

Lakewood School District Curriculum Guide

Grade: High School

Content Area: Science - Biology

Original Adoption: 2023 NJSL English Language Arts and English as a Second Language (8-21-24); Math NJSL Mathematics (8-21-24); 2020 NJSL Science, Social Studies, Career Readiness, Life Literacies & Key Skills, Computer Design & Thinking, Visual & Performing Arts, World Language, Comprehensive Health and Physical Education (5-11-22)

Created By:

Recommended Pacing Guide

From Molecules to Organisms: Structure and Function (Units 1-5)	60 days
Heredity: Inheritance and Variation of Traits (Units 6-8)	63 days
Biological Evolution: Unity and Diversity (Unit 9)	25 days
Ecosystems: Interdependence in Ecosystems (Unit 10)	35 days

Alignment with State Mandates

The following colors are used throughout this document to indicate areas in which the curriculum is aligned with the following NJSA requirements:

- **Holocaust and genocides** ([N.J.S.A. 18A:35-28](#))
- **History and contributions of African-Americans** (Amistad Law) ([N.J.S.A. 18A:35-4.43](#))
- **Highlight and promote diversity and inclusion** (Diversity & Inclusion Law) ([N.J.S.A. 18A:35-4.36a](#))
- **History of disabled and LGBT persons** included in middle and high school curriculum ([Section 18A:35-4.35](#))
- **Climate Change** - to prepare students to understand how and why climate change happens, the impact it has on our local and global communities and to act in informed and sustainable ways. Please [click here](#) for specific examples (by subject).

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From Molecules to Organisms: Structure and Function (Units 1-5)	60 days
<u>New Jersey Learning Standards-Science</u>	
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 multi-cellular organisms
HS-LS1-3	Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis
HS-LS1-6	Construct and revise an explanation based on evidence for how carbon, hydrogen and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules
HS-LS1-7	Use a model to illustrate the cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy

Science and Engineering Practices	Discipline Core Ideas/Unit Enduring Understandings	Crosscutting Concepts
<p>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.</p> <ul style="list-style-type: none"> Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-2) <p>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.</p>	<p>LS1.A: Structure and Function</p> <ul style="list-style-type: none"> Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1) 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) (Note: This Disciplinary Core Idea is also addressed by HS-LS3-1.) 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) <p>Feedback mechanisms maintain a living system’s internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as</p>	<p>Systems and System Models</p> <ul style="list-style-type: none"> 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) Structure and Function Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem. (HS-LS1-1) <p>Stability and Change Feedback (negative or positive) can stabilize or destabilize a system. (HS-LS1-2)</p>

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<ul style="list-style-type: none"> ● 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) 	<p>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)</p>	
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Social and Emotional Learning Standards	
Self-Awareness	<ul style="list-style-type: none"> ● Recognize one’s personal traits, strengths, and limitations ● Recognize the importance of self-confidence in handling daily tasks and challenges
Self-Management	<ul style="list-style-type: none"> ● Recognize the skills needed to establish and achieve personal and educational goals ● Identify and apply ways to persevere or overcome barriers through alternative methods to achieve one’s goals
Social Awareness	<ul style="list-style-type: none"> ● Demonstrate an understanding of the need for mutual respect when viewpoints differ
Responsible Decision-Making	<ul style="list-style-type: none"> ● Develop, implement and model effective problem solving and critical thinking skills

Interdisciplinary Connections	
ELA Standards	
<ul style="list-style-type: none"> ● 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.
<ul style="list-style-type: none"> ● L.SS.9–10.1 	Demonstrate command of the system and structure of the English language when writing or speaking.
<ul style="list-style-type: none"> ● L.KL.9–10.2 	Apply knowledge of language to make effective choices for meaning, or style, and to comprehend more fully when reading, writing, speaking or listening.
<ul style="list-style-type: none"> ● RL.CR.9–10.1 	Cite a range of thorough textual evidence and make relevant connections to strongly support analysis of multiple aspects of what a literary text says explicitly and inferentially, as well as including determining where the text leaves matters uncertain.
<ul style="list-style-type: none"> ● SL.II.9–10.2 	Integrate multiple sources of information presented in diverse media or formats (e.g., visually,

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	quantitatively, qualitatively, orally) evaluating the credibility and accuracy of each source.
<ul style="list-style-type: none"> ● SL.PE.9–10.1 	Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with peers on grades 9–10 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.
	Math Standards
<ul style="list-style-type: none"> ● MP.4 	Model with mathematics
<ul style="list-style-type: none"> ● HSF-IF.C.7 	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

Computer Science & Design Thinking

8.1 Computer Science

- 8.1.5.DA.1: Collect, organize, and display data in order to highlight relationships or support a claim.

8.2 Design Thinking

- 8.2.5.ED.2: Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models.
- 8.2.5.ED.3: Follow step by step directions to assemble a product or solve a problem, using appropriate tools to accomplish the task.
- 8.2.8.ED.3: Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch).

Career Readiness, Life Literacies & Key Skills

9.1 Personal Financial Literacy

- 9.1.5.EG.1: Explain and give examples of what is meant by the term “tax.”
- 9.1.8.FI.4: Analyze the interest rates and fees associated with financial products.
- 9.1.8.FP.7: Identify the techniques and effects of deceptive advertising.

9.4 Life Literacies & Key Skills

- 9.4.5.CT.3: Describe how digital tools and technology may be used to solve problems.
- 9.4.8.TL.3: Select appropriate tools to organize and present information digitally.

Evidence of Student Learning

Formative Tasks:

- Oral Questioning
- Student Conference
- Self-Assessment
- Hand Signals
- Communicators
- Graphic Organizers

Alternative Assessments:

- Teacher-Created Projects
- <https://www.khanacademy.org/>
- Completion of webquests
- On-Line Laboratory activities
- Online assessment activities example:

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<ul style="list-style-type: none"> ● Teacher Observation ● Do Now/DOL ● Quiz Classwork ● Problem of the Day ● Observation ● Homework ● Class participation ● Graphic Organizers ● Projects ● Student Response Systems (ex.Clickers) ● Laboratories Activities and Assessments ● Lab Reports ● Notebook ● Writing Assignments ● Graphs, Models, and Tables 	<ul style="list-style-type: none"> ○ Kahoot ○ Quizizz
<p>Summative Assessments:</p> <ul style="list-style-type: none"> ● Unit Tests ● Midterm Exam ● Final Exam ● Chapter/Unit Test ● Writing Assignments ● Presentations ● Laboratory Reports/Practical ● Unit Projects 	<p>Benchmark Assessments:</p> <ul style="list-style-type: none"> ● Quarterly Benchmarks ● Beginning/End of Year Assessment ● Midterm Assessment ● Unit Common Assessment

Knowledge & Skills	
<p>Enduring Understandings:</p> <ul style="list-style-type: none"> ● The structure of DNA encodes information that determines protein structure and function, directly influencing how specialized cells perform essential life processes. ● Biological systems rely on hierarchical organization, with cells forming tissues, tissues forming organs, and organs interacting within systems to sustain organismal function. ● The relationship between structure and function is fundamental across levels of biological organization, from molecular interactions to whole-organism systems. ● Homeostasis is maintained through feedback mechanisms that regulate internal conditions in response to external and internal changes. 	<p>Essential Questions:</p> <ul style="list-style-type: none"> ● How Do The Structures Of Organisms Enable Life's Functions? ● How Do Organisms Grow And Develop? ● How do organisms obtain and use the matter and energy they need to live and grow? ● How do organisms detect,process and use information about the environment?

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- Energy transfer in living systems depends on chemical reactions that break and form bonds, allowing organisms to store, release, and use energy efficiently.
- Carbon-based molecules are central to life because carbon, hydrogen, and oxygen can form complex structures that support growth, repair, and energy transformation.
- Cellular respiration is a chemical process that converts energy stored in food molecules into forms usable by cells through systematic bond rearrangement.
- Scientific models and evidence-based explanations are essential tools for understanding and communicating how interacting biological systems function and remain stable over time.

Content

Students will know...

- *Systems of specialized cells within organisms help them perform the essential functions of life.*
- *All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells.*
- *Multi cellular organisms have a hierarchical structural organization, in which any one The system is made up of numerous parts and is itself a component of the next level.*
- *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.*
- *Living systems, from the organism to the cellular level, demonstrate the complementary nature of structure and function.*
- *In multi cellular 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*

Skills

Students will be able to ...

- Identify the characteristics of living things. (Part of Nature of Science)
- Interpret and construct tables and graphs that illustrate scientific findings.
- Understand, evaluate, and practice safe procedures for conducting science investigations.
- Describe how the properties of water make it essential for life (Part of Nature of Science)
- Describe the hierarchical structural organisms (Cells through Ecosystem)
- Describe how homeostasis is essential for maintaining an organisms' internal environment
- Model how and why the function of each major category of organic molecules is essential to life.
- Analyze and explain how cells carry out a variety of chemical transformations that allow the conversion of energy from one to another.
- Discuss how the integrated functioning of all parts of systems is important for successful interpretation of inputs and responses.

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systems of tissues and organs that work together to meet the needs of the whole organism.

- *The process of photosynthesis converts light energy to stored chemical energy by converting carbon dioxide plus water into sugars plus released oxygen.*

- *The sugar molecules thus formed contain carbon, hydrogen, and oxygen: their hydrocarbon backbones are used to make amino acids and other carbon-based molecules that can be assembled into larger molecules (such as proteins or DNA), used for example to form new cells.*

- *As matter and energy flow through different organizational levels of living systems, chemical elements are recombined in different ways to form different products.*

- *As a result of these chemical reactions, energy is transferred from one system of interacting molecules to another. Cellular respiration is a chemical process in which the bonds of food molecules such as proteins or DNA, used for example to form new cells.*

- *As matter and energy flow through different organizational levels of living systems, chemical elements are recombined in different ways to form different products*

- *oxygen molecules are broken and new compounds are formed that can transport energy to muscles. Cellular respiration also releases the energy needed to maintain body temperature despite ongoing energy transfer to the surrounding environment.*

- *The sugar molecules thus formed contain carbon, hydrogen, and oxygen; their hydrocarbon backbones are used to make amino acids and other carbon-based molecules that can be assembled into larger molecules*

Core Instructional & Supplemental Materials

Suggested Activities/Resources:

- Lab safety video on YouTube
- Variable and Data collection Station Activity
- Discussions on variables
- Graphic Organizers
- BrainPoP videos – Water/ Diffusion / quiz following video to check for understanding <https://www.youtube.com/watch?v=3jwAGWky98c>
- Murder and a meal <http://sciencespot.net/Media/FrnsScience/MurderMeal.pdf>

Supplemental resources:

- Textbook : Dynamics of Life Science Websites: <http://www.biologycorner.com>
- <http://www.pbslearningmedia.org/>
- <https://www.khanacademy.org/science/biology>
- <http://www.bozemanscience.com>
- <http://www.nabt.org>
- <http://news.sciencemag.org/category/biology>
- <http://nsf.gov/>
- <https://newsela.com/>
- <http://www.nextgenscience.org>

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- [Race & Social Justice Teacher Resources](#)
- [Dr. Jane C Wright](#)

Suggested Accommodations

English Language Learners:

- Multi-Sensory Instruction
- Flexible Grouping
- Small Group Instruction
- Peer Buddies
- Graphic Organizers
- Chunking Information
- Scaffolded Questioning
- Manipulatives/Concrete Models
- Build Background/Vocabulary
- Math Word Wall/Word Bank
- Gradual Release Model
- Visual Cues
- Visual Models
- Technology Integration
- Hands-On/Experiential Activities
- Native language support when possible
- Sheltered English Instructional Strategies
- Provide additional time

Special Education/Students with Disabilities:

- Extra help opportunities provided
- Credit Recovery
- Allow use of a calculator, when appropriate
- Modified length and time frame of assignments
- Alternate assessments with extended time
- Provide guided notes and study guides as needed
- Preferential Seating
- Extra Practice
- Directions repeated, clarified, and reworded
- Breakdown task into manageable units
- Differentiated instruction
- Use of manipulatives
- Math tool paper available
- Cooperative learning groups
- Supplemental books
- Repeat, reword or clarify directions
- Small group instruction as needed
- Instructional technology as needed/required
- Effective teacher questioning; ranging from fact recall to higher order critical thinking questions

504 Plans:

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- Extra help opportunities provided
- Credit Recovery
- Allow use of a calculator, when appropriate
- Modified length and time frame of assignments
- Alternate assessments with extended time
- Provide guided notes and study guides as needed
- Preferential Seating
- Extra Practice
- Directions repeated, clarified, and reworded
- Breakdown task into manageable units
- Differentiated instruction
- Use of manipulatives
- Math tool paper available
- Cooperative learning groups
- Supplemental books
- Repeat, reword or clarify directions
- Small group instruction as needed
- Instructional technology as needed/required
- Effective teacher questioning; ranging from fact recall to higher order critical thinking questions

Gifted and Talented:

- Cooperative Learning Groups
- Enriched Assignments
- Tiered Assignments
- Word Problems
- NJSLA questions
- Model Curriculum Questions
- Inquiry Based Project
- Interest Based/Choice Activities

Students at Risk of Failure:

- Extended Time
- Multi-Sensory Instruction
- Flexible Grouping
- Small Group Instruction
- Peer Buddies
- Graphic Organizers
- Chunking Information
- Scaffolded Questioning
- Tiered Activities
- Manipulatives/Concrete Models
- Build Background/Vocabulary
- Math Word Wall/Word Bank
- Modified Assignments
- Gradual Release Model
- Preferential Seating
- Brain Breaks
- Visual Cues

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- Visual Models
- Technology Integration
- Assistive Technology
- Credit Recovery

Economically Disadvantaged:

- Pre-teach vocabulary using visuals and gestures
- Chunk texts
- Summarize as you go
- Preview lessons
- Graphic organizers
- Highlight key words
- Sentence starters
- Prompting and cueing
- Activate schema
- Build background knowledge

Culturally Diverse:

- Create pictures, posters, art, books, maps, flags, etc to hang in the classroom.
- Create an emotionally positive classroom climate.
- Bring in guest speakers
- Create effective communication
- Model and teach cultural respect
- Build relationships with students by interviewing students to understand their background

Heredity:		63 days
Inheritance and Variation of Traits (Units 6-8)		
<u>New Jersey Learning Standards-Science</u>		
HS-LS1-1	Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells	
HS-LS1-4	Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.	
HS-LS3-1	Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.	
HS-LS3-2	Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.	
HS-LS3-3	Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.	

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Science and Engineering Practices	Discipline Core Ideas/Unit Enduring Understandings	Crosscutting Concepts
<p>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.</p> <ul style="list-style-type: none"> ● Ask questions that arise from examining models or a theory to clarify relationships. (HS-LS3-1) <p>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.</p> <ul style="list-style-type: none"> ● Use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-4) <p>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.</p> <ul style="list-style-type: none"> ● Apply concepts of statistics and probability (including determining function fits to data, slope, intercept, and correlation coefficient for linear fits) to scientific and 	<p>LS1.A: Structure and Function</p> <ul style="list-style-type: none"> ● 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. (secondary to HS-LS3-1) (Note: This Disciplinary Core Idea is also addressed by HS-LS1-1.) <p>LS1.B: Growth and Development of Organisms</p> <ul style="list-style-type: none"> ● 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) <p>LS3.A: Inheritance of Traits</p> <ul style="list-style-type: none"> ● 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 	<p>Cause and Effect</p> <ul style="list-style-type: none"> ● Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-LS3-1),(HS-LS3-2) <p>Scale, Proportion, and Quantity</p> <ul style="list-style-type: none"> ● 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) <p>Systems and System Models</p> <ul style="list-style-type: none"> ● 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) <p>Connections to Nature of Science Science is a Human Endeavor</p> <ul style="list-style-type: none"> ● 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)

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<p>engineering questions and problems, using digital tools when feasible. (HS-LS3-3)</p> <p>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.</p> <ul style="list-style-type: none"> ● Make and defend a claim based on evidence about the natural world that reflects scientific knowledge, and student-generated evidence. (HS-LS3-2) 	<p>regulatory or structural functions, and some have no as-yet known function. (HS-LS3-1)</p> <p>LS3.B: Variation of Traits</p> <ul style="list-style-type: none"> ● In sexual reproduction, chromosomes can sometimes swap sections during the process of meiosis (cell division), thereby creating new genetic combinations and thus more genetic variation. Although DNA replication is tightly regulated and remarkably errors do occur and result in mutations, which are also a source of genetic variation. Environmental factors can also cause mutations in genes, and viable mutations are inherited. (HS-LS3-2) ● 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),(HS-LS3-3) 	
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Social and Emotional Learning Standards	
Self-Awareness	<ul style="list-style-type: none"> ● Recognize one’s personal traits, strengths, and limitations ● Recognize the importance of self-confidence in handling daily tasks and challenges
Self-Management	<ul style="list-style-type: none"> ● Recognize the skills needed to establish and achieve personal and educational goals ● Identify and apply ways to persevere or overcome barriers through alternative methods to achieve one’s goals
Social Awareness	<ul style="list-style-type: none"> ● Demonstrate an understanding of the need for mutual respect when viewpoints differ
Responsible Decision-Making	<ul style="list-style-type: none"> ● Develop, implement and model effective problem solving and critical thinking skills

Interdisciplinary Connections	
ELA Standards	
<ul style="list-style-type: none"> ● W.WR.9–10.5 	Conduct short as well as more sustained research projects to answer a question (including a

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	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.
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● L.KL.9–10.2	Apply knowledge of language to make effective choices for meaning, or style, and to comprehend more fully when reading, writing, speaking or listening.
● RL.CR.9–10.1	Cite a range of thorough textual evidence and make relevant connections to strongly support analysis of multiple aspects of what a literary text says explicitly and inferentially, as well as including determining where the text leaves matters uncertain.
● SL.II.9–10.2	Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, qualitatively, orally) evaluating the credibility and accuracy of each source.
● SL.PE.9–10.1	Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with peers on grades 9–10 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.
	Math Standards
● MP.4	Model with mathematics
● HSF-IF.C.7	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

Computer Science & Design Thinking

8.1 Computer Science

- 8.1.5.DA.1: Collect, organize, and display data in order to highlight relationships or support a claim.

8.2 Design Thinking

- 8.2.5.ED.2: Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models.
- 8.2.5.ED.3: Follow step by step directions to assemble a product or solve a problem, using appropriate tools to accomplish the task.
- 8.2.8.ED.3: Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch).

Career Readiness, Life Literacies & Key Skills

9.1 Personal Financial Literacy

- 9.1.5.EG.1: Explain and give examples of what is meant by the term “tax.”
- 9.1.8.FI.4: Analyze the interest rates and fees associated with financial products.
- 9.1.8.FP.7: Identify the techniques and effects of deceptive advertising.

9.4 Life Literacies & Key Skills

- 9.4.5.CT.3: Describe how digital tools and technology may be used to solve problems.
- 9.4.8.TL.3: Select appropriate tools to organize and present information digitally.

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Evidence of Student Learning

Formative Tasks:

- Oral Questioning
- Student Conference
- Self-Assessment
- Hand Signals
- Communicators
- Graphic Organizers
- Teacher Observation
- Do Now/DOL
- Quiz Classwork
- Problem of the Day
- Observation
- Homework
- Class participation
- Graphic Organizers
- Projects
- Student Response Systems (ex.Clickers)
- Laboratories Activities and Assessments
- Lab Reports
- Notebook
- Writing Assignments
- Graphs, Models, and Tables

Alternative Assessments:

- Teacher-Created Projects
- <https://www.khanacademy.org/>
- Completion of webquests
- On-Line Laboratory activities
- Online assessment activities example:
 - Kahoot
 - Quizizz

Summative Assessments:

- Unit Tests
- Midterm Exam
- Final Exam
- Chapter/Unit Test
- Writing Assignments
- Presentations
- Laboratory Reports/Practical
- Unit Projects

Benchmark Assessments:

- Quarterly Benchmarks
- Beginning/End of Year Assessment
- Midterm Assessment
- Unit Common Assessment

Knowledge & Skills

Enduring Understandings:

- DNA stores the instructions for building proteins, and the structure of those proteins determines how specialized cells perform essential life functions.
- The continuity and complexity of multicellular organisms depend on regulated cell division and differentiation, which allow cells to grow, specialize, and maintain tissues over time.

Essential Questions:

- How Do The Structures Of Organisms Enable Life's Functions?
- How Do Organisms Grow And Develop?
- How do organisms obtain and use the matter and energy they need to live and grow?
- How do organisms detect, process and use information about the environment?

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<ul style="list-style-type: none"> ● Chromosomes organize DNA in ways that ensure genetic information is accurately replicated, expressed, and passed from one generation to the next. ● Traits are inherited through predictable patterns because DNA provides a stable yet adaptable system for transmitting biological information. ● Genetic variation arises from multiple mechanisms, including recombination during meiosis, replication errors, and mutations influenced by environmental factors. ● Variation in genetic information leads to differences in expressed traits among individuals within a population. ● Statistical and probabilistic reasoning helps explain why traits are distributed unevenly across populations rather than expressed identically by all individuals. ● Scientific explanations of heredity require evidence-based claims supported by models, data analysis, and an understanding of how molecular processes scale to population-level outcomes. 	
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<p>Content <i>Students will know...</i></p> <ul style="list-style-type: none"> ● <i>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.</i> ● <i>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.</i> ● <i>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</i> 	<p>Skills <i>Students will be able to ...</i></p> <ul style="list-style-type: none"> ● Explain how cell division (mitosis) leads to growth and development of organisms.. ● Describe and discuss Mendel's studies and explain how his studies led to our current understanding patterns of inheritance. ● Predict the outcome of genetic crosses using statistics and probability. ● Simplify the process of calculating mono-, di-, tri-hybrid crosses using basic probability equations. ● Predict the results from various genetic crosses including multiple allele, sex-linked, autosomal dominant, autosomal recessive, and codominant crosses. <ul style="list-style-type: none"> ● Identify and explain the chromosomal activities that occur during meiosis. ● Compare and contrast mitosis and meiosis. ● Explain how and why an individuals chromosome number needs to remain constant. ● Apply knowledge of genetics to explain
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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.

- *In sexual reproduction, chromosomes can sometimes swap sections during the process of meiosis (cell division), thereby creating new genetic combinations and thus more genetic variation. Although DNA replication is tightly regulated and remarkably accurate, errors do occur and result in mutations, which are also a source of genetic variation. Environmental factors can also cause mutations in genes, and viable mutations are inherited.*
- *Environmental factors also affect expression of traits, and hence affect the probability of occurrences of traits in a population. Thus the variation and distribution of traits observed depends on both genetic and environmental factors.*

mechanisms of inheritance.

- Model the structure and function of a DNA molecule.
- Model the events of DNA replication.
- Model/act out the events of transcription, translation, and polypeptide synthesis.
- Compare and contrast DNA and RNA structure and function.
- Explain the central dogma (path of gene expression) of molecular biology.
- Identify mutations in a DNA sequence and demonstrate the effects of the mutations.
- Describe ways that genetic variations arise (errors in replication, environmental, through meiosis).
- Discuss the role of sexual reproduction in adding variation to organisms.

Core Instructional & Supplemental Materials

Suggested Activities/Resources:

- UNIT LONG: Genetics Project
- DNA History/Discovery timeline
- Mitosis Lab Station Activities
- LAB: Compare and Contrast Mitosis and Meiosis
- LAB: Karyotype analysis, Chromosome stations
- Genetic Inheritance follows rules:
<http://www.dnafb.org/5/> - interactive animation
- dominant and recessive genes
- <http://www.dnafb.org/4/> Some Genes are dominant interactive animation
- LAB: Dragon Genetics
- ABO Blood types Codominance Worksheet
- Blood typing Lab
- build an online DNA Molecule.
<http://learn.genetics.utah.edu/content/basics/builddna/>
- Ed Puzzle Video and Questions for Amoeba Sisters- DNA Replication.
- Explore the differences between DNA and RNA Using a Venn Diagram:
<http://learn.genetics.utah.edu/content/basics/rna/>

Supplemental resources:

- Textbook : Dynamics of Life Science Websites:
<http://www.biologycorner.com>
- <http://www.pbslearningmedia.org/>
- <https://www.khanacademy.org/science/biology>
- <http://www.bozemanscience.com>
- <http://www.nabt.org>
- <http://news.sciencemag.org/category/biology>
- <http://nsf.gov/>
- <https://newsela.com/>
- <http://www.nextgenscience.org>
- [Race & Social Justice Teacher Resources](#)
- [Biology & Gender Studies](#)
- [Science & Suffering](#)

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- make a chart of the three types of RNA and each function in their notebooks. Use the following website for reference:

<http://learn.genetics.utah.edu/content/basics/centraldogma/>

- LAB ideas: Taco protein synthesis, Dog DNA creation, Detective Game

Suggested Accommodations

English Language Learners:

- Multi-Sensory Instruction
- Flexible Grouping
- Small Group Instruction
- Peer Buddies
- Graphic Organizers
- Chunking Information
- Scaffolded Questioning
- Manipulatives/Concrete Models
- Build Background/Vocabulary
- Math Word Wall/Word Bank
- Gradual Release Model
- Visual Cues
- Visual Models
- Technology Integration
- Hands-On/Experiential Activities
- Native language support when possible
- Sheltered English Instructional Strategies
- Provide additional time

Special Education/Students with Disabilities:

- Extra help opportunities provided
- Credit Recovery
- Allow use of a calculator, when appropriate
- Modified length and time frame of assignments
- Alternate assessments with extended time
- Provide guided notes and study guides as needed
- Preferential Seating
- Extra Practice
- Directions repeated, clarified, and reworded
- Breakdown task into manageable units
- Differentiated instruction
- Use of manipulatives
- Math tool paper available
- Cooperative learning groups
- Supplemental books
- Repeat, reword or clarify directions
- Small group instruction as needed
- Instructional technology as needed/required

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- Effective teacher questioning; ranging from fact recall to higher order critical thinking questions

504 Plans:

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Gifted and Talented:

- Cooperative Learning Groups
- Enriched Assignments
- Tiered Assignments
- Word Problems
- NJSLA questions
- Model Curriculum Questions
- Inquiry Based Project
- Interest Based/Choice Activities

Students at Risk of Failure:

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- Preferential Seating
- Brain Breaks
- Visual Cues
- Visual Models
- Technology Integration
- Assistive Technology
- Credit Recovery

Economically Disadvantaged:

- Pre-teach vocabulary using visuals and gestures
- Chunk texts
- Summarize as you go
- Preview lessons
- Graphic organizers
- Highlight key words
- Sentence starters
- Prompting and cueing
- Activate schema
- Build background knowledge

Culturally Diverse:

- Create pictures, posters, art, books, maps, flags, etc to hang in the classroom.
- Create an emotionally positive classroom climate.
- Bring in guest speakers
- Create effective communication
- Model and teach cultural respect
- Build relationships with students by interviewing students to understand their background

Biological Evolution: Unity and Diversity (Unit 9)	25 days
<u>New Jersey Learning Standards-Science</u>	
HS-LS4-1	Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.
HS-LS4-2	Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.
HS-LS4-3	Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.
HS-LS4-4	Construct an explanation based on evidence for how natural selection leads to adaptation of populations.

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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.
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Science and Engineering Practices	Discipline Core Ideas/Unit Enduring Understandings	Crosscutting Concepts
<p>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.</p> <ul style="list-style-type: none"> 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) <p>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.</p> <ul style="list-style-type: none"> Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students’ own investigations, models, theories, simulations, peer 	<p>LS4.A: Evidence of Common Ancestry and Diversity</p> <ul style="list-style-type: none"> Genetic information, like the fossil record, 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) <p>LS4.B: Natural Selection</p> <ul style="list-style-type: none"> 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),(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) <p>LS4.C: Adaptation</p> <ul style="list-style-type: none"> Evolution is a consequence of the interaction of four factors: (1) the potential for a species to increase in number, (2) the genetic 	<p>Patterns</p> <ul style="list-style-type: none"> 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),(HS-LS4-3) <p>Cause and Effect</p> <ul style="list-style-type: none"> Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-LS4-2),(HS-LS4-4),(HS-LS4-5) <p>Connections to Nature of Science</p> <p>Scientific Knowledge Assumes an Order and Consistency in Natural Systems</p> <ul style="list-style-type: none"> 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),(HS-LS4-4)

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),(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)

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)

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.

(HS-LS4-2)

- 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

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<p>Connections to Nature of Science Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena</p> <ul style="list-style-type: none"> • 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) 	<p>drastic, the opportunity for the species' evolution is lost. (HS-LS4-5)</p>	
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Social and Emotional Learning Standards	
Self-Awareness	<ul style="list-style-type: none"> • Recognize one's personal traits, strengths, and limitations • Recognize the importance of self-confidence in handling daily tasks and challenges
Self-Management	<ul style="list-style-type: none"> • Recognize the skills needed to establish and achieve personal and educational goals • Identify and apply ways to persevere or overcome barriers through alternative methods to achieve one's goals
Social Awareness	<ul style="list-style-type: none"> • Demonstrate an understanding of the need for mutual respect when viewpoints differ
Responsible Decision-Making	<ul style="list-style-type: none"> • Develop, implement and model effective problem solving and critical thinking skills

Interdisciplinary Connections	
ELA Standards	
<ul style="list-style-type: none"> • 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.
<ul style="list-style-type: none"> • L.SS.9–10.1 	Demonstrate command of the system and structure of the English language when writing or speaking.
<ul style="list-style-type: none"> • L.KL.9–10.2 	Apply knowledge of language to make effective choices for meaning, or style, and to

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	comprehend more fully when reading, writing, speaking or listening.
<ul style="list-style-type: none"> ● RL.CR.9–10.1 	Cite a range of thorough textual evidence and make relevant connections to strongly support analysis of multiple aspects of what a literary text says explicitly and inferentially, as well as including determining where the text leaves matters uncertain.
<ul style="list-style-type: none"> ● SL.II.9–10.2 	Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, qualitatively, orally) evaluating the credibility and accuracy of each source.
<ul style="list-style-type: none"> ● SL.PE.9–10.1 	Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with peers on grades 9–10 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.
Math Standards	
<ul style="list-style-type: none"> ● MP.2 	Reason abstractly and quantitatively.
<ul style="list-style-type: none"> ● MP.4 	Model with mathematics.

Computer Science & Design Thinking

8.1 Computer Science

- 8.1.5.DA.1: Collect, organize, and display data in order to highlight relationships or support a claim.

8.2 Design Thinking

- 8.2.5.ED.2: Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models.
- 8.2.5.ED.3: Follow step by step directions to assemble a product or solve a problem, using appropriate tools to accomplish the task.
- 8.2.8.ED.3: Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch).

Career Readiness, Life Literacies & Key Skills

9.1 Personal Financial Literacy

- 9.1.5.EG.1: Explain and give examples of what is meant by the term “tax.”
- 9.1.8.FI.4: Analyze the interest rates and fees associated with financial products.
- 9.1.8.FP.7: Identify the techniques and effects of deceptive advertising.

9.4 Life Literacies & Key Skills

- 9.4.5.CT.3: Describe how digital tools and technology may be used to solve problems.
- 9.4.8.TL.3: Select appropriate tools to organize and present information digitally.

Evidence of Student Learning

<p>Formative Tasks:</p> <ul style="list-style-type: none"> ● Oral Questioning ● Student Conference 	<p>Alternative Assessments:</p> <ul style="list-style-type: none"> ● Teacher-Created Projects ● https://www.khanacademy.org/
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<ul style="list-style-type: none"> ● Self-Assessment ● Hand Signals ● Communicators ● Graphic Organizers ● Teacher Observation ● Do Now/DOL ● Quiz Classwork ● Problem of the Day ● Observation ● Homework ● Class participation ● Graphic Organizers ● Projects ● Student Response Systems (ex.Clickers) ● Laboratories Activities and Assessments ● Lab Reports ● Notebook ● Writing Assignments ● Graphs, Models, and Tables 	<ul style="list-style-type: none"> ● Completion of webquests ● On-Line Laboratory activities ● Online assessment activities example: <ul style="list-style-type: none"> ○ Kahoot ○ Quizizz
<p>Summative Assessments:</p> <ul style="list-style-type: none"> ● Unit Tests ● Midterm Exam ● Final Exam ● Chapter/Unit Test ● Writing Assignments ● Presentations ● Laboratory Reports/Practical ● Unit Projects 	<p>Benchmark Assessments:</p> <ul style="list-style-type: none"> ● Quarterly Benchmarks ● Beginning/End of Year Assessment ● Midterm Assessment ● Unit Common Assessment

Knowledge & Skills	
<p>Enduring Understandings:</p> <ul style="list-style-type: none"> ● Biological evolution is supported by multiple, independent lines of empirical evidence, including fossil records, comparative anatomy, embryology, molecular biology, and genetic data. ● All living organisms share common ancestry, and observable similarities among species reflect evolutionary relationships over deep time. ● Evolution is driven by interacting factors such as genetic variation, reproductive potential, competition for limited resources, and differential survival and reproduction. ● Natural selection acts on existing heritable variation within populations, leading to changes in 	<p>Essential Questions:</p> <ul style="list-style-type: none"> ● What Evidence Shows That Different Species are related? ● How does genetic variation among organisms affect survival and reproduction? ● How does the environment influence populations of organisms over multiple generations? ● What is Biodiversity, how do humans affect it, and how does it affect humans?

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trait frequencies rather than changes in individual organisms.

- Advantageous heritable traits tend to increase in frequency within a population over generations, a pattern that can be explained and supported using statistical and probabilistic reasoning.
- Adaptations arise when environmental pressures consistently favor certain traits, increasing the likelihood that organisms possessing those traits will survive and reproduce.
- Changes in environmental conditions can alter population dynamics, resulting in population growth, speciation, or extinction depending on the adaptability of organisms.
- Scientific explanations of evolution require evaluating evidence, analyzing data, and constructing coherent arguments that connect genetic variation, environmental pressures, and long-term population change.

Content

Students will know...

- *Genetic information, like the fossil record, 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.*
- Natural selection occurs only if there is both (1) variation in the genetic information between organisms in a population and (2) variation in the expression of that genetic information—that is, trait variation—that leads to differences in performance among individuals.
- The traits that positively affect survival are more likely to be reproduced, and thus are more common in the population.
- 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

Skills

Students will be able to ...

- Describe how evolution involves change in the genetic makeup of whole populations over time, not changes in the genes of an individual organism.
- Analyze natural selection simulations and use the data generated to describe how environmentally favored traits are perpetuated over generations resulting in species survival or extinction
- Identify, explain, and demonstrate how technology can be used to determine evolutionary relationships among species.
- Integrate scientific information from a variety of disciplines to provide evidence for the relatedness of species on Earth (geology, comparative anatomy, biochemistry, embryology and taxonomy).
- Recognize that a change in species over time does not follow a set pattern or timeline.
- Explain how the millions of different species on Earth today are related by common ancestry
- Provide a scientific explanation for the fossil record of ancient life forms, and the molecular similarities observed among the diverse species of living organisms.
- Predict possible evolutionary implications for a population due to environmental changes over time (e.g., volcanic eruptions, global climate change,

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in that environment.

- Natural selection leads to adaptation, that is, to a population dominated by organisms that are anatomically, behaviorally, and physiologically well
- Recognize that a change in species over time does not follow a set pattern or timeline.
- Explain how the millions of different species on Earth today are related by common ancestry
- Provide a scientific explanation for the fossil record of ancient life forms, and the molecular similarities observed among the diverse species of living organisms.
- Predict possible evolutionary implications for a population due to environmental changes over time (e.g., volcanic eruptions, global climate change, industrial pollution).
- Apply concepts of statistics and probability to support explanations that organism with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait is suited to survive and reproduce in a specific environment. That is, the differential survival and reproduction of organisms in a population that have an advantageous heritable trait leads to an increase in the proportion of individuals in future generations that have the trait and to a decrease in the proportion of individuals that do not.
- Adaptation also means that the distribution of traits in a population can change when conditions change.
- 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.
- 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.
- Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, over exploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational

industrial pollution).

- Apply concepts of statistics and probability to support explanations that organism with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.

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value.

- When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts.
- Both physical models and computers can be used in various ways to aid in the engineering design process. Computers are useful for a variety of purposes, such as running simulations to test different ways of solving a problem or to see which one is most efficient or economical; and in making a persuasive presentation to a client about how a given design will meet his or her needs

Core Instructional & Supplemental Materials

Suggested Activities/Resources:

- Evidence of Evolution powerpoint followed by video:
<https://www.youtube.com/watch?v=IIEoO5KdPv>– evidence of evolution
- Peppered Moth Simulation:
<http://peppermoths.weebly.com/index.html>
- Darwin Life webQuest
- Mechanisms WebQuest, Genetic Drift Simulation
- LAB: Bird Beak Lab-Introduced Species

Supplemental resources:

- Textbook : Dynamics of Life Science Websites:
<http://www.biologycorner.com>
- <http://www.pbslearningmedia.org/>
- <https://www.khanacademy.org/science/biology>
- <http://www.bozemanscience.com>
- <http://www.nabt.org>
- <http://news.sciencemag.org/category/biology>
- <http://nsf.gov/>
- <https://newsela.com/>
- <http://www.nextgenscience.org>
- [Race & Social Justice Teacher Resources](#)
- [Environmentalist](#)

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- Gradual Release Model
- Visual Cues

- Visual Models
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- Build Background/Vocabulary
- Math Word Wall/Word Bank
- Modified Assignments
- Gradual Release Model
- Preferential Seating
- Brain Breaks
- Visual Cues
- Visual Models
- Technology Integration
- Assistive Technology
- Credit Recovery

Economically Disadvantaged:

- Pre-teach vocabulary using visuals and gestures
- Chunk texts
- Summarize as you go
- Preview lessons
- Graphic organizers
- Highlight key words
- Sentence starters
- Prompting and cueing
- Activate schema
- Build background knowledge

Culturally Diverse:

- Create pictures, posters, art, books, maps, flags, etc to hang in the classroom.

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- Create an emotionally positive classroom climate.
- Bring in guest speakers
- Create effective communication
- Model and teach cultural respect
- Build relationships with students by interviewing students to understand their background

Ecosystems: Interdependence in Ecosystems (Unit 10)		35 days
<u>New Jersey Learning Standards-Science</u>		
HS-LS2-1	Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales	
HS-LS2-2	Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.	
HS-LS2-6	Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.	
HS-LS2-7	Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.	
HS-LS2-8	Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.	
HS-LS4-6	Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.	

Science and Engineering Practices	Discipline Core Ideas/Unit Enduring Understandings	Crosscutting Concepts
Using Mathematics and Computational Thinking <ul style="list-style-type: none"> ● Mathematical and computational thinking in 9-12 builds on K-8 experiences and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to 	LS2.A: Interdependent Relationships in Ecosystems <ul style="list-style-type: none"> ● Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support. These limits result from such factors as the availability of living and nonliving resources and from such challenges such as predation, competition, and disease. Organisms would have the capacity to produce populations of great size were it not for the fact 	Cause and Effect <ul style="list-style-type: none"> ● Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-LS2-8),(HS-LS4-6) Scale, Proportion, and Quantity <ul style="list-style-type: none"> ● The significance of a phenomenon is dependent on the scale, proportion, and quantity at which it occurs. (HS-LS2-1) ● Using the concept of orders of magnitude allows one to understand how a model at one scale relates to a model at another scale. (HS-LS2-2) Stability and Change

analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.

- Use mathematical and/or computational representations of phenomena or design solutions to support explanations. (HS-LS2-1)
- Use mathematical representations of phenomena or design solutions to support and revise explanations. (HS-LS2-2)
- Create or revise a simulation of a phenomenon, designed device, process, or system. (HS-LS4-6)

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.
- Design, evaluate, and refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations. (HS-LS2-7)

that environments and resources are finite. This fundamental tension affects the abundance (number of individuals) of species in any given ecosystem. (HS-LS2-1),(HS-LS2-2)

LS2.C: Ecosystem Dynamics, Functioning, and Resilience

- A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient), as opposed to becoming a very different ecosystem. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability. (HS-LS2-2),(HS-LS2-6)
- Moreover, anthropogenic changes (induced by human activity) in the environment—including habitat destruction, pollution, introduction of invasive species, overexploitation, and climate change—can disrupt an ecosystem and threaten the survival of some species. (HS-LS2-7)

LS2.D: Social Interactions and Group Behavior

- Group behavior has evolved because membership can increase the chances of survival for individuals and their genetic relatives. (HS-LS2-8)

LS4.C: Adaptation

- Changes in the physical environment, whether naturally

- Much of science deals with constructing explanations of how things change and how they remain stable. (HS-LS2-6),(HS-LS2-7)

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-LS4-6)

LS4.D: Biodiversity and Humans

- Biodiversity is increased by the formation of new species (speciation) and decreased by the loss of species (extinction). (secondary to HS-LS2-7)
- Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value. (secondary to HS-LS2-7), (HS-LS4-6.)

ETS1.B: Developing Possible Solutions

- When evaluating solutions it is important to take into account a range of constraints including cost, safety, reliability and aesthetics and to consider social, cultural and environmental impacts. (secondary to HS-LS2-7),(secondary to HS-LS4-6)
- Both physical models and

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	<p>computers can be used in various ways to aid in the engineering design process. Computers are useful for a variety of purposes, such as running simulations to test different ways of solving a problem or to see which one is most efficient or economical; and in making a persuasive presentation to a client about how a given design will meet his or her needs. (secondary to HS-LS4-6)</p>	
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Social and Emotional Learning Standards	
Self-Awareness	<ul style="list-style-type: none"> ● Recognize one’s personal traits, strengths, and limitations ● Recognize the importance of self-confidence in handling daily tasks and challenges
Self-Management	<ul style="list-style-type: none"> ● Recognize the skills needed to establish and achieve personal and educational goals ● Identify and apply ways to persevere or overcome barriers through alternative methods to achieve one’s goals
Social Awareness	<ul style="list-style-type: none"> ● Demonstrate an understanding of the need for mutual respect when viewpoints differ
Responsible Decision-Making	<ul style="list-style-type: none"> ● Develop, implement and model effective problem solving and critical thinking skills

Interdisciplinary Connections	
ELA Standards	
<ul style="list-style-type: none"> ● W.WR.9–10.5 	<p>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.</p>
<ul style="list-style-type: none"> ● L.SS.9–10.1 	<p>Demonstrate command of the system and structure of the English language when writing or speaking.</p>
<ul style="list-style-type: none"> ● L.KL.9–10.2 	<p>Apply knowledge of language to make effective choices for meaning, or style, and to comprehend more fully when reading, writing, speaking or listening.</p>
<ul style="list-style-type: none"> ● RL.CR.9–10.1 	<p>Cite a range of thorough textual evidence and make relevant connections to strongly support analysis of multiple aspects of what a literary text says explicitly and inferentially, as well as including determining where the text leaves matters uncertain.</p>
<ul style="list-style-type: none"> ● SL.II.9–10.2 	<p>Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, qualitatively, orally) evaluating the credibility and accuracy of each source.</p>

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<ul style="list-style-type: none"> ● SL.PE.9–10.1 	Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with peers on grades 9–10 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.
Math Standards	
<ul style="list-style-type: none"> ● HSN.Q.A.1 	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
<ul style="list-style-type: none"> ● HSN.Q.A.2 	Define appropriate quantities for the purpose of descriptive modeling.

Computer Science & Design Thinking

8.1 Computer Science
<ul style="list-style-type: none"> ● 8.1.5.DA.1: Collect, organize, and display data in order to highlight relationships or support a claim.
8.2 Design Thinking
<ul style="list-style-type: none"> ● 8.2.5.ED.2: Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models. ● 8.2.5.ED.3: Follow step by step directions to assemble a product or solve a problem, using appropriate tools to accomplish the task. ● 8.2.8.ED.3: Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch).

Career Readiness, Life Literacies & Key Skills

9.1 Personal Financial Literacy
<ul style="list-style-type: none"> ● 9.1.5.EG.1: Explain and give examples of what is meant by the term “tax.” ● 9.1.8.FI.4: Analyze the interest rates and fees associated with financial products. ● 9.1.8.FP.7: Identify the techniques and effects of deceptive advertising.
9.4 Life Literacies & Key Skills
<ul style="list-style-type: none"> ● 9.4.5.CT.3: Describe how digital tools and technology may be used to solve problems. ● 9.4.8.TL.3: Select appropriate tools to organize and present information digitally.

Evidence of Student Learning

Formative Tasks: <ul style="list-style-type: none"> ● Oral Questioning ● Student Conference ● Self-Assessment ● Hand Signals 	Alternative Assessments: <ul style="list-style-type: none"> ● Teacher-Created Projects ● https://www.khanacademy.org/ ● Completion of webquests
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<ul style="list-style-type: none"> ● Communicators ● Graphic Organizers ● Teacher Observation ● Do Now/DOL ● Quiz Classwork ● Problem of the Day ● Observation ● Homework ● Class participation ● Graphic Organizers ● Projects ● Student Response Systems (ex.Clickers) ● Laboratories Activities and Assessments ● Lab Reports ● Notebook ● Writing Assignments ● Graphs, Models, and Tables 	<ul style="list-style-type: none"> ● On-Line Laboratory activities ● Online assessment activities example: <ul style="list-style-type: none"> ○ Kahoot ○ Quizizz
<p>Summative Assessments:</p> <ul style="list-style-type: none"> ● Unit Tests ● Midterm Exam ● Final Exam ● Chapter/Unit Test ● Writing Assignments ● Presentations ● Laboratory Reports/Practical ● Unit Projects 	<p>Benchmark Assessments:</p> <ul style="list-style-type: none"> ● Quarterly Benchmarks ● Beginning/End of Year Assessment ● Midterm Assessment ● Unit Common Assessment

Knowledge & Skills	
<p>Enduring Understandings:</p> <ul style="list-style-type: none"> ● Ecosystems have finite carrying capacities that are shaped by the availability of resources, environmental conditions, and interactions among organisms at multiple scales. ● Mathematical and computational models help explain and predict how changes in limiting factors influence population size and ecosystem stability. ● Biodiversity contributes to ecosystem resilience by supporting complex interactions that help maintain relatively stable populations under consistent environmental conditions. ● When environmental conditions change beyond an ecosystem’s capacity to adapt, population 	<p>Essential Questions:</p> <ul style="list-style-type: none"> ● How do organisms interact with the Living Nonliving environments to obtain matter and energy? ● What Happens to ecosystems when the environment changes? ● How do organisms interact in groups so as to benefit individuals? ● How does the environment influence populations of organisms over multiple generations? ● What is Biodiversity, how do humans affect it, and how does it affect humans?

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<p>relationships may shift, leading to the emergence of new ecosystem structures.</p> <ul style="list-style-type: none"> ● Human activities can significantly alter ecosystem dynamics, often reducing biodiversity and disrupting population balance. ● Evaluating environmental solutions requires analyzing evidence, considering trade-offs, and refining strategies to reduce negative human impacts on ecosystems. ● Group behaviors such as cooperation, competition, and social organization influence individual survival and reproductive success within species. <p>Simulations and models provide essential tools for testing and improving solutions aimed at mitigating adverse human impacts on biodiversity and ecosystem health.</p>	
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<p>Content <i>Students will know...</i></p> <ul style="list-style-type: none"> ● <i>How and why organisms interact with their environment and what are the effects of these interactions.</i> ● <i>How organisms interact with the living and nonliving environments to obtain matter and energy</i> ● <i>How matter and energy move through an ecosystem</i> ● <i>Why and how ecosystems when the environment changes</i> ● <i>How organisms interact in groups so as to benefit individuals.</i> 	<p>Skills <i>Students will be able to ...</i></p> <ul style="list-style-type: none"> ● Explain that the process of science attempts to find explanations using evidence for events in the natural world, and to use those explanations to make useful predictions. ● Trace the flow of energy through living systems and evaluate the efficiency of energy transfer among organisms in an ecosystem. ● Describe how the availability of energy affects the ecosystem. <ul style="list-style-type: none"> ● Identify and describe that interactions that shape communities and the factors that may affect a population ● Describe human activities that affect the biosphere, ways to decrease this disturbance and how ecosystems may or may not recover from a disturbance. ● Investigate and describe the complementary relationship (cycling of matter and flow of energy) between photosynthesis and cellular respiration. ● Analyze and describe how the process of photosynthesis provides a vital connection between the sun and the energy needs of living systems.
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Core Instructional & Supplemental Materials	
<p>Suggested Activities/Resources:</p> <ul style="list-style-type: none"> ● Invasive species and BOLO/UNwanted project 	<p>Supplemental resources:</p>

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- Biome Project
- Biomes of the World (virtual field trip)
- Create an organism with specific behavioral and structural adaptations AND an ecosystem
- Build a food web

- Textbook : Dynamics of Life Science Websites:
<http://www.biologycorner.com>
- <http://www.pbslearningmedia.org/>
- <https://www.khanacademy.org/science/biology>
- <http://www.bozemanscience.com>
- <http://www.nabt.org>
- <http://news.sciencemag.org/category/biology>
- <http://nsf.gov/>
- <https://newsela.com/>
- <http://www.nextgenscience.org>
- [Race & Social Justice Teacher Resources](#)

Suggested Accommodations

English Language Learners:

- Multi-Sensory Instruction
- Flexible Grouping
- Small Group Instruction
- Peer Buddies
- Graphic Organizers
- Chunking Information
- Scaffolded Questioning
- Manipulatives/Concrete Models
- Build Background/Vocabulary
- Math Word Wall/Word Bank
- Gradual Release Model
- Visual Cues
- Visual Models
- Technology Integration
- Hands-On/Experiential Activities
- Native language support when possible
- Sheltered English Instructional Strategies
- Provide additional time

Special Education/Students with Disabilities:

- Extra help opportunities provided
- Credit Recovery
- Allow use of a calculator, when appropriate
- Modified length and time frame of assignments
- Alternate assessments with extended time
- Provide guided notes and study guides as needed
- Preferential Seating
- Extra Practice
- Directions repeated, clarified, and reworded
- Breakdown task into manageable units
- Differentiated instruction
- Use of manipulatives

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- Math tool paper available
- Cooperative learning groups
- Supplemental books
- Repeat, reword or clarify directions
- Small group instruction as needed
- Instructional technology as needed/required
- Effective teacher questioning; ranging from fact recall to higher order critical thinking questions

504 Plans:

- Extra help opportunities provided
- Credit Recovery
- Allow use of a calculator, when appropriate
- Modified length and time frame of assignments
- Alternate assessments with extended time
- Provide guided notes and study guides as needed
- Preferential Seating
- Extra Practice
- Directions repeated, clarified, and reworded
- Breakdown task into manageable units
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- Cooperative learning groups
- Supplemental books
- Repeat, reword or clarify directions
- Small group instruction as needed
- Instructional technology as needed/required
- Effective teacher questioning; ranging from fact recall to higher order critical thinking questions

Gifted and Talented:

- Cooperative Learning Groups
- Enriched Assignments
- Tiered Assignments
- Word Problems
- NJSLA questions
- Model Curriculum Questions
- Inquiry Based Project
- Interest Based/Choice Activities

Students at Risk of Failure:

- Extended Time
- Multi-Sensory Instruction
- Flexible Grouping
- Small Group Instruction
- Peer Buddies
- Graphic Organizers
- Chunking Information
- Scaffolded Questioning

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