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Name _____ Date _____ PM _____

Chemistry – Unit 5 Worksheet 3
Empirical and Molecular Formulas

Show all your work when solving the following problems. Be sure to include units and label your answer.

1. Find the empirical formula of a compound containing 32.0 g of bromine and 4.9 g of magnesium.

$$32.0 \text{ g} \times \frac{1 \text{ mole}}{79.9 \text{ g}} = 0.401 \text{ mole Br} \quad 1:2 \text{ ratio}$$
$$4.9 \text{ g} \times \frac{1 \text{ mole}}{24.31 \text{ g}} = 0.20 \text{ mole Mg} \quad \text{MgBr}_2$$

2. What is the empirical formula of a carbon-oxygen compound, given that a 95.2 g sample of the compound contains 40.8 g of carbon and the rest oxygen?

$$95.2 \text{ g} - 40.8 \text{ g} = 54.4 \text{ g O}$$
$$40.8 \text{ g} \times \frac{1 \text{ mole}}{12.0 \text{ g}} = 3.40 \text{ moles C} \quad 1:1 \text{ ratio}$$
$$54.4 \text{ g} \times \frac{1 \text{ mole}}{16.0 \text{ g}} = 3.40 \text{ moles O} \quad \text{CO}$$

3. A compound was analyzed and found to contain 9.8 g of nitrogen, 0.70 g of hydrogen, and 33.6 g of oxygen. What is the empirical formula of the compound?

$$9.8 \text{ g} \times \frac{1 \text{ mole}}{14.0 \text{ g}} = 0.70 \text{ moles N} \quad 1:1:3 \text{ ratio}$$
$$0.70 \text{ g} \times \frac{1 \text{ mole}}{1.01 \text{ g}} = 0.69 \text{ moles H} \quad \text{HNO}_3$$
$$33.6 \text{ g} \times \frac{1 \text{ mole}}{16.0 \text{ g}} = 2.10 \text{ moles O}$$

4. A compound composed of hydrogen and oxygen is found to contain 0.59 g of hydrogen and 9.40 g of oxygen. The molar mass of this compound is 34.0 g/mol. Find the empirical and molecular formulas.

$$0.59 \text{ g} \times \frac{1 \text{ mole}}{1.01 \text{ g}} = 0.58 \text{ mole H} \quad 1:1 \text{ ratio; empirical formula: HO}$$
$$9.40 \text{ g} \times \frac{1 \text{ mole}}{16.0 \text{ g}} = 0.588 \text{ mole O} \quad \text{empirical formula mass: } 17.0 \text{ g/mol}$$

molecular formula mass: 34.0 g/mol
mfm is 2x efm so the molecular formula is H₂O₂

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