- (d) Calcium bicarbonate

Q8. A salt formed by strong acid and weak base will be:

- (a) Acidic
- (b) Basic
- (c) Neutral
- (d) Amphoteric

Q9. Common salt is obtained from seawater by the process of:

- (a) Filtration
- (b) Evaporation
- (c) Distillation
- (d) Crystallization

Q10. Bleaching powder is prepared by passing chlorine gas over:

- (a) Dry slaked lime
- (b) Wet slaked lime
- (c) Quick lime
- (d) Limestone

SECTION B - Short Answer Questions (2 marks each)

Q11. State two properties of acids.

Q12. Why should curd and sour substances not be kept in brass and copper vessels?

Q13. Write the reaction of zinc metal with sodium hydroxide solution.

Q14. What happens when plaster of Paris is mixed with water? Write the equation.

SECTION C - Short Answer Questions (3 marks each)

Q15. Explain why distilled water does not conduct electricity whereas rainwater does.

Q16. How is baking soda prepared? Write the chemical equation and give two uses of baking soda.

Q17. What is meant by strong acids and weak acids? Give one example of each.

SECTION D - Long Answer Question (5 marks)

Q18. (a) What are salts? How are they formed?

(b) Classify the following salts as acidic, basic or neutral: Na_2CO_3 , NaCl , NH_4Cl , CH_3COONa

(c) Name the acid and base from which these salts are derived.

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

Q19. Case Study 1:

Gypsum is a naturally occurring mineral with the chemical formula $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$. When gypsum is heated at 373 K, it loses water molecules and becomes plaster of Paris ($\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$). Plaster of Paris is a white powder. When mixed with water, it changes back to gypsum, forming a hard solid mass. This property makes it useful for various applications.

(a) What is the chemical formula of gypsum? (1 mark)

(b) At what temperature is gypsum converted to plaster of Paris? (1 mark)

(c) Write the equation for conversion of plaster of Paris to gypsum. (1 mark)

(d) Give two uses of plaster of Paris. (1 mark)

Q20. Case Study 2:

Our stomach produces hydrochloric acid which helps in digestion of food. During indigestion, the stomach produces too much acid causing pain and irritation. To get relief, people take antacids which are mild bases. These antacids neutralize the excess acid. Magnesium hydroxide (Milk of magnesia) is a commonly used antacid. Our body works within the pH range of 7.0 to 7.8.

(a) Which acid is produced in our stomach? (1 mark)

(b) What is the pH range in which our body works? (1 mark)

(c) How do antacids provide relief during acidity? (1 mark)

(d) Name one commonly used antacid. (1 mark)

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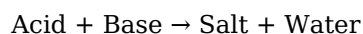
SECTION A - Answers to MCQs

Ans 1. (c) Sodium hydroxide solution

Phenolphthalein is a synthetic indicator that remains colorless in acidic medium but turns pink in basic medium. Sodium hydroxide is a base, hence it turns phenolphthalein pink.

Ans 2. (b) Neutralization reaction

When an acid reacts with a base, they neutralize each other to form salt and water. This reaction is called neutralization reaction:



Ans 3. (b) Blue

Copper sulphate crystals ($\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$) are blue in color due to the presence of 5 molecules of water of crystallization. When heated, they turn white as water is removed.

Ans 4. (b) Milk of magnesia

Milk of magnesia is magnesium hydroxide [$\text{Mg}(\text{OH})_2$], which is a base. Bases have pH greater than 7. All other options are acidic with pH less than 7.

Ans 5. (b) Sodium carbonate

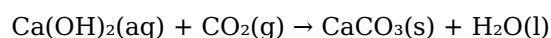
The chemical name of washing soda is sodium carbonate. Its chemical formula is $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$. The $10\text{H}_2\text{O}$ represents water of crystallization.

Ans 6. (c) Methanoic acid

Ant sting contains methanoic acid (also called formic acid) which causes pain and irritation. Applying a mild base like baking soda neutralizes the acid and provides relief.

Ans 7. (a) Calcium carbonate

When CO_2 is passed through lime water [$\text{Ca}(\text{OH})_2$], it reacts to form calcium carbonate (CaCO_3) which is insoluble in water and makes the solution milky:



Ans 8. (a) Acidic

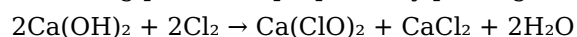
A salt formed from strong acid and weak base will be acidic in nature with pH less than 7. Example: NH_4Cl is formed from HCl (strong acid) and NH_4OH (weak base), hence it is acidic.

Ans 9. (b) Evaporation

Seawater contains dissolved salts. When seawater is allowed to evaporate in shallow pits, water evaporates leaving behind solid salt deposits. This is followed by purification.

Ans 10. (a) Dry slaked lime

Bleaching powder is prepared by passing chlorine gas over dry slaked lime [$\text{Ca}(\text{OH})_2$]:



It is important that slaked lime is dry for this reaction.

Ans 11. Properties of Acids

Two important properties of acids are:

1. Taste and Indicators:

- Acids are sour in taste
- They turn blue litmus paper red
- They remain colorless with phenolphthalein

2. Reaction with Metals:

- Acids react with metals to produce hydrogen gas and corresponding salt
- Example: $\text{Zn} + 2\text{HCl} \rightarrow \text{ZnCl}_2 + \text{H}_2 \uparrow$
- The hydrogen gas burns with a pop sound

Ans 12. Curd and Brass/Copper Vessels

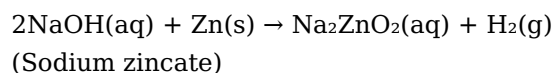
Curd and sour substances should not be kept in brass and copper vessels because:

1. Curd and sour substances contain acids (like lactic acid in curd)
2. These acids react with metals like copper and brass
3. This reaction produces toxic metal salts that are harmful for health
4. The acid can also corrode the metal vessels
5. Therefore, acidic food items should be stored in glass or ceramic containers

Ans 13. Reaction of Zinc with NaOH

When zinc metal reacts with sodium hydroxide solution, it produces sodium zincate and hydrogen gas:

Chemical Equation:

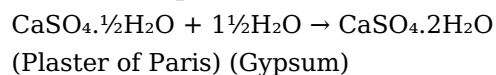


This shows that some metals like zinc can react with bases to liberate hydrogen gas. However, all metals do not react with bases.

Ans 14. Plaster of Paris and Water

When plaster of Paris is mixed with water, it undergoes a chemical change and converts back to gypsum, forming a hard solid mass.

Chemical Equation:



This property of setting into a hard mass is utilized for making statues, decorative materials, and for setting fractured bones in the right position.

SECTION C - Answers to Short Answer Questions

Ans 15. Conductivity of Distilled Water vs Rainwater

Distilled water does not conduct electricity because:

1. Pure water (distilled water) does not contain any ions
2. Water molecules exist as H_2O and do not dissociate into H^+ and OH^- ions

3. Electric current is carried by ions in a solution
4. In the absence of ions, distilled water cannot conduct electricity

Rainwater conducts electricity because:

1. Rainwater is not pure water
2. While falling through atmosphere, it dissolves acidic gases like CO_2 , SO_2 , NO_2
3. These gases form acids in water: $\text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{CO}_3$
4. These acids dissociate to produce ions (H^+ , HCO_3^- , etc.)
5. The presence of ions makes rainwater a conductor of electricity

Ans 16. Preparation and Uses of Baking Soda

Preparation of Baking Soda:

Baking soda (sodium hydrogencarbonate) is prepared using sodium chloride as one of the raw materials:

Chemical Equation:



(Sodium chloride) (Ammonium chloride) (Baking soda)

Two Uses of Baking Soda:

1. In Cooking:

- Used for making baking powder (mixture of baking soda and tartaric acid)
- When heated or mixed with water, it releases CO_2 which makes cakes and bread soft and spongy

2. As Antacid:

- Being mildly alkaline, it neutralizes excess acid in stomach
- Provides relief from indigestion and acidity
- Common ingredient in antacid medicines

Ans 17. Strong Acids vs Weak Acids

Strong Acids:

- Acids that give rise to more H^+ ions in solution are called strong acids
- They ionize completely in water
- Have pH value much less than 7 (typically 0-3)
- **Example:** Hydrochloric acid (HCl), Sulphuric acid (H_2SO_4), Nitric acid (HNO_3)
- $\text{HCl} \rightarrow \text{H}^+ + \text{Cl}^-$ (Complete ionization)

Weak Acids:

- Acids that give less H^+ ions in solution are called weak acids
- They ionize partially in water
- Have pH value close to 7 (typically 4-6)
- **Example:** Acetic acid (CH_3COOH), Citric acid, Carbonic acid
- $\text{CH}_3\text{COOH} \rightleftharpoons \text{CH}_3\text{COO}^- + \text{H}^+$ (Partial ionization)

SECTION D - Answer to Long Answer Question

Ans 18. Salts - Formation and Classification

(a) What are Salts and How are They Formed:

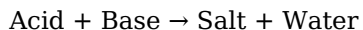
Definition:

A salt is a compound formed by the replacement of hydrogen ion of an acid by a metal ion or

ammonium ion.

Formation of Salts:

Salts are formed by the neutralization reaction between an acid and a base:



Examples:

- $\text{HCl} + \text{NaOH} \rightarrow \text{NaCl} + \text{H}_2\text{O}$
- $\text{H}_2\text{SO}_4 + 2\text{KOH} \rightarrow \text{K}_2\text{SO}_4 + 2\text{H}_2\text{O}$
- $\text{HNO}_3 + \text{NH}_4\text{OH} \rightarrow \text{NH}_4\text{NO}_3 + \text{H}_2\text{O}$

(b) Classification of Given Salts:

| Salt | Nature | Reason |
|---------------------------|------------------|-------------------------------------|
| Na_2CO_3 | Basic (pH > 7) | Salt of strong base and weak acid |
| NaCl | Neutral (pH = 7) | Salt of strong acid and strong base |
| NH_4Cl | Acidic (pH < 7) | Salt of strong acid and weak base |
| CH_3COONa | Basic (pH > 7) | Salt of weak acid and strong base |

(c) Parent Acid and Base:

1. Na_2CO_3 (Sodium carbonate):

- Acid: Carbonic acid (H_2CO_3) - Weak acid
- Base: Sodium hydroxide (NaOH) - Strong base

2. NaCl (Sodium chloride):

- Acid: Hydrochloric acid (HCl) - Strong acid
- Base: Sodium hydroxide (NaOH) - Strong base

3. NH_4Cl (Ammonium chloride):

- Acid: Hydrochloric acid (HCl) - Strong acid
- Base: Ammonium hydroxide (NH_4OH) - Weak base

4. CH_3COONa (Sodium acetate):

- Acid: Acetic acid (CH_3COOH) - Weak acid
- Base: Sodium hydroxide (NaOH) - Strong base

SECTION E - Answers to Case Study Based Questions

Ans 19. Case Study 1 - Gypsum and Plaster of Paris

(a) Chemical formula of gypsum:

$\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ (Calcium sulphate dihydrate)

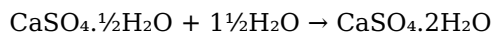
The $2\text{H}_2\text{O}$ represents two molecules of water of crystallization present in one formula unit of gypsum.

(b) Temperature for conversion:

373 K (or 100°C)

At this temperature, gypsum loses water molecules and converts to plaster of Paris.

(c) Conversion equation:



(Plaster of Paris) + (Water) → (Gypsum)

This reaction is exothermic and the mixture sets into a hard solid mass.

(d) Two uses of plaster of Paris:

1. **Medical use:** Used by doctors for setting fractured bones in the right position. It is applied as a paste which hardens to support the bone.
2. **Decorative purposes:** Used for making decorative materials, toys, statues, and for making surfaces smooth in construction work.

Ans 20. Case Study 2 - Digestive System and pH

(a) Acid produced in stomach:

Hydrochloric acid (HCl) is produced in our stomach. It helps in the digestion of food by:

- Activating digestive enzymes
- Killing harmful bacteria in food
- Creating acidic environment needed for protein digestion

(b) pH range for body function:

Our body works within the pH range of **7.0 to 7.8**.

This slightly alkaline pH is necessary for:

- Proper functioning of enzymes
- Metabolic activities
- Maintaining homeostasis

(c) How antacids provide relief:

Antacids are mild bases (alkaline substances). They provide relief during acidity by:

1. Neutralizing the excess acid in stomach through neutralization reaction
2. Acid + Base (Antacid) → Salt + Water
3. This reduces the concentration of H⁺ ions in stomach
4. pH of stomach contents increases (becomes less acidic)
5. Pain and irritation are relieved

(d) Commonly used antacid:

Magnesium hydroxide [Mg(OH)₂], commonly known as **Milk of magnesia**, is a widely used antacid. Other examples include: Sodium hydrogencarbonate (baking soda), Aluminum hydroxide, Calcium carbonate.