



Course Title: Chemistry	Semester: Fall
Teacher Name:	School Year:



## Course Overview

[Insert a brief overview of the course, description of the course, and if course ends in a regent]

Unit	Essential Question	Content Goals	Skill Goals	NYS Standards	Supports for Special Education and ENL	Formative and Summative assessments
Unit 1: Matter, States, and Properties	<i>What makes matter, and how do we classify and describe its different forms?</i>	<ul style="list-style-type: none"> <li>Define matter, elements, compounds, mixtures (homogeneous vs heterogeneous)</li> <li>Distinguish physical vs chemical properties</li> <li>Understand density, mass, volume, and how to compute or measure them</li> <li>Describe kinetic molecular theory / particle model of gases, liquids, solids</li> </ul>	<ul style="list-style-type: none"> <li>Use models (particle diagrams) to represent states of matter</li> <li>Analyze and interpret data (e.g. measuring densities, constructing graphs of temperature vs time during heating)</li> <li>Make observations and classify samples of matter</li> <li>Plan and carry out investigations (e.g.</li> </ul>	HS-PS1	Use visual models, manipulatives Provide step-by-step activities and vocabulary supports.	Formative: exit tickets, exams, quiz, regent-based assessments

		<ul style="list-style-type: none"> <li>Explain phase changes, vapor pressure, melting point, boiling point</li> </ul>	<p>find density of unknown solids/liquids)</p> <ul style="list-style-type: none"> <li>Use proportional reasoning in converting units (mass, volume)</li> </ul>			
<b>Unit 2: Atomic Structure &amp; the Periodic Table</b>	<i>How does the structure of an atom determine its properties and placement on the periodic table?</i>	<ul style="list-style-type: none"> <li>Describe subatomic particles (protons, neutrons, electrons), atomic number, mass number, isotopes</li> <li>Use models (Bohr, quantum mechanical) to represent electron configuration</li> <li>Interpret and write electron configurations, orbital diagrams</li> <li>Understand periodic table layout: groups, periods, metals/nonmetals, metalloids</li> <li>Explain periodic trends: atomic radius, ionization energy, electronegativity, electron affinity</li> </ul>	<ul style="list-style-type: none"> <li>Develop models (atomic models) to represent electron arrangements</li> <li>Use the periodic table as a tool to predict properties/trends</li> <li>Analyze patterns (e.g. trend in atomic radius vs group/period)</li> <li>Interpret data (e.g. ionization energies) and support claims</li> <li>Engage in argument from evidence (e.g. justify assigned electron configuration)</li> </ul>	HS-PS1-1	Use visual models, manipulatives Provide step-by-step activities and vocabulary supports.	Formative: exit tickets, exams, quiz, regent-based assessments

<b>Unit 3: Bonding, Molecular Geometry, &amp; Intermolecular Forces</b>	<i>Why do atoms combine, and how does their bonding affect the structure and behavior of substances?</i>	<ul style="list-style-type: none"> <li>• Ionic bonding: formation, lattice energy, properties of ionic compounds</li> <li>• Covalent bonding: Lewis structures, bonding/nonbonding pairs, resonance, multiple bonds</li> <li>• Metallic bonding basics</li> <li>• Molecular geometry, VSEPR theory, polarity</li> <li>• Intermolecular forces: van der Waals (London dispersion, dipole-dipole), hydrogen bonding</li> <li>• Relate intermolecular forces to properties: boiling point, melting point, viscosity, solubility</li> </ul>	<ul style="list-style-type: none"> <li>• Construct Lewis structures, predict molecular geometry</li> <li>• Use models of molecules to reason about polarity and molecular shape</li> <li>• Analyze data to correlate boiling/melting points to intermolecular forces</li> <li>• Develop explanations / arguments linking structure to macroscopic properties</li> <li>• Compare and contrast bonding types</li> </ul>	HS-PS1-1 HS-PS1-3	Use visual models, manipulatives Provide step-by-step activities and vocabulary supports.	Formative: exit tickets, exams, quiz, regent-based assessments
<b>Unit 4: Chemical Reactions &amp; Stoichiometry</b>	<i>How do we represent, predict, and quantify the outcomes of chemical changes?</i>	<ul style="list-style-type: none"> <li>• Write and balance chemical equations (synthesis, decomposition, single/double replacement, combustion)</li> <li>• Types of chemical reactions</li> </ul>	<ul style="list-style-type: none"> <li>• Use mathematical reasoning to convert among units (grams, moles, particles)</li> <li>• Plan investigations (e.g. determine yield in lab)</li> </ul>	HS-PS1-3, HS-PS1-4HS-PS1-6	Use visual models, manipulatives Provide step-by-step activities and vocabulary supports.	Formative: exit tickets, exams, quiz, regent-based assessments

		<ul style="list-style-type: none"> <li>• Concept of mole, Avogadro's number, molar mass</li> <li>• Conversions: mass <math>\leftrightarrow</math> moles <math>\leftrightarrow</math> particles</li> <li>• Stoichiometric calculations (limiting reagent, percent yield)</li> <li>• Empirical and molecular formula determination</li> </ul>	<ul style="list-style-type: none"> <li>• Analyze and interpret calculation data</li> <li>• Use models/diagrams to represent reactants/products</li> <li>• Communicate reasoning in short answer / multi-step problems</li> </ul>			
<b>Unit 5: Thermochemistry / Energy in Chemical Processes</b>	<i>How is energy involved in chemical and physical changes, and how can we measure</i>	<ul style="list-style-type: none"> <li>• Define and distinguish endothermic vs exothermic</li> <li>• Bond energy, Hess's Law concepts (qualitative)</li> <li>• Calorimetry basics (<math>q = m \cdot c \cdot \Delta T</math>)</li> <li>• Interpret energy diagrams (activation energy, reaction coordinate diagrams)</li> <li>• Enthalpy, entropy (qualitative)</li> </ul>	<ul style="list-style-type: none"> <li>• Perform calorimetry experiments, analyze temperature change data</li> <li>• Use models/diagrams to represent energy changes</li> <li>• Plan experiments to measure heat of reaction</li> <li>• Interpret and explain energy diagrams</li> <li>• Connect microscopic (bonding) changes with macroscopic energy transfer</li> </ul>	HS-PS1-6	Use visual models, manipulatives Provide step-by-step activities and vocabulary supports.	Formative: exit tickets, exams, quiz, regent-based assessments

<b>Unit 6: Kinetics &amp; Chemical Equilibrium</b>	<i>What determines how fast reactions occur and whether they reach a balance?</i>	<ul style="list-style-type: none"> <li>• Reaction rate, rate law qualitative, activation energy, catalysts</li> <li>• Collision theory</li> <li>• Dynamic equilibrium in reversible reactions</li> <li>• Le Chatelier's Principle: response to changes in concentration, pressure, temperature</li> <li>• Equilibrium constant (K, qualitative interpretations)</li> </ul>	<ul style="list-style-type: none"> <li>• Collect and interpret experimental rate data</li> <li>• Use models to represent equilibrium and shifting systems</li> <li>• Analyze perturbations (stress) and predict responses</li> <li>• Use reasoning to relate microscopic processes (collision frequency) to macroscopic rate changes</li> <li>• Explain equilibrium shifts using Le Chatelier's principle</li> </ul>	HS-PS1-6 HS-PS1-5	Use visual models, manipulatives Provide step-by-step activities and vocabulary supports.	Formative: exit tickets, exams, quiz, regent-based assessments
<b>Unit 7: Acids, Bases, &amp; Solutions</b>	<i>What makes a solution acidic or basic, and how does that affect chemical behavior?</i>	<ul style="list-style-type: none"> <li>• Arrhenius and Brønsted-Lowry definitions of acids / bases</li> <li>• Properties of acids and bases (conductivity, neutralization, indicators)</li> <li>• Concentration (molarity), pH, pOH,</li> </ul>	<ul style="list-style-type: none"> <li>• Plan and carry out acid-base titration lab</li> <li>• Calculate pH from concentration (when applicable)</li> <li>• Use indicators, interpret titration curves</li> <li>• Use models to represent acid-base behavior</li> </ul>	HS-PS1 series	Use visual models, manipulatives Provide step-by-step activities and vocabulary supports.	Formative: exit tickets, exams, quiz, regent-based assessments

		<p>[H<sup>+</sup>] and [OH<sup>-</sup>] relationships</p> <ul style="list-style-type: none"> <li>• Acid-base reactions and neutralization</li> <li>• Titration concepts, equivalence point, titration curve (qualitative)</li> </ul>	<ul style="list-style-type: none"> <li>• Analyze data from experiments (e.g. titration)</li> </ul>			
<b>Unit 8: Redox &amp; Electrochemistry</b>	<i>How does the movement of electrons drive chemical changes and generate electricity?</i>	<ul style="list-style-type: none"> <li>• Assign oxidation states, identify redox reactions</li> <li>• Write half-reactions, balance redox reactions</li> <li>• Types of electrochemical cells: galvanic (voltaic) vs electrolytic</li> <li>• Cell notation, E° (qualitative), cell potentials (qualitative)</li> <li>• Applications: batteries, electrolysis</li> </ul>	<ul style="list-style-type: none"> <li>• Develop and use models of electron transfer (half-reactions)</li> <li>• Plan and conduct an electrochemistry lab (e.g. voltaic cell)</li> <li>• Analyze data (voltage, current) and relate to theory</li> <li>• Use reasoning to connect redox concepts to real-world applications</li> <li>• Communicate reasoning in structured responses</li> </ul>	HS-PS1 series	Use visual models, manipulatives Provide step-by-step activities and vocabulary supports.	Formative: exit tickets, exams, quiz, regent-based assessments
<b>Unit 9: Organic Chemistry &amp; Applications (optional / lighter treatment)</b>	<i>What makes carbon uniquely suited to form the molecules of life and modern materials?</i>	<ul style="list-style-type: none"> <li>• Basic hydrocarbon structures (alkanes, alkenes, alkynes, aromatics)</li> </ul>	<ul style="list-style-type: none"> <li>• Use structural models / diagrams (line, skeletal)</li> </ul>	HS-PS1		

		<ul style="list-style-type: none"> <li>• Functional groups: alcohols, carboxylic acids, esters, amines (overview)</li> <li>• Isomerism (structural, geometric)</li> <li>• Simple reactions (e.g. combustion, substitution)</li> <li>• Real-world applications: plastics, fuels, biomolecules (qualitative)</li> </ul>	<ul style="list-style-type: none"> <li>• Classify molecules by functional group</li> <li>• Relate structure to observable properties</li> <li>• Read and interpret organic reaction schemes (qualitatively)</li> <li>• Connect organic concepts to broader scientific issues or applications</li> </ul>			
<b>Unit 10: Nuclear Chemistry &amp; Radioactivity</b>	<i>How do changes in the nucleus of an atom release energy and impact the world around us?</i>	<ul style="list-style-type: none"> <li>• Types of decay: alpha, beta, gamma, positron</li> <li>• Half-life, decay series</li> <li>• Simple qualitative models for fission and fusion</li> <li>• Energy release in nuclear processes</li> <li>• Applications (medical, energy, safety)</li> </ul>	<ul style="list-style-type: none"> <li>• Use models to represent decay and nuclear reactions</li> <li>• Calculate half-life qualitatively or (if included) quantitatively</li> <li>• Interpret charts of decay series</li> <li>• Evaluate benefits and risks of nuclear technology</li> <li>• Communicate reasoning and connect nuclear chemistry to broader contexts</li> </ul>	HS-PS1	Use visual models, manipulatives Provide step-by-step activities and vocabulary supports.	Formative: exit tickets, exams, quiz, regent-based assessments

