

### Chemical Equations

- **Word Equations** - Write the names of the \_\_\_\_\_ to the \_\_\_\_\_ of the arrow (separated by a + sign) and write the \_\_\_\_\_ in a similar manner to the \_\_\_\_\_ of the arrow.
- **Chemical Equations** - Write the formulas of the reactants to the \_\_\_\_\_ of the yields sign (arrow) and the formulas of the products to the \_\_\_\_\_.
- **Examples:**
  - Solid magnesium reacts with oxygen gas to produce magnesium oxide.
  - $\text{Fe (s)} + \text{O}_2 \text{ (g)} \rightarrow \text{Fe}_2\text{O}_3 \text{ (s)}$
  - When heated, solid mercury(II) sulfide reacts with oxygen gas to produce liquid mercury and sulfur dioxide gas.
  - $\text{CaCO}_3 \text{ (s)} \rightarrow \text{CaO (s)} + \text{CO}_2 \text{ (g)}$

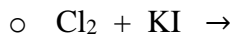
### Balancing Equations

- Use \_\_\_\_\_ to balance an equation so it obeys the \_\_\_\_\_.
- **Examples:**
  - hydrogen + oxygen  $\rightarrow$  water
  - zinc (II) + hydrochloric acid  $\rightarrow$  zinc (II) chloride + hydrogen
  - nitric acid + magnesium hydroxide  $\rightarrow$  magnesium nitrate + water





- If solid silver metal is placed in an aqueous solution of potassium nitrate will a reaction occur?



## Decomposition Reactions

- A reaction that occurs when \_\_\_\_\_ reactant breaks down into \_\_\_\_\_ products.
- **Examples:**
  - $2\text{Ag}_2\text{O} \rightarrow 4\text{Ag} + 2\text{O}_2$
  - $\text{PCl}_5 \rightarrow \text{PCl}_3 + \text{Cl}_2$
  - $\text{H}_2\text{O}_2 \rightarrow \text{H}_2\text{O} + \text{O}_2$
  - $2\text{CuO} \rightarrow 2\text{Cu} + \text{O}_2$
- **Specific Decomposition Reactions (*HONORS only*)**
  - $\text{MCO}_3 \rightarrow \text{MO} + \text{CO}_2$ 
    - *Where M is any metal*
    - **Example:**
      - $\text{CaCO}_3 \rightarrow$
  - $\text{MOH} \rightarrow \text{MO} + \text{H}_2\text{O}$ 
    - *Where M is any metal*
    - **Example:**
      - $\text{LiOH} \rightarrow$
  - $\text{MClO}_3 \rightarrow \text{MCl} + \text{O}_2$ 
    - *Where M is any metal*
    - **Example:**
      - $\text{NaClO}_3 \rightarrow$

- Acid  $\rightarrow$   $\text{H}_2\text{O}$  + remainder of elements
  - **Examples:**
    - $\text{H}_2\text{CO}_3 \rightarrow$
    - $\text{H}_2\text{SO}_4 \rightarrow$
    - $\text{H}_2\text{SO}_3 \rightarrow$
- $\text{NH}_4\text{OH} \rightarrow \text{NH}_3 + \text{H}_2\text{O}$

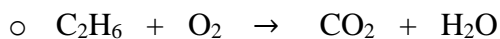
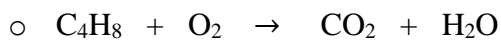
### Synthesis (Combination) Reactions

- A reaction that occurs when \_\_\_\_\_ reactants combine to form \_\_\_\_\_ product.
- **Examples:**
  - $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$
  - $2\text{Ag} + \text{S} \rightarrow \text{Ag}_2\text{S}$
  - $2\text{Al} + 3\text{Cl}_2 \rightarrow 2\text{AlCl}_3$
  - $\text{NH}_3 + \text{HCl} \rightarrow \text{NH}_4\text{Cl}$
- **Specific Synthesis Reactions (*HONORS only*) – Opposite of Decomposition!**
  - $\text{MO} + \text{CO}_2 \rightarrow \text{MCO}_3$ 
    - *Where M is any metal*
    - **Example:**
      - $\text{K}_2\text{O} + \text{CO}_2 \rightarrow$
  - $\text{MO} + \text{H}_2\text{O} \rightarrow \text{MOH}$ 
    - *Where M is any metal*
    - **Example:**
      - $\text{CaO} + \text{H}_2\text{O} \rightarrow$
  - $\text{MCl} + \text{O}_2 \rightarrow \text{MClO}_3$ 
    - *Where M is any metal*
    - **Example:**
      - $\text{KCl} + \text{O}_2 \rightarrow$

- $\text{NO} + \text{H}_2\text{O} \rightarrow \text{Acid}$ 
  - *Where N is any nonmetal*
  - **Examples:**
    - $\text{N}_2\text{O}_3 + \text{H}_2\text{O} \rightarrow \text{nitrous acid}$
    - $\text{N}_2\text{O}_5 + \text{H}_2\text{O} \rightarrow \text{nitric acid}$
    - $\text{P}_2\text{O}_3 + \text{H}_2\text{O} \rightarrow \text{phosphorous acid}$
    - $\text{P}_2\text{O}_5 + \text{H}_2\text{O} \rightarrow \text{phosphoric acid}$
    - $\text{SO}_2 + \text{H}_2\text{O} \rightarrow \text{sulfurous acid}$
    - $\text{SO}_3 + \text{H}_2\text{O} \rightarrow \text{sulfuric acid}$

## Combustion Reactions

- A reaction that occurs when a \_\_\_\_\_ reacts with \_\_\_\_\_ to form \_\_\_\_\_ and \_\_\_\_\_.
- **Steps to Balance**
  1. Balance C first
  2. Balance H next
  3. Balance O last
  4. If you would have to put  $\frac{1}{2}$  of O to balance, double all coefficients to fix!
- **Examples:**
  - $\text{CH}_4 + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$



## Chapter 11 Mixed Practice

- State the reaction type and predict the products for the following reactions:

- potassium chloride + silver (I) nitrate →

- sodium chloride →

- iron (III) metal + copper (II) sulfate →

- methyl alcohol,  $\text{CH}_3\text{OH}$  + oxygen gas →

- zinc (II) metal + oxygen gas →