

• Empirical Formula: lowest whole # ratio between atoms of different elements in a compound

↳ ex: C_2H_5 , NH_3

• Molecular compound: exact # of atoms of each type of element

↳ ex: C_4H_{10} , N_2H_4

Ex: Find the empirical formula if 25.9% N & 74.1% O

↳ Assume we have a 100g sample

$$\rightarrow \frac{25.9 \text{ g N}}{14.007 \text{ g}} \cdot \frac{1 \text{ mol}}{1} = 1.849 \text{ mol N}$$

$$\rightarrow \frac{74.1 \text{ g O}}{15.999 \text{ g}} \cdot \frac{1 \text{ mol}}{1} = 4.631 \text{ mol O}$$

$$\frac{N}{1.849} \quad \frac{O}{4.631}$$

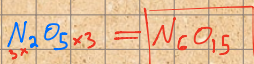
$$\frac{N}{2 \times 1} \quad \frac{O}{2.504 \times 2}$$



• Ex 1.5: Find the molecular formula if this compound has a molar mass of 324g/mol

$$N_2O_5 = 14.007 \times 2 + 15.999 \times 5 = 108.009 \text{ g/mol}$$

$$\frac{324 \text{ g/mol}}{108.009 \text{ g/mol}} = 2.998 \approx 3$$



Ex 2: A compound has 40.0% C, 6.7% H, and 53.3% O. Its molecular formula has 180g/mol. Find empirical & molecular formulas.

$$C = \frac{40.0 \text{ g}}{12.01 \text{ g}} = 3.330 \text{ mol}$$

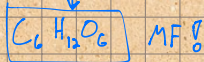
$$H = \frac{6.7 \text{ g}}{1.008 \text{ g}} = 6.647 \text{ mol}$$

$$O = \frac{53.3 \text{ g}}{15.999 \text{ g}} = 3.331 \text{ mol}$$

$$\frac{C}{3.330} \quad \frac{H}{6.647} \quad \frac{O}{3.331}$$

$$\text{EF} \quad \boxed{C_1 H_2 O_1} = 12.01 + 2.02 + 15.999 = 30.025 \text{ g/mol}$$

x 2



$$\frac{180 \text{ g/mol}}{30.025 \text{ g/mol}} = 6$$

• Bookwork → Ch 7 EOC:

62, 63, 64, 65, 72, 73

62. Which of the following compounds has the highest iron content? 73

- a. FeCl_3 c. $\text{Fe}(\text{OH})_2$
b. $\text{Fe}(\text{C}_2\text{H}_3\text{O}_2)_3$ d. FeO

63. You find that 7.36 g of a compound has decomposed to give 6.93 g of oxygen. The only other element in the compound is hydrogen. If the molar mass of the compound is 34.0 g/mol, what is its molecular formula? 73

64. Classify each formula as an empirical or a molecular formula. 73

- a. S_2Cl_2 c. Na_2SO_3 e. $\text{C}_{17}\text{H}_{13}\text{NO}_2$
b. $\text{C}_6\text{H}_{10}\text{O}_4$ d. $\text{C}_5\text{H}_{10}\text{O}_5$ f. $(\text{NH}_4)_2\text{CO}_3$

65. What is the molecular formula for each compound? Each compound's empirical formula and molar mass is given. 73

- a. CH_2O , 90 g/mol
b. HgCl , 472.2 g/mol
c. $\text{C}_3\text{H}_5\text{O}_2$, 146 g/mol

72. Determine the empirical formula of each.

- a. 42.9% C and 57.1% O
b. 32.00% C, 42.66% O, 18.67% N, and 6.67% H
c. 71.72% Cl, 16.16% O, and 12.12% C

75. Calculate the empirical formula for each compound.

- a. compound consisting of 0.40 mol Cu per 0.80 mol Br
b. compound with 4 atoms of carbon for every 12 atoms of hydrogen