

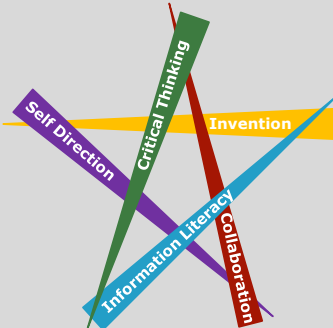
**Curriculum Development Course at a Glance  
Planning for High School Science**

Content Area	Science	Grade Level	High School
Course Name/Course Code	Biology		
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 nor 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  
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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
Population Ecology	5-6 weeks	1
Matter and Energy in an Ecosystem	5-6 weeks	2
Homeostasis	5-6 weeks	3
Genetics and Heredity	5-6 weeks	4
Change Over Time	5-6 weeks	5

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

<b>Unit Title</b>	Population Ecology		<b>Length of Unit</b>	5-6 weeks
<b>Focusing Lens(es)</b>	Interdependence	<b>Standards and Grade Level Expectations Addressed in this Unit</b>	SC09-GR.HS-S.2-GLE.1 SC09-GR.HS-S.2-GLE.2 SC09-GR.HS-S.1-GLE.3	
<b>Inquiry Questions (Engaging-Debatable):</b>	<ul style="list-style-type: none"> <li>• How is life dependent on death?</li> <li>• Which has more human impact on the environment, vegetarianism or omnivory?</li> <li>• How are humans positively or negatively impacting the biosphere?</li> <li>• How are natural systems such as wetlands both similar and different than human-managed systems such as waste water treatment plants? (SC09-GR.HS-S.2-GLE.1;RA.2)</li> </ul>			
<b>Unit Strands</b>	Life Science			
<b>Concepts</b>	Ecosystem, Interactions, Change, Equilibrium, Energy, Populations, Balance, Sustainability, Biotic, Abiotic, Adaptation, Cycles			

<b>Generalizations</b> My students will <b>Understand</b> that...	<b>Guiding Questions</b>	
	<b>Factual</b>	<b>Conceptual</b>
Populations are interdependent and fluctuate within an ecosystem due to available resources (SC09-GR.HS-S.2-GLE.2-EO.c)	<p>What resources are needed for populations to be successful? (SC09-GR.HS-S.2-GLE.2-EO.c; IQ.2; RA.1)</p> <p>What are the differences between carrying capacity, limiting factors and growth models? (SC09-GR.HS-S.2-GLE.2-EO.c; IQ.2; RA.1)</p>	<p>How do resources impact populations? (SC09-GR.HS-S.2-GLE.2-EO.c; IQ.2; RA.1)</p> <p>How do the different forms of population dynamics differ in ecosystems? (SC09-GR.HS-S.2-GLE.2-EO.c; IQ.2; RA.1)</p>
Interdependence between organisms depends on energy and its transformation and conservation for survival. (SC09-GR.HS-S.2-GLE.1-EO.a, f)	<p>Why must an ecosystem have autotrophs? (SC09-GR.HS-S.2-GLE.1-EO.a; IQ.2)</p> <p>Why are there more autotrophs than heterotrophs? (SC09-GR.HS-S.2-GLE.1-EO.a; IQ.2)</p> <p>What energy transformations occur in ecosystems? (SC09-GR.HS-S.2-GLE.1;IQ.3)</p>	<p>How does the introduction of a non-native species influence the balance of an ecosystem? (SC09-GR.HE-S.2-GLE.2;IQ.2)</p> <p>How does the elimination of a keystone species influence the balance of an ecosystem? (SC09-GR.HE-S.2-GLE.2;IQ.1)</p> <p>How does the process of burning carbon-rich fossil fuels compare to the oxidation of carbon biomolecules in cells? (SC09-GR.HS-S.2-GLE.1;RA.2)</p>
The struggle for energy and resources by populations within an ecosystem strives toward balance/equilibrium. (SC09-GR.HS-S.2-GLE.2-EO.c)	How does energy move within an ecosystem? (SC09-GR.HS-S.2-GLE.2-EO.c;IQ.2,3; RA.1)	How do populations achieve balance? (SC09-GR.HS-S.2-GLE.2-EO.c;IQ.2;RA.1)

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

<p>Sustainable ecosystems adapt to varying levels of biotic and abiotic factors (SC09-GR.HS-S.2-GLE.2-EO.c;RA.2)</p>	<p>What are biotic and abiotic factors? What is a disturbance to an ecosystem? (SC09-GR.HS-S.2-GLE.2-EO.c;IQ.2)</p>	<p>How would an ecosystem respond to an abiotic disturbance? How is the succession of local organisms altered in an area that is disturbed or destroyed? (SC09-GR.HE-S.2-GLE.2;IQ.3)) Can an ecosystem be truly sustainable? (SC09-GR.HS-S.2-GLE.2-EO.d) How does a change in abiotic factors influence the stability or progression of an ecosystem?</p>
<p>Matter cycling through ecosystems creates opportunities for renewal and survival of populations. (SC09-GR.HS-S.2-GLE.1-EO.f)</p>	<p>What are the four nutrient cycles used within ecosystems? What is the difference between matter and energy? (SC09-GR.HE-S.2-GLE.1-EO.e)</p>	<p>What happens when the cycling of matter in ecosystems is disrupted? (SC09-GR.HS-S.2-GLE.1;IQ.2;RA.1)</p>

<p><b>Critical Content:</b> My students will <b>Know</b>...</p>	<p><b>Key Skills:</b> My students will be able to <b>(Do)</b>...</p>
<ul style="list-style-type: none"> <li>• Biotic and Abiotic factors (SC09-GR.HS-S.2-GLE.2)</li> <li>• Levels of organization of the biosphere (ecosystem, community, population...) SC09-GR.HS-S.2-GLE.2)</li> <li>• Trophic levels of energy flows (energy pyramid, food webs, etc.) (SC09-GR.HS-S.2-GLE.1-EO.a,g)</li> <li>• Disturbances and succession (SC09-GR.HS-S.2-GLE.2-EO.a,b)</li> <li>• Ecosystem interactions (SC09-GR.HS-S.2-GLE.2-EO.d)</li> <li>• Human impact on ecosystems (SC09-GR.HS-S.2-GLE.2-EO.a,c)</li> <li>• Population dynamics (carrying capacity, limiting factors, growth models...) (SC09-GR.HS-S.2-GLE.2)</li> <li>• The difference between matter and energy and how they are cycled or lost through life processes (SC09-GR.HE-S.2-GLE.1-EO.e)</li> <li>• Potential ecological impacts of a plant-based or meat-based diet (SC09-GR.HS-S.2-GLE.2-EO.b)</li> <li>• The law of conservation of matter and energy (SC09-GR.HS-S.2-GLE.1-EO.d) and (SC09-GR.HS-S.1-GLE.3)</li> <li>• The water, carbon, nitrogen and phosphorus cycles (SC09-GR.HS-S.2-GLE.1-EO.f)</li> <li>• Primary and secondary succession. (SC09-GR.HS-S.2-GLE.2-EO.b)</li> </ul>	<ul style="list-style-type: none"> <li>• Explain interactions between biotic and abiotic factors in an ecosystem (SC09-GR.HS-S.2-GLE.2)</li> <li>• Analyze and interpret data about the impact of disturbances in an ecosystem such as removal of keystone species or addition of non-native species, excess nutrients, or drought (SC09-GR.HS-S.2-GLE.2-EO.a, GLE.1-EO.c)</li> <li>• Describe or evaluate communities in terms of primary and secondary succession as they progress over time (SC09-GR.HS-S.2-GLE.2-EO.b)</li> <li>• Examine and evaluate a variety of sources to investigate claims around ecosystem interactions. (SC09-GR.HS-S.2-GLE.2-EO.d)</li> <li>• Model the flow of energy through an ecosystem (SC09-GR.HS-S.2-GLE.1-EO.a)</li> <li>• Evaluate data and predict consequences regarding future human population growth (SC09-GR.HS-S.2-GLE.2-EO.c)</li> <li>• Analyze data regarding population dynamics (SC09-GR.HS-S.2-GLE.2)</li> <li>• Use computer simulations to analyze how energy flows through trophic levels (SC09-GR.HS-S.2-GLE.1-EO.g)</li> </ul>

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

<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>Interactions between biotic and abiotic factors create an ecosystem          The size of a population is determined by the limiting factors within an environment</p>
<p><b>Academic Vocabulary:</b></p>	<p>analyze, claim, model, evaluate, primary, secondary, dynamics, native, disturbance, interactions</p>
<p><b>Technical Vocabulary:</b></p>	<p>succession, disturbance, trophic levels, ecosystem, community, population, limiting factors, carrying capacity, abiotic, biotic, species, keystone, autotroph, heterotroph, biological magnification</p>

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

<b>Unit Title</b>	Matter and Energy in Ecosystems		<b>Length of Unit</b>	5-6 weeks
<b>Focusing Lens(es)</b>	Transformation	<b>Standards and Grade Level Expectations Addressed in this Unit</b>	SC09-GR.HS-S.2-GLE.1 SC09-GR.HS-S.2-GLE.4 SC09-GR.HS-S.1-GLE.3 SC09-GR.HS-S.1-GLE.4 SC09-GR.HS-S.1-GLE.6	
<b>Inquiry Questions (Engaging-Debatable):</b>	<ul style="list-style-type: none"> <li>Why is the sun the ultimate source of energy for all life?</li> <li>How does energy transform and support life on earth?</li> </ul>			
<b>Unit Strands</b>	Life Science			
<b>Concepts</b>	Energy, Transformation, Matter, Cycle, Interdependence, Conservation, Ecosystem			

<b>Generalizations</b> My students will <b>Understand</b> that...	<b>Guiding Questions</b>	
	<b>Factual</b>	<b>Conceptual</b>
Ecosystems function through the transformation of matter and energy (SC09-GR.HS-S.2-GLE.1-EO.d,e,f)	How is matter cycled through an ecosystem? (SC09-GR.HS-S.2-GLE.1-EO.e,f) How is energy transformed in an ecosystem? (SC09-GR.HS-S.2-GLE.1-EO.a,e) What is more important to an ecosystem, decomposers or plants? (SC09-GR.HS-S.2-GLE.1-EO.e,f)	What transformations occur within an ecosystem? (SC09-GR.HS-S.2-GLE.1) Why is nitrogen transformation necessary in an ecosystem? (SC09-GR.HS-S.2-GLE.1-EO.f)
Survival of species and the proper functioning of ecosystems requires conservation of matter and energy (SC09-GR.HS-S.2-GLE.1-EO.d) and (SC09-GR.HS-S.1-GLE.3)	How is matter conserved in an ecosystem?(SC09-GR.HS-S.2-GLE.1-EO.d,e,f) How is energy conserved in an ecosystem?(SC09-GR.HS-S.2-GLE.1-EO.d,e)	What happens when the cycling of matter in an ecosystem is disrupted? (SC09-GR.HS-S.2-GLE.1-EO.c;IQ.2) How do humans impact the energy flow in rainforest ecosystems? (SC09-GR.HS-S.2-GLE.1-EO.c;IQ.2) How does agriculture affect matter cycles neighboring ecosystems? (SC09-GR.HS-S.2-GLE.1-EO.c;IQ.2)
Interdependence drives ecosystem relationships that support all life (SC09-GR.HS-S.2-GLE.4-EO.b; RA.1,2)	How are heterotrophs dependent on autotrophs? (SC09-GR.HS-S.2-GLE.4-EO.b)	How are plants and decomposers dependent on each other? (SC09-GR.HS-S.2-GLE.1)

**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>• Matter cycles within an ecosystem (SC09-GR.HS-S.2-GLE.1-EO.d,e,f)</li> <li>• How energy is conserved and transformed within an ecosystem (SC09-GR.HS-S.2-GLE.1-EO.a,d,e)</li> <li>• How energy lost through life processes (SC09-GR.HS-S.2-GLE.1-EO.e)</li> <li>• Purpose of, resources for, outcomes of, and interdependence between photosynthesis and cellular respiration (SC09-GR.HS-S.2-GLE.4-EO.a,b,c)</li> <li>• Heterotrophs conduct cellular respiration and autotrophs conduct both photosynthesis and cell respiration (SC09-GR.HS-S.2-GLE.4-EO.b)</li> <li>• The role of ATP in photosynthesis and cell respiration (SC09-GR.HS-S.2-GLE.4-EO.c)</li> </ul>	<ul style="list-style-type: none"> <li>• Describe the importance of matter cycles within an ecosystem SC09-GR.HS-S.2-GLE.1-EO.f)</li> <li>• Explain the transformation of energy in an ecosystem SC09-GR.HS-S.2-GLE.1-EO.d,e)</li> <li>• Analyze data demonstrating the energy lost between trophic levels in an ecosystem (SC09-GR.HS-S.2-GLE.1-EO.e,g)</li> <li>• Examine the relationship between photosynthesis and cell respiration at the chemical level (SC09-GR.HS-S.2-GLE.4-EO.b)</li> <li>• Diagram the movement of a carbon atom through its cycle (SC09-GR.HS-S.2-GLE.4-EO.b)</li> <li>• Compare how energy is obtained between autotrophs and heterotrophs, including the role of ATP (SC09-GR.HS-S.2-GLE.4-EO.b,c)</li> <li>• Explain how variables can affect the rate of photosynthesis or cell respiration SC09-GR.HS-S.2-GLE.4-EO.a;IQ.1)</li> <li>• Explain the role of decomposer in matter cycles (SC09-GR.HS-S.2-GLE.1-EO.a,e; IQ.2; RA.2)</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>Energy is not created or destroyed, but transformed in an ecosystem          Autotrophs transform the sun’s energy for use by heterotrophs          Plants require water and carbon dioxide to convert solar energy into glucose, with oxygen as a byproduct          Heterotrophs require oxygen and glucose to store energy as ATP, with carbon dioxide as a byproduct.          Decomposers are necessary to create usable forms of matter for the ecosystem          There is an optimal environment for photosynthesis and respiration to take place</p>
<p><b>Academic Vocabulary:</b></p>	<p>energy, transformation, conservation, interdependence</p>
<p><b>Technical Vocabulary:</b></p>	<p>matter, photosynthesis, cellular respiration, decomposer, autotroph, heterotroph, carbon, trophic levels, ATP</p>

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

<b>Unit Title</b>	Homeostasis		<b>Length of Unit</b>	5-6 weeks
<b>Focusing Lens(es)</b>	Homeostasis Structure and Function	<b>Standards and Grade Level Expectations Addressed in this Unit</b>	SC09-GR.HS-S.2-GLE.3 SC09-GR.HS-S.2-GLE.5 SC09-GR.HS-S.2-GLE.6	
<b>Inquiry Questions (Engaging-Debatable):</b>	<ul style="list-style-type: none"> <li>Does structure drive function or does function drive structure?</li> <li>How does disease disrupt homeostasis?</li> <li>Are you what you eat?</li> </ul>			
<b>Unit Strands</b>	Life Science			
<b>Concepts</b>	Molecular Transport, Homeostasis, Energy, Structure, Function, Regulation			

<b>Generalizations</b> My students will <b>Understand</b> that...	<b>Guiding Questions</b>	
	<b>Factual</b>	<b>Conceptual</b>
Biomolecule shapes (structure) determine their roles (functions) in chemical reactions due to the nature of interactions amongst molecules (SC09-GR.HS-S.2-GLE.3-EO.c) and (SC09-GR.HS-S.2-GLE.5)	How does enzyme structure determine its function? (SC09-GR.HS-S.2-GLE.3-EO.c)	Why are proteins important to cell membrane function? (SC09-GR.HS-S.2-GLE.5-EO.c)
Metabolic (cellular) regulation maintains homeostasis (SC09-GR.HS-S.2-GLE.5)	How is homeostasis maintained during exercise activity? (SC09-GR.HS-S.2-GLE.3-EO.e)	Which is more effective, positive or negative feedback loops? (SC09-GR.HS-S.2-GLE.3) How does medication re-establish homeostasis? (SC09-GR.HS-S.2-GLE.3-EO.e) How is a fever beneficial or harmful to homeostasis? (SC09-GR.HS-S.2-GLE.3-EO.d,e;RA.2)
Cell membrane structures enable molecular transport which impacts the cell's ability to function as a whole (SC09-GR.HS-S.2-GLE.3-EO.a; IQ.1,2;RA.1)	How does the structure of the cell membrane control molecular transport? (SC09-GR.HS-S.2-GLE.5-EO.c)	What would happen if phospholipids had polar tails and nonpolar heads? (SC09-GR.HS-S.2-GLE.5-EO.c)
Cell function maintains homeostasis (SC09-GR.HS-S.2-GLE.6-EO.b)	How does the nervous system maintain homeostasis within the human body? (SC09-GR.HS-S.2-GLE.5-EO.b) and ((SC09-GR.HS-S.2- GLE.6-EO.a)	Are cell function and homeostasis interdependent?



**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>• Biomolecules and their building blocks (SC09-GR.HS-S.2-GLE.3-EO.a)</li> <li>• Body’s utilization of carbohydrates, lipids, and proteins (SC09-GR.HS-S.2-GLE.3-EO.e)</li> <li>• Effectiveness of feedback loops to maintain homeostasis (SC09-GR.HS-S.2-GLE.6-EO.b)</li> <li>• How disease disrupts homeostasis (SC09-GR.HS-S.2-GLE.6-EO.c)</li> <li>• Active and passive cell transport mechanisms (SC09-GR.HS-S.2-GLE.5-EO.a, d, e)</li> <li>• Purpose of enzymes as catalysts, and their optimal conditions (SC09-GR.HS-S.2-GLE.3-EO.d)</li> <li>• Mechanism of osmotic regulation (SC09-GR.HS-S.2-GLE.5-EO.b)</li> <li>• Functions of receptor proteins on the cell membrane (SC09-GR.HS-S.2-GLE.5-EO.c)</li> <li>• Cell structure and function (SC09-GR.HS-S.2-GLE.5-EO.c)</li> </ul>	<ul style="list-style-type: none"> <li>• Discuss how and why body systems interact to promote health for the organism (SC09-GR.HS-S.2-GLE.6-EO.a)</li> <li>• Infer the consequences of suboptimal enzyme function (SC09-GR.HS-S.2-GLE.3-EO.d)</li> <li>• Analyze and interpret data on the body’s utilization of biomolecules (SC09-GR.HS-S.2-GLE.3-EO.e)</li> <li>• Analyze the differences between negative and positive feedback loops (SC09-GR.HS-S.2-GLE.6-EO.c)</li> <li>• Use computer simulations to model homeostatic and cell transport mechanisms (SC09-GR.HS-S.2-GLE.5-EO.e, GLE.6-EO.d)</li> <li>• Examine the results of dietary deficiencies or excesses. (SC09-GR.HS-S.2-GLE.6;NS.1)</li> <li>• Investigate how cells transport materials into and out of the cell (SC09-GR.HS-S.2-GLE.5;NS.1)</li> <li>• Diagram the structure of a cell membrane, including receptor proteins (SC09-GR.HS-S.2-GLE.5-EO.c)</li> <li>• Demonstrate the structure of biomolecules (SC09-GR.HS-S.2-GLE.3-EO.b)</li> <li>• Relate functions of cellular organelles (SC09-GR.HS-S.2-GLE.5-EO.c)</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>The cell membrane allows some things to enter the cell and not others.          Homeostasis is maintaining a stable internal environment, and is controlled by feedback loops          Enzymes increase the speed of chemical reactions          Active transport uses energy and move molecules against their concentration gradient, and passive transport does not require energy, moving molecules with their concentration gradient          Proteins, carbohydrates, and lipids are essential nutrients for living things</p>
<p><b>Academic Vocabulary:</b></p>	<p>mechanism, optimal, transport, active, passive, regulation,</p>
<p><b>Technical Vocabulary:</b></p>	<p>homeostasis, disease, receptor proteins, enzymes, carbohydrates, lipids, proteins, biomolecules, feedback loops, active/passive transport, catalyst, deficiency, osmotic, organelles, permeability</p>

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

<b>Unit Title</b>	Genetics and Heredity		<b>Length of Unit</b>	5-6 weeks
<b>Focusing Lens(es)</b>	Patterns Change	<b>Standards and Grade Level Expectations Addressed in this Unit</b>	SC09-GR.HS-S.2-GLE.7 SC09-GR.HS-S.2-GLE.8	
<b>Inquiry Questions (Engaging-Debatable):</b>	<ul style="list-style-type: none"> <li>• Are identical twins clones? At the age of 20 are identical twins still identical?</li> <li>• Why and how can patterns be detected through heredity?</li> </ul>			
<b>Unit Strands</b>	Life Science			
<b>Concepts</b>	Heredity, Variation, Mutation, Processes (reproduction, meiosis...), Patterns, Crossing Over, Independent Assortment, Chromosomes			

<b>Generalizations</b> My students will <b>Understand</b> that...	<b>Guiding Questions</b>	
	<b>Factual</b>	<b>Conceptual</b>
Physical (phenotype) and chemical (genotype) characteristics in an organism pass from its parents through known patterns of inheritance (SC09-GR.HS-S.2-GLE.7-EO.a.d)	What are commonly known patterns of inheritance? (SC09-GR.HS-S.2-GLE.7-EO.d) What characteristics are not inherited? (SC09-GR.HS-S.2-GLE.7-EO.d)	Why are offspring not like their parents? (SC09-GR.HS-S.2-GLE.7; IQ.2) How are the heritable characteristics of organisms determined? (SC09-GR.HS-S.2-GLE.7-EO.b,c,d)
Crossing over and independent assortment alter chromosomes causing genetic variation during sexual reproduction, which leads to unique individuals (SC09-GR.HS-S.2-GLE.7-EO.d)	How does crossing over increase genetic diversity? What is the genetic benefit of sexual reproduction? (SC09-GR.HS-S.2-GLE.7-EO.b)	What makes individuals unique? (SC09-GR.HS-S.2-GLE.7-EO.d;IQ.2) Should stem cells be used for scientific research? (SC09-GR.HS-S.2-GLE.7-EO.d;IQ.2; RA.1;N.1) Should schools be allowed to provide genetically modified foods in the cafeteria? (SC09-GR.HS-S.2-GLE.7-EO.d;IQ.3;N.1)
Mutations alter inheritance patterns which can lead to diversity of species or disease (SC09-GR.HS-S.2-GLE.7-EO.e) and (SC09-GR.HS-S.2-GLE.8-EO.d)	What types of mutations are heritable? What are types of mutagens?	How are mutations beneficial, harmful, or neutral to an organism Why do mutations occur?

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<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>• Genes are expressed as proteins via portions of DNA(SC09-GR.HS-S.2-GLE.7-EO.a) and (SC09-GR.HS-S.2-GLE.8-EO.d)</li> <li>• Process of DNA replication is in all organisms (SC09-GR.HS-S.2-GLE.7-EO.b)</li> <li>• The process of Protein synthesis- transcription and translation- and gene regulation (SC09-GR.HS-S.2-GLE.7-EO.b)</li> <li>• The process of meiosis and its relationship to genetic diversity and genetic variation through independent assortment, crossing over, and mutations (SC09-GR.HS-S.2-GLE.7-EO.d)</li> <li>• Why certain cells differentiate to become specialized tissues due the expression of some genes and not others (SC09-GR.HS-S.2-GLE.8-EO.a)</li> <li>• How whole organisms can be cloned from an differentiated adult cell (SC09-GR.HS-S.2-GLE.8-EO.c)</li> <li>• The impact of environmental conditions such as toxins, radiation, and smoking on genetic mutations and cancer (SC09-GR.HS-S.2-GLE.8-EO.d)</li> <li>• The beneficial, harmful or neutral effects on an organism that can result from genetic mutations(SC09-GR.HS-S.2-GLE.7-EO.e)</li> <li>• Organisms as products of genes and environment (SC09-GR.HS-S.2-GLE.7; IQ.3)</li> </ul>	<ul style="list-style-type: none"> <li>• Show how Protein synthesis- transcription and translation- and gene regulation are the same in all organisms (SC09-GR.HS-S.2-GLE.7-EO.b)</li> <li>• Diagram DNA replication and protein synthesis (SC09-GR.HS-S.2-GLE.7-EO.b)</li> <li>• Compare and contrast meiosis and mitosis outcomes (SC09-GR.HS-S.2-GLE.7-EO.d)</li> <li>• Explain why siblings are not clones of one another or their parents (SC09-GR.HS-S.2-GLE.7-EO.d)</li> <li>• Identify environmental mutagens (SC09-GR.HS-S.2-GLE.8-EO.d)</li> <li>• Explain how mutations can be beneficial, harmful, or neutral (SC09-GR.HS-S.2-GLE.7-EO.e)</li> <li>• Examine the process of cloning (SC09-GR.HS-S.2-GLE.8-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>Characteristics are influenced by heritable genes, which code for production of proteins          Offspring are not clones of their parents, but a unique combination of their genes          The entire genome is not expressed in an individual          Genetic mutations can be beneficial, harmful, or have no effect          Cells differentiate and specialize as an organism develops</p>
<p><b>Academic Vocabulary:</b></p>	<p>expression, diversity, differentiation, specialization</p>
<p><b>Technical Vocabulary:</b></p>	<p>gene expression, DNA replication, protein synthesis, meiosis, genetic diversity, cell differentiation, cloning, stem cells, cancer, transcription, translation, RNA, genotype, phenotype, mutation</p>

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<b>Unit Title</b>	Change Over Time		<b>Length of Unit</b>	5-6 weeks
<b>Focusing Lens(es)</b>	Change, transformations	<b>Standards and Grade Level Expectations Addressed in this Unit</b>	SC09-GR.HS-S.2-GLE.8 SC09-GR.HS-S.2-GLE.9	
<b>Inquiry Questions (Engaging-Debatable):</b>	<ul style="list-style-type: none"> <li>• How can environmental change affect the human population?</li> <li>• How have humans affected extinction?</li> <li>• In what ways can humans evolve?</li> <li>• How are humans involved in controlling evolution?</li> </ul>			
<b>Unit Strands</b>	Life science			
<b>Concepts</b>	Evolutionary processes, Evolutionary evidence, Ancestry, Heredity, Speciation, Evolution, Variation			

<b>Generalizations</b> My students will <b>Understand</b> that...	<b>Guiding Questions</b>	
	<b>Factual</b>	<b>Conceptual</b>
Genetic diversity within the population allows for reproductive success in the event of environmental change. (SC09-GR.HS-S.2-GLE.9-EO.d)	How can a population achieve genetic diversity? What causes genetic diversity?	Why is genetic diversity beneficial? How does environmental change affect reproductive success?
Ancestry indicates heredity (SC09-GR.HS-S.2-GLE.9-EO.a)	What evidence suggests that you are related to an ancestor? (SC09-GR.HS-S.2-GLE.9-EO.a,b,e)	How can patterns of characteristics shared among organisms be used to categorize life's diversity according to relatedness? (SC09-GR.HS-S.2-GLE.9;IQ.3)
Evolutionary processes require variation (SC09-GR.HS-S.2-GLE.9-EO.d)	Which leads to greater variation, sexual or asexual reproduction?	How do variations benefit a population?
Ancestry evinces evolution (SC09-GR.HS-S.2-GLE.9-EO.a,b)	How does an evolutionary tree show degree of relatedness? (SC09-GR.HS-S.2-GLE.9-EO.e)	How do subtle differences among closely related fossil species provide evidence of environmental change and speciation? (SC09-GR.HS-S.2-GLE.9;IQ.1)
An organism's behavioral responses to stimuli evolve through natural selection (SC09-GR.HS-S.2-GLE.9-EO.d)	Name the three key components which drive natural selection.	Why would an organism's response to stimuli change? What inherited behavioral responses would be beneficial to natural selection?

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Variation drives speciation (SC09-GR.HS-S.2-GLE.9-EO.c,d)	What is speciation? Why does it occur? What creates a new species? How is mutation involved in speciation? (SC09-GR.HS-S.2-GLE.9-EO.c)	How does a species benefit from variation? (SC09-GR.HS-S.2-GLE.9-EO.d)
Evolutionary processes cause speciation (SC09-GR.HS-S.2-GLE.9-EO.c,d; IQ.1)	How has speciation occurred over geologic time? (SC09-GR.HS-S.2-GLE.9-EO.c)	How is speciation linked to environmental change? How would microevolution and macroevolution create speciation? (SC09-GR.HS-S.2-GLE.9-EO.c)

<b>Critical Content:</b> My students will <b>Know</b> ...	<b>Key Skills:</b> My students will be able to <b>(Do)</b> ...
<ul style="list-style-type: none"> <li>• Three components of natural selection- heritability, genetic variation, and differential survival and reproduction (SC09-GR.HS-S.2-GLE.9-EO.d)</li> <li>• Variation within populations (SC09-GR.HS-S.2-GLE.9-EO.c,d)</li> <li>• Forms of evidence that support the idea that diverse life forms evolve from common ancestors (molecular studies, comparative anatomy, biogeography, fossil record, and embryology) (SC09-GR.HS-S.2-GLE.9-EO.a,b)</li> <li>• How evolutionary trees illuminate how groups of organisms diverge from a common ancestor and how closely they are related (SC09-GR.HS-S.2-GLE.9-EO.b,e)</li> <li>• Examples of speciation that result from discrete bursts of rapid genetic changes and from gradual changes ( SC09-GR.HS-S.2-GLE.9-EO.c)</li> <li>• Ways in which genetic variations make an organism more or less fit for its environment ( SC09-GR.HS-S.2-GLE.8-EO.d)</li> <li>• The role and impact of artificial selection and evolution ( SC09-GR.HS-S.2-GLE.8;N.1, GLE.9;RA.2)</li> </ul>	<ul style="list-style-type: none"> <li>• Provide evidence to communicate, and justify scientific explanation for evolution and common ancestry (SC09-GR.HS-S.2-GLE.9-EO.a,b)</li> <li>• Categorize life’s diversity according to relatedness to generate a model of an evolutionary tree (SC09-GR.HS-S.2-GLE.9-EO.e;IQ.3)</li> <li>• Differentiate and analyze examples of the three components of natural selection (SC09-GR.HS-S.2-GLE.9-EO.d)</li> </ul>

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<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>All life on earth evolved from a common ancestor through evolutionary processes.          ...according to specific evidence...</p>
<p><b>Academic Vocabulary:</b></p>	<p>theory, law, evidence, differentiate, justify,</p>
<p><b>Technical Vocabulary:</b></p>	<p>adaptation, evolution, mutation, natural selection, variation, homologous, analogous, vestigial, structures, common ancestor, allelic frequency, Selection pressure, antibiotic resistance, molecular, heritability, speciation, biogeography, mechanism</p>