1. What are the 3 things conserved during a chemical reaction? 

2. How would you identify if something is a physical or a chemical change from a chemical equation? 

3. Balance each of the following chemical equations and identify the type of reaction:
   
a. \[ \text{2 Fe(OH)}_3 \rightarrow \text{1 Fe}_2\text{O}_3 + \text{3 H}_2\text{O} \]  - type: \text{decomp.}

b. nitrogen gas combines with hydrogen to produce ammonia (NH\textsubscript{3})  - type: \text{Synth.}

c. \[ \text{2 Fe} + \text{3 H}_2\text{SO}_4 \rightarrow \text{3 H}_2 + \text{2 Fe(SO)}_4\text{3} \]  - type: \text{Replace.}

d. \[ \text{MgCl}_2 + \text{2 AgNO}_3 \rightarrow \text{2 AgCl} + \text{Mg(NO)}_3\text{2} \]  - type: \text{Replace.}

e. \[ \text{2 C}_4\text{H}_8\text{O} + \text{13 O}_2 \rightarrow \text{8 CO}_2 + \text{9 H}_2\text{O} \]  - type: \text{Combustion}

4. Calculate the percent composition of oxygen in C\textsubscript{4}H\textsubscript{8}O\textsubscript{4}. (gfm = 120.0 g/mol)

\[
\% \text{ O} = \frac{\text{mass O in compound}}{\text{gfm compound}} \times 100 \% = \frac{164.0}{120.0} \times 100 \% = 53.3 \%
\]

5. What is the mass of 5.00 moles of Fe\textsubscript{2}O\textsubscript{3}? (gfm = 159.6 g/mol)

\[
\text{mass} = \text{moles} \times \text{gfm} = 5.00 \times \frac{159.6}{1} = 798 \text{ g}
\]
6. How many moles of argon gas are present in 11.2 L? (gfm = 39.9 g/mol)

\[
\text{L} \rightarrow \text{mol} \\
\frac{22.4 \text{ L}}{1 \text{ mol}} \times \frac{1 \text{ mol}}{11.2 \text{ L}} = \frac{3 \text{ mol}}{22.4 \text{ L}} = 0.500 \text{ mol}
\]

7. How many molecules are present in 4.00 moles of glucose, C₆H₁₂O₆ (gfm = 180.0 g/mol)

\[
mol \rightarrow \text{molecules} \\
1 \text{ mol} = 6.02 \times 10^{23} \text{ molecules} \\
4.00 \text{ mol} \times \frac{6.02 \times 10^{23} \text{ molecules}}{1 \text{ mol}} = 2.408 \times 10^{24} \text{ molecules}
\]

a. How many atoms of carbon?

\[
\frac{(2.41 \times 10^{24}) \text{ molecules}}{\text{C}_6\text{H}_{12}\text{O}_6} \times \frac{12 \text{ C atoms}}{1 \text{ molecule}} = 1.45 \times 10^{25} \text{ C atoms}
\]

8. How many molecules of CCl₄ are there in 16.8 grams of CCl₄? (gfm = 154 g/mol)

\[
\text{grams} \rightarrow \text{moles} \rightarrow \text{molecules} \\
154 \text{ g} = 1 \text{ mol} \\
1 \text{ mol} = 6.02 \times 10^{23} \text{ molecules} \\
\frac{16.8 \text{ g}}{154 \text{ g}} \times \frac{1 \text{ mol}}{6.02 \times 10^{23} \text{ molecules}} = 5.57 \times 10^{22} \text{ molecules}
\]

9. A gaseous compound has a percent composition of 83.4% nitrogen and 17.6% hydrogen. What is the empirical formula of the gas?

1. Divide % by gfm of element, keep decimals:
   \[
   \begin{align*}
   \frac{83.4}{14.0} &= 5.957\overline{1}4 \\
   \frac{17.6}{1.0} &= 17.60 \\
   \end{align*}
   \]

2. Divide each answer by the smaller of the #s:
   \[
   \begin{align*}
   \frac{5.957\overline{1}4}{5.957\overline{1}4} &= 1 \\
   \frac{17.60}{5.957\overline{1}4} &= 2.95
   \end{align*}
   \]

3. Round to nearest whole # & make results subscripts in empirical formula:
   \[
   \text{NH}_3
   \]

10. A compound has an empirical formula of CH₂O. Its molecular mass is 180.0 g/mol. What is the molecular formula?

\[
\frac{180.0}{30.0} = 6.0 \\
\text{C}_6\text{H}_{12}\text{O}_6
\]