



CHEMISTRY

REQUIRED READING

Atomic Theory and Atomic Structure

Chapter 2: Atoms, Molecules, and Ions

- **2.1 Early Ideas in Atomic Theory**
- **2.2 Evolution of Atomic Theory**
 - Dalton's Atomic Theory
 - Cathode Ray Experiments
 - Rutherford's Gold Foil Experiment
- **2.3 Atomic Structure and Symbolism**
- **2.4 Chemical Formulas**

Evidence for the Atomic Theory

- **Chapter 2: Atoms, Molecules, and Ions**
 - 2.1 Early Ideas in Atomic Theory
 - 2.2 Evolution of Atomic Theory

Atomic Masses; Determination by Chemical and Physical Means

- **Chapter 2: Atoms, Molecules, and Ions**
 - 2.3 Atomic Structure and Symbolism (Atomic mass and isotopic composition)
 - 2.6 Atomic Mass and the Atomic Mass Unit

Atomic Number and Mass Number; Isotopes and Mass Spectroscopy

- **Chapter 2: Atoms, Molecules, and Ions**
 - 2.3 Atomic Structure and Symbolism (Atomic number, mass number, isotopes, notation)
 - 2.6 Atomic Mass and the Atomic Mass Unit (Mass Spectrometry and Isotopic Abundance)

Electron Energy Levels: Atomic Spectra and Atomic Orbitals

- **Chapter 6: Electronic Structure and Periodic Properties of Elements**

- 6.1 Electromagnetic Energy (Atomic Spectra, Photoelectric Effect, and Wave Properties of Light)
- 6.2 The Bohr Model (Quantized Energy Levels and Hydrogen Spectrum)
- 6.3 Development of Quantum Theory (Wavefunctions, Orbitals, and Quantum Numbers)
- 6.4 Electronic Structure of Atoms (Electron Configurations)

Periodic Relationships

- **Chapter 6: Electronic Structure and Periodic Properties of Elements**

- 6.6 Periodic Variations in Element Properties (Atomic Radii, Ionization Energy, Electron Affinity, and Electronegativity)
- 6.7 Electron Configurations and Oxidation States

Nuclear Chemistry: Nuclear Equations, Half-Lives, and Radioactivity

- **Chapter 21: Nuclear Chemistry**

- 21.1 Nuclear Structure and Stability
- 21.2 Nuclear Equations (Balancing nuclear reactions, decay processes)
- 21.3 Radioactive Decay and Half-Life
- 21.4 Applications of Radioactivity (Medical, Industrial, and Energy-related uses of nuclear chemistry)

Chemical Bonding

Binding Forces

Chapter 7: Chemical Bonding and Molecular Geometry

- **7.1 Ionic Bonding (Electrostatic forces in ionic compounds)**
- **7.2 Covalent Bonding (Shared electron pairs in covalent bonds)**
- **7.3 Lewis Symbols and Structures (Bonding representations and octet rule)**
- **7.4 Formal Charges and Resonance (Delocalization of electrons in molecules)**

Types of Bonding

- **Chapter 7: Chemical Bonding and Molecular Geometry**

- 7.1 Ionic Bonding (Formation of ionic compounds)
- 7.2 Covalent Bonding (Types of covalent bonds, bond strength, bond energy)
- 7.3 Lewis Symbols and Structures (Electron-dot structures for different bonds)
- 7.6 Molecular Structure and Polarity (Impact of bonding types on molecular properties)

- **Chapter 8: Advanced Theories of Covalent Bonding**

- 8.1 Valence Bond Theory (Covalent bonds as overlapping atomic orbitals)
- 8.4 Intermolecular Forces (Dispersion, dipole-dipole, hydrogen bonding, ion-dipole interactions)

- **Chapter 12: Solids**

- 12.3 Structure and Bonding in Metals (Metallic bonding and conductivity)
- 12.4 Structure of Ionic Solids (Network solids and crystalline arrangements)

Relationships to Structure and Properties

- **Chapter 7: Chemical Bonding and Molecular Geometry**
 - 7.6 Molecular Structure and Polarity (How bonding affects structure and physical properties)
- **Chapter 12: Solids**
 - 12.1 Crystalline and Amorphous Solids (How atomic structure influences hardness, melting point, and conductivity)
 - 12.4 Structure of Ionic Solids (Relationship between lattice energy and properties)

Polarity of Bonds and Electronegativity

- **Chapter 7: Chemical Bonding and Molecular Geometry**
 - 7.5 Strengths of Ionic and Covalent Bonds (Electronegativity and bond polarity relationships)
 - 7.6 Molecular Structure and Polarity (Dipole moments and their effects on molecular properties)

VSEPR Theory and Lewis Electron-Dot Diagrams

- **Chapter 7: Chemical Bonding and Molecular Geometry**
 - 7.3 Lewis Symbols and Structures (Drawing Lewis structures)
 - 7.6 Molecular Structure and Polarity (VSEPR theory predictions and molecular shapes)

Hybridization of Orbitals

- **Chapter 8: Advanced Theories of Covalent Bonding**
 - 8.2 Hybrid Atomic Orbitals (sp , sp^2 , sp^3 , sp^3d , sp^3d^2 hybridization and their roles in bonding)

Geometry of Molecules, Ions, and Coordination Complexes

- **Chapter 7: Chemical Bonding and Molecular Geometry**
 - 7.6 Molecular Structure and Polarity (VSEPR models and molecular shapes)
- **Chapter 8: Advanced Theories of Covalent Bonding**
 - 8.3 Multiple Bonds (Geometry of molecules with double and triple bonds)
- **Chapter 23: Transition Metals and Coordination Chemistry**
 - 23.2 Coordination Chemistry of Transition Metals (Shapes and geometries of coordination complexes)

Structural Isomerism

- **Chapter 2: Atoms, Molecules, and Ions**
 - 2.4 Chemical Formulas (Structural representations of molecules)
- **Chapter 23: Transition Metals and Coordination Chemistry**
 - 23.3 Isomerism in Coordination Complexes (Geometric and optical isomers in transition metal complexes)
- **Chapter 24: Organic Chemistry**

- 24.3 Functional Groups and Organic Nomenclature (Isomers in organic molecules and functional groups)

Resonance

- **Chapter 7: Chemical Bonding and Molecular Geometry**
 - 7.4 Formal Charges and Resonance (Delocalized electrons and resonance structures in molecules)

Sigma and Pi Bonds

- **Chapter 8: Advanced Theories of Covalent Bonding**
 - 8.3 Multiple Bonds (Sigma (σ) and pi (π) bonds in molecular structures)

Dipole Moments of Molecules

- **Chapter 7: Chemical Bonding and Molecular Geometry**
 - 7.6 Molecular Structure and Polarity (How molecular shape influences dipole moments and intermolecular interactions)

Relation of Properties to Structure

- **Chapter 12: Solids**
 - 12.1 Crystalline and Amorphous Solids (How atomic arrangement affects macroscopic properties)
 - 12.4 Structure of Ionic Solids (Lattice energy and structure-property relationships)