

# AP Chemistry

Board Approved September 19, 2005

Standards and benchmarks to be learned/achieved	Instructional activities including materials to be used to achieve mastery of benchmarks and standards	Assessment Processes
<p>3.1.A Apply concepts of systems, subsystems, feedback and control to solve problems.</p> <p>3.1.B Apply concepts of models as a method to predict and understand science and technology.</p> <p>3.1.C Assess and apply patterns in science and technology.</p> <p>3.1.D Analyze scale as a way of relating concepts and ideas to one another by some measure.</p> <p>3.1.E Evaluate change in nature, physical systems and man made systems.</p>	<p><u>Activities</u></p> <ul style="list-style-type: none"> <li>➤ Socratic method questioning</li> <li>➤ Lab investigations</li> <li>➤ Homework</li> <li>➤ Cooperative learning</li> <li>➤ Direct instruction</li> </ul> <p><u>Materials</u></p> <ul style="list-style-type: none"> <li>➤ Lab materials</li> <li>➤ Teacher tests</li> <li>➤ AP Prep Tests</li> </ul>	<p>Lab reports</p> <p>Exams</p> <p>Quizzes</p> <p>Questioning</p> <p>Project/Research</p>
<p>3.2.A Evaluate the nature of scientific and technological knowledge.</p> <p>3.2.B Evaluate experimental information for appropriateness and adherence to relevant science processes.</p> <p>3.2.C Apply the elements of scientific inquiry to solve multi-step problems.</p> <p>3.2.D Analyze and use the technological design process to solve problems.</p>	<p><u>Activities</u></p> <ul style="list-style-type: none"> <li>➤ Socratic method questioning</li> <li>➤ Lab investigations</li> <li>➤ Homework</li> <li>➤ Cooperative learning</li> <li>➤ Direct instruction</li> </ul> <p><u>Materials</u></p> <ul style="list-style-type: none"> <li>➤ Lab materials</li> <li>➤ Teacher tests</li> <li>➤ AP Prep Tests</li> </ul>	<p>Lab reports</p> <p>Exams</p> <p>Quizzes</p> <p>Questioning</p> <p>Project/Research</p>

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Standards and benchmarks to be learned/achieved	Instructional activities including materials to be used to achieve mastery of benchmarks and standards	Assessment Processes
<p>3.4.A Apply concepts about the structure and properties of matter.</p> <p>3.4.B Apply and analyze energy sources and conversions and their relationship to heat and temperature.</p> <p>3.4.C Apply the principles of motion and force.</p> <p>3.4.D Analyze the essential ideas about the composition and structure of the universe.</p>	<p><u>Activities</u></p> <ul style="list-style-type: none"> <li>➤ Socratic method questioning</li> <li>➤ Lab investigations</li> <li>➤ Homework</li> <li>➤ Cooperative learning</li> <li>➤ Direct instruction</li> </ul> <p><u>Materials</u></p> <ul style="list-style-type: none"> <li>➤ Lab materials</li> <li>➤ Teacher tests</li> <li>➤ AP Prep Tests</li> </ul>	<p>Lab reports</p> <p>Exams</p> <p>Quizzes</p> <p>Questioning</p> <p>Project/Research</p>
<p>3.7.A Apply advanced tools, materials and techniques to answer complex questions.</p> <p>3.7.B Evaluate appropriate instruments and apparatus to accurately measure materials and processes.</p> <p>3.7.C evaluate computer operations and concepts as to their effectiveness to solve problems.</p>	<p><u>Activities</u></p> <ul style="list-style-type: none"> <li>➤ Socratic method questioning</li> <li>➤ Lab investigations</li> <li>➤ Homework</li> <li>➤ Cooperative learning</li> <li>➤ Direct instruction</li> </ul> <p><u>Materials</u></p> <ul style="list-style-type: none"> <li>➤ Lab materials</li> <li>➤ Teacher tests</li> <li>➤ AP Prep Tests</li> </ul>	<p>Lab reports</p> <p>Exams</p> <p>Quizzes</p> <p>Questioning</p> <p>Project/Research</p>

**SCOPE AND SEQUENCE**

Instructional Activity (What)	Instructional Process (How) Including Assessment	Number of Lessons (When)
<p><u>Matter and Measurement</u></p> <ul style="list-style-type: none"> <li>➤ Classification of Matter</li> <li>➤ Measurement and the Metric System</li> <li>➤ Uncertainty in Measurement</li> <li>➤ Dimensional Analysis and Problem Solving</li> </ul>	<ul style="list-style-type: none"> <li>➤ Socratic Questioning</li> <li>➤ Direct Instruction</li> <li>➤ Homework</li> <li>➤ Exams</li> <li>➤ Lab</li> </ul>	5
<p><u>Atoms, Molecules, and Ions</u></p> <ul style="list-style-type: none"> <li>➤ History</li> <li>➤ Conservation of Mass</li> <li>➤ Multiple Proportions</li> <li>➤ Dalton's Theory</li> <li>➤ Thomson, Moseley, Millikan, Rutherford Experiments</li> <li>➤ Modern Atomic Structure</li> <li>➤ Molecules and Ions</li> <li>➤ Introduction to Periodic Table</li> <li>➤ Naming Simple Compounds</li> </ul>	<ul style="list-style-type: none"> <li>➤ Socratic Questioning</li> <li>➤ Direct Instruction</li> <li>➤ Homework</li> <li>➤ Exams</li> <li>➤ Lab                             <ul style="list-style-type: none"> <li>○ Calculate empirical formula</li> </ul> </li> </ul>	15
<p><u>Stoichiometry</u></p> <ul style="list-style-type: none"> <li>➤ Atomic Masses</li> <li>➤ Mole/Molar Mass</li> <li>➤ % Composition of Compounds</li> <li>➤ Determining Formula of a Compound</li> <li>➤ Chemical Equations/Balancing</li> <li>➤ Stoichiometric Calculations</li> <li>➤ Limiting Reactant</li> </ul>	<ul style="list-style-type: none"> <li>➤ Socratic Questioning</li> <li>➤ Direct Instruction</li> <li>➤ Homework</li> <li>➤ Exams</li> <li>➤ Lab                             <ul style="list-style-type: none"> <li>○ Mass relationships in chemical equation</li> </ul> </li> </ul>	8
<p><u>Chemical Reactions and Solutions</u></p> <ul style="list-style-type: none"> <li>➤ Water and Aqueous Solutions</li> <li>➤ Electrolytes</li> <li>➤ Composition of Solutions</li> <li>➤ Precipitation/AcidBase Reactions</li> <li>➤ Relax Reactions</li> </ul>	<ul style="list-style-type: none"> <li>➤ Socratic Questioning</li> <li>➤ Direct Instruction</li> <li>➤ Homework</li> <li>➤ Exams</li> <li>➤ Lab                             <ul style="list-style-type: none"> <li>○ Gravimetric, quantitative isolation of precipitate</li> </ul> </li> </ul>	10

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Instructional Activity (What)	Instructional Process (How) Including Assessment	Number of Lessons (When)
<u>Gases</u> > Pressure > Gas laws of Boyle, Charles, and Avogadro > Ideal Gas Law > Gas Stoichiometry > Dalton's Law of Partial Pressures > Kinetic Molecular Theory > Effusion/Diffusion > Real Gases	> Socratic Questioning > Direct Instruction > Homework > Exams > Lab o Calculate molar volume of gas	10
<u>Thermochemistry</u> > Nature of Energy > Enthalpy and Calorimetry > Hess's Law > Enthalpies of Formation	> Socratic Questioning > Direct Instruction > Homework > Exams > Lab o Determine specific heat of metal o Determine heat of neutralization	10
<u>Atomic Structure and Periodicity</u> > Electromagnetic radiation > Nature of Matter > Atomic Spectrum/Bohr Model > Quantum Mechanical Model of Atom > Quantum Numbers/Orbital Shapes and Energies > Electron Spin and Pauli Principle > Electron Configurations > Periodic Trends (IE, EA, AR)	> Socratic Questioning > Direct Instruction > Homework > Exams > Lab o Calculate wavelength of spectral lines	12

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Instructional Activity (What)	Instructional Process (How) Including Assessment	Number of Lessons (When)
<p><b>Bonding</b></p> <ul style="list-style-type: none"> <li>➤ Electro negativity</li> <li>➤ Ionic vs. Covalent</li> <li>➤ Localized Electron Model                             <ul style="list-style-type: none"> <li>○ VSEPR</li> <li>○ Lewis Structures</li> <li>○ Resonance</li> <li>○ Hybridization</li> </ul> </li> <li>➤ Molecular Orbital Model</li> </ul>	<ul style="list-style-type: none"> <li>➤ Socratic Questioning</li> <li>➤ Direct Instruction</li> <li>➤ Homework</li> <li>➤ Exams</li> <li>➤ Lab                             <ul style="list-style-type: none"> <li>○ Molecular Modeling</li> </ul> </li> </ul>	10
<p><b>Liquids and Solids</b></p> <ul style="list-style-type: none"> <li>➤ Intermolecular Forces</li> <li>➤ Liquid State</li> <li>➤ Types of Solids and Characteristics</li> <li>➤ Vapor Pressure and Changes of State</li> <li>➤ Phase Diagrams</li> </ul>	<ul style="list-style-type: none"> <li>➤ Socratic Questioning</li> <li>➤ Direct Instruction</li> <li>➤ Homework</li> <li>➤ Exams</li> <li>➤ Lab</li> </ul>	10
<p><b>Properties of Solutions</b></p> <ul style="list-style-type: none"> <li>➤ Solution Composition</li> <li>➤ Enthalpies of Solution</li> <li>➤ Solubility</li> <li>➤ Vapor Pressure of Solutions</li> <li>➤ Colligative Properties                             <ul style="list-style-type: none"> <li>○ Boiling Point/Freezing Point Changes</li> <li>○ Osmotic Pressure</li> </ul> </li> <li>➤ Colloids</li> </ul>	<ul style="list-style-type: none"> <li>➤ Socratic Questioning</li> <li>➤ Direct Instruction</li> <li>➤ Homework</li> <li>➤ Exams</li> <li>➤ Lab                             <ul style="list-style-type: none"> <li>○ Calculate molar mass based on freezing point depression/boiling point elevation</li> </ul> </li> </ul>	14

**SCOPE AND SEQUENCE**

Instructional Activity (What)	Instructional Process (How) Including Assessment	Number of Lessons (When)
<p><u>Chemical Kinetics</u></p> <ul style="list-style-type: none"> <li>➤ Reaction Rates</li> <li>➤ Rate Laws: An Introduction</li> <li>➤ Determining the Form of the Rate Law</li> <li>➤ Integrated Rate Law</li> <li>➤ Reaction Mechanisms</li> <li>➤ Model for Chemical Kinetics</li> <li>➤ Catalysis</li> </ul>	<ul style="list-style-type: none"> <li>➤ Socratic Questioning</li> <li>➤ Direct Instruction</li> <li>➤ Homework</li> <li>➤ Exams</li> <li>➤ Lab                             <ul style="list-style-type: none"> <li>○ Use Colorimeter to determine rate order by following reaction</li> </ul> </li> </ul>	<p align="center">14</p>
<p><u>Chemical Equilibrium</u></p> <ul style="list-style-type: none"> <li>➤ Equilibrium Condition</li> <li>➤ Equilibrium Constant</li> <li>➤ Equilibrium Expressions Involving Pressures</li> <li>➤ Heterogeneous Equilibrium</li> <li>➤ Applications of the Equilibrium Constant</li> <li>➤ Solving Equilibrium Problems</li> <li>➤ Le Châtelier</li> </ul>	<ul style="list-style-type: none"> <li>➤ Socratic Questioning</li> <li>➤ Direct Instruction</li> <li>➤ Homework</li> <li>➤ Exams</li> <li>➤ Lab</li> </ul>	<p align="center">10</p>
<p><u>Acids/Bases</u></p> <ul style="list-style-type: none"> <li>➤ Nature of Acids/Bases</li> <li>➤ Acid Strength</li> <li>➤ pH Scale</li> <li>➤ calculating pH of Strong Acid Solutions</li> <li>➤ Calculating pH of Weak Acid Solutions</li> <li>➤ Polyprotic acids</li> <li>➤ Acid/Base Properties of Salts/Oxides</li> <li>➤ Structure and Acidity/Basicity</li> <li>➤ Common Ion Effect</li> <li>➤ Buffers</li> <li>➤ Titrations and pH Curves</li> <li>➤ Indicators</li> <li>➤ Solubility Equilibria/Solubility Product</li> <li>➤ Precipitation/Avalutitive Analysis</li> <li>➤ Complex Ions</li> </ul>	<ul style="list-style-type: none"> <li>➤ Socratic Questioning</li> <li>➤ Direct Instruction</li> <li>➤ Homework</li> <li>➤ Exams</li> <li>➤ Lab                             <ul style="list-style-type: none"> <li>○ Titrations</li> </ul> </li> </ul>	<p align="center">30</p>

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<u>Spontaneity, Entropy, and Free Energy</u> > Spontaneity and Entropy > Laws of Thermodynamics > Effect of Temperature > Free Energy > Entropy Changes in Chemical Reactions > Free Energy and Chemical Reactions > Free Energy and Pressure > Free Energy and Equilibrium > Free Energy and Work	> Socratic Questioning > Direct Instruction > Homework > Exams > Lab	10
<u>Electrochemistry</u> > Galvanic Cells > Reduction Potentials > Cell Potential, Work, and Free Energy > Cell Potential and Concentration > Electrolysis > Batteries/Corrosion	> Socratic Questioning > Direct Instruction > Homework > Exams > Lab	10
<u>Nuclear Chemistry</u> > Nuclear Stability/Radioactive Decay > Nuclear Transformation	> Socratic Questioning > Direct Instruction > Homework > Exams > Lab	3
<u>Organic Chemistry</u> > Alkanes > Alkenes > Polymers > Hydrocarbons > Functional groups > Nomenclature	> Socratic Questioning > Direct Instruction > Homework > Exams > Lab	3
<u>Chemical Reactions</u> > Predict Products of Reactions	> Socratic Questioning > Direct Instruction > Homework > Exams > Lab	3