Murrieta Valley Unified School District
High School Course Outline
April 2013

Department: Science

Course Title: Advanced Placement Chemistry

Course Number: 3528

Grade Level: 11-12

Length of Course: Year

Prerequisite: Successful completion of Chemistry with a grade of "B" or better, successful completion of Algebra II with a grade of "B" or better, and concurrent enrollment or completion of Pre-Calculus.

UC/CSU (A-G) Requirement: D

I. Goals

The student will :

A. Apply the principles of measurement uncertainty in all problem solving and laboratory tasks

B. Understand the structure of the atom including the Bohr Model and the Quantum Mechanical Model *(Chemistry 1a, 1h-j)*

C. Understand the structure of the periodic table and relate the position of an element to its physical and chemical properties *(Chemistry 1b-g)*

D. Understand types of chemical reactions including precipitation, acid-base, and oxidation-reduction reaction and perform stoichiometric analysis of these reactions both on a theoretical and experimental level *(Chemistry 3a-g, 5a-g)*

E. Utilize the kinetic molecular theory as a basis of understanding the properties of matter including gas behavior and the characteristics of solids and liquids *(Chemistry 2d, 2h, 4a-I)*

F. Understand the properties of solutions, characterize the factors affecting solubility, and be able to quantitatively describe the composition of a solution *(Chemistry 6a-f)*

G. Demonstrate an understanding of the factors that affect chemical equilibria and chemical kinetics *(Chemistry 7a-f, 8a-d, 9a-c)*

H. Understand chemical bonds and use models to represent the various types *(Chemistry 2a-c, 2e-g)*

I. Characterize the properties of the atomic nucleus in terms of nuclear stability and radioactive decay *(Chemistry 11a-g)*

II. Outline of Content for Major Areas of Study

Semester 1

A. Uncertainty in Scientific Measurement
   1. Units of Measurement
   2. Accuracy and Precision
   3. Dimensional Analysis

B. Introduction to Atomic Structure
   1. Fundamental Chemical Laws
   2. Dalton's Atomic Theory
   3. Experiments to characterize atomic composition
   4. Characteristics of subatomic particles

C. Introduction to the Periodic Table
   1. Structure of the periodic table: periods, groups, metals, nonmetal, etc.
   2. Atomic number and periodic table position

D. Basic Nomenclature
   1. Atoms and ions
   2. Naming and formula writing for binary molecular and ionic compounds

E. Stoichiometry
   1. Average atomic mass determination
   2. The mole and molar mass
   3. Percent composition of compounds
   4. Determining empirical and molecular formulas
   5. Writing balanced chemical equations
   6. Stoichiometric conversions between reactants and products including limiting reagent, excess reagent and percent yield determination

F. Types of Chemical Reactions
   1. Aqueous solutions: types and composition
   2. Precipitation reactions
   3. Acid-Base reactions
   4. Oxidation-Reduction Reactions

G. Gas Behavior
   1. Pressure
   2. The gas laws of Boyle, Charles, Avogadro, and Dalton
   3. Stoichiometry of gases
   4. Kinetic molecular theory of gases
   5. Effusion vs. diffusion
   6. Real vs. ideal gases

H. Thermochemistry
   1. Chemical energy
   2. Calorimetry
   3. Hess' Law
   4. Entropy
   5. Free Energy and equilibrium

I. Modern Atomic Theory
   1. Electromagnetic Radiation
   2. The duality of light and matter
   3. The Bohr Model
   4. Atomic spectra
   5. Quantum Mechanical Model
   6. Pauli exclusion principle, Aufbau principle and Hund's rule
   7. History of the development of the periodic table
   8. Periodic trends in atomic properties

J. Chemical Bonding
   1. Electronegativity and bond types
   2. Ionic bond formation
   3. Covalent bond characteristics
   4. Lewis structures including resonance
   5. VSEPR model

Semester II

A. Liquids and Solids
   1. Intermolecular forces
   2. The liquid state
   3. Types of solids
   4. Metallic bonding
   5. Molecular vs. ionic solids
   6. Phase diagrams

B. Solutions
   1. Composition of solutions
   2. Factors affecting solubility
   3. Colligative properties

C. Chemical Kinetics
   1. Reaction rates
   2. Rate laws
   3. Reaction mechanisms
   4. Catalysis

D. Chemical Equilibrium
   1. Characteristics of chemical equilibrium
   2. The equilibrium constant
   3. Le Chatelier's Principle

E. Acids and Bases
   1. Characteristics of acids and bases
   2. pH scale
   3. Strength of acids and bases
   4. Buffered solutions
   5. Titration
   6. Acid-base indicators
   7. Solubility product

F. Electochemistry
   1. Galvanic cells
   2. Standard reduction potential
   3. Faraday's Law
   4. The Nernst Equation
   5. Equilibrium constants for Redox reactions

G. Nuclear Chemistry
   1. Radioactive decay
   2. Nuclear transformations
   3. Nuclear fission and fusion

H. Introduction to Organic Chemistry
   1. Structure of hydrocarbons
   2. Functional groups
   3. Nomenclature

III. **Accountability Determinants**

A. Daily work assessments

B. Performance based laboratory assignments and notebook

C. Individual performance quizzes and exams

IV. **AP Exam Requirement**

Students attempting to receive college credit for Advanced Placement and International Baccalaureate courses are required to pass a College Board exam which validates coursework. This exam **is not a requirement** for District High School credit, grade increases, or extra credit.

Student fees are allowable for Advanced Placement and International Baccalaureate Diploma examinations **for college credit**, so long as (1) taking the exam is not a course requirement; (2) the exam results have no impact on a pupil's grade or credit in a course; and (3) eligible economically disadvantaged high school pupils who receive school district funding towards the exam fee shall pay $5.00 of the fee. (EC sections 52240-52244; 52920-52922.)

V. Required Text

Zumdahl, Steven S., and Zumdahl, Susan A. *Chemistry*, 6th Edition, Lexington, Massachusetts: D.C. Heath and Company., 2003.