Notes: The Five Main Types of Chemical Reactions

1. Synthesis: Two or more substances combine to form a new compound.

a. General Form: A + X ----> AX

b. Examples:

$H_2(g) + Cl_2(g) \text{ ----> } HCl(g)$

$Fe(s) + O_2(g) \text{ ----> } Fe_2O_3(s)$

2. Decomposition: A more complex compound reacts to form two or more less complex compounds.

a. General Form: AX ----> A + X

b. Examples:

$H_2SO_4(aq) \text{-----> } SO_3(g) + H_2O(l)$

$HgO(s) \text{-----> } Hg(l) + O_2(g)$

3. Single Displacement (aka Single Replacement): One element replaces a similar element in a compound.

a. Two General Forms:

i. A+ BX ----> B + AX (metal comes in to replace a metal)

Ex: $Al(s) + ZnCl_2(aq) \text{ ------> } Zn(s) + AlCl_3(aq)$

ii. Y + BX ----> X + BY (nonmetal comes in to replace a nonmetal)

Ex: $Cl_2(g) + KBr(aq) \text{ ----> } Br_2(l) + KCl(aq)$

4. Double Displacement (aka Double Replacement): The ions of two compounds trade places in an aqueous solution to form two new compounds, one of which is usually a solid liquid, or gas. [Note: when one of the new compounds is a solid it's called a precipitate.]

a. General Form: AX + BY ----> BX + AY

b. Examples:

$AgNO_3(aq) + NaCl(aq) \text{ -----> } NaNO_3(aq) + AgCl(s)$

$H_3PO_4(aq) + LiOH(aq) \text{ -----> } Li_3PO_4(aq) + HOH(l)$

5. Combustion: A substance combines with oxygen producing heat so rapidly that a flame results.

a. General Form: $X + O_2(g)$ ----> flame and different kinds of products

b. Examples:

$C(s) + O_2(g)$ ------> $CO_2(g)$

$C_3H_8(l) + O_2(g)$ ------> $CO_2(g) + H_2O(g)$

Note: hydrocarbons ($C_{something}H_{something}$) always combust to form $CO_2(g) + H_2O(g)$. They can be a bit tricky to balance: we'll look at them tomorrow. There are many forms of combustic We'll be focusing on the combustion of hydrocarbons for our definition of combustion