

CHAPTER – 1

EXPLORING SUBSTANCES: ACDIC, BASIC AND NEUTRAL

VERY SHORT ANSWER TYPE (2 MARKS):

1. Name the acid present in vinegar.

Answer: Acetic acid (Chemical formula: $\text{CH}_3 \text{COOH}$).

2. Give names of any two natural indicators.

Answer: Litmus and Turmeric.

3. What is a neutral salt?

Answer: A salt formed by the complete neutralization of a strong acid with a strong base is called a neutral salt. It has a pH value of exactly 7.

Example: Sodium chloride (NaCl).

4. Name the acid and the base from which the salt calcium chloride is formed.

Answer: Acid: Hydrochloric acid (HCl)

Base: Calcium hydroxide (Ca(OH)_2)

5. Can we taste acids and bases to identify them?

Answer: No, we cannot taste all acids and bases because many of them are highly corrosive and toxic, which can cause severe chemical burns to our tongue and tissues.

6. What is the colour of phenolphthalein in basic solution?

Answer: Pink.

7. Which chemical is used to neutralise the acidic soil?

Answer: Quicklime (Calcium oxide, CaO) or Slaked lime (Calcium hydroxide, Ca(OH)_2).

8. Name the base which is present in a window cleaner.

Answer: Ammonium hydroxide ($\text{NH}_4 \text{OH}$).

9. Write the chemical name and formula of baking soda.

Answer: Chemical Name: Sodium hydrogen carbonate (or Sodium bicarbonate), Formula: NaHCO_3

10. Name one strong and one weak acid.

Answer: Strong Acid: Hydrochloric acid (HCl)

Weak Acid: Acetic acid (CH₃COOH)

11. Name two synthetic acid-base indicators.

Answer: Phenolphthalein and Methyl orange.

12. Name the acid present in grapes.

Answer: Tartaric acid.

13. What are those substances called which change colour with acids or bases?

Answer: Indicators (or Acid-Base Indicators).

14. What is the reaction between an acid and a base called?

Answer: Neutralization reaction.

15. Which acid is present in sour milk?

Answer: Lactic acid.

SHORT ANSWER TYPE (3 MARKS):

1. A) What is an indicator? B) How will you prepare China rose indicator?

Answer: A) Indicator: A chemical substance that changes its colour to show whether a given solution is acidic, basic, or neutral.

B) Preparation: Collect some China rose (Hibiscus) petals and place them in a beaker. Add some warm water. Keep the mixture for some time until water becomes coloured. Filter out the petals; the coloured water is your China rose indicator.

2. Give an important use of neutralisation reaction in daily life.

Answer: Treating Indigestion. Our stomach produces hydrochloric acid to help digest food. Overeating or stress can cause excessive acid production, leading to acidity or indigestion. To neutralize this excess acid, we take antacids like Milk of Magnesia (Magnesium hydroxide), which is a mild base.

3. A) Why do doctor's advice to make up for salt loss to the people who sweat more?

B) Give the colours of phenolphthalein and methyl orange indicators in acidic and basic media.

Answer: A) Salt Loss: When we sweat excessively, our body loses water along with essential minerals and salts (like sodium chloride). Doctors advise replacing these salts to prevent dehydration, muscle cramps, and to maintain the body's electrolyte balance.

B) Indicator Colours:

Phenolphthalein: Colourless in an acidic medium | Pink in a basic medium.

Methyl orange: Red/Pink in an acidic medium | Yellow in a basic medium.

4. A substance 'X' gives pink colour with phenolphthalein. When another substance 'Y' is added to it the pink colour disappears after some time. What are substances 'X' and 'Y'?

Answer: * Substance 'X' is a Base (because phenolphthalein turns pink only in a basic solution).

Substance 'Y' is an Acid (when added, it neutralizes the base 'X', making the solution neutral/acidic, causing the pink colour to disappear).

5. A) Which acids are used to make the following salts? i) Sulphates ii) Acetates iii) Nitrates

B) Why should curd and other sour substances not be kept in aluminium or copper containers?

Answer: A) Acids used: i) Sulphates - Sulphuric acid (H_2SO_4)

ii) Acetates - Acetic acid (CH_3COOH)

iii) Nitrates - Nitric acid (HNO_3)

B) Container Protection: Curd and sour substances contain organic acids. These acids react chemically with metals like copper and aluminium to produce toxic, poisonous metal salts. Consuming food stored in them can cause food poisoning.

6. What are strong and weak bases? Give two examples of each.

Answer: Strong Bases: Bases that ionize completely in water to release a high concentration of hydroxyl (OH^-) ions. Examples: Sodium hydroxide (NaOH), Potassium hydroxide (KOH).

Weak Bases: Bases that ionize only partially in water, releasing a lower concentration of hydroxyl (OH^-) ions. Examples: Ammonium hydroxide (NH_4OH), Calcium hydroxide ($\text{Ca}(\text{OH})_2$).

7. Write important uses of hydrochloric and sulphuric acid.

Answer: Hydrochloric Acid (HCl): Used for cleaning iron sheets before galvanization, in the manufacture of glue, and in laboratories as a critical reagent.

Sulphuric Acid (H_2SO_4): Used in car batteries, in manufacturing fertilizers (like superphosphate), paints, plastics, and synthetic detergents.

8. Are all acids corrosive in nature? Name few acids which are non-corrosive and may be part of our food.

Answer: No, all acids are not corrosive. Organic acids naturally found in foods are weak and completely safe to eat.

Examples in food: Citric acid (lemons/oranges), Malic acid (apples), and Lactic acid (curd).

9. A) Why do antacid tablets relieve the uneasiness due to indigestion?

B) What is used to neutralise an excessive basic soil?

Answer: A) Antacids: Antacids contain mild bases (like magnesium hydroxide or aluminium hydroxide). They chemically react with and neutralize the excess hydrochloric acid in the stomach, relieving burning sensations and pain.

B) Soil Treatment: Organic matter or compost (manure) is added. Organic matter decomposes to release organic acids, which neutralize the excess alkalinity of basic soil.

10. A) Why is sulphuric acid called “Kind of Chemicals” (King of Chemicals)?

B) Which bases are called alkalis? Give an example of alkali.

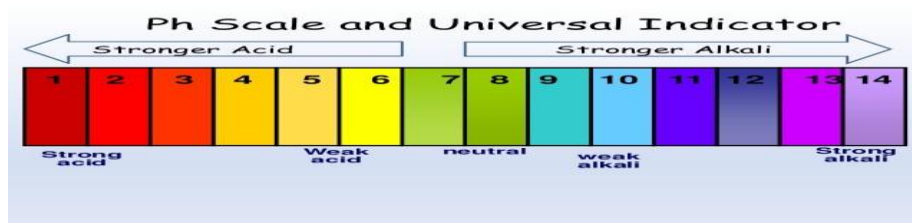
Answer: A) King of Chemicals: It is called the "King of Chemicals" because it is highly reactive and is heavily utilized in almost all industrial sectors—ranging from fertilizers, plastics, and dyes to oil refining and car batteries. A country's industrial progress can often be measured by its consumption of sulphuric acid.

B) Alkalis: Bases that completely dissolve in water are called alkalis. Example: Sodium hydroxide (NaOH).

LONG ANSWER TYPE (5 MARKS):

1. Four solutions A, B, C and D are taken in four test tubes. They were tested with four indicators – methyl orange, phenolphthalein, china rose and blue litmus. The observations are recorded below. Identify A,B,C and D as acids, bases or neutral salts.

Solution	Methyl orange	phenolphthalein	China rose	Blue litmus
A)	Orange	Colourless	Pink	Blue
B)	Yellow	Pink	Green	Blue
C)	Red	Colourless	Magenta	Red
D)	Yellow	Pink	Green	Blue



Answer:

Solution A - Neutral salt.

Solution B - Base.

Solution C - Acid.

Solution D – Base

2. Give few important applications of neutralisation reactions.

Answer: 1) Indigestion Treatment: Neutralizing stomach acid with basic antacids like Milk of Magnesia.

2) Ant/Bee Stings: Ant bites inject formic acid. Rubbing a mild base like moist baking soda (NaHCO_3) or calamine lotion (zinc carbonate) neutralizes it and stops the sting.

3) Factory Waste Treatment: Factory waste often contains acidic pollutants. Bases like slaked lime are mixed in to neutralize the liquids before dumping them safely into water bodies.

4) Soil Treatment: Excessively acidic soil is treated with quicklime (CaO) to normalize it for healthy plant growth.

3. A) How will you prepare turmeric indicator? Using this indicator gives tests for limewater, sugar solution and soap solution. B) Can turmeric paper be used to differentiate between an acid and a neutral solution? Explain your answer.

Answer: A) Preparation & Test: Take a tablespoon of turmeric powder, add a little alcohol or warm water, and make a paste. Deposit it onto blotting/filter paper and let it dry. Cut into thin strips.

Limewater (Base): Turns the yellow strip Reddish-brown.

Soap Solution (Base): Turns the yellow strip Reddish-brown.

Sugar Solution (Neutral): No change (Stays yellow).

B) Differentiation: No, turmeric paper cannot differentiate between an acid and a neutral solution. Turmeric remains its natural yellow color in both acidic and neutral environments. To tell them apart, you would need another indicator like blue litmus paper.

4. A) Give one word answer for the following

B) If we touch the test tube immediately after carrying out the neutralization reaction... it is found to be hot. Explain.

Answer: A) One Word Answers:

(i) A base which is soluble in water: Alkali

(ii) A compound which changes colour with acid and base: Indicator

(iii) An indicator extracted from lichens: Litmus

(iv) A substance formed when an acid and a base react: Salt

(v) A substance which is sour in taste and gives hydrogen ions in the solution: Acid

B) Hot Test Tube: Neutralization is an exothermic reaction, meaning energy is released in the form of heat during the chemical bond formation between H^+ and OH^- ions to produce water (H_2O). This released heat raises the temperature of the mixture and the glass tube.

5. You are given five samples A, B, C, D and E. Out of these, two are acidic, two are basic and one is neutral. (D) is a stronger acid than (C). (B) is neutral while (E) is a weaker base than (A). Match these samples with the given pH values: 7.0, 12.8, 2.1, 9.4 and 5.5? What is the significance of pH scale?

Answer: Matching Samples:

D (Strongest acid) pH 2.1

C (Weaker acid than D) pH 5.5

B (Neutral) pH 7.0

A (Stronger base) pH 12.8

E (weaker base than A) pH 9.4

Significance of pH scale: The pH scale measures the exact strength or concentration of hydrogen ions (H^+) in a solution. It ranges from 0 to 14, enabling us to precisely evaluate how strong or weak an acid or base is, which is crucial for chemical testing, farming, and medicine.

6. Tooth enamel is one of the hardest substances in our body. How does it damage due to eating chocolates and sweets? What should we do to prevent it?

Answer: Damage Process: Bacteria in our mouth break down sugar remnants left behind from chocolates and sweets. This bacterial degradation process produces acids. When the pH in our mouth drops below 5.5, these acids begin to dissolve (demineralize) the calcium phosphate in tooth enamel, creating cavities.

Prevention: We must brush our teeth thoroughly twice a day using basic toothpaste (which neutralizes the mouth acids) and rinse our mouth out cleanly after every meal.

7. A) A yellow curry stain on a white shirt turns red when it is washed with the soap. Give reason. B) A baker found that the cake prepared by him is hard and small in size. Which ingredient has he forgotten to add that would have made the cake fluffy? Give reason.

Answer: A) A yellow curry stain contains turmeric, which is a natural indicator. Turmeric remains yellow in acidic or neutral substances but turns red or reddish-brown in a basic (alkaline) medium.

Soap solution is basic (alkaline) in nature. Therefore, when the yellow curry stain is washed with soap, the turmeric reacts with the alkaline soap solution and changes from yellow to red.

Conclusion: The curry stain turns red because turmeric acts as a natural indicator and changes colour in the basic medium of soap.

B) The baker forgot to add Baking powder (or baking soda combined with a mild edible acid like tartaric acid). When heated during baking, baking soda decomposes to release carbon dioxide gas (CO_2). This expanding gas bubbles up through the wet batter, causing the cake to rise and become soft and fluffy. Without it, the cake remains flat, hard, and dense.

SUBJECTIVE QUESTIONS:

1. Why is KOH called caustic potash?

Answer: It is called "caustic" because it is highly corrosive and chemically burns skin tissue upon contact. "Potash" originates from the traditional method of extracting potassium salts from wood ashes soaked in a pot.

2. Why is nitric acid used in the purification of gold?

Answer: Nitric acid (HNO_3) is a powerful oxidizing agent. It readily dissolves cheaper base-metal impurities (like copper, silver, and zinc) mixed inside a crude alloy, but it leaves pure gold completely untouched because gold is an unreactive noble metal.

3. Name the substances formed by the dissolution of following oxides in water.

A) CO_2

B) MgO

Answer: A) Carbonic acid ($\text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{CO}_3$)

B) Magnesium Hydroxide ($\text{MgO} + \text{H}_2\text{O} \rightarrow \text{Mg(OH)}_2$)

4. What is the action of litmus on an acid and a base?

Answer:

Sustance	Blue litmus	Red litmus
Acid	Turns red	Remains red
Base (Alkali)	Remains blue	Turns blue

5. Name the salt used for the manufacture of glass. Give its formula.

Answer: Sodium carbonate (Washing soda)

Formula: $\text{Na}_2\text{CO}_3 \cdot \text{H}_2\text{O}$

6. Name the acid present in: A) Lemon B) Vinegar

Answer: A) Lemon - Citric acid

B) Vinegar - Acetic acid

7. What are mineral acids? How can they be further classified on the bases of nature of the constituents?

Answer: Mineral acids are synthetic acids prepared from the inorganic mineral compounds of the earth. They are classified based on their composition into:

Oxyacids: Acids containing oxygen along with hydrogen and another element (e.g., H_2SO_4).

Hydracids: Acids containing only hydrogen combined with a non-metallic element other than oxygen (e.g., HCl).

8. Though phosphorus acid (H_3PO_3) contains three hydrogen molecules, it is a dibasic acid. Give reason.

Answer: An acid's basicity depends entirely on the number of replaceable hydrogen atoms bonded to highly electronegative oxygen atoms. In the molecular structure of phosphorus acid (H_3PO_3), only two hydrogen atoms are bonded directly to oxygen, while the third hydrogen is bonded directly to phosphorus and cannot ionize in water. Thus, it can release only two H^+ ions.

9. Tartaric acid is one of the components in baking powder. What is its role?

Answer: Baking powder is a mixture of baking soda (a base) and a solid weak acid like tartaric acid. When mixed with water/milk in a recipe, tartaric acid reacts with the sodium bicarbonate to generate carbon dioxide gas without leaving behind a bitter, basic-tasting chemical by product.

10. Calcium hydroxide is added to soils before applying fertilisers. Justify the purpose.

Answer: Many fertilizers are chemically acidic and lower soil pH over time. Adding calcium hydroxide (a base) neutralizes extreme soil acidity, optimizing the ground conditions so plants can absorb nutrients effectively.