AP Chemistry - Overview

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Cover

EAST BRUNSWICK PUBLIC SCHOOLS

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Dr. Victor P. Valeski

Science

AP Chemistry

Course Number: 1126

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Course Overview

1126 A.P. CHEMISTRY

Prerequisite: Precalculus H and a final grade of B- in Chemistry H

A.P. Chemistry is designed for second-year chemistry students who have high motivation and plan to enter a science-related career. The course provides a rigorous quantitative approach to advanced topics of chemistry in preparation for the Advanced Placement exam. The course begins with a review of basic concepts, then progresses to kinetics and energetics to equilibrium, electrochemistry, thermodynamics, quantum mechanics, and radioactivity. The descriptive chemistry of alkalis, alkaline earths, halogens, and some organic compounds, coupled with laboratory experiences using semi-micro and microchemical techniques, round out the course. A major goal of the course is to prepare students to take the Advanced Placement test in chemistry.

The Big Ideas (Major Concepts) that we seek to convey to the students are the following:

- Science is not necessarily logical or common sense; it is experimental, performed through both formal and informal observation and experimentation, and requires mathematical analysis with calculations.
- The Law of Conservation of Matter is related to and is used to determine chemical composition in compounds and chemical reactions.
- Chemical and physical properties of materials can be explained by the structure and arrangement of atoms, ions, or molecules and the forces between them. Changes in matter involve the rearrangement and/or re-organization of atoms and/or transfer of electrons.
- The modern atomic theory is continuing to evolve and is used to explain the characteristics and interactions of atoms, as well as the enormous energy potential from nuclear reactions.
- The Periodic Table is one of the most useful tools in chemistry and may be used to obtain many pieces of information and to predict many properties of elements.
- The rate at which a chemical reaction occurs can be affected by changing concentration, temperature, or pressure and by the addition of a catalyst. The rates of chemical reactions are determined by details of the molecular collisions.
- The interactions of atoms and molecules in chemical and physical processes are influenced by the motions of the particles in the system. Any bond or intermolecular attraction that can be formed may also be broken. These two processes are in a dynamic competition, sensitive to initial conditions and external perturbations.
- Acids, bases, salts, and solutions are prevalent in our world and are characterized by their specific properties, like concentration, strength, and pH.
- The laws of thermodynamics explain and predict the direction of changes in matter. Enthalpy and entropy are driving forces in chemical reactions and equilibrium is involved when the reaction is reversible.
- Chemical reactions may be used to generate an electric potential or electric potential may be used to make a non-spontaneous chemical reaction occur.

Modifications

Each teacher, each student, each classroom is unique and adaptations are specific to each situation. Differentiating instruction and providing multiple ways to assess allows more flexibility for students to meet the standards and requirements of the class. Below are samples of the types of adaptations/modifications that may occur for students based on need including ELLs, students with a 504 Plan, Special Education, Basic Skills and Gifted and Talented students.

Adaptations/Modifications:

Input Adapt the way instruction is delivered to the learner. ***For example:*** • Use different visual aids, • Plan more concrete examples, • Provide hands-on activities, • Place students in cooperative groups.	**Output** Adapt how the learner can respond to instruction. ***For example:*** • Allow a verbal vs. written response, • Use a communication book for students, • Allow students to show knowledge with hands-on materials.	**Time** Adapt the time allotted and allowed for learning, task completion or testing. ***For example:*** • Individualize a timeline for completing a task, • Pace learning differently (increase or decrease) for some learners.
Difficulty Adapt the skill level, problem type, or the rules on how the learner may approach the work. ***For example:*** • Simplify task directions. • Use of calculator.	**Level of Support** Increase the amount of personal assistance with specific learner. ***For example:*** • Assign peer buddies, teaching assistants, peer tutors or cross-age tutors.	**Size** Adapt the number of items that the learner is expected to learn or complete. ***For example:*** • Reduce the number of vocabulary words a learner must learn at any one time.
Degree of Participation Adapt the extent to which a learner is actively involved in the task. ***For example:*** • Allow for small group/individual presentations vs. presentations to the whole class.	**Alternate Goals** Adapt the goals or outcome expectations while using the same materials. ***For example:*** • Students in the same class are expected to either write a paragraph, write a bulleted response, or meet with the teacher to provide a verbal response.	**Substitute Curriculum** Provide differentiated instruction and materials to meet a learner's individual goals. ***For example:*** • Individualize a timeline for completing a task, pace learning differently (increase or decrease) for some learners, • Use of Learning Ally.

Materials and Resources

Chemistry

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Content Specific Standards

SCI.HS-PS1	Matter and Its Interactions
SCI.HS-PS1-1	Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.
SCI.HS.PS2.B	Types of Interactions
SCI.HS-PS1-2	Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.
	Constructing Explanations and Designing Solutions
SCI.HS.PS1.A	Structure and Properties of Matter
SCI.HS.PS1.B	Chemical Reactions
	Patterns
SCI.HS-PS1-3	Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.
	Planning and Carrying Out Investigations
SCI.HS-PS1-4	Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.
SCI.HS-PS1-5	Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.
SCI.HS-PS1-6	Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.
SCI.HS.ETS1.C	Optimizing the Design Solution
	Stability and Change
SCI.HS-PS1-7	Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.
	Using Mathematics and Computational Thinking
SCI.HS-PS1-8	Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.
	Developing and Using Models
SCI.HS.PS1.C	Nuclear Processes
	Energy and Matter
SCI.HS-PS2-6	Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.
	Obtaining, Evaluating, and Communicating Information

	Structure and Function
SCI.HS-PS3-4	Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).
SCI.HS.PS3.B	Conservation of Energy and Energy Transfer
SCI.HS.PS3.D	Energy in Chemical Processes
SCI.HS-PS4	Waves and Their Applications in Technologies for Information Transfer
SCI.HS-PS4-1	Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.
SCI.HS.PS4.A	Wave Properties
	Cause and Effect
SCI.HS-PS4-3	Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.
	Engaging in Argument from Evidence
SCI.HS.PS4.B	Electromagnetic Radiation
	Systems and System Models
SCI.HS-ESS1-1	Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation.
SCI.HS.ESS1.A	The Universe and Its Stars
SCI.HS.PS3.D	Energy in Chemical Processes and Everyday Life
	Scale, Proportion, and Quantity
SCI.HS-ESS1-3	Communicate scientific ideas about the way stars, over their life cycle, produce elements.
SCI.HS-ESS3-2	Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.
SCI.HS.ESS3.A	Natural Resources
SCI.HS-ETS1	Engineering Design
SCI.HS-ETS1-1	Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
	Asking Questions and Defining Problems
SCI.HS.ETS1.A	Delimiting Engineering Problems
SCI.HS-ETS1-2	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
SCI.HS.ETS1.C	Optimizing the Design Solution
SCI.HS-ETS1-3	Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
SCI.HS-ETS1-4	Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.
SCI.HS.ETS1.B	Developing Possible Solutions

Interdisciplinary Standards

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.5	Use appropriate tools strategically.
MA.K-12.6	Attend to precision.
MA.K-12.7	Look for and make use of structure.
MA.K-12.8	Look for and express regularity in repeated reasoning.
LA.RST.9-10.1	Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions.
LA.RST.9-10.2	Determine the central ideas, themes, or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.
LA.RST.9-10.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
LA.RST.9-10.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.
LA.RST.9-10.5	Analyze the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).
LA.RST.9-10.6	Determine the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.
LA.RST.9-10.7	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
LA.RST.9-10.8	Determine if the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.
LA.RST.9-10.9	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.
LA.RST.9-10.10	By the end of grade 10, read and comprehend science/technical texts in the grades 9-10 text complexity band independently and proficiently.
LA.WHST.9-10.1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant sufficient textual and non-textual evidence.
LA.WHST.9-10.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
LA.WHST.9-10.5	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
LA.WHST.9-10.6	Use technology, including the Internet, to produce, share, and update writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.
LA.WHST.9-10.7	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when

	appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
LA.WHST.9-10.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.
LA.WHST.9-10.9	Draw evidence from informational texts to support analysis, reflection, and research.
LA.WHST.9-10.10	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

21st Century Life and Career Ready Practice Standards

CRP.K-12.CRP1.1	Career-ready individuals understand the obligations and responsibilities of being a member of a community, and they demonstrate this understanding every day through their interactions with others. They are conscientious of the impacts of their decisions on others and the environment around them. They think about the near-term and long-term consequences of their actions and seek to act in ways that contribute to the betterment of their teams, families, community and workplace. They are reliable and consistent in going beyond the minimum expectation and in participating in activities that serve the greater good.
CRP.K-12.CRP2.1	Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.
CRP.K-12.CRP3.1	Career-ready individuals understand the relationship between personal health, workplace performance and personal well-being; they act on that understanding to regularly practice healthy diet, exercise and mental health activities. Career-ready individuals also take regular action to contribute to their personal financial well-being, understanding that personal financial security provides the peace of mind required to contribute more fully to their own career success.
CRP.K-12.CRP4.1	Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.
CRP.K-12.CRP5.1	Career-ready individuals understand the interrelated nature of their actions and regularly make decisions that positively impact and/or mitigate negative impact on other people, organization, and the environment. They are aware of and utilize new technologies, understandings, procedures, materials, and regulations affecting the nature of their work as it relates to the impact on the social condition, the environment and the profitability of the organization.
CRP.K-12.CRP6.1	Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization. They can consider unconventional ideas and suggestions as solutions to issues, tasks or problems, and they discern which ideas and suggestions will add greatest value. They seek new methods, practices, and ideas from a variety of sources and seek to apply those ideas to their own workplace. They take action on their ideas and understand how to bring innovation to an organization.

CRP.K-12.CRP7.1	Career-ready individuals are discerning in accepting and using new information to make decisions, change practices or inform strategies. They use reliable research process to search for new information. They evaluate the validity of sources when considering the use and adoption of external information or practices in their workplace situation.
CRP.K-12.CRP8.1	Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.
CRP.K-12.CRP9.1	Career-ready individuals consistently act in ways that align personal and community-held ideals and principles while employing strategies to positively influence others in the workplace. They have a clear understanding of integrity and act on this understanding in every decision. They use a variety of means to positively impact the directions and actions of a team or organization, and they apply insights into human behavior to change others' action, attitudes and/or beliefs. They recognize the near-term and long-term effects that management's actions and attitudes can have on productivity, morals and organizational culture.
CRP.K-12.CRP10.1	Career-ready individuals take personal ownership of their own education and career goals, and they regularly act on a plan to attain these goals. They understand their own career interests, preferences, goals, and requirements. They have perspective regarding the pathways available to them and the time, effort, experience and other requirements to pursue each, including a path of entrepreneurship. They recognize the value of each step in the education and experiential process, and they recognize that nearly all career paths require ongoing education and experience. They seek counselors, mentors, and other experts to assist in the planning and execution of career and personal goals.
CRP.K-12.CRP11.1	Career-ready individuals find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems. They are flexible and adaptive in acquiring new technology. They are proficient with ubiquitous technology applications. They understand the inherent risks-personal and organizational-of technology applications, and they take actions to prevent or mitigate these risks.
CRP.K-12.CRP12.1	Career-ready individuals positively contribute to every team, whether formal or informal. They apply an awareness of cultural difference to avoid barriers to productive and positive interaction. They find ways to increase the engagement and contribution of all team members. They plan and facilitate effective team meetings.

Technology Standards

TECH.8.1.12	Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
TECH.8.1.12.A	Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.
TECH.8.1.12.B	Creativity and Innovation: Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.
TECH.8.1.12.C	Communication and Collaboration: Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.
TECH.8.1.12.D	Digital Citizenship: Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.

TECH.8.1.12.E	Research and Information Fluency: Students apply digital tools to gather, evaluate, and use information.
TECH.8.1.12.F	Critical thinking, problem solving, and decision making: Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.
TECH.8.2.12	Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.
TECH.8.2.12.A	The Nature of Technology: Creativity and Innovation: Technology systems impact every aspect of the world in which we live.
TECH.8.2.12.B	Technology and Society: Knowledge and understanding of human, cultural and society values are fundamental when designing technology systems and products in the global society.
TECH.8.2.12.C	Design: The design process is a systematic approach to solving problems.
TECH.8.2.12.D	Abilities for a Technological World: The designed world is the product of a design process that provides the means to convert resources into products and systems.
TECH.8.2.12.E	Computational Thinking: Programming: Computational thinking builds and enhances problem solving, allowing students to move beyond using knowledge to creating knowledge.

Pacing Guide

Topic	Pacing (blocks)	Unit	AP Standards	Assessment Examples
Prior Knowledge and Introductory Work	3	0	NJSLS from Chem Honors	Fornative: Unit 0 - Quick Check Summer Assignment Assessment
Atomic Structure and Properties 1.1 Moles and Molar Mass 1.2 Mass Spectroscopy of Elements 1.3 Elemental Composition of Pure Substances 1.4 Composition of Mixtures	6 - 8	1	1) SPQ-1.A.1 2) SPQ-1.A.2 3) SPQ-1.A.3 4) SPQ-1.B.1 5) SPQ-1.B.2 6) SPQ-2.A.1 7) SPQ-2.A.2 8) SPQ-2.A.3 9) SPQ-2.B.1 10) SPQ-2.B.2 11) SAP-1.A.1 12) SAP-1.A.2 13) SAP-1.A.3 14) SAP-1.A.4	AP Classroom Personal Progress Check #1 (20MC & 2 FRQ - short) Formative: Unit 01 - Quick Check Unit 1 Assessment

1.5 Atomic Structure and Electron Configuration 1.6 Photoelectron Spectroscopy 1.7 Periodic Trends 1.8 Valence Electrons and Ionic Compounds			15) SAP-1.B.1 16) SAP-2.A.1 17) SAP-2.A.2 18) SAP-2.A.3 19) SAP-2.B.1 20) SAP-2.B.2 21) SAP-2.B.3 **Sci Practices** 1.A 2.A 4.A 4.B 4.C 5.A 5.B 5.D **Enduring Understandings** SPQ-1: The mole allows different units to be compared SPQ-2: Chemical formulas identify substances by their unique combination of atoms. SAP-1: Atoms and Molecules can be identified by their electron distribution and energy. SAP-2: The periodic table shows patterns in electronic structure and trends in atomic properties.	
Molecular & Ionic Compound Structure & Properties 2.1 Types of Chemical Bonds 2.2 Intramolecular Forces and Potential Energy 2.3 Structure of Ionic Solids 2.4 Structure of Metals and Alloys	8 - 9	2	1) SAP-3.A.1 2) SAP-3.A.2 3) SAP-3.A.3 4) SAP-3.A.4 5) SAP-3.A.5 6) SAP-3.B.1 7) SAP-3.B2 8) SAP-3.B.3 9) SAP-3.C.1 10) SAP-3.D.1 11) SAP-3.D.2 12) SAP-3.D.3 13) SAP-4.A.1 14) SAP-4.B.1 15) SAP-4.B.2	AP Classroom Personal Progress Check #2 (15MC & 1 FRQ - long) Formative: Unit 02 - Quick Check Unit 03 - Assessment

2.5 Lewis Diagrams 2.6 Resonance and Formal Charge 2.7 VSEPR and Bond Hybridization			16) SAP-4.B.3 17) SAP-4.C.1 18) SAP-4.C.2 19) SAP-4.C.3 20) SAP-4.C.4 **Sci Practices** 3.A 3.B 4.C 6.A 6.C **Enduring Understandings** SAP-3: Atoms or ions bond due to interactions between them, forming molecules. SAP-4: Molecular compounds are arranged based on Lewis diagrams and VSEPR Theory.	
Intermolecular Forces and Properties 3.1 Intermolecular Forces 3.2 Properties of Solids 3.3 Solids, Liquids, & Gases 3.4 Ideal Gas Law 3.5 Kinetic Molecular Theory 3.6 Deviation from Ideal Gas Law 3.7 Solutions and Mixtures 3.8 Representations of Solutions 3.9 Separation of Solutions & Mixtures - Chromatography 3.10 Solubility	11 - 12	3	1) SAP-5.A.1 2) SAP-5.A.2 3) SAP-5.A.3 4) SAP-5.A.4 5) SAP-5.A.5 6) SAP-5.B.1 7) SAP-5.B.2 8) SAP-5.B.3 9) SAP-5.B.4 10) SAP-5.B.5 11) SAP-5.B.6 12) SAP-5.B.7 13) SAP-6.A.1 14) SAP-6.A.2 15) SAP-6.A.3 16) SAP-6.A.4 17) SAP-7.A.1 18) SAP-7.A.2 19) SAP-7.A.3 20) SAP-7.B.1 21) SAP-7.B.2 22) SAP-7.B.3 23) SAP-7.B.4 24) SAP-7.C.1 25) SPQ-3.A.1 26) SPQ-3.A.2 27) SPQ-3.B.1	AP Classroom Personal Progress Check #3 (30MC & 2 FRQ - short)

3.11 Spectroscopy & Electromagnetic Spectrum 3.12 Photoelectric Effect 3.13 Beer-Lambert Law			28) SPQ-3.C.1 29) SPQ-3.C.2 30) SAP-8.A.1 31) SAP-8.B.1 32) SAP-8.B.2 33) SAP-8.C.1 34) SAP-8.C.2 **Sci Practices** 2.C 2.D 2.E 3.C 4.C 4.D 5.C 5.F **Enduring Understandings** SAP-5: Intermolecular forces can explain the physical properties of a material. SAP-6: Matter exists in three states: solid, liquid, and gas, and their differences are influenced by variances in spacing and motion of the molecules. SAP-7: Gas properties are explained macroscopically - using the relationships among pressure, volume, temperature, moles, and gas constant - and molecularly by the motion of the gas. SAP-8: Spectroscopy can determine the structure and concentration in a mixture of a chemical species. SPQ-3: Interactions between intermolecular forces influence the solubility and separation of mixtures.	
Chemical Reactions 4.1 Introduction to Reactions	9 - 10	4	1) TRA-1.A.1 2) TRA-1.A.2 3) TRA-1.B.1 4) TRA-1.B.2 5) TRA-1.B.3	AP Classroom Personal Progress Check #4 (20MC & 1 FRQ - long) Formative: Unit 04 -

4.2 Net Ionic Equations 4.3 Representations of Reactions 4.4 Physical and Chemical Changes 4.5 Stoichiometry 4.6 Introduction to Titration 4.7 Types of Chemical Reactions 4.8 Introduction to Acid-Base Reactions 4.9 Oxidation-Reduction Reactions			6) TRA-1.C.1 7) TRA-1.D.1 8) TRA-1.D.2 9) SPQ-4.A.1 10) SPQ-4.A.2 11) SPQ-4.A.3 12) SPQ-4.B.1 13) TRA-2.A.1 14) TRA-2.A.2 15) TRA-2.A.3 16) TRA-2.A.4 17) TRA-2.A.5 18) TRA-2.B.1 19) TRA-2.B.2 20) TRA-2.B.3 21) TRA-2.C.1 **Sci Practices** 1.B 2.B 3.A 3.B 5.C 5.E 6.B **Enduring Understandings** TRA-1: A substance that changes its properties, or that changes into a different substance, can be represented by chemical equations. SPQ-4: When a substance changes into a new substance , or when its properties change, no mass is gained or lost. TRA-2: A substance can change into another substance through different processes, and the change itself can be classified by the sort of processes that produce it.	Quick Check Unit 04 - Assessment
Kinetics 5.1 Reaction Rates 5.2 Introduction to Rate Law	8 - 9	5	1) TRA-3.A.1 2) TRA-3.A.2 3) TRA-3.A.3 4) TRA-3.B.1 5) TRA-3.B.2 6) TRA-3.B.3 7) TRA-3.B.4	Formative: Unit 05 - Quick Check AP Classroom Personal Progress Check #5 (25MC & 2 FRQ - short & long)

5.3 Concentration Changes Over Times 5.4 Elementary Reactions 5.5 Collision Model 5.6 Reaction Energy Profile 5.7 Introduction to Reaction Mechanisms 5.8 Reaction Mechanisms and Rate Law 5.9 Stead-State Approximation 5.10 Multistep Reaction Energy Profile 5.11 Catalysis			8) TRA-3.B.5 9) TRA-3.C.1 10) TRA-3.C.2 11) TRA-3.C.3 12) TRA-3.C.4 13) TRA-3.C.5 14) TRA-3.C.6 15) TRA-4.A.1 16) TRA-4.A.2 17) TRA-4.B.1 18) TRA-4.B.2 19) TRA-4.B.3 20) TRA-4.C.1 21) TRA-4.C.2 22) TRA-4.C.3 23) TRA-4.C.4 24) TRA-5.A.1 25) TRA-5.A.2 26) TRA-5.A.3 27) TRA-5.A.4 28) TRA-5.B.1 29) TRA-5.C.1 30) TRA-5.D.1 31) ENE-1.A.1 32) ENE-1.A.2 33) ENE-1.A.3 34) ENE-1.A.4 35) ENE-1.A.5 **Sci Practices** 1.B 3.B 5.B 5.C 5.E 6.E **Enduring Understandings** TRA-3: Some reactions happen quickly while others happen more slowly and depend on reactant concentrations & temperatures. TRA-4: There is a relationship between the speed of a reaction and the collision frequency of particle collision.	UNIT 05 - Assessment

			TRA-5: Many chemical reactions occur through a series of elementary reactions. These elementary reactions when combined form a net chemical equation. ENE-1: The speed at which a reaction occurs can be influenced by a catalyst.	
Thermodynamics 6.1 Endothermic & Exothermic Processes 6.2 Energy Diagrams 6.3 Heat Transfer and Thermal Equilibrium 6.4 Heat Capacity and Calorimetry 6.5 Energy of Phase Changes 6.6 Introduction to Enthalpy of Reaction 6.7 Bond Enthalpy 6.8 Enthalpy of Formation 6.9 Hess's Law	6 - 7	6	1) ENE-2.A.1 2) ENE-2.A.2 3) ENE-2.A.3 4) ENE-2.A.4 5) ENE-2.B.1 6) ENE-2.C.1 7) ENE-2.C.2 8) ENE-2.C.3 9) ENE-2.D.1 10) ENE-2.D.2 11) ENE-2.D.3 12) ENE-2.D.4 13) ENE-2.D.5 14) ENE-2.D.6 15) ENE-2.E.1 16) ENE-2.E.2 17) ENE-2.F.1 18) ENE-3.A.1 19) ENE-3.A.2 20) ENE-3.B.1 21) ENE-3.C.1 22) ENE-3.D.1 **Sci Practices** 1.B 2.D 3.A 4.C 5.A 5.F 6.D 6.E **Enduring Understandings** ENE-2: Changes in a substance's properties or change into a different substance requires an exchange of	AP Classroom Personal Progress Check #6 (20MC & 2 FRQ - short) **Formative:** Unit 06 Quick-Check Unit 06 Assessment

			energy. ENE-3: The energy exchanged in a chemical transformation is required to break and form bonds.	
Equilibrium 7.1 Introduction to Equilibrium 7.2 Direction of Reversible Reactions 7.3 Reaction Quotient and Equilibrium Constant 7.4 Calculating the Equilibrium Constant 7.5 Magnitude of the Equilibrium Constant 7.6 Properties of the Equilibrium Constant 7.7 Calculating Equilibrium Concentrations 7.8 Representation of Equilibrium 7.9 Introduction to Le Chatelier's Principle 7.10 Reaction Quotient and Le Chatelier's Principle 7.11 Introduction to Solubility Equilibria 7.12 Common-Ion Effect 7.13 pH & Solubility 7.14 Free Energy of Dissolution	9 - 10	7	1) TRA-6.A.1 2) TRA-6.A.2 3) TRA-6.A.3 4) TRA-6.A.4 5) TRA-6.B.1 6) TRA-7.A.1 7) TRA-7.A.2 8) TRA-7.B.1 9) TRA-7.C.1 10) TRA-7.D.1 11) TRA-7.D.2 12) TRA-7.D.3 13) TRA-7.D.4 14) TRA-7.E.1 15) TRA-7.F.1 16) TRA-8.A.1 17) TRA-8.A.2 18) TRA-8.B.1 19) TRA-8.B.2 20) SPQ-5.A.1 21) SPQ-5.A.2 22) SPQ-5.A.3 23) SPQ-5.B.1 24) SPQ-5.C.1 25) SPQ-5.D.1 **Sci Practices** 2.D 2.F 3.A 3.C 4.D 5.A 5,B 5.C 5.F 6.D 6.F **Enduring Understandings** TRA-6: Some reactions can occur in both forward and reverse directions, sometimes proceeding in each	AP Classroom Personal Progress Check #7 (30MC & 2 FRQ - short and long) **Formative:** U07 Quick Check Unit 07 - Assessment

			direction simultaneously. TRA-7: A system at equilibrium depends on the relationship between concentrations, partial pressures of chemical species, and the equilibrium constant. TRA-8: Systems at equilibrium respond to external stresses to offset the effect of the stress. SPQ-5: The dissolution of a salt is a reversible process that can be influenced by environmental factors such as pH or other dissolved ions.	
Acids & Bases 8.1 Introduction to Acids & Bases 8.2 pH & pOH of Strong Acids & Bases 8.3 Weak Acid and Base Equilibria 8.4 Acid-Base Reactions & Buffers 8.5 Acid-Base Titrations 8.6 Molecular Structure of Acids & Bases 8.7 pH and pKa 8.8 Properties of Buffers 8.9 Henderson-Hasselbalch Equation 8.10 Buffer Capacity	9 - 10	8	1) SAP-9.A.1 2) SAP-9.A.2 3) SAP-9.A.3 4) SAP-9.A.4 5) SAP-9.B.1 6) SAP-9.B.2 7) SAP-9.C.1 8) SAP-9.C.2 9) SAP-9.C.3 10) SAP-9.C.4 11) SAP-9.C.5 12) SAP-9.D.1 13) SAP-9.D.2 14) SAP-9.D.3 15) SAP-9.D.4 16) SAP-9.E.1 17) SAP-9.E.2 18) SAP-9.E.3 19) SAP-9.E.4 20) SAP-9.F.1 21) SAP-10.A.1 22) SAP-10.A.2 23) SAP-10.B.1 24) SAP-10.C.1 25) SAP-10.D.1 26) SAP-10.D.2 **Sci Practices** 2.D 5.B 5.C 5.D 5.F	AP Classroom Personal Progress Check #1 (30MC & 1 FRQ - long) **Formative:** Unt 08 - Quick Check Unit 08 Assessment

			6.C 6.D 6.G **Enduring Understandings** SAP-9: The chemical of acids and bases involves reversible proton-transfer reactions, with equilibrium concentrations being related to the strength of the acids and bases involved. SAP-10: A buffered solution resists changes to its pH when small amounts of acid or base are added.	
Applications of Thermodynamics 9.1 Introduction to Entropy 9.2 Absolute Entropy & Entropy Change 9.3 Gibbs Free Energy & Thermodynamic Favorability 9.4 Thermodynamic and Kinetic Control 9.5 Free Energy and Equilibrium 9.6 Coupled Reactions 9.7 Galvanic & Electrolytic Cells 9.8 Cell Potential & Free Energy 9.9 Cell Potential Under Nonstandard Conditions 9.10 Electrolysis & Faraday's Laws	7 - 8	9	1) ENE-4.A.1 2) ENE-4.A.2 3) ENE-4.B.1 4) ENE-4.C.1 5) ENE-4.C.2 6) ENE-4.C.3 7) ENE-4.C.4 8) ENE-4.C.5 9) ENE-4.C.6 10) ENE-4.D.1 11) ENE-4.D.2 12) ENE-5.A.1 13) ENE-5.A.2 14) ENE-5.A.3 15) ENE-5.A.4 16) ENE-5.B.1 17) ENE-5.B.2 18) ENE-6.A.1 19) ENE-6.A.2 20) ENE-6.A.3 21) ENE-6.B.1 22) ENE-6.B.2 23) ENE-6.B.3 24) ENE-6.C.1 25) ENE-6.C.2 26) ENE-6.C.3 27) ENE-6.C.4 28) ENE-6.D.1 **Sci Practices** 2.F 4.D 5.B	AP Classroom Resource: Units in Thermochemical calculations AP Classroom Personal Progress Check #1 (30MC & 2 FRQ - short and long) **Formative:** Unit 09 - Quick Check Unit 09 - Assessment

			5.F 6.C 6.D 6.E **Enduring Understandings** ENE-4: Some chemical or physical processes cannot occur without intervention. ENE-5: The relationship between delta G and K can be used to determine favorability of a chemical or physical transformation. ENE-6: Electrical energy can be generated by chemical reactions.	
AP Chem Review	8 - 10	10	All AP Chem standards and Science Practices	Review questions Review quizzes Practice Test
Applications of AP Chemistry	MP 4 after Exam	11	Various AP Chem standards and Science Practices	Projects

Standards & Essential Knowledge:
SPQ = Scale, Proportion, and Quantity
SAP = Structure Property
TRA = Transformation
ENE = Energy

Science Practices:
Practice 1 = Models & Representations
Practice 2 = Questions & Method
Practice 3 = Representing Data and Phenomenon
Practice 4 = Model Analysis
Practice 5 = Mathematical Routines
Practice 6 = Argumentation

Formative and Summative Assessment

Teachers ultilize a variety of methods for assesment including:

Category Criteria	**Unit Tests and Quizzes** Individual assessments based on specific or general content knowledge.	**Labs, Projects & Classwork** Any group work primarily completed in class to be checked and/or graded for completion.	**Lab Assessments** Individual assessments based on group lab work. Lab data and other notes may sometimes be used.	**Homework** Any work assigned to be completed outside of the classroom.

All students take a common Midterm and Final Exam.

Grading Procedures and Evaluation

Test: 65%

Quiz: 25%

Homework: 10%

The final grade for the course is a weighted average of the four marking period grades and exams (midterm and final). The following weightings are used in this calculation:

- Marking period 1: 20%
- Marking period 2: 20%
- Midterm exam: 10%
- Marking period 3: 20%
- Marking period 4: 20%
- Final exam: 10%

The content, teaching strategies, common assessments, and student results for this course are evaluated annually.

Other Details

SCED

03106 AP Chemistry
Following the curricula recommended by the College Board, AP Chemistry courses usually follow high school chemistry and second-year algebra. Topics covered may include atomic theory and structure; chemical bonding; nuclear chemistry; states of matter; and reactions (stoichiometry, equilibrium, kinetics, and thermodynamics). AP Chemistry laboratories are equivalent to those of typical college courses.