Summer 2015

Units: 10 high school credits

UC Requirement Category: d

General Description:

CHEMISTRY Grades 9-12

Chemistry is a college preparatory, laboratory based two-semester science course that deals with the composition of matter, and the changes in composition that matter can undergo. The course goals are to learn the fundamental facts, concepts and principles that form the foundation for continued study of chemistry in college, and to provide students the opportunity to develop and use important chemistry skills in order to better understand the chemistry behind issues and problems that may arise within society. As society increasingly depends on scientific advances, citizens will be expected to understand scientific phenomena and principles involved in making public-policy decisions.

A positive attitude about investigating and understanding the chemical world around the student will be sought. As students learn of a world on the atomic and macroscopic level that is not readily observed but influences the student and the world at all levels, students will gain a deeper appreciation of the transient nature of knowledge, and how the scientific method enhances the search for "truth". Below is a syllabus for the course:

SEMESTER 1: Weeks 1-3

CHAPTER 1: Chemistry: An Introduction

1. a) Importance of Learning Chemistry
2. b) Using Scientific Thinking to Solve a Problem
3. c) Strategies for Learning Chemistry

CHAPTER 2: Matter

1. a) States of Matter
2. b) Elements and Compounds
3. c) Physical and Chemical Properties and Changes
4. d) Classifying Matter: Mixtures vs. Pure Substances
5. e) Separation of Mixtures

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

1. a) The Elements and Symbols for the Elements
2. b) Dalton's Atomic Theory
3. c) The Structure of the Atom
4. d) Isotopes
5. e) Introduction to the Periodic Table
6. f) Ions and their Compounds

CHAPTER 4: Nomenclature

1. a) Naming Compounds That Contain a Metal and a Nonmetal
2. b) Naming Compound That Contain Only Nonmetals and Polyelemental Ions
3. c) Naming Acids
4. d) Writing Formulas from Names

CHAPTER 5: Measurements and Calculations

1. a) Scientific Notation & Units
2. b) Measurements of Length, Volume, Mass, and Density

c) Uncertainty in Measurements

4. d) Significant Figures
5. e) Problem Solving and Dimensional Analysis

CHAPTER 6: Chemical Composition

1. a) Atomic Masses: Counting Atoms by Weighing
2. b) The Mole and Molar Mass
3. c) Percent Composition of Compounds
4. d) Calculations of Empirical Formulas & Molecular Formulas

CHAPTER 7: Chemical Reactions: An Introduction

1. a) Evidence for a Chemical Reaction
2. b) Writing and Balancing Chemical Equations

CHAPTER 8: Reactions in Aqueous Solutions

1. a) Reactions in Which a Solid Forms
2. b) Describing Reactions in Aqueous Solutions
3. c) Oxidation-Reductions Reactions

CHAPTER 9: Chemical Quantities

1. a) Using Chemical Equations to Calculate Mass
2. b) Mole-Mole Relationships
3. c) The Concept of Limiting Reactants
4. d) Calculations Involving a Limiting Reactant
5. e) Percent Yield

CHAPTER 10: Energy

1. a) The Nature of Energy
2. b) Temperature and Heat
3. c) Exothermic and Endothermic Processes
4. d) Measuring Energy Changes
5. e) Thermochemistry (Enthalpy)
6. f) Hess's Law

SEMESTER 2: Weeks 4-6

CHAPTER 11: Modern Atomic Theory

1. a) Rutherford's Atom
2. b) Energy and Light
3. c) Emission of Energy by Atoms
4. d) The Energy Levels of Hydrogen
5. e) The Bohr Model of the Atom
6. f) The Wave Mechanical Model of the Atom
7. g) The Hydrogen Orbitals
8. h) Electron Arrangements and Configurations
9. i) Atomic Properties and the Periodic Table

CHAPTER 12: Chemical Bonding

1. a) Types of Chemical Bonds
2. b) Electronegativity
3. c) Stable Electron Configurations and Charges on Ions
4. d) Lewis Structures
5. e) Molecular Structure: The VESPR Model
6. f) Bond Polarity and Dipole Moments

CHAPTER 13: Gas Laws

1. a) The Kinetic Molecular Theory of Gases
2. b) Pressure and Volume: Boyle's Law
3. c) Volume and Temperature: Charles's Law
4. d) Volume and Moles: Avogadro's Law
5. e) The Ideal Gas Law
6. f) Gas Stoichiometry

CHAPTER 14: Liquids and Solids

1. a) Intermolecular Forces and Phase Changes
2. b) Vapor Pressure and Boiling Point
3. c) Properties of Solids

CHAPTER 15: Solutions

1. a) Factors Affecting the Rate of Dissolution
2. b) Solution Composition: Molarity
3. c) Stoichiometry of Solution Reactions
4. d) Colligative Properties

CHAPTER 16: Acids and Bases

1. a) Acids and Bases
2. b) Acid Strength
3. c) Water as an Acid and a Base

4. d) The pH Scale and Measuring pH
5. e) Calculating the pH of Strong Acid Solutions
6. f) Acid-Base Titrations

CHAPTER 17: Equilibrium

1. a) How Chemical Reactions Occur
2. b) Conditions That Affect Reaction Rates
3. c) The Equilibrium Condition
4. d) Chemical Equilibrium: A Dynamic Condition
5. e) The Equilibrium Constant and Equilibria
6. f) LeChatelier's Principle
7. g) Applications Involving the Equilibrium Constant

CHAPTER 18: Oxidation-Reduction Reactions and Electrochemistry

1. a) Electron Transfer
2. b) Balancing Oxidation-Reduction Reactions
3. c) Electrochemistry