Honors Biology

Unit Title: Unit 1: Cell Specialization and Homeostasis

Stage 1: Desired Results

Standards & Indicators:

NJSLS Science:

- 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.

Science and Engineering Practices(SEP)

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)

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)

Developing and Using Models- Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds. Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-2) Use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-4)

Planning and Carrying Out Investigations 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)

Disciplinary Core Ideas (DCI)

- Environmental factors also affect expression of traits, and hence affect the probability of occurrences of traits in a population. Thus the variation and distribution of traits observed depends on both genetic and environmental factors. (HS-LS3-2)
- 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, and some have no as-yet known function. (HS-LS3-1)

Crosscutting Concepts (CCC)

- **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)

Honors Biology

Career Readiness, Life Literacies and Key Skills		
Standard	**Performance Expectations**	**Core Ideas**
9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).	Collaboration with individuals with diverse experiences can aid in the problem-solving process, particularly for global issues where diverse solutions are needed.
9.4.12.TL.1	Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task (e.g., W.11-12.6.).	Digital tools differ in features, capacities, and styles. Knowledge of different digital tools is helpful in selecting the best tool for a given task.

Central Idea/Enduring Understanding:	**Essential/Guiding Question:**
• 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.	• How do the structures of organisms enable life's functions?
Content:	**Skills(Objectives):**
• Science Safety • Common Properties of Living Things (Chapter 1.1) • Hierarchy of Organization (Chapter 1.2) • Microscope Use as a Tool (Chapter 4.1) • Structure and Function of the Endomembrane System (Chapter 4.3-4.22) • Structure and Function of the Cellular Membrane (Chapter 4.2, 5.1-5.9) • Cellular Division (Chapter 8.1-8.10)	• Develop and use a model based on evidence to illustrate hierarchical organization of interacting systems that provide specific functions within multicellular organism. • Develop and use a model based on evidence to illustrate the interaction of functions at the organism system level. • Develop and use a model based on evidence to illustrate the flow of matter • Plan and conduct an investigation individually and collaboratively to produce evidence that feedback mechanisms (negative and positive) maintain homeostasis. • Use a model based on evidence to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms

Interdisciplinary Connections:

- **ELA NJSLS**

Honors Biology

- **W.WR.9–10.5.** 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.
- **SL.UM.9–10.5.** Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance findings, reasoning, and evidence and to add interest.

- **Math NJSLS**
  - **MP 4-**Model with mathematics.
  - **N.Q-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 display

Stage 2: Assessment Evidence

Performance Task(s):

- Black Box Lab
- Are Viruses Alive? Silent Debate
- Mind Map Chapter 1
- Microscope Lab
- Cell Analogy Project
- Lab: Cell Size and Diffusion
- Lab: Investigating Osmotic Rates
- Modeling Lab: Phospholipid & Membrane Transport Kit
- Cell Cycle Creative Project
- Lab: Investigating Cell Cycle Rates of Onion Root and Fish Blastodisc

Other Evidence:

- Quizzes
- Test

Stage 3: Learning Plan

Learning Opportunities/Strategies:

- Team building activities
- Cooperative learning activities
- Online learning websites
- Internet research
- Student driven activities

Resources:

- Textbook: Campbell Biology Concepts and Connections Seventh Edition: Reece, Taylor, Simon, and Dickey
- POGIL: Activities for High School Biology: Laura Trout, Ed.
- 3D Molecular Designs: Phospholipid and Membrane Transport Kit
- Carolina Biological Supply: Cell Size and Diffusion Kit
- Carolina Biological Supply: Investigating Osmotic Rates

LGBT and Disabilities Resources:

- LGBTQ-Inclusive Lesson & Resources by Garden State Equality and Make it Better for Youth
- LGBTQ+ Books

DEI Resources:

- Learning for Justice
- GLSEN Educator Resources
- Supporting LGBTQIA Youth Resource List

Honors Biology

	• Respect Ability: Fighting Stigmas, Advancing Opportunities • NJDOE Diversity, Equity & Inclusion Educational Resources • Diversity Calendar

Differentiation *Please note: Teachers who have students with 504 plans that require curricular accommodations are to refer to Struggling and/or Special Needs Section for differentiation

High-Achieving Students	On Grade Level Students	Struggling Students	Special Needs/ELL
Allow the use of technology on assignments Provide web-based projects to further expand class materials Allow students to collaborate in small groups	Provide visual aides Study guides Allow the use of technology on assignments Allow students to collaborate in small groups	Graphic Organizers Shorten assignments Grade for content not spelling and grammar Allow extra time for assignments if student goes to tutoring Provide visual aides Study guides Allow the use of technology on assignments Allow students to collaborate in small groups	Any student requiring further accommodations and/or modifications will have them individually listed in their 504 Plan or IEP. These might include, but are not limited to: breaking assignments into smaller tasks, giving directions through several channels (auditory, visual, kinesthetic, model), and/or small group instruction for reading/writing ELL supports should include, but are not limited to, the following:: Extended time Provide visual aids Repeated directions Differentiate based on proficiency Provide word banks Allow for translators, dictionaries

Unit Title: Unit 2: DNA and Inheritance

Stage 1: Desired Results

Standards & Indicators:

NJSLS Science:

- HS-LS1-2: Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
- HS-LS1-3: Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
- HS-LS1-4- Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.

Science and Engineering Practices(SEP)

Developing and Using Models- Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds. Develop and use a model based on evidence to illustrate the relationships between

systems or between components of a system. (HS-LS1-2) Use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-4)

Disciplinary Core Ideas (DCI)

- 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. (HS-LS1-2)
- Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system. (HS-LS1-3)
- 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. (HS-LS1-4)

Crosscutting Concepts (CCC)

- **Stability and Change -** Feedback (negative or positive) can stabilize or destabilize a system. (HS-LS1-3).
- **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)
- **Systems and System Models** 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. (HS-LS1-4)

Career Readiness, Life Literacies and Key Skills

Standard	Performance Expectations	Core Ideas
9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).	Collaboration with individuals with diverse experiences can aid in the problem-solving process, particularly for global issues where diverse solutions are needed.
9.4.12.TL.1	Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task (e.g., W.11-12.6.).	Digital tools differ in features, capacities, and styles. Knowledge of different digital tools is helpful in selecting the best tool for a given task.

Central Idea/Enduring Understanding:

- 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

Essential/Guiding Question:

- How are characteristics from one generation related to the previous generation?

Honors Biology

<table>
<tr><td>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</td><td></td></tr>
<tr><td>Content:
● Meiosis and Crossing Over (Chapter 8.11-8.17, 9.16, 9.18)
● Alterations of Chromosome Number and Structure (Chapter 8.18-23)
● Mendel’s Laws of Segregation and Independent Assortment as a model for inheritance (Chapter 9.1-9.7, 9.19)
● Human inheritance and testing (Chapter 9.8-9.10, 9.22-9.23)
● Variations on Mendelian Inheritance (Chapter 9.11-9.15, 9.17, 9.20-9.21)
● Structure of Genetic Material (Chapter 10.1-10.3)
● DNA Replication (Chapter 10.4)
● Genetic Expression of Nucleic Acids to a Protein (Chapter 10.6-10.15)
● Mutation’s effect on Genetic Expression (Chapter 10.16)</td><td>Skills(Objectives):
● Ask questions that arise from examining models or a theory to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parent to offspring.
● Use empirical evidence to differentiate between cause and correlation and make claims about the role of DNA and chromosomes in coding the instructions for characteristics passed from parents to offspring.
● Make and defend a claim based on evidence that inheritable genetic variations may result from new genetic combinations through meiosis, viable errors occurring during replication, and/or mutations caused by environmental factors.
● Use data to support arguments for the ways inheritable genetic variation occurs.
● Use empirical evidence to differentiate between cause and correlation and 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. make claims about the ways inheritable genetic variation occurs.</td></tr>
<tr><td colspan="2">Interdisciplinary Connections:
● ELA NJSLS
○ W.WR.9–10.5. 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.</td></tr>
</table>

Honors Biology

- **SL.UM.9–10.5.** Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance findings, reasoning, and evidence and to add interest.

- **Math NJSLS**
  - **MP 4-**Model with mathematics.
  - **N.Q-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 display

Stage 2: Assessment Evidence

Performance Task(s):

- Lab: ChromoSock Meiosis (or Pop Beads)
- Lab: Karyotyping
- Lab: ABO/Rh Blood Typing Lab
- Lactose Intolerance Pedigree Practice
- Effect of mutations on Human Genetics (Lactose Intolerance, Melanin Production, PTC tasting)
- Epistasis Jigsaw
- Family Pedigree Project
- Modeling Lab: K'Nex DNA Structure
- Modeling Lab: K'Nex DNA Replication
- Modeling Lab: K'Nex DNA Transcription

Other Evidence:

- Quizzes
- Test

Stage 3: Learning Plan

Learning Opportunities/Strategies:

- Team building activities
- Cooperative learning activities
- Online learning websites
- Internet research
- Student driven activities

Resources:

- Textbook: Campbell Biology Concepts and Connections Seventh Edition: Reece, Taylor, Simon, and Dickey
- POGIL: Activities for High School Biology: Laura Trout, Ed.
- Carolina Biological Supply: ChromoSock Meiosis Lab
- Carolina Biological Supply: Karyotyping Lab
- Carolina Biological Supply: ABO/Rh Blood Typing Lab
- Carolina Biological Supply: K'Nex DNA Modeling Kit

LGBT and Disabilities Resources:

- LGBTQ-Inclusive Lesson & Resources by Garden State Equality and Make it Better for Youth
- LGBTQ+ Books

DEI Resources:

- Learning for Justice
- GLSEN Educator Resources
- Supporting LGBTQIA Youth Resource List
- Respect Ability: Fighting Stigmas, Advancing Opportunities
- NJDOE Diversity, Equity & Inclusion Educational Resources
- Diversity Calendar

Honors Biology

Differentiation *Please note: Teachers who have students with 504 plans that require curricular accommodations are to refer to Struggling and/or Special Needs Section for differentiation			
High-Achieving Students	**On Grade Level Students**	**Struggling Students**	**Special Needs/ELL**
Allow the use of technology on assignments Provide web-based projects to further expand class materials Allow students to collaborate in small groups	Provide visual aides Study guides Allow the use of technology on assignments Allow students to collaborate in small groups	Graphic Organizers Shorten assignments Grade for content not spelling and grammar Allow extra time for assignments if student goes to tutoring Provide visual aides Study guides Allow the use of technology on assignments Allow students to collaborate in small groups	Any student requiring further accommodations and/or modifications will have them individually listed in their 504 Plan or IEP. These might include, but are not limited to: breaking assignments into smaller tasks, giving directions through several channels (auditory, visual, kinesthetic, model), and/or small group instruction for reading/writing ELL supports should include, but are not limited to, the following:: Extended time Provide visual aids Repeated directions Differentiate based on proficiency Provide word banks Allow for translators, dictionaries

Unit Title: Unit 3: Natural Selection

Stage 1: Desired Results

Standards & Indicators:

NJSLS Science:

HS-LS4-4- Construct an explanation based on evidence for how natural selection leads to adaptation of populations.
HS-LS4-3- Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.
HS-LS4-5- 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-LS2-8- Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.

Science and Engineering Practices(SEP)

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. Apply concepts of statistics and probability (including determining function fits to data, slope, intercept, and correlation coefficient for linear fits) to scientific and engineering questions and problems, using digital tools when feasible. (HS-LS4-3)

Honors Biology

Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories. 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-LS4-4)

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 or historical episodes in science. Evaluate the evidence behind currently accepted explanations or solutions to determine the merits of arguments. (HS-LS4-5)

Disciplinary Core Ideas (DCI)

- 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. (HS-LS4-3)
- The traits that positively affect survival are more likely to be reproduced, and thus are more common in the population. (HS-LS4-3)
- 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. (HS-LS4-3), (HS-LS4-4)
- Adaptation also means that the distribution of traits in a population can change when conditions change. (HS-LS4-3)
- Changes in the physical environment, whether naturally occurring or human induced, have thus 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. (HS-LS4-5),
- 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. (HS-LS4-5)
- Group behavior has evolved because membership can increase the chances of survival for individuals and their genetic relatives. (HS-LS2-8)

Crosscutting Concepts (CCC)

- **Patterns** Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena. (HS-LS4-3**)**
- **Cause and Effect** Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-LS4-4), (HS-LS4-5), (HS-LS2-8)
- S**cientific Knowledge Assumes an Order and Consistency in Natural Systems** Scientific knowledge is based on the assumption that natural laws operate today as they did in the past and they will continue to do so in the future. (HS-LS4-4)
- **Scientific Knowledge is Open to Revision in Light of New Evidence** Scientific argumentation is a mode of logical discourse used to clarify the strength of relationships between ideas and evidence that may result in revision of an explanation. (HS-LS2-8)

Career Readiness, Life Literacies and Key Skills

Standard	Performance Expectations	Core Ideas
9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).	Collaboration with individuals with diverse experiences can aid in the problem-solving process, particularly for

Honors Biology

		global issues where diverse solutions are needed.
9.4.12.TL.1	Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task (e.g., W.11-12.6.).	Digital tools differ in features, capacities, and styles. Knowledge of different digital tools is helpful in selecting the best tool for a given task.

Central Idea/Enduring Understanding:	**Essential/Guiding Question:**
● A scientific theory is a substantiated explanation of some aspect of the natural world, based on a body of facts that have been repeatedly confirmed through observation and experiment, and the science community validates each theory before it is accepted. If new evidence is discovered that the theory does not accommodate, the theory is generally modified in light of this new evidence. ● 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. ● 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. ● 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. ● Empirical evidence is required to differentiate between cause and correlation and make claims about the process of evolution.	● What evidence shows that different species are related?
Content:	**Skills(Objectives):**
● Darwin's theory of Natural Selection (Chapter 13.1-13.3)	● Communicate scientific information in multiple forms that common ancestry and biological

Honors Biology

● Evidences of Evolution (Chapter 13.4-13.6) ● Evolution of Populations (Chapter 13.7-13.10) ● Mechanisms of Microevolution (13.11-13.17) ● Defining Species (Chapter 14.1-14.3) ● Mechanisms of Speciation: Allopatric vs Sympatric (14.4-14.11)	evolution are supported by multiple lines of empirical evidence. ● Understand the role each line of evidence has relating to common ancestry and biological evolution. ● Observe patterns in multiple lines of empirical evidence at different scales and provide evidence for causality in explanations of common ancestry and biological evolution. ● 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, 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. ● Use empirical evidence to explain the influences of: (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, on number of organisms, behaviors, morphology, or physiology in terms of ability to compete for limited resources and subsequent survival of individuals and adaptation of species.

Interdisciplinary Connections:

- **ELA NJSLS**
  - **W.WR.9–10.5.** 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.
  - **SL.UM.9–10.5.** Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance findings, reasoning, and evidence and to add interest.
  - **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.
- **Math NJSLS**
  - **MP 2-** Reason abstractly and quantitatively.
  - **MP 4-**Model with mathematics.

Honors Biology

- **N.Q-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

Stage 2: Assessment Evidence

Performance Task(s):

- POGIL: Evolution and Selection
- Jigsaw: Evidence for Evolution
- Lab: Investigating Bird Beak Adaptations
- Lab: Road to Life Forming Molecules
- Lab: Genetic Equilibrium and Natural Selection Kit

Other Evidence:

- Quizzes
- Test

Stage 3: Learning Plan

Learning Opportunities/Strategies:

- Team building activities
- Cooperative learning activities
- Online learning websites
- Internet research
- Student driven activities

Resources:

- Textbook: Campbell Biology Concepts and Connections Seventh Edition: Reece, Taylor, Simon, and Dickey
- POGIL: Activities for High School Biology: Laura Trout, Ed.
- Ward's Science: Investigating Bird Beak Adaptations
- Lab Aids: Genetic Equilibrium and Natural Selection Kit
- Ward's Science: Road to Life Forming Molecules

LGBT and Disabilities Resources:

- LGBTQ-Inclusive Lesson & Resources by Garden State Equality and Make it Better for Youth
- LGBTQ+ Books

DEI Resources:

- Learning for Justice
- GLSEN Educator Resources
- Supporting LGBTQIA Youth Resource List
- Respect Ability: Fighting Stigmas, Advancing Opportunities
- NJDOE Diversity, Equity & Inclusion Educational Resources
- Diversity Calendar

Differentiation *Please note: Teachers who have students with 504 plans that require curricular accommodations are to refer to Struggling and/or Special Needs Section for differentiation

High-Achieving Students	On Grade Level Students	Struggling Students	Special Needs/ELL
Allow the use of technology on assignments Provide web-based projects to further expand class materials	Provide visual aides Study guides Allow the use of technology on assignments	Graphic Organizers Shorten assignments Grade for content not spelling and grammar	Any student requiring further accommodations and/or modifications will have them individually listed in their 504 Plan or IEP. These might include, but are not limited to: breaking assignments into smaller tasks, giving

Allow students to collaborate in small groups	Allow students to collaborate in small groups	Allow extra time for assignments if student goes to tutoring Provide visual aides Study guides Allow the use of technology on assignments Allow students to collaborate in small groups	directions through several channels (auditory, visual, kinesthetic, model), and/or small group instruction for reading/writing ELL supports should include, but are not limited to, the following:: Extended time Provide visual aids Repeated directions Differentiate based on proficiency Provide word banks Allow for translators, dictionaries

Unit Title: Unit 4: Evolution

Stage 1: Desired Results

Standards & Indicators:

NJSLS Science:

- 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.

Science and Engineering Practices(SEP)

Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories. 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-LS4-2)

Obtaining, Evaluating, and Communicating Information Obtaining, evaluating, and communicating information in 9–12 builds on K–8 experiences and progresses to evaluating the validity and reliability of the claims, methods, and designs. Communicate scientific information (e.g., about phenomena and/or the process of development and the design and performance of a proposed process or system) in multiple formats (including orally, graphically, textually, and mathematically). (HS-LS4-1)

Disciplinary Core Ideas (DCI)

- 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. (HS-LS4-1)

Honors Biology

- 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. (HS-LS4-2)

Crosscutting Concepts (CCC)

- **Patterns** Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena. (HS-LS4-1)
- **Cause and Effect** Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-LS4-2)
- **Scientific Knowledge Assumes an Order and Consistency in Natural Systems** Scientific knowledge is based on the assumption that natural laws operate today as they did in the past and they will continue to do so in the future. (HS-LS4-1)
- **Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena** A scientific theory is a substantiated explanation of some aspect of the natural world, based on a body of facts that have been repeatedly confirmed through observation and experiment and the science community validates each theory before it is accepted. If new evidence is discovered that the theory does not accommodate, the theory is generally modified in light of this new evidence. (HS-LS4-1)

Career Readiness, Life Literacies and Key Skills

Standard	Performance Expectations	Core Ideas
9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).	Collaboration with individuals with diverse experiences can aid in the problem-solving process, particularly for global issues where diverse solutions are needed.
9.4.12.TL.1	Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task (e.g., W.11-12.6.).	Digital tools differ in features, capacities, and styles. Knowledge of different digital tools is helpful in selecting the best tool for a given task.

Central Idea/Enduring Understanding:

- Students construct explanations for the processes of natural selection and evolution and then communicate how multiple lines of evidence support these explanations.
- Students evaluate evidence of the conditions that may result in new species and understand the role of genetic variation in natural selection. Additionally, students can apply concepts of probability to explain trends in population as those trends relate to advantageous heritable traits in a specific environment.
- Students demonstrate an understanding of these concepts by obtaining, evaluating, and communicating information and constructing explanations and designing solutions. The crosscutting concepts of patterns and cause and effect support the development of a deeper understanding.

Essential/Guiding Question:

- What evidence shows that different species are related?

Content:

Skills(Objectives):

- Communicate scientific information in multiple forms that common ancestry and biological

● Mechanisms of Macroevolution (Chapter 15.7-15.13) ● Phylogeny trees, Classification, and Molecular Clocks (Chapter 15.14-15.19)	evolution are supported by multiple lines of empirical evidence. ● Understand the role each line of evidence has relating to common ancestry and biological evolution. ● Observe patterns in multiple lines of empirical evidence at different scales and provide evidence for causality in explanations of common ancestry and biological evolution. ● 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, 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. ● Use empirical evidence to explain the influences of: (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, on number of organisms, behaviors, morphology, or physiology in terms of ability to compete for limited resources and subsequent survival of individuals and adaptation of species.

Interdisciplinary Connections:

- **ELA NJSLS**
  - **W.WR.9–10.5.** 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.
  - **SL.UM.9–10.5.** Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance findings, reasoning, and evidence and to add interest.
- **Math NJSLS**
  - **MP 4-**Model with mathematics.
  - **N.Q-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 display

Honors Biology

Stage 2: Assessment Evidence

Performance Task(s):
- Cladogram Lab
- Analysis of Protein Sequences to Create Phylogenetic Tree
- POGIL: Biological Classification

Other Evidence:
- Quizzes
- Test

Stage 3: Learning Plan

Learning Opportunities/Strategies:
- Team building activities
- Cooperative learning activities
- Online learning websites
- Internet research
- Student driven activities

Resources:
- Textbook: Campbell Biology Concepts and Connections Seventh Edition: Reece, Taylor, Simon, and Dickey
- POGIL: Activities for High School Biology: Laura Trout, Ed.

LGBT and Disabilities Resources:
- LGBTQ-Inclusive Lesson & Resources by Garden State Equality and Make it Better for Youth
- LGBTQ+ Books

DEI Resources:
- Learning for Justice
- GLSEN Educator Resources
- Supporting LGBTQIA Youth Resource List
- Respect Ability: Fighting Stigmas, Advancing Opportunities
- NJDOE Diversity, Equity & Inclusion Educational Resources
- Diversity Calendar

Differentiation *Please note: Teachers who have students with 504 plans that require curricular accommodations are to refer to Struggling and/or Special Needs Section for differentiation

High-Achieving Students	On Grade Level Students	Struggling Students	Special Needs/ELL
Allow the use of technology on assignments Provide web-based projects to further expand class materials Allow students to collaborate in small groups	Provide visual aides Study guides Allow the use of technology on assignments Allow students to collaborate in small groups	Graphic Organizers Shorten assignments Grade for content not spelling and grammar Allow extra time for assignments if student goes to tutoring Provide visual aides Study guides Allow the use of technology on assignments	Any student requiring further accommodations and/or modifications will have them individually listed in their 504 Plan or IEP. These might include, but are not limited to: breaking assignments into smaller tasks, giving directions through several channels (auditory, visual, kinesthetic, model), and/or small group instruction for reading/writing ELL supports should include, but are not limited to, the following:: Extended time Provide visual aids

Honors Biology

		Allow students to collaborate in small groups	Repeated directions Differentiate based on proficiency Provide word banks Allow for translators, dictionaries

Pacing Guide

Course Name	Textbook: Campbell Biology Concepts & Connections, Seventh Edition	Content Standards
UNIT 1 Cell Specialization and Homeostasis (20 days)	**CHAPTERS 1.1-1.2, 4, 5.1-5.9, 8.1-8.10**	HS-LS3-1 HS-LS3-2
MP 1 or 3		
UNIT 2 DNA and Inheritance (21 Days)	**CHAPTERS 8.11-8.23, 9, 10**	HS-LS1-4 HS-LS1-2 HS-LS1-3
MP 1 or 3		
UNIT 3 Natural Selection (21 Days)	**CHAPTERS 13 & 14**	HS-LS4-4 HS-LS4-3 HS-LS4-5 HS-LS2-8
MP 2 or 4		
UNIT 4 Evolution (11 Days)	**CHAPTER 15.7-15.19**	HS-LS4-1 HS-LS4-2
MP 2 or 4		