Predicting Products of Chemical Equations.

A. Composition Reactions.
   1. Assume products of composition reactions follow ionic bonding rules and form ions found in the Table of Common Ions.

   2. Example:
      potassium + oxygen → *potassium oxide*

      $4K + O_2 \rightarrow 2K_2O$

B. Decomposition Reactions - Chlorates.
   1. Metallic chlorates decompose to form a metallic chloride and oxygen.

      $MClO_3 \rightarrow MCl^{-1} + O_2$

   2. Example:
      potassium chlorate → *potassium chloride + oxygen*

      $2KClO_3 \rightarrow 2KCl + 3O_2$

C. Decomposition Reactions - Hydroxides.
   1. Metallic hydroxides decompose to form a metallic oxide and water.

      $MOH \rightarrow MO^{-2} + H_2O$

   2. Example:
      potassium hydroxide → *potassium oxide + water*

      $2KOH \rightarrow K_2O + H_2O$

D. Decomposition Reactions - Carbonates.
   1. Metallic carbonates decompose to form a metallic oxide and carbon dioxide.

      $MCO_3 \rightarrow MO^{-2} + CO_2$

   2. Example:
      potassium carbonate → *potassium oxide + carbon dioxide*

      $K_2CO_3 \rightarrow K_2O + CO_2$

E. Decomposition Reactions - Nonspecific.
   1. If presented with a decomposition reaction that does not fit one of the other classes, assume the substance decomposes to its elements.

   2. Example:
      potassium oxide → *potassium + oxygen*

      $2K_2O \rightarrow 4K + O_2$

F. Replacement Reactions.
   1. Not all replacements take place! An activity series must be used to see if the uncombined element is more reactive than one of the ions making up the compound. In the characteristic equation above, A replaces B only if it is more reactive than B.
   2. The reaction, $Fe + 2HCl \rightarrow FeCl_2 + H_2$, proceeds since iron is more reactive than hydrogen, but,

Ag + HC l→ does not proceed since silver is less reactive than hydrogen.

3. Write “no rxn” next to any reaction which does not occur.

G. Ionic Reactions.

1. Unlike replacement reactions, ionic reactions always occur.

2. Be sure to use the Table of Common Ions to determine radicals and their charges.

3. Example:

$$3CaSO_4 + 2Al(NO_3)_3 \rightarrow 3Ca(NO_3)_2 + Al_2(SO_4)_3$$

H. Combustion Reactions.

1. The products of combustion reactions are always carbon dioxide and water:

$$C_XH_Y + O_2 \rightarrow CO_2 + H_2O.$$

2. Examples:

$$C_4H_{12} + 7O_2 \rightarrow 4CO_2 + 6H_2O$$

$$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$$