Chemical Reactions and Equations

Types of Chemical Reactions - 1

Contents

1. Combination Reactions

Reaction in which a single product is formed from two or more reactants is known as a combination reaction

$$A + B \rightarrow AB$$

a) Quick Lime with Water

Quick lime (calcium oxide) reacts vigorously with water to produce slaked lime (calcium hydroxide)

$$CaO\ (s) + H_2O\ (l) \rightarrow Ca(OH)_2\ (aq) + Heat$$

A solution of slaked lime is used for whitewashing of walls. Calcium hydroxide reacts slowly with the carbon dioxide in air to form a thin layer of calcium carbonate on the walls. Calcium carbonate is formed after two to three days of whitewashing and gives a shiny finish to the walls.

$$Ca(OH)_{2\ (aq)} + CO_2\ (g) \rightarrow CaCO_3\ (s) + H_2O\ (l)$$

b) Burning of Coal

$$C\ (s) + O_2\ (g) \rightarrow CO_2\ (g)$$

c) Formation of Water

$$2H_2\ (g) + O_2\ (g) \rightarrow 2H_2O\ (l)$$

2. Exothermic Reactions

Reaction in which heat (energy) is evolved along with the formation of products is known as an exothermic reaction

a) Quick Lime with Water

Reaction of quick lime with water is an exothermic reaction where energy is given out in the form of heat

$$CaO\ (s) + H_2O\ (l) \rightarrow Ca(OH)_{2\ (}aq) + Heat$$

b) Burning of Natural Gas

$$CH_4\ (s) + 2O_2\ (g) \rightarrow CO_2\ (g) + 2H_2O\ (g) + Heat$$

c) Cellular Respiration

$$C_6H_{12}O_6\ (aq) + O_2\ (aq) \rightarrow CO_2\ (aq) + H_2O\ (aq) + Energy$$

3. Decomposition Reactions

Reaction in which a single reactant breaks down to give simpler products is known as a decomposition reaction

$$AB \rightarrow A + B$$

a) Heating of Ferrous Sulphate

Ferrous sulphate crystals lose water when heated and the green colour of the crystals changes to red or reddish-brown. It then decomposes to ferric oxide (Fe_2O_3), sulphur dioxide (SO_2) and sulphur trioxide (SO_3)

$$2FeSO_4\,(s) \xrightarrow{\text{Heat}} Fe_2O_3\,(s) + SO_2\,(g) + SO_3\,(g)$$

When a decomposition reaction is carried out by heating, it is called thermal decomposition.

b) Heating of Calcium Carbonate

Decomposition of calcium carbonate to calcium oxide and carbon dioxide on heating is an important decomposition reaction used in various industries

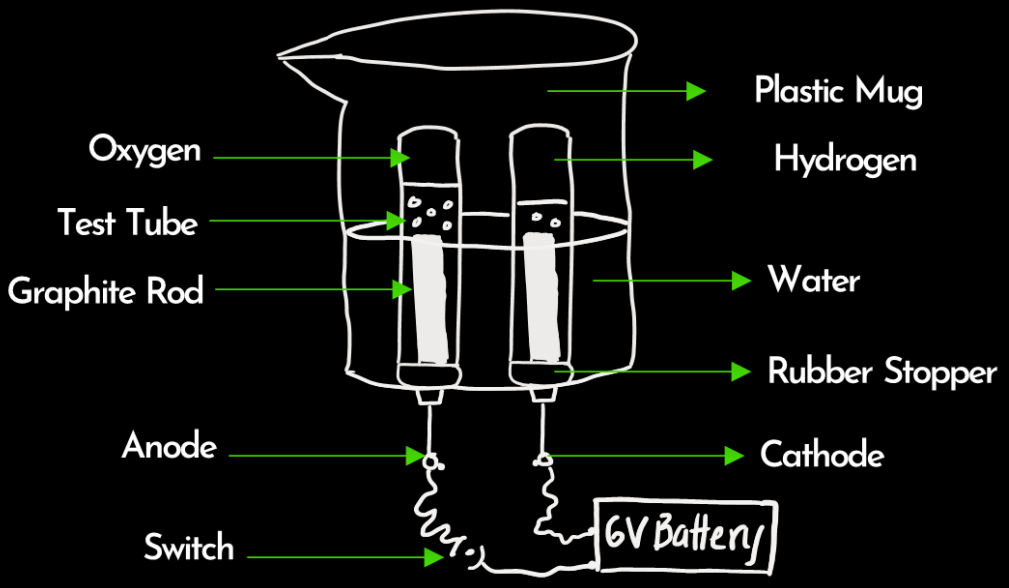
$$CaCO_3\,(s) \xrightarrow{\text{Heat}} CaO(s) + CO_2\,(g)$$

c) Heating of Lead Nitrate

$$2Pb(NO_3)_2\,(s) \xrightarrow{\text{Heat}} 2PbO(s) + 4NO_2\,(g) + O_2\,(g)$$

Nitrogen dioxide is observed as brown gas fumes upon heating lead nitrate

d) Electrolysis of Water



$$2H_2O\ (l) \rightarrow 2H_2\ (g) + O_2\ (g)$$

e) Decomposition of Silver Chloride/ Silver Bromide

The following reactions are used in black and white photography

$$AgCl\ (s) \xrightarrow{\text{Sunlight}} 2Ag(s) + Cl_2\ (g)$$

$$AgBr\ (s) \xrightarrow{\text{Sunlight}} 2Ag(s) + Br_2\ (g)$$

4. Endothermic Reactions

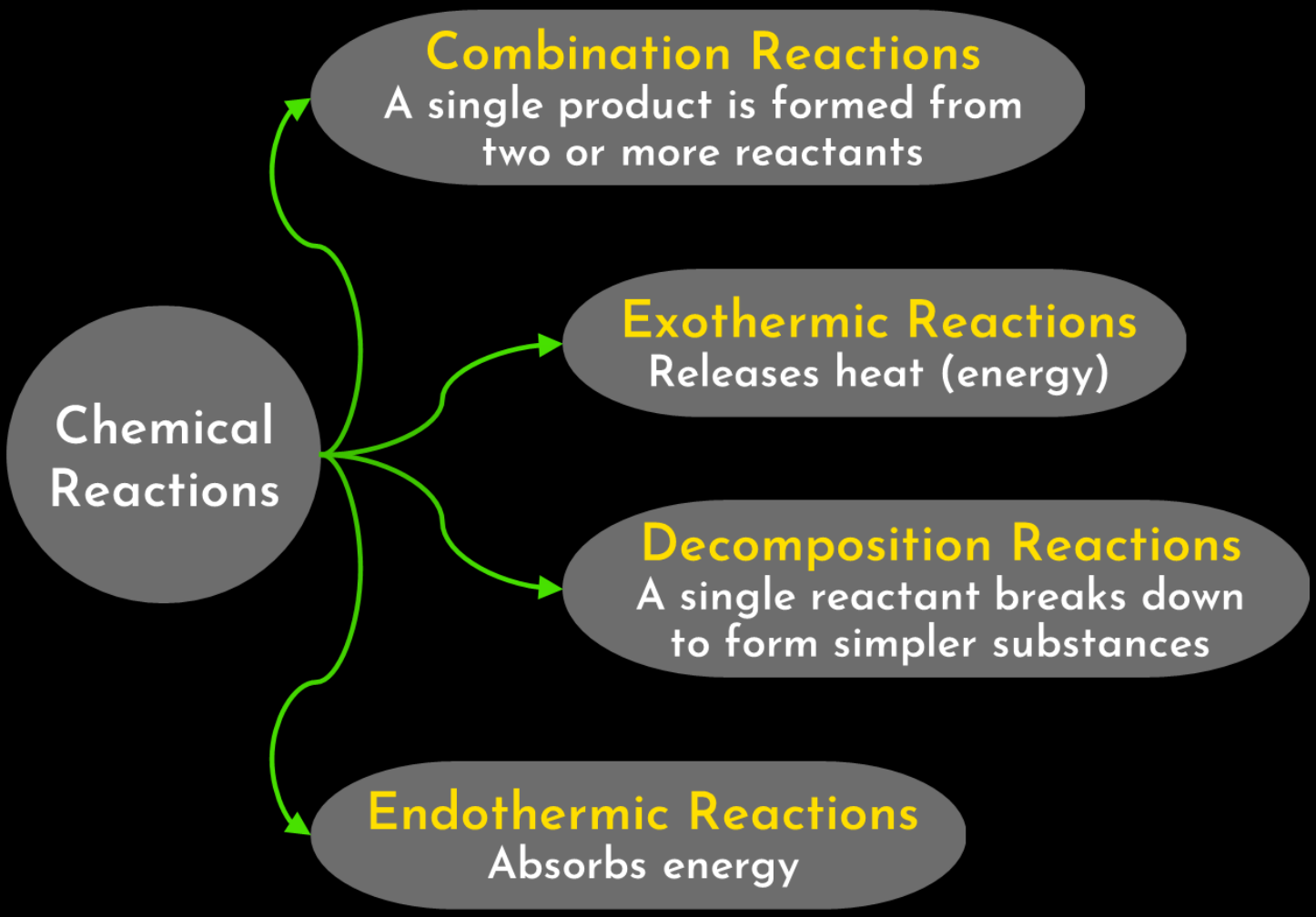
Reaction in which heat (energy) is absorbed is known as an endothermic reaction

a) Photosynthesis

During photosynthesis, energy required for the reaction of synthesis of glucose in absorbed in the form of sunlight

$$6CO_2(aq)+12H_2O(aq) \xrightarrow{\text{Sunlight}} C_6H_{12}O_6(aq) + 6O_2(aq) + 6H_2O(l)$$

*All examples listed as Decomposition Reactions in these notes are also examples of Endothermic Reactions


Chemical Reactions
Combination Reactions
A single product is formed from two or more reactants
Exothermic Reactions
Releases heat (energy)
Decomposition Reactions
A single reactant breaks down to form simpler substances
Endothermic Reactions
Absorbs energy