

Percentage Composition

- **Percent Composition:** Identifies the elements present in a compound as a mass percent of the total compound mass.
- The mass percent is obtained by dividing the mass of each element by the total mass of a compound and converting to percentage.

percentage composition: the mass % of each element in a compound

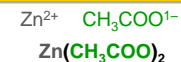
$$\% \text{ of element} = \frac{\text{g element}}{\text{molar mass of compound}} \times 100$$

Find % composition. (see calcs above)

$$\begin{array}{l} \text{PbO}_2 \quad 207.2 \text{ g Pb} \div 239.2 \text{ g} = 86.6\% \text{ Pb} \\ \quad \quad 32.0 \text{ g O} \div 239.2 \text{ g} = 13.4\% \text{ O} \end{array}$$

$$\begin{array}{l} (\text{NH}_4)_3\text{PO}_4 \quad 42.0 \text{ g N} \div 149.0 \text{ g} = 28.2\% \text{ N} \\ \quad \quad \quad 12.0 \text{ g H} \div 149.0 \text{ g} = 8.1\% \text{ H} \\ \quad \quad \quad 31.2 \text{ g P} \div 149.0 \text{ g} = 20.8\% \text{ P} \\ \quad \quad \quad 64.0 \text{ g O} \div 149.0 \text{ g} = 43.0\% \text{ O} \end{array}$$

zinc acetate



$$\begin{array}{l} \text{Zn: } 1 (65.4 \text{ g}) = 65.4 \text{ g} \\ \text{C: } 4 (12.0 \text{ g}) = 48.0 \text{ g} \\ \text{H: } 6 (1.0 \text{ g}) = 6.0 \text{ g} \\ \text{O: } 4 (16.0 \text{ g}) = 64.0 \text{ g} \\ \hline 183.4 \text{ g} \end{array} \left. \vphantom{\begin{array}{l} \text{Zn: } 1 (65.4 \text{ g}) = 65.4 \text{ g} \\ \text{C: } 4 (12.0 \text{ g}) = 48.0 \text{ g} \\ \text{H: } 6 (1.0 \text{ g}) = 6.0 \text{ g} \\ \text{O: } 4 (16.0 \text{ g}) = 64.0 \text{ g} \\ \hline 183.4 \text{ g} \end{array}} \right\} \div 183.4 \text{ g} = \begin{array}{l} 35.7\% \text{ Zn} \\ 26.2\% \text{ C} \\ 3.3\% \text{ H} \\ 34.9\% \text{ O} \end{array}$$

Empirical Formula

- The **empirical formula** gives the simplest ratio of the number of atoms of each element in a compound.

Compound	Formula	Empirical Formula
Hydrogen peroxide	H ₂ O ₂	OH
Benzene	C ₆ H ₆	CH
Ethylene	C ₂ H ₄	CH ₂
Propane	C ₃ H ₈	C ₃ H ₈

Percentage Composition

- Glucose has the molecular formula C₆H₁₂O₆. What is its empirical formula, and what is the percentage composition of glucose?

Empirical Formula = smallest whole number ratio



Percentage Composition



$$\text{Total mass} = 12.01 + 2.02 + 16.00 = 30.03$$

$$\% \text{C} = 12.01/30.03 \times 100\% = 39.99\%$$

$$\% \text{H} = 2.02/30.03 \times 100\% = 6.73\%$$

$$\% \text{O} = 16.00/30.03 \times 100\% = 53.28\%$$

Percentage Composition

Saccharin has the molecular formula $C_7H_5NO_3S$.
What is its empirical formula, and what is the percentage composition of carbon in saccharin?

Empirical Formula is same as molecular formula

MW = 183.19 g/mole

$\%C = (7 \times 12.011)/183.19 \times 100\% = 45.89\%$ etc.