STOICHIOMETRY

When we talk about stoichiometry, we’re talking about how to convert between units and compounds in a chemical reaction using molecular weight and Avogadro’s number.

**Step 1:**
- To begin, you need a balanced chemical equation.

**Step 2:**
- Next, convert known values to moles.
  - If given an amount of something in grams, use the molar weight to convert to moles.
    - Remember that molar weight is given in grams/mole so you would need to divide the mass by the molar mass to get moles.
  - If given an amount in liters, you should also be given either a concentration in g/L or molarity in mol/L.
    - If given the concentration, you will need to use both the concentration (g/L) and the molar mass (g/mol) to convert to moles.

**Step 3:**
- Use the molar ratio from the balanced chemical equation to convert from moles of one thing to another.
  - A balanced chemical equation is a lot like a recipe – if you use 2 cups of flour plus all the other ingredients, you get 12 cookies.

**Step 4:**
- Once you have moles of the desired product or reactant, convert to the desired units.
  - Use the methods given above to know what to use when converting.

**Example:**
- From the reaction: $\text{B}_2\text{H}_6 + \text{O}_2 \rightarrow \text{HBO}_2 + \text{H}_2\text{O}$
  - What mass of $\text{O}_2$ will be needed to burn 36.1 g of $\text{B}_2\text{H}_6$?
  - First balance the equation:
    - $\text{B}_2\text{H}_6 + 3\text{O}_2 \rightarrow 2\text{HBO}_2 + 2\text{H}_2\text{O}$
  - Using the molar mass convert from grams to moles:
    - $36.1 \text{ g } \text{B}_2\text{H}_6 / 27.66 \text{ g/mol } \text{B}_2\text{H}_6 = 1.305 \text{ mol } \text{B}_2\text{H}_6$
  - From the balanced equation we see that for every 1 $\text{B}_2\text{H}_6$ there are 3 $\text{O}_2$.
  - We use this mole ratio to convert from moles of $\text{B}_2\text{H}_6$ to moles of $\text{O}_2$:
    - $1.305 \text{ mol } \text{B}_2\text{H}_6 * 3 \text{ mol } \text{O}_2 / 1 \text{ mol } \text{B}_2\text{H}_6 = 3.92 \text{ mol } \text{O}_2$
  - Using molar mass to convert from moles to grams:
    - $3.92 \text{ mol } \text{O}_2 * 32 \text{ g } \text{O}_2 / 1 \text{ mol } \text{O}_2 = 125.3 \text{ g } \text{O}_2$