

Chapter 19: Chemical Reactions

Section 2: Classifying Chemical Reactions

5 Types of Chemical Reactions:

1. Combustion reaction: occurs when a substance reacts with oxygen to produce energy in the form of heat and light.

a. General Formula: Carbon/Hydrogen Molecule + Oxygen → Carbon dioxide and water

b. Example: Methane gas reacts with oxygen gas to produce carbon dioxide gas and water

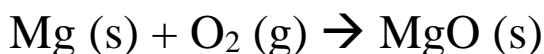


2. Synthesis reaction: two or more substances combine to form one product.

a. General Formula: $A + B \rightarrow AB$

i. Requires the addition of light.

b. Example: Magnesium solid plus oxygen gas produces magnesium oxide solid



3. Decomposition reaction: the reverse of a synthesis reaction in which one reactant breaks down, or decomposes, into two or more substances

a. General Formula: $AB \rightarrow A + B$

i. Requires the addition of heat, light, or electricity.

b. Example: Water in the presence of an electrical current will decompose into hydrogen gas and oxygen gas

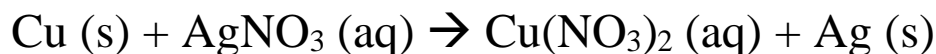


4. Single-displacement reaction: the chemical reaction in which one element replaces another element in a compound

a. Sometimes called Single-replacement reactions.

b. **General Formula:** $A + BC \rightarrow AC + B$

c. Example: Copper solid reacts with silver (I) nitrate to produce copper (II) nitrate aqueous and silver solid



d. More reactive metals will “replace” less active metals

e. More reactive metals are generally found in nature as compounds while less reactive metals are found in nature as pure elements.

5. Double-displacement reaction: the positive ion of one compound replaces the positive ion of the other to form two new compounds

a. Sometimes called double-replacement reactions.

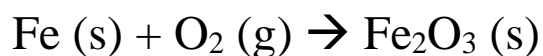
b. Will produce a **precipitate:** an insoluble compound (solid) that comes out of solution during this type of reaction.

c. **General Formula:** $AB + CD \rightarrow AD + CB$

d. Example: Sodium hydroxide aqueous reacts with copper (II) chloride aqueous to produce sodium chloride aqueous and copper (II) hydroxide solid



- e. Oxidation-Reduction Reactions: the tendency of the substances involved to lose or gain electrons
- i. **Oxidation:** the loss of electrons
 1. Becomes more positive and it is oxidized.
 2. Typically, the metal
 - ii. **Reduction:** the gain of electrons
 1. Becomes more negative and it is reduced.
 2. Typically, the nonmetal
 - iii. Reduction is the partner to oxidation. These two work as a pair so they are commonly referred to as a redox reaction.
 - iv. Iron solid plus oxygen gas produces iron (III) oxide solid commonly known as rust.



Fe went from a 0 charge to a +3 charge, so it lost 3 electrons, so it was oxidized.

O₂ went from a 0 charge to a -2 charge, so it gained 2 electrons, so it was reduced.