

Name: KEY

## WP Practice

### Exam 5: Chemistry Quantitation, Empirical and Molecular Formulas (Also review pretest packet for Unit 7: The Mole)

1. How many molecules are present in 6.88 moles of  $N_2O_3$ ?

$$6.88 \text{ mol } N_2O_3 \times \frac{6.02 \times 10^{23} \text{ molecules } N_2O_3}{1 \text{ mol } N_2O_3} = \boxed{4.14 \times 10^{24} \text{ molecules}}$$

2. How many molecules of  $F_2$  are present in 59.0 g of  $F_2$ ?

$$59.0 \text{ g } F_2 \times \frac{1 \text{ mol } F_2}{38.00 \text{ g } F_2} \times \frac{6.02 \times 10^{23} \text{ molecules } F_2}{1 \text{ mol } F_2} = \boxed{9.35 \times 10^{23} \text{ molecules}}$$

3. How many atoms of oxygen are in one molecule of  $H_2CO_3$ ?

$$1 \text{ molecule } H_2CO_3 = \boxed{3 \text{ atoms O}}$$

4. How many moles of hydrogen are in 0.50 mole of  $(NH_4)_2O$ ?

$$0.50 \text{ mol } (NH_4)_2O \times \frac{8 \text{ mol H}}{1 \text{ mol } (NH_4)_2O} = \boxed{4.0 \text{ mol H}}$$

5. Calculate the mass, in grams, of  $6.2 \times 10^{23}$  aluminum atoms.

$$6.2 \times 10^{23} \text{ atoms Al} \times \frac{1 \text{ mol Al}}{6.02 \times 10^{23} \text{ atoms Al}} \times \frac{26.98 \text{ g Al}}{1 \text{ mol Al}} = \boxed{28 \text{ g}}$$

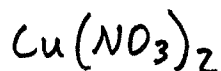
6. Determine the total number of atoms in 30.0 grams of  $C_2H_4$  (Hint: consider the definition of an atom vs. a molecule).

$$30.0 \text{ g } C_2H_4 \times \frac{1 \text{ mol } C_2H_4}{28.06 \text{ g } C_2H_4} \times \frac{6.02 \times 10^{23} \text{ molecules } C_2H_4}{1 \text{ mol } C_2H_4} \times \frac{6 \text{ atoms}}{1 \text{ molecule } C_2H_4} = \boxed{3.86 \times 10^{24} \text{ atoms}}$$

7. Calculate the molar mass of  $\text{MgCO}_3$ .

$$24.31 + 12.01 + 3(16.00) = \boxed{84.32 \text{ g}}$$

8. Calculate the molar mass of copper(II) nitrate.



$$63.55 + 2(14.01) + 6(16.00) = \boxed{187.57 \text{ g}}$$

9. Calculate the density, in g/L, of krypton gas at STP (1 mole of gas at STP occupies 22.4 L).

$$d = \frac{m}{V} = \frac{83.80 \text{ g}}{22.4 \text{ L}} = \boxed{3.74 \text{ g/L}}$$

10. A compound is comprised of 50.05% sulfur and 49.94% oxygen and has a molar mass of 64.07 g/mol.

a. Determine the compound's empirical formula.

$$50.05 \text{ g S} \times \frac{1 \text{ mol S}}{32.06 \text{ g S}} = 1.561 \text{ mol S}$$

$$49.94 \text{ g O} \times \frac{1 \text{ mol O}}{16.00 \text{ g O}} = \frac{3.121 \text{ mol O}}{1.561 \text{ mol S}} \approx \frac{2 \text{ mol O}}{1 \text{ mol S}}$$

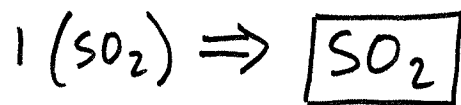
empirical formula:  $\boxed{\text{SO}_2}$

b. Determine the compound's molecular formula.

$$n = \frac{64.07 \text{ g}}{64.06 \text{ g}} \approx 1$$

$$32.06 + 2(16.00) = 64.06 \text{ g}$$

empirical mass



molecular formula