TOPIC: ACID, BASES AND SALTS

Date 7/5/16 No.

1.1 Definitions

1) An **acid** is a substance that produces hydrogen ions, H^+ ions when dissolved in water.

2) The **strength of an acid** refers do the extent to which the acid molecule dissociates (i.e splits into ions) when dissolved in water.

3) **Base** is a substance that reacts with an acid to form salt and water only.

4) **Neutralisation reaction**: Reaction between an acid and base to form a salt and water only.

5) **concentration**: Tells how much a substance is dissolved in 1dm³ of the solution

6) **strength**: Refers to how readily an acid/alkali dissociates (ionises) when dissolved in water

7) **Alkali**: Base which is soluble in water.

8) **pH Scale**: Set of numbers used to show whether a solution is acidic, neutral or alkaline

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Learning outcomes:

1) Define an **acid** in terms of **ions produced in aqueous solution** and **effect on Universal indicator**

2) Describe the **characteristic properties of acid** in **reactions with metal**.

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Example:

$Mg + H_2SO_4 \longrightarrow MgSO_4 + H_2$

Magnesium — Sulfuric acid — Magnesium sulfate — Hydrogen

→ $MgSO_4$ is a salt. Salts of H_2SO_4 are called sulfates, those of nitric acid are called nitrates and those of HCl are chlorides.

- Acids react with carbonates to form salt, water and carbon dioxide. The general equation is:

Acid + Carbonate → Salt + water + carbon dioxide

Example:

$Na_2CO_3 + 2HCl \longrightarrow 2NaCl + H_2O + Co_2$

Sodium carbonate — dilute hydrochloric acid — Sodium Chloride — Water — Carbon dioxide.

- Acids react with metal oxides and hydroxides to form salt and water only. This reaction is called neutralisation reaction

General equation:

Acid + metal oxide → Salt + water

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Example:

$ZnO + H_2SO_4 \longrightarrow ZnSO_4 + H_2O$

Zinc oxide — dilute Sulfuric acid — Zinc sulfate — water

- General equation for reaction of an acid with metal hydroxide:

Acid + metal hydroxide → Salt + water

Example:

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* acidic oxides do not react with acids.

5) Basic oxides:

- Oxides of metals are called basic oxides
- Most basic oxides are insoluble in water.
- Few oxides, such as sodium oxide, Na_2O, potassium oxide, K_2O and calcium oxide CaO dissolve in water to form alkaline solutions (alkalis)

Example:

- When calcium oxide is added to water, a vigorous reaction occurs. A white suspension of calcium hydroxide is formed.
- Calcium hydroxide is sparingly soluble in water.

$$CaO + H_2O \rightarrow Ca(OH)_2$$

calcium oxide — water — calcium hydroxide

- Calcium oxide, CaO is known as quicklime and aqueous calcium hydroxide ~~is known as~~ (slaked lime) in water is known as limewater.
- Basic oxides are solid at room temperature
- React with acids to form salt & water

Example:

$$CaO + 2HCl \rightarrow CaCl_2 + H_2O$$

Pto →

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Q2 How would you separate the following mixtures?

a) copper oxide from a mixture of copper oxide and zinc oxide?

Ans:
- Zinc oxide is atmospheric oxide and will dissolve in sodium hydroxide solution. copper oxide is basic oxide and hence won't dissolve in sodium hydroxide solution.
- The following steps are used to separate copper oxide from a mixture of copper and zinc oxide:

Step 1) Add excess sodium hydroxide solution to a mixture of zinc oxide and copper oxide and stir

Step 2) Filter the reaction mixture. copper oxide will be the residue.

Step 3) Wash copper oxide with distilled water and dry it using filter paper

b) Carbon monoxide from a mixture of carbon monoxide and carbon dioxide

[in presence of sodium hydroxide soln]

Ans: Carbon monoxide is a neutral oxide whereas carbon dioxide [CO_2] is an acidic oxide and hence its soluble in sodium hydroxide solution.

Step 1: Pass the mixture of gases [CO and CO_2] into sodium hydroxide soln. (NaOH)

Step 2: Collect carbon monoxide by displacement of water.

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