Lab Biology A Curriculum Map 2022

Updated 9/1/2022

Unit	Topics	Time Frame
Introduction and Characteristics of Life	Characteristics of Life, Microscopes	10 periods
Ecology	Biotic/Abiotic, Habitat,Niche, Ecological Levels of Organization, Ecological Pyramids, Food Webs/Trophic Levels, Symbioses, Ecological Succession, CHNOPS, Biogeochemical Cycles, Resources, Human Impacts	24 periods
Cells	Prokaryotes, Eukaryotes, Animal Cell, Plant Cell, Major Organelles	10 Periods
Cell Transport	Membrane Structure and Function, Lipids, Homeostasis, Diffusion, Osmosis	10 Periods
Photosynthesis	Plant Structures, Chloroplast, Plant Cells, Carbohydrates, Photosynthesis Equation, Light Reactions, Calvin Cycle, External Influences	12 Periods
Respiration	Glycolysis, Fermentation, Aerobic Respiration	7 periods
Cell Reproduction (Mitosis/Meiosis)	Chromosomes, Karyotypes, Cell Cycle, Mitosis, Meiosis, Asexual vs. Sexual Reproduction	11 periods
Mendelian Genetics	Mendel's Experiments, Monohybrid Crosses, Dihybrid Crosses, Incomplete Dominance, Codominance	10 periods

Science Curriculum Map 2022

Human Genetics	Sex Chromosomes, Sex Determination, Mutations, Genetic Disorders, Human Genome	11 periods
DNA →PS	DNA structure and function, DNA replication, RNA structure and function, Transcription, Translation	12 periods
Evolution	Darwin's discoveries, Artificial and Natural selection, Homologous structures, Analogous structures, Vestigial structures, Fossil record, DNA similarities, Embryology, Cladogram	12 periods
		130 total

Unit 1 Summary: Introduction and Characteristics of Life

Students will learn the major themes of biology in an effort to define "life" as a system in which organisms use energy, reproduce, maintain homeostasis and evolve. Interconnectedness, organization, and the relationship of form to function will be stressed. Students begin to use scientific inquiry and experiment using equipment such as the microscope to investigate these properties. Students will identify and utilize parts of a compound light microscope to observe prepared and wet mount slides. Compound light microscope and the stereomicroscope will be compared and contrasted.

Essential Questions:

These questions establish inquiry to unify the unit's assignments and assessments.

What are the procedures to safely operate laboratory equipment, including compound light microscopes?
What constitutes life?
What major themes are intertwined in the topics of life science?
How is each of the major properties of life accomplished by various organisms?

Back to top

Science Curriculum Map 2022

Evidence of Learning:

Major Assessments: Summative/Performance Assessments (Tests/Projects = 40%)

Minor Assessments: Quizzes (20%)

Labs (30%)

Required lab: Introduction to the Microscope Lab

Practice (Homework/Classwork =10 %)

Formative Assessments: Formative assessments will be in the form of warm ups, exit tickets, responder activities, objective checks and other teacher evaluations during class including concept reinforcement worksheets and reading comprehension checks.

Resources

Biology **by Miller & Levine – Chapter 1**

Science Recommended Accommodations & Modifications for Curriculum Implementation

STANDARDS for Learning Targets			
NJSLS	**Literacy**	**Cross curricular**	**CTE(NJSLS 9) Technology(NJSL8)**
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-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. HS-LS1-3. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.	RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. 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,	MP.4 Model with mathematics. HSF-IF.C.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. HSF-BF.A.1 Write a function that describes a relationship between two quantities.	CTE 9.3.ST.2 Use technology to acquire, manipulate, analyze and report data. 9.3.ST.6 Demonstrate technical skills needed in a chosen STEM field. Technology 8.2.12.ETW.2: Synthesize and analyze data collected to monitor the effects of a technological product or system on the environment. 8.1.12.DA.6: Create and refine computational models to better represent the relationships among different

Back to top

	demonstrating understanding of the subject under investigation. 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 overreliance on any one source and following a standard format for citation. WHST.9-12.9 Draw evidence from informational texts to support analysis, reflection, and research.	elements of data collected from a phenomenon or process.

Sample Measurable Objectives for Lesson Planning
1. Explain all living things are made of cells with similar properties 2. Demonstrate how DNA codes the information responsible for creating all living systems and can be passed on from parent to offspring 3. Develop a model in which they identify and describe the relevant parts (e.g., organ system, organs) and processes of body systems in multicellular organisms 4. Explain how organisms use feedback mechanisms to maintain internal conditions 5. List, define, and discuss the characteristics common to all living things 6. Demonstrate proper use of the microscope

Back to top

Science Curriculum Map 2022

Unit 2 Summary: Ecology

In this unit of study, students construct explanations for the role of energy in the cycling of matter in organisms and ecosystems. They develop models to illustrate the interactions of photosynthesis and cellular respiration. Students also understand organisms' interactions with each other and their physical environment and how organisms obtain resources.

Students explore how and why do organisms interact with each other (biotic factors) and their environment (abiotic factors), and what affects these interactions? Secondary ideas include the interdependent relationships in ecosystems; dynamics of ecosystems; and social interactions, including group behavior. Students use mathematical reasoning and models to make sense of carrying capacity, factors affecting biodiversity and populations.

Students examine factors that have influenced the distribution and development of human society; these factors include climate, natural resource availability, and natural disasters. Students analyze how earth systems and their relationships are being modified by human activity. Students also develop an understanding of how human activities affect natural resources and of the interdependence between humans and Earth's systems, which affect the availability of natural resources. Students will apply their engineering capabilities to reduce human impacts on earth systems and improve social and environmental cost-benefit ratios. All crosscutting concepts of matter and energy; systems, and system models; cause and effect; stability and change; scale, proportion, and quantity; and the influence of engineering, technology, and science on society and the natural world are called out as organizing concepts.

Essential Questions:

These questions establish inquiry to unify the unit's assignments and assessments.

What is ecology?
What are biotic and abiotic factors and how do they compare?
How do organisms interact with the living and nonliving environments to obtain matter and energy?
How does competition shape a community?
How can change in one part of an ecosystem affect change in other parts of the ecosystem?
How do ecosystems change over time?
What factors affect populations?
What is the relationship between resource use and sustainable development?
How do humans impact the diversity and stability of ecosystems?
How can the impacts of human activities on natural systems be reduced?

Back to top

Science Curriculum Map 2022

Evidence of Learning:

Major Assessments: Summative/Performance Assessments (Tests/Projects = 40%)

Minor Assessments: Quizzes (20%)

Labs (30%)

Practice (Homework/Classwork =10 %)

Formative Assessments: Formative assessments will be in the form of warm ups, exit tickets, responder activities, objective checks and other teacher evaluations during class including concept reinforcement worksheets and reading comprehension checks.

Resources

Biology **by Miller & Levine- Unit 2, Chapters 3, 4, 5, 6.**

Science Recommended Accommodations & Modifications for Curriculum Implementation

STANDARDS for Learning Targets			
NJSLS	**Literacy**	**Cross curricular**	**CTE(NJSLS 9) Technology(NJSL8)**
HS-LS2-1 -Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales. 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.	ELA/Literacy - RST.9-10.8 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. RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.	Mathematics - MP.2 Reason abstractly and quantitatively. MP.4 Model with mathematics. HSN.Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the	CTE- 9.3.ST.2 Use technology to acquire, manipulate, analyze and report data. 9.3.ST-ET.2 Display and communicate STEM information Technology 8.1.12.IC.3: Predict the potential impacts and implications of emerging technologies on larger social, economic, and

Back to top

Science Curriculum Map 2022

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. HS-LS2-7 - Design, evaluate, and refine a solution for reducing the impacts of human activities on the	RST.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. RST.11-12.8 Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. 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.	origin in graphs and data displays. HSN.Q.A.2 Define appropriate quantities for the purpose of descriptive modeling. HSS-IC.A.1 Understand statistics as a process for making inferences about population parameters based on a random sample from that population. HSS-IC.B.6 Evaluate reports based on data.	political structures, using evidence from credible sources. 8.1.12.DA.6: Create and refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process. 8.1.12.AP.5: Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects. 8.2.12.ED.4: Design a product or system that addresses a global problem and document decisions made based on research, constraints, trade-offs, and aesthetic and ethical considerations and share this information with an appropriate audience. 8.2.12.ETW.1: Evaluate ethical considerations regarding the sustainability of environmental resources that are used for the design, creation, and maintenance of a chosen product. 8.2.12.ETW.2: Synthesize and analyze data collected to monitor the effects of a technological product or system on the environment. 8.2.12.ETW.3: Identify a

Back to top

	complex, global environmental or climate change issue, develop a systemic plan of investigation, and propose an innovative sustainable solution.

Sample Measurable Objectives for Lesson Planning
1. Illustrate how interactions among living systems and with their environment result in the movement of matter and energy. 2. Interpret real or simulated data of populations and analyze the trends to understand consumption patterns and resource availability, and make predictions as to what will happen to the population in the future. 3. Provide evidence that the growth of populations are limited by access to resources, and how selective pressures may reduce the number of organisms or eliminate whole populations of organisms. 4. Develop a working definition of ecology and identify the components of an ecosystem 5. Identify and describe biotic and abiotic factors of an environment 6. Explain how consumers obtain and use nutrients. 7. Classify and explain different trophic levels within an ecosystem 8. Describe how carbon, nitrogen phosphorous, and water are recycled within ecosystems 9. Explain the niche of an organism 10. Develop a timeline of, and explain what happens during ecological succession 11. Discuss and explain the ways in which humans disrupt ecosystems 12. List the major sources of environmental pollution and develop methods to alleviate their effects 13. Compare and contrast renewable and nonrenewable resources 14. Design a solution that involves reducing the negative effects of human activities on the environment and biodiversity.

updated 9/1/2022

Back to top

Science Curriculum Map 2022

Unit 3 Summary: Cells

Students will investigate the similarities and differences between prokaryotic and eukaryotic cells. The structure and functional complexities will be discussed and compared. Students will learn to identify and discuss the basic structural organization of eukaryotic cells as well as the function of each major organelle (Nucleus, Mitochondria, Chloroplast, Ribosomes, Cell Membrane). Students will be able to explain the relationships between organelles. As well as why certain types of cells have or lack certain organelles (cell specialization). Specific emphasis will be placed on the cell membrane, as its role is pivotal to cell survival. Students will also be able to distinguish between plant and animal cells. Students will utilize microscope skills to investigate differences in types of cells. Students will observe both prepared slides and live wet mounts.

Essential Questions:

These questions establish inquiry to unify the unit's assignments and assessments.

What is a cell?
How do the major cell types differ?
How do prokaryotic and eukaryotic cells compare?
How does structure relate to function in living systems from the organismal to the cellular level?
What do you mean they say that people are made of a system of systems?
How do feedback mechanisms maintain homeostasis?

Evidence of Learning:

Major Assessments: Summative/Performance Assessments (Tests/Projects = 40%)

Minor Assessments: Quizzes (20%)

Labs (30%)
Required lab: Prokaryote vs Plant vs Animal Cell Microscope Lab

Practice (Homework/Classwork =10 %)

Formative Assessments: Formative assessments will be in the form of warm ups, exit tickets, responder activities, objective checks and other teacher evaluations during class including concept reinforcement worksheets and reading comprehension checks.

Resources

***Biology* by Miller & Levine- Chapter 7**

Science Recommended Accommodations & Modifications for Curriculum Implementation

Back to top

Science Curriculum Map 2022

STANDARDS for Learning Targets			
NJSLS	Literacy	Cross curricular	CTE(NJSLS 9) Technology(NJSL8)
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-LS1-2 - Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.	RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. 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. (HS-LS1-3) 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 overreliance on any one source and following a standard format for citation.	MP.4 Model with mathematics. HSF-IF.C.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. HSF-BF.A.1 Write a function that describes a relationship between two quantities.	CTE 9.3.ST.2 Use technology to acquire, manipulate, analyze and report data. 9.3.ST.3 Describe and follow safety, health and environmental standards related to science, technology, engineering and mathematics (STEM) workplaces. 9.3.ST.6 Demonstrate technical skills needed in a chosen STEM field. 9.3.ST-ET.3 Apply processes and concepts for the use of technological tools in STEM. 9.3.ST-SM.4 Apply critical thinking skills to review information, explain statistical analysis, and to translate, interpret and summarize research and statistical data. Technology 8.1.12.DA.6: Create and refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process.

Back to top

	WHST.9-12.9 Draw evidence from informational texts to support analysis, reflection, and research. SL.11-12.5 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.

Sample Measurable Objectives for Lesson Planning
1. Identify similarities and differences in the three most common cell types
2. Compare and contrast the differences between prokaryotic and eukaryotic cells
3. Compare and contrast plant and animal cells
4. List and describe organelles and their functions
5. Explain the hierarchy of structure and function from subatomic particles to cells
6. Name parts and functions for a compound microscope
7. Demonstrate ability to properly focus a prepared sample under a microscope
8. Prepare and observe a wet mount slide of living organisms

Back to top

Science Curriculum Map 2022

updated 9/1/2022

Unit 4 Summary: Transport

Students will identify the structure and function of the cell membrane and recognize its significance to the survival of the cell. Students will describe, compare and contrast the various methods cells use to move materials into or out of a cell. Students will define and interpret the various types of cell transport (osmosis, diffusion, facilitated diffusion, active transport, pumps, bulk transport). Students will explain the relationship between certain cell types and varying environmental conditions (Hypertonic, Isotonic, Hypotonic).

Essential Questions:

These questions establish inquiry to unify the unit's assignments and assessments.

What are the structures that make up a cell membrane?
What are the functions of membrane proteins?
What are the different types of transport utilized by membranes?
How do cell membranes restrict the exchange of substances?
How do feedback mechanisms maintain homeostasis?
How do cells respond to various environments?

Evidence of Learning:

Major Assessments: Summative/Performance Assessments (Tests/Projects = 40%)

Minor Assessments: Quizzes (20%)

Labs (30%)

Practice (Homework/Classwork =10 %)

Formative Assessments: Formative assessments will be in the form of warm ups, exit tickets, responder activities, objective checks and other teacher evaluations during class including concept reinforcement worksheets and reading comprehension checks.

Resources

Biology by Miller & Levine- Chapter 7

Science Recommended Accommodations & Modifications for Curriculum Implementation

Back to top

Science Curriculum Map 2022

STANDARDS for Learning Targets			
NJSLS	Literacy	Cross curricular	CTE(NJSLS 9) Technology(NJSL8)
HS-LS1-2 - Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. HS-LS1-3 - Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.	RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. 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. (HS-LS1-3) 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 overreliance on any one source and following a standard format for citation.	MP.4 Model with mathematics. HSF-IF.C.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. HSF-BF.A.1 Write a function that describes a relationship between two quantities.	CTE 9.3.ST.2 Use technology to acquire, manipulate, analyze and report data. 9.3.ST-SM.4 Apply critical thinking skills to review information, explain statistical analysis, and to translate, interpret and summarize research and statistical data. Technology 8.1.12.DA.6: Create and refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process. 8.2.12.ETW.2: Synthesize and analyze data collected to monitor the effects of a technological product or system on the environment.

Back to top

Science Curriculum Map 2022

	WHST.9-12.9 Draw evidence from informational texts to support analysis, reflection, and research. SL.11-12.5 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.

Sample Measurable Objectives for Lesson Planning
1. Name and describe membrane parts 2. Compare methods by which substances enter or leave cells 3. Construct models that explain the movement of molecules across membranes with membrane structure and function 4. Provide examples and explain how organisms use feedback systems to maintain their internal environments 5. Identify the cell membrane as selectively permeable and describe the movement of molecules across a membrane when placed in various solutions 6. Define, discuss, compare and contrast osmosis and diffusion 7. Differentiate between active and passive transport 8. Predict effect of fresh/saltwater on cells. Design exp to test the effects of water on cells. 9. Diagram the five different types of cell transport

Back to top

Science Curriculum Map 2022

updated 9/1/2022

Unit 6 Summary: Photosynthesis

In this unit of study, students construct explanations for the role of energy in the cycling of matter in organisms and ecosystems. They will relate energy from the sun to energy stored in food through photosynthesis concepts. Students will describe the general structure and function of carbohydrate molecules. Students will explain separate processes involved in photosynthesis and how those individual processes build upon each other to accomplish the overall goal. Students will trace the path of energy through transformations and relate to the concept of conservation of energy. They apply mathematical concepts to develop evidence to support the interactions of photosynthesis and cellular respiration, and they will develop models to communicate these explanations. Students also understand organisms' interactions with each other and their physical environment and how organisms obtain resources. Students utilize the crosscutting concepts of matter and energy and systems, and system models to make sense of ecosystem dynamics.

Essential Questions:

These questions establish inquiry to unify the unit's assignments and assessments.

How does the process of photosynthesis relate to us?
How do plants make their own food?
How do organisms obtain energy?
How do matter and energy cycle through ecosystems?
How can the process of photosynthesis and respiration in a cell impact ALL of Earth's systems?

Evidence of Learning:

Major Assessments: Summative/Performance Assessments (Tests/Projects = 40%)

Minor Assessments: Quizzes (20%)

Labs (30%)

Practice (Homework/Classwork =10 %)

Formative Assessments: Formative assessments will be in the form of warm ups, exit tickets, responder activities, objective checks and other teacher evaluations during class including concept reinforcement worksheets and reading comprehension checks.

Resources

Biology by Miller & Levine- Chapter 8

Science Recommended Accommodations & Modifications for Curriculum Implementation

Back to top

Science Curriculum Map 2022

STANDARDS for Learning Targets			
NJSLS	Literacy	Cross curricular	CTE(NJSLS 9) Technology(NJSL8)
HS-LS1-3 - Plan and conduct an investigation to provide evidence that, feedback mechanisms maintain homeostasis. HS-LS1-5 - Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy. 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. HS-LS2-4. Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem. 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.	RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. 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. WHST.9-12.9 Draw evidence from informational texts to support analysis, reflection, and research. SL.11-12.5 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. 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.	MP.2 Reason abstractly and quantitatively. MP.4 Model with mathematics. HSN-Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. HSN-Q.A.2 Define appropriate quantities for the purpose of descriptive modeling. HSN-Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.	CTE 9.3.ST.2 Use technology to acquire, manipulate, analyze and report data. 9.3.ST.3 Describe and follow safety, health and environmental standards related to science, technology, engineering and mathematics (STEM) workplaces. 9.3.ST.6 Demonstrate technical skills needed in a chosen STEM field. 9.3.ST-ET.3 Apply processes and concepts for the use of technological tools in STEM. 9.3.ST-SM.4 Apply critical thinking skills to review information, explain statistical analysis, and to translate, interpret and summarize research and statistical data. Technology 8.1.12.DA.6: Create and refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process. 8.1.12.AP.5: Decompose problems into smaller components through systematic analysis, using

Back to top

	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 overreliance on any one source and following a standard format for citation.	constructs such as procedures, modules, and/or objects. 8.2.12.ETW.2: Synthesize and analyze data collected to monitor the effects of a technological product or system on the environment.

Sample Measurable Objectives for Lesson Planning
1. Identify organisms as autotrophs or heterotrophs (producers/consumers).
2. Recite and analyze the equation of photosynthesis
3. Discuss the importance of plants to human civilization.
4. Identify plant structures that are essential for photosynthesis
5. Describe the structure of the chloroplast:
6. Determine the most efficient wavelength and color of light for photosynthesis
7. Describe the function of photosynthetic pigments.
8. Explain how carbon dioxide and water is consumed, and how oxygen and glucose are produced, in photosynthesis
9. Evaluate the effects of environmental factors on the rate of photosynthesis.

Back to top

Science Curriculum Map 2022

updated 9/1/2022

Unit 7 Summary: Cellular Respiration

In this unit of study, students construct explanations for the role of energy in the cycling of matter in organisms and ecosystems. The connection between producing glucose and breaking down glucose into ATP will be determined. Individual processes will be related to the overall goal of the respiration process. The role of oxygen will be related through aerobic vs anaerobic processes. They apply mathematical concepts to develop evidence to support the interactions of photosynthesis and cellular respiration, and they will identify models to communicate these explanations. Students also understand organisms' interactions with each other and their physical environment and how organisms obtain resources. Students utilize the crosscutting concepts of matter and energy and systems, and system models to make sense of ecosystem dynamics.

Essential Questions:

These questions establish inquiry to unify the unit's assignments and assessments.

Why is cellular respiration important to organisms?
How do matter and energy cycle through ecosystems?
How can the process of photosynthesis and respiration in a cell impact ALL of Earth's systems?
How is anaerobic respiration different from aerobic respiration?
What is fermentation?
How is ATP created and utilized by cells?
Where does respiration take place in the cell?
How does respiration relate to nutrition?

Evidence of Learning:

Major Assessments: Summative/Performance Assessments (Tests/Projects = 40%)

Minor Assessments: Quizzes (20%)

Labs (30%)

Practice (Homework/Classwork =10 %)

Formative Assessments: Formative assessments will be in the form of warm ups, exit tickets, responder activities, objective checks and other teacher evaluations during class including concept reinforcement worksheets and reading comprehension checks.

Resources

Miller & Levine's *Biology* Chapter 9

Science Recommended Accommodations & Modifications for Curriculum Implementation

Back to top

Science Curriculum Map 2022

STANDARDS for Learning Targets			
NJSLS	Literacy	Cross curricular	CTE(NJSLS 9) Technology(NJSL8)
HS-LS1-3 - Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. 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. 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. HS-LS2-4. Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem. 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.	WHST.9-12.9 Draw evidence from informational texts to support analysis, reflection, and research. WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.	MP.2 Reason abstractly and quantitatively. MP.4 Model with mathematics. HSN-Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. HSN-Q.A.2 Define appropriate quantities for the purpose of descriptive modeling. HSN-Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.	CTE 9.3.ST.2 Use technology to acquire, manipulate, analyze and report data. 9.3.ST.3 Describe and follow safety, health and environmental standards related to science, technology, engineering and mathematics (STEM) workplaces. 9.3.ST.6 Demonstrate technical skills needed in a chosen STEM field. 9.3.ST-SM.1 Apply science and mathematics to provide results, answers and algorithms for engineering and technological activities. Technology 8.1.12.DA.6: Create and refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process.

Back to top

Science Curriculum Map 2022

Sample Measurable Objectives for Lesson Planning
1. Compare the processes of cellular respiration to metabolism. 2. Identify the products of lactic acid fermentation and alcoholic fermentation. 3. Describe the structure and function of the ATP molecule. 4. Distinguish between ATP production in anaerobic respiration vs. aerobic respiration. 5. Describe the structure of the mitochondria. 6. Write the general formula for aerobic respiration and compare it to the general formula for photosynthesis. 7. Compare and contrast photosynthesis and respiration.

Back to top

Science Curriculum Map 2022

updated 9/1/2022

Unit 8 Summary: Cell Reproduction

Students analyze data and develop models to make sense of the relationship between DNA and chromosomes in the process of cellular division, which passes traits from one generation to the next. Students determine why individuals of the same species vary in how they look, function, and behave. Students develop conceptual models of the role of DNA in the unity of life on Earth. Students explain crossing over and independent assortment as mechanisms of genetic inheritance and describe the alteration of gene expressions. Cell cycle processes and stages will be identified. Students will determine the sequence of events in cell division. Malfunctions in cell cycle events will be related to tumor formation and cancer.

In order to ensure that life continues all cells must have the ability to grow and reproduce. In this particular unit, students will discuss various means of asexual reproduction and compare them to the process of sexual reproduction. The process of mitosis will be compared to the stages and purpose of meiosis. Crosscutting concepts of structure and function, systems and system models, and stability and changes will be used as organizing concepts.

Essential Questions:

These questions establish inquiry to unify the unit's assignments and assessments.

Why is cell reproduction important to organisms?
What are the parts of a chromosome?
Why are karyotypes used in medicine?
How is cell division different in prokaryotes vs. eukaryotes?
What role does the cell cycle play in the life of organisms?
How are cancer cells different from regular cells and why do they occur in organisms?
How does mitosis compare to meiosis?
What is the difference between asexual reproduction and sexual reproduction?

Evidence of Learning:

Major Assessments: Summative/Performance Assessments (Tests/Projects = 40%)

Minor Assessments: Quizzes (20%)

Labs (30%) Mitosis Microscope Lab

Practice (Homework/Classwork =10 %)

Formative Assessments: Formative assessments will be in the form of warm ups, exit tickets, responder activities, objective checks and other teacher evaluations during class including concept reinforcement worksheets and reading comprehension checks.

Back to top

Science Curriculum Map 2022

Resources
Biology by Miller & Levine - Chapters 10, 11 -
Science Recommended Accommodations & Modifications for Curriculum Implementation

STANDARDS for Learning Targets			
NJSLS	Literacy	Cross curricular	CTE(NJSLS 9) Technology(NJSL8)
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-LS1-2 - Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. HS-LS1-3 - Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. HS-LS1-4 - Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organ 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	WHST.9-12.9 Draw evidence from informational texts to support analysis, reflection, and research. WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. SL.11-12.5 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.	MP.4 Model with mathematics. HSF-BF.A.1 Write a function that describes a relationship between two quantities.	CTE 9.3.ST-SM.4 Apply critical thinking skills to review information, explain statistical analysis, and to translate, interpret and summarize research and statistical data. 9.3.ST.6 Demonstrate technical skills needed in a chosen STEM field. Technology 8.2.12.EC.1: Analyze controversial technological issues and determine the degree to which individuals, businesses, and governments have an ethical role in decisions that are made.

Back to top

factors.isms.

Sample Measurable Objectives for Lesson Planning
1. Describe the parts of a chromosome. 2. Distinguish between haploid and diploid cells. 3. Identify gender and abnormalities in a karyotype. 4. Compare the process of cell division in prokaryotic and eukaryotic cells 5. Summarize the cell cycle and discuss how it is controlled 6. Sequence and describe the events of mitosis 7. Explain cancer and tumor formation. 8. Compare and contrast mitosis and meiosis 9. Distinguish between asexual and sexual reproduction

Back to top

Science Curriculum Map 2022

updated 9/1/2022

Unit 9 Summary: Mendelian Genetics

Students develop conceptual models of the role of DNA in the unity of life on Earth and use statistical models to explain the importance of variation within populations for the survival and evolution of species. Ethical issues related to genetic modification of organisms and the nature of science are described. Students explain the mechanisms of genetic inheritance and the alteration of gene expressions. Students will compare complete dominance, incomplete dominance, and codominance. Various patterns including multiple alleles, and sex linked inheritance will be observed.

In this unit, students develop a genetic vocabulary necessary for understanding how traits are passed from parents to offspring through the use of Punnett squares. The probability of inheriting traits are determined using monohybrid and dihybrid crosses.

Essential Questions:

These questions establish inquiry to unify the unit's assignments and assessments.

Based on his observations of his pea plant experiments, how was Gregor Mendel able to contribute to our understanding of genetics?
How do genotypes and phenotypes compare?
How is genetic information passed from parent to offspring?
How do alleles segregate when more than one gene is involved?
What is the difference between monohybrid and dihybrid crosses?
Can a biologist predict the probability of expressed traits in offspring?

Evidence of Learning:

Major Assessments: Summative/Performance Assessments (Tests/Projects = 40%)

Minor Assessments: Quizzes (20%)

Labs (30%)

Practice (Homework/Classwork =10 %)

Formative Assessments: Formative assessments will be in the form of warm ups, exit tickets, responder activities, objective checks and other teacher evaluations during class including concept reinforcement worksheets and reading comprehension checks.

Resources

Biology **by Miller & Levine - Chapter 11**

Science Recommended Accommodations & Modifications for Curriculum Implementation

Back to top

Science Curriculum Map 2022

STANDARDS for Learning Targets			
NJSLS	Literacy	Cross curricular	CTE(NJSLS 9) Technology(NJSL8)
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-LS3-1 - Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring. 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. HS-LS3-3 - Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.	RST.11-12.1 - Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. WHST.9-12.2 - Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. WHST.9-12.9 - Draw evidence from informational texts to support analysis, reflection, and research. RST.11-12.9 - Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. WHST.9-12.1 - Write arguments focused on discipline-specific content.	MP.2 Reason abstractly and quantitatively.	<u>CTE</u> 9.3.ST.2 - Use technology to acquire, manipulate, analyze and report data 9.3.ST.6 - Demonstrate technical skills needed in a chosen STEM field. 9.3.ST-SM.4 - Apply critical thinking skills to review information, explain statistical analysis, and to translate, interpret and summarize research and statistical data. 9.3.ST-SM.2 - Apply science and mathematics concepts to the development of plans, processes and projects that address real world problems. <u>Technology</u> 8.1.12.DA.5: Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena.

Back to top

Science Curriculum Map 2022

Sample Measurable Objectives for Lesson Planning
1. Explain how the process of meiosis results in the passage of traits from parent to offspring, and how that results in increased genetic diversity necessary for evolution. 2. Using the traits of dominant and recessive, explain how Mendel's experiment contributed to the Laws of Heredity. 3. Identify homozygous vs. heterozygous genotypes and phenotypes in a genetic cross. 4. Using the results of Mendel's experiment on garden peas, describe how his data could be explained by scientific knowledge of genes and chromosomes. 5. Identify genes as a set of instructions, coded in the DNA sequence of each organism. 6. Explain how probability is used to predict the results of monohybrid and dihybrid crosses. 7. Define and distinguish between complete dominance, incomplete dominance and co-dominance.

Back to top

Science Curriculum Map 2022

updated 9/1/2022

Unit 10 Summary: HUMAN GENETICS

In this unit, students will apply their gained knowledge from Mendelian Genetics and use it to take a close look at how human inheritance is directed by our chromosomes. Students will reinforce their knowledge of a karyotype and explore multiple karyotypes to distinguish the autosomes from the sex chromosomes, as well as, determine the sex of the individual based on the given chromosome pair. Students will then further investigate different karyotypes and determine if there is a chromosomal disorder present in the individual.

Further exploration in this unit will have students investigating different inheritance patterns, such as codominance and multiple alleles, as expressed in blood type determination, followed by an examination of sex-linked inheritance and particular genetic disorders caused by the X chromosome. Students will be introduced to a pedigree, a visual chart showing genetic connections in families, then use a pedigree to analyze human inheritance and calculate the percent chance of a specific outcome of a cross. Human genetic disorders will be investigated and their causes, including nondisjunction, which will result in an abnormal number of chromosomes in offspring.

Lastly, students will explore the Human Genome and investigate the technology that makes it possible. Students will learn how DNA can be manipulated and tested in order to study the genes present on the chromosome and propose possible future achievements to be made in the field of genomics and bioinformatics.

Essential Questions:

How are characteristics from one generation related to the previous generation?
How can the information learned from pedigrees determine the nature of genes and alleles associated with inherited human traits?
Can a biologist predict the distribution of expressed traits in a population?

Evidence of Learning:

Major Assessments: Summative/Performance Assessments (Tests/Projects = 40%)

Minor Assessments: Quizzes (20%)

Labs (30%)

Practice (Homework/Classwork =10 %)

Formative Assessments: Formative assessments will be in the form of warm ups, exit tickets, responder activities, objective checks and other teacher evaluations during class including concept reinforcement worksheets and reading comprehension checks.

Resources

***Biology* by Miller & Levine - Chapter 14**

Science Recommended Accommodations & Modifications for Curriculum Implementation

Back to top

Science Curriculum Map 2022

STANDARDS for Learning Targets			
NJSLS	Literacy	Cross curricular	CTE(NJSLS 9) Technology(NJSL8)
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-LS3-1 - Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring. 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. HS-LS3-3 - Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.	RST.11-12.1 - Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. WHST.9-12.2 - Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. WHST.9-12.9 - Draw evidence from informational texts to support analysis, reflection, and research. RST.11-12.9 - Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. WHST.9-12.1 - Write arguments focused on discipline-specific content.	MP.2 - Reason abstractly and quantitatively.	<u>CTE</u> 9.3.ST.2 - Use technology to acquire, manipulate, analyze and report data. 9.3.ST-SM.2 Apply science and mathematics concepts to the development of plans, processes and projects that address real world problems. <u>Technology</u> 8.2.12.EC.1: Analyze controversial technological issues and determine the degree to which individuals, businesses, and governments have an ethical role in decisions that are made. 8.2.12.ITH.2: Propose an innovation to meet future demands supported by an analysis of the potential costs, benefits, trade-offs, and risks related to the use of the innovation.

Back to top

Science Curriculum Map 2022

Sample Measurable Objectives for Lesson Planning
1. Define mutations and describe different types of chromosomal mutations. 2. Explain the role of sex chromosomes in sex determination. 3. Explain the effect of crossing-over on the inheritance of genes in linkage groups. 4. Show how pedigree analysis can be used to illustrate the inheritance of traits. 5. Give examples of traits or disorders transmitted by autosomal dominant, autosomal recessive, polygenic and X-linked recessive inheritance. 6. Explain how nondisjunction can cause genetic disorders. 7. Explain the value and potential applications of genome projects.

Back to top

Science Curriculum Map 2022

updated 9/1/2022

Unit 11 Summary: DNA to PROTEIN SYNTHESIS

In this unit, students will explore the complex structure of the DNA molecule, as discovered by James Watson and Francis Crick. Students will investigate and understand the relationship between DNA and chromosomes. Taking a detailed look at the molecule, students will identify deoxyribose, phosphates, and nitrogenous bases as the 3 main building blocks of the molecule, then further understand their role in building its double helix shape.

After a complete examination of the structure of the DNA molecule, students will investigate the process of replication and explain how the DNA molecule copies itself. A link between prior learning of the cell cycle and the process of replication will be created. The role of enzymes in the process will be examined and explained.

Different RNA molecules will be introduced, including their structures, basic components, and the function of each type of RNA molecule. The processes of transcription and translation will be explained and the students will demonstrate how to use a codon wheel to determine which amino acids will be coded for during protein synthesis. The role of these proteins and their vitality in genetic variability will be examined. Students will investigate DNA mutations by examining the different types of mutations and their different effects on the genes and chromosomes. Gene regulation will also be explored and the effect of cell differentiation on developmental stem cells.

Essential Questions:

What is the structure of DNA and what is its role in genetic inheritance?
How does information flow from DNA to RNA to direct the synthesis of proteins?
What controls the development of cells and tissues in multicellular organisms?
What are mutations and how do they affect protein synthesis?

Evidence of Learning:

.**Major Assessments:** Summative/Performance Assessments (Tests/Projects = 40%)

Minor Assessments: Quizzes (20%)

Labs (30%)

Practice (Homework/Classwork =10 %)

Formative Assessments: Formative assessments will be in the form of warm ups, exit tickets, responder activities, objective checks and other teacher evaluations during class including concept reinforcement worksheets and reading comprehension checks.

Resources

Biology **by Miller & Levine - Chapter 12, 13**

Science Recommended Accommodations & Modifications for Curriculum Implementation

Back to top

Science Curriculum Map 2022

STANDARDS for Learning Targets			
NJSLS	**Literacy**	**Cross curricular**	**CTE(NJSLS 9) Technology(NJSL8)**
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-LS3-1 - Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring. 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.	RST.11-12.1 -Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. WHST.9-12.2 - Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. WHST.9-12.9 - Draw evidence from informational texts to support analysis, reflection, and research. RST.11-12.9 - Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. WHST.9-12.1 - Write arguments focused on discipline-specific content.	MP.2 - Reason abstractly and quantitatively.	<u>CTE</u> 9.3.ST-SM.2 - Apply science and mathematics concepts to the development of plans, processes and projects that address real world problems. 9.3.ST-SM.3 - Analyze the impact that science and mathematics has on society. 9.3.ST.2 - Use technology to acquire, manipulate, analyze and report data. <u>TECHNOLOGY</u> 8.2.12.NT.1: Explain how different groups can contribute to the overall design of a product. 8.2.12.ITH.3: Analyze the impact that globalization, social media, and access to open source technologies has had on innovation and on a society's economy, politics, and culture.

<u>Sample Measurable Objectives for Lesson Planning</u>

1. Describe the structure of the DNA molecule
2. Explain Chargraff's rule and explain how it mathematically can be used to determine amounts of each nucleotide
3. Sequence the process of replication, including the enzymes involved
4. Contrast RNA with DNA.
5. Summarize the processes of transcription and translation
6. Create a visual representation to illustrate how changes in a DNA nucleotide sequence can result in a change in the polypeptide produced.
7. Define mutations and describe different types of mutations.

Back to top

Science Curriculum Map 2022

updated 9/1/2022

Unit 12 Summary: EVOLUTION

In this unit, students will explore and investigate the fundamentals of evolution proposed by Charles Darwin, then use their gained knowledge to analyze and interpret data, as well as, engage in argument from evolutionary evidence to make sense of the relationship between the environment and natural selection. Students also develop an understanding of the driving factors influencing natural selection of species over time.

Students evaluate evidence of the conditions that may result in new species and explore and understand the role of genetic variation in natural selection. Additionally, students can apply concepts of probability to explain trends in populations as they relate to advantageous heritable traits in a specific environment. The crosscutting concepts of patterns and cause and effect support the development of a deeper understanding.

Essential Questions:

How does natural selection lead to adaptations of populations?
How are species affected by changing environmental conditions?
What is the relationship between natural selection and evolution?
How can we evaluate evidence provided for the theory of evolution?

Evidence of Learning:

Major Assessments: Summative/Performance Assessments (Tests/Projects = 40%)

Minor Assessments: Quizzes (20%)

Labs (30%)

Practice (Homework/Classwork =10 %)

Formative Assessments: Formative assessments will be in the form of warm ups, exit tickets, responder activities, objective checks and other teacher evaluations during class including concept reinforcement worksheets and reading comprehension checks.

Resources

Biology **by Miller & Levine - Chapter 16, 17, 18, 19**

Science Recommended Accommodations & Modifications for Curriculum Implementation

Back to top

Science Curriculum Map 2022

STANDARDS for Learning Targets			
NJSLS	Literacy	Cross curricular	CTE(NJSLS 9) Technology(NJSL8)
HS-LS4-1 - Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence. HS-LS4-2 - Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) 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 the environment. 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 organisms lacking this trait. HS-LS4-4 - Construct an explanation based on evidence for	RST.11-12.1 - Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. RST.11-12.8 - Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. WHST.9-12.2 - Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. WHST.9-12.9 Draw evidence from informational texts to support analysis, reflection, and research.	MP.2 - Reason abstractly and quantitatively. MP.4 - Model with mathematics.	<u>CTE</u> 9.3.ST-SM.2 - Apply science and mathematics concepts to the development of plans, processes and projects that address real world problems. 9.3.ST-SM.3 - Analyze the impact that science and mathematics has on society. 9.3.ST.2 - Use technology to acquire, manipulate, analyze and report data. <u>TECHNOLOGY</u> 8.2.12.EC.3: Synthesize data, analyze trends, and draw conclusions regarding the effect of a technology on the individual, culture, society, and environment and share this information with the appropriate audience

Back to top

how natural selection leads to adaptation of populations.

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.

Sample Measurable Objectives for Lesson Planning

1. Identify important insights and discoveries towards the development of the theory of evolution.
2. Explain and cite evidence for the process of natural selection as proposed by Charles Darwin
3. Make predictions about the effects of artificial selection on the genetic makeup of a population over time
4. Compare/Contrast the processes of Natural and Artificial Selection.
5. Construct an explanation that identifies the cause and effect relationship between natural selection and adaptation.
6. Examine a group of related organisms using a phylogenetic tree or cladogram in order to (1) identify shared characteristics, (2) make inferences about the evolutionary history of the group, and (3) identify character data that could extend or improve the phylogenetic tree
7. Compile evidence for human origins.
8. Describe the fossil record for prokaryotes and eukaryotes.

Back to top