AP Chemistry Course Overview
2009-2010

AP Chemistry meets for an 82 minute block all year. The course is a rigorous treatment equivalent to a first year college chemistry course which includes a significant amount of lab experience. It is an exciting examination of advanced chemistry and its application to our world.

Textbook Bibliography

Brown, LeMay, and Bursten, **Chemistry the Central Science**, Prenice Hall, 2006.

Course Goals

- Master the concepts of chemistry.
- Investigate the concepts of chemistry in the laboratory through qualitative observation and quantitative analysis.
- Apply knowledge and skills to quantitatively analyze "unknown" substances in the laboratory.
- Pass the AP Chemistry exam with a score of three or better.

Grading Policies

Student grades will include quizzes, tests, lab reports, presentations, and practice problems. Formal lab reports are to be prepared following the CCPS standard lab report format. Partial credit is given on most assignments. Grades will be classified as formative and summative. Formative grades are grades earned during the learning process, and summative grades are assessments of concept mastery. Formative grades will be given a weight of 30% and summative a weight of 70%.

Unit Outline

Atomic theory and atomic structure
Chemical Bonding
Nuclear Chemistry
States of Matter: Solids, Liquids, Gases, and Solutions
Types of Reactions
Stoichiometry
Equilibrium
Kinetics
Thermodynamics

Laboratory Notebook Requirements

A laboratory notebook is where a scientist keeps track of the progress of his or her research. While the laboratory activities and challenges completed in AP Chemistry do not qualify as original research, it is important to develop the skills needed to maintain a clear, concise record of your lab work. A complete portfolio of all laboratory work will be prepared throughout the course and graded as a summative grade in the fourth marking period.

The investigations that will be completed during the course will include: (additional laboratory work may be completed)

- **Synthesis and Analysis of a Complex Iron Salt** In this sequence of experiments you will first synthesis a green crystal and then analyze the sample to determine the empirical formula, percent water, percent potassium, percent iron, and percent oxalate.
- **Analysis of a Volatile Liquid** An "unknown" volatile liquid will be examined to determine the molar mass using the vapor pressure.
- **Determination of Molar Mass by Freezing Point Depression** The freezing point of a pure solvent and that solvent with varying concentrations of solute will be compared to investigate how adding solute affects the freezing point of a solution.
- **Determination of the Molar Volume of a Gas** Hydrogen gas will be generated from a chemical reaction and the precise molar volume determined.
- **Standardization of a Solution** A solution of sodium hydroxide will be standardized for use in an acid-base titration.

- **Determination of Concentration using a Acid-Base Titration** An acid-base titration will be used to solve a real world problem.
- **Determination of Concentration using an Oxidation Reduction Titration** An oxidation reduction titration will be used to analyze the complex iron salt synthesized by the students.
- **Determination of Mass and Mole Relationship in a Chemical Reaction**
- **Determination of an Equilibrium Constant from a Chemical Reaction**
- **Determination of Proper pH Indicators for a Titration** Students will observe the colors associated with solutions with a wide range of pH values to determine which indicators are appropriate for which titrations.
- **Determine the Rate of Reaction and Its Order** The rate of reaction and the order of the reaction will be determined quantitatively.
- **Determination of an Enthapy Change Associated with a Reaction** The enthalpy vs. time will be monitored as a reaction completes for reactions with different concentrations of compounds.
- **Analytical Gravimetric Analysis** An element will be isolated from a compound to determine the formula for the compound.
- **Spectrophotometric Analysis** The relationship between concentration and adsorption will be determined using a spectrophometer.
- **Separation by Chromatography** A complex chemical will be separated using liquid chromatography.
- **Preparation and Properties of Buffer Solutions** A series of buffer solutions will be prepared to compare the properties to each other.
- **Determination of Electrochemical Series** An electrochemical series will be determined.
- **Measurements using Electrochemical Cells and Electroplating** Measurements of electric potential vs. concentration will be examined for a series of electrochemical cells.
- **Synthesis, Purification, and an Analysis of an Organic Compound** Aspirin will be synthesized and analyzed. An ester will also be synthesized.

Chemical Calculations

This is a list of the types of calculations that will be mastered during the course.

1. Percentage composition
2. Empirical and molecular formulas from experimental data
3. Molar masses from gas density, freezing-point, and boiling-point measurements
4. Gas laws, including the ideal gas law, Dalton's law, and Graham's law
5. Stoichiometric relations using the concept of the mole; titration calculations
6. Mole fractions; molar and molal solutions
7. Faraday's laws of electrolysis
8. Equilibrium constants and their applications, including their use for simultaneous equilibria
9. Standard electrode potentials and their use; Nernst equation
10. Thermodynamic and thermochemical calculations
11. Kinetics calculations