



# 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.*

### **Curriculum Development Timeline**

**School:** Ocean Township High School

**Course:** Biology

**Department:** Science

<b>Board Approval</b>	<b>Supervisor</b>	<b>Notes</b>
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

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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	Matter & Energy Transformations in Ecosystems	12	Inheritance & Variation of Traits
3	Matter & Energy Transformations in Ecosystems	13	Inheritance & Variation of Traits
4	Interdependent Relationships in Ecosystem	14	Inheritance & Variation of Traits
5	Ecosystems Succession & Change	15	Molecular Genetics & Biotechnology
Week	Marking Period 2	Week	Marking Period 4
6	Human Activity & Climate	16	Natural Selection
7	Human Activity & Biodiversity	17	Evolution
8	Biochemistry	18	Evolution
9	Cell Specialization & Homeostasis with a focus on structure and function	19	Cell Specialization & Homeostasis with a focus on Human Body Systems
10	Cell Specialization & Homeostasis	20	Final Exam Project

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

#### **Texts:**

Glencoe Biology – McGraw Hill Companies, Inc 2007 – Biology Standard Level 3  
Biology Holt McDougall – Houghton Mifflin Harcourt 2015 textbook & online textbook– Adv.  
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)  
Tedx Talks

Time Frame	<b>1 Week</b>
<b>Topic</b>	
Introduction to Biology	
<b>Essential Questions</b>	
<ul style="list-style-type: none"><li>● What is biology?</li><li>● What are the characteristics of life?</li><li>● What are scientific processes?</li><li>● What is the importance of laboratory safety?</li><li>● What is the proper care and procedures for use of a microscope?</li></ul>	
<b>Enduring Understandings</b>	
<ul style="list-style-type: none"><li>● Biology is the study of life and the functioning of organisms</li><li>● Scientific processes are critical when investigating the natural world and the interrelationship between different systems</li><li>● Living organisms have characteristics that differentiate them from nonliving organisms.</li><li>● The cell is the basic unit of structure and function of living things</li><li>● Laboratory safety is important to ensure the safety of all students</li></ul>	

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- By utilizing the microscope, different organisms can be studied and analyzed
- Homeostasis is a self-regulating process that keeps biological systems stable and maintains an internal stable environment

### Alignment to Standards

- **HS-LS1-2**
- **HS-LS1-3**

### Learning Activities & Key Concepts and Skills

- Lab Safety Activity
- Characteristics of Life Project
- Scientific Method – Dish Soap and the Environment
- Microscope – care and use
- Exercise and Pulse Rate Experiment
- Scientific Method Lab - Tums, Senses Distinguish between characteristics of life.
- Distinguish between Characteristic of Life
- Interpret scientific investigations using scientific practices.
- Relate science to current events
- Demonstrate proper and safe lab techniques.
- 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 method in action

#### **Summative:**

- Ch. 1 Test (M/C and short answer)
- Chapter quiz
- Formal Lab Report – Dish Soap & Environment Lab

#### **Benchmark:**

- Biology Skills Benchmark

#### **Alternative:**

- Characteristics of Life Project

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- Lab Portfolio

### 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.

### 21st Century Skills

- PFL.9.1.12.B.1- Students will make a decision about the utilization of an environmentally safe soap versus a store brand and the resulting consequences on the environment with cost analysis.
- 9.3.ST-SM.4 Apply critical thinking skills to review information, explain statistical analysis, and to translate, interpret and summarize research and statistical data.

### Interdisciplinary Connections

- MA.9-12.N-Q.A.1 – Calculate Heart Rate Lab
- MA.9-12.N-Q.A.1 – Calculate measurements of bubble diameter in Dish Soap & Environment Lab
- MA.9-12.A-REI.D.10 – graphing of two variables
- LA.9-10.RST.9-10.3 – Read and follow all lab procedures
- **LA.9-10.WHST.9-10.2 – Writing component to each unit in the form of lab reports. Additionally, each test includes an essay and/or short answer questions**

### Technology Integration

TECH.8.1.12.C. – Additional resources and extension activities on google classroom in order to reflect on their learning and expand on knowledge.

TECH.8.1.12.C. – Students will use google docs to formulate and submit lab reports to google classroom.

TECH.8.1.12.D.5 – Demonstrate personal responsibility for life-long learning by researching the internet to apply skills to new content.

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Time Frame	2 Weeks
<b>Topic</b>	
Matter & Energy Transformation in Ecosystems	
<b>Essential Questions</b>	
<ul style="list-style-type: none"><li>• What are the various trophic levels in an ecosystem?</li><li>• How does matter cycle through an ecosystem?</li><li>• What happens to energy in an ecosystem?</li><li>• Relate a food chain to a food web</li><li>• What would happen if organisms were removed from a food web?</li><li>• What are the products and reactants of photosynthesis and respiration?</li></ul>	
<b>Enduring Understandings</b>	
<ul style="list-style-type: none"><li>• Ecosystems are communities made up of living organisms and their nonliving environment</li><li>• All organisms depend on each other and link the flow of nutrients</li><li>• The amount of energy decreases as you move through each trophic level due to the loss of heat from metabolic processes</li><li>• Food webs show the interrelationship between members of a community and are more realistic than a food chain</li><li>• The removal of an organism from a food web can have detrimental effects on other members</li><li>• Photosynthesis makes glucose that is used in cellular respiration to make ATP</li><li>• The rise of the human population causes more resources to be used that may have a detrimental effect on the environment</li></ul>	
<a href="#"><u>Alignment to Standards</u></a>	

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- HS-LS1-5
- HS-LS1-6
- HS-LS1-7
- HS-LS2-3
- HS-LS2-4
- HS-LS2-5

### Learning Activities & Key Concepts and Skills

- Building a food web
- 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

#### **Summative:**

- Chapter quiz
- Photosynthesis and Cellular Respiration Project

#### **Benchmark:**

#### **Alternative:**

- Lab Portfolio
- Gizmo food web

### 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.

### 21st Century Skills

9.3.ST-SM.2 Apply science and mathematics concepts to the development of plans, processes and projects that address real world problems.

### Interdisciplinary Connections

- **LA.9-10.RST.9-10.5 – Study key terms and vocabulary**
- **LA.9-10.RST.9-10.3 – Students follow procedures when carrying out an experiment**
- **LA.9-10.WHST.9-10.2 – Students create a project to illustrate the relationship between photosynthesis and respiration. There is also a writing component on summative assessments in form of short answers or essay questions**
- **MA.9-12.N-Q.A.1-Students study the loss of energy in a food web**

### Technology Integration

TECH.8.1.12.D-5 – Demonstrate personal responsibility for life-long learning by researching the internet to apply skills to new content.

TECH.8.1.12.F-1 – Students complete a gizmo where the students construct a food web.

Time Frame	2 Week
Topic	
Interdependent Relationships in Ecosystems & Succession & Change	
Essential Questions	
<ul style="list-style-type: none"><li>● What are abiotic and biotic factors?</li></ul>	

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- What affects organisms interactions with each other
- How does 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?

### Enduring Understandings

- Ecosystems are communities made up of living organisms and their nonliving environment
- All organisms depend on each other and are linked by the flow of nutrients
- The removal of an organism from a food web can have detrimental effects on other members
- There are certain abiotic factors that limit what can exist in a particular community
- Organisms have different tolerance levels that determine if they can survive in a particular habitat
- The rise of the human population causes more resources to be used that may have a detrimental effect on the environment

### [Alignment to Standards](#)

- **HS-LS2-1**
- **HS-LS2-2**
- **HS-LS2-6**

### Learning Activities & Key Concepts and Skills

- 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 (ex. succession)

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### Assessments

#### **Formative:**

- Nutrient Cycle Lab
- Do Now – cycling worksheet
- Strategic questioning
- Population studies in organisms in the biosphere
- Class discussion – density dependent vs. independent

#### **Summative:**

- Chapter quiz
- Ecology Test (m/c and short answer)
- Collaborative group participation

#### **Benchmark:**

#### **Alternative:**

- Lab Portfolio
- Mt. St. Helen's activity

### 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.

### 21st Century Skills

9.3.ST-SM.4 Apply critical thinking skills to review information, explain statistical analysis, and to translate, interpret and summarize research and statistical data.

### Interdisciplinary Connections

- **LA.9-10.RST.9-10.3 – Students follow procedures when carrying out an experiment**
- **LA.9-10.WHST.9-10.2 – There is a writing component to each unit in the form of lab reports. Additionally, each test includes an essay and/or short answer questions.**
- **MA.9-12.N-Q.A.1 – Students calculate population size**

### Technology Integration

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TECH.8.1.12.A-1 – Additional resources and extension activities on google classroom in order to reflect on their learning and expand on knowledge.

TECH.8.1.12.D-5 – Demonstrate personal responsibility for life-long learning by researching the internet to apply skills to new content.

Time Frame	<b>1 Week</b>
<b>Topic</b>	
Human Activity & Climate	
<b>Essential Questions</b>	
<ul style="list-style-type: none"><li>• What factors influence the distribution and development of human society?</li><li>• How are Earth's systems and their relationships being modified by human activity?</li><li>• How are human activities affecting natural resources?</li><li>• What is the interdependence between humans and Earth's systems?</li><li>• How can we apply engineering to reduce human impact on Earth?</li></ul>	
<b>Enduring Understandings</b>	
<ul style="list-style-type: none"><li>• <b>Climate is the average temperature and precipitation within a specific area</b></li><li>• Climate affects the species of vegetation that is able to survive within an area</li><li>• Vegetation is affected by the climate, which will also affect the primary consumers that are able to survive within an ecosystem</li><li>• An ecosystem relies on biogeochemical cycles in order to maintain a chemical balance within</li><li>• Species that are heavily relied upon within an ecosystem are keystone species and their survival affects the balance of life within an ecosystem</li><li>• <b>Human society has developed in response to and alongside Earth's resources, including minerals, water, plants, animals, and ecosystems.</b></li></ul> <p>The unbalanced consumption of resources is disrupting ecosystems on a global scale</p>	
<a href="#"><u>Alignment to Standards</u></a>	

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- HS-ESS3-1
- HS-ESS3-4
- HS-ESS3-5
- HS-ESS3-6
- HS-ETS1-3
- HS-ESS2-2
- HS-ESS2-4
- HS-ESS2-6
- HS-ESS2-7

### Learning Activities & Key Concepts and Skills

- 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

#### **Formative:**

- Lab analysis questions
- Do Now – effects of human activity
- Strategic questioning

#### **Summative:**

- Participation / Discussion
- Environment Test (m/c and short answers)
- Chapter quiz

#### **Benchmark:**

#### **Alternative:**

- Lab Portfolio

### Career Education

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

### 21st Century Skills

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9.3.ST-SM.4 Apply critical thinking skills to review information, explain statistical analysis, and to translate, interpret and summarize research and statistical data.  
9.3.ST.2 Use technology to acquire, manipulate, analyze and report data.

### Interdisciplinary Connections

- **LA.9-10.WHST.9-10.2 - There is a writing component to each unit in the form of lab reports**
- MA.9-12.N-Q.A.1 - Understand problem and guide to a solution
- MA.9-12.A-REI.D.10 – Graphing data

### Technology Integration

TECH.8.1.12.D-5 – Demonstrate personal responsibility for life-long learning by researching the internet to apply skills to new content.

Time Frame	1 Week
Topic	
Human Activity & Biodiversity	
Essential Questions	
<ul style="list-style-type: none"> <li>● How can human impact on biodiversity be reduced and the current level be maintained?</li> <li>● What are example solutions for mitigating adverse impacts on biodiversity?</li> <li>● What are areas of high biodiversity? Low biodiversity?</li> <li>● What factors in the environment affect biodiversity and organisms survival rate?</li> <li>● Can we design solutions that reduce human impact and analyze them using mathematical and engineering practices?</li> </ul>	
Enduring Understandings	
<ul style="list-style-type: none"> <li>● Human Activity has been disrupting ecosystems and increasing the level of extinction within species or the entire species is endangered</li> </ul>	

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- Keystone species are important to maintain a balance of consumption and production within an ecosystem
- Biodiversity's affected by the amount of resources available for an organism's survival and this includes land, food source, and all other needs met in order to ensure reproductions and survival of the species
- Areas of high biodiversity have high vegetation, which is reliant on high precipitation and higher temperatures. Ex Rainforest
- Conservation is a positive analytical plan to ensure certain species survive disruption within their ecosystem

## [Alignment to Standards](#)

- **HS-ESS3-3**
- **HS-LS2-7**
- **HS-LS4-4**
- **HS-LS4-5**
- **HS-LS4-6**
- **HS-ETS1-1**
- **HS-ETS1-2**
- **HS-ETS1-3**
- **HS-ETS1-4**

## Learning Activities & Key Concepts and Skills

- 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

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### **Formative:**

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

### **Summative:**

- Multimedia presentation – Endangered Species slide show
- Chapter Test (m/c and short answers)

### **Benchmark:**

### **Alternative:**

- Lab Portfolio
- Biodiversity project

## Career Education

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

## 21st Century Skills

9.3.ST-SM.2 Apply science and mathematics concepts to the development of plans, processes and projects that address real world problems.

9.3.ST.2 Use technology to acquire, manipulate, analyze and report data.

## Interdisciplinary Connections

- **LA.9-10.RST.9-10.1 – Students accurately cite through evidence to support text on project**
- **LA.9-10.RST.10.1 – Students research text from authors to support their multimedia presentation**
- **LA.9-10.WHST.9-10.2A-2F - There is a writing component to each unit in the form of lab reports**
- **MA.9-12.N-Q.A.1 - Calculation of environmental data / Interpretation of data / Calculate pH**

## Technology Integration

TECH.8.1.12.A-1 – Students will use google slides to synthesize and present information for endangered species project.

TECH.8.1.12.D-5 – Demonstrate personal responsibility for life-long learning by researching the

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internet to apply skills to new content.

Time Frame	<b>1 Week</b>
<b>Topic</b>	
Biochemistry	
<b>Essential Questions</b>	
<ul style="list-style-type: none"><li>● Explain how Carbon is an essential element in the human body.</li><li>● What are the four organic compounds that are essential to life?</li><li>● How do lipids and carbohydrates differ in their molecular makeup?</li><li>● How are carbohydrates (glucose) the basis for other biological processes?</li><li>● Compare/contrast DNA and RNA.</li><li>● The importance of enzymes in the maintenance of homeostasis?</li></ul>	
<b>Enduring Understandings</b>	
<ul style="list-style-type: none"><li>● Carbon is the basis of all living things</li><li>● Biochemistry is referring to the chemical makeup or basis of living things within an ecosystem</li><li>● Organic compounds consist of elements such as carbon, oxygen, nitrogen, phosphorus, and hydrogen</li><li>● The building of molecules create stored or potential energy within bonds</li><li>● The breaking of molecules release energy and the most common energy molecule is ATP</li><li>● The bonding of molecules allow for complexity to arise within organisms; which will influence their adaptation within an environment</li><li>● Carbohydrates, lipids, proteins, and nucleic acids are major categories within complex molecules of an organism</li></ul>	
<a href="#"><u>Alignment to Standards</u></a>	

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- **HS-LS1-1**
- **HS-LS1-2**
- **HS-LS1-6**

### Learning Activities & Key Concepts and Skills

- 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**
- **Size of an atom**

#### **Summative:**

- **Enzyme Inquiry Lab**
- **Nutrition Lab**
- **Chapter quiz**
- **Chemistry Test (m/c and short answers)**

#### **Benchmark:**

#### **Alternative:**

- **Lab Portfolio**

### Career Education

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

### 21st Century Skills

9.3.ST-SM.2 Apply science and mathematics concepts to the development of plans, processes and projects that address real world problems.

### Interdisciplinary Connections

- **LA.9-10.RST.9-10.1 – Students accurately cite through evidence to support text on nutrition project**
- **LA.9-10.WHST.9-10.2A-2F - There is a writing component to each unit in the form of lab reports**
- **MA.9-12.A-REI.D.10 – bar graph of two variables in food nutrition lab**
- **MA.9-12.N-Q.A.1 – Counting ratios and measurements**

### Technology Integration

TECH.8.1.12.A-1 – Additional resources and extension activities on google classroom in order to reflect on their learning and expand on knowledge.

TECH.8.1.12.D-5 – Demonstrate personal responsibility for life-long learning by researching the internet to apply skills to new content.

Time Frame

**1 Week**

### Topic

Cell Specialization & Homeostasis with a focus on structure and function

### Essential Questions

- 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

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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?

### Enduring Understandings

- 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?

### Alignment to Standards

- **HS-LS1-2**
- **HS-LS1-5**

### Learning Activities & Key Concepts and Skills

- 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 & 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**

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### **Summative:**

- **Potato Core Lab**
- **Cell Agar Lab**
- **Plant vs. Animal Lab**
- **Chapter quiz**
- **Cells Test (m/c and short answers)**

### **Benchmark:**

### **Alternative:**

- Lab Portfolio
- Cell Organelle Exploration

### Career Education

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

### 21st Century Skills

### Interdisciplinary Connections

- **LA.9-12.RST.9-10.3 – Students will follow all lab procedures**
- **LA.9-10.WHST.9-10.2A-2F – Students discuss the relationship between organelle and diseases in the body by reading and writing their response**
- MA.9-12.N-Q.A.1 - Calculate surface area to volume ratio, depth of diffusion, differences in volume, mass, length, and diameter of osmosis in potatoes, and calculate field of view of cells

### Technology Integration

TECH.8.1.12.A-1 – Additional resources and extension activities on google classroom in order to reflect on their learning and expand on knowledge.  
TECH.8.1.12.D-5 – Demonstrate personal responsibility for life-long learning by researching the internet to apply skills to new content.

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Office of Teaching and Learning

## **SPARTAN MISSION:**

*Meeting the needs of all students with a proud tradition of academic excellence.*

Time Frame	2 Week
<b>Topic</b>	
Cell Specialization and Homeostasis	
<b>Essential Questions</b>	
<ul style="list-style-type: none"><li>● How do cells reproduce?</li><li>● What are the advantages/disadvantages of sexual reproduction vs. asexual reproduction?</li><li>● How does somatic cell reproduction differ from sex cell reproduction?</li><li>● How does cell regulation affect the growth of cells and thus the health of the organism?</li><li>● What are some factors that affect the regulation of the cell cycle?</li><li>● How does the organism protect itself against cell cycle disruption?</li><li>● How does the discovery of stem cells and their usage affect humanity as a whole?</li><li>● Why is stem cell research considered controversial? What is Bioethics?</li><li>● How is meiosis importance to providing genetic variation?</li></ul>	
<b>Enduring Understandings</b>	
<ul style="list-style-type: none"><li>● How do cells reproduce?</li><li>● In multicellular organisms, individual cells grow and then divide via the process called mitosis</li><li>● A single cell divides successfully to produce many cells</li><li>● Cellular division and differentiation produce and maintain a complex organism.</li><li>● Each chromosome consists of a single, very long DNA molecule and each gene on the chromosome is a particular segment of that DNA</li><li>● In sexual reproduction, chromosomes can sometimes swap sections during a process called meiosis creating new genetic combinations</li><li>● Not all DNA codes for a protein; some segments of DNA are involved in regulatory functions or structural functions</li></ul>	
<a href="#"><u>Alignment to Standards</u></a>	

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### **HS-LS1**

#### Learning Activities & Key Concepts and Skills

- Cell Cycle Lab
- Mitosis and Cytokinesis Lab
- Stem Cell Research
- Asexual Reproduction Activity
- Comparing Mitosis & Meiosis on the Table
- Modeling Crossing Over Lab
- Describe the steps of the cell cycle
- 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.
- Provide examples of apoptosis in living organisms.
- 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 exist**

##### **Summative:**

- **Asexual lab**
- **Crossing over lab**
- **Cell cycle quiz**

##### **Benchmark:**

##### **Alternative:**

- **Lab Portfolio**

#### Career Education

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

### 21st Century Skills

### Interdisciplinary Connections

- **LA.9-10.RST.9-10.5 – Students will read about key terms and vocabulary**
- **LA.9-10.WHST.9-10.2A-2F – Researching stem cells and how they cure disease**
- **MA.9-12.S-CP.A.3 – The chance a cell will get through the cell cycle**
- **MA.9-12.N.Q.A.1 - Calculation of chromosome number, measuring**

TECH.8.1.12.A-1 – Additional resources and extension activities on google classroom in order to reflect on their learning and expand on knowledge.

TECH.8.1.12.D-5 – Demonstrate personal responsibility for life-long learning by researching the internet to apply skills to new content.

Time Frame

**4 Weeks**

### Topic

DNA & Inheritance & Molecular Genetics

### Essential Questions

- Why are Mendel’s Laws important to the study of genetics?
- What are the Mendelian and Non-Mendelian patterns of inheritance?
- How are karyotypes interpreted?
- How was DNA determined to be the genetic carrier?
- How is DNA replicated?
- How is the code of DNA transcribed and translated into a protein?

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- What is the role of mutations?
- How can genotypes and phenotypes be predicted using punnett squares?
- 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?

### Enduring Understandings

- Mendelian and Non-Mendelian Inheritance.
- Reading and making karyotypes
- Historical perspective of DNA
- Structure and Function of DNA
- Protein Synthesis
- Genetic crosses
- DNA – tools and technology - DNA Fingerprinting
- Who Ate the Cheese?
- Molecular Biology

### [Alignment to Standards](#)

- **HS-LS3-1**
- **HS-LS3-2**
- **HS-LS3-3**
- **HS-LS1-1**
- **HS-ETS1-3**
- **HS-ETS1-4**

### Learning Activities & Key Concepts and Skills

- Karyotyping
- Probability and genetics
- The Face Lab
- Protein synthesis decoding sentences of RNA
- Posters – genetic disorders
- Transgenic Slide Show

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- DNA Fingerprinting Lab
- Summarize Mendel's Laws of genetics
- Follow Mendelian and Non-Mendelian genetic patterns using punnett squares.
- Interpret karyotypes and determine the abnormalities caused by non-disjunction genetic disorders
- Summarize the process of DNA replication
- Determine the relationships between mutations and genetic disorders
- Summarize the process of how proteins are made from DNA
- 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:**

- Meiosis & Genetics Test
- Mitosis vs. Meiosis lab

### **Benchmark:**

### **Alternative:**

- Lab Portfolio
- Karyotype Online lab

## Career Education

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

## 21st Century Skills

9.3.ST.2 Use technology to acquire, manipulate, analyze and report data.

## Interdisciplinary Connections

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- **LA.9-10.RST.9-10.7 – complete analysis questions writing component of lab / translate data into charts/tables**
- **LA.9-10.WHST.9-10.2A-2F – Multimedia presentation**
- **MA.9-12.S-CP.A.3 – Probability of inheritance**
- **MA.9-12.N.Q.A.1 - Conversion of percentages and ratios, Number of base pairs**

### Technology Integration

TECH.8.1.12.A-1 – Additional resources and extension activities on google classroom in order to reflect on their learning and expand on knowledge.

TECH.8.1.12.D-5 – Demonstrate personal responsibility for life-long learning by researching the internet to apply skills to new content.

TECH.8.1.12.F- – Edpuzzle Meiosis – Students use technology to determine what disorder Patient A + B + C has. Students will access OMIM database for researching genes and genetic disorders.

Time Frame	<b>1 Week</b>
<b>Topic</b>	
Natural Selection	
<b>Essential Questions</b>	
<ul style="list-style-type: none"><li>● Why is oxygen not present in early atmosphere?</li><li>● How has Miller and Urey’s experiment contributed to support the primordial soup hypothesis?</li><li>● What factors affect natural selection of a species over time?</li><li>● How does evidence contribute to the theory of evolution by way of natural selection?</li><li>● What is the relationship between the environment and natural selection?</li><li>● What are the four parts of the theory of natural selection?</li></ul>	
<b>Enduring Understandings</b>	
<ul style="list-style-type: none"><li>● <b>Why is oxygen not present in early atmosphere?</b></li><li>● <b>Genetic information provides evidence for evolution</b></li></ul>	

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- **Natural selection occurs only if there is variation in genetic information between organisms in a population**
- **Adaptation means that the distribution of traits in a population can change when conditions change**
- **Species become extinct because they can no longer survive and reproduce.**
- **Changes in the physical environment have thus contributed to the expansion of some species**

### Alignment to Standards

- **HS-LS4-3**
- **HS-LS4-4**
- **HS-LS4-5**
- **HS-LS2-8**

### Learning Activities & Key Concepts and Skills

- Peppered Moth Lab - how organisms adapt to changes in environment
- Biochemical Evolution
- Coacervate Lab
- Adaptation Lab - how adaptations help organisms live
- Construct explanations and design solutions to investigate the relationship between the environment and natural selection
- Analyze and interpret data that includes evidence to support the theory of 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
- Biochemical WS

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### **Summative:**

- Origin of Life quiz
- Evidence of Evolution lab
- Coacervate Lab

### **Benchmark:**

### **Alternative:**

- Lab Portfolio

### Career Education

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

### 21st Century Skills

9.3.ST.2 Use technology to acquire, manipulate, analyze and report data.

### Interdisciplinary Connections

- **LA.9-10.WHST.9-10.2.A – Organize info into graphic tables**
- **LA.9-10.RST.9-10.5, 9-10.7 - Miller & Urey's debate on Primordial Soup**
- **MA.9-12.N-Q.A.1 – Students graph amino acids vs. ammonia in amino acid lab to compare and contrast the trends**

### Technology Integration

TECH.8.1.12.A-1 – Additional resources and extension activities on google classroom in order to reflect on their learning and expand on knowledge.  
TECH.8.1.12.D-5 – Demonstrate personal responsibility for life-long learning by researching the internet to apply skills to new content.

Time Frame	2 Weeks
Topic	
Evolution	

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### Essential Questions

- What are the pieces of evidence that supports the theory of evolution?
- 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?
- What are various adaptations used by species?

### Enduring Understandings

- **Genetic information provides evidence for evolution**
- **Natural selection occurs only if there is variation in genetic information between organisms in a population**
- **Adaptation means that the distribution of traits in a population can change when conditions change**
- **Species become extinct because they can no longer survive and reproduce**
- **Changes in the physical environment have thus contributed to the expansion of some species**

### [Alignment to Standards](#)

- **HS-LS4-1**
- **HS-LS4-2**

### Learning Activities & Key Concepts and Skills

- 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

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### Assessments

#### **Formative:**

- Do Now – natural selection vs. artificial selection
- Strategic questioning – human traits
- Human vs. Ape WS

#### **Summative:**

- Natural Selection lab
- Evolution Test (m/c and short answers)

#### **Benchmark:**

#### **Alternative:**

- Lab Portfolio

### Career Education

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

### 21st Century Skills

9.3.ST-SM.4 Apply critical thinking skills to review information, explain statistical analysis, and to translate, interpret and summarize research and statistical data.

### Interdisciplinary Connections

- **LA.9-10.RST.10.1,2,3,4,5,6,7,8,9,10** – Students read and differentiate between **homologous/analogous**
- MA.9-12.N.Q.A.1 - Construct Graph / Interpretation of data of amino acid sequences / Collection of measurements

### Technology Integration

TECH.8.1.12.A-1 – Additional resources and extension activities on google classroom in order to reflect on their learning and expand on knowledge.  
TECH.8.1.12.D-5 – Demonstrate personal responsibility for life-long learning by researching the internet to apply skills to new content.

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Time Frame	1 Week
<b>Topic</b>	
Cell Specialization & Homeostasis – The Human Body	
<b>Essential Questions</b>	
<ul style="list-style-type: none"><li>• How is homeostasis a continuous theme among all the body systems?</li><li>• What are the major structures and functions of the integumentary, skeletal and muscular systems?</li><li>• How are the systems interconnected with one another?</li><li>• What are the major parts of a neuron and how do they function in the nervous system?</li><li>• What is the flow of blood through the body and heart?</li><li>• What is the path of air through the respiratory system?</li><li>• What is the function of the kidney?</li></ul>	
<b>Enduring Understandings</b>	
<ul style="list-style-type: none"><li>• What are the main functions of the digestive system?</li><li>• How does the number of calories eaten relate to the need of the body?</li><li>• What are the functions of the glands that make up the endocrine system?</li><li>• How does the immune system work to protect against various pathogens?</li></ul>	
<a href="#"><u>Alignment to Standards</u></a>	
<b>HS-LS1-2</b> <b>HS-LS1-4</b>	
<b>Learning Activities &amp; Key Concepts and Skills</b>	
Describe the structure and function of the following systems: <ul style="list-style-type: none"><li>• Integumentary</li><li>• Skeletal</li><li>• Muscular</li><li>• Nervous</li><li>• Circulatory</li></ul>	

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- Respiratory
- Digestive
- Endocrine
- Immune
- The Body System Project

### Assessments

#### **Formative:**

- Systems of the human body
- Strategic questioning

#### **Summative:**

- Human body system project

#### **Benchmark:**

#### **Alternative:**

### Career Education

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

### 21st Century Skills

9.3.ST-SM.3 Analyze the impact that science and mathematics has on society.

### Interdisciplinary Connections

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

### Technology Integration

TECH.8.1.12.A-1 – Additional resources and extension activities on google classroom in order to reflect on their learning and expand on knowledge.

TECH.8.1.12.D-5 – Demonstrate personal responsibility for life-long learning by researching the internet to apply skills to new content.

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Time Frame	1 Week
Topic	
Final Exam Project	
Essential Questions	
<ul style="list-style-type: none"><li>● What is the essential role of an organism in a food web?</li><li>● How do environmental disruptions (disease, human impact, etc.) affect food webs, especially keystone species?</li><li>● How do biogeochemical cycles and organisms influence the balance of the biosphere?</li><li>● How do mutations contribute to adaptations and evolution of species?</li><li>● Why are certain traits expressed while others are recessive?</li><li>● How do genotypes determine phenotypes of individuals?</li></ul> How do environmental factors influence the evolution and survival of species over time?	
Enduring Understandings	
Summation of entire course - see each unit's Enduring Understandings	
<a href="#">Alignment to Standards</a>	
Summation of entire course - see each unit's Alignment to Standards	
Learning Activities & Key Concepts and Skills	
Explain how a chosen organism exhibits or fits into each of the topics covered this year: <ul style="list-style-type: none"><li>● Matter and Energy Transformations in Ecosystems</li><li>● Interdependent Relationships in Ecosystems</li><li>● Human Activity and Climate</li><li>● Human Activity and Biodiversity</li><li>● Cell Specialization and Homeostasis</li><li>● DNA and Inheritance</li><li>● Natural Selection and Evolution</li><li>● Final Exam Project</li></ul>	

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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

#### **Benchmark:**

- 25 question m/c exit benchmark / skills #2

#### **Alternative:**

- Final Project

### Career Education

CRP-4 – Communicate clearly and affectively with reason

### 21st Century Skills

9.3.ST-SM.4 Apply critical thinking skills to review information, explain statistical analysis, and to translate, interpret and summarize research and statistical data.

9.3.ST-ET.6 Apply the knowledge learned in the study of STEM to provide solutions to human and societal problems in an ethical and legal manner.

### Interdisciplinary Connections

See all previous connections

### Technology Integration

TECH.8.1.12.A-1 – Additional resources and extension activities will be posted on Google Classroom in order to reflect on their learning and expand on knowledge.

TECH.8.1.12.D-5 – Demonstrate personal responsibility for life-long learning by researching the internet to apply skills to new content.

TECH.8.1.12.E-Organize, analyze, evaluate, and synthesize information from a variety of sources and media.

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

#### **ELL:**

- Work toward longer passages as skills in English increase
- Use visuals
- Introduce key vocabulary before lesson
- Teacher models reading aloud daily
- Provide peer tutoring
- 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:**

- 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

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- 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

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