Chemical Reactions & Equations
Types of Chemical Reactions

TYPES OF CHEMICAL REACTIONS:

(a) Addition Reactions:

It is a union of two or more than two substances to from a new substance. It may be brought about by the application of heat, light electricity or pressure.

For eg. $H_2 + CI_2 \rightarrow 2HCI$

In the above example H_2 and CI_2 two elements combine to from hydrogen chloride.

Addition reactions may be formed in the following conditions –

(i) When two or more elements combine to form a new compound.

Synthesis reaction: It is a type of addition reaction in which a new substance is formed by the union of its component elements.

For eg. $N_2 + 3H_3 \rightarrow 2NH_3$ (Haber's Process)

Ammonia is synthesised from its components, nitrogen and hydrogen, so it is a synthetic reaction.

- **All synthesis reaction are addition reactions but all addition reactions are not synthesis reactions.**

Other Example of synthesis reactions are -

- $2H_2 + O_2 \longrightarrow 2H_2O$
- $2Mg + O_2 \longrightarrow 2MgO$
- $2Na + CI_2 \longrightarrow 2NaCI$

(ii) When two or more compounds combine to from a new compound.

For eg.

- $NH_3 + HCI \longrightarrow NH_4CI$
- $CaO + CO_2 \longrightarrow CaCO_3$
- $CH_2 = CH_2 + Br_2 \longrightarrow \begin{matrix} CH_2 - Br \\ | \\ CH_2 - Br \end{matrix}$

(iii) When and element and a compound combine to from a new compound.

For eg.

- $2CO + O_2 \longrightarrow 2CO_2$
- $2CO_2 + O_2 \longrightarrow 2CO_3$

➢ **Only single substance is formed as a product in the addition reactions.**

(b) Decomposition Reaction:

It is breaking up of a substance into simpler compounds and it may be brought about by the application of heat, light, electricity etc.

(i) A decomposition reaction brought by heat is known as thermal decomposition.

For eg.

- $CaCO_3 \xrightarrow{\Delta} CaO + CO_2$
- $2Pb\,(NO_3)_2 \xrightarrow{\Delta} 2PbO + 4NO_2 + O_2$

(ii) Decomposition performed by electricity is known as electrolysis.

For eg.

- $2H_2O \xrightarrow{\text{Electricity}} 2H_2 + O_2$
- $2NaCI \xrightarrow{\text{Electricity}} 2Na + CI_2$
- $2AI_2O_3 \xrightarrow{\text{Electricity}} 4\,AI + 3O_2$

(iii) A decomposition reaction brought by light is known as photo decomposition.

For eg.

- $2AgBr \xrightarrow{Light} 2Ag + Br_2$
- $2AgCI \xrightarrow{Light} 2Ag + CI_2$

(iv) Decomposition reaction in which a compound decomposes into its elements is known as analysis reaction.

For eg.

- $2HgO \xrightarrow{\Delta} 2Hg + O_2$
- $2HI \xrightarrow{\Delta} H_2 \uparrow + \downarrow$

All analysis reactions are decomposition reactions, but all decomposition reactions are not analysis reactions.

- **Decomposition reaction is just opposite of the addition reaction.**

(c) Displacement Reactions :

It involves displacement of one of the constituents of a compound by another substance and may be regarded as a displacement reaction.

For eg.

(i) Zinc displaces hydrogen from sulphuric acid.

$Zn\ (s) + dill.\ H_2SO_4\ (aq) \longrightarrow ZnSO_4\ (aq) + H_2\uparrow$

(ii) Iron displaces copper from a copper sulphate solution.

$Fe\ (s) + CuSO_4(aq) \longrightarrow FeSO_4\ (aq) + Cu$

- **In general a more reactive element displaces a less reactive element from the soluble solution of its salt.**

(d) Double Displacement:

It is mutual exchange of the radicals of two compounds taking part in the reaction and results in the formation of two new compounds.

- $NaCI\ (aq) + AgNO_3\ (aq) \longrightarrow AgCI \downarrow + NaNO_3\ (aq)$

- $BaCI_2\ (aq) + Na_2SO_4\ (aq) \longrightarrow BaSO_4 \downarrow + 2NaCI\ (aq)$

➢ **Acid base neutralisation reactions are double displacement reactions.**