**Predicting Products in Equation Writing NOTES**

In order to predict products in chemical reactions, it is necessary to learn a few rules so that the type of reaction is identified with its possible products.

1. Composition Reactions (Synthesis)

Composition reactions are of the general type:

A + B -----------> AB

element element compound

or or

compound compound

This reaction will occur as long as A and B are: metal plus a nonmetal, or a nonmetal combination. When A and B are both metals, there will be NO REACTION.

EXAMPLES:

aluminum plus oxygen yields aluminum oxide

4Al + 3O2 -----------> 2Al2O3

metal nonmetal compound

silver plus gold yields NO REACTION

Ag + Au -----------> no reaction

potassium plus bromine ---------->

1. Decomposition

AB ---------------> A + B

compound elements or smaller compounds

The products can be elements or smaller compounds.

1. metallic carbonates (heated) decompose into carbon dioxide and a metallic oxide

CuCO3 ------------> CO2 + CuO

1. metallic hydroxides (heated) decompose into water and a metallic oxide

Cu(OH)2 ------------> H2O + CuO

1. metallic chlorates (heated) decompose into oxygen and a metallic chloride

2KClO3 ------------> 3O2 + 2KCl

1. oxyacids heated yield a nonmetallic oxide and water

H2CO3 ------------> CO2 + H2O

1. some oxides when heated oxygen plus the remaining element

2HgO ------------> 2Hg + O2

1. compounds composed of only two elements yield element plus element

2NaCl ------------> 2Na + Cl2

EXAMPLE:

zinc carbonate (heated) ----------->

1. Single Replacement Reaction

A + BX -------------> B + AX

element compound element compound

A “bumps” B in the compound and replaces it, when A and B are both (+) ions in the compound. This can **only** occur when A is more active chemically than B. You can tell this by looking at an activity series sheet.

EXAMPLES:

Li + NaCl -----------> Na + LiCl

Na + LiCl -----------> no reaction

magnesium + hydrochloric acid --------->

1. Double Replacement Reactions

AB + XY -------------> AY + XB

compound compound compound compound

The positive ions in the compounds exchange places. For now, we will assume that all the reactions will occur.

Reactions are driven by the formation of a precipitate, a gaseous product, or water. Use solubility rules to determine the precipitate.

EXAMPLES:

2NaCl + H2SO4 ------------> Na2SO4 + 2HCl

aluminum hydroxide + barium chloride ----------->

1. Combustion

Hydrocarbon + oxygen -------------> carbon dioxide + water

Oxidation reaction of a hydrocarbon (CH)

EXAMPLES:

2C4H10 + 13O2  --------------> 8CO2 + 10H20

methane + oxygen ------------->