

General Chemistry
Mr. MacGillivray
Quiz #19:
Empirical and Molecular Formulas

1. Calculate the % composition by mass of Na_3PO_4 . Show all work.
Report answers to three significant figures.

% Na = _____ % P = _____ % O = _____

2. Calculate the empirical formula of a compound for which the
% composition by mass is 69.9% Fe and 30.1% O. Show all work.

3. Calculate the molecular formula of a compound (molar mass = 150.
g/mol) for which the empirical formula is CH_2O .

Assume 100 mol Na_3PO_4

$$\begin{aligned} \therefore 3.00 \text{ mol Na} &\times \frac{23 \text{ g}}{1 \text{ mol}} = \underline{69 \text{ g Na}} \\ 1.00 \text{ mol P} &\times \frac{31 \text{ g}}{1 \text{ mol}} = \underline{31 \text{ g P}} \\ 4.00 \text{ mol O} &\times \frac{16 \text{ g}}{1 \text{ mol}} = \underline{64 \text{ g O}} \end{aligned}$$

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$$\text{total} = 164 \text{ g}$$

1. Calculate the % composition by mass of Na_3PO_4 . Show all work.
Report answers to three significant figures.

$$\% \text{ Na} = \underline{42.1\%} \quad \% \text{ P} = \underline{18.9\%} \quad \% \text{ O} = \underline{39.0\%}$$

$$\% \text{ Na} = \frac{69}{164} \times 100 = 42.1\%$$

$$\% \text{ O} = \frac{64}{164} \times 100$$

$$\% \text{ P} = \frac{31}{164} \times 100 = 18.9\%$$

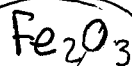
2. Calculate the empirical formula of a compound for which the % composition by mass is 69.9% Fe and 30.1% O. Show all work.

Assume 100g $\therefore 69.9 \text{ g Fe}$ and 30.1 g O

$$69.9 \text{ g Fe} \times \frac{1 \text{ mol Fe}}{55.85 \text{ g Fe}} = \underline{1.25 \text{ mol Fe}}$$

$$30.1 \text{ g O} \times \frac{1 \text{ mol O}}{16.0 \text{ g O}} = \underline{1.88 \text{ mol O}}$$

$$\begin{aligned} &\rightarrow \text{Fe}_{1.25} \text{O}_{1.88} \\ &\frac{1.88}{1.25} = 1.50 \\ &= \frac{3}{2} = \frac{\text{O}}{\text{Fe}} \end{aligned}$$



3. Calculate the molecular formula of a compound (molar mass = 150. g/mol) for which the empirical formula is CH_2O .

$$\begin{array}{rcl} \text{CH}_2\text{O} & \text{C} = 12.0 & = 12 \\ & \text{H} = 2 \times 1.01 & = 2 \\ & \text{O} = 16 & = 16 \\ & & \hline & & 30 \text{ g/mol} \end{array}$$

$$\frac{150 \text{ g/mol}}{30 \text{ g/mol}} = 5$$

