**Study Guide: Chemical Quantities, Mole Concepts and Stoichiometry**

**Chemical Quantities: Use the factor label (“fence post”) method to convert the following:**

275 mm = cm 15 g = mg 3 hrs = sec.

**Mole and Avogadro’s number: Use Avogadro’s number (6.02 x 1023) to determine the number of moles or particles in each of the following:**

3.4 x 1026 molecules PCl3 = mol

1.5 moles H2O = molecules

0.75 moles Zn = atoms

2.0 moles NaCl = formula units

15 moles CO2 = atoms

**Mole and Mass: Determine the number of moles or grams in each of the quantities below.**

74 g of KCl = moles 1.70 moles of KMnO4 = g

**Mole and Volume: For gases at STP (0oC and 1 atm), one mole occupies a volume of 22.4 L. What volume will the following quantities of gases occupy at STP?**

1.75 moles CO2 = L 28.0 g of N2 = L

**Molar Mass and Density**

What is the molar mass of a gas with a density of 85.3 g/L?

**Mixed Mole Problems**

What is the mass of a sample of NH3 that takes up 75 liters at STP?

A 5.0 g sample of O2 is in a container at STP. What volume is the container?

**Gram Formula Mass: Determine the gram formula mass (mass of one mole) of each compound below.**

H2CO3 Zn3(PO4)2

**Percent Composition:** **Determine the percent composition for each of the following compounds.**

A 9.14 g sample contains 4.77 g carbon, 1.19 g hydrogen, and 3.18 g oxygen.

% C % H % O\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

CaC2O4: %Ca %C %O

**Empirical Formula: What is the empirical formula (lowest whole number ratio) of the compounds below?**

75% carbon and 25% hydrogen:

Calculate the empirical formula for a compound having 37.70% sodium, 22.95% silicon, and 39.34% oxygen.

**Molecular formula**

The empirical formula of a compound is NO2. Its molecular mass is 92 g/mol. What is its molecular formula? .

A compound is 54.5% carbon, 9.1% hydrogen, and 36.4% oxygen. Its molecular mass is 88 g/mol. What is its molecular formula?

**Stoichiometry**

Find the mass of sugar (C6H12O6) required to produce 3.7 L of carbon dioxide gas at STP from the reaction described by the following equation. (Answer: 14.9 g C6H12O6)

C6H12O6 🡪 2C2H6O + 2CO2

What mass of hydrogen peroxide (H2O2) must decompose to produce 107.2 g of water according to the following reaction: 2H2O2 🡪 2H2O + O2 (Answer: 202.5 g H2O2)

**Limiting Reagent:** Identify the limiting reactant when 5.87 grams of Mg(OH)2 reacts with 12.84 grams of HCl to form MgCl2 and water. How much MgCl2 is produced? (Answer: Mg(OH)2 is the limiting reactant and only 9.6g of MgCl2 can be produced).