

Chapter 4 Chemical Composition

Learning Objectives

4.1 Percent Composition

- Explain the significance of percent composition for a compound as it relates to various samples of the compound.
- Calculate the percent composition of elements in a compound given the mass of the element and the mass of a sample of the compound.

4.2 Mole Quantities

- Explain the basis of the mole and Avogadro's number.
- Convert between moles and number of atoms, molecules, ions, or formula units using Avogadro's number and relationships described by a chemical formula.
- Determine the molar mass for elements from information on the periodic table, including those that exist as diatomic elements.
- Calculate the molar mass for a compound from the molar masses of the component elements.
- Convert between moles and mass for a given substance.
- Convert between moles, mass, and number of atoms, molecules, ions, or formula units.

4.3 Determining Empirical and Molecular Formulas

- Distinguish between empirical and molecular formulas.
- Determine empirical formulas from molecular formulas.
- Determine empirical formulas from percent composition.
 - Determine empirical formulas from percent composition for compounds that contain two elements.
 - Determine empirical formulas from percent composition for compounds that contain more than two elements.
 - Determine empirical formulas from percent composition when the ratio of one element to another is a fraction.
- Determine molecular formulas from appropriate data, such as compound molar mass and percent composition.
- Determine the percent composition of elements in a compound from the formula for the compound.

4.4 Chemical Composition of Solutions

- Distinguish between solute and solvent in a solution.
- Describe various ways of expressing a solution's concentration.
- Distinguish between dilute and concentrated solutions.
- Calculate the concentrations of solutions in various units (ppm, mg/dL, % by mass, & molarity for example).
- Use the molarity of a solution to calculate the moles of solute present in a given volume of the solution.
- Use the molarity of a solution to calculate the volume needed to provide a given number of solute moles.
- Calculate quantities associated with dilutions.