

Diamond Bar High School

AP Chemistry

2011-2012

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COURSE DESCRIPTION AND OBJECTIVES

AP Chemistry is designed to be the equivalent of a first year college general chemistry course and follows the College Board's AP Chemistry Topic Outline. As such, the course is suitable only for high school students who exhibit high levels of commitment, motivation and academic maturity. This course presents a rigorous treatment of the following concepts: the nature of matter, gas laws, thermodynamics, stoichiometry, bonding, chemical kinetics, chemical equilibria, and more. Students are expected to be motivated and spend extra time studying outside of class. The problem-solving strategies obtained during this course will prepare college-bound students for careers in the sciences, medicine, engineering, and other technical areas.

INSTRUCTIONAL MATERIALS

- Text: *Zumdahl, Steven, and Susan Zumdahl. Chemistry. Boston: Houghton Mifflin. 2000. 7th ed.*
- AP Chemistry Free Response Questions: Selection of AP Chemistry Free Response Questions from 1961-2009 made available for classroom instruction by the College Board
- Kits: Molecular Modeling Kits
- Laboratory Equipment and Chemicals: supplies necessary for laboratories provided by teacher.

SUPPLIES

- Calculator: scientific or graphing. Basic calculators are not acceptable. Calculators on cell phones, PDA's and other electronic devices are not acceptable. Students must have calculators with them on a daily basis.
- Composition Notebook: lined or quadrille acceptable. Loose leaf not acceptable for laboratory use.
- 3 Ring Binder: **Required daily.**
- While not an absolute requirement, it is very strongly recommended that students invest in one of the AP Chemistry course preparation books currently on the market. There are several available and each student should examine the titles and select one based upon personal preference. It is not a good idea to wait until two weeks before the examination to purchase the book. Buy it at the beginning of the course and use it regularly throughout the year.

THE ADVANCED PLACEMENT TOPIC OUTLINE

The following list describes the topic outline provided by the College Board in the AP Chemistry course description. The outline is designed to be a guide to the breadth and depth of an AP Chemistry course and is not to be viewed as the absolute syllabus. This syllabus is published at the start of the course and should be viewed as provisional and as such is subject to alteration from time to time. Students will always be given sufficient notice of any changes.

The following is a sample outline which describes the five major areas listed below plus a list of types of chemical calculations one might encounter in an AP Chemistry course.

I. Structure of Matter

II. States of Matter

III. Reaction Types

IV. Descriptive Chemistry

V. Laboratory Work

VI. Chemical Calculations

I. Structure of Matter (20% of multiple-choice questions)

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 (including London dispersion forces)
 - 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 (20% of multiple-choice questions)

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 (The use of normalities is not tested.)

3. Raoult's law and colligative properties (non-volatile solutes); osmosis
4. Non-ideal behavior (qualitative aspects)

III. Reactions (35-40% of multiple-choice questions)

A. Reaction types

1. Acid-base reactions; concepts of Arrhenius, Brønsted-Lowry, and Lewis; coordination complexes; amphoterism
2. Precipitation reactions
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; Le Chatelier's principle; equilibrium constants
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 differential rate laws to determine order of reaction and rate constant from experimental data
3. Effect of 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 (10-15% of multiple-choice questions)

Knowledge of specific facts of chemistry is essential for an understanding of principles and concepts. These descriptive facts, including the chemistry involved in environmental and societal issues, should not be isolated from the principles being studied but should be taught throughout the course to illustrate and illuminate the principles. The following areas should be covered:

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, chemical properties).

V. Laboratory Work (5-10% of multiple-choice questions)

The differences between college chemistry and the usual secondary school chemistry course are especially evident in the laboratory work. The AP Chemistry Examination includes some questions based on experiences and skills 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

Colleges have reported that some AP candidates, while doing well on the examination, have been at a serious disadvantage because of inadequate laboratory experience. Meaningful laboratory work is important in fulfilling the requirements of a college-level course of a laboratory science and in preparing a student for sophomore-level chemistry courses in college. Because chemistry professors at some institutions ask to see a record of the laboratory work done by an AP student before making a decision about granting credit, placement, or both, in the chemistry program, students should keep reports of their laboratory work that can be readily reviewed.

Chemical Calculations in Sections I–V above

The following list summarizes types of problems either explicitly or implicitly included in the topic outline. Attention should be given to significant figures, precision of measured values, and the use of logarithmic and exponential relationships. Critical analysis of the reasonableness of results is to be encouraged.

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 law 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

AP EXAMINATION FORMAT

The AP Chemistry examination format

The AP Chemistry exam is divided into two sections.

Section I: (90 minutes in length, 50% of the total grade, no calculators allowed)

75 Multiple choice questions. Select the best answer from a choice of 5 (A-E).

Section II: (95 minutes in length, 50% of the total grade)

PART A: (55 minutes of the 95, calculators allowed)

Question 1: The Equilibrium Question (Compulsory, 20% of the 50%)

Since the introduction of a new examination format in 1998, question 1 has asked about some aspect of equilibrium and associated questions.

Questions 2 and 3: The Calculation Questions (Compulsory, 20% each of the 50%)

In question 2 and 3 expect CALCULATIONS to be involved. A question based upon laboratory procedure could be asked here (calculation based), or in Part B (non-calculation based).

PART B: (40 minutes of the 90, NO calculators allowed)

Question 4: The Net Ionic Equation Question (Compulsory, 10% of the 50%)

Candidates are asked to write three, **balanced**, net ionic equations **AND** to answer a short question that follows each equation.

Questions 5 and 6: The "Essay" Questions" (Compulsory, 15% each out of the 50%)

A Laboratory questions WILL be asked, but they may be the subject of question 2 or 3 and have a calculation component. Question 5 and 6 are not "essays", but this term is often used to distinguish them from calculation-based questions.

Chapter Covered from <i>Chemistry (Zumdahl, 7th Ed.)</i>	Sections Covered	Duration
1. Chemical Foundations	1.3-1.9	1 week
2. Atoms, Molecules, and Ions	2.2-2.8	1 week
3. Stoichiometry	3.1-3.9	2 weeks
4. Types of Chemical Reactions and Solution Stoichiometry	4.2-4.10	2 weeks
5. Gases	5.1-5.8	2 weeks
6. Thermochemistry	6.1-6.4	2 weeks
7. Atomic Structure and Periodicity	7.1-7.9, 7.11-7.13	2-3 weeks
8. Bonding: General Concepts	8.1-8.13	2-3 weeks
9. Covalent Bonding: Orbitals	9.1-9.2	1 week
10. Liquids and Solids	10.1-10.2, 10.8-10.9	1 week
11. Properties of Solutions	11.1, 11.3-11.7	1-2 weeks
12. Chemical Kinetics	12.1-12.4, 12.6-12.8	2-3 weeks
13. Chemical Equilibrium	13.1-13.7	2-3 weeks
14. Acids and Bases	14.1-14.9, 14.11	2-3 weeks
15. Applications of Aqueous Equilibria	15.1-15.6, 15.8	1-2 weeks
16. Spontaneity, Entropy, and Free Energy	16.1-16.6, 16.8	2-3 weeks
17. Electrochemistry	17.1-17.4, 17.7-17.8	1-2 weeks
21. The Nucleus: A Chemist's View	21.1-21.2	1 week
22. Organic Chemistry	22.1-22.3, 22.5	1-2 weeks

GRADING POLICY

Semester Grading Scheme

70%	Tests, Quizzes & other Performance Based Assessments, Finals
15%	Labs, Hands-On Activities, Group & Individual Projects, Classroom Demos
10%	Homework and other In-Class Work
5%	Evaluation of participation and effort given in class
100%	Total

- **Students with unexcused absences can not make up any graded assignment or participation that took place during the period of unexcused absence.**

Grade Distribution

Mark	Range	Mark	Range
A+	98-100	C	74-76
A	94-97	C-	70-73
A-	90-93	D+	67-69
B+	87-89	D	64-66
B	84-86	D	60-63
B-	80-83	F	0-59
C+	77-79		

CLASS ASSESSMENTS

- Students will receive assessments in the form of quizzes, tests, projects, lab write-ups, etc.
- Unit tests are usually given after the completion of a chapter in the textbook, but the tests may include information from more than one chapter. These tests will model AP testing conditions. Half of your test will be multiple choice questions similar in difficulty to those questions that would be found on the AP Test. The other half of your test will resemble the free-response questions. At least one question on the free response section will be calculator-based.
- In addition to the above described assessments, a comprehensive final exam will be administered at the close of each semester.
- While not required, it is **STRONGLY RECOMMENDED** that each student commit his/her self to taking the AP examination in May 2012.

LABS

- Labs provide students with hands-on learning that promote scientific inquiry and can be very enjoyable. The scientific community is dependent on collaboration between peers. To this end, you will be working with a lab partner as you gather data in the laboratory. You will also find it very useful to work together after the lab has been completed.
- You will need to keep a bound copy of your lab work as the year proceeds. You should also keep a portfolio of lab reports. Many colleges will require a copy of your lab work to assure that you indeed

had an appropriate college chemistry lab experience. You may not be granted college credit without it.

- I will not tolerate any inappropriate behavior in the lab.
- Behavior that endangers the safety of others will not be tolerated.
- Lab safety will be reviewed at the beginning of the year. Students will be required to sign a safety contract that must also be endorsed by their guardians.
- Serious violations or repeat offenses in the lab may result in a zero for the lab and a referral to your GLC.
- Some labs cannot be made up if you are absent. If this is the case, you will receive an alternate assignment that you must do in order to receive an excused grade for a lab.

The AP Chemistry curriculum is very lab intensive, and the College Board is intent on making the AP Chemistry class **equivalent** to a first-year college chemistry course. To that end the following guidelines have been set forth. The following is quoted directly from the AP Chemistry Course Description:

"Developing the requisite intellectual and laboratory skills required of an AP Chemistry student demands that adequate classroom and laboratory time be scheduled. Surveys of students taking the AP Chemistry Exam indicate that performance improved as both total instructional time and time devoted to laboratory work increased.

Experiments to Be Performed Over the Course of the Year*

1. Density Lab or Thickness Lab
2. Formula Determination of a Hydrate
3. Precipitate Lab
5. Titration Lab
6. Hess's Law Lab
7. Thermodynamics Lab
8. Flame Test
9. Molecular Geometry Lab (Dry/Concept Lab)
10. Kinetics Lab
11. Le Chateliers' Lab
12. V-C Lab Titration

* **additional experiments may be added**

HOMEWORK POLICY

- Homework is a constructive tool in the learning process when geared to the needs and abilities of students. Purposeful assignments not only enhance student achievement but also develop self-discipline and associated good working habits. Homework provided will be planned and organized; will be purposeful to the students; and will be evaluated and returned to students in a timely manner. Successful homework completion and study will enable students to master chemical principles and to develop powerful problem-solving skills.
- Homework may be assigned for one or more of the following purposes:
 - Practice -- to help students to master specific skills which have been presented in class;
 - Preparation -- to help students gain the maximum benefits from future lessons;
 - Extension -- to provide students with opportunities to transfer specific skills or concepts to new situations; and
 - Creativity -- to require students to integrate many skills and concepts in order to produce original responses.
- All students should keep a portfolio of all returned assignments until after the semester grade is issued. This is your evidence to refute any errors that may arise in evaluating your grade for the class. Please contact me as soon as possible if you suspect errors in your grade.

LATE WORK POLICY

- Late work will receive a 20% reduction for each school day the assignment is late after the accepted due date.
- I will not accept any late work unless you write LATE on the top and include the date you handed the assignment in.
- Late work will not be accepted after the completion of a unit. This means no late work accepted after the administration of a unit test.

MAKE UP POLICY

Illness/Unforeseen Event

- If you are absent due to illness or some other unforeseen event, you will receive one day to make up missing assignments (homework, tests, quizzes, labs) for each day you have missed. (i.e. if you are sick for two days, you have two school days to make up missing assignments until you are caught up.)
- Any additional days past those given to make up assignments, will be treated the same as late work (see Late Work Policy above).
- If you are sick for more than one day, you should **call the school and get a homework request** from all of your teachers.
- You must talk with me the day of your return in order to receive your missing assignments.

Other Absences

- Vacations, Sporting Events, Field Trips and other Absences that require a pre-trip authorization, are not included as absences subject to the Make Up Policy. All missing assignments work must be submitted the day upon return, or it will be subject to the Late Work Policy.
- Tests or Quizzes missed while absent must be made up on the day of your return.
- If you miss an assignment that is based upon classroom participation, you may not be able to make this up. If this is the case, please talk to me about it.

TARDIES

- Tardiness is an undesirable behavior in all academic settings. Students are expected to be in their seats before the bell rings and ready to learn.
- Consequences of being tardy may be the forfeiture of taking a quiz or receiving other assignments given at the beginning of class.
- Please refer to the tardy policy outline in the Student Planner on page 19.

PARTICIPATION POINTS

- Unexcused and frequent tardies, will negatively impact your overall participation grade.
- Frequent use of the hall pass will negatively impact your overall participation grade.
- If you disrupt the learning environment in the classroom, you will first be given a warning. Additional warnings will negatively impact your overall participation grade.
- Every day you come unprepared will negatively impact your overall participation grade.

TECHNOLOGY

- Cell phones may **not** be used in any way during the class period. Any use of a cell phone will result in a referral to your GLC.

- Calculators are scientific/mathematic tools that can be very useful in the school setting. Games on calculators are, however, unacceptable. If I see games on your calculator in my class, I will clear the memory on your calculator. Repeat offenders will have their parents contacted.
- Apart from your calculator, no use of any other electronic devices in class will be permitted. This includes, but is not limited to: Gameboys (Original, Pocket, Color, Advance, Micro), Nintendo DSs, PSPs, iPods, mp3 players or other digital music/video devices, cassette players, CD players, portable DVD players, 8-track devices, record players, laptops, etc. Headphones must be put away as well. Your calculator is the one device to which you are limited. Hearing aids and pacemakers are also acceptable.

FOOD/DRINK

- No food or drink is allowed by students in class, except during class sponsored activities (food labs, parties, etc.)
- Water bottles are acceptable in class, provided they have lids and are kept out of the way.
- Absolutely no food or drink is allowed in the lab. This includes water bottles and gum as well.

GETTING HELP

- A tutoring schedule will be posted outside my classroom. This schedule lists the days and times myself as well as other Chemistry teachers are available.