

**Curriculum Development Course at a Glance  
Planning for High School Science**

Content Area	Science	Grade Level	High School
Course Name/Course Code	Chemistry		
Standard	Grade Level Expectations (GLE)	GLE Code	
1. Physical Science	1. Newton’s laws of motion and gravitation describe the relationships among forces acting on and between objects, their masses, and changes in their motion – but have limitations	SC09-GR.HS-S.1-GLE.1	
	2. Matter has definite structure that determines characteristic physical and chemical properties	SC09-GR.HS-S.1-GLE.2	
	3. Matter can change form through chemical or nuclear reactions abiding by the laws of conservation of mass and energy	SC09-GR.HS-S.1-GLE.3	
	4. Atoms bond in different ways to form molecules and compounds that have definite properties	SC09-GR.HS-S.1-GLE.4	
	5. Energy exists in many forms such as mechanical, chemical, electrical, radiant, thermal, and nuclear, that can be quantified and experimentally determined	SC09-GR.HS-S.1-GLE.5	
	6. When energy changes form, it is neither created not destroyed; however, because some is necessarily lost as heat, the amount of energy available to do work decreases	SC09-GR.HS-S.1-GLE.6	
2. Life Science	1. Matter tends to be cycled within an ecosystem, while energy is transformed and eventually exits an ecosystem	SC09-GR.HS-S.2-GLE.1	
	2. The size and persistence of populations depend on their interactions with each other and on the abiotic factors in an ecosystem	SC09-GR.HS-S.2-GLE.2	
	3. Cellular metabolic activities are carried out by biomolecules produced by organisms	SC09-GR.HS-S.2-GLE.3	
	4. The energy for life primarily derives from the interrelated processes of photosynthesis and cellular respiration. Photosynthesis transforms the sun’s light energy into the chemical energy of molecular bonds. Cellular respiration allows cells to utilize chemical energy when these bonds are broken.	SC09-GR.HS-S.2-GLE.4	
	5. Cells use the passive and active transport of substances across membranes to maintain relatively stable intracellular environments	SC09-GR.HS-S.2-GLE.5	
	6. Cells, tissues, organs, and organ systems maintain relatively stable internal environments, even in the face of changing external environments	SC09-GR.HS-S.2-GLE.6	
	7. Physical and behavioral characteristics of an organism are influenced to varying degrees by heritable genes, many of which encode instructions for the production of proteins	SC09-GR.HS-S.2-GLE.7	
	8. Multicellularity makes possible a division of labor at the cellular level through the expression of select genes, but not the entire genome	SC09-GR.HS-S.2-GLE.8	
	9. Evolution occurs as the heritable characteristics of populations change across generations and can lead populations to become better adapted to their environment	SC09-GR.HS-S.2-GLE.9	

**Curriculum Development Course at a Glance  
Planning for High School Science**

3. Earth Systems Science	1. The history of the universe, solar system and Earth can be inferred from evidence left from past events	SC09-GR.HS-S.3-GLE.1
	2. As part of the solar system, Earth interacts with various extraterrestrial forces and energies such as gravity, solar phenomena, electromagnetic radiation, and impact events that influence the planet's geosphere, atmosphere, and biosphere in a variety of ways	SC09-GR.HS-S.3-GLE.2
	3. The theory of plate tectonics helps to explain geological, physical, and geographical features of Earth	SC09-GR.HS-S.3-GLE.3
	4. Climate is the result of energy transfer among interactions of the atmosphere, hydrosphere, geosphere, and biosphere	SC09-GR.HS-S.3-GLE.4
	5. There are costs, benefits, and consequences of exploration, development, and consumption of renewable and nonrenewable resources	SC09-GR.HS-S.3-GLE.5
	6. The interaction of Earth's surface with water, air, gravity, and biological activity causes physical and chemical changes	SC09-GR.HS-S.3-GLE.6
	7. Natural hazards have local, national and global impacts such as volcanoes, earthquakes, tsunamis, hurricanes, and thunderstorms	SC09-GR.HS-S.3-GLE.7

**Colorado 21<sup>st</sup> Century Skills**

**Critical Thinking and Reasoning:** *Thinking Deeply, Thinking Differently*

**Information Literacy:** *Untangling the Web*

**Collaboration:** *Working Together, Learning Together*

**Self-Direction:** *Own Your Learning*

**Invention:** *Creating Solutions*

**Reading & Writing Standards for Literacy  
in Science and Technical Subjects 6 - 12**

**Reading Standards**

- Key Ideas & Details
- Craft And Structure
- Integration of Knowledge and Ideas
- Range of Reading and Levels of Text Complexity

**Writing Standards**

- Text Types & Purposes
- Production and Distribution of Writing
- Research to Construct and Present Knowledge
- Range of Writing

Unit Titles	Length of Unit/Contact Hours	Unit Number/Sequence
Structure and Properties of Matter	Teacher's discretion	1
Chemical Bonding	Teacher's discretion	2
Reactions of Matter (Chemical Reactions)	Teacher's discretion	3
Energy and Matter	Teacher's discretion	4

**Curriculum Development Overview  
Unit Planning for High School Science**

<b>Unit Title</b>	Structure and Properties of Matter		<b>Length of Unit</b>	Teacher's discretion
<b>Focusing Lens(es)</b>	Structure/Function Patterns	<b>Standards and Grade Level Expectations Addressed in this Unit</b>	SC09-GR.HS-S.1-GLE.2	
<b>Inquiry Questions (Engaging-Debatable):</b>	<ul style="list-style-type: none"> <li>• How is chemical engineering beneficial in finding patterns that benefit society?</li> <li>• What are the benefits and risks associated with chemical research?</li> </ul>			
<b>Unit Strands</b>	Physical Science			
<b>Concepts</b>	Atoms, Matter, Structure, Models, Trends/Patterns, Properties, Changes, Classification			

<b>Generalizations</b> My students will <b>Understand</b> that...	<b>Guiding Questions</b>	
	<b>Factual</b>	<b>Conceptual</b>
Atomic structure explains properties of matter, which determines useful applications. (SC09-GR.HS-S.1-GLE.2;RA.1)	How does atomic structure affect the properties of matter? (SC09-GR.HS-S.1-GLE.2-EO.a,b,c,d) How are metalloids and semiconductors useful electronic applications?	What makes elements useful?
Properties of matter follow specific trends/patterns based upon atomic structure (SC09-GR.HS-S.1-GLE.2-EO.b,c)	What patterns can be observed in the properties of elements and families in the periodic table?	Why are elements organized for study?
The unique properties of nanoscale particles provide special benefits and embody specific dangers (SC09-GR.HS-S.1-GLE.2-EO.a;RA.4)	What properties do nanoscale particles have that are different than those of macro scale samples of the same substance? (SC09-GR.HS-S.1-GLE.2;IQ.2)	What benefits and dangers are associated with matter? (SC09-GR.HS-S.1-GLE.2;RA.3,4)
The model and understanding of the atom changes with new research and technologies. (SC09-GR.HS-S.1-GLE.2;N.1)	How has our understanding of the atomic model changed over time? (SC09-GR.HS-S.1-GLE.2-EO.a;N.1)	How have advances in technology changed our understanding of the world around us?
The classification of matter changes depending on its structure and composition. (SC09-GR.HS-S.1-GLE.2-EO.d)	How is matter classified?	How might various industries use classification of matter in the development and utilization of materials? (SC09-GR.HS-S.1-GLE.2-EO.d; RA.1,2,3)

**Curriculum Development Overview  
Unit Planning for High School Science**

<b>Critical Content:</b> <b>My students will Know...</b>	<b>Key Skills:</b> <b>My students will be able to (Do)...</b>
<ul style="list-style-type: none"> <li>• The changes to the atomic model that have occurred over time as more sophisticated technologies have led to new evidence (SC09-GR.HS-S.1-GLE.2;N.1)</li> <li>• The current model of an atom (SC09-GR.HS-S.1-GLE.2-EO.a)</li> <li>• Chemical and physical properties of elements: density, melting point, boiling point, and conductivity (SC09-GR.HS-S.1-GLE.2-EO.b)</li> <li>• Elements' positions on the periodic table and how it indicates chemical and physical properties (SC09-GR.HS-S.1-GLE.2-EO.c)</li> <li>• Groups of elements (families) on the periodic table (alkali metals, alkaline earth metals, halogens, and noble gases) (SC09-GR.HS-S.1-GLE.2-EO.c; IQ.1)</li> <li>• The differences between atoms, molecules, elements, compounds, pure substances, and mixtures (SC09-GR.HS-S.1-GLE.2-EO.d)</li> <li>• Properties of compounds (both chemical and physical) different from the elements that compose them. (SC09-GR.HS-S.1-GLE.4-EO.b)</li> <li>• The subatomic particles that compose atoms (protons, neutrons, and electrons) which have distinct properties that determine the properties of the atom (SC09-GR.HS-S.1-GLE.2-EO.a)</li> <li>• That not all atoms of an element are identical (isotopes and ions) (SC09-GR.HS-S.1-GLE.2-EO.a)</li> </ul>	<ul style="list-style-type: none"> <li>• Develop, communicate, and justify an evidence-based scientific explanation supporting the current model of an atom. (SC09-GR.HS-S1-GLE.2-EO.a)</li> <li>• Gather, analyze, and interpret data on chemical and physical properties of elements such as density, melting point, boiling point, and conductivity. (SC09-GR.HS-S1-GLE.2-EO.b)</li> <li>• Gather, analyze, and interpret data on chemical and physical properties of different compounds such as density, melting point, boiling point, pH, and conductivity (SC09-GR.HS-S1-GLE.4-EO.b)</li> <li>• Employ data-collection technology to gather, view, analyze, and interpret data about chemical and physical properties of different compounds. (SC09-GR.HS-S1-GLE.4;N2)</li> <li>• Predict chemical and physical properties of elements based upon their positions on the periodic table. (SC09-GR.HS-S1-GLE.2-EO.c)</li> <li>• Develop a model that differentiates atoms and molecules, elements and compounds, and pure substances and mixtures. (SC09-GR.HS-S1-GLE.2-EO.d)</li> <li>• Determine the number of protons, neutrons, and electrons in a given atom. (SC09-GR.HS-S1-GLE.2-EO.c)</li> <li>•</li> </ul>

<p><b>Critical Language:</b> includes the Academic and Technical vocabulary, semantics, and discourse which are particular to and necessary for accessing a given discipline.          EXAMPLE: A student in Language Arts can demonstrate the ability to apply and comprehend critical language through the following statement: <i>“Mark Twain exposes the hypocrisy of slavery through the use of satire.”</i></p>	
<p><b>A student in _____ can demonstrate the ability to apply and comprehend critical language through the following statement(s):</b></p>	<p><i>Properties of elements can be predicted by their position on the periodic table. (SC09-GR.HS-S1-GLE.2-EO.b,c)          The number and arrangement of subatomic particles determines the chemical and physical properties of an atom. (SC09-GR.HS-S1-GLE.2-EO.a)</i></p>
<p><b>Academic Vocabulary:</b></p>	<p>predict, develop, justify, communicate, analyze, gather, interpret, model, inquiry</p>
<p><b>Technical Vocabulary:</b></p>	<p>conductivity, density, macroscopic, periodic, metalloids, solution, nanoscale, semiconductor, homogeneous, heterogeneous, mixture, subatomic, chemical engineering, chemical property, physical property, chemical change, physical change, suspension, colloid</p>

**Curriculum Development Overview  
Unit Planning for High School Science**

<b>Unit Title</b>	Chemical Bonding		<b>Length of Unit</b>	Teacher's discretion
<b>Focusing Lens(es)</b>	Relationships Interactions	<b>Standards and Grade Level Expectations Addressed in this Unit</b>	SC09-GR.HS-S.1-GLE.4	
<b>Inquiry Questions (Engaging-Debatable):</b>	<ul style="list-style-type: none"> <li>How do a variety of substances we encounter every day interact and/or change?</li> </ul>			
<b>Unit Strands</b>	Physical Science			
<b>Concepts</b>	Atoms, Valence electrons, Bonding, Compounds, Structure, Models, Trends/Patterns, Properties, Changes, Classification, Technology			

<b>Generalizations</b> My students will <b>Understand</b> that...	<b>Guiding Questions</b>	
	<b>Factual</b>	<b>Conceptual</b>
The number and arrangement of valence electrons create different types of bonding. (SC09-GR.HS-S.1-GLE.4-EO.d;IQ.2)	What is the relationship between valence electrons and bonding type?	How is the structure of an atom related to the number and types of compounds it can form?
Chemical bonding results in endless variety of compounds. (SC09-GR.HS-S.1-GLE.4-EO.b)	How are compounds formed? (SC09-GR.HS-S.1-GLE.4-EO.a,d)	What is the importance of chemical bonding?
Chemical and physical properties determine a compound's identification. (SC09-GR.HS-S.1-GLE.4;RA.1;N.2)	What properties can be used to differentiate bonding types in compounds? What technologies can be used to determine molecular structure? (SC09-GR.HS-S.1-GLE.4;N.1)	How are various compounds identified? How have technologies for determining chemical and physical properties of matter changed over time? (SC09-GR.HS-S.1-GLE.4;N.1)
Periodic trends and properties of atoms, determined by the number and arrangement of valence electrons around an atom, dictate the types of compounds that elements can form. (SC09-GR.HS-S.1-GLE.4-EO.a,b,d,e)	How is the periodic table used to determine chemical bonding types? (SC09-GR.HS-S.1-GLE.4-EO.e)	Why can the periodic table be used to determine chemical bonding? (SC09-GR.HS-S.1-GLE.4-EO.e)

**Curriculum Development Overview  
Unit Planning for High School Science**

<b>Critical Content:</b> <b>My students will Know...</b>	<b>Key Skills:</b> <b>My students will be able to (Do)...</b>
<ul style="list-style-type: none"> <li>• Current models of chemical bonding (ionic, covalent, metallic) ( i.e., in ionic bonding electron are transferred between atoms of different elements; in covalent bonding electrons are shared between atoms of the same or different elements; metallic bonding is a special type of bonding among atoms of different metals) (SC09-GR.HS-S.1-GLE.4-EO.a)</li> <li>• Valence electrons are the subatomic particles actively involved in the process of chemical bonding (SC09-GR.HS-S.1-GLE.4-EO.d;IQ.2)</li> <li>• The difference between the chemical and physical properties of compounds and the properties of the elements that compose them (ex. Density, melting point, boiling point, pH, and conductivity) (SC09-GR.HS-S.1-GLE.4-EO.b)</li> <li>• Differences among ionic, polar covalent, and nonpolar covalent bonding (SC09-GR.HS-S.1-GLE.4-EO.c)</li> <li>• How bonding types can be predicted based upon the elements' positions on the periodic table (SC09-GR.HS-S.1-GLE.4-EO.e)</li> <li>• The process by which atoms become ions (SC09-GR.HS-S.1-GLE.4-EO.a)</li> </ul>	<ul style="list-style-type: none"> <li>• Develop, communicate, and justify an evidence-based explanation supporting the current models of chemical bonding (SC09-GR.HS-S.1-GLE.4-EO.a)</li> <li>• Employ data-collection technology to gather, view, analyze, and interpret data about chemical and physical properties of different compounds (SC09-GR.HS-S.1-GLE.4;N.2)</li> <li>• Classify compounds as ionic, polar covalent, or nonpolar covalent based upon their chemical and physical properties. (SC09-GR.HS-S.1-GLE.4-EO.c)</li> <li>• Explain the importance and the role of valence electrons in atomic (chemical) bonding. (SC09-GR.HS-S.1-GLE.4-EO.d;IQ.2)</li> <li>• Predict the type of bonding that will occur among elements based on their position on the periodic table. (SC09-GR.HS-S.1-GLE.4-EO.e)</li> <li>• Write formulas for chemical compounds (ionic and molecular) (SC09-GR.HS-S.1-GLE.4-EO.c; IQ.1)</li> <li>•</li> </ul>

<p><b>Critical Language:</b> includes the Academic and Technical vocabulary, semantics, and discourse which are particular to and necessary for accessing a given discipline.          EXAMPLE: A student in Language Arts can demonstrate the ability to apply and comprehend critical language through the following statement: <i>“Mark Twain exposes the hypocrisy of slavery through the use of satire.”</i></p>	
<p><b>A student in _____ can demonstrate the ability to apply and comprehend critical language through the following statement(s):</b></p>	<p><i>Bonding occurs due to the interactions of valence electrons between atoms.          Bonding types and the resulting compounds can be determined by elements' positions on the periodic table.</i></p>
<p><b>Academic Vocabulary:</b></p>	<p>predict, develop, justify, communicate, analyze, gather, interpret, model, support, role, employ, explain, describe, transfer</p>
<p><b>Technical Vocabulary:</b></p>	<p>chemical bonding, valence electrons, ion, ionic bond, covalent bond, polar covalent, nonpolar covalent, pH, matter,</p>

**Curriculum Development Overview  
Unit Planning for High School Science**

<b>Unit Title</b>	Chemical Reactions		<b>Length of Unit</b>	Teacher's discretion
<b>Focusing Lens(es)</b>	Transformation Patterns	<b>Standards and Grade Level Expectations Addressed in this Unit</b>	SC09-GR.HS-S.1-GLE.3	
<b>Inquiry Questions (Engaging-Debatable):</b>	<ul style="list-style-type: none"> <li>• If matter can't be created or destroyed, why are we running out of resources? (SC09-GR.HS-S.1-GLE.3-EO.d)</li> <li>• Why are compounds limited in living systems? (SC09-GR.HS-S.1-GLE.3-EO.c,d)</li> <li>• How are medicines related to chemical reactions? (SC09-GR.HS-S.1-GLE.3-EO.a,b,c)</li> <li>• What are positive and negative effects of chemical reactions? (SC09-GR.HS-S.1-GLE.3;RA.1,2)</li> </ul>			
<b>Unit Strands</b>	Physical Science			
<b>Concepts</b>	Reactions, Equations, Quantities, Mass, Conservation, Classification, Prediction			

<b>Generalizations</b> My students will <b>Understand</b> that...	<b>Guiding Questions</b>	
	Factual	Conceptual
Chemical reactions conserve mass as matter is neither created nor destroyed. (SC09-GR.HS-S.1-GLE.3-EO.d)	How is the law of conservation of mass/matter related to chemical reactions?	Why is the mass of products equal to the mass of reactants?
Products of chemical reactions follow predictable patterns based on classification (reaction type). (SC09-GR.HS-S.1-GLE.3-EO.a,b)	What are the differences among various reaction types? (SC09-GR.HS-S.1-GLE.3-EO.a)	What patterns of chemical reactions exist?
Balanced chemical equations illustrate the relationships between quantities of products and reactants. (SC09-GR.HS-S.1-GLE.3-EO.a,c,d)	How are amounts of products and/or reactants calculated from a balanced chemical equation? (SC09-GR.HS-S.1-GLE.3-EO.a,c)	How are chemical reactions used to maximize production in manufacturing? (SC09-GR.HS-S.1-GLE.3-EO.c)

**Curriculum Development Overview  
Unit Planning for High School Science**

<b>Critical Content:</b> <b>My students will Know...</b>	<b>Key Skills:</b> <b>My students will be able to (Do)...</b>
<ul style="list-style-type: none"> <li>• Why mass/matter is neither created nor destroyed in chemical reactions(SC09-GR.HS-S.1-GLE.3-EO.d)</li> <li>• Law of conservation of mass/matter)) (SC09-GR.HS-S.1-GLE.3-EO.c,d)</li> <li>• The difference between reactants and products in a chemical reaction (SC09-GR.HS-S.1-GLE.3-EO.a)</li> <li>• Characteristics of the main types of chemical reactions, including synthesis, decomposition, single-replacement, double-replacement, and combustion reactions (SC09-GR.HS-S.1-GLE.3-EO.a)</li> <li>• How reactants and products can be predicted based on the type of reaction (SC09-GR.HS-S.1-GLE.3-EO.b)</li> <li>• The connections between the amount(s) of product(s) produced and the amount(s) of reactant(s) involved in the reaction (SC09-GR.HS-S.1-GLE.3-EO.c)</li> <li>• Mole as a unit in chemistry that represents the amount of matter (SC09-GR.HS-S.1-GLE.3-EO.c)</li> <li>• The mole is equal to <math>6.02 \times 10^{23}</math> representative particles of matter (atoms, molecules, formula units, ions, etc.) (SC09-GR.HS-S.1-GLE.3-EO.c)</li> <li>• The role/effects of the limiting reactant in a chemical equation (SC09-GR.HS-S.1-GLE.3-EO.c)</li> </ul>	<ul style="list-style-type: none"> <li>• Calculate the amount(s) of reactant(s) and product(s) based on information given, using the law of conservation of mass (SC09-GR.HS-S.1-GLE.3-EO.c,d)</li> <li>• Write and balance a chemical equation to illustrate the law of conservation of mass / matter (SC09-GR.HS-S.1-GLE.3-EO.c,d)</li> <li>• Identify the reactant(s) and product(s) in a given chemical reaction (SC09-GR.HS-S.1-GLE.3-EO.a)</li> <li>• Identify reaction type based upon the reactant(s) given (SC09-GR.HS-S.1-GLE.3-EO.a,b)</li> <li>• Predict reactant(s) and product(s) for different types of chemical reactions (SC09-GR.HS-S.1-GLE.3-EO.b)</li> <li>• Analyze a balanced chemical equation and use the information to write mole ratios from the equation (SC09-GR.HS-S.1-GLE.3-EO.a)</li> <li>• Use mole ratios to determine relationships between substances in a chemical equation (SC09-GR.HS-S.1-GLE.3-EO.a)</li> <li>• Use the various stoichiometric calculations (mole-mole, mole-mass, mass-mole, mass-mass) to determine amounts of reactants and products in ideal stoichiometric calculations (SC09-GR.HS-S.1-GLE.3-EO.c)</li> <li>• Determine the limiting reactant of a chemical reaction, given appropriate data (SC09-GR.HS-S.1-GLE.3-EO.c)</li> <li>• Use an inquiry approach to test predictions about chemical reactions (i.e. titrations, activity series of metals and halogens, neutralization reactions, etc.) (SC09-GR.HS-S.1-GLE.3;N.3)</li> </ul>

**Critical Language:** includes the Academic and Technical vocabulary, semantics, and discourse which are particular to and necessary for accessing a given discipline.  
 EXAMPLE: A student in Language Arts can demonstrate the ability to apply and comprehend critical language through the following statement: *“Mark Twain exposes the hypocrisy of slavery through the use of satire.”*

<b>A student in _____ can demonstrate the ability to apply and comprehend critical language through the following statement(s):</b>	<i>A balanced chemical equation can be used to determine the amount(s) of reactant(s) and product(s).          The limiting reactant of a chemical equation determines how much product is formed.          Identifying the type of reaction can be determined by analysis of the reactant(s) and/or product(s).</i>
---	--

<b>Academic Vocabulary:</b>	inquiry, predict, develop, justify, communicate, analyze, gather, interpret, model, recognize, balance, calculate
-----------------------------	---

<b>Technical Vocabulary:</b>	law of conservation of mass / matter, reactant, product, synthesis, decomposition, single-replacement, double-replacement, mole, activity series, neutralization, percent yield, theoretical yield, actual yield, limiting reactant, mole ratio, stoichiometry, balanced chemical equation, chemical equation, chemical reaction, combustion
------------------------------	--

**Curriculum Development Overview  
Unit Planning for High School Science**

<b>Unit Title</b>	Matter and Energy		<b>Length of Unit</b>	Teacher's discretion
<b>Focusing Lens(es)</b>	Interdependence System	<b>Standards and Grade Level Expectations Addressed in this Unit</b>	SC09-GR.HS-S.1-GLE.2 SC09-GR.HS-S.1-GLE.3 SC09-GR.HS-S.1-GLE.5 SC09-GR.HS-S.1-GLE.6	
<b>Inquiry Questions (Engaging-Debatable):</b>	<ul style="list-style-type: none"> <li>How is energy involved in living systems and in Earth systems? (SC09-GR.HS-S.1-GLE.5;RA.1,2,5)</li> <li>If energy is conserved, why is 100% efficiency impossible to achieve? (SC09-GR.HS-S.1-GLE.6;IQ.1,3)</li> </ul>			
<b>Unit Strands</b>	Physical Science			
<b>Concepts</b>	Energy, Transformation, Transfer, Conservation, Radiation, Quantification			

<b>Generalizations</b> My students will <b>Understand</b> that...	<b>Guiding Questions</b>	
	Factual	Conceptual
Radiation, as a form of energy, has both benefits and risks for living organisms. (SC09-GR.HS-S.1-GLE.3;RA.3)	How is a nuclear reaction different from a chemical reaction? (SC09-GR.HS-S.1-GLE.3-EO.a;IQ.2)	Why are some forms of radiation harmful to living organisms? (SC09-GR.HS-S.1-GLE.3;RA.3) and (SC09-GR.HS-S.1-GLE.2;RA.4;IQ.2)
Energy transforms during chemical reactions allowing most of that energy to be available to do work and some lost as heat. (SC09-GR.HS-S.1-GLE.6-EO.a,c)	How is energy quantified in a chemical reaction? (SC09-GR.HS-S.1-GLE.6-EO.c)	How is energy obtained from chemicals? (SC09-GR.HS-S.1-GLE.6-EO.b,c) What are some ways in which energy is obtained? (SC09-GR.HS-S.1-GLE.6-EO.b)
Energy assumes many forms due to its ability to be transformed and transferred. (SC09-GR.HS-S.1-GLE.6-EO.a,b,c)	What are the various forms that energy can take? (SC09-GR.HS-S.1-GLE.5-EO.c,d)	What makes some forms of energy hard to measure? (SC09-GR.HS-S.1-GLE.5;IQ.4)

**Curriculum Development Overview  
Unit Planning for High School Science**

<b>Critical Content:</b> <b>My students will Know...</b>	<b>Key Skills:</b> <b>My students will be able to (Do)...</b>
<ul style="list-style-type: none"> <li>• The differences between nuclear and chemical reactions (SC09-GR.HS-S.1-GLE.5-EO.d)</li> <li>• Various forms of electromagnetic radiation (x-rays, ultraviolet, alpha particles, beta particles, gamma particles, infrared, etc.) (SC09-GR.HS-S.1-GLE.2;RA.4;IQ.2)</li> <li>• The benefits and dangers associated with radioactive substances (SC09-GR.HS-S.1-GLE.3;RA.3)</li> <li>• That energy transformations exist in chemical reactions (SC09-GR.HS-S.1-GLE.6-EO.c)</li> <li>• The law of conservation of energy (SC09-GR.HS-S.1-GLE.3-EO.d) (SC09-GR.HS-S.1-GLE.6-EO.e)</li> <li>• Differences between renewable and nonrenewable energy sources (SC09-GR.HS-S.1-GLE.5;IQ.3)</li> <li>• The difference between exothermic and endothermic chemical reactions (SC09-GR.HS-S.1-GLE.6-EO.c)</li> <li>• The difference between entropy and enthalpy (SC09-GR.HS-S.1-GLE.6-EO.a,b; IQ.3)</li> <li>• How chemical energy is stored in chemical bonds, and released when bonds are broken (SC09-GR.HS-S.1-GLE.4-EO.a,c)</li> </ul>	<ul style="list-style-type: none"> <li>• Identify benefits and dangers associated with nanoscale properties (SC09-GR.HS-S.1-GLE.2-RA.4-IQ.2) (SC09-GR.HS-S.1-GLE.3-RA.3)</li> <li>• Differentiate between kinetic and potential energy in chemical systems (SC09-GR.HS-S.1-GLE.5-EO.a)</li> <li>• Identify different energy forms (kinetic, potential, chemical, nuclear, thermal) (SC09-GR.HS-S.1-GLE.5-EO.d)</li> <li>• Calculate bond energy between atoms (SC09-GR.HS-S.1-GLE.6-EO.c)</li> <li>• Calculate free energy in a chemical reaction (SC09-GR.HS-S.1-GLE.6-EO.c)</li> <li>• Convert among units of temperature (Celsius, Kelvin, Fahrenheit) (SC09-GR.HS-S.1-GLE.3-EO.c)</li> <li>• Explain the movement of heat in a system (SC09-GR.HS-S.1-GLE.6-EO.b.e)</li> <li>• Explain different types of energy transformation (SC09-GR.HS-S.1-GLE.6-EO.c)</li> <li>• Explain advantages and disadvantages to using various energy sources (ex. Gasoline, diesel, ethanol, hydrogen, and electricity as a transportation fuel) (SC09-GR.HS-S.1-GLE.5;RA.3)</li> </ul>

**Critical Language:** includes the Academic and Technical vocabulary, semantics, and discourse which are particular to and necessary for accessing a given discipline.  
 EXAMPLE: A student in Language Arts can demonstrate the ability to apply and comprehend critical language through the following statement: *“Mark Twain exposes the hypocrisy of slavery through the use of satire.”*

<b>A student in _____ can demonstrate the ability to apply and comprehend critical language through the following statement(s):</b>	<i>Energy is stored in chemical bonds, and is released when chemical bonds are broken.          There are various forms of energy, and there are advantages and disadvantages of each.          Energy cannot be created or destroyed, however, it can be transformed and can move from place to place.</i>
<b>Academic Vocabulary:</b>	identify, differentiate, calculate, convert, explain
<b>Technical Vocabulary:</b>	electromagnetic radiation, entropy, enthalpy, renewable, nonrenewable, heat, temperature, conservation, transformation, conservation of energy, nanoscale, kinetic energy, potential energy, radioactivity, alpha, beta, gamma, infrared, endothermic, exothermic, free energy, Celsius, Fahrenheit, Kelvin