

## Predicting Reaction Products Notes

It's frequently handy to know what will be formed when two chemicals are put together. After all, the whole point of chemistry is to produce useful chemicals for various purposes, and it doesn't do us much good if we can't figure out how to do it.

The big question: How do we figure out the products of a reaction?

The answer: It depends on the type of reaction that's taking place.

### **Combustion reactions:**

- **Identification:** Whenever you see  $C_xH_y$  reacting with  $O_2$ .
- **Products:**  $CO_2$ ,  $H_2O$ , and heat.

**Example:**  $CH_4 + O_2 \rightarrow ?$

### **Synthesis reactions:**

- **Identification:** If two elements or VERY simple molecules are reacting with each other, it's probably a synthesis reaction.
  - Elements usually combine to form ionic compounds.
  - Simple covalent molecules usually combine to form more complex covalent molecules (Example)
- **Products:**
  - If an ionic compound will be formed, write it based on the possible products.

**Example:**  $Mg + Cl_2 \rightarrow ?$

- If a covalent compound is formed, it'll usually be something that you've seen before.

**Example:**  $N_2 + H_2 \rightarrow ?$

### Decomposition reactions:

- **Identification:** If one compound has an arrow coming off of it, it's decomposing.
- **Products:** The products will be either simple covalent molecules (water, CO<sub>2</sub>, O<sub>2</sub>, N<sub>2</sub>, etc) or the constituent elements (if you can't figure out what simple molecules might be present).

**Example:** CuCO<sub>3</sub> → ?

**Example:** H<sub>2</sub>O → ?

### Single replacement reactions:

- **Identification:** A single element (either a metal or halogen) reacts with one ionic compound. Coming up with products at this point should be simple.
- **The big question: Will a reaction take place at all?**
  - Look at the activity series. If the lone element is higher than the element that it's trying to replace, the reaction will proceed. Otherwise, it will not.

**Examples:**

- Li + NaOH → ? **reaction will occur.**  
So: Li + NaOH →
- Zn + Ca(OH)<sub>2</sub> → ? **will not occur.**

### Double replacement reactions:

- **Identification:** Two ionic compounds react with each other.
- **Products:** The cations exchange places and two new ionic compounds are formed.
  - **Example:** MgCl<sub>2</sub> + NaOH → ?