
9th Grade Biology/Chemistry I 2008-2009

Chemistry Syllabus

*Text: Essentials of General Chemistry, 2nd Ed, Ebbing, Gammon and Ragsdale
(Chapters/sections from the text to be covered are indicated)*

I. Matter, Energy and Change 1.3-1.4

A. Mass and Energy

1. Conservation of Mass, Energy
2. States of Matter
3. Physical and Chemical Properties + Changes
4. Endothermic and Exothermic Reactions

B. Mixtures and Pure Substances

1. Law of Definite Proportions

II. Atomic Structure of Matter (Historical Overview) 2.1-2.5

A. Dalton's Atomic Theory

1. Law of Multiple Proportions

B. Basic Aspects of the Electron and the Nucleus 2.2

1. Thomson, Millikan and Rutherford

C. Atomic Number, Mass Number and Atomic Mass 2.3-2.4

III. Electronic Structure of the Atom

A. Light and Spectroscopy 7.1

B. Particle Nature of Light 7.2

1. Photoelectric effect
2. Line spectra

C. The Bohr Model and the de Broglie Hypothesis 7.3-7.4

D. The Schrodinger Equation and Quantum Mechanical Model (**) 7.5

1. Quantum Numbers 7.5
2. Electron Configurations for Atoms and Ions 8.1-8.4
 - a. Aufbau Principle
 - b. Hund's Rule + Pauli Exclusion Principle
 - c. Aufbau Exceptions

IV. The Periodic Table 8.5-8.7

A. Groups, Periods, Electron Configurations and Valence Electrons

B. Periodic Properties and Trends

1. Atomic/ionic radii 8.7,9.3
2. Electronegativity (**) 9.5

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3. Ionization energy (**)
 4. Electron affinity (**)
 5. Assigning Oxidation Numbers

V. Chemical Bonding and Formulas

A. Nature of the Chemical Bonds

B. Types of Bonding

1. Metallic Bonding 11.5
2. Ionic Bonding and Ionic Compounds 9.1-9.3
3. Covalent Bonding and Lewis Structures (**)
9.4-9.10
 - a. Basic Structures
 - b. Expanded Octets and Other Exceptions
 - c. Resonance
 - d. Formal Charge
 - e. Introduction of Organic Functional Groups 23.1-23.7
 - i. Acids, Esters, Sugars
 - ii. Amino Acids
 - iii. Other Carbonyl Compounds

C. Naming and Formula Writing 2.8

1. Binary Molecular compounds (including acids)
2. Ionic compounds
 - a. Stock system
 - b. Important Polyatomic Ions and Transition Metal ions
3. Binary and Tertiary Oxyacids and Carboxylic Acids

VI. Chemical Equations and Types of Chemical Reactions

A. Balancing Equations 2.9-2.10

B. Types of Reactions 4.3-4.6

1. Acid-Base 4.4
 - a. Bronsted-Lowry Theory and Acid-Base Conjugates 15.2
 - b. Lewis Acid-Base Theory 15.3
 - c. Hydration of Acid and Basic Anhydrides
 - d. (Acid Catalyzed) Hydrolysis of Acids, Esters, Amides and Sugars
 - e. Precipitation reactions 4.3
2. Oxidation-Reduction 4.5-4.6
 - a. Combustion
 - b. Single Replacement
 - c. Combination
3. Additional Biological Applications

VII. Covalent Compounds and Molecular Geometry 10.1-10.4

A. VSEPR

B. Hybridization (and Expanded Octets) (**)

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C. Polarity and Intermolecular Forces

1. London Dispersion Forces
2. Dipole-Dipole
3. Hydrogen Bonding
4. Hydrophilic/Hydrophobic functional groups

D. Sigma and Pi Bonds

E. Cloud Structures (**)