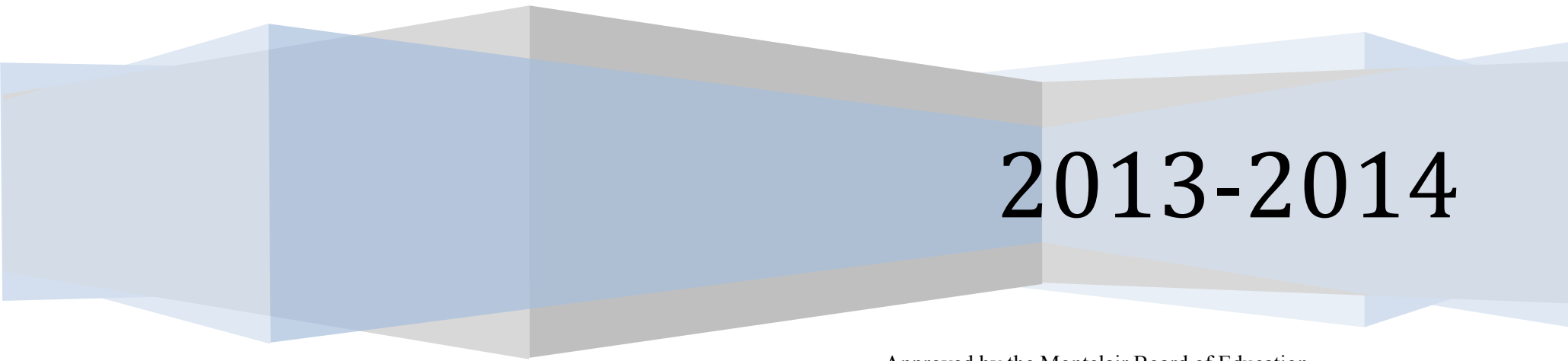


Montclair Public Schools

Science

Curriculum Guide

6th - 12th Grade Honors



2013-2014

Approved by the Montclair Board of Education
September 2011/Revised: September 2013

Montclair Public Schools
CCSS Biology Honors Unit: Marshall A.b

Subject	Biology Honors	Grade	9-12	Unit #	1	Pacing	Marking Period 1
Unit	From molecules to ecosystems: Structure, Interactions, Energy and Dynamics						
Overview							
<p>The performance expectations help students formulate answers to the questions, “What atoms/molecules make up organisms, how do these atoms/molecules and energy cycle through ecosystems and how do organisms interact with each other and the physical world?” The Disciplinary Core Idea is presented as five sub ideas: structure and function, interdependent relationships, cycles of matter/energy in ecosystems, ecosystem dynamics/function/resilience, and social interactions/group behavior. Students can use mathematical reasoning to demonstrate understanding of fundamental concepts of carrying capacity, factors affecting biodiversity and populations, and the cycling of matter and flow of energy among organisms in an ecosystem. These mathematical models provide support of students’ conceptual understanding of systems and their ability to develop design solutions for reducing the impact of human activities on the environment and maintaining biodiversity. Cross-cutting concepts of systems and system models play a central role in students’ understanding of science and engineering practices and core ideas of ecosystems.</p>							
Standard #	Next Generation Science Standards			SLO #	Student Learning Objectives		Depth of Knowledge
HS-LS1- 6	Construct and revise an explanation based on evidence for how carbon, hydrogen and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon based molecules.			1	Explain the relationship between monomers and polymers using polysaccharides as an example.		4
				2	Represent and explain the relationship between the structure and function of each class of complex molecules using a variety of models.		3
HS-LS2-1	Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.			3	Analyze the interdependence and interrelationship among different organisms, and explain how these relationships contribute to the stability of an ecosystem.		4

HS-LS2-2	Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.	4	Describe how one population of organisms may affect other plants and/or animals in the ecosystem.	2-3
HS-LS2-4	Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.	5	Illustrate the flow of energy through a community and calculate the percentage of usable energy passed through trophic levels of a food web/biomass pyramid.	2-3
HS-LS2-6	Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.	6	Predict the impact that altering biotic and abiotic factors has on an ecosystem.	2-3
		7	Model the effect of positive and negative changes in population size on a symbiotic pairing.	3-4
HS-LS2-7	Design, evaluate and refine a solution for reducing the impacts of human activities on the environment and biodiversity.	8	Explain the impact of meeting human needs and wants on local and global environments.	1-2
HS-LS4-6	Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.	9	Model how natural and human-made changes in the environment will affect individual organisms and the dynamics of populations.	3
HS-LS2-5	Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere and geosphere.	10	Using a plant in Rand Park, explain how a carbon atom can pass from the atmosphere, to the plant, to the ocean to a human and then back to the atmosphere.	2-3

HS-LS2-8	Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.	11	Evaluate similar populations in an ecosystem with regard to their ability to thrive and grow.	1-2
Standard #	CCSS ELA Standard	SLO #	Student Learning Objectives	Depth of Knowledge
WHST.9-12.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.	11	Write an essay on the trends in the growth of world population from 1950 - 2050, including factors that affect population size and growth, and projections about future growth. Be sure to distinguish between population growth and population growth rate.	4
WHST.9-12.5	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.	12	Incorporated into SLO of previous standard (WHST.9-12.2)	4
WHST.9-12.7	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.	13	Design an experiment to investigate how a change in food supply affects the growth of a bacterial population.	4
WHST.11-12.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas,	14	Research and decide the following question: Does the Gray Wolf Population Need Protection? Research multiple sources for information, assess pros and cons of each option. Be sure to consider the perspectives of all stakeholders.	4

<p>WHST.9-12.9 SL.11-12.5</p>	<p>avoiding plagiarism and over-reliance on any one source and following a standard format for citation.</p> <p>Draw evidence from informational texts to support analysis, reflection, and research.</p>	<p>15</p>	<p>Organize and present evidence to show how the extinction of a species is related to an inability to adapt to the changing environmental conditions using qualitative and qualitative data.</p>	<p>3</p>
<p>MP.4 HSF-IF.C.7</p>	<p>Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.</p>	<p>16</p>	<p>Choose a biome to depict in a piece of artwork. Be sure to include flora and fauna in your art, and to label organisms represented.</p>	<p>3-4</p>
<p>HSF-BF.A.1</p>	<p>Model with mathematics.</p>	<p>17</p>	<p>Research the Montreal Protocol on CFC's. Graph the ozone levels of the past 50 years, predict what the ozone level will be 50 years if the resolutions of the Montreal Protocol are effective. Be sure to include data to support your prediction.</p>	<p>2-3</p>
<p>RST9-10.1</p>	<p>Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.</p>	<p>18</p>	<p>Utilize the textbook and suggested resource to support understanding</p>	<p>2</p>
<p>RST9-10.2</p>	<p>Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text</p>	<p>19</p>	<p>From a prepared list of resources, choose a reading about global climate change. Write an essay describing the author's explanation, citing scientific facts to support the author's opinion.</p>	<p>3</p>
	<p>Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to</p>	<p>20</p>	<p>Use lab instructions and background materials to develop a scheme for collection and analysis of data.</p>	<p>3</p>

RST9-10.3	special cases or exceptions defined in the text. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.	21	Define all key vocabulary terms and concepts and review them with the teacher.	2
RST9-10.4	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).	22	Explain the interrelationships between climate, weather temperature and humidity.	2
RST9-10.5	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.	23	Generate a conclusion about energy transfer and circulation by observing a model of convection currents.	4
RST9-10.7	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.	24	Use scientific facts, measurements, observations and patterns in nature to build and critique scientific arguments.	4
RST9-10.8	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.	25	Demonstrate understanding and use interrelationships among central scientific concepts to revise explanations and to consider alternative explanations.	4
RST9-10.9				

- Cohesion/adhesion, polarity, H bonds, monomer, polymer, macromolecules, organic, functional groups, dehydration/hydrolysis, homeostasis, niche, trophic levels, species, population, community, logistic/exponential growth, carrying capacity, biodiversity

Assessments: Marshall A.d, D.c

- Formal and informal formative and summative assessments as determined by the teacher
- Common Benchmark as per district schedule

Suggested Resources (These are recommended; you may select others as long as they are aligned to the standards and Lexile levels in this unit of study.)

- Miller and Levine Biology (2004) chapters: Chapters 1 - 6
- CCSS Framework Appendix A: Grade Level Text Complexity (p.5)
- CCSS Framework Appendix B: Text Exemplars and Sample Performance Tasks
- CCSS Framework Appendix C: Writing Exemplars

DIFFERENTIATION

Special Education	ELL	RtI
<ul style="list-style-type: none"> • Modifications & accommodations as listed in the student's IEP • Assign a peer to help keep student on task • Modified or reduced assignments • Reduce length of assignment for different mode of delivery • Increase one to one time • Working contract between you and student at risk • Prioritize tasks • Think in concrete terms and provide hands on tasks • Position student near helping peer or have quick access to teacher • Anticipate where needs will be • Break tests down in smaller increments • NJDOE resources 	<ul style="list-style-type: none"> • Strategy groups • Teacher conferences • Graphic organizers • Modification plan • NJDOE resources • Adapt a Strategy-Adjusting strategies for ESL students: http://www.teachersfirst.com/content/esl/ada ptstrat.cfm 	<ul style="list-style-type: none"> • Tiered Interventions following RtI framework • RtI Intervention Bank • Foundations Double-Dose (Tier II) • LLI (Tier III) • FFI Skill Report: DRA On-Line • enVision intervention supports • NJDOE resources

ALIGNMENT TO 21st CENTURY SKILLS AND TECHNOLOGY

21 st Century/ Interdisciplinary Themes: Bold all that apply	21 st Century Skills: Bold all that apply
Global Awareness Financial, Economic, Business and Entrepreneurial Literacy Civic Literacy Health Literacy Environmental Literacy	Creativity & Innovation Critical Thinking & Problem Solving Communication & Collaboration Media Literacy Information Literacy Information, Communication & Technology Life & Career Skills

Technology Infusion

- Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others
- Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.
- Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.

Epson Interactive Whiteboard Applications

Evidence of Student Learning

<ul style="list-style-type: none"> • Common benchmark • Evaluation rubrics 	<ul style="list-style-type: none"> • Teacher-student conferences • Running records 	<ul style="list-style-type: none"> • Students' published work • Unit tests 	<ul style="list-style-type: none"> • Quizzes • Laboratory Investigations
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Montclair Public Schools
CCSS Biology Honors Unit: Marshall A.b

Subject	Biology Honors	Grade	9-12	Unit #	2	Pacing	Marking Period 2
Unit	Matter and Energy in Organisms and Ecosystems						
Overview							
<p>The performance expectations help students formulate an answer to the question, “How do organisms live and grow?” The Disciplinary Core Idea is presented as three sub ideas: structure and function, growth and development of organisms, and organization for matter and energy flow in organisms. Students will use models to explain photosynthesis, respiration and the cycling of matter and flow of energy in living organisms. Cellular processes can be used as a model for understanding the hierarchical organization of an organism and maintaining homeostasis. Cross-cutting concepts of matter and energy, structure and function, and systems and system models provide students with insights to the structures and processes of organisms.</p>							
Standard #	Next Generation Science Standards	SLO #	Student Learning Objectives	Depth of Knowledge			
HS-LS1-2	Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.	1	Compare and contrast structures that have similar functions in various organisms, and explain how those functions may be carried out by structures that have different physical appearances.	3			
		2	Relate the structures of cells, tissues, organs and systems to their functions in supporting life.	3			
HS-LS1-5	Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.	3	Use a model to demonstrate how the energy in the sun is transformed to chemical bond energy in starch.	3			
		4	Develop an analogy to explain ATP and energy transfer to a classmate who does not understand the concept.				

HS-LS1- 6	Construct and revise an explanation based on evidence for how carbon, hydrogen and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon based molecules.	5	Using models, follow a C molecule from the atmosphere to a glucose molecule in a plant to a starch molecule or an amino acid in the same plant.	4
HS-LS2-3.	Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.	6	Using yeast, which can be aerobic and anaerobic, hypothesize and explain in which case yeast would grow more rapidly.	3
HS-LS1-7	Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.	7	Compare/contrast the burning of fossil fuels to cellular respiration using the chemical equation and a discussion of the conservation of energy.	3
		8	Compare and contrast fermentation and cellular respiration in terms of energy production.	
Standard #	CCSS ELA Standard	SLO #	Student Learning Objectives	Depth of Knowledge
WHST.9-12.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.	9	Write a summary describing the experiments that led to the cell theory.	2
WHST.9-12.5	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.	10	Construct written laboratory reports for each laboratory exercise completed. Revise each new report based on feedback from previous reports.	3

WHST.11-12.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and over-reliance on any one source and following a standard format for citation.	11	Create a food diary of your daily intake for three days. Analyze deficiencies and excesses and explain the effects on the human body.	4
RST9-10.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.	12	Utilize the textbook and suggested resources to support understanding.	2
RST9-10.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text	13	Utilize the textbook and suggested resources to support understanding.	2
RST9-10.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.	14	Use lab instructions and background materials to develop a scheme for collection and analysis of data.	3
RST9-10.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a	15	Define and interpret all key vocabulary terms and concepts and review them with the teacher.	2

RST9-10.5	specific scientific or technical context relevant to grades 9-10 texts and topics. Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).	16	Define and interpret all key vocabulary terms and concepts and review them with the teacher.	2
RST9-10.6	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.	17	Write a summary describing the experiments that led to the cell theory.	2
RST9-10.7	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words	18	Create a table and interpret the data to reflect understanding of the effects of temperature and light on the rate of photosynthesis.	3

Big Ideas: Marshall A.c

1. The cell theory is the basis of all living organisms.
2. All living things are a combination of four main macromolecules.

Essential Questions: Marshall A.c, C.c

1. How do macromolecules interact with each other to make complex living organisms?
2. How do cells interact with each other and their environment to sustain life?

Assessments: Marshall A.d, D.c

- Formal and informal formative and summative assessments as determined by the teacher
- Common Benchmark as per district schedule

Key Vocabulary		
<ul style="list-style-type: none"> Chloroplast/chlorophyll, ATP, biochemical pathway, glycolysis, oxidation, electron transport chain, aerobic/anaerobic, fermentation 		
Suggested Resources (These are recommended; you may select others as long as they are aligned to the standards and Lexile levels in this unit of study.)		
<ul style="list-style-type: none"> Miller and Levine Biology (2004) chapters: Chapters 7-9, 22-23 		
<ul style="list-style-type: none"> CCSS Framework Appendix A: Grade Level Text Complexity (p.5) 		
<ul style="list-style-type: none"> CCSS Framework Appendix B: Text Exemplars and Sample Performance Tasks 		
<ul style="list-style-type: none"> CCSS Framework Appendix C: Writing Exemplars 		
DIFFERENTIATION		
Special Education	ELL	RtI
<ul style="list-style-type: none"> Modifications & accommodations as listed in the student's IEP Assign a peer to help keep student on task Modified or reduced assignments Reduce length of assignment for different mode of delivery Increase one to one time Working contract between you and student at risk Prioritize tasks Think in concrete terms and provide hands on tasks Position student near helping peer or have quick access to teacher Anticipate where needs will be Break tests down in smaller increments NJDOE resources 	<ul style="list-style-type: none"> Strategy groups Teacher conferences Graphic organizers Modification plan NJDOE resources Adapt a Strategy-Adjusting strategies for ESL students: http://www.teachersfirst.com/content/esl/ada ptstrat.cfm 	<ul style="list-style-type: none"> Tiered Interventions following RtI framework RtI Intervention Bank Foundations Double-Dose (Tier II) LLI (Tier III) FFI Skill Report: DRA On-Line enVision intervention supports NJDOE resources
ALIGNMENT TO 21st CENTURY SKILLS AND TECHNOLOGY		
21st Century/ Interdisciplinary Themes: Bold all that apply		21st Century Skills: Bold all that apply
Global Awareness Financial, Economic, Business and Entrepreneurial Literacy Civic Literacy Health Literacy Environmental Literacy		Creativity & Innovation Critical Thinking & Problem Solving Communication & Collaboration Media Literacy Information Literacy Information, Communication & Technology Life & Career Skills
Technology Infusion		
<ul style="list-style-type: none"> Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism. Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations. Epson Interactive Whiteboard Applications		

Evidence of Student Learning

<ul style="list-style-type: none">• Common benchmark• Evaluation rubrics	<ul style="list-style-type: none">• Teacher-student conferences• Running records	<ul style="list-style-type: none">• Students' published work• Unit tests	<ul style="list-style-type: none">• Quizzes• Laboratory Investigations
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Subject	Biology Honors	Grade	9-12	Unit #	Three	Pacing	40 days (8 weeks?)
Unit	Heredity: Inheritance and Variation of Traits						
Overview							
<p>The performance expectations help students formulate answers to the questions: How are characteristics of one generation passed to the next? How can individuals of the same species and even siblings have different characteristics?" The core includes two subunits" inheritance of traits, and variation of traits. Students are able to ask questions, make and defend a claim and use concepts of probability to explain the genetic variation in a population. Students demonstrate understanding of why individuals of the same species vary in how they look, function and behave. Students can explain the mechanism of genetic inheritance and describe the environmental and genetic causes if gene mutation and the alteration of gene expression. Cross-cutting concepts of patterns and cause and effect are called out as organized concepts for these core ideas.</p>							
Standard #	Next Generation Science Standards	SLO #	Student Learning Objectives	Depth of Knowledge			
HS-LS3-1	Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.	LS1.A	Predict the potential impact on an organism given a change in a specific DNA code, and provide specific real world examples of conditions caused by mutations.	2-4			
		LS3.A	Defend the principle that, through reproduction, genetic traits are passed from one generation to the next, using evidence collected from observations of inherited traits.	3-4			
HS-LS1-1	Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.						
HS-LS3-2	Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.	LS3.B	Compare and contrast how the possible impact of a chromosome mutation that occurs during meiosis differs from that of a similar event occurring during mitosis of a somatic cell.	2-3			
HS-LS1-4	Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.	LS1.B	Suppose you were small enough to hitch a ride on a chromosome located in a plant cell that goes through mitosis and cytokinesis. Describe what you would see	2-3			

HS-LS3-3	Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.	LS3.B	happening during each phase of the process. Using a di-hybrid Punnett square, demonstrate the probability of crossing two organisms that are heterozygous for three traits. Include genotypes and ratios, and phenotypes and phenotype ratio.	3-4
Standard #	CCSS ELA Standard	SLO #	Student Learning Objectives	Depth of Knowledge
WHST.9-12.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.	LS1.A	Incorporating the scientific breakthroughs regarding DNA from (1928 - 2000), complete the timeline and discuss what recent discoveries have been made as well as the impact of these discoveries to science.	3-4
WHST.9-12.7	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.	LS3.B	Research a genetic disorder and prepare a presentation to include: specific genetic cause, symptoms, treatments, fatality, genetic treatment/technology to cure.	3-4
HSF-BF.A.1	Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.	LS3.B	Prepare a visual presentation explaining the value and potential applications of genome projects.	3

Big Ideas
Demo Mendel's principles using Punnett squares and pedigrees. Outline the flow of genetic information in cells from DNA to proteins. Compare the end products of meiosis with those of mitosis.
Essential Questions
How is probability used to predict genetic crosses? Where does protein come from? How does meiosis lead to more genetic variation than mitosis does?
Assessments
<ul style="list-style-type: none"> Common Benchmark as per district schedule

Key Vocabulary

- mutation
- heterozygous/homozygous
- protein synthesis
- heredity
- chromosome
- genetic recombination
- genome

Suggested Resources (CCSS Exemplar Texts in Bold)

- Textbook chapters: Miller and Levine - 10,11,12,13,14

DIFFERENTIATION

Special Education	ELL	RtI
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ALIGNMENT TO 21st CENTURY SKILLS AND TECHNOLOGY

21st Century/ Interdisciplinary Themes: Bold all that apply

Global Awareness
 Financial, Economic, Business and Entrepreneurial Literacy
 Civic Literacy
 Health Literacy
Environmental Literacy

21st Century Skills: Bold all that apply

Creativity & Innovation
Critical Thinking & Problem Solving
Communication & Collaboration
Media Literacy
Information Literacy
Information, Communication & Technology
Life & Career Skills

Technology Infusion

- Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others
 - Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.
 - Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.
- Epson Interactive Whiteboard Applications

Evidence of Student Learning

<ul style="list-style-type: none">• Common benchmark• Evaluation rubrics	<ul style="list-style-type: none">• Teacher-student conferences• Running records	<ul style="list-style-type: none">• Students' published work• Unit tests	<ul style="list-style-type: none">• Quizzes• Laboratory Investigations
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Subject	Biology Honors	Grade	9-12	Unit #	4	Pacing	Marking Period 4
Unit	Biological Evolution: Unity and Diversity						
Overview							
<p>The performance expectations help students formulate an answer to the question: “What evidence shows that different species are related?” The core involves four sub-ideas: evidence of common ancestry and diversity, natural selection, adaptation and biodiversity, and human physiology. Students can construct explanations for the processes of natural selection and evolution and communicate how multiple lines of evidence support these explanations. Students can evaluate evidence of the conditions that may result in new species and understand the role of genetic variation in natural selection. Additionally, students can apply concepts of probability to explain trends in populations as those trends relate to advantageous heritable traits in a specific environment. Finally, students will be able to use their foundation in cellular biology and evolution to describe how form and function applies to the human organ systems. The cross-cutting concepts of cause and effect and systems and system models play an important role in students’ understanding of the evolution of life on Earth.</p>							
Standard #	Next Generation Science Standards	SLO #	Student Learning Objectives	Depth of Knowledge			
HS-LS4-1.	Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.	LS4.A	Provide a scientific explanation for the history of life on Earth using scientific evidence (fossil records, DNA, protein structures, etc.)	2-3			
HS-LS4-2.	Construct an explanation based on evidence that the process of evolution primarily results from four factors: the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in an environment.	LS4.B	Model an adaptation to a species that would increase its chances of survival, should the environment become wetter, drying, colder or hotter over time.	3-4			
HS-LS4-3	Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to those lacking this trait.	LS4.B	Organize and present evidence to show how the extinction of a species is related to an inability to adapt to changing environmental conditions using quantitative and qualitative data.	4			
HS-LS4-4	Construct an explanation based on evidence for how natural selection leads to adaption of populations.	LS4.C	Account for the appearance of a novel trait that arose in a given population. Model how natural and human-made changes in the environment will affect individual	3-4			

HS-LS4-5	Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.	LS4.C	organisms and the dynamics of populations.	
	Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.	LS4.D	Write an essay explaining the effects of fishing restrictions on fish populations. Your essay should include reasons for the regulations, and the effects of the regulations.	2-3
HS-LS4-6	Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.		Model the interdependence of the human body's major systems in regulating its internal environment	2-3
HS-LS1-3				
Standard #	CCSS ELA Standard	SLO #	Student Learning Objectives	Depth of Knowledge
WHST.9-12.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.	LS4.B	Compare the research of Darwin, LaMarck and Wallace, and explain how the work of each of them contributed to the theory of evolution. Be sure to include evidence that supported each of their positions.	2-4
HSF-BF.A.1	Model with mathematics.	LS4.B	Using qualitative and quantitative data to support your answer, explain how the work of the economist Thomas Malthus was significant to Darwin's explanation of natural selection.	2-3
WHST.9-12.9 SL.11-12.5	Draw evidence from informational texts to support analysis, reflection, and research.	LS2.A LS2.C	Organize and present evidence to show how the extinction of a species is related to an inability to adapt to the changing environmental conditions using qualitative and qualitative data.	2-3
Big Ideas				
Describe the ongoing development of evolutionary theory. Explain how variation in a population can lead to speciation. Identify the kinds of evidence that modern biologists use in classifying organisms.				

Essential Questions

How is natural selection related to a species' fitness?
 How can Hardy-Weinberg equilibrium help explain speciation?
 Why is a biological classification system necessary?

Assessments

- Common Benchmark as per district schedule

Key Vocabulary

- | | |
|--|---|
| <ul style="list-style-type: none"> • taxonomy • cladogram • phylogeny • speciation | <ul style="list-style-type: none"> • natural selection • adaptation • adaptive radiation |
|--|---|

Suggested Resources (CCSS Exemplar Texts in Bold)

- Textbook chapters: Miller and Levine - 15,16,17,18, 26,29, 33, 34, 38, 40
- CCSS Framework Appendix A: Grade Level Text Complexity (p.5)
- CCSS Framework Appendix B: Text Exemplars and Sample Performance Tasks
- CCSS Framework Appendix C: Writing Exemplars

DIFFERENTIATION

Special Education	ELL	RtI
<ul style="list-style-type: none"> • Modifications & accommodations as listed in the student's IEP • Assign a peer to help keep student on task • Modified or reduced assignments • Reduce length of assignment for different mode of delivery • Increase one to one time • Working contract between you and student at risk • Prioritize tasks • Think in concrete terms and provide hands on tasks • Position student near helping peer or have quick access to teacher • Anticipate where needs will be • Break tests down in smaller increments • NJDOE resources 	<ul style="list-style-type: none"> • Strategy groups • Teacher conferences • Graphic organizers • Modification plan • NJDOE resources • Adapt a Strategy-Adjusting strategies for ESL students: http://www.teachersfirst.com/content/esl/ada_ptstrat.cfm 	<ul style="list-style-type: none"> • Tiered Interventions following RtI framework • RtI Intervention Bank • Foundations Double-Dose (Tier II) • LLI (Tier III) • FFI Skill Report: DRA On-Line • enVision intervention supports • NJDOE resources

ALIGNMENT TO 21st CENTURY SKILLS AND TECHNOLOGY

21st Century/ Interdisciplinary Themes: Bold all that apply	21st Century Skills: Bold all that apply
<p>Global Awareness Financial, Economic, Business and Entrepreneurial Literacy Civic Literacy Health Literacy Environmental Literacy</p>	<p>Creativity & Innovation Critical Thinking & Problem Solving Communication & Collaboration Media Literacy Information Literacy Information, Communication & Technology</p>

Technology Infusion

- Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others
- Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.
- Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.

Epson Interactive Whiteboard Applications

Evidence of Student Learning

- | | | | |
|--|--|--|--|
| <ul style="list-style-type: none"> • Common benchmark • Evaluation rubrics | <ul style="list-style-type: none"> • Teacher-student conferences • Running records | <ul style="list-style-type: none"> • Students' published work • Unit tests | <ul style="list-style-type: none"> • Quizzes • Laboratory Investigations |
|--|--|--|--|