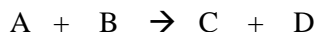


8.1: The Chemical Equation

- Chemical Equations always involve change...atoms, molecules, or ions can rearrange to form different substances.
- During reactions, chemical bonds are broken and **new bonds** are formed.
- But remember...in a chemical reaction, atoms are neither created nor destroyed. All atoms present in the beginning **must** also be present in the end!

Define **Chemical Equation**:



1. Reactants are separated by an arrow (\rightarrow) that shows the direction of the reaction. Reactants are placed to the left and products to the right of the arrow. A plus sign (+) is placed between reactants and products when needed.
2. Coefficients (whole #'s) are placed in front of substances to balance the equation and to indicate the # of units (atoms, molecules, ions, etc) of each substance reacting or being produced. When no number is shown, it is understood that one unit of that substance is indicated.
3. The conditions required to carry out the reaction may be placed above or below the arrow.
Ex:
4. The physical state of each substance is indicated using the symbols in the table below:

Symbol	Meaning
(s)	
(l)	
(g)	
(aq)	

8.2: Writing and Balancing Equations

To write a chemical equation, address the following questions: “how much (coefficient)”, “of what (chemical formula)”, and “in what physical state (s, l, g, aq)”?

Ex 1: Write the following chemical equation from its given word equation:

Two atoms of solid aluminum react with three molecules of aqueous copper (II) chloride to produce three atoms of solid copper and two molecules of aqueous aluminum chloride.

Define a **Balanced Equation** and how do we balance an equation?

Examples Problems: Write **and balance** the following equations from the given word equations.

1.) Mercury (II) oxide decomposes to form mercury and oxygen.

2.) When a piece of solid magnesium ribbon burns in air, a white powder called magnesium oxide is formed.

3.) Sulfuric acid reacts with sodium hydroxide to form sodium sulfate and water.

4.) Magnesium hydroxide reacts with phosphoric acid to produce magnesium phosphate and water.

8.4: Types of Chemical Equations

List the 4 major types of chemical reactions:

1.)

3.)

2.)

4.)

1.) Combination/Synthesis:

General Format:

Types of Combination/Synthesis reactions:

- **Metal + Oxygen → Metal Oxide**

- **Nonmetal + Oxygen → Nonmetal Oxide**

- **Metal + Nonmetal → Salt (aka ionic compound: metal + nonmetal)**

2.) Decomposition:

General Format:

- **Miscellaneous Decomposition Reactions:**

3.) Single-Replacement:

- If A is a **metal**, A will replace B to form AC, provided that A is a more reactive metal than B*.

***Reference the Activity Series: Table 8.2 on pg. 161.**

Metal Single-Replacement General Format:

Ex 1:

Ex 2:

- If A is a **halogen**, it will replace C to form BA, provided that A is a more reactive halogen than C*.

Halogen Single-Replacement General Format:

Ex 1:

Ex 2:

Predict the products of these single replacement reactions. If no reaction will occur, write "no reaction":



4.) Double-Replacement:

General Format:

Types of Double Replacement reactions:

- **Neutralization of an Acid and a Base:**

- **Formation of a Precipitate:** *What is a precipitate?*

8.5: Heat in Chemical Reactions

Energy changes always accompany chemical reactions. Reactions are either exothermic or endothermic.

○ Exothermic reactions:

Ex:

○ Endothermic reactions:

Ex:

Define Activation Energy:

Define Catalyst:

Define Heat of Reaction (aka _____):

Draw an energy diagram for an exothermic reaction in the space below. Label reactants, products, activation energy, and heat of reaction:

Draw an energy diagram for an endothermic reaction in the space below. Label reactants, products, activation energy, and heat of reaction:
**Then, also show the reaction if a catalyst were present.*