**Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date:\_\_\_\_\_\_\_**

**H. Chemistry**

**Ch. 8.5-8.8 Lecture Guide**

* Percent Composition of Compounds
  + Equation: Mass percent for a given element = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ x 100
* Calculating Mass Percent
  + Ex) Determine the mass percent of each element in sulfuric acid.
    - Step 1: Calculate the molar mass of sulfuric acid.
    - Step 2: Calculate the mass percent of each element.
* Molecular vs. Empirical Formulas
  + Molecular Formula:
    - Ex)
  + Empirical Formula:
    - Ex)
* Determining Empirical Formulas
  + Practice Problems
    - C6H6. This is the molecular formula for benzene. Write the empirical formula.
    - C12H4Cl4O2. This is the molecular formula for dioxin. Write the empirical formula.
    - C6H16N2. This is the molecular formula for one of the reactants used to produce nylon. Write the empirical formula.
* Calculating Empirical Formulas
  + Ex) Suppose we weigh out a 0.2015 g sample of a compound that contains 0.0806 g of carbon, 0.01353 g of hydrogen atoms, and 0.1074 g of oxygen atoms. How could we determine the formula of this compound?
    - Step 1: Calculate the number of moles of each element.
    - Step 2: Because chemical formulas use only whole numbers, we next find the integer (whole number) ratio of the atoms by **dividing the numbers by the smallest of the three.** This converts the smallest number to 1.
    - Step 3: Note the following:
      * The compound contains the same number of carbon and oxygen atoms.
      * The compound contains twice as many hydrogen atoms as carbon and oxygen atoms.
    - Step 4: Write the **empirical formula**.
      * **Reminder:** This will be the *simplest possible formula*.
* Practice Problems
  + When a 0.3546 g sample of vanadium metal is heated in air, it reacts with oxygen to achieve a final mass of 0.6330 g of vanadium oxide. Calculate the empirical formula of this vanadium oxide.
    - Step 1: Calculate the mass of oxygen in the compound.
    - Step 2: Calculate the moles of each element present in the compound.
    - Step 3: Divide both numbers of moles by the smaller.
    - Step 4: Because one of these numbers (2.500) is not an integer, we have to include another step. Multiply both numbers by 2 to get two whole numbers.
* Calculating Empirical Formulas from % Composition
  + Ex) Cisplatin, the common name for a platinum compound that is used to treat cancerous tumors, has the composition (mass percent) 65.02% platinum, 9.34% nitrogen, 2.02% hydrogen, and 23.63% chlorine. Calculate the empirical formula for cisplatin.
    - Step 1: Assume sample contains 100 g of cisplatin.
    - Step 2: Calculate the number of moles of each type of atom.
    - Step 3: Divide through by the smallest number.
    - Empirical formula =
* Calculating Molecular Formulas:
  + Ex) A white powder has an empirical formula of P2O5. The compound has a molar mass of 283.88 g. What is the compounds molecular formula?
    - Step 1: Find the empirical formula mass.
    - **Important:** Molecular formula = n x empirical formula
    - **Therefore:** Molar mass = n x empirical formula mass.
    - **Therefore:** n = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    - Step 2: Calculate “n”.
    - Step 3: Multiply n by the empirical formula to find the molecular formula.