CHEMISTRY STUDY MATERIALS FOR CLASS 10
(NCERT Based notes of Chapter -02)

GANESH KUMAR DATE:- 21/04/2021

ACIDS, BASES AND SALTS

REACTION OF ACID WITH HYDROGEN CARBONATES (BICARBONATES):

Acids give carbon dioxide gas, respective salt and water when they react with metal hydrogen carbonate.

Acid + Metal hydrogen carbonate → Salt + Carbon dioxide + Water

Examples:

- Hydrochloric acid gives carbon dioxide, sodium chloride and water when it reacts with sodium bicarbonate.

  $NaHCO_3 + HCl \rightarrow NaCl + CO_2 + H_2O$

- Sulphuric acid gives sodium sulphate, carbon dioxide gas and water when it reacts with sodium bicarbonate.

  $2NaHCO_3 + H_2SO_4 \rightarrow Na_2SO_4 + 2CO_2 + 2H_2O$

- Sodium bicarbonate is also known as sodium hydrogen carbonate, baking soda, baking powder, bread soda and bicarbonate of soda.

  The gas evolved because of reaction of acid with metal carbonate or metal hydrogen carbonate turns lime water milky. This shows that the gas is carbon dioxide gas. This happens because of formation of white precipitate of calcium carbonate.

  $Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$

  $CaCO_3 + CO_2 + H_2O \rightarrow Ca(HCO_3)_2$

But when excess of carbon dioxide is passed through lime water, it makes milky colour of lime water disappear. This happens because of formation of calcium hydrogen carbonate. As calcium hydrogen carbonate is soluble in water, thus the milky colour of solution mixture disappears.

REACTION OF ACID WITH MARBLE AND EGG SHELL:

Since, marble and egg shell are made of calcium carbonate, hence when acid is poured over marble or egg shell, bubbles of carbon dioxide are formed.

USES OF ACIDS

- Sulphuric acid (King of chemicals) is used in car battery and in the preparation of many other compounds.
- Nitric acid is used in the production of ammonium nitrate which is used as fertilizer in agriculture.
- Hydrochloric acid is used as cleansing agent in toilet.
- Tartaric acid is a constituent of baking powder.
- Salt of benzoic acid (sodium benzoate) is used in food preservation.
- Carbonic acid is used in aerated drinks.

BASES

Base is a substance which releases hydroxide ions when dissolved in water. It is a substance which is bitter in taste and soapy to touch (e.g. Washing soda, caustic soda and caustic potash). They change red litmus to blue. They are pink with phenolphthalein and yellow with methyl orange.

CLASSIFICATION OF BASES

1. **Based on ionisation**

   Strong bases:- These are bases which ionise completely in aqueous solution eg. NaOH, KOH.

   Weak bases:- These are bases which ionise partially in aqueous solution eg. NH4OH, Ca(OH)2.

2. **Based on their acidity**

   Monoacidic base:- It is a base which ionises in water to give one hydroxide ion per molecule eg. NaOH, KOH.

   Diacidic base:- It is a base which ionises in water to give two hydroxide ions per molecule eg. Ca(OH)2, Mg(OH)2.

   Triacidic base:- It is a base which ionises in water to give three hydroxide ions per molecule eg. Al(OH)3, Fe(OH)3.

3. **Based on the concentration:**

   Depending on the percentage or amount of base dissolved in water, bases are classified as concentrated alkali and dilute alkali.

   Concentrated alkali:- It is an alkali having a relatively high percentage of alkali in its aqueous solution.

   Dilute alkali:- It is an alkali having a relatively low percentage of alkali in its aqueous solution.

REACTION OF BASE WITH METALS:

When alkali (base) reacts with metal, it produces salt and hydrogen gas.

Alkali + Metal → Salt + Hydrogen

Example:

- Sodium aluminate and hydrogen gas are formed when sodium hydroxide reacts with aluminium metal.

$$2NaOH + 2Al + 2H_2O \rightarrow 2NaAlO_2 + 2H_2$$

- Sodium hydroxide gives hydrogen gas and sodium zincate when reacts with zinc metal. $2NaOH + Zn \rightarrow Na_2ZnO_2 + H_2$

REACTION OF BASE WITH OXIDES OF NON-METALS:

Non-metal oxides are acidic in nature. For example; carbon dioxide is a non-metal oxide. When carbon dioxide is dissolved in water it produces carbonic acid.

Therefore, when a base reacts with non-metal oxide both neutralize each other resulting respective salt and water are produced.

Base + Non-metal oxide → Salt + Water

Example:

- Calcium hydroxide gives calcium carbonate and water when it reacts with carbon dioxide. $Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$
- Sodium hydroxide gives sodium carbonate and water when it reacts with carbon dioxide. $2NaOH + CO_2 \rightarrow Na_2CO_3 + H_2O$

USES OF BASES

- Sodium hydroxide is used in the manufacture of soap.
- Calcium hydroxide is used in white washing the buildings.Magnesium hydroxide is used as a medicine for stomach troubles.
- Ammonium hydroxide is used to remove grease stains from clothes.

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