

## 4 • Chemical Equations and Stoichiometry

### STUDY LIST

I can:

#### Chemical Equations

- Give examples of **products** and **reactants** in a chemical equation.
- State that Antoine Lavoisier introduced the **law of conservation of matter**.

#### Combustion

- State that **combustion** is another name for **burning**.
- Write an equation for a combustion reaction given only the **fuel** that is burned.
- Correctly label substances in an equation as solid (s), gas (g), liquid (l), or aqueous (aq)

#### Balancing Equations

- Balance** equations by adding **coefficients**.
- Recognize** when an equation is balanced.
- State that the **formulas** of reactants and products **should not be changed** in order to balance equations.

#### Stoichiometry Problems

- Use the **stoichiometric factor** (♥ of the problem) to convert from moles of one substance to moles of a different substance. (i.e. In the equation:  $\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$ ,  
 $3 \text{ mol H}_2 \approx 2 \text{ mol NH}_3$ )
- Convert** between the quantities of mass, volume, molecules and moles using dimensional analysis (i.e. use  $1 \text{ mol} = 22.4 \text{ L}$ ,  $1 \text{ mol} = 6.02 \times 10^{23}$  molecules, and  $1 \text{ mol} = \text{gram molecular mass}$ )
- Show the **units** of molar mass as grams/mol or  $\text{g}\cdot\text{mol}^{-1}$ .

#### Limiting Reactant Problems

- Recognize that a problem with two “given values” is a **limiting reactant** problem.
- Determine the **limiting reactant** and **excess reactant** in a problem.
- Solve problems involving Limiting Reactants
- Calculate how much **excess chemical** is **left over** after a reaction.

#### Percent Yield Problems

- Use stoichiometry to calculate the **theoretical yield** (mass of a product) in a problem.
- State that **actual yields** are usually given in a problem.
- Use the **theoretical yield** and **actual yield** to calculate the **percent yield**.

#### Chemical Analysis Problems

- Calculate the mass of each element in a given compound given data such as the masses of  $\text{CO}_2$  and  $\text{H}_2\text{O}$  formed in a combustion reaction.
- Use mass and mole information to calculate the **empirical formula** of an unknown substance.
- Use **percent composition** to **equalize** mass and mole information derived from **different samples**.

#### Continuous Variation Data

- Use “**continuous variation**” laboratory data to determine the correct mole ratio of an equation. (Micro Mole Rockets Lab)