

Homework:**Part I: Calculate the empirical formula for each of the following.**

1. What is the empirical formula of a compound that is 25.9% nitrogen and 74.1% oxygen?

$$\text{N: } 25.9 \div 14.01 = 1.85 \div 1.85 = 1 \times 2 = 2$$

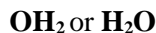
$$\text{O: } 74.1 \div 16.00 = 4.63 \div 1.85 = 2.5 \times 2 = 5$$



2. Determine the empirical formula of a compound that is composed of 88.8% O, 11.1% H.

$$\text{O: } 88.8 \div 16.00 = 5.55 \div 5.55 = 1$$

$$\text{H: } 11.1 \div 1.01 = 11.1 \div 5.55 = 1.98$$



3. Magnetite is an iron ore with natural magnetic properties. It contains 72.5% Fe & 27.5% O. What is the empirical formula for magnetite?

$$\text{Fe: } 72.5 \div 55.85 = 1.30 \div 1.30 = 1 \quad \times 3 = 3$$

$$\text{O: } 27.5 \div 16.00 = 1.72 \div 1.30 = 1.32 \times 3 = 4$$



4. An inorganic chemical used to treat burn patients is made up of silver, nitrogen, and oxygen in corresponding percentages of 78, 10, and 12. Calculate the empirical formula of this substance.

$$\text{Ag: } 78 \div 107.87 = 0.72 \div 0.71 = 1.0 \times 1 = 1$$

$$\text{N: } 10 \div 14.01 = 0.71 \div 0.71 = 1.0 \times 1 = 1$$

$$\text{O: } 12 \div 16.00 = 0.75 \div 0.71 = 1.1 \times 1 = 1$$



5. Propane is a hydrocarbon composed of 81.8% carbon and 18.2% hydrogen. What is its empirical formula?

$$\text{C: } 81.8 \div 12.01 = 6.82 \div 6.82 = 1.00 \times 3 = 3$$

$$\text{H: } 18.2 \div 1.01 = 18.2 \div 6.82 = 2.67 \times 3 = 8$$



6. What is the empirical formula of a compound that is sixty six percent calcium and the rest phosphorus?

$$\text{Ca: } 66.0 \div 40.08 = 1.65 \div 1.10 = 1.50 \times 2 = 3.0$$

$$\text{P: } 34.0 \div 30.97 = 1.10 \div 1.10 = 1.00 \times 2 = 2.0$$



7. Gigi is given 14.0 grams of an oxide of iron and asked to determine the empirical formula of the oxide. She finds that the sample contains 9.8 grams of iron and 4.2 grams of oxygen. What answer did she get?

$$\text{Fe: } 9.8 \div 55.85 = 0.176 \div 0.176 = 1.0 \times 2 = 2$$

$$\text{O: } 4.2 \div 16.00 = 0.263 \div 0.176 = 1.5 \times 2 = 3$$

14.0

**Part II: Calculate the empirical and molecular formula for each of the following.**

8. 2-Methylpropene is a compound used to make synthetic rubber. A sample contains 0.556 g of carbon and 0.0933 g of hydrogen. Determine its empirical formula. Determine the molecular formula if the molecular formula mass is 56 g/mol.

$$\text{C: } 0.556 \div 12.01 = .0463 \div .0463 = 1$$

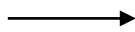
$$\text{C: } 1 \times 12.01 = 12.01$$

$$56 \div 14.03 = 4$$

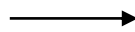
$$\text{H: } 0.0933 \div 1.01 = .0933 \div .0463 = 2$$

$$\text{H: } 2 \times 1.01 = 2.02$$

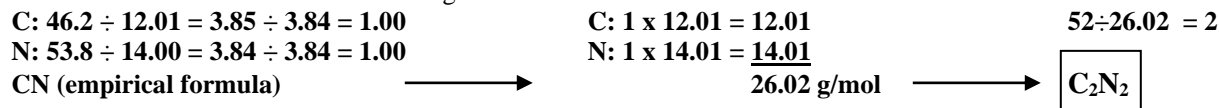
0.6493



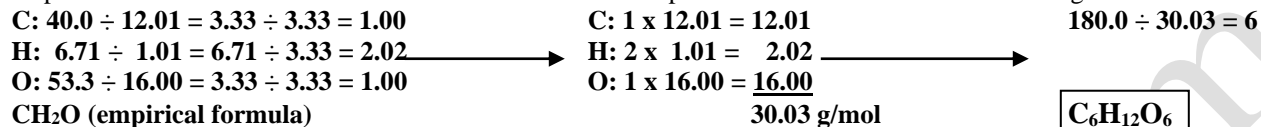
14.03 g/mol



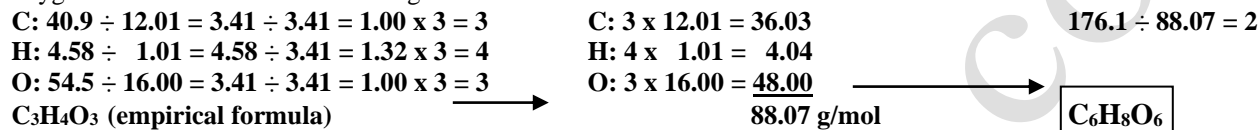
9. What is the empirical formula of a compound that contains 46.2% carbon & 53.8% nitrogen? What is its molecular formula if it has a molecular mass of 52 g/mol.



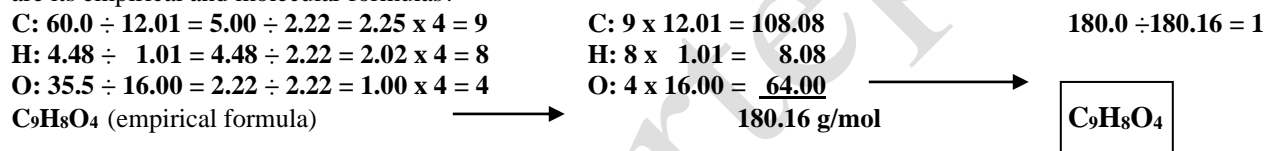
10. A compound has a percentage composition of 40.0% carbon, 6.71% hydrogen and 53.3% oxygen. What is the empirical formula? What is the molecular formula if the compound has a molecular mass of 180.0 g/mol.



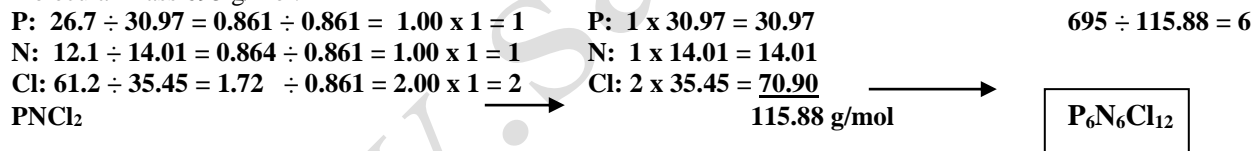
11. Ascorbic acid, also known as vitamin C, has a percentage composition of 40.9% carbon, 4.58% hydrogen, and 54.5% oxygen. Its molecular mass is 176.1 g/mol. What is its molecular formula?



12. Aspirin contains 60.0% carbon, 4.48% hydrogen, and 35.5% oxygen. It has a molecular mass of 180.0 g/mol. What are its empirical and molecular formulas?



13. Find the molecular formula of a compound with percentage composition 26.7% P, 12.1% N, and 61.2% Cl and a molecular mass 695 g/mol.



The Empirical Formula Rhyme:

Percent to Mass
 Mass to mole
 Divide by small
 Multiply 'til whole