Types of Reactions

Metal Oxides

I.) Formation

A.) Alkai Metals-very controlled amount of oxygen

$4\ M + O_2 \rightarrow 2\ M_2O$

B.) Alkaline Earth Metals

$MCO_3 \xrightarrow{\Delta} MO + CO_2$

$M(OH)_2 \xrightarrow{\Delta} MO + H_2O$

II.) Reactions

$M_2O + H_2O \rightarrow 2\ MOH$ } water

$MO + H_2O \rightarrow M(OH)_2$ }

$M_2O + 2\ HCl \rightarrow 2\ MCl + H_2O$ } acid

$MO + 2\ HNO_3 \rightarrow M(NO_3)_2 + H_2O$ }

Metal Hydoxides

I.) Formation

$M + H_2O \rightarrow 2\ MOH$ → very explosive

$M_2O + H_2O \rightarrow 2\ MO$ }

$M_2O + H_2O \rightarrow 2\ MOH$ }

$MO + H_2O \rightarrow M(OH)_2$

Soluble hydroxide in solution with salt of insoluble hydroxide

$Mg(NO_3)_2\ (aq) + 2\ NaOH\ (aq) \rightarrow Mg(OH)_2\ (s) + 2\ NaNO_3\ (aq)$

II.) Reactions

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

Carbonates

I.) Formation

$M_2O + CO_2 \rightarrow M_2CO_3$ } metal oxides

$MO + CO_2 \rightarrow MCO_3$ }

$2\ MOH + CO_2 \rightarrow M_2CO_3 + H_2O$

$M(OH)_2 + CO_2 \rightarrow MCO_3 + H_2O$

II.) Reactions

$CO_3^{2-} + H_2O \rightarrow HCO_3^- + OH^-$

Metal Carbonate + Acid → salt + CO_2 + water

Ex: $CaCO_3 + 2\ HCl \rightarrow CaCl_2 + CO_2 + H_2O$

Hydrogen Carbonates

Reaction:

$2\ NaHCO_3 \xrightarrow{\Delta} Na_2HCO_3 + H_2O + CO_2$

Hydrides

Formation

$2\ M + H_2 \rightarrow 2\ MH$

$M + H_2 \rightarrow MH_2$

General Types of Reactions

Acid-Base Reaction: $2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$

Oxidation-Reduction Reaction (Single Replacement Reaction): $Mg + H_2S\ (g) \rightarrow MgS + H_2\ (g)$

Metathesis Reaction (Double Replacement or Precipitation Reaction):

$Ba^{2+}\ (aq) + 2\ Cl^-\ (aq) + 2\ Na^+\ (aq) + SO_4^{2-}\ (aq) \rightarrow BaSO_4\ (s) + 2\ Na^+\ (aq) + Cl^-\ (aq)$

Types of Reactions

Nonmetal Oxides

Most nonmetal oxides will react with water to form oxyacids

$N_2O_5 + H_2O \rightarrow HNO_3$