

Curriculum at a Glance

AP Chemistry

Level: 400

Grades 11 or 12

The Advanced Placement Chemistry course emphasizes the theoretical aspects of chemistry. The course is structured around six big ideas articulated in the AP Chemistry curriculum framework. Topics such as the structure of matter, kinetic theory of gases, chemical equilibria, chemical kinetics, and the basic concepts of thermodynamics are presented in considerable depth. Instruction is directed toward developing the student's ability to reason with the fundamental facts of science. It is assumed that the student might spend an additional six hours a week in unsupervised individual study outside the classroom. The difference between college chemistry and high school courses lies mainly in the laboratory. Observing chemical substances and reactions, recording data, and calculating and interpreting results based on the quantitative data are required. Students will gain experience in working with glass, filtrating, titrating, collecting and handling gases, colorimetry, synthesis of compounds, and analysis and identification of unknowns.

Unit Name / Description	Essential Content and/or Skills
Matter, Measurements, and Mass Relations	<ul style="list-style-type: none">• Types of matter• Measurements• Properties of substances• Atoms, atomic theory, components of an atom• Introduction to the periodic table, molecules and ions• Formulas and names of compounds
Reactions in aqueous solutions	<ul style="list-style-type: none">• Solute concentration• Precipitation reactions• Acid – base reactions
Gases	<ul style="list-style-type: none">• Measurements of gases• Ideal gas law and gas calculations• Stoichiometry of gaseous reactions• Gas mixtures – Partial pressures and mole fraction• Kinetic theory of gases and real gases
Electron structure and periodic table	<ul style="list-style-type: none">• Light, photon energy, and atomic spectra• Atomic orbitals, shapes and sizes• Electron configurations and orbital diagrams

	<ul style="list-style-type: none"> ● Electron arrangements and periodic trends
Covalent Bonding	<ul style="list-style-type: none"> ● Lewis structures, octet rule ● Molecular geometry, polarity of molecules ● Atomic orbitals, hybridization
Thermochemistry	<ul style="list-style-type: none"> ● Principles of heat flow, measurement of heat flow, calorimetry ● Enthalpy, thermochemical equations, enthalpies of formation ● Bond enthalpy, first law of thermodynamics
Liquids and solids	<ul style="list-style-type: none"> ● Liquid-Vapor equilibrium, phase diagrams ● Molecular substances, intermolecular forces ● Network covalent, ionic, and metallic solids; crystal structures
Solutions	<ul style="list-style-type: none"> ● Concentration units, principles of solubility ● Colligative properties of non-electrolytes and electrolytes
Rates of reactions	<ul style="list-style-type: none"> ● Meaning of reaction rate, rate and concentration ● Reactant concentration and time, models for reaction rate ● Reaction rate and temperature, catalysts, reaction mechanisms
Gaseous chemical equilibrium	<ul style="list-style-type: none"> ● The equilibrium system, the equilibrium constant expression ● Determination of K, applications of the equilibrium constant ● Effect of changes in conditions on the equilibrium constant
Acids and Bases	<ul style="list-style-type: none"> ● Bronsted-Lowry acid-base model, the ion product of water ● pH and pOH, weak acids and their equilibrium constants ● Weak bases and their equilibrium constants, acid-base properties of salt solutions ● Buffers ● Acid-base indicators and acid-base titrations
Precipitation reactions	<ul style="list-style-type: none"> ● Precipitation formation, solubility product constant ● Dissolving precipitates
Spontaneity of reaction	<ul style="list-style-type: none"> ● Spontaneous process, entropy, free energy, standard free energy change ● Effect of temperature, pressure and concentration on reaction spontaneity

	<ul style="list-style-type: none"> • The free energy change and the equilibrium constant • Additive free energy changes and coupled reactions
Electrochemistry	<ul style="list-style-type: none"> • Voltaic cells and standard voltages • Relations between E, G, and K; effect of concentration on voltage • Electrolytic cells, commercial cells
Nuclear reactions (Enrichment topic)	<ul style="list-style-type: none"> • Radioactivity, rate of radioactive decay • Mass energy relations • Nuclear fission and fusion
Organic Chemistry (Enrichment topic)	<ul style="list-style-type: none"> • Alkanes, alkenes, alkynes • Aromatics, functional groups • Isomerism and synthetic polymers