Chapter 3: Worksheet #1 Mass Relationships

1. Calculate the mass percent of carbon, nitrogen and oxygen in acetamide, C₂H₅NO.

2. A 50.51 g sample of a compound made from phosphorus and chlorine is decomposed. Analysis of the products showed that 11.39 g of phosphorus atoms were produced. What is the empirical formula of the compound?

3. When 2.5000 g of an oxide of mercury, (HgₓOᵧ) is decomposed into the elements by heating, 2.405 g of mercury are produced. Calculate the empirical formula.

4. The compound benzamide has the following percent composition. What is the empirical formula?

   C = 69.40 %  H= 5.825 %  O = 13.21 %  N= 11.57 %
5. A component of protein called serine has an approximate molar mass of 100 g/mole. If the percent composition is as follows, what is the empirical and molecular formula of serine?

\[ C = 34.95\% \quad H = 6.844\% \quad O = 46.56\% \quad N = 13.59\% \]

6. Balance the following equations:

- \[ \text{NaCl(aq)} + \text{Ba(NO}_3\text{)}_2(aq) \rightarrow \text{NaNO}_3(aq) + \text{BaCl}_2(aq) \]
- \[ \text{Na}_3\text{PO}_4(aq) + \text{AgNO}_3(aq) \rightarrow \text{NaNO}_3(aq) + \text{Ag}_3\text{PO}_4(s) \]
- \[ \text{K}_2\text{SO}_4(aq) + \text{BaCl}_2(aq) \rightarrow \text{BaSO}_4(s) + \text{KCl(aq)} \]
- \[ \text{HCl(aq)} + \text{Ca(OH)}_2(aq) \rightarrow \text{H}_2\text{O(ℓ)} + \text{CaCl}_2(aq) \]
- \[ \text{Na(s)} + \text{S(s)} \rightarrow \text{Na}_2\text{S(s)} \]
- \[ \text{C}_2\text{H}_6(\text{g}) + \text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + \text{H}_2\text{O(ℓ)} \]
- \[ \text{Li(s)} + \text{H}_2\text{O(ℓ)} \rightarrow \text{LiOH(s)} + \text{H}_2(\text{g}) \]
- \[ \text{Mg(s)} + \text{CuCl}_2(\text{aq}) \rightarrow \text{MgCl}_2(\text{aq}) + \text{Cu(s)} \]
\[
\text{HgO(s)} \rightarrow \text{Hg(ℓ)} + \text{O}_2(\text{g})
\]

\[
\text{FeO(s)} + \text{O}_2(\text{g}) \rightarrow \text{Fe}_2\text{O}_3(\text{s})
\]

\[
\text{Ca(HSO}_3\text{)}_2(\text{s}) \rightarrow \text{CaO(ℓ)} + \text{H}_2\text{O(ℓ)} + \text{SO}_2(\text{g})
\]

\[
\text{Fe(s)} + \text{Br}_2(\text{ℓ}) \rightarrow \text{FeBr}_3(\text{s})
\]

\[
\text{CH}_3\text{CH}_2\text{OH(ℓ)} + \text{O}_2 \rightarrow \text{CO}_2(\text{g}) + \text{H}_2\text{O(ℓ)}
\]