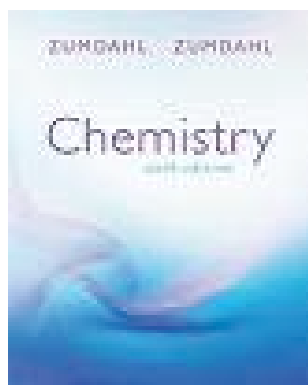


**Syllabus/ Overview of
AP Chemistry at Ledyard High School
2008-2009**



***Chemistry* by Zumdahl and Zumdahl, 6th ed.,
Houghton Mifflin Company, 2003**

Advanced Placement Chemistry Program and Syllabus Course Description:

Advanced Placement Chemistry is designed to be the equivalent of the general chemistry course usually taken during the first college year. Topics such as the structure and states of matter, reactions, chemical equilibria, chemical kinetics, and concepts of thermodynamics are presented. Descriptive chemistry including the chemistry of environmental and societal issues will also be presented. Laboratory activities are at a higher level than regular chemistry labs and are geared toward providing students with advanced laboratory skills. Technology including graphing calculators, laptop computers, probe-ware, graphing and data analysis software, and chemistry apparatus is used throughout this course.

There are required summer reading and problem assignments. All students are required to read and complete assigned problems from the first three chapters of the text. This is done online using WebAssign. This material is reviewed during the first two weeks of school and assessed.

Goals of the Course:

1. To understand the fundamental concepts and principles of chemistry through the investigation of chemical phenomena, theories and experimental methods.
2. To develop problem solving skills, and mathematical reasoning, through the active asking and answering of testable questions, and employing the components of a well-designed experimental investigation.
3. To foster scientific habits of mind including curiosity, creativity, and objectivity.
4. To understand the interconnections of chemistry to the other sciences, society, and technology.

Textbook, Materials and Other Resources:

Textbook:

Chemistry by Zumdahl and Zumdahl, 6th ed., Houghton Mifflin Company, 2003

Laboratory Manuals

We do not use a lab manual but rather a collection of labs from various sources including:

- Randall, Jack. 2007. *Advanced Chemistry with Vernier*. Beaverton, OR: Vernier Technologies.
- Vonderbrink, Sally. 1995. *Experiments for AP Chemistry*. Batavia, IL. Flinn Scientific.

Other Resources:

- Laboratory classroom that includes the space, facilities and equipment to conduct hands-on, inquiry-based investigations including molecular model kits, analytical balances, titration apparatus, spectrophotometers, calorimeters, suction filtration, volumetric glassware, vacuum pumps, distillation and separatory apparatus
- Data gathering, graphing, analysis software including Logger Pro, Graphical Analysis, and Excel.
- Graphing calculators: TI-83+
- Mobile laptop computer labs with wireless printer and internet capabilities.
- Vernier Labpro and GoLink computer interfaces and probe ware including colorimeters, temperature probes, pressure, pH, ORP, and conductivity sensors.

Course Content Outline:

As stated earlier, coordination between our Chemistry I and AP programs ensures that students receive a broad range of laboratory experiences. Labs that are marked with an asterisk* below are those that are done in our Chemistry I classes. They perform many more, but those listed below reflect content, equipment and procedures found in some of the AP "recommended" labs. Times for these are not listed below.

Chapter	Quarter	Time	Topics	Laboratory	Major Assessments
1 Chemical Foundations	1	Summer work	The Scientific Method, Units of measurement, Uncertainty in measurement, Significant figures and calculations. Dimensional analysis, Temperature, Density, and Classification of matter	Identification of Substances by Physical Properties* (hands-on) Separation of the Components of a Mixture*(hands-on)	Chapter 1 Problems and quiz
2 Atoms, Molecules and Ions	1	Summer work	Fundamental chemical laws, Dalton's atomic theory , Atomic structure , molecules and ions, Introduction to the Periodic table, Naming compounds.	Periodic Table Activity* (handout based, non-lab)	Chapter 2 Problems and quiz
3 Stoichiometry	1	Summer work 2 weeks	Atomic masses, The Mole, Molar mass, Percent Composition, Determining the formula of a compound, Chemical equations, and Stoichiometry	Determination of Mass-Mole Relationship in a Chemical Reaction* (hands-on) Analysis of a Silver Alloy (<i>Vonderbrink</i>) (hands-on; 3 days-2.0 hrs.) Synthesis of Alum (<i>Vonderbrink</i>) (hands-on; 3 days- 2 hrs.)	Chapter 3 Problems and quiz Unit exam I on Chapters 1-3 Lab Reports
4 Type of Chemical Reactions and Solution Stoichiometry	1	1.5 weeks	Properties of aqueous solutions , Precipitation reactions, Acid-base reactions, Oxidation-reduction reactions, Concentrations of solutions, and Solution stoichiometry	Introduction to Qualitative Analysis* (hands-on) Determination of the Concentration of a Solution: Beer's Law* (hands-on) Reaction Types (hands-on; 1 hr.) Acid- Base Titration (<i>Randall</i>) (hands-on; 3 hr.)	Chapter 4 Problems and quiz Lab Report

Chapter	Quarter	Time	Topics	Laboratory	Major Assessments
5 Gases	1	2 weeks	Gas pressure, Gas laws Applications of ideal-gas law, Dalton's law of partial pressures, Kinetic-molecular theory, Molecular effusion & diffusion, Real gases: deviation from ideal behavior Chemistry in the atmosphere	Boyles Law* (hands-on) Molar Volume of a Gas (hands-on, 2 hr) Determination of the Molar Mass of Butane in a Butane Lighter (hands-on, collaborative inquiry, 2 hrs.) Vacuum packing (demo)	Chapter 5 Problems and quiz Lab Report
6 Thermo-chemistry	1	2 weeks	The nature of energy, Enthalpy and Calorimetry, Hess's Law, Standard enthalpies of formation, Sources of energy	Hot Stuff lab (hands-on, collaborative inquiry, 2 hrs.) Hot and Cold Packs, Burning \$\$ (demos)	Chapter 6 Problems and quiz Unit exam II on Chapters 3-6 Lab Report
7 Atomic Structure and Periodicity	1	2 weeks	Electromagnetic radiation, Nature of matter, Atomic structure , Bohr Model, Quantum mechanical model, Quantum numbers, Orbital shapes and energies, Electron spin and the Pauli exclusion principle, Polyelectronic atoms, Aufbau principle and the Periodic table, Periodic trends in atomic properties , Properties of the alkali earth metals	Flame test/spectral tubes (demos) Sodium metal (demo)	Chapter 7 Problems and quiz Lab Report
8 Bonding: General Concepts	2	2 week	Types of chemical bonds, Electronegativity, Bond polarity, Ions and Ionic bonding, Covalent bonding, Bond energies and chemical reactions, Localized electron bonding model, Lewis structures, Resonance, Molecule structure: VSEPR theory.	Molecular Geometries of Covalent Molecules: Lewis Structures and VSEPR Theory (model kits- 1 hr) Magnetic Properties of Certain Metals (hands-on, 1 hr)	Chapter 8 Problems and quiz Lab
9 Covalent Bonding: Orbitals	2	0.5 week	Hybridization and the Localized Electron model		Chapter 9 Problems and quiz Unit exam III on Chapters 7-9 Lab Report

Chapter	Quarter	Time	Topics	Laboratory	Major Assessments
22 Organic and Biological Molecules	2	0.5 week	Alkanes, Alkenes, Alkynes, Hydrocarbon derivatives, polymers	Ester preparation* The Synthesis and Analysis of Aspirin (<i>Randall</i>) (hands-on; 3 days 3 hrs.)	Chapter 22 Problems and quiz Lab Report
10 Liquids, and Solids	2	2 weeks	Intermolecular Forces, Liquids, Solids: types of and bonding in, Vapor pressure and changes of state, Phase diagrams	Vapor Pressure and Enthalpy of Vaporization of Water (<i>Vonderbrink</i>) (hands-on; 2 hrs) Liquid Nitrogen (demo)	Chapter 10 Problems and quiz Lab Report
11 Properties of Solutions	2	1.5 week	Solution composition, Energies of solution formation of liquids/solids, Factors affecting solubility, Vapor pressure of solutions, colligative properties of electrolyte and nonelectrolyte solutions	Using Freezing-point Depression to Find Molecular Weight (<i>Randall</i>) (hands-on; 1.5 hrs.) Freezing of Club soda (demo)	Chapter 11 Problems and quiz Lab Report
12 Chemical Kinetics	2	2 weeks	Factors affecting reaction rates, Reaction rates, Rate laws, Concentration & rate, Change of concentration with time, Temperature & rate, Reaction mechanisms, Catalysis	The Rate and Order of a Chemical Reaction (<i>Randall</i>) (hands-on; 2 hrs.) Factors affecting reaction rates (demos)	Chapter 12 Problems and quiz Unit exam IV on Chapters 10-12 Lab Report Final Exam for Semester 1
13 Chemical Equilibrium	3	1.5 weeks	Concept of equilibrium , Equilibrium constant, Heterogeneous equilibria, Calculating equilibrium constants, Applications of equilibrium constants, Le Châtelier's principle	Determination of An Equilibrium Constant (spectrophotometry) (<i>Randall</i>) (hands-on; 2 hrs.) Le Châtelier's Principle (demos)	Chapter 13 Problems and quiz Lab Report
14 Acids and Bases	3	3 weeks	Acids & bases, pH scale and calculations, Brønsted-Lowery acids & bases, Strong acids & bases, Weak acids & bases, Relationship between K_a & K_b , Acid-base properties of salt solutions, Effect of structure on acid-base properties, Acid-base properties of oxides, Lewis acids & bases	Determining K_a by the Half-Titration of a Weak Acid (<i>Randall</i>) (hands-on; 1.5 hrs)	Chapter 13 Problems and quiz Lab Report

Chapter	Quarter	Time	Topics	Laboratory	Major Assessments
15 Applications of Aqueous Equilibria	3	3 weeks	Common ion effect, Buffered solutions, Buffer capacity, Acid-base titrations and pH curves, Acid-base indicators, Solubility equilibria and the solubility product, K_{sp} , Precipitation & qualitative analysis Equilibria involving complex ions, K_f	Determining the K_{sp} of Calcium Hydroxide (<i>Randall</i>) (hands-on; 2 hrs.)	Chapter 12 Problems and quiz Unit exam V on Chapters 13-15 Lab Report
16 Spontaneity, Entropy, and Free Energy	3	1.5 weeks	Spontaneous processes and Entropy, 2 nd Law of thermodynamics , Entropy changes in chemical reactions, Effect of temperature on spontaneity, Free energy, Free energy and chemical reactions, Free energy, equilibrium, and work	Rubber bands and Enthalpy (hands-on; 30 min.)	Chapter 16 Problems and quiz
17 Electro-chemistry	4	2 weeks	Galvanic cells, Standard reduction potentials, Cell potential, electrical work, and free energy, Dependence of cell potential on concentration Batteries, Corrosion Electrolysis	Electrochemistry: Voltaic Cells (<i>Randall</i>) (hands-on; 3 hrs) Tarnish removal (hands-on; 2.0 hr.) Floating Penny (demo and problem) Potato-Clock (demo)	Chapter 17 Problems and quiz Lab Report
18 Nuclear Chemistry	4	1 week	Nuclear stability and radioactive decay, Kinetics of radioactive decay, Nuclear transformations, Detection and uses of radioactivity Energy changes, Nuclear fission & fusion, Effects of Radiation	Nuclear shielding* (All students did in Environmental class)	Chapter 18 Problems and quiz Unit exam VI on Chapters 16-18