



SYLLABUS

Welcome to the FlinnPREP™ AP* Chemistry Online Prep Course! Your enrollment in this course is your first step toward a 5 on the AP* Chemistry exam. FlinnPREP™ covers fundamental concepts in Chemistry using clear and concise text, vibrant images, practice problems with fully worked solutions, illustrative videos, engaging animations and end-of-unit summaries and assessments. All of the content can be viewed on a desktop, tablet or phone, so you can prepare for AP* Chemistry conveniently and on the go.

Unit 1 – Nomenclature

- Ionic Compounds
- Cations and Anions
- Cations with One Charge
- Cations with Multiple Charges
- Polyatomic Ions
- Naming Ionic Compounds and Writing Formulas
- More Examples of Ionic Compound Names and Formulas
- Common Mistakes
- Naming Covalent (Molecular) Compounds
- Examples of Covalent Compounds with Chemical Names and Formulas
- Naming Binary Acids and Oxyacids

Unit 2 – Atomic Structure and Periodic Trends

- Protons, Neutrons and Electrons
- Ions
- Isotopes
- Average Atomic Mass
- Electron Configuration and Valence Electrons
- Periodic Trends
- Atomic Radius
- Ionic Radius
- Ionization Energy
- Electron Affinity
- Electronegativity

Unit 3 – Chemical Reactions

- Writing Chemical Reactions
- Balancing Chemical Equations
- Evidence of a Chemical Reaction
- Precipitation Reactions
- Oxidation–Reduction (Redox) Reactions
- Acid–Base Reactions
- Synthesis and Decomposition Reactions

Unit 4 – Bonding Basics

- The Chemical Bond
- Octet Rule
- Electronegativity
- Ionic Bonds
- Covalent Bonds
- Polar and Nonpolar Covalent Bonds
- Lewis Structures
- Rules for Drawing Lewis Structures
- Incomplete and Expanded Octets
- Lewis Structures and Polyatomic Ions
- Resonance
- Determining Electron and Molecular Geometries
- Metallic Bonds

Unit 5 – Structures and Properties

- Molecular Compounds
- Intermolecular Forces and States of Matter
- Dispersion Forces
- Dipole–Dipole Forces
- Hydrogen Bonds
- Ion–Dipole Forces
- Polarity
- Ionic and Atomic Solids
- Ionic Solids
- Nonbonding Atomic Solids
- Metallic Solids
- Network Covalent Solids
- Alloys

Unit 6 – Stoichiometry

- The Mole
- Molar Mass
- Conversion Calculations
- Percent Composition
- Empirical and Molecular Formulas
- Stoichiometry Calculations
- Limiting and Excess Reactants

Unit 7 – Gases

- Pressure
- The Simple Gas Laws
- Charles's Law (Volume and Temperature)
- Boyle's Law (Volume and Pressure)
- Avogadro's Law (Volume and Amount)
- The Ideal Gas Law
- Gaseous Mixtures and Partial Pressures (Dalton's Law)
- Gas Stoichiometry
- Kinetic Molecular Theory

Unit 8 – Solutions

- Solutions
- Aqueous Solutions
- Solubility
- Solution Concentration
- Solution Preparation
- Dilutions
- Solution Stoichiometry

Unit 9 – Acids and Bases

- Arrhenius Acids and Bases
- Brønsted-Lowry Acids and Bases
- Strong and Weak Acids
- The Acid Dissociation Constant, K_a
- What Does "Small" Mean When it Comes to K_a Values?
- The pH Scale
- Autoionization of Water
- Strong Acid Calculations
- Diprotic Acids
- Strong and Weak Bases
- Strong Base Calculations
- Acid–Base Reactions
- Counting H^+ and OH^- Ions
- Titrations
- Indicators

Unit 10 – Aqueous Equilibrium

- Weak Acids
- Calculations Involving Weak Acids
- Weak Bases
- Calculations Involving Weak Bases
- Buffers
- Calculating the pH of a Buffer Solution
- Buffer Capacity
- Buffer Problems and Calculations
- The Solubility Product Constant, K_{sp}
- Q and K_{sp}
- The Common Ion Effect
- Thermodynamics of Solubility

Unit 11 – Thermochemistry

- Average Kinetic Energy
- Maxwell-Boltzmann Distributions
- Temperature
- Kinetic Energy and Potential Energy
- Heat and Work
- State Functions or State Properties
- Enthalpy
- Enthalpy of Reaction
- Hess's Law
- Calorimetry

Unit 12 – Equilibrium

- What is Equilibrium?
- Equilibrium and Concentration
- Equilibrium and Pressure
- Relating K_c and K_p
- Calculating K_c with Known Equilibrium Concentrations
- Calculating K_c with Initial Concentrations and a Known Equilibrium Concentration
- Calculating Equilibrium Concentration from K_c and Remaining Equilibrium Concentrations
- Calculating Equilibrium Concentration from K_c and Initial Concentrations
- Heterogeneous Equilibrium
- LeChâtelier's Principle
- Changing Concentration in the Equilibrium Reaction
- Adding New Substances to the Equilibrium Reaction
- Changing Temperature in an Equilibrium Reaction
- Changing Pressure in an Equilibrium Reaction
- Reaction Quotient

Unit 13 – Kinetics

- Chemical Kinetics
- Reaction Rates
- Reaction Rates and Stoichiometry
- Rate Laws
- Determining Reaction Orders
- Half-Life
- Integrated Rate Law
- Reaction Mechanisms
- The Collision Model
- Catalysis

Unit 14 – Electrochemistry

- Oxidation–Reduction Reactions and Balancing Equations
- Balancing Redox Equations in Acidic Solution
- Balancing Redox Equations in Basic Solution
- Galvanic Cells (Voltaic Cells)
- Standard Reduction Potentials
- Line Notation
- Gibbs Free Energy, ΔG
- Corrosion
- Electrolysis

Unit 15 – Photoelectron Spectroscopy & Mass Spectrometry

- Ionization Energy and Electronic Structures of Atoms
- Coulomb's Law
- Principles of Photoelectron Spectroscopy
- Interpreting Photoelectron Spectra
- Number of Peaks
- Peak Position
- Peak Size
- More Examples of Photoelectron Spectra
- Mass Spectrometry
- Electronic and Vibrational Spectroscopy
- UV Spectroscopy
- Infrared Spectroscopy
- Visible Spectroscopy, Beer's Law

ISBN: 978-1-933709-73-4

FlinnPREP™ Online Student Prep Course for AP* Chemistry

For more information on this course, please contact the FlinnPREP™ team:

flinnprep@flinnsci.com

800-452-1261 (M–F 7:30 am–5:00 pm CT)

* AP and Advanced Placement are registered trademarks of the College Board, which was not involved in the production of, and does not endorse, these products.