

# Predicting Products in Chemical Reactions

Name: \_\_\_\_\_

This is not a complete list, only an attempt to help you predict the many reaction products. Testing the validity of your predictions will come at a much later date. But remember, after you have predicted what the products could be, you must then write all reactants and products in the correct formula before you try balancing the equation.

Here are 5 types of chemical reactions that can help you in predicting what the products of a chemical reaction might be:

I. **Combination (synthesis)**: Two reactants come together to make one product.

a. Some simple kinds where 2 elements combine to make one compound:



b. Some are more complicated and must be memorized. Here are a few:

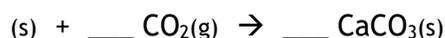
1. Water + Metal oxide  $\rightarrow$  Metal hydroxide (base)



2. Water + Nonmetal oxide  $\rightarrow$  Acid



3. Metal oxide + Carbon dioxide  $\rightarrow$  Metal carbonate



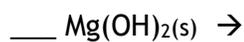
II. **Decomposition (analysis)**: One reactant breaks into two products. The opposite of synthesis.

a. Simple kinds where a compounds breaks into its elements:



b. More complicated ones. Mostly opposite to the synthesis listing:

1. Metal hydroxide  $\rightarrow$  Metal oxide + Water



2. Acid  $\rightarrow$  Nonmetal oxide + Water



3. Metal carbonate  $\rightarrow$  Metal oxide + Carbon dioxide



4. Metal chlorate  $\rightarrow$  Metal chloride + Oxygen



III. **Single Replacement (displacement)**: One element replaces another in a compound.

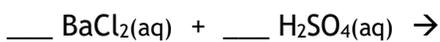
a. Metal-metal replacement. The positive ion is replaced. Examples:



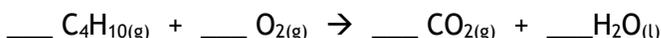
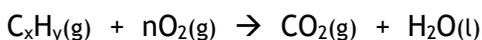
b. Nonmetal-nonmetal replacement. The negative ion is replaced. Examples:



IV. **Double Replacement (displacement)**: Positive ions change places. If one reactant is water or carbon dioxide, the reaction will be synthesis, not double replacement! Examples:



V. **Combustion**: A hydrocarbon reacts with oxygen to produce carbon dioxide and water. However, this is not how it will always be in Chemistry. But for now and for the scope of our class, we will only look at combustion reactions that follow this **GENERAL** term.



This is by no means a complete list, but an attempt to help you predict the many chemical reaction products. Testing the validity of your predictions will come at a much later date. Remember, after you have predicted what the products could be, you must then write all the reactants and the products in correct formula form before you try to balance the equation!