

# AP<sup>®</sup> CHEMISTRY

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Advanced Placement Chemistry is a course designed much like a college freshman chemistry course. An AP Edition college textbook will be used, college level laboratories will be conducted, and exams will be given that are on a collegiate level. It will also be necessary to spend time out of class doing lab work or other assignments.

## Text

*Chemistry: Atoms First 2e*, Flower, Paul et al, Openstax 2nd edition - 2019 [OpenStax](#)

## Structure of the Course:

AP Chemistry is organized into nine Units with Big Ideas and Science Practices integrated and spiraled throughout the curriculum framework.

**Unit 1:** Atomic Structure and Properties

**Unit 2:** Molecular and Ionic Compound Structure and Properties

**Unit 3:** Intermolecular Forces and Properties

**Unit 4:** Chemical Reactions

**Unit 5:** Kinetics

**Unit 6:** Thermodynamics

**Unit 7:** Equilibrium

**Unit 8:** Acids and Bases

**Unit 9:** Applications of Thermodynamics

**Big Idea 1:** Scale, Proportion, and Quantity (SPQ) – Units 1, 3, 4, 9

**Big Idea 2:** Structure and Properties (SAP) – Units 1, 2, 3, 8, 9

**Big Idea 3:** Transformations (TRA) – Units 4, 5, 7

**Big Idea 4:** Energy (ENE) – Units 5, 6, 9

**Science Practice 1:** Models and Representations – Units 1, 4, 5, 6

**Science Practice 2:** Question and Method – Units 1, 3, 4, 6, 7, 8, 9

**Science Practice 3:** Representing Data and Phenomena – Units 2, 3, 4, 5, 6, 7

**Science Practice 4:** Model Analysis – Units 1, 2, 3, 6, 7, 9

**Science Practice 5:** Mathematical Routines – Units 1, 3, 4, 5, 6, 7, 8, 9

**Science Practice 6:** Argumentation – Units 2, 3, 4, 5, 6, 7, 8, 9

## Behavior Expectations

I have high expectations for all students. I expect students to achieve academically to their fullest potential. I also expect students to contribute in a **positive** manner to the classroom. The following is a list of class rules.

- Come to class prepared and with a positive attitude.
- Be respectful and polite.
- Participate – be responsible for your own learning.
- Follow directions quickly.
- Lab rules must be followed at all times.
- All school rules apply in this class.

## Grading

The student's overall grade is based on classwork, homework, quizzes, labs, activities, projects, and unit tests. Grades are determined using the point system. Grades are given in fraction form with the points earned over the points possible. Tests count more points than individual activities but overall account for approximately 50% of the student's grade. The total number of points earned is divided by the total number of points possible to calculate a student's average.

Grades are posted to Skyward in a reasonable time after an assignment is due.

## Classwork/Homework

Learning to do problems of all types, quickly, will be one of the major goals of this class. Classwork/homework will be assigned on a regular basis. Students are expected to complete all classwork and homework individually. Students need to ask questions if they do not understand how to do part of the assignment. Questions and problems on classwork/homework are teaching skills and problem solving that students need in order to be successful on the AP exam.

## Laboratories

Students must turn in a signed lab safety contract and pass a lab safety quiz in order to participate in the lab. They must adhere to all safety rules during labs. Students that are absent during a lab must complete the make-up lab. At a minimum, twenty-five percent of instructional time during this course will be spent in the laboratory.

## Absences and Makeup Work

In Chemistry, each new lesson builds on previously learned information. Therefore, regular attendance is essential. If you miss class, it is **YOUR** responsibility to get necessary make-up work. Complete all work that you missed **within 5 days** of your absence. Any work not turned in within the acceptable time period will be recorded as a 'zero'.

## Extra Help

There are a few options available if you believe you are falling behind and need extra help.

1. Come see me. I will be happy to tutor before school or after school as needed.
2. Watch AP Classroom videos related to topics or videos posted on google classroom.
3. Attend AAA.

## Tests

In order to simulate the National AP Exam testing format, unit tests will be formatted in multiple choice and free response questions. You will have 30 minutes to complete 20 multiple choice questions and 32 minutes to complete two free response questions. If you have an unexcused absence the day of the test, you will need to take the exam the day you return to school unless you previously arrange a makeup time with the instructor.

## The AP Exam

By the time you take the AP National Exam in May, you will have been exposed to many different types of problem sets that cover the topics for the AP exam. The National Exam is not required to pass the class, but it is highly encouraged.

**AP<sup>®</sup> CHEMISTRY MAJOR TOPICS AND SCHEDULE**

Unit	Topic Number	Lesson Title	AP LO	Science Practice	OpenStax Section
<b>1</b>		Measurement and Significant Figures		5.F	1.4-1.6
	1.1	Moles and Molar Mass	SPQ-1.A	5.B	6.1
	1.2	Mass Spectroscopy of Elements	SPQ-1.B	5.D	
	1.3	Elemental Composition of Pure Substances	SPQ-2.A	2.A	6.2, 7.5
	1.4	Composition of Mixtures	SPQ-2.B	5.A	
	1.5	Atomic Structure and Electron Configuration	SAP-1.A	1.A	2.3, 3.2, 3.3, 3.4
	1.6	Photoelectron Spectroscopy	SAP-1.B	4.B	
	1.7	Periodic Trends	SAP-2.A	4.A	3.5, 3.6
	1.8	Valence Electrons and Ionic Compounds	SAP-2.B	4.C	3.4, 3.7, 4.1

Unit	Topic Number	Lesson Title	AP LO	Science Practice	OpenStax Section
<b>2</b>	2.1	Types of Chemical Bonds	SAP-3.A	6.A	2.4, 3.7, 4.1, 4.2
	2.2	Intramolecular Force and Potential Energy	SAP-3.B	3.A	
	2.3	Structure of Ionic Solids	SAP-3.C	4.C	9.4, 10.6
	2.4	Structure of Metals and Alloys	SAP-3.D	4.C	10.6
	2.5	Lewis Diagrams	SAP-4.A	3.B	4.4
	2.6	Resonance and Formal Charge	SAP-4.B	6.C	4.5
	2.7	VSEPR and Bond Hybridization	SAP-4.C	6.C	4.6, 5.1-5.3

Unit	Topic Number	Lesson Title	AP LO	Science Practice	OpenStax Section
3	3.1	Intermolecular Forces	SAP-5.A	4.D	10.1
	3.2	Properties of Solids	SAP-5.B	4.C	10.5
	3.3	Solids, Liquids, and Gases	SAP-6.A	3.C	8.1, 8.4, 10.2, 10.5
	3.4	Ideal Gas Law	SAP-7.A	5.C	8.2, 8.3
	3.5	Kinetic Molecular Theory	SAP-7.B	4.A	8.5
	3.6	Deviation from Ideal Gas Law	SAP-7.C	6.E	8.6
	3.7	Solutions and Mixtures	SPQ-3.A	5.F	6.3, 6.4, 11.1, 11.2
	3.8	Representations of Solutions	SPQ-3.B	3.C	
	3.9	Separation of Solutions and Mixtures Chromatography	SPQ-3.C	2.C	
	3.10	Solubility	SPQ-3.C	4.D	7.2, 11.1, 11.2, 11.3
	3.11	Spectroscopy and the Electromagnetic Spectrum	SAP-8.A	4.A	3.1
	3.12	Photoelectric Effect	SAP-8.B	5.F	3.1
	3.13	Beer-Lambert Law	SAP-8.C	2.E	

Unit	Topic Number	Lesson Title	AP LO	Science Practice	OpenStax Section
4	4.1	Introduction for Reactions	TRA-1.A	2.B	7.1
	4.2	Net Ionic Equations	TRA-1.B	5.E	7.1
	4.3	Representations of Reactions	TRA-1.C	3.B	7.1
	4.4	Classification of Matter	TRA-1.D	6.B	1.2-1.3
	4.5	Stoichiometry	SPQ-4.A	5.C	6.3, 7.3, 7.4
	4.6	Introduction to Titration	SPQ-4.B	3.A	7.5, 14.7
	4.7	Types of Chemical Reactions	TRA-2.A	1.B	7.2
	4.8	Introduction to Acid-Base Reactions	TRA-2.B	1.B	7.2
	4.9	Oxidation-Reduction (Redox) Reactions	TRA-2.C	5.E	7.2, 16.1

Unit	Topic Number	Lesson Title	AP LO	Science Practice	OpenStax Section
5	5.1	Reaction Rates	TRA-3.A	6.E	17.1,17.2
	5.2	Introduction to Rate Law	TRA-3.B	5.C	17.1, 17.3, 17.4
	5.3	Concentration Changes Over Time	TRA-3.C	5.B	17.3, 17.4
	5.4	Elementary Reactions	TRA-4.A	5.E	17.6
	5.5	Collision Model	TRA-4.B	6.E	17.2, 17.5
	5.6	Reaction Energy Profile	TRA-4.C	3.B	
	5.7	Introduction to Reaction Mechanisms	TRA-5.A	1.B	17.6
	5.8	Reaction Mechanism and Rate Law	TRA-5.B	5.B	17.6
	5.9	Steady-State Approximation	TRA-5.C	5.B	
	5.10	Multistep Reaction Energy Profile	TRA-5.D	3.B	
	5.11	Catalysis	ENE-1.A	6.E	17.7

Unit	Topic Number	Lesson Title	AP LO	Science Practice	OpenStax Section
6	6.1	Endothermic and Exothermic Processes	ENE-2.A	6.D	9.1
	6.2	Energy Diagrams	ENE-2.B	3.A	
	6.2	Bond Enthalpies	ENE-3.A	5.F	9.3, 9.4
	6.3	Heat Transfer and Thermal Equilibrium	ENE-2.C	6.E	9.1
	6.4	Heat Capacity and Calorimetry	ENE-2.D	2.D	9.1, 9.2
	6.5	Energy of Phase Changes	ENE-2.E	1.B	10.3, 10.4
	6.6	Introduction to Enthalpy of Reaction	ENE-2.F	4.C	9.3
	6.8	Enthalpy of Formation	ENE-3.B	5.F	9.3
	6.9	Hess's Law	ENE-3.C ENE-3.D	5.A	9.3

Unit	Topic Number	Lesson Title	AP LO	Science Practice	OpenStax Section
7	7.1	Introduction to Equilibrium	TRA-6.A	6.D	13.1
	7.2	Direction of Reversible Reactions	TRA-6.B	4.D	
	7.3	Reaction Quotient and Equilibrium Constant	TRA-7.A	3.A	13.2
	7.4	Calculating the Equilibrium Constant	TRA-7.B	5.C	13.4
	7.5	Magnitude of the Equilibrium Constant	TRA-7.C	6.D	
	7.6	Properties of the Equilibrium Constant	TRA-7.D	5.A	
	7.7	Calculating Equilibrium Concentrations	TRA-7.E	3.A	13.4
	7.8	Representations of Equilibrium	TRA-7.F	7.8	
	7.9	Introduction to Le Chatelier's Principle	TRA-8.A	6.F	13.3
	7.10	Reaction Quotient and Le Chatelier's Principle	TRA-8.B	5.F	
	7.11	Introduction to Solubility Equilibria	SPQ-5.A	5.B	15.1
	7.12	Common-Ion Effect	SPQ-5.B	2.F	15.1
	7.13	pH and Solubility	SPQ-5.C	2.D	14.4
	7.14	Free Energy of Dissolution	SPQ-5.D	4.D	

Unit	Topic Number	Lesson Title	AP LO	Science Practice	OpenStax Section
8	8.1	Introduction to Acids and Bases	SAP-9.A	5.B	14.1, 15.2
	8.2	pH and pOH of Strong Acids and Bases	SAP-9.B	5.B	14.2
	8.3	Weak Acid and Base Equilibria	SAP-9.C	5.C	14.3
	8.4	Acid-Base Reactions and Buffers	SAP-9.D	5.F	14.6
	8.5	Acid-Base Titrations	SAP-9.E	5.D	7.5, 14.7
	8.6	Molecular Structure of Acids and Bases	SAP-9.F	6.C	14.3
	8.7	pH and pKa	SAP-10.A	2.D	
	8.8	Properties of Buffers	SAP-10.B	6.D	14.6
	8.9	Henderson-Hasselbalch Equation	SAP-10.C	5.F	14.6
	8.10	Buffer Capacity	SAP-10.D	6.G	14.6

Unit	Topic Number	Lesson Title	AP LO	Science Practice	OpenStax Section
9	9.1	Introduction of Entropy	ENE-4.A	6.C	12.1, 12.2
	9.2	Absolute Entropy and Entropy Change	ENE-4.B	5.F	12.2, 12.3
	9.3	Gibbs Free Energy and Thermodynamic Favorability	ENE-4.C	6.E	12.4
	9.4	Thermodynamic and Kinetic Control	ENE-4.D	6.E	
	9.5	Free Energy and Equilibrium	ENE-5.A	6.D	13.4
	9.6	Coupled Reactions	ENE-5.B	4.D	12.4
	9.7	Galvanic (Voltaic) and Electrolytic Cells	ENE-6.A	2.F	16.2
	9.8	Cell Potential and Free Energy	ENE-6.B	5.F	16.3, 16.4
	9.9	Cell Potential Under Nonstandard Conditions	ENE-6.C	6.D	16.4
	9.10	Electrolysis and Faraday's Law	ENE-6.D	5.B	16.7