COURSE OVERVIEW: AP CHEMISTRY

Instructor: Robert Bloomfield

Textbook: *Chemistry: The Central Science Tenth Edition*

Course Description:

The AP Chemistry course is designed to be the equivalent of the general chemistry course usually taken during the first or second year in college. For some students, this course enables them to undertake, as freshmen, second-year work in the chemistry sequence or to register in courses in other fields where general chemistry is a prerequisite. Successful completion of Algebra II and Honors Chemistry with a grade of "A" or "B" are the prerequisites for AP/IB Chemistry.

Laboratory work is an important part of the AP/IB Chemistry program. Labs will account for approximately 30 hours of the student's class time.

Both the AP and IB (SL and HL) tests will be given in May. Students taking AP/IB Chemistry will be prepared to take both tests. All students, both AP and IB, are required to take the AP Chemistry test.

Academic Grade Information:

The academic grade will be based on the following criteria, with the approximate percentage of the grade given for each:

Tests: 50 - 60% Labs: 30 - 40% Homework, projects: 10% Daily Requirements: 5%

Class Requirements:

Two *separate* notebooks: one Laboratory notebook and one for notes and other work
Calculator
Lab fee of $15

Miscellaneous:

Class Homepage found at *http://cghs.dadeschools.net/shs/homepage.html*
The work for the week is posted here. Students who are absent should go here to find out what work has been missed. There are also links to websites that offer help and other information dealing with chemistry in general and AP Chemistry in particular, including online tutorials and practice tests.

AP Chemistry Course Outline:

I. Structure of Matter

A. Atomic theory and atomic structure
1. Evidence for the atomic theory
2. Atomic Masses; determination by chemical and physical means
3. Atomic number and mass number; isotopes
4. Electron energy levels; atomic spectra; quantum numbers, atomic orbitals
5. Periodic relationships including, for example, atomic radii, ionization energies, electron affinities, oxidation states

B. Chemical Bonding
1. Binding forces
   a. Types: ionic, covalent, metallic, hydrogen bonding, Van der Waals
   b. Relationships to states. structure, and properties of matter
   c. Polarity of bonds, electronegativities
2. Molecular models
   a. Lewis structures
   b. Valence bond: hybridization of orbitals, resonance, sigma and pi bonds
   c. VSEPR
3. Geometry of molecules and ions, structural isomerism of simple organic molecules and coordination complexes; dipole moments of molecules; relation of properties to structure

C. Nuclear Chemistry; nuclear equations, half-lives, and radioactivity; chemical applications

II. States of Matter

A. Gases
1. Laws of ideal gases
   a. Equation of state for an ideal gas
   b. Partial pressures
2. Kinetic-molecular theory
   a. Interpretation of ideal gas laws on the basis of this theory
   b. Avogadro's hypothesis and the mole concept
   c. Dependence of kinetic energy of molecules on temperature
   d. Deviations from ideal gas laws.

B. Liquids and Solids
1. Liquids and solids from the kinetic-molecular viewpoint
2. Phase diagrams of one-component systems
3. Changes of state, including critical points and triple points
4. Structure of solids; lattice energies

C. Solutions
1. Types of solutions and factors affecting solubility
2. Methods of expressing concentration
3. Raoult's law and colligative properties: osmosis
4. Non-ideal behavior (qualitative aspects)

III. Reactions

A. Reaction types
1. Acid-base reactions, concepts of Arrhenius, Bronsted/Lowry, and Lewis; coordination complexes, amphoterism
2. Precipitation reaction
3. Oxidation-reduction reactions;
   a. Oxidation number
   b. The role of the electron in oxidation -reduction
   c. Electrochemistry: Electrolytic and galvanic cells, Faraday's laws; standard half-cell potentials; Nernst equation; prediction of the direction of redox reactions

B. Stoichiometry
1. Ionic and molecular species present in chemical systems; net ionic equations
2. Balancing of equations including those for redox reactions
3. Mass and volume relations with emphasis on the mole concept, including empirical formulas and limiting reactants

C. Equilibrium
1. Concept of dynamic equilibrium, physical and chemical; LeChatelier's principle
2. Quantitative treatment
   a. Equilibrium constants for gaseous reactions: K_p, K_c
   b. Equilibrium constants for reactions in solution
      (1) Constants for acids and bases; pK; pH
      (2) Solubility product constants and their application to precipitation and the dissolution of slightly soluble compounds
      (3) Common ion effect; buffers; hydrolysis

D. Kinetics
1. Concept of rate of reaction
2. Use of experimental data and graphical analysis to determine reactant order, rate constants, and reaction rate laws
3. Effect if temperature change on rates
4. Energy of activation; the role of catalysts
5. The relationship between the rate-determining step and a mechanism

E. Thermodynamics
1. State functions
2. First law: change in enthalpy; heat of formation; heat of reaction; Hess’s law; heats of vaporization and fusion; calorimetry
3. Second law: entropy; free energy of formation; free energy of reaction; dependence of change in free energy on enthalpy and entropy changes
4. Relationship of change in free energy to equilibrium constants and electrode potentials

IV. Descriptive Chemistry

1. Chemical reactivity and products of chemical reactions
2. Relationships in the periodic table: horizontal, vertical, and diagonal, with examples from alkali metals, alkaline earth metals, halogens, and the first series of transition elements
3. Introduction to organic chemistry; hydrocarbons and functional groups (structure, nomenclature, properties)

V. Laboratory

The AP Chemistry exam includes some questions based on experiences and skills that students acquire in the laboratory:

- making observations of chemical reactions and substances
- recording data
- calculating and interpreting results based on the quantitative data obtained
- communicating effectively the results of experimental work

Class Rules:

1. No food (including gum) or drinks are allowed in class.
2. Sleeping in class is never allowed.
3. All school policies will be enforced. If you have to be sent to the office because of a dress code or ID infraction, you will receive a detention.
4. Sinks are to be kept free of trash. No writing or drawing of any kind is allowed on the tables.
5. No radios, CD players, or cell phones are to be used in class. During a test this means an automatic "F".
6. No unsatisfactory tardies are permitted.
7. Do not disrupt the class with unnecessary talking or fooling around.
8. Taking notes during lectures, reviews, and discussions is considered an assignment, not an option.
9. A textbook, calculator, and *separate* chemistry notebook are required in class each day.
10. At the end of class, the teacher (a human), not the bell (a mechanical device), will dismiss the class. Remember, be a human, not a lab mouse!