

Chapter 3 – Mass Relationships

Michael Brodskiy

Instructor: Mr. Morgan

September 15, 2020

- Molar Mass

1. $6.022 \cdot 10^{23}$ is one mole (Avogadro's number)
2. Obtained by adding the atomic mass of each element present
3. ex. C = 12[g]/mol

- Molarity (M)

1. mol/L

- Molar Ratio

1. Use $C_12H_22O_{11}$ for example:
2. Ratio for Carbon: $\frac{12\text{mol}_C}{\text{mol}_{C_{12}H_{22}O_{11}}}$
3. Ratio for Hydrogen: $\frac{22\text{mol}_H}{\text{mol}_{C_{12}H_{22}O_{11}}}$
4. Ratio for Oxygen: $\frac{11\text{mol}_O}{\text{mol}_{C_{12}H_{22}O_{11}}}$

- Mass Percent

1. Mass of Element per Mass of Compound times 100 ($\frac{m_e}{m_c} \cdot 100$)

- Chemical Formulas:

1. Empirical Formula – The simplest form, only gives the ratios of atoms
2. Molecular Formula – The actual formula, gives the exact ratio of atoms (sometimes Molecular can be Empirical, but usually not)

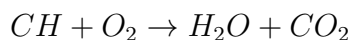
- Calculating the Empirical Formula:

1. Convert to Moles

2. Divide all by the smallest
3. Multiply by integer

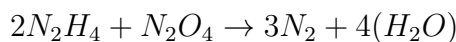
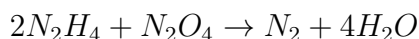
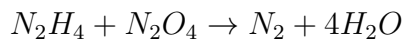
- Combustion Reactions:

1. Always involves a hydrocarbon (anything involving CH)
2. Ex (simplest reaction):

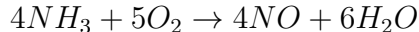
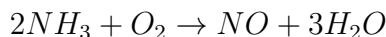


- Balancing Equations:

1. $N_2H_4 + N_2O_4 \rightarrow N_2 + H_2O$



2. $NH_3 + O_2 \rightarrow NO + H_2O$



- What is the Difference? One is three unbound nitrate molecules, while the other is three chemically bound nitrate molecules



- Stoichiometry – Calculations with balanced equations
- Combust C_3H_8 :

1. $C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$

2. Start with 17.8[g] of O_2 , how much H_2O do we have at the end?

$$\frac{17.8}{32} = .556[\text{mol}] \cdot \frac{4}{5} = .445[\text{mol}] \cdot 18 \frac{[\text{g}]}{[\text{mol}]} = 8[\text{g}] \text{ } H_2O$$

- Percent Yield (or Recovery) = Actual/Theoretical
- Limiting Reactants – When forming products, one reactant is used up first, meaning that reactant limits the process
- Excess Reactants – Reactants that are left over when the limiting reactant is used up