

Experiment 4

Advance Study Assignment: Determination of a Chemical Formula

1. To find the mass of a mole of an element, one looks up the atomic mass of the element in a table of atomic masses (see Appendix III or the Periodic Table). The molar mass of an element is simply the mass in grams of that element that is numerically equal to its atomic mass. For a compound substance, the molar mass is equal to the mass in grams that is numerically equal to the sum of the atomic masses in the formula of the substance. Find the molar mass of

give me a break

→ Cu _____ g Cl _____ g H _____ g O _____ g H₂O _____ g

2. If one can find the ratio of the number of moles of the elements in a compound to one another, one can find the formula of the compound. In a certain compound of copper and oxygen, Cu_xO_y, we find that a sample weighing 0.6349 g contains 0.5072 g Cu.

- a. How many moles of Cu are there in the sample?

$$0.5072 \text{ g Cu} \left(\frac{\text{mol Cu}}{63.546 \text{ g Cu}} \right) \quad \left(\text{No. moles} = \frac{\text{mass Cu}}{\text{molar mass Cu}} \right) \quad \underline{0.007982} \text{ moles}$$

- b. How many grams of O are there in the sample? (The mass of the sample equals the mass of Cu plus the mass of O.)

$$m(\text{O}) = 0.6349 \text{ g} - 0.5072 \text{ g} = \underline{0.1277} \text{ g}$$

- c. How many moles of O are there in the sample?

$$0.1277 \text{ g O} \left(\frac{\text{mol O}}{15.9994 \text{ g O}} \right) = \dots \quad \underline{0.007982} \text{ moles}$$

- d. What is the mole ratio (no. moles Cu/no. moles O) in the sample?

$$\frac{0.007982 \text{ mol Cu}}{0.007982 \text{ mol O}} = \dots \quad \underline{1} : 1$$

- e. What is the formula of the oxide? (The atom ratio equals the mole ratio, and is expressed using the smallest integers possible.)

CuO

- f. What is the molar mass of the copper oxide?

$$\underline{79.545} \text{ g/mol}$$