

## Predicting Products Practice Worksheet

When predicting products:

1. You must first decide what type of reaction it is based on the reactants. I will only ask you to predict the products of three types of reactions:

**Combustion:** A hydrocarbon and oxygen

Example:  $C_2H_6 + O_2 \rightarrow$

**Single Replacement:** A compound and an element (the element is either a metal or a halogen)

Example:  $Mg + HCl \rightarrow$  -or-  $KF + Cl_2 \rightarrow$

**Double Replacement:** Two separate compounds

Example:  $Pb(NO_3)_2 + KI \rightarrow$  -or-  $NaCl + CaCO_3 \rightarrow$

2. To predict the products, rearrange the elements according to what you know about the reactions:

**Combustion:** The products are ALWAYS  $CO_2$  and  $H_2O$ !

Example:  $C_2H_6 + O_2 \rightarrow CO_2 + H_2O$

**Single Replacement:** Switch the element with the corresponding element in the compound (If the element is a metal, replace the metal in the compound. If the element is a halogen, replace the halogen in the compound.)

Example:  $Mg + HCl \rightarrow MgCl_2 + H_2$  -or-  $KF + Cl_2 \rightarrow KCl + F_2$

**Double Replacement:** Switch the first members of each compound.

Example:  $Pb(NO_3)_2 + KI \rightarrow KNO_3 + PbI_2$  -or-  $NaCl + CaCO_3 \rightarrow CaCl_2 + Na_2CO_3$

NOTE: When rearranging elements, make sure that your products are written correctly (meaning that the overall charge of the compound is zero).

3. Balance the equations!

Example:  $2C_2H_6 + 7O_2 \rightarrow 4CO_2 + 6H_2O$

Example:  $Mg + 2HCl \rightarrow MgCl_2 + H_2$  -or-  $2KF + Cl_2 \rightarrow 2KCl + F_2$

Example:  $Pb(NO_3)_2 + 2KI \rightarrow 2KNO_3 + PbI_2$  -or-  $2NaCl + CaCO_3 \rightarrow CaCl_2 + Na_2CO_3$

4. Determine if the reaction will happen or not. If it will not happen, write NR (no reaction).

Single Replacement: Use the Activity Series (the higher element of the table will end up in a compound). If the element is lower than the corresponding element in the compound, the reaction **WILL NOT** happen.

**Example:**  $Mg + 2HCl \rightarrow MgCl_2 + H_2$  (**Will Happen**) -or-  $2KF + Cl_2 \rightarrow 2KCl + F_2$  (**NR**)

Double Replacement: Use the Solubility Table. If both products are soluble (S or D), the reaction **WILL NOT** happen. If ANY of the products are insoluble (I), the reaction **WILL** happen.

**Example:**  $Pb(NO_3)_2 + 2KI \rightarrow 2KNO_3 + PbI_2$  (**Will Happen**) -or-  $2NaCl + CaCO_3 \rightarrow CaCl_2 + Na_2CO_3$

**(NR)**

**Practice Problems:**

<u>Reactants</u>	<u>Products</u>	<u>Type of Reaction</u>	<u>Will it Happen?</u>
1. $NaBr + Cl_2 \rightarrow$			
2. $Na_3PO_4 + MgSO_4 \rightarrow$			
3. $NH_4OH + BaCl_2 \rightarrow$			
4. $C_3H_8 + O_2 \rightarrow$			XXXXXXX
5. $C_2H_2 + O_2 \rightarrow$			XXXXXXX
6. Potassium chloride and sulfuric acid $\rightarrow$			
7. Calcium metal and hydrochloric acid $\rightarrow$			
8. Aluminum metal and iron (III) oxide $\rightarrow$			

## Word to Formula Practice Worksheet

When given a word equation, you must use your knowledge of bonding and naming compounds to correctly write a balanced chemical reaction. Follow the following rules:

1. Decide whether the bond is ionic or covalent. If the name has prefixes (i.e. mono-, di-, tri-, etc.), the compound is covalent.
2. Use the appropriate rules to correctly write the formulas.
  - a. For ionic compounds, use the criss-cross method. See examples below:

### Example 1: Write the formula for aluminum oxide.

Write down the  $\text{Al}^{3+}$  and  $\text{O}^{2-}$  right next to each other, as in this image:

Move the positive charge (dropping the sign) to the subscript position of the anion:

Move the negative charge (dropping the sign) to the subscript position of the cation:

The result of all this moving is:

Notice that there is no fifth image in this problem. The  $\text{Al}_2\text{O}_3$  is at a minimum set of subscripts, so no reducing is necessary. Not so in this next example.

### Example 2: Write the formula for barium oxide.

Write down the  $\text{Ba}^{2+}$  and  $\text{O}^{2-}$  right next to each other, as in this image:

Move the positive charge (dropping the sign) to the subscript position of the anion:

Move the negative charge (dropping the sign) to the subscript position of the cation:

The result of all this moving is:

Since both subscripts have a common factor of two, we are not at a minimum set of subscripts. After reducing, the final answer is:

- b. For covalent compounds, just write what the name tells you (i.e. di- = 2 or tri = 3)
3. Balance the equation!

### Practice Problems:

- 1) When dissolved beryllium chloride reacts with dissolved silver nitrate (silver's charge is +1), aqueous beryllium nitrate and silver chloride powder are made.
- 2) When isopropanol ( $\text{C}_3\text{H}_8\text{O}$ ) burns in oxygen, carbon dioxide, water, and heat are produced.
- 3) When dissolved sodium hydroxide reacts with sulfuric acid ( $\text{H}_2\text{SO}_4$ ), aqueous sodium sulfate, water, and heat are formed.
- 4) When fluorine gas is put into contact with calcium metal at high temperatures, calcium fluoride powder is created.
- 5) When sodium metal reacts with iron (II) chloride, iron metal and sodium chloride are formed.