

Welcome to AP Chem!

AP Program

We offer a class of AP chemistry, 5 days a week, 55 minutes a period, with an average of 2 days a week of lab.

Teaching Strategies

I enter the class under the assumption that students are highly motivated and ready to learn. Given that, I assume they will be motivated enough to accomplish much outside study! With that in mind...

- 1) Each chapter will be read and outlined *before* we discuss it.
- 2) I will lecture on the highlights of each chapter.
- 3) Students will work in pairs at first - later individually - at the end of each chapter on a "fake test" as we call it, a test completely in AP style, with multiple choice and essays. The following day the pair will go over their test, with answers in hand, and help each other in the correcting and understanding of it all.
- 4) Ideally with each chapter there will be some form of lab activity, either hands-on lab and/or virtual lab and/or appropriate demonstration.
- 5) In the last weeks leading to The Test, we will do fully, with correct timing and environment, two released AP exams.

Notebook

Each student is required to have a separate AP Chem 3-ring notebook. Here will be kept notes, graded experiments, Fake Tests, in-class participation answers - your whole "collection of evidence" of your participation in this class.

Laboratories

Students are required to submit a complete report for each lab experiment, including an hypothesis, procedure, observations/data, calculations, and a conclusion. All reports are kept in a lab notebook.

Textbooks

Chemistry, Zumdahl, 5th ed.

Study Guide for Chemistry, Zumdahl and Kelter, 5th ed.

Cracking the AP Chemistry Exam, Foglino, 2006-07 ed.

Lab Manuals

Laboratory Experiments for Advanced Placement Chemistry, Vonderbrink, Flinn Scientific Publisher

AP Chemistry Virtual Labs, Neo/SCI Corporation

Flinn Scientific Self Contained AP Labs, Flinn Scientific

Course Outline

Unit 1: Calculations and Uncertainty

Main Topics: Dimensional Analysis, Uncertainty, Significant Figures

Unit 2: Naming

Main Topics: Ionic compounds, Covalent Compounds

Unit 3: Atomic Structure and the Periodic Table

Main Topics: The Periodic Table, Electrons, Periodic Trends

Subtopics: Quantum Number, Aufbau Principle, Pauli Exclusion Principle, Electrons and Energy, Atomic Radius, Ionization Energy, Electron Affinity, Electronegativity

Lab: [An Activity Series \(Flinn\)](#)

Unit 4: Bonding

Main Topics: Coulomb's Law, Bonds Within Molecules, Bonds Between Molecules, Attractive Forces in Solids and Liquids

Subtopics: Ionic Bonds, Covalent Bonds, Lewis Dot Structures, Molecular Geometry, van der Waals Forces, Hydrogen Bonds

Unit 5: Stoichiometry and Chemical Reactions

Main Topics: Moles, Chemical Equations, Equations and Calculations

Subtopics: Moles and Molecules, Moles and Grams, Moles and Gases, Moles and Solutions, Balancing Chemical Equations, Chem Equations and Calculations

Lab: [Determining the Stoichiometry of Chemical Reactions \(Flinn\)](#)

And one of the following:

[Percentage Water in a Hydrate \(NeoSCI\)](#)

[Mass and Mole Relationships \(NeoSCI\)](#)

[Formula for a Compound \(NeoSCI\)](#)

Unit 6: Gases

Main Topics: STP, Kinetic Molecular Theory, Ideal Gas Equation, Dalton's Law, Graham's Law, van der Waal's Equation, Density

Lab: [Molecular Mass of a Volatile Liquid \(Flinn\)](#)

And one of the following:

[Molar Mass by Vapor Density \(NeoSCI\)](#)

[Molar Volume of a Gas \(NeoSCI\)](#)

Unit 7: Phase Diagrams

Main Topics: The Phase Diagram, Phase Changes, Phase Diagram for Water, Heating Curves

Subtopics: Naming the Phase Changes, Heat of Fusion, Heat of Vaporization

Unit 8: Thermodynamics

Main Topics: First and Second Laws of Thermodynamics, State Functions, Standard State Conditions, Enthalpy, Entropy, Gibbs Free Energy, Energy Diagrams

Subtopics: ΔH , ΔH° , Bond Energy, Hess' Law, Heat Capacity & Specific Heat, ΔG , ΔS , Catalysts and Energy Diagrams

Lab: [Thermochemistry and Hess' Law \(Flinn\)](#)

Unit 9: Solutions

Main Topics: Concentration Measurements, Solutes, Solvents, Colligative Properties, Density, Solubility

Subtopics: Molarity, Molality, Mole Fraction, Boiling Point Elevation, Freezing Point Depression, Vapor Pressure Lowering, Osmotic Pressure, The Solubility Product, Common Ion Effect, Solubility Rules, Gas Solubility

Lab: [Molecular Mass by Freezing Point Depression \(Flinn\)](#)

And one of the following:

[Molar Mass by Freezing Point Depression \(NeoSCI\)](#)

[Spectrophotometric Analysis \(NeoSCI\)](#)

Unit 10: Equilibrium

Main Topics: The Equilibrium Constant, K_{eq} , K_p and Gases, The Reaction Quotient, K_{eq} and the Multistep Process, Le Chatelier's Law

Lab: [Equilibrium and Le Chatelier's Principle \(Flinn\)](#)

Unit 11: Acids and Bases

Main Topics: Definitions, pH, Weak Acids, Strong Acids, K_w , Acid and Base Salts, Buffers, Polyprotic Acids and Amphoteric Substances, Anhydrides, Titration

Subtopics: Arrhenius, Bronsted, Lewis, Weak Acid Calculations, Strong Acid Calculations, Acid-Base Salts and Calculations

Lab: [Determination of the \$K_a\$ of Weak Acids \(Flinn\)](#)

And one of the following:

[Strong Acid - Strong Base Titration \(NeoSCI\)](#)

[Weak Acid - Strong Base Titration \(NeoSCI\)](#)

[Indicators \(NeoSCI\)](#)

[Buffer Solutions \(NeoSCI\)](#)

Unit 12: Kinetics

Main Topics: The Rate Law Using Initial Concentration, The Rate Law Using Concentration and Time, Collision Theory, Reaction Mechanisms, Catalysts, Kinetics and Equilibrium

Subtopics: First Order-, Second Order-, Third Order Rate Laws, Rate Constant and Temperature

Lab: [The Kinetics of a Reaction \(Flinn\)](#)

Unit 13: Oxidation-Reduction and Electrochemistry

Main Topics: Oxidation States, Redox Reactions, Reduction Potentials, Voltage and Spontaneity, Voltage and Equilibrium, Galvanic Cells, Electrolytic Cells

Lab: *One of the following:*

Electrochemical Cells and Electroplating (NeoSCI)

Oxidation-Reduction Reactions (NeoSCI)

Electrochemical Series (NeoSCI)

Unit 14: Nuclear Decay

Main Topics: Types of Nuclear Decay, Nuclear Stability, Mass Defect and Binding Energy

Subtopics: Alpha-, Beta-, Positron-Emission, Electron Emission, Gamma Rays, Half-Life

Unit 15: Laboratory

Main Topics: Review of Safety and Accuracy, Lab procedures, methods of separation and measuring concentration, identifying chemicals in solution

Subtopics: Methods of Separation, Measuring Concentration, Precipitation, Conduction, Flame Tests, Colored Solutions

Lab: Liquid Chromotography (Flinn)

And one of the following:

Cations and Anions (NeoSCI)

Separation by Chromotography (NeoSCI)

Coordination Compounds (NeoSCI)

Unit 16: Organic Chemistry

Main Topics: Hydrocarbons, Functional Groups, Isomers, Organic Reactions

Lab: Organic Compounds (NeoSCI)

Unit 17: Descriptive Chemistry

Main Topics: Review of chemical reactions, Relationships of the Periodic Table

Lab: Determination of the Hardness of Water

Liquid Chromotography

Analytical Gravimetric Determination