



**Advanced Placement Chemistry
0360**

I. Course Description

Advanced Placement Chemistry

- 1.0 Credit; Weighted
- 2.0 Length: Year; Format: Meets Daily
- 3.0 Prerequisite: Honors Chemistry and Advanced Precalculus

Advanced Placement Chemistry is a challenging second year chemistry course which prepares students to take the AP Chemistry exam by providing instruction equivalent to first year college level chemistry. Success in AP Chemistry requires a serious commitment to independent study and laboratory work. The class is intended for those students with a strong math and science background who are interested in pursuing a career in science, medicine or engineering. The class meets for one 80 minute period and three 41 minute periods each week for the entire year. To make up for time limitations in our schedule, some laboratory components of the AP Chemistry curriculum are completed after school or during the first year Honors Chemistry I course. The course is well defined by the College Board. It is built around the Big Ideas of chemistry, with supporting Enduring Understandings, required Essential Knowledge and well defined Learning Objectives. A special emphasis is placed on an inquiry laboratory experience and the seven Sciences Practices, which capture important aspects of the work in which scientists in.

II. Materials & Equipment

Primary Text: Zumdahl and Zumdahl, *Chemistry, 9th edition*
Supplementary Text: Chang, Raymond, *Chemistry, 8th edition*

Supplementary workbooks available in the classroom: (*these textbooks are frequently used in AP Chemistry courses and provide additional explanations and problems*)

Demmin & Hostage, *Multiple Choice and Free Response Questions Workbook*
Hague & Smith, *The Ultimate Chemical Equations Handbook*

Lab Manuals: Laboratory Experiments are taken from several sources:
Vonderbrink, *Laboratory Experiments for Advanced Placement Chemistry*
Slowinski, *Chemical Principles in the Lab, 4th edition*
Nelson & Kemp, *Laboratory Experiments*
College Board, *AP Chemistry – Guided Inquiry Experiments*
Randall, Jack, *Advance Chemistry with Vernier*
Flinn Scientific Advanced Placement Chemistry

Technology: Vernier *LabPro* and Pasco *Sparkvue* technologies are use in collecting and analyzing laboratory data

III. Course Goals & Objectives

Goals and Objectives of AP Chemistry based on the College Board's Curricular Requirements

Students and teachers use a recently published (within the last 10 years) college-level chemistry textbook.

The course is structured around the enduring understandings within the big ideas as described in the

The course provides students with opportunities outside the laboratory environment to meet the learning objectives within Big Idea 1: Structure of matter.

The course provides students with opportunities outside the laboratory environment to meet the learning objectives within Big Idea 2: Properties of matter-characteristics, states, and forces of attraction.
The course provides students with opportunities outside the laboratory environment to meet the learning objectives within Big Idea 3: Chemical reactions.
The course provides students with opportunities outside the laboratory environment to meet the learning objectives within Big Idea 4: Rates of chemical reactions.
The course provides students with opportunities outside the laboratory environment to meet the learning objectives within Big Idea 5: Thermodynamics.
The course provides students with opportunities outside the laboratory environment to meet the learning objectives within Big Idea 6: Equilibrium.
The course provides students with the opportunity to connect their knowledge of chemistry and science to major societal or technological components (e.g., concerns, technological advances, innovations) to help them become scientifically
Students are provided the opportunity to engage in investigative laboratory work integrated throughout the course for a minimum of 25 percent of instructional
Students are provided the opportunity to engage in a minimum of 16 hands-on laboratory experiments integrated throughout the course while using basic laboratory equipment to support the learning objectives listed within the AP Chemistry Curriculum Framework.
The laboratory investigations used throughout the course allow students to apply the seven science practices defined in the AP Chemistry Curriculum Framework (see below). At minimum, six of the required 16 labs are conducted in a guided-inquiry format.

Science Practices for AP Chemistry

Science Practice 1: The student can use representations and models to communicate scientific phenomena and solve scientific problems.

Science Practice 2: The student can use mathematics appropriately.

Science Practice 3: The student can engage in scientific questioning to extend thinking or to guide investigations within the context of the AP course.

Science Practice 4: The student can plan and implement data collection strategies in relation to a particular scientific question.

Science Practice 5: The student can perform data analysis and evaluation of evidence.

Science Practice 6: The student can work with scientific explanations and theories.

Science Practice 7: The student is able to connect and relate knowledge across various Scales, concepts, and representations in and across domains.

IV. Course Topics (Summary Outline)

Topics Covered	AP Chemistry Big Ideas Developed
1. Chemical Foundations	1, 2, 3
2. Atoms, Molecules and Ions	1, 2
3. Stoichiometry	1, 3
4. Chemical Reactions & Solution Stoichiometry	1, 2, 3
5. Gases	1, 2, 3, 5
6. Thermochemistry	2, 3, 5
13. Chemical Equilibrium	6

14. Acids and Bases	1, 2, 3, 6
15. Acid-Base Equilibria	1, 3, 6
16. Solubility and Complex Ion Equilibria	6
17. Spontaneity, Entropy and Free Energy	2, 5, 6
18. Electrochemistry	3, 5, 6
12. Chemical Kinetics	4
7. Atomic Structure and Periodicity	1, 2, 5
8. Bonding: General Concepts	1, 2, 5
9. Covalent Bonding: Orbitals	1, 2, 5
10. Liquids and Solids	1, 2, 5
11. Properties of Solutions	1, 2, 5, 6
19. Nuclear Chemistry	1, 2, 4
21. Complex Ion Formation	1, 2, 6
22. Organic Chemistry	1, 2
AP Chemistry Exam Review	All

V. Assignments & Grading

Laboratory Component

Laboratory work is an important part of the AP Chemistry curriculum. During the labs, students learn to manipulate the equipment and materials commonly found in chemistry labs. They collect data and make careful observations in their lab notebooks. They analyze their data and draw conclusions. Error analysis is emphasized. Finally, the students learn to communicate their results effectively in formal lab reports. The inquiry nature of real-world laboratory work and the relevant Science Practices are emphasized with several inquiry based labs. A minimum of 25% contact time is spent on hands-on laboratory activities as students work in the lab at least one double period each week. They work in lab groups of two or three students. Each student is required to keep a formal lab notebook. Most of the lab grade is based on the lab reports which are required for each lab completed. Laboratory work counts for 30% of the student's grade.

Homework Component

Each student is expected to spend a minimum of five hours outside of class on homework and studying. Homework is assigned for each topic covered. Homework assignments are extensive and meant to help students focus on, practice and learn the important concepts for each topic. Homework counts for 10% of the student's grade. See *attached Comprehensive Syllabus*.

Test Component

Tests and/or quizzes are given for each chapter covered throughout the year. There is also a midterm and final exam. Tests are based on AP level questions and format. Tests are worth 60% of the student's grade.

Labs	Science Practices
<i>Note: Some labs are completed in first year honors chemistry and not all labs are done each year. Every year, at least 16 of the following labs will be completed, six of those being inquiry labs. One lab will focus on a societal issue (e.g. Lab 18).</i>	
1. Inquiry Lab: Determining the Thickness (in atoms) of Aluminum Foil	1,2,3,4,5,6,7
2. Inquiry Lab: Separation of the Components of a Mixture	2,3,4,5,6
3. Lab: Determination of the Chemical Formula of a Hydrate (Completed in Honors Chem I)	1,2,3,5,6,7
4. Lab: Analysis of a Silver Alloy	2,5,6

5. Lab: Mass Relationships Accompanying Chemical Changes Involving Silver (Completed in Honors Chem I)	2,3,5,6
6. Inquiry Lab: Beer's Law and the Mass Percent of Copper in Brass.	2,3,4,5,6,7
7. Lab: An Activity Series (completed in Honors Chem I)	3,5,6
8. Lab: The Copper Cycle	3,5,6
9. Lab: Standardization of NaOH with KHP	2,5
10. Lab: Production of a gas and the Ideal Gas Law Constant (completed in Honors Chem I)	2,3,5,6
11. Lab: Molar Mass of a Volatile Liquid	2,3,5
12. Lab: Specific Heat of Copper (completed in Honors Chem I)	2,3,5
13. Lab: Heating and Cooling Curves (completed in Honors Chem I)	2,5,6,7
14. Inquiry Lab: Hand Warmer Design Challenge	2,3,5,6,7
15. Lab: Beer's Law	2,5,7
16. Inquiry Lab: Determination of the Equilibrium Constant for the Formation of FeSCN^{2+}	2,3,4,5,6,7
17. Inquiry Lab: What is the Rate Law of the Fading of Crystal Violet	2,3,4,5,7
18. Lab: Acid Rain Lab: How Long Will That Marble Statue Last?	2,3,4,5,6,7
19. Lab: Equilibrium and LeChâtelier's Principle	3,5,6,7
20. Lab: Determination of the Equivalent Mass and pK_a of an Unknown Acid	2,5,6,
21. Inquiry Lab: Determination of the Concentrations of 3 Acids and 3 Bases	2,3,4,5,6,7
22. Inquiry Lab: Buffering Activity of Common Household Products	2,3,4,5,6,7
23. Lab: Determining the Percent of H_2O_2 in a bottle of Hydrogen Peroxide.	2,3,4,5,6,7
24. Determination of the Solubility Product of an Ionic Compound	2,5,6,7
25. Lab: Electrochemical Cells	2,3,5,6,7
26. Lab: Rates of Reaction: The Iodination of Acetone	2,3,5,6,7
27. InquiryLab: : Kinetics Lab: A Chemical Egg Timer	2,3,4,5,6,7
28. Lab: Analysis of Commercial Bleach	2,3,5,6

29. Lab: The Alkaline Earths and the Halogens	3,5,6
30. Inquiry Lab: The 14 Bottle Problem	3,4,5,6,7
31. Lab: The Oscillating Clock Reaction	2,6