

Math of Chemistry Worksheet

Name: Key

Part 1: Mole calculations

Use *dimensional analysis* to solve the following problems. Show all your work. Use significant figures and label with units.

1. Determine the number of moles in a 50.0 gram sample of K_2S

$$50.0g \times \frac{1 \text{ mol } K_2S}{110.3 \text{ g } K_2S} = 0.453 \text{ mol } K_2S$$

2. Calculate the number of moles of xenon gas in a 25.0 L container at STP.

$$25.0g \text{ Xe} \times \frac{1 \text{ mol Xe}}{131.3g \text{ Xe}} = 0.190 \text{ mol Xe}$$

3. How many molecules of carbon monoxide are in a 0.70 mole sample?

$$0.70 \text{ mol} \times \frac{6.02 \times 10^{23} \text{ molecules}}{1 \text{ mol}} = 4.2 \times 10^{23} \text{ molecules}$$

4. Calculate the mass in grams of 5.0×10^{21} molecules of $CaSO_4$.

$$5.0 \times 10^{21} \text{ molecules } CaSO_4 \times \frac{1 \text{ mol } CaSO_4}{6.02 \times 10^{23} \text{ molecules}} \times \frac{136.2g \text{ CaSO}_4}{1 \text{ mol } CaSO_4} = 1.0g \text{ CaSO}_4$$

5. How many liters would a 45.0 g sample of Krypton gas occupy at STP?

$$45.0g \text{ Kr} \times \frac{1 \text{ mol Kr}}{83.8g \text{ Kr}} \times \frac{6.02 \times 10^{23} \text{ molecules}}{1 \text{ mol}} = 3.23 \times 10^{23} \text{ molecules}$$

$$45.0g \text{ Kr} \times \frac{1 \text{ mol Kr}}{83.8g \text{ Kr}} \times \frac{22.4L \text{ Kr}}{1 \text{ mol Kr}} = 12.0 \text{ L Kr}$$

Part 2: Empirical and Molecular Formulas

6. Given the following percent composition, calculate the empirical formula for the compound: Show all work.

77.6% Gold and 22.4% Fluorine

$$77.6g \text{ Au} \times \frac{1 \text{ mol Au}}{197.0g \text{ Au}} = 0.394 \text{ mol Au} = 1$$

$$22.4g \text{ F} \times \frac{1 \text{ mol F}}{19.0g \text{ F}} = 1.18 \text{ mol F} \approx 3$$



7. Find the molecular formula for the compound with an empirical formula of C_2H_3 and a molar mass of 189.0 g/mol. Show all work.

$$\text{mass of emp. formula } C_2H_3 = 27.0 \text{ g/mol}$$

$$\frac{189.0 \text{ g/mol}}{27.0 \text{ g/mol}} = 7 \quad \boxed{C_{14}H_{21}}$$

Part 3: Percent Composition

8. What is the percent iodine in magnesium iodide? Show all work and use significant figures.



$$\frac{253.8 \text{ g I}}{278.1 \text{ g } MgI_2} \times 100 = 91.26\% \text{ I in } MgI_2$$

9. What is the percent water in the hydrate $CaSO_4 \cdot 5H_2O$. Show all work and use significant figures.

$$\frac{5(18.0) \text{ g } H_2O}{226.2 \text{ g } CaSO_4 \cdot 5H_2O} \times 100 = 39.8\% \text{ } H_2O \text{ in } CaSO_4 \cdot 5H_2O$$

Part 4: Write your own question that could be used on the Math of Chemistry Test. Show how to solve the problem below the question that you write.