Washington Township School District

The mission of the Washington Township Public Schools *is to provide a safe, positive, and progressive educational environment that provides opportunity for all students to attain the knowledge and skills specified in the NJ Learning Standards at all grade levels, so as to ensure their full participation in an ever-changing world as responsible, self-directed and civic-minded citizens.*

Course Title:	**CP Biology**
Grade Level(s):	**10**

Duration:	*Full Year:*	**x**	*Semester:*		*Marking Period:*	
Course Description:	This course covers a basic, yet comprehensive, knowledge of biology from the macroscopic to the microscopic level. Learning activities are designed to enhance student understanding and to utilize and strengthen critical thinking, scientific reasoning, decision making and problem solving skills. Student motivation to do preparatory work, including independent reading and application assignments, will contribute to success in this course. There is a weekly double lab period during which science lab skills will be developed. The course is designed to prepare students to understand biological concepts and their relationship to society, as well as to prepare them for future study and skill application in successive science courses.					
Grading Procedures:	**Tests-40%, Quizzes-15%, Labs-25%, Independent Work-10%, Projects-10%**					
Primary Resources:	**NJ Model Biology Curriculum** **Next Generation Science Standards (NGSS)** **New Jersey Learning Standards (NJSLS)** **Textbook- Miller & Levine Biology**					

Washington Township Principles for Effective Teaching and Learning

- Implementing a standards-based curriculum
- Facilitating a learner-centered environment
- Using academic target language and providing comprehensible instruction
- Adapting and using age-appropriate authentic materials
- Providing performance-based assessment experiences

- Infusing 21st century skills for College and Career Readiness in a global society

Designed by:	Bonnie Farrell

Under the Direction of:	Dr. Patricia Hughes

Written: _Bonnie Farrell_____

Revised: _____

BOE Approval: _____

Unit Title: Interdependence Relationships and Ecosystems

Unit Description:

In this unit of study, students formulate answers to the question “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 functioning, resilience, and social interactions, including group behavior. Students use mathematical reasoning and models to make sense of carrying capacity, factors affecting biodiversity and populations, the cycling of matter and flow of energy through systems. The crosscutting concepts of scale, proportion, and quantity and stability and change are called out as organizing concepts for the disciplinary core ideas. Students are expected to use mathematical reasoning and models to demonstrate proficiency with the disciplinary core ideas.

Unit Duration: 5.5 weeks

Desired Results

Standard(s): 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 an explanation based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.), **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-LS2-8** (Evaluate the evidence for the role of group behavior on individual and species’ chances to survive and reproduce**)**

Indicators: LS2.A: Interdependent Relationships in Ecosystems, LS2.C: Ecosystem Dynamics, Functioning, and Resilience, LS2.D: Social Interactions and Group Behavior

Understandings: *Students will understand that…*

- Ecosystems have carrying capacities, which are limits to the number of organisms and populations they can support.
- These limits result from such factors as the availability of living and nonliving resources and from such challenges such as predation, completion, and disease.
- Organisms would have the capacity to produce populations of great size were it not for the fact that environments and resources are finite. This fundamental tension affects the abundance (the number of individuals) of species in any given ecosystem.
- The significance of carrying capacity in ecosystems is dependent on the scale proportion and quantity at which it occurs.
- Quantitative analysis can be used to compare and determine relationships among interdependent factors that affect the carrying capacity of ecosystems at different scales.
- Ecosystems have carrying capacities, which are limits to the number of organisms and populations they can support.
- These limits result from such factors as the availability of living and nonliving resources and from such challenges such as predation, completion, and disease.

Essential Questions:

- How do organisms interact with the living and nonliving environments to obtain matter and energy?
- How is the biomass pyramid and or the pyramid of numbers effected by the energy availability in a community?
- What factors contribute to changes to populations?
- How do exponential and logistic patterns differ and why?
- How does the dynamics of human population growth in developed versus underdeveloped nations compare?
- How do ecosystems change over time?
- How does group behavior in wildlife and human populations effect survival and reproduction rate?

- Organisms would have the capacity to produce populations of great size were it not for the fact that environments and resources are finite.
- This fundamental tension affects the abundance (number of individuals) of species in any given ecosystem.
- A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions.
- If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient), as opposed to becoming a very different ecosystem.
- Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability.
- Much of science deals with constructing explanations of how things change and how they remain stable.
- A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions.
- If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem) as opposed to becoming a very different ecosystem.
- Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability.

Assessment Evidence

Performance Tasks:

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.

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.

Other Evidence:

Student Independent Work on Ed-Puzzle and Blackboard Written Assignments (Characteristics of Life)
Written Vocabulary Quizzes on Chapter 1 The Science of Biology combined with Chapter 3 The Biosphere, Chapter 4 The Ecosystem and Communities and Chapter 5 Populations
Written Content Quizzes on Chapter 1 The Science of Biology combined with Chapter 3, Chapter 4 The Ecosystem and Communities and Chapter 5 Populations
LABS:
Lab Safety
Graphing Skills
How Do Abiotic Factors Effect Population Growth? (Radish Seed Lab)
Predator Prey Lab
M and M Lab (Ecological Interactions)
Animal Population Lab (Tag and Recapture)

HS-LS2-8. Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.	Austrailian Rabbit Disaster Pond Water Lab Virtual Food Chain and Food Web Owl Pellet Dissection **Lab Participation and Skill Accuracy** **Written Quiz on Lab Activities** assessing graphing skills **Written Test** - Chapter 1 The Science of Biology combined with Chapter 3 The Biosphere, Chapter 4 Ecosystems and Communities and Chapter 5 Populations **Project Ideas:** Biomes and Aquatic Ecosystems Power Point Presentation or Brochure

Benchmarks: Chapter Tests

Learning Plan

Learning Activities:

Chapter 1-The Science of Biology

Students Brainstorm- What is Biology?
Explain what the goal of science is.
Explain what a hypothesis is.
Students will use the scientific method in an investigation.
Students will practice making tables and graphs and then analyze data.
Group Work on creating a list of what it requires for a being to be considered alive.
Describe some characteristics of living things.
Explain how life can be studied at each level of organization from the molecular level to the biosphere.
Review terms-Key Concepts and Reinforcement Worksheets
Kahoot Interactive Review Games
Biology.com Activities
Chapter Standardized Test Prep Questions
NGSS Problem-based Learning Activity

Chapter 3- The Biosphere

What is ecology?
What are biotic and abiotic factors?
Students will brainstorm using picture prompts and personal experiences and visits to compare biotic and abiotic factors.
Students will develop food chains and food webs from organisms found in pond water observation.
Identify the three types of ecological pyramids and discuss how it illustrates the transfer the energy and matter.
What methods are used in ecological studies?
Review terms-Key Concepts and Reinforcement Worksheets
Kahoot Interactive Review Games
Biology.com Activities
Chapter Standardized Test Prep Questions
NGSS Problem-based Learning Activity

Chapter 4- Ecosystems and Communities

Define niche
What interaction occurs within communities?
Describe the role competition and predation play in shaping communities.
Students will role play and or view predator prey relationships.
Identify the three types of symbiotic relationships.
Students will identify the relationship displayed in a picture prompt or video as either mutualism, commensalism or parasitism.

What is ecological succession?
Describe how ecosystems recover from a disturbance.
Review terms-Key Concepts and Reinforcement Worksheets
Kahoot Interactive Review Games
Biology.com Activities
Chapter Standardized Test Prep Questions
NGSS Problem-based Learning Activity

Chapter 5- Populations
What characteristics are used to describe a population?
Identify factors that affect the population.
Describe, compare and contrast exponential and logistic growth.
Have students study 2 graphs related to exponential growth. Ask questions such as How are graphs alike, different, what do differences indicate in reference to exponential growth?
Identify factors that determine carrying capacity.
What are the limiting factors that affect population growth?
Display a list of examples that relate to limiting factors. Call on students to identify examples as density-dependent or density-independent.
Discuss the trend of human population growth.
Students will view video clip: on Human Population Growth
Explain why population growth rates differ in countries throughout the world.
Review terms-Key Concepts and Reinforcement Worksheets
Kahoot Interactive Review Games
Biology.com Activities
Chapter Standardized Test Prep Questions
NGSS Problem-based Learning Activity

Resources:
Textbook Sources
Internet Resources
Lab Materials Resources
Teacher Collaboration on content being instructed

Unit Learning Goal and Scale *(Level 2.0 reflects a minimal level of proficiency)*	
Standard(s): **HS-LS2-1, HS-LS2-2, HS-LS2-6**	
4.0	**Students will be able to:** • **In addition to score3.0 performance, the student demonstrates in depth inferences and applications that go beyond what was taught.**
3.0	**Students will be able to:** • **HS-LS2-1: Use mathematical and /or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.(ex graphs, charts, or quantitative analysis** • **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.**

	• **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.**
2.0	**Students will be able to:** • **HS-LS2-1: Recognize or recall specific vocabulary .** **Describe how various factors affect the carrying capacity of ecosystems.** • **HS-LS2-2: Recognize or recall specific vocabulary.** **Describe how various factors affect the biodiversity and populations of ecosystems.** • **HS-LS2-6: Recognize or recall specific vocabulary.** **Describe the effects of transitions in ecosystems.**
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s):HS-LS2-8	
4.0	**Students will be able to:** • **In addition to score 3.0 performance, the student demonstrates in depth inferences and applications that go beyond what was taught.**
3.0	**Students will be able to:** • **Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.**
2.0	**Students will be able to:** • **Recognize or recall specific vocabulary .** • **Describe the relationship between group behavior and individual survival.**
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Unit Modifications for Special Population Students

Advanced Learners	N/A
Struggling Learners	Use L1 Differentiated Instructional Support Explanations & Activities As guided by the textbook.
English Language Learners	Use ELL Differentiated Instructional Support Explanations & Activities As guided by the textbook. Follow any guidelines based on student specific ESL modifications http://www.state.nj.us/education/modelcurriculum/ela/ELLSupport.pdf
Special Needs Learners	Modifications based on IEP & 504 plans http://www.nj.gov/education/udl/

Interdisciplinary Connections

Indicators:

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.
(HS-LS2-6),(HS-LS2-7),(HS-LS2-8)

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. (HS-LS2-1),(HS-LS2-2),(HS-LS2-3),(HS-LS2-6),(HS-LS2-8)

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. (HS-LS2-6),(HS-LS2-7),(HS-LS2-8)

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. (HS-LS2-6),(HS-LS2-7),(HS-LS2-8)

WHST.9-12.2 Write informative/explanatory

Mathematics:

MP.2 Reason abstractly and quantitatively. (HS-LS2-1),(HS-LS2-2),(HS-LS2-4),(HS-LS2-6),(HS-LS2-7)

MP.4 Model with mathematics. (HS-LS2-1),(HS-LS2-2),(HS-LS2-4)

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. (HS-LS2-1),(HS-LS2-2),(HS-LS2-4),(HS-LS2-7)

HSN-Q.A.2 Define appropriate quantities for the purpose of descriptive modeling. (HS-LS2-1),(HS-LS2-2),(HS-LS2-4),(HS-LS2-7)

HSN-Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. (HS-LS2-1),(HS-LS2-2),(HS-LS2-4),(HS-LS2-7)

HSS-ID.A.1 Represent data with plots on the real number line. (HS-LS2-6)

HSS-IC.A.1 Understand statistics as a process for making inferences about population parameters based on a random sample from that population. (HS-LS2-6)

HSS-IC.B.6 Evaluate reports based on data. (HS-LS2-6)

Integration of 21st Century Skills

Indicators:
Appropriate and contemporary technologies will be applied throughout the unit to practice 21st century skills.

The standards listed above and the performance tasks and activities that support them are infused with 21st Century Skills. The Level 3 skills listed in each of the Goals & Scales sections involve critical and creative thinking, communication and collaboration. The methods by which students attain these skills require that students practice multi-step problem solving, using technology to research and solve problems, and communicate results with their instructors and peers. The learning activities listed provide a mix of traditional classroom work and interactive, online experiences.

Science & Engineering Practices:
Asking questions and defining problems
Using Mathematics and Computational Thinking
Analyzing and Interpreting Data
Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena

Cross-Cutting Connections:
Influence of Science, Engineering, and Technology on Society and the Natural World
Cause and Effect

Connections to Nature of Science:
Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomenon

Unit Title: Matter and Energy Transformation in Ecosystems

Unit Description:

In this unit of study, students *construct explanations* for the role of energy in the cycling of matter in organisms and ecosystems. They *apply mathematical concepts* to *develop evidence to support explanations* of 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. Students are expected to use students *construct explanations* for the role of energy in the cycling of matter in organisms and ecosystems. They *apply mathematical concepts* to *develop evidence to support explanations* as they demonstrate their understanding of the disciplinary core ideas.

Unit Duration: 4.5 weeks

Desired Results

Standard(s):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**),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-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-LS1-5 (**Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy)

Indicators:

LS2.B: Cycles of Matter and Energy Transfer in Ecosystems, LS1.C: Organization for Matter and Energy Flow in Organisms

Understandings:

Students will understand that…

- Energy drives the cycling of matter within and between systems in aerobic and anaerobic conditions.
- Photosynthesis and cellular respiration (including anaerobic processes) provide most of the energy for life processes.
- Energy cannot be created or destroyed—it only moves between one place and another place, between objects and/or fields, or between systems.
- At each link in an ecosystem, matter and energy are conserved.
- Plants or algae form the lowest level of the food web. At each link upward in a food web, only a small fraction of the matter consumed at the lower level is transferred upward to produce growth and release energy in cellular respiration at the higher level.

Essential Questions:

- How do living and non-living parts of earth interact and affect the survival of organisms?
- How do different organisms get the energy they need to survive through molecular interaction and energy storage?
- How does energy move through an ecosystem?
- Why is the cycling of matter important to life on Earth?
- How do plants and other organisms capture energy from the sun?
- How do organisms store energy?
- What cellular structures and molecules are involved in photosynthesis?
- How do photosynthetic organisms convert the sun's energy into chemical energy?

• Given this inefficiency, there are generally fewer organisms at higher levels of a food web. • Some matter reacts to release energy for life functions, some matter is stored in newly made structures, and much is discarded. • The chemical elements that make up the molecules of organisms pass through food webs and into and out of the atmosphere and soil, and they are combined and recombined in different ways. • Models (e.g., physical, mathematical, computer) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales. • Photosynthesis and cellular respiration are important components of the carbon cycle, in which carbon is exchanged among the biosphere, atmosphere, oceans, and geosphere through chemical, physical, geological, and biological processes. • The main way that solar energy is captured and stored on Earth is through the complex chemical process known as photosynthesis.	• Why is the conversion of ADP and NADP to ATP and NADPH essential for cell function? • How do organisms obtain energy? • Why do most organisms undergo the process of cellular respiration? • How do cells release energy from food in the presence of oxygen? • How do cells release energy from food without oxygen?

Assessment Evidence

Performance Tasks: 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. 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-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.	**Other Evidence:** **Student Independent Work** on Ed puzzle and Blackboard **Written Quizzes on Related Vocabulary** for Chapter 3 The Biosphere Section 3 Cycles of Matter, Chapter 2 The Chemistry of Life- Sections 2:3 and 2:4 Carbon Compounds and Chemical Reactions, Chapter 8 Photosynthesis, Chapter 9 Cell Respiration **Written Quizzes on Content** for Chapter 3 The Biosphere Section 3 Cycles of Matter, Chapter 2 The Chemistry of Life- Sections 2:3 and 2:4 Carbon Compounds and Chemical Reactions, Chapter 8 Photosynthesis, Chapter 9 Cell Respiration **LAB ACTIVITIES**: Soil and Cycles Lab Carbon Cycle Organic Compound Lab (Food Lab) Measuring Energy in Food (Calorie Lab) Yeast and Carbon Dioxide Production Comparing Fermentation Rates of Sugars Photosynthesis Lab Photosynthesis and Cell Respiration Inquiry Photosynthesis- Leaf Disc Lab Lab Participation and Skill Accuracy **Written Chapter Test**

HS-LS1-5. Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.	Chapter 3 Section 3 Cycles of Matter and Chapter 2 The Chemistry of Life- Sections 2:3 and 2:4 Carbon Compounds and Chemical Reactions Combined Test Chapter 8- Photosynthesis Chapter 9- Cell Respiration **Written Assessment:** SGO on Photosynthesis and Cell Respiration

Benchmarks: SGO: Photosynthesis and Cell Respiration

Learning Plan

Learning Activities:

Chapter 3-Section 3:3-- Cycles of Matter

Describe how matter move among the living and nonliving parts of an ecosystem.
How are nutrients important in living systems?
Identify and explain the biogeochemical cycles.
Using pictures of the cycles, call on students to "translate" the diagram pictures, labels, and arrows into complete sentences.
Video: Hank Green Hydrologic and Carbon Cycle
VIDEO CLIP: CRASH COURSE #8 ON CYCLES
Creative writing assignment for Cycles
Review terms-Key Concepts and Reinforcement Worksheets
Kahoot Interactive Review Games
Biology.com Activities
Chapter Standardized Test Prep Questions
NGSS Problem-based Learning Activity

Chapter 2-Section 2:3- Carbon Compounds and Section 2:4- Chemical Reactions

Describe the unique qualities of carbon.
Describe the structures and functions of each group of macromolecules.
Video Clips: BIOLOGICAL MOLECULES CRASH COURSE BIOLOGY VIDEO #3: https://youtu.be/H8WJ2KENlK0
Amoeba Sisters Clip on biological molecules: https://youtu.be/YO244P1e9QM
Web LAB Activity: A case study in Lactose Intolerance from HHMI Biointeractive
Explain how chemical reactions affect chemical bonds
Explain how energy changes affect how easily a chemical reaction will occur.
Review terms-Key Concepts and Reinforcement Worksheets
Kahoot Interactive Review Games
Biology.com Activities
Chapter Standardized Test Prep Questions
NGSS Problem-based Learning Activity

Chapter 8- Photosynthesis
Describe the role of ATP in cellular activities.
Explain where plants get energy they need to produce food.
Explain the role of light and pigments in photosynthesis.
State the overall equation for photosynthesis.
Mini investigations/demonstrations that illustrate the historical discoveries made that have lead to the photosynthesis reaction.
Video clips: by the Amoeba Sisters and Hank Green's Crash Course, Bill Nye
Chapter Mystery: Out of Thin Air
Describe what happens during the light dependent reaction.
Describe what happens during the light independent reaction.
Identify factors that affect the rate of photosynthesis.
Entrance and Exit tickets to reinforce major concepts in Chapter.
Review terms-Key Concepts and Reinforcement Worksheets
Kahoot Interactive Review Games
Biology.com Activities
Chapter Standardized Test Prep Questions
NGSS Problem-based Learning Activity

Chapter 9- Cell Respiration
Explain where organisms get the energy they need for life processes.
Define cellular respiration.
Student demonstration: Have students blow into Bromothymol blue to test for the presence of carbon dioxide.showing how carbon dioxide gets exhaled.
Compare photosynthesis and cell respiration.
Describe what happens during glycolysis.
Describe what happens during the Krebs Cycle.
Chapter Mystery: Diving Without a Breath
Identify how much ATP cellular respiration generates.
Explain how organisms get energy in the absence of oxygen
Identify the pathways the body uses to release energy during exercise.
Review terms-Key Concepts and Reinforcement Worksheets
Kahoot Interactive Review Games
Biology.com Activities
Chapter Standardized Test Prep Questions
NGSS Problem-based Learning Activity

Resources:
Textbook Sources
Internet Resources
Lab Materials Resources
Teacher Collaboration on content being instructed

Unit Learning Goal and Scale *(Level 2.0 reflects a minimal level of proficiency)*	
Standard(s): **HS-LS2-3, HS-LS-2-4, HS-LS2-5**	
4.0	**Students will be able to:** • **In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.**
3.0	**Students will be able to:** • **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 and geosphere**
2.0	**Students will be able to:** • **HS-LS2-3, HS-LS2-4- Recognize or recall specific vocabulary** **Describe how matter cycles and energy flows in aerobic and anaerobic conditions, among organisms in an ecosystem** **HS-LS2-5- Recognize or recall specific vocabulary** **State accurate information about photosynthesis, cellular respiration and the cycles**
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s):HS-LS-1-5, HS-LS-1-6, HS-LS 1-7	
4.0	**Students will be able to:** • **In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.**
3.0	**Students will be able to:** • **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-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**
2.0	**Students will be able to:** **HS-LS1-5** • **Recognize or recall specific vocabulary** • **Describe how plants use photosynthesis** • **Describe the inputs and outputs of photosynthesis** **HS-LS1-7** **Recognize or recall specific vocabulary** **Describe how organisms use cellular respiration**

	Describe the inputs and outputs of cell respiration
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Unit Modifications for Special Population Students

Advanced Learners	N/A
Struggling Learners	Use L1 Differentiated Instructional Support Explanations & Activities As guided by the textbook.
English Language Learners	Use ELL Differentiated Instructional Support Explanations & Activities As guided by the textbook. Follow any guidelines based on student specific ESL modifications http://www.state.nj.us/education/modelcurriculum/ela/ELLSupport.pdf
Special Needs Learners	Modifications based on IEP & 504 plans http://www.nj.gov/education/udl/

Interdisciplinary Connections

Indicators:
ELA/Literacy –
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. (HS-LS2-1),(HS-LS2-2),(HS-LS2-3),(HS-LS2-6),(HS-LS2-8)
WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (HS-LS2-1),(HSLS2-2),(HS-LS2-3)
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. (HS-LS2-3)
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-LS2-7)
Mathematics –
MP.2 Reason abstractly and quantitatively. (HS-LS2-1),(HS-LS2-2),(HS-LS2-4),(HS-LS2-6),(HS-LS2-7)
MP.4 Model with mathematics. (HS-LS2-1),(HS-LS2-2),(HS-LS2-4)
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. (HS-LS2-1),(HS-LS2-2),(HS-LS2-4),(HS-LS2-7)

Integration of 21st Century Skills

Indicators:
Appropriate and contemporary technologies will be applied throughout the unit to practice 21st century skills.

The standards listed above and the performance tasks and activities that support them are infused with 21st Century Skills. The Level 3 skills listed in each of the Goals & Scales sections involve critical and creative thinking, communication and collaboration. The methods by which students attain these skills require that students practice multi-step problem solving, using technology to research and solve problems, and communicate results with their

instructors and peers. The learning activities listed provide a mix of traditional classroom work and interactive, online experiences.

Science & Engineering Practices:
Asking questions and defining problems
Using Mathematics and Computational Thinking
Analyzing and Interpreting Data
Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena

Cross-Cutting Connections:
Influence of Science, Engineering, and Technology on Society and the Natural World
Cause and Effect

Connections to Nature of Science:
Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomenon

Unit Title: Human Activity and the Biosphere

Unit Description:

In this unit of study, students examine factors that have influenced the distribution and development of human society; these factors include climate, natural resource availability, and natural disasters. Students use *computational representations* to 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. The crosscutting concepts of *cause and effect*, *systems and systems models*, *stability and change*, and *the influence of engineering, technology, and science on society and the natural world* are called out as organizing concepts for the disciplinary core ideas. Students will analyze and interpret data, use mathematical and computational thinking, and construct explanations as they demonstrate understanding of the disciplinary core ideas.

Unit Duration: 4 weeks

Desired Results

Standard(s): HS-LS4-5 (Evaluate the evidence supporting claims that changes in environmental conditions may result in(1) increase in the number of individuals of some species**, (2)** the emergence of new species over time and (3) the extinction of other species) **HS-LS4-6 (**create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity), **HS-LS2.-7 (**Design, evaluate and refine a solution for reducing the impacts of human activities on the environment and biodiversity**)**

Indicators: LS2.C: Ecosystem Dynamics, Functioning, and Resilience

LS4.D: Biodiversity and Humans

LS4.C: Adaptation

Understandings:
Students will understand that…

- Resource vitality has guided the development of human society.
- Natural hazards and other geologic events have shaped the course of human history.
- Natural hazards and other geologic events have significantly altered the sizes of human populations and have driven human migration.
- Empirical evidence is required to differentiate between cause and correlation and make claims about how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activities.

Essential Questions:

1. What is the matter in organisms made of?
2. How do organisms use different types of carbon compounds?
3. How do chemicals break apart and combine inside living things?
4. How have human activities shaped local and global ecology?
5. How can we use our natural resources wisely?
6. How do changes in the environment (such as global climate change or invasive species) affect a wildlife population or cause extinction?
7. How do human activities (such as habitat fragmentation or fertilizer pollution) affect biodiversity?
8. Why is it important to protect and conserve biodiversity?
9. How can human activity impact be reduced to cause less environmental harm?
10. What solutions and methods have been successful in returning ecosystems to its healthy state?
11. How has human population growth negatively impacted the environment?

• Modern civilization depends on major technological systems. • Changes in climate can affect population or drive mass migration. • Current models predict that, although future regional climate changes will be complex and will vary, average global temperatures will continue to rise. • The outcomes predicted by global climate models strongly depend on the amounts of human-generated greenhouse gases are added to the atmosphere each year and by the ways in which these gases are absorbed by the ocean and biosphere. • Through computer simulations and other studies, important discoveries are still being made about how the ocean, the atmosphere, and the biosphere interact and are modified in response to human activities. • Human activities can modify the relationships among Earth systems. • Although the magnitude of human impacts are greater than they have ever been, so too are human abilities to model, predict, and manage current and future impacts. • Change in rates of change can be quantified and modeled over very short or very long periods of time. Some system changes are irreversible. • Scientist and engineers can make major contributions by developing technologies that produce less pollution and waste and that preclude ecosystem degradation. • Engineers continuously modify these systems to increase benefits while decreasing costs and risks. • Feedback (negative or positive) can stabilize or destabilize natural systems. • When evaluating solutions, it is important to take into account a range of constraints,	12. What solutions could correct problems such as habitat fragmentation, urbanization, invasive species, and various pollution sources?

including costs, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts. • New technologies can have deep impacts on society and the environment, including some that are not anticipated. • Analysis of costs and benefits is a critical aspect of decisions about technology. • The sustainability of human societies and the biodiversity that supports them require responsible management of natural resources. • Change and rates of change can be quantified and modeled over very short or very long periods. • Some system changes are irreversible. • Modern civilization depends on major technological systems. • New technologies can have deep impacts on society and the environment including some that are not anticipated. • Scientific knowledge is a result of human endeavors imagination and creativity. • Anthropogenic changes (induced by human activity) in the environment—including habitat destruction, pollution, introduction of invasive species, overexploitation, and climate change—can disrupt an ecosystem and threaten the survival of some species. • Biodiversity is increased by the formation of new species (speciation) and decreased by the loss of species (extinction). • Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change.	

• Thus sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. • Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value. • Much of science deals with constructing explanations of how things change and how they remain stable. • New technologies can have deep impacts on society and the environment, including some that where not anticipated. Analysis of cost and benefits is a critical. • Changes in the physical environment, whether naturally occurring or human induced, have contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline—and sometimes the extinction—of some species. • Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. • Thus sustaining biodiversity so that ecosystems' functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value. • New technologies can have deep impacts on society and the environment, including some that were not anticipated. • Analysis of costs and benefits is a critical aspect of decisions about technology.	

Assessment Evidence

Performance Tasks:

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.

HS-LS-4-6 Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity**.**

HS-LS2-7 Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

Other Evidence:

Student Independent Work on Ed Puzzle and Blackboard

Written Quizzes on Related Vocabulary for Chapter 2 Section 2:2 Properties of Water combined with Chapter 6 Humans in the Biosphere

Written Quizzes on Content for Chapter 2 Section 2:2 Properties of Water combined with Chapter 6 Humans in the Biosphere

LAB ACTIVITIES:

Water Lab
PH Lab
The Effect of Fertilizer on Algae
Ocean Acidification Inquiry
Global Climate Change Inquiry
Great Rabbit Disaster
Lab Participation & Skill Accuracy

Written Chapter Test for Chapter 2 Section 2:2 Properties of Water combined with Chapter 6 Humans in the Biosphere

Projects Ideas:

Ocean Acidification Research Paper

Climate Change Research Paper

Benchmarks:

Chapter Test, Research Paper

Learning Plan

Learning Activities:

Chapter 2 – Section 2:2 The Chemistry of Life

Discuss the unique properties of water
Students will work in groups to demonstrate properties of water through mini lab activities.
Students will explore the structure and the properties of water by using the “Exploring Water Model Kit”.
Differentiate between solutions and suspensions.
Explain the characteristics of acidic and basic solutions.
Review terms-Key Concepts and Reinforcement Worksheets
Kahoot Interactive Review Games
Chapter Standardized Test Prep Questions
NGSS Problem-based Learning Activity

Chapter 6- Humans in the Biosphere

Describe human activities that can affect the biosphere.
Describe the relationship between resource use and sustainable development.
Describe how human activities affect soil and land.
Student Team Writing Activity: What Signs of Growth Do You See in Your Community? Explain how it affects the local ecosystems.
Describe how human activities affect water resources.
Describe how human activities affect air resources.
Define biodiversity and explain its value.
Identify current threats to biodiversity.
Describe how biodiversity can be preserved.
Video clips: Madagascar: Biodiversity Hotspot(Part1 Vanishing Planet); Crash Course Ecology #10; Biodiversity Web of Life; Endangered Species (ex: Saving the Red Wolf); The Great Pacific Garbage Patch; Day After Tomorrow; Before the Flood; Inconvenient Truth Video Clips; Climate Change: 6th Mass Extinction
Explain the concept of ecological footprint.
Identify the role of ecology in a sustainable future.
Student Team Writing Activity: Computer research: list and describe unsustainable practices in history and devise a plan for implementation of more sustainable practices.
Debates and discussion on Controversy of Global Climate Change
Review terms-Key Concepts and Reinforcement Worksheets
Kahoot Interactive Review Games
Biology.com Activities
Chapter Standardized Test Prep Questions
NGSS Problem-based Learning Activity

Resources:

Textbook Sources
Internet Resources
Lab Materials Resources
Teacher Collaboration on content being instructed

Unit Learning Goal and Scale *(Level 2.0 reflects a minimal level of proficiency)*	
Standard(s): HS-LS4-5; HS-LS2-7; HSLS4-6	
4.0	**Students will be able to:** • **In addition to score3.0 performance, the student demonstrates in depth inferences and applications that go beyond what was taught.**
3.0	**Students will be able to:** • **HS-LS4-5:** Evaluate the evidence supporting claims that changes in environmental conditions may result in increases in numbers of individuals of some species or emergence of new species or their extinction over time.

	• **HS-LS2-7**: Design, evaluate, and refine a solution for reducing the impacts of human on the environment and biodiversity • **HS-LS4-6:** Create or revise a simulation to test a solution to mitigate adverse impacts of Of human activity
2.0	**Students will be able to:** • **HS-LS4-5:** Recognize and recall specific vocabulary. Describe how environmental conditions can change over time. Describe the relationships between environmental conditions and the distribution or disappearance of species. • **HS-LS2-7 :** Recognize or recall specific vocabulary . Describe how technological or social methods have attempted to reduce the impact of human activities**.** • **HS-LS4-6:** Recognize or recall specific vocabulary. Describe ways in which human activity has an adverse impact on biodiversity**.**
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s):	
4.0	**Students will be able to:** •
3.0	**Students will be able to:** •
2.0	**Students will be able to:** •
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s):	
4.0	**Students will be able to:** •
3.0	**Students will be able to:** •
2.0	**Students will be able to:** •
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Unit Modifications for Special Population Students	
Advanced Learners	NA

Struggling Learners	Use L1 Differentiated Instructional Support Explanations & Activities As guided by the textbook
English Language Learners	Use ELL Differentiated Instructional Support Explanations & Activities As guided by the textbook. Follow any guidelines based on student specific ESL modifications http://www.state.nj.us/education/modelcurriculum/ela/ELLSupport.pdf
Special Needs Learners	Modifications based on IEP & 504 plans http://www.nj.gov/education/udl/

Interdisciplinary Connections

Indicators:

ELA/Literacy :

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. (HS-LS4-5)
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. (HS-LS4-6)
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-LS4-6)
WHST.9-12.9 Draw evidence from informational texts to support analysis, reflection, and research. (HS-LS4-1),(HS-LS4-2),(HS-LS4-3),(HS-LS4-4),(HS-LS4-5)

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.
(HS-LS2-7).
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. (HS-LS2-7).
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. (HS-LS2-7)
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-LS2-7)

Mathematics:

MP.2 Reason abstractly and quantitatively. (HS-LS4-1),(HS-LS4-2),(HS-LS4-3),(HS-LS4-4),(HS-LS4-5)
MP.2 Reason abstractly and quantitatively. (HS-LS2-7)
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. (HS-LS2-7)
HSN-Q.A.2 Define appropriate quantities for the purpose of descriptive modeling. (HS-LS2-7)
HSN-Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities(HS-LS2-7)

Integration of 21st Century Skills

Indicators:

Appropriate and contemporary technologies will be applied throughout the unit to practice 21st century skills.

The standards listed above and the performance tasks and activities that support them are infused with 21st Century Skills. The Level 3 skills listed in each of the Goals & Scales sections involve critical and creative thinking, communication and collaboration. The methods by which students attain these skills require that students practice multi-step problem solving, using technology to research and solve problems, and communicate results with their instructors and peers. The learning activities listed provide a mix of traditional classroom work and interactive, online experiences.

Science & Engineering Practices:
Asking questions and defining problems
Using Mathematics and Computational Thinking

Analyzing and Interpreting Data
Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena

Cross-Cutting Connections:
Influence of Science, Engineering, and Technology on Society and the Natural World
Cause and Effect

Connections to Nature of Science:
Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena

Unit Title: Cells and Homeostasis

Unit Description:

How do the structures of organisms enable life's functions?

Students formulate an answer to the question "How do the structures of organisms enable life's functions?" Students investigate explanations for the structure and functions of cells as the basic unit of life, of hierarchical organization of interacting organ systems, and of the role of specialized cells for maintenance and growth. The crosscutting concepts of *structure and function*, *matter and energy*, and *systems and system models* are called out as organizing concepts for the disciplinary core ideas. Students use *critical reading*, *modeling*, and *conducting investigations*. Students also use the science and engineering practices to demonstrate understanding of the disciplinary core ideas.

Unit Duration: 4 weeks

Desired Results

Standard(s): HS-LS1- (Develop and use a model to illustrate the hierarchal organization of interacting2systems that provide specific functions within multicellular organisms**) and HS-LS1-3 (**plan and construct a investigation to provide evidence that feedback mechanisms maintain homeostasis)

Indicators:

HS LS1:A Structure and Function HS LS1:B Growth and Development of Organisms

Understandings:

Students will understand that…

- Systems of specialized cells within organisms help them perform the essential functions of life.
- All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells.
- Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal their functions and/or solve a problem.
- Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level.
- Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows— within and between systems at different scales.
- Feedback mechanisms maintain a living system's internal conditions within certain limits, and they mediate behaviors, allowing the system to remain alive and functional even as external conditions

Essential Questions:

- What are the three main parts of the cell theory?
- How are cell structures adapted to their functions?
- How does a cell transport materials across the cell membrane?
- How does a cell maintain homeostasis both within itself and as part of a multicellular organism?
- How do organisms use different types of carbon compounds?
- How do chemicals combine and break apart inside living things?
- What role do enzymes play in living things?

change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system. • Feedback (negative or positive) can stabilize or destabilize a system.	

Assessment Evidence

Performance Tasks: 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.	**Other Evidence:** **Student Independent Work** on Ed puzzle and Blackboard **Written Quizzes** on related vocabulary for Chapter 7 Cell Structure and Function **LAB ACTIVITIES**: Microscope Use Lab Plant and Animal Cells Comparison Lab Osmosis Lab (Egg Lab) Diffusion and Cell Size Detecting Diffusion **Written Assessment on Lab Activities :** Microscope SGO on Care and Function and Comparison of Plant and Animal Cells, Lab Quiz on Diffusion and Cell Size **Lab Participation and Skill Accuracy** **Written Chapter Test** on Chapter 7 Cell Structure and Function

Benchmarks:
Midterm and SGO: Microscope

Learning Plan

Learning Activities:
Chapter 7- Cell Structure and Function
State the cell theory.
Describe how different types of microscopes work.
Describe the structure and function of the cell nucleus.
Describe the role of the organelles.
Students will label diagrams of plant and animal cells.
Students will view and differentiate between plant and animal cells through microscope work.
Students will create graphic organizers to compare and contrast plant and animal cells.
Describe the importance of the mitochondria and chloroplast in the cell.
Students will view cytoplasmic streaming while viewing elodea under microscope.
Describe the function of the cell membrane.
Students will view osmosis and explain the various osmotic states in living cells.
Describe passive and active transport.
Chapter Mystery- Death by Water? Hyponatremia
Explain how unicellular and multicellular organisms maintain homeostasis (Amoeba Sisters).
Video clips: from you tube- How Water Can Kill You. and Osmosis: A solute and solvent love story.
Review terms-Key Concepts and Reinforcement Worksheets

Kahoot Interactive Review Games
Animated Concepts on Osmotic States and Cell Movement
Biology.com Activities
Chapter Standardized Test Prep Questions
NGSS Problem-based Learning Activity

Resources:
Textbook Sources
Internet Resources
Lab Materials Resources
Teacher Collaboration on content being instructed

Unit Learning Goal and Scale *(Level 2.0 reflects a minimal level of proficiency)*	
Standard(s): Standard(s): HS-LS1-2 and HS-LS1-3	
4.0	**Students will be able to:** • **In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.**
3.0	**Students will be able to:** • **HS-LS1-2 - Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms** o For example, create a model and use it to explain the hierarchical organization of interacting systems (such as artery depending on the proper function of elastic tissue and smooth muscle to regulate and deliver the proper amount of blood within the circulatory system) that provide specific functions within multicellular organisms at the system level (such as nutrient uptake, water delivery, and organism movement in response to stimuli). • **HS-LS1-3 – Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis** o For example, investigate feedback mechanisms -such as heart rate response to exercise, stomate response to moisture and temperature, and root development in response to water levels – to demonstrate that these mechanisms maintain homeostasis).
2.0	**Students will be able to:** **HS-LS1-2** • Recognize or recall specific vocabulary. • Describe how various systems provide specific functions within multicellular organisms. **HS-LS1-3** • Recognize or recall specific vocabulary. • Describe how various feedback mechanisms maintain homeostasis.
1.0	**With help, partial success at level 2.0 content and level 3.0 content**
0.0	**Even with help, no success**

Standard(s):	
4.0	**Students will be able to:** •

3.0	**Students will be able to:** •
2.0	**Students will be able to:** •
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Unit Modifications for Special Population Students

Advanced Learners	N/A
Struggling Learners	Use L1 Differentiated Instructional Support Explanations & Activities As guided by the textbook
English Language Learners	Use ELL Differentiated Instructional Support Explanations & Activities As guided by the textbook. Follow any guidelines based on student specific ESL modifications http://www.state.nj.us/education/modelcurriculum/ela/ELLSupport.pdf
Special Needs Learners	Modifications based on IEP & 504 plans http://www.nj.gov/education/udl/

Interdisciplinary Connections

Indicators:
Common Core State Standards Connections:
ELA/Literacy –

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. (HS-LS1-1),(HS-LS1-6)

WHST.9-12.2
- Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (HS-LS1-1),(HS-LS1-6)

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. (HS-LS1-6)

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. (HS-LS1-3)

WHST.9-12.9
- Draw evidence from informational texts to support analysis, reflection, and research. (HS-LS-1-1),(HS-LS1-6)

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. (HS-LS1-2),(HS-LS1-4),(HS-LS1-5),(HS-LS1-7)

Integration of 21st Century Skills

Indicators:
Appropriate and contemporary technologies will be applied throughout the unit to practice 21st century skills.

The standards listed above and the performance tasks and activities that support them are infused with 21st Century Skills. The Level 3 skills listed in each of the Goals & Scales sections involve critical and creative thinking, communication and collaboration. The methods by which students attain these skills require that students practice multi-step problem solving, using technology to research and solve problems, and communicate results with their instructors and peers. The learning activities listed provide a mix of traditional classroom work and interactive, online experiences.

Science & Engineering Practices:
Asking questions and defining problems
Using Mathematics and Computational Thinking
Analyzing and Interpreting Data

Cross-Cutting Connections:
Influence of Science, Engineering, and Technology on Society and the Natural World
Cause and Effect

Connections to Nature of Science:
Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena

Unit Title: DNA and Inheritance

Unit Description: Students analyze data 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 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 describe the environmental and genetic causes of gene mutation and the alteration of gene expressions. The crosscutting concepts of *structure and function*, *patterns*, and *cause and effect* are used as organizing concepts for the disciplinary core ideas. Students also use the science and engineering practices to demonstrate understanding of the disciplinary core ideas.

Unit Duration: 9.5 weeks

Desired Results

- **Standard(s): 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-LS1-4 (**Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms**), 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**)**

Indicators: LS1.A: Structure and Function; LS1.B: Growth and Development of Organisms; LS3.A: Inheritance of Traits; LS3.B: Variation of Traits

Understandings:

Students will understand that…

- In multicellular organisms, individual cells grow and then divide via a process called mitosis, thereby allowing the organism to grow.
- The organism begins as a single cell (fertilized egg) that divides successively to produce many cells, with each parent cell passing identical genetic material (two variants of each chromosome pair) to both daughter cells.
- Cellular division and differentiation produce and maintain a complex organism, composed of systems of tissues and organs that work together to meet the needs of the whole organism.
- All cells contain genetic information in the form of DNA molecules.
- Genes are regions in the DNA that contain the instructions that code for the formation of proteins.

Essential Questions:

- What are the basic chemical principles that affect DNA and inheritance in living things?
- How do organisms use different types of carbon compounds related the DNA and inheritance?
- How does a cell produce a new cell?
- How do cells divide?
- Why do cells divide?
- How does a cell control the process of cell division?
- How does a single undifferentiated cell lead to a complex multicellular organism?
- How does cellular information pass from one generation to another?
- How does an organism pass its characteristics on to its offspring?
- How can you predict the outcome of a genetic cross?
- How can interactions between alleles, genes, and the environment affect an organism's traits?
- How does a cell divide to create cells with exactly half of the original cell's genetic information?
- What is the structure of DNA, and how does it function in genetic inheritance?

• Each chromosome consists of a single, very long DNA molecule, and each gene on the chromosome is a particular segment of that DNA. • The instructions for forming species' characteristics are carried in the DNA. • All cells in an organism have the same genetic content, but the genes used (expressed) by the cell may be regulated in different ways. • Empirical evidence is required to differentiate between cause and correlation and to make claims about the role of DNA and chromosomes in coding the instructions for the characteristic traits passed from parents to offspring. • In sexual reproduction, chromosomes can sometimes swap sections during the process of meiosis (cell division), thereby creating new genetic combinations and thus more genetic variation. • Although DNA replication is tightly regulated and remarkably accurate, errors do occur and result in mutations, which are also a source of genetic variation. • Environmental factors can also cause mutations in genes, and viable mutations are inherited. • Environmental factors also affect expression of traits, and hence affect the probability of occurrence of traits in a population. Thus the variation and distribution of traits observed depends on both genetic and environmental factors. • Empirical evidence is required to differentiate between cause and correlation and to make claims about inheritable genetic variations resulting from new genetic combinations through meiosis, viable errors occurring during replication, and/or mutations caused by environmental factors. • Technological advances have influenced the progress of science, and science has influenced advances in technology. • Science and engineering are influenced by society, and society is influenced by science and engineering.	• How did scientists determine that DNA is responsible for storing, copying, and transmitting genetic information? • How was the basic structure of DNA discovered? • How do cells copy their DNA? • How does information flow from the cell nucleus to direct the synthesis of proteins in the cytoplasm? • What is RNA? • How do cells make proteins? • What happens when a cell's DNA changes? • How do cells regulate gene expression?

Assessment Evidence

Performance Tasks: 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.	**Other Evidence:** **Student Independent Work** on Ed puzzle and Blackboard **Written Quizzes on Related Vocabulary** for Chapter 10- Cell Growth and Division and Chapter 11 Section 4: Meiosis, Chapter 11- Introduction to Genetics, Chapter 12 and13 - DNA and Protein Synthesis, Chapter 14- Human Chromosomes and Genetic Engineering

HS-LS1-4. Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms. 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.	**Written Quizzes on Content** for Chapter 10-Cell Growth and Division and Chapter 11 Section 4: Meiosis, Chapter 11- Introduction to Genetics, Chapter 12and13 - DNA and Protein Synthesis, Chapter 14- Human Chromosomes and Genetic Engineering **LAB ACTIVITIES:** Identifying Stages of Mitosis Lab Practical on Stages of Mitosis Virtual Lab: Timing of cell cycle in onion root tip Cell Cycle Flip Chart Meiosis Inquiry Virtual Lab on Cancer Alien Critter Genetics Lab DNA Structure Lab DNA Extraction Blood Lab (Who Dunnit) Karyotyping Sickle Cell Anemia Lab (“It is all Greek to me”- Case Study) Human Inheritance(Penny Lab- Face) Identifying Human Characteristics Pedigree Lab (Construct a Pedigree and/or Nicotine Addiction) Using DNA to Identify Human Remains and to Solve Crimes) **Lab Participation and Skill Accuracy** **Written Quizzes on Lab Activities:** Stages of Mitosis Lab Practical **Written Chapter Test** Chapter 10-Cell Growth and Division and Chapter 11 Section 4: Meiosis, Chapter 11- Introduction to Genetics, Chapter 12and13 - DNA and Protein Synthesis, Chapter 14- Human Chromosomes and Genetic Engineering **Projects Ideas:** Genetic Disorders Power Point Presentation or Research Paper Topics in Biology Power Point Presentation: Topic Choices to include: Stem Cells, Cloning, Genetically Modified Foods, Designer Babies, Endangered Species, Cancer, Immunotherapy, Proton Therapy
Benchmarks: Chapter Test, Power Point Presentation on Topics in Biology	

Learning Plan

Learning Activities:

Chapter 10-Cell Growth and Division

Explain the problems that growth causes for cells.
Video Clips: Bozman Why are Cells Small?
Compare asexual and sexual reproduction.
Describe the role of chromosomes in cell division.
Name the main events of the cell cycle.
Describe what happens during the four phases of mitosis.
Students will view and identify the stages of the cell cycle under the microscope.
Describe the process of cytokinesis.
Describe how the cell cycle is regulated.
Analyze data involving Life Spans of Human Cells and The Rise and Fall of Cyclins.
Explain how cancer cells are different from other cells.
Video Clips: Cancer and New Research on Cures.
Describe the process of cell differentiation.
Define stem cells and discuss importance.
Identify the possible benefits and issues relating to stem cell research.
Students Debate on Stem Cells Pros and Cons.
Contrast the number of chromosomes in body cells and in gametes.
Summarize the events of meiosis.
Contrast Mitosis and Meiosis.
Video Clip: Ted Talk: Sex Determination.
Chapter Mystery Pet Shop Accident
Review terms-Key Concepts and Reinforcement Worksheets.
Kahoot Interactive Review Games
Biology.com Activities
Chapter Standardized Test Prep
NGSS Problem- based Learning Activity

Chapter 11- Introduction to Genetics

Describe Mendel's studies and conclusions about inheritance.
Describe what happens during segregation.
Explain how geneticists use the principles of probability to make a Punnett square.
Complete sample problems of Punnett squares that demonstrate various inheritance patterns, such as complete and incomplete dominance, codominance, sex-linked, multiple alleles, polygenic or multifactorial, and 2 trait crosses.
Explain the principle of independent assortment.
Explain how Mendel's principles apply to all organisms.
Practice inheritance patterns and probability with coin tosses and paper models.
Describe other inheritance patterns.
Review terms-Key Concepts and Reinforcement Worksheets.
Kahoot Interactive Review Games
Biology.com Activities
Chapter Standardized Test Prep
NGSS Problem- based Learning Activity

Chapter 12, 13-DNA and Protein Synthesis

Identify the role of DNA in heredity.
Identify the chemical components of DNA and proteins , especially focusing on the role of enzymes.
Mystery Clue and visual analogy: unlocking enzymes.
Analyze factors that affect enzymes and trace the enzyme catalyzed reaction.
Compare energy and absorbing and releasing reactions and their energy of activation.
Demonstrate structure of DNA, RNA, transcription and translation using manipulatives.
Describe the steps leading to the development of the double-helix model of DNA.

Summarize the events of DNA replication.
Compare DNA replication in prokaryotes and eukaryotes.
Contrast DNA and RNA.
Explain and have students practice the process of transcription.
Identify the genetic code and explain how it is read. Students will practice interpreting the genetic code.
Summarize the process of translation.
Virtual Transcription/Translation activity.
Internet Activity: Tour of DNA
Video Clips: Bill Nye, Amoeba Sisters, Crash Course on DNA and Protein Synthesis
Define mutations and describe the different types of mutations.
Review terms-Key Concepts and Reinforcement Worksheets.
Kahoot Interactive Review Games
Biology.com Activities
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NGSS Problem- based Learning Activity

Chapter 14 Human Heredity and Chapter 15-Genetic Engineering
Identify the types of human chromosomes in a karyotype.
Explain how pedigrees are used to study human traits.
Chapter Mystery: Anemia case Study
Complete pedigree and karyotyping investigations
Discuss the correlation between DNA and genetic disorders.
Summarize the problems caused by nondisjunction.
Recognize chromosome mutations such as nondisjunction, duplication, deletion, inversion, and translocation.
Identify examples of chromosome mutations and the resulting genetic disorder (such as Down Syndrome, Turner Syndrome and Klinefelter's Syndrome) by viewing human karyotypes.
Explain the purpose of selective breeding.
Explain how people increase genetic variation.
Explain how scientists manipulate DNA.
Describe the importance of recombinant DNA.
Define transgenic and describe the usefulness of some transgenic organisms to humans.
Give examples of genetically modified organisms and explain their advantages to humans (include cloning).
How is DNA used to identify individuals?
Describe some of the issues that relate to biotechnology and genetic engineering.
Identify the pro and cons of biotechnology and genetic engineering.
Chapter Mystery- " A Case of Mistaken Identity"
Research important genetic discoveries by scientists that led to expanding knowledge in the genetic field.
Students Debate-"Food Fight" research and debate Genetically Modified Foods, Cloning
Review terms-Key Concepts and Reinforcement Worksheets
Kahoot Interactive Review Games
Biology.com Activities
Chapter Standardized Test Prep
NGSS Problem- based Learning Activity

Resources:
Textbook Sources
Internet Resources
Lab Materials Resources
Teacher Collaboration on content being instructed

Unit Learning Goal and Scale *(Level 2.0 reflects a minimal level of proficiency)*	
Standard(s): **HS-LS1-1, HS-LS1-4**	
4.0	**Students will be able to:** • **In addition to score 3.0 performance, the student demonstrates in depth inferences and applications that go beyond what was taught.**
3.0	**Students will be able to:** • **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-LS1-4 – Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.**
2.0	• **HS-LS1-1 – The student will be able to** o Recognize or recall specific vocabulary. o Describe the relationship between the structure of DNA and the structure of proteins. • **HS-LS1-4 – The student will be able to** o Recognize or recall specific vocabulary. o Summarize the process of cellular division.
1.0	**With help, partial success at level 2.0 content and level 3.0 content.**
0.0	**Even with help, no success.**

Standard(s):HS-LS3-1	
4.0	**Students will be able to:** • **In addition to score 3.0 performance, the student demonstrates in depth inferences and applications that go beyond what was taught.**
3.0	**Students will be able to:** • **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.**
2.0	• **HS-LS3-1 – The student will be able** o Recognize specific vocabulary. o Describe the functions of DNA and chromosomes. o Describe the relationships between DNA and chromosomes.
1.0	**With help, partial success at level 2.0 content and level 3.0 content.**
0.0	**Even with help, no success.**

Standard(s): HS-LS3-2, HS-LS3-3	
4.0	**Students will be able to:**

	• **In addition to score 3.0 performance, the student demonstrates in depth inferences and applications that go beyond what was taught.**
3.0	**Students will be able to:** • **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.**
2.0	• **HS-LS3-2 – Students will be able to** o Recognize or recall specific vocabulary. o Describe ways in which inheritable genetic variations can develop. • **HS-LS3-3 – Students will be able to** o Recognize and recall specific vocabulary. o Describe the variation and distribution of expressed traits in a population.
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Unit Modifications for Special Population Students

Advanced Learners	N/A
Struggling Learners	Use L1 Differentiated Instructional Support Explanations & Activities As guided by the textbook.
English Language Learners	Use ELL Differentiated Instructional Support Explanations & Activities As guided by the textbook. Follow any guidelines based on student specific ESL modifications. http://www.state.nj.us/education/modelcurriculum/ela/ELLSupport.pdf
Special Needs Learners	Modifications based on IEP & 504 plans http://www.nj.gov/education/udl/

Interdisciplinary Connections

Indicators:

ELA/Literacy –

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. (HS-LS3-1),(HS-LS3-2)

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. (HS-LS3-1)

WHST.9-12.1 Write arguments focused on discipline-specific content. (HS-LS3-2)

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. (HS-LS1-1),(HS-LS1-6)

WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (HS-LS11),(HS-LS1-6)

WHST.9-12.9 Draw evidence from informational texts to support analysis, reflection, and research. (HS-LS-1-1),(HS-LS1-6)
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.

Mathematics –
MP.2 Reason abstractly and quantitatively. (HS-LS3-2),(HS-LS3-3)
MP.4 Model with mathematics. (HS-LS1-4)
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. (HS-LS1-4)
HSF-BF.A.1 Write a function that describes a relationship between two quantities. (HS-LS1-4)

Integration of 21st Century Skills

Indicators:

Appropriate and contemporary technologies will be applied throughout the unit to practice 21st century skills.

The standards listed above and the performance tasks and activities that support them are infused with 21st Century Skills. The Level 3 skills listed in each of the Goals & Scales sections involve critical and creative thinking, communication and collaboration. The methods by which students attain these skills require that students practice multi-step problem solving, using technology to research and solve problems, and communicate results with their instructors and peers. The learning activities listed provide a mix of traditional classroom work and interactive, online experiences.

Science & Engineering Practices:
Asking questions and defining problems
Using Mathematics and Computational Thinking
Analyzing and Interpreting Data
Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena

Cross-Cutting Connections:
Influence of Science, Engineering, and Technology on Society and the Natural World
Cause and Effect

Connections to Nature of Science:
Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena

Unit Title: Evolution

Unit Description:

Students understand, analyze and interpret data to investigate evidence to make sense of the relationship between the environment, natural selection and evolution. They also demonstrate understandings of how multiple lines of evidence contribute to the strength of scientific theories of natural selection and evolution. Also, students evaluate evidence of the conditions that may result in new species and understand the role of genetic variation in natural selection.

Unit Duration: 8

Desired Results

- **Standard(s): 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 numbers, (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-LS4-4 (**Construct and explanation bases on evidence for how natural selection leads to adaptation)**, 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.

Indicators:

LS4.A: Evidence of Common Ancestry and Diversity, LS4.B: Natural Selection, LS4.C: Adaptation,

Understandings:
Students will understand that…

- Natural selection leads to adaptation, that is, to a population dominated by organisms that are anatomically, behaviorally, and physiologically well suited to survive and reproduce in a specific environment. That is the differential survival and reproduction of organisms in a population that have an advantageous heritable trait leads to an increase in the proportion of individuals in future generations that have the trait and to a decrease in the proportion of individuals that do not.
- Empirical evidence is required to differentiate between cause and correlation and make claims about how natural selection leads to adaptation of populations.
- Empirical evidence is required to differentiate between cause and correlation and make claims about how specific biotic and abiotic differences in ecosystems contribute to change in gene frequency over time, leading to adaptation of populations.
- Scientific knowledge is based on the assumption that natural laws operate today as they did in the past and will continue to do so in the future.

Essential Questions:

1. What is natural selection?
2. What patterns of biodiversity did Darwin observe while traveling aboard the Beagle?
3. How did other scientists' work help Darwin develop his theory of natural selection?
4. What is Darwin's theory of evolution by natural selection?
5. What are the mainlines of scientific evidence that support Darwin's theory of evolution by natural selection?
6. How do scientists use fossils to study Earth's history?
7. What are some patterns in which evolution has occurred?
8. What happened during Earth's early history?
9. How can populations evolve to form new species?
10. How do genes make evolution possible?
11. What causes a populations gene pool to change?
12. What can genes tell us about an organism's evolutionary history?

• Natural selection occurs only if there is both (1) variation in the genetic information between organisms in a population and (2) variation in the expression of that genetic information—that is, trait variation—that leads to differences in performance among individuals. • The traits that positively affect survival are more likely to be reproduced, and thus are more common in the population. • Natural selection leads to adaptation, that is, to a population dominated by organisms that are anatomically, behaviorally, and physiologically well suited to survive and reproduce in a specific environment. That is, the differential survival and reproduction of organisms in a population that have an advantageous heritable trait leads to an increase in the proportion of individuals in future generations that have the trait and to a decrease in the proportion of individuals that do not. • Adaptation also means that the distribution of traits in a population can change when conditions change. • Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait. • Changes in the physical environment, whether naturally occurring or human induced, have contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline, and sometimes the extinction, of some species. • Species become extinct because they can no longer survive and reproduce in their altered environment. If members cannot adjust to change that is too fast or drastic, the opportunity for the species' evolution is lost. • Empirical evidence is required to differentiate between cause and correlation and make 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 • Group behavior has evolved because membership can increase the chances of survival for individuals and their genetic relatives. • Empirical evidence is required to differentiate between cause and correlation and to make claims about the role of group behavior in individual and species' chances to survive and reproduce.	

- Genetic information provides evidence of evolution. DNA sequences vary among species, but there are many overlaps; in fact, the ongoing branching that produces multiple lines of descent can be inferred by comparing the DNA sequences of different organisms. Such information is also derivable from the similarities and differences in amino acid sequences and from anatomical and embryological evidence.
- Different patterns in multiple lines of empirical evidence may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of common ancestry and biological evolution.
- Evolution is a consequence of the interaction of four factors: (1) the potential for a species to increase in number, (2) the genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for an environment's limited supply of the resources that individuals need in order to survive and reproduce, and (4) the ensuing proliferation of those organisms that are better able to survive and reproduce in that environment.

Assessment Evidence

Performance Tasks:

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-LS4-4. Construct an explanation based on evidence for 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.

Other Evidence:

Student Independent Work on Ed puzzle and Blackboard
Written Quizzes on Related Vocabulary for Chapter 19 History of Life, Chapter 16- Darwin's Theory of Evolution, Chapter 17 - Evolution of Populations

LAB ACTIVITIES:

Darwin Activity WebQuest
Bird Beak and Wing Adaptation Lab
Variation and Natural Selection Lab
Amino Acid Sequences: Indicators of Evolution
Modeling Coevolution

Lab Participation and Skill Accuracy

Written Chapter Test on Content for Chapter 19 History of Life, Chapter 16- Darwin's Theory of Evolution, Chapter 17 - Evolution of Populations

Project Ideas:

Frog Dissection

Benchmarks:

CP Biology Final

Learning Plan

Learning Activities:

Chapter 16- Darwin's Theory of Evolution
State Charles Darwin's contribution to science.
Describe the three patterns of biodiversity noted by Darwin.
Identify the conclusions drawn by scientists such as Hutton and Lyell, Lamarck and Malthus etc
Describe the conditions under which natural selection occurs.
Explain the principle of common descent.
Use current or historical examples of various evolution concepts brought up by theorists.
Virtual Lab Activity: Peppered Moth simulation
Chapter Mystery- "Varied Honeycreepers"
NGSS Problem-Based Learning-"The Alpine Chipmunk's Genetic Decline"
Review terms-Key Concepts and Reinforcement Worksheets.
Kahoot Interactive Review Games
Biology.com Activities
Chapter Standardized Test Prep Questions

Chapter 19 History of Life
Explain what information fossils can reveal about ancient life.
Identify the divisions of geologic time scale.
Explain how environmental processes and living things have shaped life on Earth.
Explain the evolutionary characteristics of coevolving organisms.
Identify some of the hypotheses about early Earth and the origin of life.
Explain and recognize examples of evidence of evolution such as homologous and analogous structures, vestigial organs and structures, embryological similarities and phylogenic patterns, fossils, biochemical similarities in closely evolved species.
Explain the endosymbiotic theory.
Explain the significance of sexual reproduction in evolution.
Review terms-Key Concepts and Reinforcement Worksheets.
Kahoot Interactive Review Games
Biology.com Activities
Chapter Standardized Test Prep Questions
NGSS Problem-Based Learning Activity

Chapter 17 - Evolution of Populations
Define evolution in genetic terms.
Identify the main sources of genetic variation in a population.
State what determines the number of phenotypes for a trait.
Explain how natural selection affects single and polygenic traits.

Describe genetic drift.
Explain how different factors affect genetic equilibrium.
Explain and give examples of directional, stabilizing and disruptive natural selection.
Give examples of coevolution.
Identify the types of isolation that can lead to a new species.
Web Activities: Evolution 101: Nova, Understanding Evolution, Population Genetics, Selection and Evolution
Student Debate- Evolution vs Other Theories of Creation
Review terms-Key Concepts and Reinforcement Worksheets.
Kahoot Interactive Review Games
Biology.com Activities
Chapter Standardized Test Prep Questions
NGSS Problem-Based Learning Activity

Resources:
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Teacher Collaboration on content being instructed

Unit Learning Goal and Scale *(Level 2.0 reflects a minimal level of proficiency)*	
Standard(s): **HSLS4-1, HSLS4-2,HSLS4-4,HSLS4-5**	
4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • **HSLS4-1 Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.** • **HSLS4-2 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 numbers, (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.** • **HSLS4-4 Construct and explanation bases on evidence for how natural selection leads to Adaptation.** • **HSLS4-5 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.**
2.0	**Students will be able to:** • **HSLS4-1** o Recognize and recall specific vocabulary. o Describe the process of biological evolution and its evidence such as fossils, and embryological similarities. • **HSLS4-2** o Recognize and recall specific vocabulary. o Describe factors related to the process of evolution. • **HSL4-4** o Recognize and recall specific vocabulary. o Describe how genetic variations of traits in a population increase some individual's probability of surviving. o Describe how differences in the environment can contribute to natural selection over time. o Describe the relationship between natural selection and adaptation of populations. • **HSL4-5** o Recognize and recall specific vocabulary, o Describe how environmental conditions change over time. o Describe the relationship between environmental conditions and the distribution or disappearance of traits in a species.
1.0	**With help, partial success at level 2.0 content and level 3.0 content.**

0.0	**Even with help, no success.**

Unit Modifications for Special Population Students	
Advanced Learners	N/A
Struggling Learners	Use L1 Differentiated Instructional Support Explanations & Activities As guided by the textbook.
English Language Learners	Use ELL Differentiated Instructional Support Explanations & Activities As guided by the textbook. Follow any guidelines based on student specific ESL modifications http://www.state.nj.us/education/modelcurriculum/ela/ELLSupport.pdf
Special Needs Learners	Modifications based on IEP & 504 plans http://www.nj.gov/education/udl/

Integration of 21st Century Skills

Indicators:

Appropriate and contemporary technologies will be applied throughout the unit to practice 21st century skills.

The standards listed above and the performance tasks and activities that support them are infused with 21st Century Skills. The Level 3 skills listed in each of the Goals & Scales sections involve critical and creative thinking, communication and collaboration. The methods by which students attain these skills require that students practice multi-step problem solving, using technology to research and solve problems, and communicate results with their instructors and peers. The learning activities listed provide a mix of traditional classroom work and interactive, online experiences.

Science & Engineering Practices:
Asking questions and defining problems
Using Mathematics and Computational Thinking
Analyzing and Interpreting Data
Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena

Cross-Cutting Connections:
Influence of Science, Engineering, and Technology on Society and the Natural World
Cause and Effect

Connections to Nature of Science:
Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena

Interdisciplinary Connections

Indicators:
ELA/Literacy –
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. (HS-LS4-1),(HS-LS4-2),(HS-LS4-3),(HS-LS4-4)
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. (HS-LS4-5)
WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (HS-LS4-1),(HS-LS4-2),(HS-LS4-3),(HS-LS4-4)
WHST.9-12.9 Draw evidence from informational texts to support analysis, reflection, and research. (HS-LS4-1),(HS-LS4-2),(HS-LS4-3),(HS-LS4-4),(HS-LS4-5)
SL.11-12.4 Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation. (HS-LS4-1),(HS-LS4-2)