Review: Molecular Formula and Stoichiometry Quiz

1) A compound contains 92.25% C and 7.75% H. Find the molecular formula of the compound if its molecular mass is 78g.

$\frac{1\ mol\ C}{12.01\ g\ C} \left| \frac{92.25\ g\ C}{} \right. = \frac{7.6811\ mol\ C}{7.6733} = 1$

$\frac{1\ mol\ H}{1.01\ g\ H} \left| \frac{7.75\ g\ H}{} \right. = \frac{7.6733\ mol\ H}{7.6733} = 1$

Empirical = CH = 13.02g

$\frac{78\ g}{13.02\ g} = 6$

Molecular C_6H_6

2) Find the formula of the hydrate with the following analysis: 151 g $CaCl_2$, 49 g H_2O.

$\frac{1\ mol\ CaCl_2}{110.98\ g\ CaCl_2} \left| \frac{151\ g\ CaCl_2}{} \right. = \frac{1.3605\ mol\ CaCl_2}{1.3605} = 1$

$\frac{1\ mol\ H_2O}{18.02\ g\ H_2O} \left| \frac{49\ g\ H_2O}{} \right. = \frac{2.7192\ mol\ H_2O}{1.3606} = 2$

$CaCl_2 \cdot 2H_2O$

3) How many grams of sulfuric acid are produced when 15 grams of hydrochloric acid reacts with sodium sulfate in this double replacement reaction?

$2HCl + Na_2SO_4 \rightarrow 2NaCl + H_2SO_4$

15 g ? g

$\frac{98.09\ g\ H_2SO_4}{1\ mol\ H_2SO_4} \left| \frac{1\ mol\ H_2SO_4}{2\ mol\ HCl} \right| \frac{1\ mol\ HCl}{36.46\ g\ HCl} \left| \frac{15\ g\ HCl}{} \right. = 20\ g\ H_2SO_4$

4) How many grams of potassium nitrate are required to produce 7.00 g of potassium nitrite according to the equation below? What type of reaction is this? Decomposition

$2KNO_3 \rightarrow 2KNO_2 + O_2$

? g 7.00 g

$\frac{101.11\ g\ KNO_3}{1\ mol\ KNO_3} \left| \frac{2\ mol\ KNO_3}{2\ mol\ KNO_2} \right| \frac{1\ mol\ KNO_2}{85.11\ g\ KNO_2} \left| \frac{7.00\ g\ KNO_2}{} \right. = 8.32\ g\ KNO_3$

5) What other type of reactions have we studied?

- Synthesis → $A + B \rightarrow AB$
- Single Replacement → $A + BC \rightarrow AC + B$

Review: Molecular Formula and Stoichiometry Quiz (Version 2)

1) A compound contains 92.3% C and 7.7% H. Find the molecular formula of the compound if its molecular mass is 26 g.

$$\frac{1\ \text{mol C}}{12.01\ \text{g C}} \left| \frac{92.3\ \text{g C}}{} \right. = \frac{7.6853\ \text{mol C}}{7.6238} = 1$$

$$\frac{1\ \text{mol H}}{1.01\ \text{g H}} \left| \frac{7.7\ \text{g H}}{} \right. = \frac{7.6238\ \text{mol H}}{7.6238} = 1$$

Empirical : CH

13.02 g

$\frac{26}{13.02} = 2$

Molecular : C_2H_2

2) Find the formula of the hydrate with the following analysis: 25.36 g $BeBr_2$, 16.24 g H_2O.

$$\frac{1\ \text{mol } BeBr_2}{168.81\ \text{g } BeBr_2} \left| \frac{25.36\ \text{g } BeBr_2}{} \right. = \frac{0.1502\ \text{mol } BeBr_2}{0.1502} = 1$$

$$\frac{1\ \text{mol } H_2O}{18.02\ \text{g } H_2O} \left| \frac{16.24\ \text{g } H_2O}{} \right. = \frac{0.9012\ \text{mol } H_2O}{0.1502} = 6$$

$BeBr_2 \cdot 6H_2O$

3) How many grams of nitric acid are produced when 23 grams of hydrochloric acid reacts with potassium nitrate in this double replacement reaction?

$$HCl + KNO_3 \rightarrow HNO_3 + KCl$$

23 g ? g

$$\frac{63.02\ \text{g } HNO_3}{1\ \text{mol } HNO_3} \left| \frac{1\ \text{mol } HNO_3}{1\ \text{mol } HCl} \right| \frac{1\ \text{mol } HCl}{36.46} \left| \frac{23\ \text{g } HCl}{} \right. = 40\ \text{g } HNO_3$$

4) How many grams of magnesium would be required to produce 2.50 g of magnesium oxide? What type of reaction is this?

Synthesis

? g 2.50 g

$$2Mg + O_2 \rightarrow 2MgO$$

$$\frac{24.31\ \text{g Mg}}{1\ \text{mol Mg}} \left| \frac{2\ \text{mol Mg}}{2\ \text{mol MgO}} \right| \frac{1\ \text{mol MgO}}{40.31\ \text{g MgO}} \left| \frac{2.50\ \text{g MgO}}{} \right. = 1.51\ \text{g Mg}$$

5) What other type of reactions have we studied?

Decomposition

Single Replacement

Double Replacement