Biology

Unit 1: Cell Specialization and Homeostasis

Stage 1: Desired Results

Standards & Indicators:

NJSLS Science:

- HS-LS1-1- Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.
- HS-LS1-2: Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
- HS-LS1-3: Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
- HS-LS1-4- Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.

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-LS1-1)

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)

- Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1)

Biology

- 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. (HS-LS1-1)
- 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)

- **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-LS1-2) (HS-LS1-4)

- **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)

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

Biology

	• How does the structure of DNA determine the structure of proteins, and what is the function of proteins? • What do you mean they say that people are made of a system of systems? • How do feedback mechanisms maintain homeostasis? • Why aren't all elephants the same size?
Content: Ch. 7 Cell Structure and Function Ch. 10 Cell Growth and Division Ch. 11.4 Meiosis	**Skills(Objectives):** • 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. • Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. • Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. • Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms

Interdisciplinary Connections:

- **ELA NJSLS**
  - WHST.9-12.7 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
  - WHST.11-12.8 (HS-LS1-3)
  - 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.
- **Math NJSLS**
  - Model with mathematics.
  - 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): • Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including	**Other Evidence:** • Vocab quiz, written assessment, oral assessment • Cell Quiz

students' own investigations, models, theories, simulations, peer review) for how the structure of DNA determines the structure of proteins, which carry out the essential functions of life through systems of specialized cells. ● Construct an explanation, based on 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, for how the structure of DNA determines the structure of proteins, which carry out the essential functions of life through systems of specialized cells. ● Conduct a detailed examination of the structure and function of DNA ● DNA to Disease Lab. ● 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 and energy within and between systems of an organism at different scales. ● Plan and conduct an investigation individually and collaboratively to produce evidence that feedback mechanisms (negative and positive) maintain homeostasis. ● In the planning of the investigation, decide on the types, amount, and accuracy of the data needed to produce reliable measurements, consider limitations on the precision of the data, and refine the design accordingly. ● Gummy Bear Lab or Potato Lab ● Osmosis Protocol ● Membrane Protocol	● Chapter Test

• Human Homeostasis Virtual Activity • Use a model based on evidence to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms. • Use a model to illustrate the role of cellular division and differentiation in terms of energy, matter, and information flows within and between systems of cells/organisms. • Comparing Eukaryotic Cells Lab • Comparing Mitosis and Meiosis	

Stage 3: Learning Plan

Learning Opportunities/Strategies:	**Resources:**
• Vocabulary • Youtube Video Proteins in the body • Youtube video Protein Structure • Teacher notes understanding Functions of Proteins and DNA; Foundation ed. lesson review p. 295; 12.2 study guide packets A & B • Chapter 7 Cell Structure and Function Person- Miller & Levine pg. 196-205 Section 7.2 • Section assessment pg 205 • Plant and Animal Cell Assessment • Chapter 7 Cell Structure and Function Person- Miller & Levine pg. 190-205 Section 7.1-7.2 • Section assessment 7.2 pg 205 • Video on Homeostasis • https://www.youtube.com/watch?v=6fhbbFd4icY • • Video on Osmosis • https://www.youtube.com/watch?v=w3_8FSrqc-I; • Foundation ed. Homeostasis section 7.4 p. 181- 183; Foundation ed. lesson review p. Foundation ed. lesson review p.183	http://www.youtube.com/watch?v=T500B5yTy58 https://www.youtube.com/watch?v=FKwSIu_XxnY https://www.explorelearning.com/index.cfm?method=cResource.dspDetail&ResourceID=519 https://www.youtube.com/watch?v=6fhbbFd4icY https://www.youtube.com/watch?v=w3_8FSrqc-I; Miller & Levine Biology Textbook- Pearson 2019 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

Biology

• Chapter 7 Cell Structure and FunctionPerson- Miller & Levine pg. 208-217 • Section assessment 7.3 pg 213 • Section assessment 7.4 pg 217 • Study Guide; Mitosis POGIL; Foundation ed. lesson review p.243 and 247.Chapter 10 Cell Growth and Division Person- Miller & Levine pg. 273-297 • Quick lab 10.1 pg 275 • Section assessment 10.2 pg 284 • Section assessment 10.4 pg 297 • Chapter 11.4 Meiosis Person- Miller & Levine pg. 323-329 • Analyzing data 11.4 pg 327 • Section assessment 11.4 pg 329	

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	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

		collaborate in small groups	

Unit 2: DNA and Inheritance

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.
- 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)

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)

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)

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-LS3-3)

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-LS3-3)
- 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)

- 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)

- **Cause and Effect-** Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-LS3-1)
- **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)
- **Science is a Human Endeavor** 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)
- **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:	Essential/Guiding Question:
• How are characteristics from one generation related to the previous generation?	• What can't two roses ever be identical? • How does inheritable genetic variation occur? • Can a zoologist predict the distribution of expressed traits in a population?

Biology

Content:	**Skills(Objectives):**
Ch. 11.1-11.3 Intro to GEnetics Ch. 12 DNA Ch. 13 RNA and Protein Synthesis Ch. 14 Human Heredity	• Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms. • Explain how the process of meiosis results in the passage of traits from parent to offspring, and how that results in increased genetic diversity necessary for evolution. • Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring. • Create a visual representation to illustrate how changes in a DNA nucleotide sequence can result in a change in the polypeptide produced. • 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.

Interdisciplinary Connections:

- **ELA NJSLS**
  - WHST.9-12.7 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
  - WHST.11-12.8 (HS-LS1-3)
  - 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.
- **Math NJSLS**
  - Model with mathematics.
  - 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):	**Other Evidence:**
• 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.	• Vocab quiz, written assessment, oral assessment • DNA Quiz • DNA & RNA QUIZ • Chapter Test

Biology

● 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. ● Beaker Babbies Lab ● Human Population Traits Project ● Penny Genetics ● 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 make claims about the ways inheritable genetic variation occurs. ● DNA Webquest ● DNA Extraction Lab ● DNA to RNA to Protein Model ● Apply concepts of statistics and probability (including determining function fits to data, slope, intercepts, and correlation coefficient for linear fits) to explain the variation and distribution of expressed traits in a population. ● Use mathematics to describe the probability of traits as it relates to genetic and environmental factors in the expression of traits. ● Use algebraic thinking to examine scientific data on the variation and distribution of traits in a population and predict the effect of a change in probability of traits as it relates to genetic and environmental factors. ● Karyotype Lab	

Biology

Stage 3: Learning Plan

Learning Opportunities/Strategies:

- Monohybrid Cross Practice
- Dihybrid Cross Practice
- Incomplete & Codominance Cross Practice
- Multiple Allele practice
- Vocabulary Ch.11 in the Textbook
- Chapter 11 Person- Miller & Levine pg. 308-321
- Section 11.1-Quick Lab Activity pg. 311
- Section 11.1-Section Assessment pg. 312
- Section11.2-Section Assessment pg.318
- Section 11.3 -Analyzing Data pg. 320
- Section 11.3- Section Assessment pg. 321; Foundation ed. section 11.1p.265; 11.2 p. 270, 11.3 p. 273.
- Foundation ed. lesson review p. 279
- GATTACA
- DNA Structure and Replication Worksheet
- DNA Extraction Video
- DNA to RNA to Protein Practice
- Transcription to Translation to Protein Manipilatives; Foundation ed. lesson review p. 299
- Chapter 12 DNA Person- Miller & Levine pg. 337-353
- Section assessment 12.1 pg 343
- Analyzing data 12.2 pg 345
- Section assessment 12.2 pg 348
- Section assessment 12.3 pg. 353
- Chapter 13 RNA & Protein Synthesis Person- Miller & Levine pg. 361-383
- Section assessment 13.1 pg 365
- Quick lab pg 367
- Section assessment 13.2 pg 371
- Quick lab pg 374
- Section assessment 13.3 pg 376
- Pedigree Problems
- X-linked Gene Practice; Magnetic Karyotype Lab

Resources:

http://www.stevespanglerscience.com/lab/experiments/strawberry-dna#sthash.SQvgncks.dpuf

Miller & Levine Biology Textbook- Pearson 20196

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

• Chapter 14 Human HeredityPerson-Miller & Levine pg. 391-401 • Section assessment 14.1 pg 397 • Section assessment 14.2 pg 401	

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 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.

Biology

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)

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)
- **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-LS4-4)
- **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 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:

- How can there be so many similarities among organisms yet so many different plants, animals, and microorganisms?

Essential/Guiding Question:

- How does natural selection lead to adaptations of populations?
- Why is it so important to take all of the antibiotics in a prescription if I feel better?
- How are species affected by changing environmental conditions?
- Why do some species live in groups and others are solitary?

Biology

Content:	**Skills(Objectives):**
Ch. 16 Darwin's Theory of Evolution	● Construct an explanation based on evidence for how natural selection leads to adaptation of populations. ● 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. ● 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. ● Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.

Interdisciplinary Connections:

- **ELA NJSLS**
  - WHST.9-12.7 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
  - WHST.11-12.8 (HS-LS1-3)
  - 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.
  - 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**
  - Model with mathematics.
  - Reason abstractly and quantitatively.
  - 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):	**Other Evidence:**
● 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	● Vocab quiz, written assessment, oral assessment ● Natural Selection Quiz ● Chapter 16 Test

on 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, for how natural selection leads to adaptation of populations. ● Use data to differentiate between cause and correlation and to make claims about how specific biotic and abiotic differences in ecosystems contribute to change in gene frequency over time, leading to adaptation of populations. ● Squirrel Island Project ● Stickleback Evolution Virtual Lab ● Apply concepts of statistics and probability (including determining function fits to data, slope, intercept, and correlation coefficient for linear fits) to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait. ● Analyze shifts in numerical distribution of traits and, using these shifts as evidence, support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait. ● Observe patterns at each of the scales at which a system is studied to provide evidence for causality in explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait. ● Darwin Station Lab ● 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.	

• Determine cause-and-effect relationships for how changes to the environment affect distribution or disappearance of traits in species. • Use empirical evidence to differentiate between cause and correlation and to 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. • Bird Beak Lab • Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce. • Distinguish between group and individual behavior. • Identify evidence supporting the outcome of group behavior. • Develop logical and reasonable arguments based on evidence to evaluate the role of group behavior on individual and species' chances to survive and reproduce. • Use empirical evidence to differentiate between cause and correlation and to make claims about the role of group behavior on individual and species' chances to survive and reproduce.	

Stage 3: Learning Plan

Learning Opportunities/Strategies:	**Resources:**
• Adapting to the World Video and Analysis questions • Evolution Concept Map; Foundation ed. lesson review p. 387 and 391. 16.2 Study Packets A & B • Natural Selection FOSSweb Webquest; Foundation ed. lesson review p.391; 16.3 Study Packet A & B	http://www.bozemanscience.com/007-speciation-and-extinction http://www.bozemanscience.com/007-speciation-and-extinction http://www.bozemanscience.com/001-natural-selection https://www.youtube.com/watch?v=TUFWQ-sZGq8

Biology

• Mass Extinction Interactive; Foundation ed. lesson review 19.2 p. 455 & 461 • Social Interactions and Group Behavior	Miller & Levine Biology Textbook- Pearson 2019 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 • 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

Biology

Unit 2: 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)
- 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)

Biology

- **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:	Essential/Guiding Question:
• What evidence shows that different species are related?	• How can someone prove that birds and dinosaurs are related? • What is the relationship between natural selection and evolution?
Content: Ch. 17.1-17.3 Evolution of Populations Ch. 19.1-19.3 History of Life on Earth	**Skills(Objectives):** • Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence. • 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.

Biology

Interdisciplinary Connections:

- **ELA NJSLS**
  - WHST.9-12.7 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
  - WHST.11-12.8 (HS-LS1-3)
  - 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.
- **Math NJSLS**
  - Model with mathematics.
  - 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):

- Communicate scientific information in multiple forms that common ancestry and biological 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.
- Animal Evolution Project
- How Eyes Evolved – Analyzing the Evidence Lab
- Section 17.1 and 17.2
- Foundation ed. lesson review 17.1 p. 408 and 17.2 p. 413
- 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

Other Evidence:

- Vocab quiz, written assessment, oral assessment
- Chapter Test

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. ● Pearson Biology Book- p. 570 Unit 5- Evolutionary Documentary	

Stage 3: Learning Plan

Learning Opportunities/Strategies:	**Resources:**
● Evidence of Common Ancestry and Diversity ● Pandemic II Webquest/ Game with Analysis; ; Foundation ed. lesson review 17.2 p. 413 and 17.3 p.416	https://www.youtube.com/watch?v=Q9Aa_VsHK3I https://www.youtube.com/watch?v=JrJPPUgSB4A Miller & Levine Biology Textbook- Pearson 20196 LGBT and Disabilities Resources: ● LGBTQ-Inclusive Lesson & Resources by Garden State Equality and Make it Better for Youth ● LGBTQ+ Books DEI Resources:

Biology

	• 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 • 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

Biology

Pacing Guide

Course Name	Resource	Content Standards
UNIT 1 Cell Specialization and Homeostasis (20 days)	**CHAPTERS 7, 10, 11.4** Days 1-20	HS-LS1-1 HS-LS1-2 HS-LS1-3 HS-LS1-4
MP 1 or 3		
UNIT 2 DNA and Inheritance (21 Days)	**CHAPTERS 11.1-11.3, 12, 13, 14** Days 21-41	HS-LS1-4 HS-LS3-1 HS-LS3-2
MP 1 or 3		
UNIT 2 Natural Selection (21 Days)	**CHAPTERS 16** Days 42-62	HS-LS4-4 HS-LS4-3 HS-LS4-5 HS-LS2-8
MP 2 or 4		
UNIT 4 Evolution (11 Days)	**CHAPTERS 17.1-17.3, 19.1-19.3** Days 63-73	HS-LS4-1 HS-LS4-2
MP 2 or 4		