

1/15/08

## CHEMISTRY Grades 9-12

**Units:** 10 high school credits

**UC Requirement Category:** d

### **General Description:**

Chemistry is a two-semester college prep science course that is most often used as a second lab science course in order to fulfill the lab science requirement of most four year colleges. This is a developmental course whereby the concepts of matter and energy are examined through discussion and analysis of chemical properties, characteristics and laboratory test reactions.

The course goals are to learn the basic facts, concepts and principles that form the foundation for continued study of chemistry in college. We want to expose students to a world on the atomic and macroscopic level that is not readily observed but influences the student and the world at all levels. The students come away with an appreciation of the transient nature of knowledge and how the scientific method enhances the search for “truth”. Students will be provided with the background information necessary to make informed decisions about chemical issues around them. An understanding will be gained of scientific methods and skills employed by chemists. A positive attitude about investigating and understanding the chemical world around the student will be sought. Below is a syllabus for the course:

SEMESTER 1:

UNIT I: INTRODUCTION TO CHEMISTRY, MATTER, & ATOMIC STRUCTURE

### **CHAPTER 2: Matter**

- a) Elements and Compounds
- b) The States of Matter
- c) Physical and Chemical Properties and Changes
- d) Mixtures and Pure Substance

### **CHAPTER 3: Chemical Foundations: Elements, Atoms, and Ions**

- a) The Elements and Symbols for the Elements
- b) Dalton’s Atomic Theory
- c) Modern Atomic Structure of the Atom
- d) Isotopes & Ions
- e) Introduction to the Periodic Table

### **CHAPTER 19: Radioactivity and Nuclear Energy**

- a) Alpha & Beta Decay
- b) Transformations
- c) Nuclear Fission & Nuclear Fusion

1/15/08

## UNIT II: NOMENCLATURE

### **CHAPTER 4: Nomenclature**

- a) Naming Ions
- b) Naming Compounds That Contain a Metal and a Nonmetal
- c) Naming Compounds That Contain Only Nonmetals and Polyatomic Ions
- d) Naming Acids
- e) Writing Formulas from Names

## UNIT III: MEASUREMENTS & CHEMICAL COMPOSITION

### **CHAPTER 5: Measurements and Calculations**

- a) Scientific Notation & Units
- b) Measurements of Length, Volume, Mass, and Density
- c) Uncertainty in Measurements
- d) Significant Figures
- e) Problem Solving and Dimensional Analysis

### **CHAPTER 6: Chemical Composition**

- a) Counting by Weighing
- b) Atomic Masses: Counting Atoms by Weighing
- c) The Mole and Molar Mass
- d) Percent Composition of Compounds
- e) Formulas of Compounds
- f) Calculations of Empirical Formulas & Molecular Formulas

## UNIT IV: TYPES OF REACTIONS

### **CHAPTER 7: Chemical Reactions: An Introduction**

- a) Evidence for a Chemical Reaction
- b) Chemical Equations
- c) Balancing Chemical Equations

### **CHAPTER 8: Reactions in Aqueous Solutions**

- a) Reactions in Which a Solid Forms
- b) Describing Reactions in Aqueous Solutions
- c) Ways to Classify Reactions

## UNIT V: STOICHIOMETRY

### **CHAPTER 9: Chemical Quantities**

- a) Mole-Mole Relationships
- b) Mass Calculations; Using Scientific Notations; Comparing Two Reactions
- c) Calculations Involving a Limiting Reactant
- d) Percent Yield

SEMESTER 2

1/15/08

## UNIT VI: THERMOCHEMISTRY

### **CHAPTER 10: Energy**

- a) The Nature of Energy
- b) Temperature and Heat
- c) Exothermic and Endothermic Processes
- d) Measuring Energy Changes
- e) Thermochemistry (Enthalpy)
- f) Hess's Law

## UNIT VII: MODERN ATOMIC THEORY & PERIODICITY

### **CHAPTER 11: Modern Atomic Theory**

- a) The Bohr Model of the Atom
- b) Atomic Energy Levels
- c) Electron Configurations
- d) Periodicity of Elements

## UNIT VIII: CHEMICAL BONDING, LIQUIDS & SOLIDS

### **CHAPTER 12: Chemical Bonding**

- a) Types of Chemical Bonds
- b) Lewis Structures
- c) Molecular Structure: The VESPR Model

### **CHAPTER 14: Liquids and Solids**

- a) Intermolecular Forces
- b) Energy Requirements for the Changes of State
- c) Evaporation and Vapor Pressure
- d) Boiling Point and Vapor Pressure
- e) Types of Solids
- f) Bonding in Solids

## UNIT IX: GASES & SOLUTIONS

### **CHAPTER 13: Gas Laws**

- a) The Kinetic Molecular Theory of Gases
- b) Pressure and Volume: Boyle's Law
- c) Volume and Temperature: Charles's Law
- d) Volume and Moles: Avogadro's Law
- e) The Ideal Gas Law
- f) Gas Stoichiometry

### **CHAPTER 15: Solutions**

1/15/08

- a) Factors Affecting the Rate of Dissolution
- b) Solution Composition: Molarity
- c) Stoichiometry of Solution Reactions
- d) Neutralization Reactions
- e) The Properties of Solutions: Boiling Point and Freezing Point

## UNIT X: ACIDS AND BASES & EQUILIBRIUM

### **CHAPTER 16: Acids and Bases**

- a) Acids and Bases
- b) Acid Strength
- c) Water as an Acid and a Base
- d) The pH Scale and Measuring pH
- e) Calculating the pH of Strong Acid Solutions
- f) Acid-Base Titrations

### **CHAPTER 17: Equilibrium**

- a) How Chemical Reactions Occur
- b) Conditions That Affect Reaction Rates
- c) The Equilibrium Condition
- d) Chemical Equilibrium: A Dynamic Condition
- e) The Equilibrium Constant and Equilibria
- f) LeChatelier's Principle
- g) Applications Involving the Equilibrium Constant