Township of Ocean Schools

Assistant Superintendent
Office of Teaching and Learning

SPARTAN MISSION:
Meeting the needs of all students with a proud tradition of academic excellence.

DEPARTMENT: **Science** COURSE: **Biology**

Curriculum Development Timeline

School: Ocean Township High School

Course: Biology

Department: Science

Board Approval	Supervisor	Notes
December 2008	Patrick Sullivan	Born Date
July 2008	Patrick Sullivan	Revisions
July 2011	Patrick Sullivan	Revisions
August 2016	Patrick Sullivan	Update Standards
March 2019	Patrick Sullivan	Review
August 2022	Patrick Sullivan	Alignment to Standards
August 2024	Patrick Sullivan	Updated to include New State Mandates
August 2026	Patrick Sullivan	Alignment to Standards & Revisions

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Township of Ocean Pacing Guide			
Week	**Marking Period 1**	**Week**	**Marking Period 3**
1	What is Biology? Safety Techniques. Scientific Processes. Characteristics of Life.	11	Cell Specialization & Homeostasis
2	What is Biology? Safety Techniques. Scientific Processes. Characteristics of Life.	12	Cell Specialization & Homeostasis
3	Matter & Energy Transformations in Ecosystems	13	Inheritance & Variation of Traits
4	Matter & Energy Transformations in Ecosystems	14	Inheritance & Variation of Traits
5	Interdependent Relationships in Ecosystems	15	Inheritance & Variation of Traits
Week	**Marking Period 2**	**Week**	**Marking Period 4**
6	Ecosystems Succession & Change	16	Molecular Genetics & Biotechnology
7	Human Activity & Climate	17	Natural Selection
8	Human Activity & Biodiversity	18	Natural Selection
9	Biochemistry	19	Human Evolution
10	Cell Specialization & Homeostasis with a focus on structure and function	20	Final Exam Project

Climate Change: Interdependent Relationships In Ecosystems (NJSLS-S: HS-ESS3-1)

Core Instructional & Supplemental Materials including various levels of Texts
Texts:

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Glencoe Biology, McGraw Hill Companies, Inc 2007 - Biology Standard Level 3
Biology Holt McDougall, Houghton Mifflin Harcourt 2015 textbook/online textbook - Advanced
McGraw Hill Higher Education Virtual text - Honors

Digital Resources Across All Levels: (D=differentiated)
BioDigital Human (D)
Edpuzzle (D)
Gizmo (D)
Live Surgery Program
New York Times Articles
PhET Interactive Simulations (D)
Science News (D)
Ted Talks

Time Frame	**2 Weeks**

Topic

Introduction to Biology

Alignment to Standards

HS-LS1-2:Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
HS-LS1-3: Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

Learning Objectives and Activities

Learning Objectives:

- What is biology?
- What are the characteristics of life?
- What are scientific processes?
- Biology is the study of life and the functioning of organisms.
- Scientific processes are critical when investigating the natural world and the interrelationship between different systems.

Learning Activities:

- Lab Safety Activity
- Characteristics of Life Project

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DEPARTMENT: **Science** COURSE: **Biology**

- Scientific Method - Dish Soap and the Environment
- Microscope - care and use
- Exercise and Pulse Rate Experiment
- Scientific Method Lab - Tums, Senses Distinguish characteristics of life
- Interpret scientific investigations using scientific practices
- Relate science to current events
- Demonstrate proper use and care of a compound microscope

Assessments

Formative:

- Identify the characteristics of life
- Do Now - scientific inquiry
- Strategic questioning
- Group discussion - scientific practices in action

Summative:

- Chapter 1 Test (multiple choice and short answer)
- Chapter Quiz
- Formal Lab Report - Dish Soap & Environment Lab
- Demonstrate proper and safe lab techniques

Benchmark:

- Biology Skills Benchmark

Alternative:

- Characteristics of Life Project
- Lab Portfolio

Interdisciplinary Connections

ELA:

L.VL.9-10.3. Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grades 9–10 reading and content, including technical meanings, choosing flexibly from a range of strategies.

W.IW.9-10.2. Write informative/explanatory texts **(including the narration of historical events, scientific procedures/ experiments, or technical processes)** to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.

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Mathematics:
S.IC.B.6 Evaluate reports based on data (e.g. interrogate study design, data sources, randomization, the way the data are analyzed and displayed, inferences drawn and methods used; identify and explain misleading uses of data; recognize when arguments based on data are flawed).

S.ID.B.6 Represent data on two quantitative variables on a scatter plot and describe how the variables are related.

Career Readiness, Life Literacies, and Key Skills

9.4.12.CI.1: Demonstrate the ability to reflect, analyze and use creative skills and ideas (e.g., 1.1.12prof.CR3a).

Technology Integration

Career Education

CRP-1: Students will make a decision about the utilization of an environmentally safe soap versus a store brand being a responsible member of the community.
CRP-2: Students use knowledge and skills through their lab work.
CRP-12: Students work productively in collaborative groups using culturally global competence.

Time Frame	**2 Weeks**

Topic

Matter & Energy Transformation in Ecosystems

Alignment to Standards

HS-LS1-5:Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.
HS-LS1-6:Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids

and/or other large carbon-based molecules
HS-LS1-7: Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.
HS-LS2-3: Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.
HS-LS2-4: Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem
HS-LS2-5: Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.

Learning Objectives and Activities

Learning Objectives:

- What are the various trophic levels in an ecosystem?
- How does matter cycle through an ecosystem?
- What happens to energy in an ecosystem?
- Relate a food chain to a food web
- What would happen if organisms were removed from a food web?
- What are the products and reactants of photosynthesis and respiration?

Learning Activities:

- Photosynthesis Lab
- Photosynthesis & Respiration Project
- Anaerobic Respiration with Yeast
- Create a food web
- Identify trophic levels in a food web
- Diagram the process of photosynthesis and cellular respiration and explain the cyclic nature
- Trace the pathway of carbon in the processes of photosynthesis and cellular respiration
- Photosynthesis & Respiration Project

Assessments

Formative:

- Do Now - ecology quest
- Strategic questioning - differentiate between a keystone, generalist, etc.
- Design your own experiment to investigate photosynthesis and respiration
- Google questions

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DEPARTMENT: **Science** COURSE: **Biology**

Summative:
- Building a food web
- Photosynthesis and Cellular Respiration Project

Benchmark: N/A

Alternative:
- Lab Portfolio
- Gizmo food web

Interdisciplinary Connections

ELA:
L.VL.9-10.3. Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grades 9–10 reading and content, including technical meanings, choosing flexibly from a range of strategies.
W.AW.9-10.1. Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant
SL.UM.9–10.5. Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance findings, reasoning, and evidence and to add interest.

Mathematics:
S.IC.B.3 Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each

Career Readiness, Life Literacies, and Key Skills

9.4.12.CT.3: Enlist input from a variety of stakeholders (e.g., community members, experts in the field) to design a service learning activity that addresses a local or global issue (e.g., environmental justice).

Technology Integration

Career Education

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CRP-4: Students visually represent via google slides, poster presentation, booklet, etc. the processes of photosynthesis and cellular respiration.
CPR-5: Students will have an increased awareness of how human population can affect the environment.
CRP-12: Students work productively in collaborative groups using culturally global competence.

Time Frame	**2 Weeks**

Topic

Interdependent Relationships in Ecosystems, Succession & Change

Alignment to Standards

HS-LS2-1: Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
HS-LS2-2: Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.
HS-LS2-6: 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-ESS3-1: Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and climate change have influenced human activity
HS-ESS3-4: Evaluate or refine a technological solution that reduces impacts of human activities on climate change and other natural systems.
HS-ESS3-5: Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.

Learning Objectives and Activities

Learning Objectives:

- What are abiotic and biotic factors?
- What affects organisms' interactions with each other?
- How are community and ecosystem homeostasis dependent on a complex set of interactions among biologically-diverse individuals?
- What are limiting factors and how do they affect organisms in the biosphere?
- Ecosystems are communities made up of living organisms and their nonliving

environment.
- The rise of the human population leads to impacts which may have a detrimental effect on the environment (e.g., climate change).

Learning Activities:
- Identifying relationships - mutualism, parasitism, commensalism
- Cycles of matter - Carbon, Nitrogen, Oxygen
- Model of R vs. K Populations
- Change in population of frogs and human impact
- Lesson on Kaibab Population
- Succession in Mt. St. Helen - primary vs. secondary succession
- Identify cause and effect of natural and human caused fluctuations in populations
- Demonstrate and provide evidence of limiting factors for various organisms
- Evaluate the claims that interactions amongst organisms in ecosystems account for changes in conditions resulting in a new ecosystem (e.g., succession)

Assessments

Formative:
- Nutrient Cycle Lab
- List reasons for natural and human caused fluctuations in populations
- Strategic questioning
- Population studies of organisms in the biosphere
- Class discussion - density dependent vs. independent

Summative:
- Diagram the flow of nutrients in an ecosystem
- Describe how climate change may impact an ecosystem
- Collaborative group participation on the impacts of climate change

Benchmark: N/A

Alternative:
- Lab Portfolio
- Mt. St. Helen's activity
- Model of R vs. K Populations

Interdisciplinary Connections

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ELA:
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.

L.VL.9-10.3. Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grades 9–10 reading and content, including technical meanings, choosing flexibly from a range of strategies.

Mathematics:
S.IC.B.6 Evaluate reports based on data (e.g. interrogate study design, data sources, randomization, the way the data are analyzed and displayed, inferences drawn and methods used; identify and explain misleading uses of data; recognize when arguments based on data are flawed).

Career Readiness, Life Literacies, and Key Skills

Technology Integration

9.4.12.IML.5: Evaluate, synthesize and apply information on climate change from various sources appropriately.

Career Education

CRP-4: Students plan their cycling lab with chalk with clarity and visual representation.
CPR-5: Students are aware of their impact on the environment and cycling of matter.
CRP-12: Students work productively in collaborative groups using culturally global competence.

Time Frame	**1 Week**

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Topic

Human Activity & Climate

Alignment to Standards

HS-ESS3-1: Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and climate change have influenced human activity
HS-ESS3-4: Evaluate or refine a technological solution that reduces impacts of human activities on climate change and other natural systems.
HS-ESS3-5: Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems
HS-ESS3-6: Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity (i.e., climate change).
HS-ETS1-3: Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

Learning Objectives and Activities

Learning Objectives:

- What factors influence the distribution and development of human society?
- How are Earth's systems and their relationships being modified by human activity?
- How are human activities affecting natural resources?
- What is the interdependence between humans and Earth's systems?
- How can we apply engineering to reduce human impact on Earth?

Learning Activities:

- Biomes
- Effect of human activity on populations
- Solutions to anthropogenic problems in ecosystems
- Demonstrate how humans affect organisms both positively and negatively in all biomes
- Apply engineering concepts to evaluate the impact of real-world problems on various environments
- Analyze and interpret data by using mathematical and computational explanations for environmental issues

Assessments

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Formative:
- Lab analysis questions
- Do Now - effects of human activity
- Strategic questioning
- How organisms and ecosystems are affected by climate change

Summative:
- Participation/Discussion on possible solutions to mitigate human impact
- Environmental scenarios (how humans play a positive/negative role)
- Climate change impacts (presentations)

Benchmark: N/A

Alternative:
- Lab Portfolio
- Discussions on how the unbalanced consumption of resources affects the biosphere

Interdisciplinary Connections

ELA:
L.VL.9-10.3. Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grades 9–10 reading and content, including technical meanings, choosing flexibly from a range of strategies.
RI.CT.9–10.8. Analyze and reflect on (e.g., practical knowledge, historical/cultural context, and background knowledge) seminal and informational text of historical and scientific significance, including how they relate in terms of themes and significant concepts.

Mathematics:

S.ID.A.1 Represent data with plots on the real number line (dot plots, histograms, and box plots)

Career Readiness, Life Literacies, and Key Skills

Technology Integration

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Career Education
CRP-12: Students work productively in collaborative groups using culturally global competence.

Time Frame	**1 Week**

Topic
Human Activity & Biodiversity

Alignment to Standards
HS-ESS3-3: Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity **HS-LS2-7:**Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity. **HS-LS4-4:**Construct an explanation based on evidence for how natural selection leads to adaptation of populations. **HS-LS4-5:**Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species **HS-LS4-6:**Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity. **HS-ESS3-2:** Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios. **HS-ETS1-1:**Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

Learning Objectives and Activities
Learning Objectives: • How can human impact on biodiversity be reduced and the current level be maintained? • What are example solutions for mitigating adverse impacts on biodiversity? • What are areas of high biodiversity? Low biodiversity? • What factors in the environment affect biodiversity and organisms survival rate? • Can we design solutions that reduce human impact and analyze them using mathematical and engineering practices?

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Learning Activities:

- Land and People finding a balance
- Endangered Species Activity
- Human Impact on Biodiversity Activity
- Apply data to solve a necessity of life and the impact on the community
- Compare and contrast pros and cons of presented ideas taking into account cost and workload
- Create a solution to alleviate the number of endangered species
- Demonstrate a flipped classroom environment by collaborating, researching and presenting information on a selected environmental issue

Assessments

Formative:

- Group discussion - differentiate between endangered and extinct organisms
- Do Now - human intervention
- Strategic questioning

Summative:

- Multimedia presentation - Endangered Species slide show
- Biodiversity scenarios

Benchmark: N/A

Alternative:

- Lab Portfolio
- Biodiversity project

Interdisciplinary Connections

ELA:

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W.AW.9-10.1. Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant

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Mathematics:
S.IC.B.4 Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling

Career Readiness, Life Literacies, and Key Skills

Technology Integration

9.4.12.IML.8: Evaluate media sources for point of view, bias and motivations.

Career Education

CRP-12: Students work productively in collaborative groups using culturally global competence.

Time Frame	**1 Week**

Topic

Biochemistry

Alignment to Standards

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-LS1-6: 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.

Learning Objectives and Activities

Learning Objectives:

- Explain how Carbon is an essential element in the human body
- What are the four organic compounds that are essential to life?

DEPARTMENT: **Science** COURSE: **Biology**

- How do lipids and carbohydrates differ in their molecular makeup?
- How are carbohydrates (glucose) the basis for other biological processes?
- Compare/contrast DNA and RNA
- What is the importance of enzymes in the maintenance of homeostasis?

Learning Activities:

- Organic Compound WebQuest
- DNA Puzzle
- Enzyme Inquiry Lab
- Toothpickase Activity
- Nutrient Analysis Activity
- Evaluate the optimal conditions for an enzyme to catalyze a reaction by designing an experiment
- Identify organic compounds in various food items by testing each with an indicator
- Determine the similarities and differences between nucleic acids: DNA & RNA
- Differentiate between the four types of organic compounds and the importance in incorporating them in a nutrient-rich diet.

Assessments

Formative:

- Do Now - biochemical reactions
- Completion of DNA puzzle
- Strategic questioning
- Water/Acid/Base Webquest
- Diagram stored and potential energy in chemical bonds

Summative:

- Enzyme Inquiry Lab
- Nutrition Lab
- Chart detailing the chemical make-up of living things in an ecosystem
- Chemistry Scenarios

Benchmark: N/A

Alternative:

- Lab Portfolio

Interdisciplinary Connections

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ELA:
W.IW.9-10.2. Write informative/explanatory texts **(including the narration of historical events, scientific procedures/ experiments, or technical processes)** to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.
L.VL.9-10.3. Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grades 9–10 reading and content, including technical meanings, choosing flexibly from a range of strategies.

Mathematics:
S.IC.B.4 Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling

Career Readiness, Life Literacies, and Key Skills

Technology Integration
9.4.12.TL.2: Generate data using formula-based calculations in a spreadsheet and draw conclusions about the data.

Career Education
CRP-2: Students use knowledge and skills to work collaboratively on an inquiry-based lab. **CRP-12:** Students work productively in collaborative groups using culturally global competence.

Time Frame	**1 Week**

Topic
Cell Specialization & Homeostasis with a focus on structure and function

Alignment to Standards
HS-LS1-2: Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

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HS-LS1-5: Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.

Learning Objectives and Activities

Learning Objectives:

- How do cell structures contribute to the maintenance of homeostasis in organisms?
- What are the three organelles that make plant cells different from an animal cell?
- What is the purpose of the phospholipid bilayer when allowing things to enter and exit the cell?
- Explain the function of the chloroplast and mitochondria in relation to cellular processes
- What is the relationship between cell size and rate of diffusion?
- How do the structures of organisms enable life's functions?

Learning Activities:

- Cell Organelle Exploration
- Disease and its relation to organelle malfunction
- Potato Core Lab - hypertonic, hypotonic, isotonic
- Cell Agar Lab - how cell size affects diffusion rate
- Describe the structure and function of the cell's organelles
- Determine the change in mass in potatoes in terms of osmosis and identify which type of the solution would be hypotonic, hypertonic, and isotonic to the potato
- Analyze why cells are small by performing a lab activity on diffusion

Assessments

Formative:

- Do Now - prokaryote vs. eukaryotic cells/scientists involved with the cell theory
- Diffusion in the body
- Rice iodine solutions - mini lab
- Strategic questioning - differentiate between diffusion and osmosis

Summative:

- Potato Core Lab
- Cell Agar Lab
- Plant vs. Animal Lab
- Detail cell sizes and rates of diffusion
- Create a chart detailing the structures of organisms and their life functions

Benchmark: N/A

DEPARTMENT: **Science** COURSE: **Biology**

Alternative:
- Lab Portfolio
- Cell Organelle Exploration

Interdisciplinary Connections

ELA:
L.VL.9-10.3. Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grades 9–10 reading and content, including technical meanings, choosing flexibly from a range of strategies.

RI.CT.9–10.8. Analyze and reflect on (e.g., practical knowledge, historical/cultural context, and background knowledge) seminal and informational text of historical and scientific significance, including how they relate in terms of themes and significant concepts.

Mathematics:
S.IC.B.5 Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.

Career Readiness, Life Literacies, and Key Skills

Technology Integration

Career Education

CRP-12: Students work productively in collaborative groups using culturally global competence.

Time Frame	**2 Week**

Topic

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DEPARTMENT: **Science** COURSE: **Biology**

Cell Specialization and Homeostasis

Alignment to Standards

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.

Learning Objectives and Activities

Learning Objectives:

- What are the advantages/disadvantages of sexual reproduction vs. asexual reproduction?
- How does somatic cell reproduction differ from sex cell reproduction?
- How does cell regulation affect the growth of cells and thus the health of the organism?
- What are some factors that affect the regulation of the cell cycle?
- How does the organism protect itself against cell cycle disruption?
- How does the discovery of stem cells and their usage affect humanity as a whole?
- Why is stem cell research considered controversial? What is Bioethics?
- How is meiosis important to providing genetic variation?

Learning Activities:

- Cell Cycle Lab
- Mitosis and Cytokinesis Lab
- Stem Cell Research
- Asexual Reproduction Activity
- Identify organisms that reproduce asexually and describe the benefits of this type of reproduction
- Justify how the diploid number of chromosomes are maintained during somatic cell reproduction and how this differs from sexual reproduction
- Evaluate the pros and cons of the use of stem cells
- Distinguish practices that can contribute to cell cycle disruption
- Justify why the process of meiosis is used prior to the process of fertilization

Assessments

Formative:

- Do Now - asexual vs. sexual reproduction

- Mitosis webquest
- Strategic questioning - types of cancers and why cancer exists

Summative:

- Asexual lab
- Crossing over lab
- Describe the steps of the cell cycle
- Provide examples of apoptosis in living organisms

Benchmark: N/A

Alternative:

- Lab Portfolio
- Comparing Mitosis & Meiosis on the Table

Interdisciplinary Connections

ELA:

L.VL.9-10.3. Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grades 9–10 reading and content, including technical meanings, choosing flexibly from a range of strategies.

RI.CT.9-10.8. Analyze and reflect on (e.g. practical knowledge, historical/cultural context, and background knowledge) seminal and informational text of historical and scientific significance, including how they relate in terms of themes and significant concepts.

Mathematics:

S.IC.A.1 Understand statistics as a process for making inferences about population parameters based on a random sample from that population.

Career Readiness, Life Literacies, and Key Skills

Technology Integration

Career Education

CRP-12: Students work productively in collaborative groups using culturally global

competence.

Time Frame	**4 Weeks**

Topic

DNA, Inheritance & Molecular Genetics

Alignment to Standards

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.

Learning Objectives and Activities

Learning Objectives:

- What are the Mendelian and Non-Mendelian patterns of inheritance?
- How are karyotypes interpreted?
- How is DNA replicated?
- What is the role of mutations?
- How is the Human Genome Project beneficial to our understanding gene expression and its applications?
- What are the applications of various genetic engineering practices and why is this a topic of bioethical concern?

Learning Activities:

- Karyotyping
- Probability and genetics
- The Face Lab
- Protein synthesis decoding sentences of RNA
- Posters - genetic disorders
- Transgenic Slide Show
- DNA Fingerprinting Lab
- Summarize Mendel's laws of genetics
- Follow Mendelian and Non-Mendelian genetic patterns using Punnett squares

DEPARTMENT: **Science** COURSE: **Biology**

- Compare and contrast DNA and RNA

Assessments

Formative:

- Do Now - genetic practice problems/genetic terms
- Mendel's laws of segregation and independent assortment
- Strategic questioning - what makes a genetic disorder non-disjunction vs. hereditary

Summative:

- Interpret karyotypes and determine the abnormalities caused by non-disjunction genetic disorders
- Summarize the process of how proteins are made from DNA
- Summarize the process of DNA replication
- Mitosis vs. Meiosis lab

Benchmark: N/A

Alternative:

- Lab Portfolio
- Karyotype Online lab
- Determine the relationships between mutations and genetic disorders

Interdisciplinary Connections

ELA:

L.VL.9-10.3. Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grades 9–10 reading and content, including technical meanings, choosing flexibly from a range of strategies.

RI.CT.9-10.8. Analyze and reflect on (e.g. practical knowledge, historical/cultural context, and background knowledge) seminal and informational text of historical and scientific significance, including how they relate in terms of themes and significant concepts.

Mathematics:

S.ID.A.1 Represent data with plots on the real number line (dot plots, histograms, and box plots)

S.IC.B.6 Evaluate reports based on data (e.g. interrogate study design, data sources, randomization, the way the data are analyzed and displayed, inferences drawn and methods

used; identify and explain misleading uses of data; recognize when arguments based on data are flawed).
Career Readiness, Life Literacies, and Key Skills
9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving.
Technology Integration
Career Education
CRP-12: Students work productively in collaborative groups using culturally global competence.

Time Frame	**1 Week**
Topic	
Natural Selection	
Alignment to Standards	
HS-LS2-8: Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce. **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. **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.	
Learning Objectives and Activities	
Learning Objectives: • Why is oxygen not present in early atmosphere?	

DEPARTMENT: **Science** COURSE: **Biology**

- How has Miller and Urey's experiment contributed to support the primordial soup hypothesis?
- What factors affect natural selection of a species over time?
- How does evidence contribute to the theory of evolution by way of natural selection?
- What is the relationship between the environment and natural selection?
- What are the four parts of the theory of natural selection?

Learning Activities:

- Peppered Moth Lab - how organisms adapt to changes in environment
- Biochemical Evolution
- Adaptation Lab - how adaptations help organisms live
- Construct explanations and design solutions to investigate the relationship between the environment and natural selection
- Develop an understanding of the factors that cause natural selection of a species over time
- Understand how multiple lines of evidence contribute to the strength of scientific theories of natural selection
- Reflection of specific theories and their contributions to what is accepted today by the scientific community

Assessments

Formative:

- Do Now - evidence of life/origin of life in a cup
- Origin of Life flipped classroom
- Analyze and interpret data that includes evidence to support the theory of natural selection

Summative:

- Present an argument on how physical changes in the environment can lead to species expansion
- Evidence of Evolution lab
- Coacervate Lab

Benchmark: N/A

Alternative:

- Lab Portfolio
- Detail the genetic information that provides evidence for evolution

Interdisciplinary Connections

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DEPARTMENT: **Science** COURSE: **Biology**

ELA:
RI.CT.9-10.8. Analyze and reflect on (e.g. practical knowledge, historical/cultural context, and background knowledge) seminal and informational text of historical and scientific significance, including how they relate in terms of themes and significant concepts.
W.IW.9-10.2. Write informative/explanatory texts **(including the narration of historical events, scientific procedures/ experiments, or technical processes)** to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.

Mathematics:
A.REI.C.6 Solve systems of linear equations algebraically (include using the elimination method) and graphically, focusing on pairs of linear equations in two variables.

Career Readiness, Life Literacies, and Key Skills

Technology Integration

Career Education
CRP-12: Students work productively in collaborative groups using culturally global competence.

Time Frame	**2 Weeks**

Topic
Evolution

Alignment to Standards
HS-LS4-1: Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence. **HS-LS4-2:**Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable

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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.

Learning Objectives and Activities

Learning Objectives:

- How does genetic variation play a role in evolution of a species?
- How can probability explain inheritable traits in specific environments?
- How have humans contributed to the expansion or depletion of certain species?
- How are population trends formed in regards to environmental factors?
- Why does evolution affect an entire population versus an individual organism?

Learning Activities:

- Evidence of Evolution Lab
- Evolution WebQuest
- Human Adaptation Lab
- Evaluate and describe the four pieces of evidence that support the theory of evolution
- Reflect on specific adaptations that have made humans a successful species on Earth
- Compare and contrast Darwin's theories of evolution to that of previous scientists
- Correlate homologous structures in various organisms to identify common ancestry
- Analyze how two organisms can adapt to similar environments without a common ancestor

Assessments

Formative:

- Do Now - natural selection vs. artificial selection
- Strategic questioning - human traits
- Human vs. Ape exit slip

Summative:

- Natural Selection lab
- Describe various scenarios of organisms adapting to their environment
- Discuss the various causes that may lead to extinction of a species

Benchmark: N/A

Alternative:

- Lab Portfolio
- Population trends presentation

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Interdisciplinary Connections
ELA: **L.VL.9-10.3.** Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grades 9–10 reading and content, including technical meanings, choosing flexibly from a range of strategies. **RI.CT.9-10.8.** Analyze and reflect on (e.g. practical knowledge, historical/cultural context, and background knowledge) seminal and informational text of historical and scientific significance, including how they relate in terms of themes and significant concepts. **Mathematics:** **A.REI.C.6** Solve systems of linear equations algebraically (include using the elimination method) and graphically, focusing on pairs of linear equations in two variables. **N.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.
Career Readiness, Life Literacies, and Key Skills
Technology Integration
Career Education
CRP-12: Students work productively in collaborative groups using culturally global competence.

Time Frame	**1 Week**
Topic	
Cell Specialization & Homeostasis – The Human Body	
Alignment to Standards	

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HS-LS1-2: Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

Learning Objectives and Activities

Learning Objectives:

- How is homeostasis a continuous theme among all the body systems?
- What are the major structures and functions of the integumentary, skeletal and muscular systems?
- How are the systems interconnected with one another?
- What are the major parts of a neuron and how do they function in the nervous system?
- What is the flow of blood through the body and heart?
- What is the path of air through the respiratory system?
- What is the function of the kidney?
- What are the main functions of the digestive system?
- What are the functions of the glands that make up the endocrine system?
- How does the immune system work to protect against various pathogens?

Learning Activities:

- Describe the structure and function of the following systems:
  - Integumentary
  - Skeletal
  - Muscular
  - Nervous
  - Circulatory
  - Respiratory
  - Digestive
  - Endocrine
  - Immune
  - The Body System Project

Assessments

Formative:

- Systems of the human body
- Strategic questioning

Summative:

- Human body system project

Benchmark: N/A

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Alternative: N/A

Interdisciplinary Connections

ELA:
LA.9-10.RST.9-10.3: Students follow all lab procedures.
LA.9-10.RST.9-10.7: Translate information into visual representation.
LA.9-10.WHST.9-10.2A-2F: Multimedia presentation.

Mathematics: N/A

Career Readiness, Life Literacies, and Key Skills

Technology Integration

Career Education

CRP-12: Students work productively in collaborative groups using culturally global competence.

Time Frame	**1 Week**

Topic

Final Exam Project

Alignment to Standards

Summation of entire course - see each unit's Alignment to Standards

Learning Objectives and Activities

Learning Objectives:
- Course Summation

Learning Activities:

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- Explain how a chosen organism exhibits or fits into each of the topics covered this year:
  - Matter and Energy Transformations in Ecosystems
  - Interdependent Relationships in Ecosystems
  - Human Activity and Climate
  - Human Activity and Biodiversity
  - Cell Specialization and Homeostasis
  - DNA and Inheritance
  - Natural Selection and Evolution
  - Final Exam Project

Organize and present this information in written, oral and visual form in a presentation

Assessments

Formative:
- Strategic questioning - role of an organism in a food web, disease, etc.
- Review questions

Summative:
- Final Exam Project

Benchmark:
- 25 question multiple choice/exit benchmark/skills #2

Alternative: N/A

Interdisciplinary Connections

ELA: See all previous connections.

Mathematics: See all previous connections.

Career Readiness, Life Literacies, and Key Skills

9.4.12.CI.1: Demonstrate the ability to reflect, analyze and use creative skills and ideas (e.g., 1.1.12prof.CR3a).

Technology Integration

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Career Education
CRP-4: Communicate clearly and effectively with reason.

Modifications (ELL, Special Education, At-Risk Students, Gifted & Talented, & 504 Plans)

ELL:

- Curriculum Companion
- Work toward longer passages as skills in English increase
- Use visuals
- Introduce key vocabulary before lesson
- Teacher models reading aloud daily
- Use of Bilingual Dictionary
- Guided notes and/or scaffold outline for written assignments
- Provide students with English Learner leveled readers.

Supports for Students With IEPs:

- Allow extra time to complete assignments or tests
- Guided notes and/or scaffold outline for written assignments
- Work in a small group
- Allow answers to be given orally or dictated
- Use large print books, Braille, or books on CD (digital text)
- Follow all IEP modifications

At-Risk Students:

- Guided notes and/or scaffold outline for written assignments
- Introduce key vocabulary before lesson
- Work in a small group
- Lesson taught again using a differentiated approach
- Allow answers to be given orally or dictated
- Use visuals / Anchor Charts
- Leveled texts according to ability

Gifted and Talented:

DEPARTMENT: **Science** COURSE: **Biology**

- Create an enhanced set of introductory activities (e.g. advance organizers, concept maps, concept puzzles)
- Provide options, alternatives and choices to differentiate and broaden the curriculum
- Organize and offer flexible small group learning activities
- Provide whole group enrichment explorations
- Teach cognitive and methodological skills
- Use center, stations, or contracts
- Organize integrated problem-solving simulations
- Propose interest-based extension activities
- Expose students to beyond level texts.

Supports for Students With 504 Plans:

- Follow all the 504 plan modifications
- Text to speech/audio recorded selections
- Amplification system as needed
- Leveled texts according to ability
- Fine motor skill stations embedded in rotation as needed
- Modified or constrained spelling word lists
- Provide anchor charts with high frequency words and phonemic patterns