

## Advanced Placement Chemistry Learning Standards

The Advanced Placement Chemistry course is designed to be the equivalent of the second semester of college chemistry offered chemistry majors. This course emphasizes equation writing, problem solving, and the quantitative aspects of chemistry. General topics will include: reaction rates; equilibrium; kinetics; electrochemistry; thermodynamics; and organic chemistry. This course will serve as preparation for the Advanced Placement test. Dual college chemistry credit may be available. Prerequisites: Physics First or Physics First Honors, completion of Honors Chemistry, teacher recommendation, and mastery of algebraic processes (completion of Algebra II).

PS1 - Matter and Its Interactions	
A. Structure and Properties of Matter	
9-12.SPS.PS1.A.1	Write names and formulas for hydrocarbons.
9-12.SPS.PS1.A.2	Identification of functional groups.
9-12.SPS.PS1.A.3	Compare and contrast the properties of transition metals and coordination compounds.
9-12.SPS.PS1.A.4	Investigate the properties of metals and metallurgy.
9-12.SPS.PS1.A.5	Investigate the chemistry of nonmetals.
B. Types of Interactions of Matter	
9-12.SPS.PS1.B.1	Investigate the characteristics of chemical equilibrium.
9-12.SPS.PS1.B.2	Apply equilibrium/aqueous equilibrium concepts to solve gaseous reactions.
9-12.SPS.PS1.B.3	Interpret kinetics problems dealing with rate of reactions and order of reactions.
9-12.SPS.PS1.B.4	Predict chemical reactivity and products of chemical reactions using the knowledge of descriptive chemistry
9-12.SPS.PS1.B.5	Understand the theoretical basis of oxidation-reduction reactions.
9-12.SPS.PS1.B.6	Calculate pH, $[H_3O^+]$ , and $[OH^-]$ for acidic and basic solutions.
9-12.SPS.PS1.B.7	Interpret a pH titration curve and determine the equivalence point given experimental data.
9-12.SPS.PS1.B.8	Apply equilibrium/aqueous equilibrium concepts to solve acid-base and buffer problems.
9-12.SPS.PS1.B.9	Apply equilibrium/aqueous equilibrium concepts to solve solubility product problems.
PS3 - Energy	
A. Definitions of Energy	
9-12.SPS.PS3.A.1	Apply the principles of thermodynamics (i.e. enthalpy, entropy, and free energy).
B. Conservation of Energy and Energy Transfer	
9-12.SPS.PS3.B.1	Relate thermodynamics to galvanic (voltaic) cells.
ETS1-Engineering Design	

A. Defining and Delimiting Engineering Problems	
9-12.ETS1.A.1	Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
9-12.ETS1.A.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.
B. Developing Possible Solutions	
9-12.ETS1.B.1	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.
9-12.ETS1.B.2	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.
SI - Processes of scientific inquiry	
9-12.SPS.SI.1	Formulate a testable question and explanation.
9-12.SPS.SI.2	Select appropriate investigative methods in order to obtain evidence relevant to the explanation.
9-12.SPS.SI.3	Gather evidence from qualitative and quantitative observations.
9-12.SPS.SI.4	Evaluate explanations (laws/principles, theories/models) in light of evidence (data) and scientific principles (understandings).
9-12.SPS.SI.5	Communicate results and justify explanations.