

**Advanced Chemistry (one year)  
High School  
Standards, Supporting Skills, Assessments, and Resources**

**Indicator 1: Describe structures and properties of, and changes in, matter.**

Bloom's Taxonomy Level	Standard	Supporting Skills	Assessments	Resources
(Analysis)	<p><b>9-12.P.1.1A. Students are able to distinguish between the changing models of the atom using the historical experimental evidence.</b></p> <p><b>Examples:</b> Dalton, Thompson, Rutherford, Bohr, wave-mechanical models</p>			
(Synthesis)	<p><b>9-12.P.1.2A. Students are able to predict electron configuration, ion formation, reactivity, compound formation, periodic trends, and types of compounds formed based on location on the Periodic Table.</b></p> <p><b>Examples:</b> periodic trends including ionization, energy, electronegativity, atomic and ionic size, and shielding effect.</p>	<p>Chemical Bonds and Electron Configuration</p> <p>Names and Formulas for Ionic Compounds</p> <ul style="list-style-type: none"> <li>- Binary</li> <li>-Ternary</li> </ul> <p>Names and Formulas for Molecular Compounds</p> <ul style="list-style-type: none"> <li>-Binary</li> <li>-Ternary</li> </ul> <p>Classification of Elements</p> <ul style="list-style-type: none"> <li>Groups</li> <li>Metals, Nonmetals, Metalloids</li> </ul>		<p>Chapter 8.1</p> <p>Chapter 8.3</p> <p>Chapter 6.2</p>

		<p>Natural vs. Synthetic</p> <p>Block s,p,d,f</p> <p>Electron Configuration</p> <p>Periodic Trend</p> <p>Atomic Radii</p> <p>Ionic Radii</p> <p>Ionization Energy</p> <p>Electonegativity</p> <p>Electron Affinity</p> <p>Shielding Affect</p> <p>Exceptions to Trends</p> <ul style="list-style-type: none"> <li>-“D” block</li> <li>- Row 2 &amp; 3</li> </ul> <p>Electronegativity Polarity in reference to bonding</p>		Chapter 6.3
(Synthesis)	<p><b>9-12.P.1.3A. Students are able to identify five basic types of chemical reactions and predict the products.</b></p> <ul style="list-style-type: none"> <li>• Single replacement, double replacement, synthesis, decomposition, and combustion reactions</li> <li>• Describe the properties and interactions of acids, bases, and salts.</li> <li>• Calculate pH, pOH, <math>[H_3O^+]</math>,</li> </ul>	<p>Physical and Chemical Properties</p> <p>Classification</p> <p>Arrhenius/Bronsted-Lowry/Lewis</p> <p>PH vs.pOH</p> <p>Strength of Acid/base</p> <p>Neutralization</p> <ul style="list-style-type: none"> <li>- Writing equation</li> <li>- Titration</li> </ul>		<p>Chapter 19:1</p> <p>Chapter 19:3</p>

	<p>[OH].</p> <ul style="list-style-type: none"> <li>Distinguish between Arrhenius, Bronsted-Lowry, and Lewis definitions of acids and bases.</li> </ul>	<ul style="list-style-type: none"> <li>- Buffer</li> <li>-Salt of hydrolysis</li> </ul>		
(Synthesis)	<p><b>9-12.P.1.4A. Students are able to describe factors that affect solution interactions.</b></p> <ul style="list-style-type: none"> <li>Calculate concentration of solutions.</li> <li>“Like dissolves like”</li> <li>Vander Waal’s forces</li> </ul>	<p>Solutions</p> <ul style="list-style-type: none"> <li>- Characteristics</li> <li>- Types</li> <li>- Solvation Process</li> <li>- Solubility and Factors Affecting It</li> </ul> <p>Solution Concentration</p> <p>Colligative Properties with Calculations</p>		<p>Chapter 15:1</p> <p>Chapter 15:2</p>
(Application)	<p><b>9-12.P.1.5A. Students are able to examine energy transfer as matter changes.</b></p> <p><b>Examples:</b></p> <p>Determine <math>\Delta H</math>, <math>\Delta G</math>, <math>\Delta S</math> for thermo-chemical equations.</p> <p>Calculate energy involved in phase changes.</p> <p>Compare the specific heats of various substances.</p> <ul style="list-style-type: none"> <li>Describe physical and chemical processes that result in endothermic and</li> </ul>	<p>Energy</p> <ul style="list-style-type: none"> <li>-PE vs KE</li> <li>-Heat</li> </ul> <p>Heat in Reaction</p> <ul style="list-style-type: none"> <li>- Calorimetry</li> <li>-Enthalpy</li> <li>Endothermic vs. Exothermic</li> </ul> <p>Thermochemical Equation</p> <ul style="list-style-type: none"> <li>- Stoichiometry Calculation</li> </ul>		<p>Chapter 16:1</p> <p>Chapter 16:2</p> <p>Chapter 16:3</p>

	<p>exothermic changes.</p> <ul style="list-style-type: none"> <li>Describe energy transfer as matter changes from one phase to another.</li> </ul>	<p>- Hess's Law</p> <p>Calculating Enthalpy</p> <ul style="list-style-type: none"> <li>Heating/Cooling Curve</li> </ul> <p>Reaction Spontaneity</p> <ul style="list-style-type: none"> <li>Entropy</li> <li>Gibb's Free Energy</li> </ul>		<p>Chapter 16:4</p> <p>Chapter 16:5</p>
(Application)	<p><b>9-12.P.1.6A. Students are able to perform stoichiometric calculations.</b></p> <ul style="list-style-type: none"> <li>Convert between moles, mass, particles, volume.</li> <li>Calculate empirical and molecular formulas from mass percents.</li> <li>Determine limiting and excess reactants and percent yield in chemical reactions.</li> </ul>	<p>Measuring Matter</p> <p>Mass and the Mole</p> <p>Moles of Compounds</p> <p>Empirical and Molecular Formula</p> <ul style="list-style-type: none"> <li>Advance Calculations</li> </ul> <p>Formula of Hydrates</p> <ul style="list-style-type: none"> <li>Advance Calculatons</li> </ul> <p>What is Stoichiometry</p> <p>Stoichiometry Calculations</p> <ul style="list-style-type: none"> <li>Advance Calculations</li> </ul> <p>Limiting reactant</p> <ul style="list-style-type: none"> <li>Advance Calculations</li> </ul> <p>Percent Yield</p>		<p>Chapter 12:1</p> <p>Chapter 12:2</p> <p>Chapter 12:3</p> <p>Chapter 12:4</p>

		-Advance Calculations		
(Application)	<p><b>9-12.P.1.7A. Students are able to apply the kinetic molecular theory to solve quantitative problems involving pressure, volume, temperature, and number of moles of gas.</b></p> <ul style="list-style-type: none"> <li>• Apply Boyle's Law, Charles' Law, Gay-Lussac's Law, Combined Gas Law, and Ideal Gas Law.</li> </ul>	<p>Gas Laws</p> <ul style="list-style-type: none"> <li>- Boyle's law</li> <li>- Charles' Law</li> <li>- Gay-Lussac</li> </ul> <p>Combined Gas/Avogadro's law</p> <p>Ideal Gas Law</p> <p>Modification of ideal Gas law</p> <p>Gas Stiochiometry</p>		<p>Chapter 14:1</p> <p>Chapter 14:2</p> <p>Chapter 14:3</p>
(Synthesis)	<p><b>9-12.P.1.8A. Students are able to use models to make predictions about molecular structure, chemical bonds, chemical reactivity, and polarity of molecules.</b></p> <ul style="list-style-type: none"> <li>• Create Lewis structures for molecules and polyatomic ions.</li> <li>• Determine molecular shape using VSEPR theory.</li> <li>• Determine the polarity of a molecule.</li> </ul>	<p>Electronegativity vs. Polarity</p> <p>Lewis Structures</p> <p>Resonances</p> <p>VSEPR</p> <p>Hybridization</p>		<p>Chapter 9:5</p> <p>Chapter 9:3</p> <p>Chapter 9:4</p>

(Analysis)	<p><b>9-12.P.1.9A. Students are able to describe the characteristics of equilibria.</b></p> <ul style="list-style-type: none"> <li>• Apply LeChatelier's principle to equilibrium reactions.</li> <li>• Identify factors that drive reactions toward completion.</li> <li>• Calculate <math>K_{eq}</math> values for equilibrium reactions.</li> </ul>	<p>Equilibrium</p> <ul style="list-style-type: none"> <li>- characteristics</li> <li>- equilibrium expression</li> <li>- calculate equilibrium constants</li> </ul> <p>Factors Affecting Equilibrium</p> <ul style="list-style-type: none"> <li>- factors</li> <li>- LeChatelier's Principle</li> </ul> <p>Using Equilibrium constant/Calculation</p>		<p>Chapter 18:1</p> <p>Chapter 18:2</p>
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**Indicator 2: Analyze forces, their forms, and their effects on motions.**

Bloom's Taxonomy Level	Standard	Supporting Skills	Assessments	Resources
(Synthesis)	<p><b>9-12.P.2.1A. Students are able to solve vector problems graphically and analytically.</b></p> <ul style="list-style-type: none"> <li>• Define and manipulate vectors and scalars.</li> <li>• Determine if an object is in equilibrium and distinguish among stable, neutral, and unstable equilibria.</li> </ul> <p>Examples: center of mass, torque</p>			

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(Analysis)	<p><b>9-12.P.2.2A. Students are able to relate gravitational or centripetal force to projectile or uniform circular motion.</b></p> <ul style="list-style-type: none"> <li>• Analyze and graph projectile motion.</li> </ul>			

**Indicator 3: Analyze interactions of energy and matter.**

Bloom's Taxonomy Level	Standard	Supporting Skills	Assessments	Resources
(Synthesis)	<p><b>9-12.P.3.1A. Students are able to explain wave behavior in the fundamental processes of reflection, refraction, diffraction, interference, resonance, and image formation.</b></p> <ul style="list-style-type: none"> <li>• Construct ray diagrams to show the relationship between image and focal point.</li> <li>• Compare properties of images (real vs virtual).</li> <li>• Identify situations when diffraction occurs.</li> <li>• Identify conditions necessary for refraction to occur.</li> </ul>			

(Application)	<p><b>9-12.P.3.2A. Students are able to describe the relationship between charged particles, static electricity, and electric fields.</b></p> <ul style="list-style-type: none"> <li>• Use Coulomb’s Law to calculate forces.</li> <li>• Explain methods of transferring charge.</li> </ul> <p>Examples: induction, conduction, friction, electron guns</p> <ul style="list-style-type: none"> <li>• Describe the direction and general shape of electric fields.</li> </ul>			
(Analysis)	<p><b>9-12.P.3.3A. Students are able to describe the relationship between changing magnetic and electric fields.</b></p> <ul style="list-style-type: none"> <li>• Explain the properties of magnetic fields.</li> <li>• Describe how electric and magnetic fields can induce each other.</li> </ul>			



### Additional Concepts to Cover

Blooms Taxonomy Level	Standard/Objective	Supporting Skills	Assessments	Resources
		<p>Kinetics</p> <ul style="list-style-type: none"> <li>- model of reaction rate</li> <li>- factors affecting reaction rate</li> <li>- instantaneous reaction</li> <li>- reaction mechanism</li> </ul> <p>Redox</p> <ul style="list-style-type: none"> <li>- oxidation/reduction</li> <li>- balancing redox equations</li> <li>- half-reactions balancing</li> <li>- acidic vs. basic conditions</li> </ul> <p>Electrochemistry</p> <ul style="list-style-type: none"> <li>- voltaic cell</li> <li>- types of batteries</li> <li>- electrolysis</li> </ul> <p>Hydrocarbons</p> <ul style="list-style-type: none"> <li>- alkanes</li> <li>- acyclic alkane and properties</li> <li>- alkenes and alkynes</li> <li>- isomers</li> <li>- aromatic hydrocarbons</li> </ul> <p>Organic</p> <ul style="list-style-type: none"> <li>- functional groups</li> <li>- alcohols, ethers, amines</li> <li>- carbonyl</li> <li>- organic reactions</li> </ul>		<p>Chapter 17:1 Chapter 17:2</p> <p>Chapter 20:1</p> <p>Chapter 21:1 Chapter 21:2</p> <p>Chapter 22:1 Chapter 22:2 Chapter 22:3</p> <p>Chapter 23:1 Chapter 23:2 Chapter 22:3</p>

