

Chapter 5: Acid, bases and salts

Question. 1. Fill in the blanks

- (1) The chemical formula of red oxide is **Fe_2O_3** .
- (2) The electrode connected to the negative terminal of a battery by means of a conducting wire is called a **cathode**
- (3) The electrode connected to the positive terminal of a battery is called an **anode**.
- (4) Aluminium oxide reacts with sodium hydroxide to form **sodium aluminate (NaAlO_2)** and water.
- (5) Magnesium metal reacts with dilute hydrochloric acid and an inflammable gas, **hydrogen**, is formed.
- (6) pH 7 indicates a **neutral** solution
- (7) pH : power of **hydrogen**
- (8) The proportion of a solute in a solution is called the **concentration** of the solute in the solution.

Question. 2. Odd man out

- (1) Chloride, nitrate, hydride, ammonium. **Hydride**
- (2) Hydrogen chloride, sodium hydroxide, calcium oxide, ammonia.
Ammonia
- (c) Acetic acid, carbonic acid, hydrochloric acid, nitric acid. **Acetic acid**
- (d) Ammonium chloride, sodium chloride, potassium nitrate, sodium sulphate. **Ammonium chloride**
- (e) Sodium nitrate, sodium carbonate, sodium sulphate, sodium chloride.
Sodium chloride
- (f) Calcium oxide, magnesium oxide, zinc oxide, sodium oxide. **Zinc oxide**
- (g) Crystalline blue vitriol, crystalline common salt, crystalline ferrous sulphate, crystalline sodium carbonate. **Crystalline common salt (Sodium chloride)**
- (h) Sodium chloride, potassium hydroxide, acetic acid, sodium acetate.
Acetic acid

Question. 3. Answer in one sentence**(1) What is strong acid?**

Answer: On dissolving in water, a strong acid dissociates almost completely and the resulting aqueous solution contains mainly H^+ ions and the concerned acidic radical.

(2) What is strong base?

Answer: On dissolving in water, a strong base dissociates almost completely and the resulting aqueous solution contains mainly OH^- ions and the concerned basic radicals.

(3) What is alkali?

Answer: The bases which are highly soluble in water are called alkali.

(4) What is weak acid?

Answer: On dissolving in water a weak acid does not dissociate completely. The resulting aqueous solution contains H^+ ion and the concerned acidic radical in small proportion along with large proportion of the undissociated molecules of the acid.

(5) What is weak base?

Answer: On dissolving in water a weak base does not dissociate completely. The resulting aqueous solution contains a small proportion of OH^- ions and the concerned basic radical along with a large proportion of undissociated molecules of the base.

(6) What is Basicity of acids?

Answer: The number of H^+ ions obtainable by the dissociation of one molecule of an acid is called its basicity. **(7) What is Acidity of bases?**

Answer: The number of OH^- ions obtainable by the dissociation of one molecule of a base is called its acidity.

Question. 4. Answer the following question.**(1) What is concentration of acid and bases?**

Answer: The concentration of acids and bases refers to the amount of acid or base dissolved in a given volume of solution. It is commonly expressed in terms of molarity (moles of solute per liter of solution), where a higher molarity means a stronger, more concentrated solution.

(2) What is universal indicator?

Answer: A universal indicator is a pH indicator composed of a mixture of dyes that change color gradually over a wide pH range (0-14), providing a visual indication of the acidity or alkalinity of a solution. It changes from red in strongly acidic solutions to violet in strongly basic solutions.

(3) Explain water of crystallisation?

Answer: Water of crystallization refers to the fixed number of water molecules chemically bound within the crystalline structure of a compound. These water molecules are necessary for the compound to maintain its crystalline shape. For example, copper sulfate pentahydrate ($\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$) has five water molecules of crystallization.

(4) Explain with diagram Electrolysis of water?

Answer:

Setup:

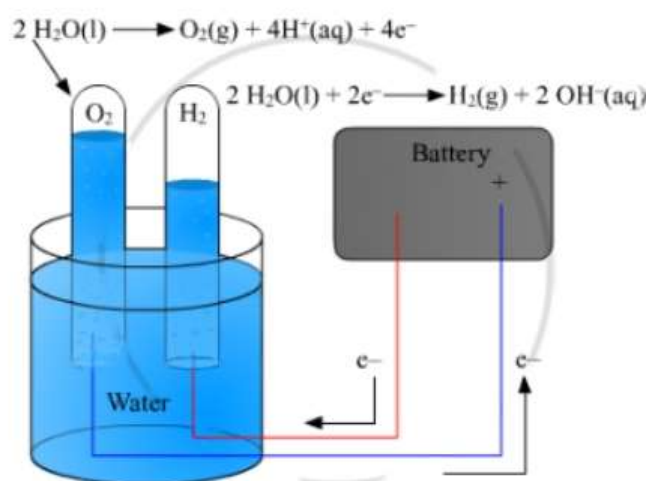
1. **Electrolysis Cell:** A container filled with water, usually mixed with a small amount of acid or base (such as sulfuric acid or sodium hydroxide) to increase the conductivity of water.

2. **Electrodes:** Two electrodes (an anode and a cathode) are placed in the water and connected to a power source (like a battery or DC power supply).

- **Anode (positive electrode):**
Oxygen gas is released here.
- **Cathode (negative electrode):** Hydrogen gas is released here.

3. **Power Supply:** Provides the electrical current needed for electrolysis.

4. **Water:** Pure water has low conductivity, so an electrolyte (acid/base) is added.



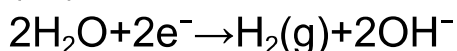
Reaction:

The electrolysis of water decomposes it into hydrogen (H₂) and oxygen (O₂) gases when an electric current is passed through the water.

The reactions at the electrodes are:

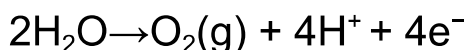
At the Cathode (Reduction):

Hydrogen ions (H⁺) gain electrons (reduction) to form hydrogen gas (H₂).

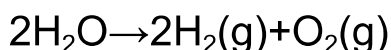


At the Anode (Oxidation):

Water molecules lose electrons (oxidation) to form oxygen gas (O₂) and hydrogen ions (H⁺).



Overall Reaction:



Hydrogen gas (H₂) is collected at the cathode.

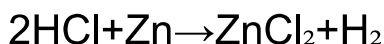
Oxygen gas (O₂) is collected at the anode

(5) Explain the Reaction of acids with metals.

Answer: When acids react with metals, they produce a salt and hydrogen gas. The general reaction is:



For example, hydrochloric acid reacts with zinc to form zinc chloride and hydrogen gas:

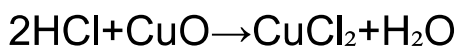


(6) Explain the Reaction of acids with oxides of metals.

Answer: Acids react with metal oxides to form salt and water. Metal oxides are basic in nature, so they neutralize acids in the following reaction:



For example, hydrochloric acid reacts with copper oxide to form copper chloride and water:



(7) Explain the Reaction of bases with oxides of non-metals.

Answer: Bases react with non-metal oxides to form salts and water.

Non-metal oxides are acidic in nature, and when they react with a base, they neutralize each other:

Base+Non-metal Oxide→Salt+Water

For example, sodium hydroxide reacts with carbon dioxide to form sodium carbonate and water:

