

Dr. Stephanie Katz

AP Chemistry Syllabus • 2009-2010

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Course Philosophy: This course is designed give you an equivalent experience to a first-year college chemistry class. Many universities will give you course credit for their first-year chemistry course if you earn a 5 on the AP Chemistry Exam. Like many science classes, success in AP Chemistry requires an aptitude in critical thinking and problem solving. Having a solid grasp of content knowledge is not enough to achieve high marks; you must also know how to manipulate information and synthesize myriad concepts into new situations with which you are unfamiliar. We will take the basic knowledge you learned in first year chemistry and build a broader, deeper understanding through hands-on, virtual, and concept design. We will then apply your solid grasp of the subject to real-world problems which will lead to your high achievement on the AP Chemistry Exam in May.

Our classroom is a place where you can learn and have fun at the same time. It is extremely important to keep a positive attitude during the moments when you feel frustrated. While AP Chemistry can be a difficult subject, if you practice good study habits you will find it much easier. Patience and a sense of humor are essential. If you are having trouble with concepts, make sure you ask me to clarify the material. It is also important for you to recognize your responsibility in the learning process. Our classroom should be a team effort; teaching and learning are equally important components. Your job is to take notes in class, complete all assigned work on time, and ask questions when you do not understand. I will make time to help you whenever you need me!

Course Materials:

1. **Textbook:** Brown, T.L., LeMay, H.E., Bursten, B.E., *AP* Chemistry: The Central Science*; 10th ed., Pearson, 2006; ISBN-13: 9780131937192, ISBN-10: 0131937197.
2. **Required Materials:** One 1", 3-ring binder and loose-leaf notebook paper for note-taking; scientific calculator; blue, red, and black pens and/or pencils; earphones; one **bound** Composition note book to be used as a lab notebook; and one entirely different notebook (spiral or bound composition, your choice) to be used for problem sets.
3. **Optional Materials:** Instead of 3-ring binder and loose-leaf paper you may substitute a spiral notebook for note-taking; AP Chemistry Baron's or Princeton Review (for extra AP practice problems); pocket folders or other organizational folder system; colored pens or highlighter pens (for taking notes); and 3x5 index cards (for learning vocabulary, ions, and equations).

Grading Procedures: As quoted directly from the Linden Hall Student Handbook, "Rather than trimester exams, a mid-year and final exam will be given. The mid-year exam will occur in February and the final exam in May. Both are cumulative and will be counted as follows: the mid-year exam will count as 10% of the final grade and the final exam will count as 15% of the final grade. To emphasize the importance of growth through the school year, the weight of each trimester grade has been changed. The first trimester will count as 15%, the second as 25%, the third as 35%, the mid-year exam as 10%, and the final exam as 15%." The Handbook also states, "Students who take AP tests are exempt from taking final exams in the corresponding classes." Further, "In AP classes in December, January, and February, AP practice tests given in class will count as a test in the teachers' grading system...(where a 5 or 4 is the equivalent grade of an A, a score of 3 is an equivalent grade of a B, a score of 2 yields a C, and a student earning a score of 1 on the AP practice exams during these months will receive a D); in March,

April and May the AP practice tests will count as a test...(during these months, a 5 yields an A, a 4 generates a B, a 3 gives a student a C, and a grade of 2 on these practice tests gives a student a grade of D); at the end of the year, the actual AP score will count as the final exam grade.”

Grading Scale: You will receive a **percentage grade** in this class, using the following method: (Total points earned ÷ total points possible to earn) x 100% = your percentage grade. This percent will be turned into a **letter grade** using the school-determined grading scale: A- to A+: 90-100; B- to B+: 80-89; C- to C+: 70-79; D- to D+: 60-69; and F: 0-59.

Coursework Policies:

1. All students enrolled in this class are required to take the AP Chemistry Exam in May.
2. All assignments are due **at 4:00 PM** on the due date. This policy encourages students to come to class on the day an assignment is due and ask questions on parts of the assignment she does not understand. This also allows students to attend Academic Help the day an assignment is due and finish the assignment after hearing other students' questions in class.
3. Late assignments may be subject to a **50% grade penalty** especially assignments that are not submitted on the due date by 4:00PM. According to the Student Handbook, “Short-range assignments, like daily homework, for example, should be completed by arranging for Academic Help time **on the day it was due and not turned in** by coming to the teacher to complete the assignment. If the student does not come for Academic Help on the day of a missed homework assignment, then she must come the next day; point deduction for late work at this time should be at the discretion of the teacher. If the student does not report on the second day for Academic Help, then this action is considered a cut and will be followed by a pink slip.” Therefore, while I will not *usually* deduct 50% for a late assignment, the school policy allows me to decide how many points to deduct, and it is possible I may deduct up to 50%. Excused absences represent an exception to this late policy, so please make sure that you let me know if you have a valid reason for being absent, including the proper documentation to accompany your absence. Additional exceptions are allowable but will be discussed on a case by case basis. Please always feel free to discuss with me your reasons for submitting a late assignment, but always do so in a respectful matter. Also know that while I will ALWAYS accept late work, I will be the judge and jury about what late points will be deducted. If you feel that you will be unable to submit an assignment on time, it is best if you discuss it with me BEFORE the due date!
4. All assignments are to be submitted into my INBOX, which is located at the front of my classroom. Once you place your assignment into the INBOX, **you** are not permitted to remove your assignment from the INBOX for any reason. If you need to retrieve an assignment that you previously submitted, **you should ask me** to retrieve the assignment for you. This policy protects everyone's assignments. Please submit your assignment into *your class period's* INBOX, i.e. place your assignment in the INBOX marked AP Chemistry Period F.
5. PRIOR APPROVAL IS REQUIRED (from me and only me) if you are going to submit an assignment via email. You may only email an assignment that has been okayed by me in advance. Please do NOT assume just because you sent it that I received it. Email is NOT always a reliable method of submitting assignments. If you want to be certain an emailed assignment has been received by me, request a receipt email or ask me in person. If I don't receive it, it is considered not submitted.

6. Assignments should be submitted with the name of the assignment, your full English name, class name, period, and date (e.g. Experiment 1, Susie Student, AP Chemistry, Per F, 8/30/09) PRINTED at the top RIGHT corner of your paper UNLESS if there is a designated space for this information elsewhere. If I receive an assignment without a student name which I cannot identify by process of elimination or handwriting, I will hang the unnamed assignment on the class bulletin board for the student author to claim; please note, assignments received without a student name subsequently turned in the following day may be subject to a late penalty.
7. Handwritten assignments should be completed in either BLUE or BLACK ink or PENCIL only. Other colored pens should NEVER be used. When you are instructed to correct your own PS assignment, RED pen should be used for corrections.
8. Your work must be legible or it will not receive a grade. Unless otherwise specified, you are permitted to type assignments if you feel that your handwriting is illegible.
9. Missed work, labs, and tests must be made up in accordance with Linden Hall policy. Please note...it is your responsibility to obtain work missed due to absence, regardless of whether it is an excused or unexcused absence! Please consult your classmates, the in-class bulletin board, my webpage, or simply ask me for the assignment when you miss class. If you know, in advance, that you will be absent, please let me know as soon as possible, especially if you are going to be absent the day of a test or quiz.
- 10.

Classroom Policies:

1. **General Expectations** - You should bring your (spiral or) 3-ring notebook and Laptop computer (Netbook) to class every day. You will be taking notes directly into your Netbook or your notebook, whichever is most comfortable for you; however we will often access guided notes electronically. If you prefer to print PowerPoint slides or other electronic resources and bring them to class, they will be made available to you on my website ahead of class time. Much of what will be discussing will be easier to handwrite, as we will write chemical equations and have mathematical problems to solve, so it is important that you have both paper and your Netbook available. You will have many electronic resources this year, including PowerPoints, video podcasts (screencasts), electronic flashcards, e-concept maps, and more. I have gone to great lengths to make sure you have a variety of resources, so please be prepared for the myriad opportunities to learn.

2. **Staying informed** - My webpage (www.chemkatz.com) is updated on a regular basis to keep pace with the flow of the class. Students are expected to access my webpage **daily** to stay abreast of changes and daily classroom expectations and assignments. If you print out the "Week-at-a-Glance" (WAG) page over the weekend, it may look very different by Tuesday. Your WAG page can be found on the "Click HERE" link on my website. Once you are redirected to the "teacher web" homepage, you will find the WAG page on the #6 AP Chemistry link. You may subscribe to my teacher web homepage via the RSS link at the bottom of the teacher web homepage; however, if you do so, you will get updates when I make changes to any and all of my classes. Alternatively you can save the #6 link as one of your favorites and check the WAG page each day to monitor important changes. Our class's agenda will change to best serve your learning needs. You will also notice you can access your grades on the #11 Grades AP link. You will be given an ID number to log in and access your grades. If you or your parents have questions, please contact me via email. Finally, at the top right hand corner of the teacher web homepage, there is an email link (looks like a mailbox) which is the same email at the top of this syllabus. My school voice mail extension is listed on the #1 Dr. Katz link. Voicemail is the one place to leave me a voice message;

however, email is the best way to reach me. I will check email up until 9pm and then again on the following day; I will usually return email within one day, if possible. I will check voicemail only until 4pm and return messages within one day, if possible.

3. **Class Participation** - Learning is not an individual endeavor. Therefore, class cooperation is an essential component of the learning environment. Each marking period, you will be assessed on your class cooperation by my subjective evaluation of your ability to work effectively with your classmates and contribute to class discussions. Class participation will be assessed as part of your effort grade.

4. **Safety in the Laboratory** – Safety is everyone’s responsibility. We will be performing many experiments in this class that pose potential safety risks. The risks will be significantly minimized by using common sense precautions and following the appropriate safety rules. You will be expected to read, learn, and sign a two-page safety contract (found on the #5 Handouts link) before you perform any experiments in my class. Your signature on this safety contract is a promise to me and your classmates that you will take all precautions necessary to keep the lab environment hazard-free. Your parents or guardians (dorm parents will suffice) are also expected to sign the safety contract because it is important that they are aware of the potential risks you may encounter and that you are being tasked with the responsibility of following these safety rules. Please have your parents read and sign both pages after you have read and signed both pages of the contract. Once you and your parents have both read and signed it, please promptly return it to me.

5. **Problem Sets (PS)** – PS will be assigned each week to correspond with the chapter(s) we are covering. Due dates will be posted on the WAG page and in the classroom. Unless otherwise indicated, PS will NOT be graded. Answer keys will be available in the classroom for you to use to check your assignments. You should correct your PS with these answer keys using a RED pen as though you are the teacher and ask questions on problems you don’t understand. PS are a required part of the AP Chemistry curriculum and will be assessed as part of your effort grade. You should complete all PS in a spiral or bound notebook which is separate from where you keep your notes or labs. PS notebooks will be collected periodically during the trimester so I can check your progress.

6. **Honor Code** – Students are expected to uphold the Linden Hall Honor Code. While students are often encouraged to work collaboratively, there are unequivocal differences between collaboration and collusion. Intentional acts of plagiarism or other types of academic dishonesty will be met with firm consequences as outlined in the Student Handbook.

Labs

AP Chemistry includes a laboratory component comparable to college-level chemistry laboratories. The College Board™ recommends the 22 experiments listed below for us to complete in order for you to be sufficiently prepared for the AP Exam. Every effort will be made to engage in laboratory work for a minimum of one extended period a week. The official lab schedule will be determined as the year unfolds. In collaboration with other students, you will be called upon to collect, process, and manipulate data taken from physical observations, both measured and unmeasured, and then develop and report your conclusions. While we will not likely have time to complete all labs listed below, we will discuss most of the labs even if we do not perform them. Some of these labs will be completed using graphing calculators and Pasco™

equipment.¹ The labs designated with an asterisk (*) are the labs that may be done as either virtual labs or Pasco labs. Whether we are doing the labs virtually or as wet labs, each student is required to write up her own lab report and keep her own lab notebook. The lab report format will be provided on a separate handout.

1. Determination of the formula of a compound*
2. Determination of the percentage of water in a hydrate*
3. Determination of molar mass by vapor density
4. Determination of molar mass by freezing-point depression*
5. Determination of the molar volume of a gas
6. Standardization of a solution using a primary standard*
7. Determination of concentration by acid-base titration, including a weak acid or weak base*
8. Determination of concentration by oxidation-reduction titration
9. Determination of mass and mole relationship in a chemical reaction*
10. Determination of the equilibrium constant for a chemical reaction
11. Determination of appropriate indicators for various acid-base titrations; pH determination*
12. Determination of the rate of a reaction and its order
13. Determination of enthalpy change associated with a reaction*
14. Separation and qualitative analysis of cations and anions
15. Synthesis of a coordination compound and its chemical analysis
16. Analytical gravimetric determination
17. Colorimetric or spectrophotometric analysis
18. Separation by chromatography
19. Preparation and properties of buffer solutions
20. Determination of electrochemical series*
21. Measurements using electrochemical cells and electroplating
22. Synthesis, purification, and analysis of an organic compound

Tentative Schedule:

2009-2010 School year	Text Chapters	Instructional Units	Tentative Quizzes
Trimester 1, Week 1	Ch 1 & 2	1. Intro to Chemistry	Pre-Test
Trimester 1, Week 2 & 3	Ch 3	2. Stoichiometry	Quiz Units 1-2
Trimester 1, Week 4	Ch 4	3. Types of Chemical Reactions & Solution Stoichiometry	
Trimester 1, Week 5	RP Packets	4. Reaction Prediction (RP)	Quiz Units 1-4
Trimester 1, Week 6 - 8	Ch 10	5. Gases	Quiz Unit 5
Trimester 1, Week 9 & 10	Ch 5	6. Thermochemistry	Quiz Unit 6
Trimester 1, Week 10 & 11	Ch 6 & 7	7. Atomic Structure and Periodicity	Quiz Units 1-7
Trimester 2, Week 1 & 2	Ch 8 & 9	8. Bonding: General Concepts	Quiz Unit 8

¹ Pasco Scientific, 2007, 1-886998-99-X

During Thanksgiving break	Ch 25	9. Organic Chemistry
Trimester 2, Week 3	Ch 11	10. Liquids and Solids
Trimester 2, Weeks 4 & 5	Ch 13	11. Properties of Solutions Dec Practice Exam
During Winter Break	Ch 24	12. Transition Metals & Coordination Chemistry
Trimester 2, Week 5 & 6	Ch 14	13. Chemical Kinetics
Trimester 2, Week 7	Ch 15	14. Chemical Equilibrium Jan Practice Exam
Trimester 2, Week 8	Ch 16	15. Acids and Bases
Trimester 2, Week 9	Ch 1-16, 24, 25, RP	Feb Practice Exam
Trimester 2, Weeks 10 – 12	Ch 17	16. Aqueous Equilibria
Spring Break	Ch 21	17. Nuclear Chemistry
Trimester 3, Weeks 1 & 2	Ch 19	18. Spontaneity, Entropy, & Free Energy Mar Practice Exam
Trimester 3, Week 3	Ch 20	19. Electrochemistry
Trimester 3, Week 4 – 8	Old AP Exams	20. Review for AP Exam April & May Practice Exams
Trimester 3, Week 9		AP CHEMISTRY EXAM
Trimester 3, Week 10		21. Cross-Curricular Project Atomic Poetry

AP Chemistry 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: atomic radii, ionization energies, electron affinities, oxidation states

B. Chemical bonding

1. Binding forces
 - a. Types: ionic, covalent, metallic, hydrogen bonding, 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
 - d. Geometry of molecules and ions
 - e. Dipole moments of molecules
 - f. Relationship between properties and structure
- C. Nuclear chemistry
- 1. Nuclear equations
 - 2. Half-lives

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
- 5. Lattice energies

C. Solutions

- 1. Types of solutions and factors affecting solubility
- 2. Methods of expressing concentration
 - a. Raoult's law
 - b. Colligative properties (nonvolatile solutes)
 - c. Osmosis
- 3. Nonideal behavior

III. Reactions

A. Reaction types

- 1. Acid-base reactions: Arrhenius, Brønsted-Lowry, and Lewis
 - a. Coordination complexes
 - b. 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
 - (1) Faraday's laws
 - (2) Standard half-cell potentials
 - (3) Nernst equation
 - (4) 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
 - a. Le Chatelier's principle
 - b. 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) K_{sp} , precipitation, and the dissolution of slightly soluble compounds
 - (3) Common ion effect
 - (4) Buffers
 - (5) Hydrolysis

D. Kinetics

1. Concept of rate of reaction
2. Reactant order, rate constants, and rate laws
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
 - a. Change in enthalpy
 - b. Heat of formation
 - c. Heat of reaction
 - d. Hess's law
 - e. Heats of vaporization and fusion
 - f. Calorimetry
3. Second law
 - a. Entropy
 - b. Free energy of formation
 - c. Free energy of reaction
 - d. 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

A. Chemical reactivity

1. Predicting products of chemical reactions

B. Relationships in the periodic table

1. Analysis of trends: horizontal, vertical, and diagonal
 - a. Alkali metals, alkaline earth metals, halogens, and transition elements

C. Organic chemistry basics: hydrocarbons and functional groups

1. Structure
2. Nomenclature
3. Chemical properties

