SYLLABUS FOR
ADVANCED PLACEMENT CHEMISTRY

Welcome to A.P. Chemistry. The goal of this course is to present the equivalent of a one-year Freshman College Chemistry course. This course offers the opportunity to earn college credit (determined by AP score) as well as high school credit (by passing the class). Thus one of your goals is to prepare for the AP Chemistry test in May, which also gives a rigorous preparation in College Chemistry. The class runs a total of 46 minutes per day, five days a week. Laboratory classes encompass on average two to three days per week. Thus little time is spent on lecture ─ I believe that learning is active not passive. Students perform hands-on laboratory work, throughout the course that accounts for more than 25% of class time, and additional class time will be used to help students meet each of the learning goals in the AP Scientific Practices (see below). **[CR5a]** The class emphasizes depth of understanding of a topic, rather than surface coverage or memorization of topics.

Textbook, Laboratory Manual, and Study Guides:
Chemistry by Zumdahl and Zumdahl, 7th Edition, Houghton Mifflin Company, 2007. **[CR1]**
AP Chemistry Manual, 2nd edition. Charleston, W.Va. Kanawha County Schools, 2003.
Zumdahl, Stephen and Susan Zumdahl, Fast Track to a Five, Evanston, IL, Houghton Mifflin Company, 2006.
Experimental Chemistry, Hall, 7th Edition, Houghton Mifflin, 2007.
Laboratory Experiments, Nelson/Kemp, Pearson/Prentice Hall, 10th ed., 2006.
Laboratory Experiments for AP Chemistry, Vonderbrink, Flinn Scientific, 2001.
Problem Help: Study Guide, Zumdahl, Zumdahl, and Kelter, 7th Edition, Houghton Mifflin Company, 2007.
Online study tools as available.

STRUCTURE OF THE COURSE: [CR2]
AP Chemistry is built around six big ideas and seven science practices. Thus the course objectives are for students to gain an understanding of the following:
Big Idea 1:
The chemical elements are fundamental building materials of matter, and all matter can be understood in terms of arrangements of atoms. These atoms retain their identity in chemical reactions.
Big Idea 2:
Chemical and physical properties of materials can be explained by the structure and the arrangement of atoms, ions, or molecules and the forces between them.
Big Idea 3:
Changes in matter involve the rearrangement and/or reorganization of atoms and/or the transfer of electrons.
Big Idea 4:
Rates of chemical reactions are determined by details of the molecular collisions.
Big Idea 5:
The laws of thermodynamics describe the essential role of energy and explain and predict the direction of changes in matter.
Big Idea 6:
Any bond or intermolecular attraction that can be formed can be broken. These two processes are in a dynamic competition, sensitive to initial conditions and external perturbations.

The science practices for AP Chemistry are designed to get the students to think and act like scientists. Students will be expected to learn to:
Science Practice 1: use representations and models to communicate scientific phenomena and solve scientific problems.
Science Practice 2: use mathematics appropriately.
Science Practice 3: engage in scientific questioning to extend thinking or to guide investigations within the context of the AP course.
Science Practice 4: plan and implement data collection strategies in relation to a particular scientific question.
Science Practice 5: perform data analysis and evaluation of evidence.
Science Practice 6: work with scientific explanations and theories.
Science Practice 7: connect and relate knowledge across various scales, concepts, and representations in and across domains.

10 Parts of a Laboratory Report [CR7]

All lab reports are turned in to the teacher in very neat, handwritten form in a laboratory notebook. Specific formats will be given to the student for each lab, but each lab must also include the following 10 sections. Students must follow the following format and label all sections absolutely clearly. AP Chemistry lab reports are longer and more in depth the first year chemistry ones, and they make up a larger portion of your grade. For success in the class, do not procrastinate when doing pre-lab and post-lab work. Labs not completed in class must be done at lunch or before/after school by appointment. At least one lab or activity (in part or in full) will be presented to the class each quarter.

Pre-Lab Work: Pre-lab work is to be completed and turned in on the day the lab is performed.

1. Title: The title should be descriptive. For example, "pH Titration Lab" is a descriptive title and "Experiment 5" is not a descriptive title.

2. Date: This is the date the student performed the experiment.

3. Purpose: A purpose is a statement summarizing the "point" of the lab.

4. Procedure Outline: Students need to write an outline of the procedure. They should use bulleted statements or outline format to make it easy to read. If a student is doing a guided inquiry lab, they may be required to write a full procedure that they develop.

5. Pre-Lab Questions: Students will be given some questions to answer before the lab is done. They will need to either rewrite the question or incorporate the question in the answer. The idea here is that when someone (like a college professor) looks at a student's lab notebook, they should be able to tell what the question was by merely looking at their lab report. It is important to produce a good record of lab work.

6. Data Tables: Students will need to create any data tables or charts necessary for data collection in the lab.

During the Lab

7. Data: Students need to record all their data directly in their lab notebook. They are NOT to be recording data on their separate lab sheet. They need to label all data clearly and always include proper units of measurement. Students should underline, use capital letters, or use any device they choose to help organize this section well. They should space things out neatly and clearly.

Post-Lab Work

8. Calculations and Graphs: Students should show how calculations are carried out. Graphs need to be titled, axes need to be labeled, and units need to be shown on the axis. To receive credit for any graphs, they must be at least ½ page in size.

9. Conclusions: This will vary from lab to lab. Students will usually be given direction as to what to write, but it is expected that all conclusions will be well thought out and well written.

10. Post Lab Error Analysis Questions: Follow the same procedure as for Pre-Lab Questions.

AP Chemistry Unit Overview:

Unit 1: Review of Chemistry Fundamentals

Class Periods (43 minutes): 10
Homework Sets Assigned: 8
Number of Quizzes: 2
Number of Exams: 1

Topics Covered:	**Curriculum Framework Articulation:**
1. Scientific Method	BI 1.D.1: a
2. Classification of Matter	
a. pure substances vs. mixtures	1.A.1:b
b. law of definite proportions	1.A.1:c
c. law of multiple proportions	1.A.1:d
d. chemical and physical changes	3.C.1:b, 3.C.1:c, 5.D:2
3. Nomenclature and formula of binary compounds	1.E.2:b
4. Polyatomic ions and other compounds	1.E.2:b
5. Determination of atomic masses	1.A.1:a
6. Mole concept	1.A.3:b, 1.A.3:c, 1.A.3:d, 1.E.2:b
7. Percent composition	1.A.2:a
8. Empirical and molecular formula	1.A.2:b
9. Writing chemical equations and drawn representations	1.E.1:a, 1.E.1:c, 3.C.1:a
10. Balancing chemical equations	1.A.3:a, 1.E.2:c, 1.E.2:d, 3.A.1:a
11. Applying mole concept to chemical equations (Stoich)	1.A.3:a, 1.E.1:b
12. Determine limiting reagent, theoretical and % yield	3.A.2:a

Labs: [CR5b] [CR6][

*Guided Inquiry: Cacciatore and Sevian, "Teaching Lab Report Writing through Inquiry: A Green Chemistry Stoichiometry Experiment for General Chemistry"	LO 1.1-1.3, 1.19, 3.5, 3,6 SP 2.1, 2.2, 4.2, 5.1, 6.1, 6.4
Analysis of a Silver Alloy, Vonderbrink **Activity:** Students will perform data analysis of a Job's plot lab data in which they also draw particle level drawings and write reaction equations for an observed reaction. **[CR3c]**	LO 1.1, 3.3, 3.4; SP 2, 5 LO 3.1, SP 1.5, SP 7.1LO 3.2, SP 1.5, SP 7.1LO 3.3, SP 2.2, SP 5.1O 3.4, SP 2.2, SP 5.1, SP 6.4

<u>Unit 2: Gas Laws</u>

Class Periods (43 minutes): 12
Homework Sets Assigned: 5
Number of Quizzes: 2
Number of Exams: 1

Topics Covered:	**Curriculum Framework Articulation:**
1. Measurement of gases	
2. General gas laws - Boyle, Charles, Combined, and Ideal	2.A.2:a, 2.A.2:c
3. Dalton's Law of partial pressure	2.A.2:b
4. Molar volume of gases and Stoichiometry	3.A.2:b
5. Graham's Law	
6. Kinetic Molecular Theory	2.A.2:d, 5.A.1
7. Real Gases and deviation from ideal gas law	2.A.2:e, 2.A.2:f, 2.A.2:g, 2.B.2:c,2.B.2:d
8. Graham's Law	LO 2.6; SP 1, 6

Labs: [CR5b] & [CR6]

Molecular Mass of a Volatile Liquid	LO 2.4, 2.5, 5.2; SP 2, 5
Graham's Law microscale **Activity:** Students interact with the PhET simulation "Gas Properties" to familiarize themselves with the Kinetic Molecular Theory and different ways to represent P, V, and T.	LO 2.5, SP 1.3, SP 6.4, SP 7.

<u>Unit 3: Kinetics</u>

Class Periods (43 minutes): 24
Homework Sets Assigned: 4
Number of Quizzes: 3
Number of Exams: 1

Topics Covered:	**Curriculum Framework Articulation:**
1. Rates of reactions	4.A.1:a
2. Factors that affect rates of reactions/collision theory	4.A.1:b, 4.A.1:c, 4.D.1, 4.D.2
3. Reaction Pathways	4.B.3:a, 4.B.3:b
4. Rate equation determination	4.A.2:a
a. rate constants	4.A.3
b. mechanisms	4.B.1, 4.C.1, 4.C.2, 4.C.3
c. method of initial rates	4.A.2:c
d. integrated rate laws	4.A.2:b, 4.A.3:d
5. Activation energy and Boltzmann distribution	4.B.2, 4.B.3:c LO 4.1, 4.8, 4.9; SP 1

Labs: [CR5b] & [CR6]

Determining Order of a Reaction	LO 1.16, 4.2, 4.3, 4.4; SP 2-6
*Guided Inquiry: How Long Will That Marble Statue Last?	LO 4.1
Study of the Kinetics of a Reaction (Vonderbrink)	LO 4.1, SP 4.2, SP 5.1
Kinetics: Differential and Integrated Rate Laws (Hostage/Fossett)	LO 4.1, SP 4.2, SP 5.1

Activity:

1) Online Kinetics Activity Using the web based PhET "Reactions and Rates" simulation, students will study the interaction of energy, reaction rate and collision theory. **[CR3d]**	LO 4.1; SP 1, 3, 6
2) Kinetics of Ice Cream Sundaes (Mechanisms)	

Unit 4: Intro to Equilibrium

Class Periods (43 minutes) 14
Homework Sets Assigned: 3
Number of Quizzes: 2
Number of Exams: 1

Topics Covered:	**Curriculum Framework Articulation:**
1. Characteristics and conditions of chemical equilibrium	6.A.1, 6.A.3:a, 6.A.3:f
2. Equilibrium expression derived from rates	6.A.3:b
3. Factors that affect equilibrium	6.A.3:c
4. Le Chatelier's principle	6.A.3:b, 6.B.1, 6.B.2, 6.C.3:e, 6.C.3:f
5. The equilibrium constant	6.A.3:d, 6.A.3.e, 6.A.4
6. Solving equilibrium problems	

Labs: [CR5b] & [CR6]

*Guided Inquiry Lab: Can we make the colors of the rainbow?	LO 5.17, 6.1-6.10; SP 2, 5

Activity:

Online Gas Phase Equilibrium Demo	LO 6.8, 6.9; SP 1, 6
Online Salts and Solubility Demo	LO 6.8, SP 1.4, SP 6.4
In the online inquiry activity, students are able to manipulate the environment and produce stresses to observe Le Chatelier's principle. **[CR3f]**	

Unit 5: Acids, Bases and Titrations

Class Periods (43 minutes): 14
Homework Sets Assigned: 4
Number of Quizzes: 3
Number of Exams: 1

Topics Covered:	**Curriculum Framework Articulation:**
1. Definition and nature of acids and bases	3.B.2, 6.C.1:c, 6.C.1:d, 6.C.1:e, 6.C.1:f
2. Kw and the pH scale	6.C.1:a, 6.C.1:b, 6.C.1:g
3. pH of strong and weak acids and bases	6.C.1:h
4. Polyprotic acids	6.C.1:n
5. pH of salts	
6. Structure of Acids and Bases	

Labs: [CR5b] & [CR6]

*Guided Inquiry Lab: How Much Acid is in Fruit Juices and Soft Drinks?	LO 2.2, 3.3; SP 1.1, 2.2, 3.1, 4.2, 5.1, 6.4, 7.1

Unit 6: Buffers, Weak Acids/Bases and Ksp

Class Periods (43 minutes): 18
Homework Sets Assigned: 6
Number of Quizzes: 3
Number of Exams: 1

Topics Covered:	**Curriculum Framework Articulation:**
1. Characteristics and capacity of buffers	6.C.2
2. Titrations and pH curves	6.C.1:i, 6.C.1:j, 6.C.1:k, 6.C.1:l, 6.C.1:m
3. Choosing Acid Base Indicators	
4. pH and solubility	
5. Ksp Calculations and Solubility Product	6.C.3:a, 6.C.3:b

Labs: [CR5b] & [CR6]

*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?	LO 6.11, 6.12, 6.13, 6.14, 6.15, 6.16, 6.17; SP 2, 5, 6
*Guided Inquiry: To What Extent Do Common Household Products Have Buffering Activity? Hostage and Fossett, Experiment 12: "Preparation of a Buffer Solution at a Given pH"	LO 6.18, 6.19, 6.20; SP 2, 3, 4, 5
Vonderbrink, Experiment 13: "Determination of the Solubility Product of an Ionic Compound" Hostage and Fossett, Experiment 18: "Determining the Solubility Product Constant of Calcium Hydroxide	LO 6.21, 6.22, 6.23, 6.24; SP 2, 5, 6

Unit 7: Thermochemistry and Thermodynamics

Class Periods (43 minutes): 18
Homework Sets Assigned: 5
Number of Quizzes: 4
Number of Exams: 1

Topics Covered:	**Curriculum Framework Articulation:**
1. Law of conservation of energy, work, internal energy	5.B.1, 5.E.2:a
2. Endothermic and exothermic reactions	3.C.2, 5.B.3:e, 5.B.3:f
3. Potential energy diagrams	3.C.2, 5.C.2:c, 5.C.2:d, 5.C.2:e
4. Calorimetry, heat capacity, and specific heat	5.A.2, 5.B.2, 5.B.3:a, 5.B.3:b, 5.B.4
5. Hess's law	5.B.3:a
6. Heat of formation/combustion	5.C.2:g
7. Bond energies	2.C.1:d, 5.C.1, 5.C.2:a, 5.C.2:b
8. Laws of thermodynamics	
9. Spontaneous process and entropy	5.E.1
10. Spontaneity, enthalpy, and free energy	5.E.2:c, 5.E.3,
11. Free energy	5.E.2:d, 5.E.2:e, 5.E.2:f, 6.C.3:c, 6.D.1:a
12. Free energy and equilibrium	5.E.2, 6.D.1:b, 6.D.1:c, 6.D.1:d
13. Rate and Spontaneity	5.E.2:e, 5.E.5

Labs: [CR5b] & [CR6]

Hess's Law Lab	LO 3.11, 5.3-5.5, 5.7, 5.8; SP 2, 5, 3, 4, 6
Solubility and Determination of $\Delta H°$, $\Delta S°$, $\Delta G°$ of Calcium Hydroxide	LO 5.12, 5.13, 5.14, 5.18, 6.25; SP 2, 5, 6
*Guided Inquiry Lab: The Hand Warmer Design Challenge: Where Does Heat Come From?	LO 5.6, 5.7 SP 1.4, 2.2, 2.3, 4.2, 5.1, 5.3, 6.4, 7.2
Entropy Lab	LO 5.12, 5.13, 6.24, SP 6.2

Activities:

1) PhET simulation: Energy Forms and Changes and questions Students will be able to generate explanations for and make predictions about energy transfer and heat capacity of different substances **[CR3e]**	LO 5.3, 5.6
2) Online Heating and Cooling Curve simulation and questions (http://www.kentchemistry.com/links/Matter/HeatingCurve.htm)	LO 5.6 & SP 1
3) Utilizing the eduweb lab simulation website, students heat an unknown and graph its temperature as it cools, giving them the ability to calculate the energy released. **[CR3e]**	

Unit 8: Electrochemistry

Class Periods (43 minutes): 8
Homework Sets Assigned: 3
Number of Quizzes:3
Number of Exams: 1

Topics Covered:	**Curriculum Framework Articulation:**
1.Balancing redox equations	3.B.3:a, 3.B.3:b, 3.B.3:c, 3.B.3:d
2.Electrochemical cells and voltage	3.C.3:a, 3.C.3:b, 3.C.3:c, 5.E.4:a
3.The Nernst equation	3.C.3:d
4.Spontaneous and non-spontaneous equations	3.C.3:e
5.Chemical applications	3.C.3:f
Teacher Demo: Electrolysis of Water	LO 3.12, 3.13, 5.15; SP 1
Labs: [CR5b] & [CR6]	
*Guided Inquiry: Build a Functioning Galvanic Cell	LO 3.12, 3.13, 5.16; SP 2, 5, 3.8, 3.9, 3.12, 3.13
Exploring Electrochemistry Lab (Hostage & Fossett)	SP 2.2, 2.3, 5.1, 6.4
Microscale Reduction Series Lab	SP 1.4, 2.2, 4.2, 4.4, 5.1, 6.1

Unit 9: Atomic Structure, Periodicity and Chemical Bonding

Class Periods (43 minutes): 26
Homework Sets Assigned: 5
Number of Quizzes: 4
Number of Exams: 1

Topics Covered:	**Curriculum Framework Articulation:**
1. Electron configuration and the Aufbau principle	1.B.2:a
2. Valence electrons and Lewis dot structures	1.B.2:c
3. Periodic trends	1.B.1:b, 1.B.1:c, 1.B.2:b, 1.B.2:d, 1.C.1:c, 1.D.1:b, 2.C.1:a, 2.C.1:b
4. Table arrangement based on electronic properties	1.C.1:a, 1.C.1:b, 1.C.1:d
5. Properties of light and study of waves	1.C.2:e, 1.D.3:a, 5.E.4:b
6. Atomic spectra of hydrogen and energy levels	1.B.1:d, 1.B.1:e, 1.D.3:b
7. Quantum mechanical model	1.C.2:d
8. Quantum theory and electron orbitals	1.C.2:c
9. Orbital shape and energies	1.C.2:b
10. Spectroscopy	1.D.2:a, 1.D.2:b, 1.D.2:c, 1.D.3:b
11. Lewis Dot structures	2.C.4:a
12. Resonance structures and formal charge	2.C.4:c, 2.C.4:d, 2.C.4:e
13. Bond polarity and dipole moments	2.C.1:c, 2.C.1:e, 2.C.1:f
14. VSEPR models and molecular shape	2.C.4:b, 2.C.4:e, 2.C.4:f
15. Polarity of molecules	2.C.1:e
16. Lattice energies	1.B.1:a, 1.C.2:a, 2.C.1:d (1-2), 2.C.2:a, 2.C.2:b, 2.D.1:b
17. Hybridization	2.C.4:g
18. Molecular orbitals and diagrams	2.C.4:h, 2.C.4:i

Labs: [CR5b] & [CR6]
NASA Spectroscopy Labs on Supernova Chemistry
And Spectroscopy of Supernova Remnants **[CR4][CR3a]** LO 1.5, 1.6, 1.7, 1.8, 1.14, 1.15; SP 1, 6
Activity:
Atomic Theory Dry Lab LO 2.21 & SP 1, 6
Students make Styrofoam models and drawings of a series of molecules and from those drawings predict geometry, hybridization, and polarity. **[CR3b]**

Unit 10: Liquids, Solids, and Solutions
Class Periods (43 minutes): 14
Homework Sets Assigned: 4
Number of Quizzes: 2
Number of Exams: 1

Topics Covered:	**Curriculum Framework Articulation:**
1. Electrolytes and properties of water	2.A.3:h
2. Molarity and preparation of solutions	1.D.3:c, 2.A.3:i, 2.A.3:j
3. Precipitation reactions and solubility rules	6.C.3:d
4. Acid Base reactions and formation of a salt by titration	1.E.2:f, 3.A.2:c
5. Balancing redox	3.B.3:a, 3.B.3:b, 3.B.3:c, 3.B.3:d
6. Simple redox titrations	1.E.2:f
7. Gravimetric calculations	1.E.2:e
8. Structure and bonding	
a. metals, network, and molecular	2.A.1:a, 2.A.1:d, 2.C.3, 2.D.1:a, 2.D.2:a, 2.D.1:b, 2.D.3, 2.D.4
b. ionic, hydrogen, London, van der Waals	2.A.1:b, 2.B.1:a, 2.B.1:b, 2.B.1:c, 2.B.2:a, 2.B.2:b, 2.B.2:c, 2.B.2:d, 2.B.3:a, 5.D:1
9. Vapor pressure and changes in state	
10. Heating and cooling curves	2.A.1:e, 5.B.3:c, 5.B.3:d
11. Composition of solutions	2.A.1:c, 2.A.3:b, 2.A.3:c, 2.B.3:b
12. Colloids and suspensions	2.A.3:a, 2.A.3:b, 2.A.3:g
13. Separation techniques	2.A.3:e, 2.A.3:f
14. Effect on biological systems	2.B.3:e, 2.D.3, 5.E.4:c

Teacher Lab Demo: Evaporation of liquids LO 2.11, 2.18, 5.9, 5.12; SP 1, 6
Labs: [CR5b] & [CR6]
Solution Preparation Lab LO 2.8, LO 2.9, 2.14, 2.15; SP 1-4
Vapor Pressure of Liquids Lab LO 2.3, 2.12, 2.13, 2.16; SP 2, 5, 6
*Guided Inquiry: Investigation of Solids LO 2.22-2.32; SP 1, 3, 4, 6
*Guided Inquiry: Sticky Question: How Do You Separate Molecules That Are Attracted to One Another? LO 2.10 SP 4.2, 4.3, 5.2, 6.4
*Guided Inquiry: What's in that Bottle? LO 2.22, SP 4.2, 1.1, 7.1, 6.4, 6.2
Activity: Materials Science Edcanvas
Students learn about materials science and Strongly Correlated Materials research through an on-line "Virtual Field Trip to the Leone Lab" created by the teacher**. [CR4][CR3b]** LO 2.3, 2.19, 2.25, 2.27-2.32

GRADES: The grading scale for this class is influenced by the national averages for the 2014 AP Chemistry exam scores.

A 81 - 100% D 44 - 55%

B 69 - 80% F 0 - 43%

C 56 - 68%

The following components make up your class grade each semester:

EXAMS: The exams will follow the AP format with a multiple choice test as well as one to three free response questions. In order to facilitate learning the material, students will be allowed to make corrections on multiple choice and free response tests in order to improve their scores. Instructions on corrections will be given after each test, but students should expect to do these on their own time (not in class) and in Room B241. You may come in during a free period or before and after school. Corrections will be worth partial credit. The exams will cover current and previously covered material. Any portion of the class, including reading, problems and labs are fair game for the tests. If you are absent for a test, you will need to take it the day you get back. I will not hand back exams until all students have taken them. Exams comprise 50% of the course grade, about half from the multiple choice and half from the free response question or questions.

At the end of the year an ACS standardized exam will be given as the final exam for the second semester.

QUIZZES: Quizzes will be given approximately once a week, and they are worth 10 % of your grade.

PROBLEMS: For homework I assign a minimal number of problems to help you understand the material and practice solving problems. *Students are encouraged to do more practice as needed on their own.* Answers for most problems are in the back of the book, and you are expected to use these to check your answers. Homework problems will be checked periodically and a "complete" or "incomplete" recorded in the grade book.

LABORATORY: You must keep a lab notebook to record data and in which to write lab reports. Lab experiments must act as college labs, which are 2-3 hours in length. At least 25% of class time will be spent on hands-on laboratory investigations. You will need to have the pre-lab work done before class. Lab reports will include introduction, methods, data and calculated results as well as a discussion sections (see above). Students will collaborate and data from different teams may be combined to enlarge the database, requiring further collaboration. Communicating and working together effectively are important to getting the labs prepped and conducted efficiently. Data and results can be displayed for other teams so comparisons and errors can be discussed. Labs must be completed and made up outside of school hours if missed. Labs are due the Monday following a lab and will comprise 40% of the class grade. Lab reports and project assignments will have 10% deducted from the final grade for every day that they are late (including weekends).

I expect you to follow the class rules: BE PREPARED, TRY YOUR BEST, and BE RESPECTFUL and COURTEOUS. Please talk with me or email me if you have problems.

TEACHER INFO:
Mr. Anthony Gates
agates@dbqschools.org
School Ext. 552-5632

References: College Board, "AP®Chemistry Sample Syllabus 1: Syllabus 1029708v1", *AP Course Audit*, 2010, retrieved on August 6, 2013 at http://www.collegeboard.com/html/apcourseaudit/courses/pdfs/chemistry-sample-syllabus-1-id-1029708v1.pdf.