

Moles and Math Unit 8 Test Review

1. Complete the table below:

Formula	Molar Mass (include units!)
Na ₂ SO ₄	Na: 2 × 22.99 = 45.98 S: 1 × 32.06 = 32.06 + = 142.04 g/mol O: 4 × 16 = 64
C ₃ N ₄	C: 3 × 12.01 = 36.03 N: 4 × 14.01 = 56.04 + = 92.07 g/mol
Mg(OH) ₂	Mg: 1 × 24.3 = 24.3 O: 2 × 16 = 32 + = 58.316 g/mol H: 2 × 1.008 = 2.016
CaCO ₃	Ca: 1 × 40.08 = 40.08 C: 1 × 12.01 = 12.01 + = 100.09 g/mol O: 3 × 16 = 48

2. What is the percent composition of each element in the following compounds?

Compound	% Composition (for each element)
C ₃ N ₄	C: $\frac{36.03}{92.07} \times 100 = 39.13\% \text{ C}$ N: $\frac{56.04}{92.07} \times 100 = 60.87\% \text{ N}$
CaCO ₃	Ca: $\frac{40.08}{100.09} \times 100 = 40.04\% \text{ Ca}$ C: $\frac{12.01}{100.09} \times 100 = 12.00\% \text{ C}$ O: $\frac{48}{100.09} \times 100 = 47.96\% \text{ O}$

3. What is the difference between an empirical formula and a molecular formula?

↓
simplified formula
↓
real formula

4. The empirical formula of a compound is CH₂O. Its molecular mass is 60 g/mol. What is its molecular formula?

$$\text{CH}_2\text{O} = 30.026 \quad \frac{60}{30.026} \approx 2 \times \text{CH}_2\text{O} = \boxed{\text{C}_2\text{H}_4\text{O}_2}$$

5. The empirical formula of a compound is C₄H₁₀O. Its molecular mass is 74 g/mol. What is its molecular formula?

$$\text{C}_4\text{H}_{10}\text{O} = 74.12 \quad \frac{74}{74.12} \approx 1 \times \text{C}_4\text{H}_{10}\text{O} = \boxed{\text{C}_4\text{H}_{10}\text{O}}$$

6. A compound is C_2H_8O . Its molecular mass is 96g/mol. What is its molecular formula?

$$C_2H_8O = 48.084 \quad \frac{96}{48.084} \approx 2 \times C_2H_8O = \boxed{C_4H_{16}O_2}$$

7. How many atoms are in 6.2 moles of aluminum?

$$6.2 \text{ mol} \times \frac{6.02 \times 10^{23} \text{ atoms}}{1 \text{ mol}} = 3.73 \times 10^{24} \text{ atom Al}$$

8. What would be the mass of a sample of 5.3×10^{25} molecules of CO_2 ?

$$5.3 \times 10^{25} \text{ mc} \times \frac{1 \text{ mol}}{6.02 \times 10^{23} \text{ mc}} \times \frac{44.01 \text{ g}}{1 \text{ mol}} = 3,874.63 \text{ g } CO_2$$

9. How many molecules are in 3.55 moles of NaCl?

$$3.55 \text{ mol} \times \frac{6.02 \times 10^{23} \text{ mc}}{1 \text{ mol}} = 2.14 \times 10^{24} \text{ mc NaCl}$$

10. 78.54 g of NO_2 contain how many molecules?

$$78.54 \text{ g} \times \frac{1 \text{ mol}}{46.01 \text{ g}} \times \frac{6.02 \times 10^{23} \text{ mc}}{1 \text{ mol}} = 1.03 \times 10^{24} \text{ mc } NO_2$$

11. How many grams does 8.92×10^{24} atoms of tin weigh?

$$8.92 \times 10^{24} \text{ atoms} \times \frac{1 \text{ mol}}{6.02 \times 10^{23} \text{ atom}} \times \frac{118.71 \text{ g}}{1 \text{ mol}} = 1758.96 \text{ g Sn}$$

12. How many atoms of C are in by 11.5 g of C_2H_5OH ?

$$11.5 \text{ g} \times \frac{1 \text{ mol}}{46.068 \text{ g}} \times \frac{6.02 \times 10^{23} \text{ mc}}{1 \text{ mol}} = 1.50 \times 10^{23} \text{ mc} \times 2 \text{ carbon} = 3.00 \times 10^{23} \text{ atom C}$$

13. How many moles of carbon are there in 7 moles of C_2H_5OH ?

$$14 \text{ mol C}$$

15. What is the empirical formula of C_8H_{16} ? $\div 8$



14. How many moles are present in 184.1 grams of $MgBr_2$?

$$184.1 \text{ g} \times \frac{1 \text{ mol}}{184.1 \text{ g}} = 1 \text{ mol } MgBr_2$$

16. What is the empirical formula of $N_3H_6C_3S_{12}$? $\div 3$

