Name Answer Key Hour _____

Empirical & Molecular Formulas

(Honors Chemistry)

Use the information provided to calculate the Empirical Formula.

1. 82.2% nitrogen; 17.8% hydrogen

$82.2\text{-g} \left| \frac{1\text{ mol}}{14\text{-g}} \right. = \frac{5.87\text{ mol}}{5.87\text{ mol}} = 1$; $17.8 \left| \frac{1\text{ mol}}{1\text{-g}} \right. = \frac{17.8}{17.8} = 3$

NH_3

2. 63.5% silver; 8.2% nitrogen; 28.2% oxygen

$63.5 \left| \frac{1\text{ mol}}{108\text{-g}} \right. = \frac{.588}{.588} = 1$; $8.2 \left| \frac{1\text{ mol}}{14\text{ g}} \right. = \frac{.586}{.586} = 1$; $28.2 \left| \frac{}{16\text{ g}} \right. = \frac{1.76}{.586} = 3$

$AgNO_3$

3. 14.3% nitrogen; 4.1% hydrogen; 81.6% bromine

N: $14.3 \left| \frac{1\text{ mol}}{14} \right. = \frac{1}{1} = 1$; H: $4.1 \left| \frac{1\text{ mol}}{1\text{-g}} \right. = \frac{4.1}{4.1} = 4$; Br: $81.6 \left| \frac{1\text{ mol}}{80} \right. = \frac{1.0}{1} = 1$

NH_4Br

4. 24.7% potassium; 34.7% manganese; 40.5% oxygen

K: $\frac{24.7\text{ mol}}{39} = \frac{.63}{.63} = 1$; Mn: $34.7 \left| \frac{1\text{ mol}}{55} \right. = \frac{.63}{.63} = 1$; O: $40.5 \left| \frac{1\text{ mol}}{16} \right. = \frac{2.53}{.63} = 4$

$KMnO_4$

5. 35.0% nitrogen; 5.0% hydrogen; 60.0% oxygen

N: $35 \left| \frac{1\text{ mol}}{14} \right. = \frac{2.5}{2.5} = 1$; H: $5 \left| \frac{1\text{ mol}}{1\text{-g}} \right. = \frac{5}{2.5} = 2$; O: $60 \left| \frac{1\text{ mol}}{16\text{-g}} \right. = \frac{3.75}{2.5} = 1.5$

$N_2H_4O_3$

6. A compound containing 3.26 g of arsenic and 1.04 g of oxygen. Must Find % composition

As: $75.8 \left| \frac{1\text{ mole}}{75} \right. = \frac{1}{1} = 1$; O: $24.2 \left| \frac{1\text{ mole}}{16\text{-g}} \right. = \frac{1.5}{1} = 1.5$

As_2O_3

7. A sample of Na_2O has a total mass of 12.57. It contains 9.34 g of sodium. Find % Comp.

Na: $74.3 \left| \frac{1\text{ mole}}{23} \right. = \frac{3.23}{1.61} = 2$; O: $25.7 \left| \frac{1\text{ mole}}{16\text{-g}} \right. = \frac{1.61}{1.61} = 1$

Na_2O

8. A compound containing 0.17 g of hydrogen, 2.82 g of sulfur, and 5.67 g of oxygen.

H: $1.96 \left| \frac{1\text{ mol}}{1\text{-g}} \right. = \frac{1.96}{1} = 2$; S: $32.6 \left| \frac{1\text{ mol}}{32} \right. = \frac{1.0}{1.0} = 1$; O: $65.5 \left| \frac{1\text{ mol}}{16} \right. = \frac{4.0}{1.0} = 4$

H_2SO_4

Use the information provided to calculate the Molecular Formula.

1. A compound with a molar mass of 60.0 g has an empirical formula of CH_4N. EFM = 30-g $\quad \frac{60}{30} = 2$	$C_2H_8N_2$
2. A compound with a molar mass of 180.0 g has an empirical formula of CH_2O. EFM = 30-g $\quad \frac{180.0}{30} = 6$	$C_6H_{12}O_6$
3. A compound with a molar mass of 135.0 g has an empirical formula of C_2H_3. EFM = 27-g $\quad \frac{135}{27} = 5$	$C_{10}H_{15}$
4. 26.7% carbon; 2.2% hydrogen; 71.1% oxygen. The molar mass of the compound is 90.0 grams. EF = CHO_2 EFM = 45-g $\quad \frac{90}{45} = 2$	$C_2H_2O_4$
5. 54.6% carbon; 9.0% hydrogen; 36.4% oxygen. The molar mass of the compound is 176.0 grams. EF = C_2H_4O EFM = 44-g $\quad \frac{176.0}{44} = 4$	$C_8H_{16}O_4$
6. 80.0% carbon; 20.0% hydrogen. The molar mass of the compound is 30.0 grams. EF = CH_3 EFM = 15-g $\quad \frac{30}{15} = 2$	C_2H_6
7. 24.3% carbon; 4.1% hydrogen; 71.6% chlorine. The molar mass of the compound is 99.0 grams. EF = CH_2Cl EFM = 49.5-g $\quad \frac{99}{49.5} = 2$	$C_2H_4Cl_2$