

# The Mole Review (Chapter 7)

$$1. \frac{8.1 \times 10^{21} \text{ molec.}}{6.02 \times 10^{23} \text{ molec.}} \times \frac{1 \text{ mol}}{1 \text{ mol}} \times \frac{342.34 \text{ g}}{1 \text{ mol}} = 4.6 \text{ g } C_{12}H_{22}O_{11}$$

$$\text{Sucrose } C_{12}H_{22}O_{11} = 12(12.01) + 22(1.01) + 11(16.00) = 342.34 \text{ g/mol}$$

$$2. \frac{53.8 \text{ g } MgCl_2}{95.21 \text{ g}} \times \frac{1 \text{ mol}}{1 \text{ mol}} = 0.565 \text{ mol } MgCl_2$$

$$24.31 + 2(35.45) = 95.21 \text{ g/mol}$$

$$3. \frac{0.845 \text{ mol } NaNO_3}{1 \text{ mol}} \times \frac{6.02 \times 10^{23} \text{ molec.}}{1 \text{ mol}} = 5.09 \times 10^{23} \text{ molec. } NaNO_3$$

$$4. \frac{50.0 \text{ g } CaS}{72.14 \text{ g}} \times \frac{1 \text{ mol}}{1 \text{ mol}} \times \frac{6.02 \times 10^{23} \text{ molec.}}{1 \text{ mol}} = 4.17 \times 10^{23} \text{ molec. } CaS$$

$$5. \frac{2.0 \text{ kg } Au}{1 \text{ kg}} \times \frac{1000 \text{ g}}{1 \text{ kg}} \times \frac{1 \text{ mol}}{196.97 \text{ g}} \times \frac{6.02 \times 10^{23} \text{ atoms}}{1 \text{ mol}} = 6.1 \times 10^{24} \text{ atoms}$$

$$6. \% C = \frac{144.12}{342.34} \times 100 = 42.1\%$$

$$\% O = \frac{176}{342.34} \times 100 = 51.4\%$$

$$\% H = \frac{22.22}{342.34} \times 100 = 6.5\%$$

$$7. C = \frac{1.29}{3.00} \times 100 = 43\% \quad O = \frac{1.71}{3.00} \times 100 = 57\%$$

$$8. Na_2CO_3 \cdot 10H_2O$$

$$106 + 10(18.02) = 286 \text{ g}$$

$$\% H_2O = \frac{180}{286} \times 100 = 62.9\%$$

$H_2O$

$$9. Zn(NO_3)_2 \quad 65.39 + 28 + 96 = 189.39 \text{ g total}$$

$$\% Zn = \frac{65.39}{189.39} \times 100 = 34.5\% \times 37.2 \text{ g} = 12.8 \text{ g Zn}$$

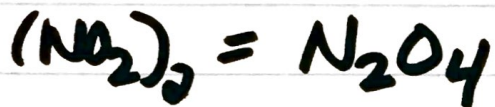
$$10. \quad C = \frac{75g}{12.01g/mol} = 6.24 = 1 \quad H = \frac{25g}{1.01g/mol} = 24.8 = 4 \quad CH_4$$

$$11. \quad Mg = \frac{9.03g}{24.31g/mol} = .371 \quad N = \frac{3.48g}{14.01g/mol} = .249$$

$$\frac{.371}{.249} = 1.5 \quad \frac{.249}{.249} = 1$$

$$\frac{1.5}{3} = \frac{1}{2} \quad Mg_3N_2$$

$$12. \quad NO_2 \quad 14.01 + 2(16.00) = 46.00g \quad \frac{92}{46} = 2$$



$$13. \quad CH_2O \quad 12 + 2 + 16 = 30 \quad \frac{180}{30} = 6 \quad (CH_2O)_6 = C_6H_{12}O_6$$

$$14. \quad Na = \frac{34.2g}{23} = 1.49 = 1 \quad NaCO_2$$

$$23 + 12 + 32 = 67$$

$$C = \frac{17.7g}{12} = 1.48 = 1 \quad \frac{134}{67} = 2 \quad Na_2C_2O_4$$

$$O = \frac{47.6g}{16} = 2.98 = 2$$

$$15. \quad a) \quad 30.25g - 28.71g = 1.54g \text{ Cu} \quad 1.93 - 1.54 = 0.39g \text{ S}$$

$$30.64 - 28.71g = 1.93g \text{ Product}$$

$$\% \text{ Cu} = \frac{1.54g}{1.93g} \times 100 = 79.8\% \quad \% \text{ S} = \frac{0.39}{1.93} \times 100 = 20.2\%$$

$$b) \quad Cu = \frac{79.8g}{63.55g/mol} = 1.26 = 2 \quad Cu_2S$$

$$S = \frac{20.2}{32.06g/mol} = .631 = 1$$

c) ionic  
d) copper (I) sulfide  
cuprous sulfide



## UNIT 6 TEST REVIEW - THE MOLE (from Ch. 7)

\*\*\*\*ALL ANSWERS MUST INCLUDE THE PROPER UNITS & SIG FIGS.\*\*\*\*

Show all work on a separate paper

### SOLVE THE FOLLOWING MOLAR CONVERSION PROBLEMS:

1. How many grams would  $8.1 \times 10^{21}$  molecules of sucrose ( $C_{12}H_{22}O_{11}$ ) weigh?
2. How many moles are in 53.8 g of magnesium chloride?
3. How many representative particles (molecules) are in 0.845 moles of  $NaNO_3$ ?
4. How many molecules are in 50.0 g of calcium sulfide?
5. How many atoms are in a 2.0 kg ingot of gold? (Note mass units. 1 kg = 1000 g)

### SOLVE THE FOLLOWING PERCENTAGE COMPOSITION PROBLEMS:

6. Find the percentage composition of sucrose ( $C_{12}H_{22}O_{11}$ ).
7. Find the percentage composition of a sample containing 1.29 g of carbon and 1.71 g of oxygen.
8. Find the mass percentage of water in sodium carbonate decahydrate.
9. How many grams of zinc are in a 37.2-gram sample of zinc nitrate?

### SOLVE THE FOLLOWING EMPIRICAL & MOLECULAR FORMULA PROBLEMS:

10. Find the empirical formula of a compound that contains 75% carbon and 25% hydrogen.
11. Find the empirical formula of a compound that contains 9.03 g magnesium and 3.48 g of nitrogen.
12. The empirical formula of a compound is  $NO_2$ . Its molecular mass is 92 g/mol. What is its molecular formula?
13. Glucose has an empirical formula of  $CH_2O$ . Find its molecular formula if its molecular mass is 180.0 g/mol.
14. A compound is composed of 34.2% sodium, 17.7% carbon, and 47.6% oxygen. Find its empirical formula. If its molecular mass is 134 g/mol, find its molecular formula.
15. A compound of copper and sulfur was produced in the lab by heating copper and sulfur together in a crucible. This data was collected:

Mass of crucible and cover	28.71g
Mass of crucible, cover and copper	30.25g
Mass of crucible, cover and copper-sulfur compound	30.64

- a) calculate the percent composition of the compound
- b) determine its empirical formula
- c) is it an ionic or molecular compound?
- d) Name the compound using both the Stock and traditional systems

16. What is the Molarity of a 1.5 L solution that has 29.5g of NaF.

$$\frac{29.5 \text{g NaF}}{41.99 \text{g}} \times 1 \text{mol} = 0.702 \text{mol}$$

$$M = \frac{0.702 \text{mol}}{1.5 \text{L}} = 0.468 \text{M NaF solution}$$