AP Chemistry 2016-2017 Syllabus

Course Description:
The purpose of Advanced Placement Chemistry is to provide a college level course in chemistry and to prepare the student to seek credit and/or appropriate placement in college chemistry courses. Students are engaged in hands-on laboratory work, integrated throughout the course that accounts for more than 25% of the class time. **[CR5a]** Emphasis is placed on depth of understanding of a topic, rather than breadth of topics.

Objectives:

Students will:

1. Learn the inquiry process through numerous laboratory investigations.
2. Gain an understanding of the six big ideas as articulated in the AP Chemistry Curriculum Framework. **[CR2]**
3. Apply mathematical and scientific knowledge and skills to solve quantitative, qualitative, spatial, and analytic problems.
4. Apply basic arithmetic, algebraic, and geometric concepts.
5. Formulate strategies for the development and testing of hypotheses.
6. Use basic statistical concepts to draw both inferences and conclusions from data.
7. Identify implications and consequences of drawn conclusions.
8. Use manipulative and technological tools including the Vernier LabQuests, Vernier Probes, and Vernier's LoggerPro software.
9. Measure, compare, order, scale, locate, and code accurately.
10. Do scientific research and report and display the results of this research.
11. Learn to think critically in order to solve problems.

Textbook, Laboratory Manual, and Study Guides:

Zumdahl, Steven S., et. al., Chemistry, 9th Edition. Boston, New York, Houghton Mifflin Company, 2013.

It is recommended that students purchase a study guide for this course. I recommend either the most recent Princeton Review, Barrons, or Crash Course for AP Chemistry. Please ask me if you have any questions.

Laboratory Work:

All of the laboratory experiments in this course are hands-on. Students work individually or in a group of two depending upon the lab. They collect, process, manipulate, and graph data from both qualitative and quantitative observations. Inquiry is emphasized in many of the experiments that students complete. The laboratory work requires students to design, carry out, and analyze data using guided inquiry principles. For all labs, students are required to report the purpose, hypothesis, procedure, all data, data analysis, error analysis, results, and conclusions in a lab report that is submitted for grading. The following are the guided-inquiry lab. **[CR7]**:

1. Energy Levels and Electron Transitions
2. Chromatography --- Sticky Question: How Do You Separate Molecules That Are Attracted to One Another?
3. The Hand Warmer Design Challenge: Where Does the Heat Come from?
4. Rate of Reaction: How Long Will That marble Statue Last?
5. Rate Laws: What is the rate law of the fading crystal violet using Beer's Law?
6. Le Chatelier's Principle: Can We make the colors of the rainbow?
7. How do the structure and the initial concentration of an acid and a base influence the pH of the resultant solution during a titration?
8. To what extent do common household products have buffering activity?
9. The preparation and testing of an effective buffer: how do components influence a buffer's pH and capacity?

10. How can color be used to determine the mass percent of copper in brass?

Safety: Students will review safety precautions and correct technique for using safety and laboratory equipment.

Technology: Students use Vernier LabPros and probes in laboratory work to gather data. Graphs are produced using Vernier LoggerPro software.

Laboratory Notebook: A laboratory notebook is required for the course. All completed lab reports documenting all lab experiences must be included in the notebook. **[CR7]**

Tests: A chapter test is assigned for each chapter. A comprehensive, standardized semester exam is administered at the end of 1st semester and a final exam at the end of the year.

Mock Test: Students are required to take a mock test for this course in order to assist in reviewing for the AP Test. This test is tentatively scheduled for the morning on March 25th. The test lasts 3.5 hours. Make up dates will also be provided.

District Review Session: This session is highly encouraged. It will be three hours long on April 1st. I will give more information as it becomes available.

Course Outline: [CR2]

Chapter	Title in Zumdahl Chemistry	AP Chemistry Topic Covered	Big Ideas
7	Atomic Structure and Periodicity	Atomic Theory & Atomic Structure	1 & 2
8	Bonding -- General Concepts	Chemical Bonding	1 & 2
9	Covalent Bonding: Orbitals		
10	Liquids and Solids	Liquids & Solids	1 & 2
11	Properties of Solutions	Solutions	2
6	Thermochemistry	Thermodynamics	5
17	Spontaneity, Entropy, and Free Energy		
12	Chemical Kinetics	Kinetics	4
13	Chemical Equilibrium	Equilibrium	6
14	Acids and Bases		
15	Acid-Base Equilibria		
16	Solubility & Complex Ion Equilibria		
18	Electrochemistry	Reaction Types	3
19	The Nucleus -- A Chemist's View	Nuclear Chemistry	1
1	Chemical Foundations	None	
2	Atoms, Molecules, and Ions	Atomic Theory & Atomic Structure	1 & 2
3	Stoichiometry	Stoichiometry	3
4	Types of Chemical Reactions & Solutions Stoichiometry	Reaction Types & Stoichiometry	3
5	Gases	Gases	1 & 2
20	The Representative Elements	Descriptive Chemistry	2
22	Organic Chemistry		

Big Idea 1 – Structure of matter, Big Idea 2 – Properties of matter-characteristics, states and forces of attraction, Big Idea 3 – Chemical reactions, Big Idea 4 – Rates of chemical reactions, Big Idea 5 – Thermodynamics, Big Idea 6 – Equilibrium.

Corresponding book problems will be assigned through each unit.

Assignments (by Chapter)

Chapter 7: Atomic Structure and Periodicity
Learning Objectives: ***1.5, 1.6, 1.7, 1.9, 1.10, 1.12, 1.13, 1.15***
Read: Pages 295-352
Lab Investigations
Guided Inquiry*:* Energy Levels and Electron Transitions (SP 3.1-3.3, 4.1, 5.2, 5.3, 6.4; LO 1.15) [CR5b] & [CR6]
Beer's Law (SP 2.2, 4.2, 5.1, 5.2, 5.3, 6.4; LO 3.4) **[CR5b] & [CR6]**
Activity (Big Idea 1)
SP 6.1, LO 1.10: Justify with evidence the arrangement of the periodic table and apply periodic properties to chemical reactivity. **Description:** Students are given several elements pairing them by families or by period and are asked to rationalize the change in electronegativity of each group based on the electronic structure of the atom **[CR3a]**

Chapter 8: Bonding --- General Concepts
Learning Objectives: ***1.7, 1.8, 1.15, 2.1, 2.17, 2.18, 2.21, 2.23, 2.24, 5.1, 5.8***
Read: 351 – 414
Activity (Big Idea 2)
SP 1.4, LO 2.21: Use Lewis diagrams and VSEPR to predict the geometry of molecules, identify hybridization, and make predictions about polarity. **Description:** Students construct balloon models of the arrangement of pairs of electrons around a central atom. They then draw 2D pictures of these arrangements and apply these to predicting the shapes of molecules. **[CR3b]**

Chapter 9: Covalent Bonding: Orbitals
Learning Objectives: ***1.6, 1.7, 1.15***
Read 415 – 452
Lab Investigation
Determination of the Formula of a Hydrate (SP 2.1, 4.2, 6.4; LO 3.5) **[CR5b] & [CR6]**

Chapter 10: Liquids and Solids
Learning Objectives: ***2.1, 2.3, 2.11, 2.13, 2.16, 2.19, 2.20, 2.22, 2.23, 2.24, 2.25, 2.26, 2.27, 2.28, 2.29, 2.30, 2.31, 2.32, 5.6, 5.9, 5.10, 5.11***
Read 453 – 509

Chapter 11: Properties of Solutions
Learning Objectives: ***1.11, 2.7, 2.8, 2.9, 2.11, 2.13, 2.14, 2.15, 2.16, 5.10, 6.24***
Read 510 – 551
Lab Investigation
Guided Inquiry: Chromatography --- Sticky Question: How Do You Separate Molecules That Are Attracted to One Another? (SP 3.1-3.3, 4.2,5.1, 6.3, 6.4, 6.5, LO 2.10)

Chapter 6: Thermochemistry
Learning Objectives: ***3.11, 5.3, 5.4, 5.5, 5.6, 5.7, 5.8***
Read 245-294
Lab Investigations
Hess's Law Lab (SP 2.2, 2.3, 4.2, 5.1, 5.2, 5.3, 6.4; LO 5.6, 5.7)
Analysis by Calorimetry (Zumdahl) (SP 4.2, 5.1, 6.4, LO 5.7)
Guided Inquiry**:** The Hand Warmer Design Challenge: Where Does the Heat Come from? (SP 3.1-3.3, 4.2, 4.3, 4.4, 5.1, 6.4, LO 5.7) **[CR5b] & [CR6]**
Activity (Big Idea 5)
SP 1.1, 1.2, 1.4, 7.1, LO 5.2: Students relate temperature to the motions of particles, either via particulate representations, such as drawings of particles with arrows indicating velocities, and/or via representations of average kinetic energy and distribution of kinetic energies of the particles, such as plots of the Maxwell-Boltzmann distribution. **[CR3e]**

Chapter 17: Spontaneity, Entropy, and Free Energy
Learning Objectives: ***2.15, 5.3, 5.12, 5.13, 5.14, 5.15, 5.16, 5.17, 5.18, 6.25***
Read 787-831

Chapter 12: Chemical Kinetics
Learning Objectives: ***4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9***
Read 552-605
Lab Investigations
Guided Inquiry: Rate of Reaction: How Long Will That Marble Statue Last? (SP 3.1-3.3, 4.2, 4.3, 4.4, 5.1, 6.3, 6.4, 6.5; LO 4.1, 4.2) **[CR5b] & [CR6]**
Guided inquiry*:* Rate Laws: What is the rate law of the fading crystal violet using Beer's Law? (SP 3.1-3.3, 4.3, 4.4, 5.1, 6.3, 6.4, 6.5, 7.1; LO 4.1, 4.2, 4.4) **[CR5b] & [CR6]**
Activity (Big Idea 4)
SP 1.5, LO 4.8: Translate among reaction energy profile representations, particulate representations, and symbolic representations (chemical equations) of a chemical reaction occurring in the presence and absence of a catalyst. **Description:** Students create energy diagrams to explain why catalysts and raising the temperature can increase the rate of a chemical reaction. **[CR3d]**

Chapter 13: Chemical Equilibrium
Learning Objectives: ***6.1, 6.2, 6.3, 6.4, 6.5, 6.6, 6.7, 6.8, 6.9, 6.10***
Read 606-651
Lab Investigations
Guided Inquiry**:** Can We Make the Colors of the Rainbow? An Application of Le Chatelier's Principle? (SP 3.1-3.3, 4.2, LO 6.9)
Lab: Equilibrium Constant Determination (SP 4.2; LO 6.9) **[CR5b] & [CR6]**

Activity (Big Idea 6)
SP 6.2, LO 6.1: Given a set of experimental observations regarding physical, chemical, biological, or environmental processes that are reversible, student is able to construct an explanation that connects the observations to the reversibility of the underlying chemical reactions or processes. **[CR3f]**

Chapter 14: Acids and Bases
Learning Objectives: ***2.1, 2.2, 3.7, 6.1, 6.11, 6.12, 6.14, 6.15, 6.16***
Read 652 - 710
Lab Investigation
K_a Lab – Determination of Dissociation Constant of Weak Acids (SP 1.1, 1.2, 1.4, 2.3 3.1-3.3; LO 6.11) **[CR5b] & [CR6]**

Chapter 15: Acid Base Equilibria
Learning Objectives: ***1.20, 2.2, 3.3, 6.1, 6.12, 6.13, 6.15, 6.16, 6.17, 6.18, 6.19, 6.20***
Read 711 – 757
Lab Investigations
Guided Inquiry*:* How do the structure and the initial concentration of an acid and a base influence the pH of the resultant solution during a titration? (SP 1.4, 1.5, 3.1, 3.2, 3.3, 4.2, 5.1, 6.4, 7.1; LO 1.18, 1.20, 3.2, 6.12, 6.13) **[CR5b] & [CR6]**
Guided Inquiry*:* To what extent do common household products have buffering activity? (SP 2.3, 3.1-3.3, 4.2, 6.4, 7.1; LO 1.4, 6.18, 6.20) **Description:** Students write a report whereby they make claims as to the buffering activity of multiple household products and how this affects the disposal of the household products. **[CR4] [CR5b] & [CR6]**
Guided Inquiry*:* The preparation and testing of an effective buffer: how do components influence a buffer's pH and capacity? (SP 2.3, 3.1-3.3, 4.2, 6.4, 7.1; LO 1.4, 6.18, 6.20) **[CR5b] & [CR6]**

Chapter 16: Solubility & Complex Equilibria
Learning Objectives: ***6.1, 6.21, 6.22, 6.23***
Read 758 – 786
Lab Investigation
Lab: Determination of a Solubility Product Constant (SP 1.4, 2.1, 2.2, 2.3, 3.1, 3.2, 3.3, 4.1, 5.1, 6.4, 7.1; LO 1.4, 3.3, 6.12, 6.20) **[CR5b] & [CR6]**

Chapter 18: Electrochemistry
Learning Objectives: ***3.2, 3.8, 3.12, 3.13, 5.15, 6.1***
Read 832 – 889
Lab Investigations
Lab: Electroplating (SP 2.2, 3.1, 3.2, 3.3, 4.2, 4.3, 4.4, 5.1; LO 3.3) **[CR5b] & [CR6]**
Electrochemical Cells (SP 2.2, 2.3, 5.1, 6.4; LO 3.12, 3.13) **[CR5b] & [CR6]**

Chapter 19: The Nucleus
Learning Objective: ***4.3***
Read 890 – 925

Chapter 1: Chemical Foundations
Learning Objectives: ***2.7, 2.10, 3.10***
Read 1 – 41
Lab Investigations
Ion Chromatography Lab (SP 6.1; LO 2.18) **[CR5b] & [CR6]**
Chapter 2: Atoms, Molecules, and Ions
Learning Objectives: ***1.1, 1.17, 2.17, 3.5, 3.6***
Read 42-80
Lab Investigation
Determination of Avogadro's Number Lab (SP 2.2, 6.1; LO 3.6) **[CR5b] & [CR6]**

Chapter 3: Stoichiometry
Learning Objectives: ***1.1, 1.2, 1.3, 1.4, 1.14, 1.16, 1.17, 1.18, 1.19, 3.1, 3.3, 3.4, 3.6***
Read 81-114
Lab Investigations
Determination of the Formula of a Compound Lab (SP 2.1, 4.2, 5.1, 6.4; LO 3.5) **[CR5b] & [CR6]**
Chemical Reactions of Copper and Percent Yield (SP 1.4, 1.5, 2.1, 2.2, 4.2, 5.1, 6.1, 6.4, 7.1; LO 1.19, 3.2, 3.3, 3.4, 3.10)
Guided Inquiry**:** How can color be used to determine the mass percent of copper in brass? (SP 3.1-3.3, 4.2, 5.1, L.O. 1.16) **[CR5b] & [CR6]**
Gravimetric Analysis of a Sulfate Mixture Lab (Zumdahl) (SP 4.2, 5.1, 6.4 LO 1.19)
Activity (Big Idea 3)
Activity: LO 3.6: Use data from synthesis or decomposition of a compound to confirm the conservation of matter and the law of definite proportions. **Description:** The students present problems to the class in which they demonstrate how to find the empirical formula of a compound from data on the percent composition by mass. **[CR3c]**

Chapter 4: Types of Chemistry Reactions and Solution Stoichiometry
Learning Objectives: ***1.17, 1.18, 1.4, 2.8, 2.9, 2.14, 3.1, 3.2, 3.3, 3.4, 3.8, 3.9, 3.10***
Read 138 – 188
Lab Investigation
Analysis by Oxidation-Reduction Titration Lab (Zumdahl) (SP 4.2, 5.1, 3.9)

Chapter 5: Gases
Learning Objectives: ***1.3, 1.4, 2.4, 2.5, 2.6, 2.12, 2.15, 3.4, 5.2***

Read 189 – 244
Lab Investigation
The Determination of the Molar Mass of a Volatile Liquid Lab (SP 1.3, 1.4, 6.4, 7.2; LO 2.4, 2.5) **[CR5b] & [CR6]**

Ch. 20 Descriptive
Learning Objectives: ***1.10, 1.11, 2.17, 5.18***
Read 926 – 971

Ch. 22 Organic Chemistry
Learning Objectives: ***2.15, 5.11***
Read 1023 - 1059

Materials

1. Calculator: You will need a calculator that has scientific capabilities:

    Preferred – TI-83 plus / TI-84 – great graphing calculator that will be used for your mathematics courses also.

2. Spiral Notebook (2)-one for notes, the other for lab reports

    Single-subject - 100 page Notebook (8-1/2" X 11" paper) with plastic cover

3. Other products (optional)

    Facial tissue paper

    Hand soap

    Hand sanitizer

    Paper towels

Test Retakes

If a student fails a major test/assessment (below 70%), they may retake *a* test once for a grade of up to a 70%.

Students have to make arrangements with the teacher to retake a major test afterschool.

All retakes must be completed prior to the end of each six week grading period.

Students are encouraged to attend at least one tutorial before retaking a test.

Students will organize a date to take any test if they were absent on the test day. Missed tests will not be administered during class.

Late Work

Students may be assessed a penalty of no more than 30 points per day for up to one class period before a zero may be given for work not turned in on time.

All assignments must be completed prior to the end of each six week grading period.

Lab Safety

Student safety is of the utmost importance and it is therefore imperative that students understand the rules and procedures set forth in this class. Please understand the inherent dangers associated with the science labs and the necessity to carefully follow the rules set forth.
Students will be issued a Lab Safety Contract to be signed prior to any work in the lab.

Academic Dishonesty

Academic dishonesty—cheating or plagiarism—is not acceptable. Cheating includes the copying of another student's work—homework, class work, test answers, etc.—as one's own. Plagiarism is the use of another person's original ideas or writing without giving credit to the true author. A student found to have engaged in academic dishonesty will receive a zero grade and a discipline referral.

Please refer to the Student handbook for more information on student behavior and requirements

Grading

A. Tests/Projects 50%

B. Lab Reports 30%

C. Daily work/Quizzes 20%

Participation is expected but will not be graded.

No extra credit work is given to any student.

The final exam for each 18-week session will be worth 20% of that eighteen week's period grade. Furthermore, this exam will include some essay questions.

Student will be evaluated from a minimum of six grades with at least two test grades per six weeks.

Attendance/Tardies

If a student misses an assignment or exam due to absence, the assignment will be due the number of days absent plus one. Exams will be arranged with the teacher to be taken out of normal class time.

Regular school attendance is essential for a student to make the most of his or her education—to benefit from teacher-led and school activities, to build each day's learning on the previous day's, and to grow as an individual. Absences from class may result in serious disruption of a student's mastery of the instructional materials; therefore, the student and parent should make every effort to avoid unnecessary absences. Two state laws—one dealing with compulsory attendance, the other with attendance for course credit—are of special interest to students and parents. They are discussed below.

An absence is defined as missing 20 minutes or more of any class.

Checking In to School during the Day (Student responsibility): A student who is late to school, must sign in in the Attendance Office with acknowledgement by the attendance clerk. A student who does not sign in without the approval of the attendance clerk or Assistant Principal will be considered truant from school and will receive an unexcused absence for each class missed.

Attendance for Credit: To receive credit in a class, a student must attend at least 90 percent of the days the class is offered.

Classroom Rules

1. Be on time. Please be in your seat when the bell rings.
2. Bring the proper supplies: textbook, notebook, calculator, pencil.
3. Respect other people's rights and property.
4. Come to class prepared by doing your homework/having studied for your test.
5. No food or drink of any kind in the lab area when working with chemicals.

Office Hours

Students are encouraged to pace their studying and not cram for exams. Office hours will mostly provide an opportunity for other students to come and work through problems amongst themselves. Although the teacher will be there, collaboration and working in groups will be emphasized.