Honors Biology Curriculum

This curricula has been developed to align with the NJSLS and Atlantic Cape Community Colleges general education requirement for graduation for non-science majors. Topics of biological principles includes: cell theory, diversity of living organisms, bioenergetics, genetics and evolution. Continuity is maintained via an ecological emphasis and the application of biology to everyday life. This course includes animal dissection.

About the Standards

In 1996, the New Jersey State Board of Education adopted the state's first set of academic standards called the Core Curriculum Content Standards. The standards described what students should know and be able to do upon completion of a thirteen-year public school education. Over the last twenty years, New Jersey's academic standards have laid the foundation for local district curricula that is used by teachers in their daily lesson plans.

Revised every five years, the standards provide local school districts with clear and specific benchmarks for student achievement in nine content areas. Developed and reviewed by panels of teachers, administrators, parents, students, and representatives from higher education, business, and the community, the standards are influenced by national standards, research-based practice, and student needs. The standards define a "Thorough and Efficient Education" as guaranteed in 1875 by the New Jersey Constitution. Currently the standards are designed to prepare our students for college and careers by emphasizing high-level skills needed for tomorrow's world.

The New Jersey Student Learning Standards include Preschool Teaching and Learning Standards, as well as nine K-12 standards for the following content areas: **21st Century Life and Careers, Comprehensive Health and Physical Education, English Language Arts, Mathematics, Science, Social Studies, Technology, Visual and Performing Arts, World Languages**. The most recent review and revision of the standards occurred in 2020.

Lower Cape May Regional School District Honors Biology Curriculum	
Content Area: Biology	
Course Title: Honors Biology	**Grade level: 9**
Unit 1: Introduction to Biology	**Pacing: 4 weeks and ongoing throughout the year**
Unit 2: Chemistry of Life	**Pacing: 6 weeks**
Unit 3: Cells: Structure & Function, Energy and Reproduction	**Pacing: 6 weeks**
Unit 4: Genetics and Molecular Biology	**Pacing: 6 weeks**
Unit 5: Evolution	**Pacing: 5 weeks**
Unit 6: Microbes, Fungi, Plants & Animals	**Pacing: 5 weeks**
Unit 7: Ecology	**Pacing: 6 weeks**

Date Created/Revised: June 2025	**Board Approved On:**

Lower Cape May Regional School District Honors Biology Curriculum
Unit 1 Overview

Content Area: Biology

Unit Title: Introduction to Biology

Target Course/Grade Level: 9

Unit Summary:

Introduces students to Biology by describing the properties and organization of life and explain the method of scientific research.

Interdisciplinary Connections:

Connections to NJSLS – English Language Arts

• RST.11-12.1 Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions. (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 selfgenerated 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)

Connections to NJSLS – Mathematics

• 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)

Cross-cutting concepts

Scientific Investigations Use a Variety of Methods

- Scientific inquiry is characterized by a common set of values that include: logical thinking, precision, open-mindedness, objectivity, skepticism, replicability of results, and honest and ethical reporting of findings. (HS-LS1-3)

Science and Engineering Practices

Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-2)

Planning and carrying out in 9–12 builds on K–8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models.

Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly. (HS-LS1-3)

Construct an explanation based on valid and reliable evidee obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-LS1-1)

Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-LS1-6)

Unit Enduring Understandings:

- Thinking like a scientist using the scientific method to design and conduct an experiment
- Learn that there are about 8 characteristics of life and assess is something is alive or not based on these characteristics

Students who understand can demonstrate the following standards:

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.

Unit Enduring Questions:

- What is Science?
- What are the characteristics of a living organism?
- What is the chemical composition of living organism?
- How does structure determine function, the morphology, of living organisms?

Students will be able to……

- Identify and describe the properties of life
- Describe the levels of organization among living things
- Describe the process of the scientific method.

Content Area: Biology

Unit Title: Chemistry of Life

Target Course/Grade Level: 9

Unit Summary:
Topics covered in this unit includes atomic structure and how it affects chemical bonding as well as the importance of water, pH and the four categories of macromolecules in living systems.

Interdisciplinary Connections:
Connections to NJSLS – English Language Arts
• RST.11-12.1 Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions. (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 selfgenerated 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)

Connections to NJSLS – Mathematics
• 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)

Crosscutting Concepts

Energy and Matter
- Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system. (HS-LS1-5), (HS-LS1-6)
- Energy cannot be created or destroyed—it only moves between one place and another place, between objects and/or fields, or between systems. (HS-LS1-7)

Structure and Function
- 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 its function and/or solve a problem. (HS-LS1-1)

Science and Engineering Practices

Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-2)

Planning and carrying out in 9–12 builds on K–8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models.

Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly. (HS-LS1-3)

Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-LS1-1)

Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-LS1-6)

Unit Enduring Understandings:

- Understanding that all matter and also living things are composed of elements
- Understanding that the elements are made of atoms
- Students should be able to interpret models of the carbon cycle, water cycle and nitrogen cycle in order to understand how these life dependent compounds cycle among organisms in the biosphere

Students who understand can demonstrate the following standards:

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

Unit Enduring Questions

- How is Chemistry important in Biology
- What are the basic BioMacromolecules?
- What does it mean to be "organic"?

Students will be able to:

- Define element, atom, atomic number, and atomic mass
- Name the six most common chemical elements found in living systems
- Define octet rule, ionic bond, covalent bond, and hydrogen bond.
- Describe the properties of water that are critical to maintaining life
- Define acid and base
- State the range of pH scale, and explain pH in terms of hydrogen ion concentration
- Describe the ways in which carbon is critical to life
- Describe the four classes of biological molecules and state their functions

Content Area: Biology

Unit Title: Cells: Structure & Function, Energy and Reproduction

Target Course/Grade Level: 9

Unit Summary:
This unit is broken into 3 main topics:
Structure & Function, Energy and Reproduction of Cells
The main focus is the life of a cell.

Interdisciplinary Connections:
Connections to NJSLS – English Language Arts
• RST.11-12.1 Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions. (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 selfgenerated 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)

Connections to NJSLS – Mathematics
• 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)

Crosscutting Concepts
Cause and Effect
- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-LS3-1), (HS-LS3-2)

Scale, Proportion, and Quantity
- Algebraic thinking is used to examine scientific data and predict the effect of a change in one variable on another (e.g., linear growth vs. exponential growth). (HS-LS3-3)

Connections to Nature of Science
- Technological advances have influenced the progress of science and science has influenced advances in technology. (HS-LS3-3)
- Science and engineering are influenced by society and society is influenced by science and engineering.

(HS-LS3-3)

Science and Engineering Practices
Asking Questions and Defining Problems Asking questions and defining problems in 9–12 builds on K–8 experiences and progresses to formulating, refining, and evaluating empirically testable questions and design problems using models and simulations. Ask questions that arise from examining models or a theory to clarify relationships. (HS-LS3-1) Analyzing and Interpreting Data Analyzing data in 9–12 builds on K–8 experiences and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data. (HS-LS3-3)

Unit Enduring Understandings:
- Cells are the basic unit of life.
- Cells consist of organelles which work together to enable an organism to regulate its chemistry.
- Cells reproduce through cell cycles of mitosis and meiosis
- Cancer is a disruption in the cell cycle
- Photosynthesis converts light energy into chemical energy, specifically glucose sugar which is the basic fuel source for all cells
- Cellular respiration converts food into energy

Students who understand can demonstrate the following standards:
HS-LS1-2
Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
HS-LS1-1
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-LS1-5
Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy
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

Unit Enduring Questions:
- What is the basic unit of life?
- How do cells regulate an organisms' biochemistry?
- How do cells reproduce?
- What is cancer?
- How do cells metabolize?

Students will be able to:
- Summarize the cell theory
- Explain why metabolically active cells are so small.
- Compare and contrast prokaryotic cells and eukaryotic cells
- Describe the structure of eukaryotic plant and animal cells
- Describe the structure and function of the major organelles

- State the structure and function of the plasma membrane
- Describe the extracellular matrix and intercellular junctions
- Define catabolism and anabolism
- State the first and second laws of thermodynamics
- Explain the difference between potential energy and kinetic energy
- Define exergonic reaction and endergonic reaction
- Explain how enzymes speed up chemical reactions
- Define glycolysis and name its inputs and outputs
- Describe the location of the citric acid cycle and name its inputs and outputs
- Describe the location of the oxidative phosphorylation and name its inputs and outputs
- Describe the two types of fermentation
- Describe how fats and proteins participate in ATP production
- Define photosynthesis, autotrophs, and heterotrophs
- Name the structure in the cell that carries out photosynthesis
- Describe the process of light-dependent reactions
- Describe the process of light-independent reactions (Calvin Cycle)
- Define genome, haploid, diploid, gamete, homologous chromosome, gene, locus
- Describe the three stages of interphase
- Describe the process of mitosis
- Describe the process of cytokinesis
- Discuss the importance of G1, G2, and metaphase checkpoints
- Explain how cancer is caused by uncontrolled cell division.
- Discuss the involvement of proto-oncogenes and tumor suppressor genes in cancer formation
- Describe the process of binary fission in prokaryotes
- Describe the process of meiosis
- Explain how genetic variations are generated during sexual reproduction
- Explain how nondisjunction leads to disorders in chromosome number
- Discuss various types of chromosome structural abnormality

Lower Cape May Regional School District Biology Curriculum
Unit 4 Overview

Content Area: Biology

Unit Title: Genetics and Molecular Biology

Target Course/Grade Level: 9

Unit Summary:
This unit is broken into 2 topics:
Patterns of Inheritance & Molecular Biology
Compare and contrast different patterns of genetic inheritance and explain their molecular basis. Apply ethical reasoning to the application of biotechnology

Interdisciplinary Connections
Connections to NJSLS – English Language Arts

- RST.11-12.1 Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions. (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)

Connections to NJSLS – Mathematics

- MP.2 Reason abstractly and quantitatively. (HS-LS3-2), (HS-LS3-3)

Crosscutting Concepts

Cause and Effect

- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-LS3-1), (HS-LS3-2)

Scale, Proportion, and Quantity

- Algebraic thinking is used to examine scientific data and predict the effect of a change in one variable on another (e.g., linear growth vs. exponential growth). (HS-LS3-3)

Connections to Nature of Science

- Technological advances have influenced the progress of science and science has influenced advances in technology. (HS-LS3-3)
- Science and engineering are influenced by society and society is influenced by science and engineering. (HS-LS3-3)

Science and Engineering Practices

Asking Questions and Defining Problems Asking questions and defining problems in 9–12 builds on K–8 experiences and progresses to formulating, refining, and evaluating empirically testable questions and design problems using models and simulations. Ask questions that arise from examining models or a theory to clarify relationships. (HS-LS3-1)

Analyzing and Interpreting Data Analyzing data in 9–12 builds on K–8 experiences and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data. (HS-LS3-3)

Unit Enduring Understandings:

- All cells contain DNA which contains units called genes which codes for proteins
- Groups of specialized cells use proteins to carry out functions that are essential to the organism
- Cells have the ability to divide and differentiate and are regulated by the cell cycle
- Investigating patterns of inheritance that allow us to predict the outcome of genetic crosses between various individuals
- Variations in genetic material naturally result during meiosis when corresponding sections of chromosome pairs exchange places

Students who understand can demonstrate the following standards:

HS-LS1.A

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

HS-LS3-1

Ask questions 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.

HS-LS3-A

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 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. Not all DNA codes for a protein; some segments of DNA are involved in regulatory or structural functions.

Unit Enduring Questions

- How do DNA and RNA participate in the process of making proteins?
- How is the genetic code preserved and passed on from generation to generation?
- How does the cell cycle regulate normal and abnormal cell growth?
- What causes variations in individuals within a given population?
- How are traits passed from one generation to another?

Students will be able to:

- State Mendel's Laws, and illustrate Mendel's Laws with appropriate monohybrid and dihybrid crosses
- Use a Punnett square to calculate the expected proportions of genotypes and phenotypes in a monohybrid cross
- Explain the purpose and methods of a test cross
- Identify non-Mendelian inheritance patterns such as incomplete dominance, codominance, multiple alleles, and sex linkage from the results of crosses
- Explain the effect of linkage and recombination on gamete genotypes
- Explain the phenotypic outcomes of epistatic effects among genes
- Describe the structure of DNA
- Explain the process of DNA replication
- Explain the importance of telomerase to DNA replication
- Describe mechanisms of DNA repair
- Explain the central dogma
- Explain the main steps of transcription
- Describe how eukaryotic mRNA is processed
- Define codon and anticodon, and describe the function of mRNA, tRNA, and rRNA in translation
- Explain the basic techniques used to manipulate genetic material
- Explain molecular and reproductive cloning
- Describe uses of biotechnology in medicine and agriculture
- Define genomics and proteomics
- Define whole genome sequencing
- Explain different applications of genomics and proteomics
- Discuss ethical issues involving the application of biotechnology

Lower Cape May Regional School District Biology Curriculum
Unit 5 Overview

Content Area: Biology

Unit Title: Evolution

Target Course/Grade Level: 9

Unit Summary:
This unit is broken into 2 topics:
Evolution and Its Processes & Diversity of Life

Provide evidence of evolution and discuss the process of evolution

Interdisciplinary Connections

Connections to NJSLS – English Language Arts

- RST.11-12.1 Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions. (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)

Connections to NJSLS – Mathematics

- MP.2 Reason abstractly and quantitatively. (HS-LS3-2), (HS-LS3-3)

Crosscutting Concepts

Cause and Effect

- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-LS3-1), (HS-LS3-2)

Scale, Proportion, and Quantity

- Algebraic thinking is used to examine scientific data and predict the effect of a change in one variable on another (e.g., linear growth vs. exponential growth). (HS-LS3-3)

Connections to Nature of Science

- Technological advances have influenced the progress of science and science has influenced advances in technology. (HS-LS3-3)
- Science and engineering are influenced by society and society is influenced by science and engineering. (HS-LS3-3)

Science and Engineering Practices

Asking Questions and Defining Problems Asking questions and defining problems in 9–12 builds on K–8 experiences and progresses to formulating, refining, and evaluating empirically testable questions and design problems using models and simulations. Ask questions that arise from examining models or a theory to clarify relationships. (HS-LS3-1)

Analyzing and Interpreting Data Analyzing data in 9–12 builds on K–8 experiences and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data. (HS-LS3-3)

Engaging in Argument from Evidence Engaging in argument from evidence in 9–12 builds on K–8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about the natural and designed world(s). Arguments may also come from current scientific or historical episodes in science.

Make and defend a claim based on evidence about the natural world that reflects scientific knowledge, and student-generated evidence. (HS-LS3-2)

Unit Enduring Understandings:

- Evidence for evolution can be found in comparisons of DNA sequences, the fossil record, anatomical and embryological evidence
- Competition for limited resources causes individuals with traits that give a competitive advantage to be able to survive and reproduce at higher rates
- Genes for traits with competitive advantage will be passed on in greater proportions to the next generation. Over many generations, groups with these traits can evolve into a different species
- Natural selection causes adaptations that lead to changes in the distribution of traits within a population as conditions change
- Changes in the environment. either natural or human induced lead to changes in species such as growth, decline, emergence of new species or extinction

Students who understand can demonstrate the following standards:

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.

Unit Enduring Questions:

- How are Natural Selection and Evolution related?
- What is the evidence of Evolution?

Students will be able to …

- Explain how Darwin's theory of evolution differed from the current view at the time
- Describe how the present-day theory of evolution was developed
- Describe how population genetics is used to study the evolution of populations
- Describe the basic factors that causes evolution
- Explain how each evolutionary force can influence the allele frequencies of a population
- Discuss the evidence of evolution
- Describe the definition of species
- Explain allopatric and sympatric speciation
- Identify common misconceptions about evolution
- List the different levels of the taxonomic classification system
- Describe how systematics and taxonomy relate to phylogeny
- Compare homologous and analogous traits
- Discuss the purpose of cladistics

Lower Cape May Regional School District Biology Curriculum
Unit 6 Overview

Content Area: Biology

Unit Title: Microbes, Fungi, Plants and Animals

Target Course/Grade Level: 9

Unit Summary:
This Unit is broken into 3 topics:
Diversity of Microbes, Fungi, and Protists
Diversity of Plants
Diversity of Animals
Describe the characteristics and evolutionary significances of organisms from primitive bacteria to advanced human

Interdisciplinary Connections
Connections to NJSLS – English Language Arts

- RST.11-12.1 Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions. (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)

Connections to NJSLS – Mathematics

- MP.2 Reason abstractly and quantitatively. (HS-LS3-2), (HS-LS3-3)

Crosscutting Concepts
Cause and Effect

- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-LS3-1), (HS-LS3-2)

Scale, Proportion, and Quantity

- Algebraic thinking is used to examine scientific data and predict the effect of a change in one variable on another (e.g., linear growth vs. exponential growth). (HS-LS3-3)

Connections to Nature of Science

- Technological advances have influenced the progress of science and science has influenced advances in technology. (HS-LS3-3)
- Science and engineering are influenced by society and society is influenced by science and engineering. (HS-LS3-3)

Science and Engineering Practices
Asking Questions and Defining Problems Asking questions and defining problems in 9–12 builds on K–8

experiences and progresses to formulating, refining, and evaluating empirically testable questions and design problems using models and simulations. Ask questions that arise from examining models or a theory to clarify relationships. (HS-LS3-1)
Analyzing and Interpreting Data Analyzing data in 9–12 builds on K–8 experiences and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data. (HS-LS3-3)
Engaging in Argument from Evidence Engaging in argument from evidence in 9–12 builds on K–8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about the natural and designed world(s). Arguments may also come from current scientific or historical episodes in science.
Make and defend a claim based on evidence about the natural world that reflects scientific knowledge, and student-generated evidence. (HS-LS3-2)

Unit Enduring Understandings:

- In the hierarchy of life there is an increasingly complex structure
- The greater the taxonomic classification, the more complex an organism will be

Students who understand can demonstrate the following standards:
HS-LS1-2
Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
HS-LS1-2
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.

Unit Enduring Questions:

- How are microbes similar to each other?
- What is the difference between plant species?
- How similar anatomically are invertebrates and vertebrates?

Students will be able to…

- Describe the evolutionary history of prokaryotes
- Describe the basic structure of a typical prokaryote
- Discuss the importance of prokaryotes
- Describe the endosymbiotic theory
- Explain the origin of mitochondria and chloroplasts
- Describe the main characteristics of protists
- Discuss the importance of protists
- List the characteristics of fungi
- Discuss the importance of fungi
- Describe the distinguishing traits of the three divisions of nonvascular plants
- Identify the new traits that first appear in seedless vascular plants
- Describe the major classes of seedless vascular plants
- Define gymnosperms and discuss their characteristics
- List the four groups of modern-day gymnosperms and provide examples of each
- Explain the life cycle of an angiosperm
- Describe the structure of flower and seed
- Discuss the differences between monocots and eudicots

- Describe the major characteristics of the animal kingdom
- Explain the processes of animal reproduction and embryonic development
- Describe the hierarchy of basic animal classification
- Compare and contrast the embryonic development of protostomes and deuterostomes
- Describe the basic structure of sponges and state the function of choanocyte
- Describe the basic structure of cnidarians and state the function of cnidocytes
- Describe the basic structure of flatworms and give examples of free-living and parasitic flatworms
- Describe the basic structure of nematodes and give examples of free-living and parasitic nematodes
- Describe the basic structure of arthropods and give examples of Hexapoda, Myriapoda, Crustacea, and Chelicerata
- Describe the three-part body plan of mollusks and give examples of bivalves, gastropods, and cephalopods
- Describe the characteristics of annelids
- Describe the characteristics of echinoderms
- Describe the four characteristics of chordates
- Compare and contrast the characteristics of fishes, amphibians, reptiles, and mammal

Lower Cape May Regional School District Biology Curriculum
Unit 7 Overview

Content Area: Biology

Unit Title: Ecology

Target Course/Grade Level: 9

Unit Summary:
This unit is broken into 3 topics:
Population and Community Ecology
Ecosystems and the Biosphere
Conservation and Biodiversity
Discuss the relationship among organisms and between organisms and their environment. Apply ethical reasoning to human activities that impact the environment

Interdisciplinary Connections
Connections to NJSLS – English Language Arts

- RST.11-12.1 Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions. (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)

Connections to NJSLS – Mathematics

- MP.2 Reason abstractly and quantitatively. (HS-LS3-2), (HS-LS3-3)

Crosscutting Concepts
Cause and Effect

- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-LS3-1), (HS-LS3-2)

Scale, Proportion, and Quantity

- Algebraic thinking is used to examine scientific data and predict the effect of a change in one variable on another (e.g., linear growth vs. exponential growth). (HS-LS3-3)

Connections to Nature of Science

- Technological advances have influenced the progress of science and science has influenced advances in technology. (HS-LS3-3)
- Science and engineering are influenced by society and society is influenced by science and engineering. (HS-LS3-3)

Science and Engineering Practices

Asking Questions and Defining Problems Asking questions and defining problems in 9–12 builds on K–8 experiences and progresses to formulating, refining, and evaluating empirically testable questions and design problems using models and simulations. Ask questions that arise from examining models or a theory to clarify relationships. (HS-LS3-1)

Analyzing and Interpreting Data Analyzing data in 9–12 builds on K–8 experiences and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data. (HS-LS3-3)

Engaging in Argument from Evidence Engaging in argument from evidence in 9–12 builds on K–8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about the natural and designed world(s). Arguments may also come from current scientific or historical episodes in science.

Make and defend a claim based on evidence about the natural world that reflects scientific knowledge, and student-generated evidence. (HS-LS3-2)

Unit Enduring Understandings:

- Human activities have an impact on the cycling of matter and the flow of energy within the biosphere
- The success of organisms is dependent on the relationships between organisms and the biotic and abiotic factors in an ecosystem

Students who understand can demonstrate the following standards:

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-LS2-3

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.

Students will be able to …

- Describe how ecologists measure population size and density
- Describe three different patterns of population distribution
- Use life tables to calculate mortality rates
- Describe the three types of survivorship curves and relate them to specific populations
- Define exponential and logistic growth patterns
- Define carrying capacity
- Compare and contrast density-dependent growth regulation and density-independent growth regulation
- Discuss how human population growth can be exponential
- Explain how humans have expanded the carrying capacity of their habitat
- Relate population growth and age structure to the level of economic development in different countries
- Discuss the long-term implications of unchecked human population growth
- Discuss the predator-prey cycle
- Give examples of defenses against predation and herbivory
- Describe the competitive exclusion principle
- Give examples of symbiotic relationships between species
- Describe community structure and succession
- Identify the early and predicted effects of climate change on biodiversity
- Describe the basic types of ecosystems on Earth
- Differentiate between food chains and food webs and recognize the importance of each
- Describe how organisms acquire energy in a food web and in associated food chains
- Explain how the efficiency of energy transfers between trophic levels effects ecosystem
- Discuss the biogeochemical cycles of water, carbon, nitrogen, phosphorus, and sulfur and apply ethical reasoning to human activities that have impacted these cycles
- Identify the two major abiotic factors that determine the type of terrestrial biome in an area
- Recognize distinguishing characteristics of each of the eight major terrestrial biomes
- Describe the effects of abiotic factors on the composition of plant and animal communities in aquatic biomes
- Compare the characteristics of the ocean zones
- Summarize the characteristics of standing water and flowing water in freshwater biomes
- Describe biodiversity as the equilibrium of naturally fluctuating rates of extinction and speciation
- Identify benefits of biodiversity to humans
- Identify significant threats to biodiversity
- Explain the effects of habitat loss, exotic species, and hunting on biodiversity
- Describe biodiversity as the equilibrium of naturally fluctuating rates of extinction and speciation
- Explain the legislative framework for conservation
- Identify the factors important in conservation preserve design
- Identify examples of the effects of habitat restoration
- Identify the role of zoos in biodiversity conservation
- Apply ethical reasoning to resource use, allocation, and protection

Lower Cape May Regional School District Biology Curriculum
Evidence of Learning

Summative Assessment Utilized throughout Units:

- 5 Exams
- Students should understand scientific practices and be able to generate scientific evidence through laboratory investigations
- Students will participate in classroom activities that include problem solving and group work
- Students will complete formal written laboratory reports
- Lab quizzes

Laboratory Experiments can include:

- Laboratory Safety and the Scientific Method
- Basic Microscope Techniques
- Cell Structure
- Diffusion and Osmosis
- Enzyme Activity
- Fermentation and Respiration
- Photosynthesis
- DNA Mitosis and Mitosis
- Meiosis and Mendelian Genetics
- Bacteria and Protists
- Bacteria and Fungi
- Plants
- Predation: Simulation of Natural Selection
- Animals: Invertebrates
- Animals: Vertebrates

Resources:

- Laboratory Manual
- Lab specimens
- Exams
- CK12 Online Biology Textbook
- Youtube
- Edpuzzle