Chemical Reactions

Chemical Reaction Types

- A chemical reaction is a process that is usually characterized by a chemical change in which the starting materials (**reactants**) are different from the **products**.
- Chemical reactions tend to involve the motion of electrons, leading to the formation and breaking of chemical bonds.
- There are several different types of chemical reactions and many ways of classifying them.

Synthesis Reaction

- In a synthesis reaction, two or more chemical reactants combine to form a more complex product.

$$A + B \rightarrow AB$$

- The combination of iron and sulfur to form iron (II) sulfide is an example of a synthesis reaction:

$$8Fe + S_8 \rightarrow 8FeS$$

Decomposition Reaction

- In a decomposition reaction, a compound is broken into smaller chemical components.

$$AB \rightarrow A + B$$

- The electrolysis of water into oxygen and hydrogen gas is an example of a decomposition reaction:

$$2H_2O \rightarrow 2H_2 + O_2$$

Single Displacement or Substitution Reaction

- A substitution or single displacement reaction is characterized by one element being displaced from a compound by another element.

$$A + BC \rightarrow AC + B$$

- An example of a substitution reaction occurs when zinc combines with hydrochloric acid. The zinc replaces the hydrogen:

$$Zn + 2HCl \rightarrow ZnCl_2 + H_2$$

Double Displacement Reaction

- In a double displacement reaction two compounds exchange bonds or ions in order to form different compounds.

$$AB + CD \rightarrow AD + CB$$

- An example of a double displacement reaction occurs between sodium chloride and silver nitrate to form sodium nitrate and silver chloride.

$$NaCl(aq) + AgNO_3(aq) \rightarrow NaNO_3(aq) + AgCl(s)$$

Combustion

- A combustion reaction is a type of redox reaction in which a combustible material combines with an oxidizer to form oxidized products and generate heat (exothermic reaction).
- Usually, in a combustion reaction **oxygen** **(O_2)** combines with another organic compound to form carbon dioxide and water.
- An example of a combustion reaction is the burning of naphthalene:

$$C_{10}H_8 + 12O_2 \rightarrow 10CO_2 + 4H_2O$$

Hydrolysis Reaction

- A hydrolysis reaction involves the breakdown of a water molecule. The general form for a hydrolysis reaction is:

$$X\text{-}(aq) + H_2O(l) \leftrightarrow HX(aq) + OH\text{-}(aq)$$