Name Key Period____ Date_____

PreAP Chemistry Homework: Percent Composition & Empirical Formulas

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1. **What is the percent composition of oxygen in potassium permanganate?**

$KMnO_4$ K 1×39 = 39; Mn 1×55 = 55; O 4×16 = 64 → 158 g/mol

$\frac{64\ g/mol}{158\ g/mol} \times 100 = 40.5\%$

40.5% O

2. **What is the percent composition of hydrogen in calcium acetate**

$Ca(C_2H_3O_2)_2$ Ca 1×40 = 40; C 4×12 = 48; H 6×1 = 6; O 4×16 = 64 → 158 g/mol

$\frac{6\ g/mol}{158\ g/mol} \times 100 = 3.80\%$

3.80% H

3. **A 138 g sample of a compound is analyzed and found to contain 25.8 g of lithium, 22.5 g of carbon, and the remainder to be oxygen. Calculate the percent composition.**

25.8 + 22.5 = 48.3 g

138 g − 48.3 = 89.7 g O

Li $\frac{25.8\ g}{138\ g} \times 100 = 18.7\%$

C $\frac{22.5\ g}{138\ g} \times 100 = 16.3\%$

O $\frac{89.7\ g}{138\ g} \times 100 = 65\%$

Li: 18.7%
C 16.3%
O 65%

4. **A sample contains 52.94% aluminum and 47.06% oxygen. What is the empirical formula of the substance?**

Al: $52.94\ g \times \frac{1\ mol}{27\ g} = \frac{1.96\ mol}{1.96\ mol} = 1 \times 2 = 2$

O: $\frac{47.06\ g}{1} \times \frac{1\ mol}{16\ g} = \frac{2.94\ mol}{1.96\ mol} = 1.5 \times 2 = 3$

Al_2O_3

5. **A sample contains 17.96 grams of potassium, 7.35 gram of sulfur, and 14.70 grams of oxygen. What is the empirical formula of the sample?**

$17.96\ g\ K \times \frac{1\ mol}{39\ g} = .461\ mol\ K$; $\frac{.461}{.230} = 2$

$7.35\ g \times \frac{1\ mol}{32\ g} = .230\ mol$; $\frac{.230}{.230} = 1$

$14.70\ g \times \frac{1\ mol}{16\ g} = .919\ mol$; $\frac{.919}{.230} = 4$

K_2SO_4

6. **50.0 grams of sulfur are mixed with 100.0 grams of iron and then the mixture is heated. When the reaction is completed, 12.7 grams of iron remain. What is the empirical formula of the compound that was formed?**

100 g Fe − 12.7 g left = 87.3 g used

$50\ g\ S \times \frac{1\ mol}{32\ g} = \frac{1.56}{1.56} = 1$

$87.3\ g \times \frac{1\ mol}{55.85\ g} = \frac{1.56}{1.56} = 1$

FeS

7. **A 165 g sample of a compound to contain only arsenic and sulfur was analyzed and found to contain 101 g of arsenic. Calculate the empirical formula**

$101\ g\ As \times \frac{1\ mol}{75\ g} = \frac{1.35\ mol}{1.35} = 1 \times 2 = 2$

$64\ g\ S \times \frac{1\ mol}{32\ g} = \frac{2.00}{1.35} = 1.5 \times 2 = 3$

As_2S_3

8. **A 145 g sample of a compound to contain only phosphorus and oxygen was analyzed and found to contain 63.28 g of phosphorus. Calculate the empirical formula.**

145 g − 63.28 g P = 81.72 g O

$63.28\ g\ P \times \frac{1\ mol}{31\ g} = 2$

$81.72\ g\ O \times \frac{1\ mol}{16\ g} = 5$

P_2O_5

9. **Find the molecular formula of ethylene glycol. The molar mass is 62 g/mol and the empirical formula is CH_3O.**

$CH_3O = 31\ g/mol$

$\frac{62\ g/mol}{31\ g/mol} = 2$

$C_2H_6O_2$

10. **A compound is composed of 7.20 g of carbon, 1.20 g of hydrogen, and 9.60 grams oxygen. The molecular mass of the compound is 180 grams. What are the empirical and molecular formulas for this compound?** [redacted]

$7.20\ g\ C \times \frac{1\ mol}{12\ g} = \frac{.6}{.6} = 1$

$1.20\ g\ H \times \frac{1\ mol}{1\ g} = \frac{1.20}{.6} = 2$

$9.60\ g \times \frac{1\ mol}{16\ g} = \frac{.6}{.6} = 1$

EF = CH_2O

$CH_2O = 30\ g/mol$

$\frac{180\ g}{30} = 6$

MF = $C_6H_{12}O_6$