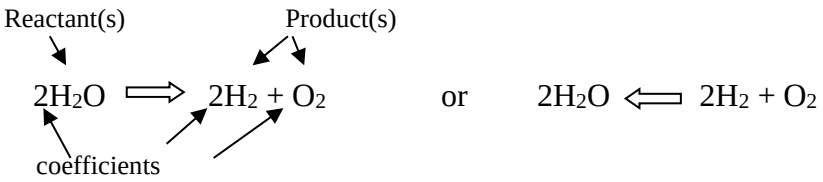
Chemical Equations

Chemical Equations are composed of three components: (a) reactants (b) products and (c) coefficients.



Law of Conservation of Matter must be observed in all reactions, thus the need for Balancing a chemical equation.

CLASSIFICATION OF CHEMICAL COMPOUNDS

- Salts
- Acids & Bases
- Electrolytes
- Polymers

Salts

- Contains a metallic ion
- Contains a nonmetallic or polyatomic ion

Acids & Bases

- Bronsted Acid (A species which donates protons)
- Bronsted Base (A proton accepting species)
- Lewis Acid (An electron pair accepting species)
- Lewis Base (A species which donates an electron pair)

Electrolytes & Nonelectrolytes (compounds which conduct an electric current in solution)

- Strong electrolytes
- Weak electrolytes
- Nonelectrolytes

Polymers are very large molecules composed of many smaller units called monomers

Classification of Chemical Reactions by type

- Composition
- Decomposition
- Metathesis
- Replacement

Composition Reactions

$A + B \rightarrow AB$

Decomposition Reactions

$AB \rightarrow A + B$

(a) Binary Compounds -- Decompose into their component elements

$2HgO \rightarrow 2Hg + O_2(g)$

(b) Metallic Carbonates -- Decompose into metallic oxides and carbon dioxide

$CaCO_3 \rightarrow CaO + CO_2$

(c) Metallic Hydroxides -- Decompose into metallic oxides and water

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

(d) Metallic Chlorates -- Decompose into metallic chlorides and oxygen

$2KClO_3 \rightarrow 2KCl + 3O_2$

(e) Acids --Decompose into nonmetallic oxides and water

$H_2CO_3 \rightarrow CO_2(g) + H_2O$

Metathesis Reactions

$AB + CD \rightarrow AD + CB$

One product of a metathesis reaction will be:

Percipitate(s)
Gase(s)
Electrolyte(s)

Replacement Reactions

$AB + C \rightarrow AC + B$

- More active halogens replace less active halogens
  - activity decreases down the family
- More active metals replace less active metals
  - activity increases down the family

Two groups of reactions occur across more that one of the above types. The first group of reactions are so common that they are referred to as Redox Reactions, Oxidation-Reduction Reactions, or Combustion Reactions.

$2Na + Cl_2 \rightarrow 2NaCl$ Na is the reducing agent and Cl is the oxidizing agent

The second group are known as Acid-Base Neutralization -- A special case of metathesis reaction in which the products are always a salt and water

$HCl + NaOH \rightarrow NaCl + H2O$

$2HNO_3 + Ca(OH)_2 \rightarrow Ca(NO_3)_2 + 2H_2O$

A third group may move back and forth between reactant and product based on the chemical environment. These are known as Reversible Reactions.

- Occur in both directions simultaneously
- Establish equilibrium
- Dependent on the concentration of all substances

$PCl_5 \leftrightarrows PCl_3 + Cl_2$