

# Chemistry

## 10th – 12th Grade Text

### Course Description

**Assignments:** 36 Lessons, 15 Labs

**Format:** Text-based

**UC a-g Requirements:** Meets UC requirement d: Laboratory Science

**Instructional Materials:** *Chemistry*, Prentice Hall: text, syllabus and CD-ROM

This course offers a study of Chemistry for students pursuing a technical career or college entrance. Our course is extremely thorough. Main topics include Phases, Atomic and Molecular Models, Polarity, Solutions, Ionic Bonding, Stoichiometry, Acids and Bases, Le Chatelier's Principle, The Mole, Nuclear Reactions, Periodic Table, Isomers, Molecular Orbitals, Chemical Reactions, Energy and Change, Osmosis, Entropy, Reaction Rates, and more. For those students with access to a computer, this course also takes advantage of multimedia simulations, animations and practice problems on an accompanying CD-ROM.

### Course Outline

#### Lesson 1: Introduction to Chemistry

- A) Chemistry Overview
- B) Thinking Like a Scientist
- C) Problem Solving in Chemistry
- D) *Order lab kit*

#### Lesson 2: Matter & Change

- A) Properties of Matter
- B) Mixtures

- C) Elements & Compounds
- D) Chemical Reactions
- E) *Read Pages 5-28. Sign and send safety sheet*

### **Lesson 3: Scientific Measurement I**

- A) Measurements and Their Uncertainty
- B) The International System of Units
- C) *Lab 1: Laboratory Techniques & Measurements*

### **Lesson 4: Scientific Measurement II**

- A) Conversion Problems
- B) *Interactive CD: 3.3: Conversion Factors Animation*
- C) Density
- D) *Lab 2: Separation of a Mixture of Solids*

### **Lesson 5: Atomic Structure**

- A) Defining the Atom
- B) Structure of the Nuclear Atom
- C) *Interactive CD: 4.40: The Nuclear Atom Animation*
- D) Distinguishing Among Atoms
- E) Calculating Atomic Mass

### **Lesson 6: Electrons in Atoms**

- A) Models of the Atom
- B) Electron Arrangement in Atoms
- C) Physics and the Quantum Mechanical Model
- D) *Interactive CD: 5.5: Atomic Orbitals Animation*
- E) **Milestone Assignment**

### **Lesson 7: The Periodic Table**

- A) Organizing the Elements
- B) Classifying the Elements
- C) Periodic Trends
- D) Introduction to Ions

### **Lesson 8: Ionic and Metallic Bonding**

- A) Ions
- B) Ionic Bonds and Ionic Compounds
- C) *Interactive CD: 7.5: Ionic Compounds Simulation*

### **Lesson 9: Ionic and Metallic Bonding II**

- D) Bonding in Metals
- E) *Interactive CD: 7.38: Ionic Bonding*

### **Lesson 10: Covalent Bonding I**

- A) Molecular Compounds
- B) The Nature of Covalent Bonding
- C) *Interactive CD: 8.6: Covalent Bonding Simulation*

### **Lesson 11: Covalent Bonding II**

- A) Bonding Theories
- B) VSEPR
- C) Polar Bonds and Molecules

### **Lesson 12: Chemical Names and Formulas I**

- A) Naming Ions
- B) Naming and Writing Formulas for Ionic Compounds
- C) **Milestone Assignment - Journal**

### **Lesson 13: Chemical Names and Formulas II**

- A) Naming and Writing Formulas for Molecular Compounds
- B) Naming and Writing Formulas for Acids and Bases
- C) *Interactive CD: 9.9: Deriving Chemical Formulas Simulation*
- D) *Lab 14: Qualitative Anion Tests*

### **Lesson 14: Chemical Names and Formulas III & Chemical Quantities I**

- A) The Laws Governing Formulas and Names
- B) Atomic Mass vs. Molar Mass
- C) The Mole: A Measurement of Matter
- D) *Interactive CD: 10.10: Mole Road Map Simulation*

### **Lesson 15: Chemical Quantities II**

- A) Mole-Mass and Mole-Volume Relationships
- B) Percent Composition and Chemical Formulas
- C) Interpreting Formulae
- D) *Lab 11: Chromatography of Food Dyes*

### **Lesson 16: Chemical Reactions I**

- A) Describing Chemical Reactions
- B) Types of Chemical Reactions

*C) Lab 4: Physical and Chemical Properties*

### **Lesson 17: Chemical Reactions II & Stoichiometry I**

- A) Reactions in Aqueous Solution
- B) The Arithmetic of Equations
- C) *Interactive CD: 11.11: Balancing Equations Simulation*
- D) *Interactive CD: 11.12: Symbols in Chemical Equations Animation*
- E) *Lab 5: Ionic Reactions*

### **Lesson 18: Stoichiometry II**

- A) Chemical Calculations
- B) Limiting Reagent and Percent Yield
- C) *Interactive CD: 12.13: Limiting Reagent Animation*
- D) *Lab 6: Stoichiometry of a Precipitation Reaction*

### **Midterm Exam (Lessons 1-18)**

### **Lesson 19: States of Matter**

- A) The Nature of Gases
- B) The Nature of Liquids
- C) The Nature of Solids
- D) Sublimation
- E) Changes of State
- F) *Read Pages 5-29. Sign and send safety sheet\**

### **Lesson 20: The Behavior of Gases**

- A) Properties of Gases
- B) The Gas laws
- C) *Interactive CD: 14.15 and 14.16: Boyle's and Charles' Laws Simulations*
- D) *Interactive CD: 14.17 and 14.18: Dalton's and Graham's Laws Animation*
- E) Ideal Gases
- F) Gases: Mixtures and Movements
- G) *Lab 3: Properties of Gases*
- H) *Semester Test / Milestone Assignment*

### **Lesson 21: Water and Aqueous Systems**

- A) Water and Its Properties
- B) Homogeneous Aqueous Systems
- C) Heterogeneous Aqueous Systems
- D) *Interactive CD: 15.19: Electrolytes and Nonelectrolytes Simulation*

## **Lesson 22: Solutions I**

- A) Properties of Solutions
- B) Concentrations of Solutions
- C) Colligative Properties of Solutions
- D) *Interactive CD: 16.21: Colligative Properties Simulation*
- E) *Lab 8: Colligative Properties and Osmotic Pressure*

## **Lesson 23: Solutions II & Thermochemistry I**

- A) Calculations Involving Colligative Properties
- B) The Flow of Energy – Heat and Work
- C) Measuring and Expressing Enthalpy Changes

## **Lesson 24: Thermochemistry II**

- A) Heat in Changes of States
- B) Calculating Heats of Reactions
- C) *Interactive CD: 17.21: Phase Changes Animation*
- D) *Lab 7: Caloric Content of Food*
- E) **Milestone Assignment**

## **Lesson 25: Reaction Rates and Equilibrium I**

- A) Rates of Reaction
- B) *Interactive CD: 18.23: Factors That Affect Reaction Rates Simulation*
- C) Reversible Reactions and Equilibrium
- D) Solubility Equilibrium

## **Lesson 26: Reaction Rates and Equilibrium II & Acids, Bases and Salts I**

- A) Entropy and Free Energy
- B) The Progress of Chemical Reactions
- C) *Interactive CD: 18.22: Heat of Combustion Animation*
- D) *Lab 9: Le Chatelier's Principle*
- E) Acid-Base Theories
- F) *Interactive CD: 19.25: Acid-Base Definitions Animation*

## **Lesson 27: Acids, Bases and Salts II**

- A) Hydrogen Ions and Acidity
- B) Strengths of Acids and Bases
- C) Neutralization Reactions
- D) *Interactive CD: 19.26: Titration of Acids and Bases Simulation*
- E) *Lab 12: Titration for Acetic Acid in Vinegar*

## **Lesson 28: Acids, Bases and Salts III & Oxidation-Reduction Reactions**

- A) Salts in Solution
- B) The Meaning of Oxidation and Reduction
- C) Oxidation Numbers
- D) Balancing Redox Numbers
- E) *Lab 13: Oxidation-Reduction Activity Series*

## **Lesson 29: Electrochemistry**

- A) Electrochemical Cells
- B) Half-Cells and Cell Potentials
- C) Electrolyte Cells
- D) *Interactive CD: 21.27: Voltaic Cells Simulation*
- E) *Internet Virtual Lab - Demonstration of a Voltaic Cell*

## **Lesson 30: Hydrocarbon Compounds I**

- A) Hydrocarbons
- B) Unsaturated Hydrocarbons
- C) **Milestone Assignment**

## **Lesson 31: Hydrocarbon Compounds II**

- A) Isomers
- B) *Interactive CD: 22.28: Isomers Simulation*
- C) Hydrocarbon Rings
- D) Hydrocarbons from Earth's Crust
- E) *Interactive CD: 22.28: Hydrocarbons Animation*

## **Lesson 32: Functional Groups**

- A) Introduction to Functional Groups
- B) Alcohols and Ethers
- C) Carbonyl Compounds
- D) Polymerization

## **Lesson 33: The Chemistry of Life I**

- A) A Strategy for Life
- B) Carbohydrates

## **Lesson 34: The Chemistry of Life II**

- A) Amino Acids and Their Polymers
- B) Lipids

C) Non-Graded Capstone Assessment

**Lesson 35: The Chemistry of Life III**

A) Nucleic Acids

B) *Interactive CD: 24.19: DNA Structure Simulation*

C) Metabolism

D) *Interactive CD: 24.29: Biomolecules Animation*

**Lesson 36: Nuclear Chemistry**

A) Nuclear Reaction

B) Nuclear Transformations

C) *Interactive CD: 25.30: Radioactive Decay Simulation*

D) Fission and Fusion of Atomic Nuclei

E) *Interactive CD: 25.30: Nuclear Fission Animation*

F) Radiation in Your Life

**G) Turn in Term Paper**

***Final Exam (Lessons 19-36)***

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Extra Credit    *Lab 10: Beer's Law & Colorimetry*

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