Unit 1: CELL SPECIALIZATION AND HOMEOSTASIS

Content Area: **Science**
Course(s): **CP BIOLOGY, HON BIOLOGY, BIOLOGY**
Time Period: **Marking Period 1**
Length: **11 weeks**
Status: **Published**

Standards and Phenomena

Science Standards

SCI.HS-LS1-4	Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.
SCI.HS-LS1-3	Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
SCI.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.

Phenomena

Science and Engineering Practices

Planning and Carrying Out Investigations

Constructing Explanations and Designing Solutions

Obtaining, Evaluating, and Communicating Information

Developing and Using Models

Using Mathematics and Computational Thinking

Asking Questions and Defining Problems

Engaging in Argument from Evidence

Analyzing and Interpreting Data

Disciplinary Core Ideas

SCI.HS-LS1	From Molecules to Organisms: Structures and Processes

Crosscutting Concepts

	Cause and Effect
	Systems and System Models
	Energy and Matter
	Patterns
	Scale, Proportion, and Quantity
	Structure and Function
	Stability and Change

Transfer Goals, Life Literacy/Key Skills and Social Emotional Learning

Transfer Goals

Predict the response of a cell to the changes of its environment

Identify the proper amino acid sequence when given a DNA nucleotide sequence

Life Literacy and Key Skills

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TECH.9.4.12.CI	Creativity and Innovation
TECH.9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
TECH.9.4.12.CI.3	Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1).
TECH.9.4.12.CT	Critical Thinking and Problem-solving
TECH.9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).
TECH.9.4.12.DC.6	Select information to post online that positively impacts personal image and future college and career opportunities.
TECH.9.4.12.TL.2	Generate data using formula-based calculations in a spreadsheet and draw conclusions about the data.
TECH.9.4.12.TL.4	Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem (e.g., 7.1.AL.IPERS.6).
TECH.9.4.12.GCA.1	Collaborate with individuals to analyze a variety of potential solutions to climate change effects and determine why some solutions (e.g., political. economic, cultural) may work

	better than others (e.g., SL.11-12.1., HS-ETS1-1, HS-ETS1-2, HS-ETS1-4, 6.3.12.GeoGI.1, 7.1.IH.IPERS.6, 7.1.IL.IPERS.7, 8.2.12.ETW.3).
TECH.9.4.12.IML.2	Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources (e.g., NJSLSA.W8, Social Studies Practice: Gathering and Evaluating Sources.
TECH.9.4.12.IML.5	Evaluate, synthesize, and apply information on climate change from various sources appropriately (e.g., 2.1.12.CHSS.6, S.IC.B.4, S.IC.B.6, 8.1.12.DA.1, 6.1.12.GeoHE.14.a, 7.1.AL.PRSNT.2).
TECH.9.4.12.IML.6	Use various types of media to produce and store information on climate change for different purposes and audiences with sensitivity to cultural, gender, and age diversity (e.g., NJSLSA.SL5).

Social Emotional Learning

HE.9-12.2.1.12.EH.1	Recognize one's personal traits, strengths, and limitations and identify how to develop skills to support a healthy lifestyle.
HE.9-12.2.1.12.EH.4	Analyze and adapt mental and emotional health messages and communication techniques to peers and other specific target audience (e.g., dimensions of health).
HE.9-12.2.1.12.CHSS.7	Describe how individuals and local, state, and global advocacy organizations can collaborate to address common local and global health and social issues (e.g., hunger, clean water, organ/tissue donation).
HE.9-12.2.1.12.CHSS.8	Investigate how local, state, and global agencies are addressing health issues caused by climate change and share this information in an appropriate setting.
	Self-confidence, personal traits, stress, limitations, and strengths impact the mental and emotional development of an individual.

Concepts

Essential Questions

- How do feedback mechanisms maintain homeostasis?
- How does the structure of DNA determine the structure of proteins, and what is the function of proteins?
- In what way are people made up of a "system of systems"?
- Why aren't all members of a species the same size?

Understandings

- Students will understand that biological molecules are made of repeating subunits
- Living things are made of cells
- DNA determines the structure of a protein
- Cell transport of materials is dependent on the structure and function of the cell membrane
- Cells undergo division in order to reproduce (Mitosis)

- Multicellular organisms require cell specialization and differentiation in order to survive
- Cells need to maintain their internal environment through homeostasis

Critical Knowledge and Skills

Knowledge

Students will know:

- The sequence and subcomponents of a biomolecule and its properties
- Genetic information and how it flows from one organism to the next
- Sequence of nucleotides
- Sequence of amino acids in proteins
- Movement of molecules across membranes
- Membrane structure and function
- Definition of homeostasis
- Cell division (just Mitosis)

Skills

Students will be able to:

- Explain the connection between the sequence and the subcomponents of a biomolecule and its properties
- Create representations that illustrate how genetic information flows from a sequence of nucleotides in a gene to a sequence of amino acids in a protein
- 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
- Construct models that explain the movement of molecules across membranes with membrane structure and function
- Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms
- Provide examples and explain how organisms use feedback systems to maintain their internal environments
- Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis
- Use a model to illustrate the role of cellular division (Mitosis) and differentiation in producing and maintaining complex organisms

Assessment and Resources

School Formative Assessment Plan (Other Evidence)

- Quizzes
- Labs
- Classwork
- Homework
- Projects
- Do Nows
- Performance Tasks
    - Biology Poster Project (CP)
    - Cell Transport Graphic Organizer (CP)
    - Characteristics of Life Lab (CP)
    - DNA Extraction Lab (CP and Honors)
    - DNA and RNA Virtual Lab (CP and Honors)
    - DNA/RNA Graphic Organizer (CP)
    - DNA/RNA Webquest (CP)
    - Hierarchy of Life Lab (CP)
    - Homeostasis Lab (CP)
    - Homeostasis Webquest (CP)
    - Homeostasis and Negative Feedback Activity (CP)
    - Osmosis Chicken Egg Lab (CP and Honors)
    - Prokaryotic and Eukaryotic Card Sort (CP)
    - Red Rover Cell Transport Activity (CP and Honors)
    - Transport Graphic Organizer (CP)
    - Water Movement Virtual Lab (CP)

School Summative Assessment Plan

To measure mastery of concepts and a collection of units the following will be administered per the discretion of the teacher:

- ***Unit Tests***
- ***Weekly Quizzes***

To show mastery of the concepts within multiple units from the beginning of the year to the end of the year, the following will be administered to the students across all levels within the biology curriculum:

- ***Midterm and Final Assessment***

These summative assessments encompass multiple standards covered throughout the year. Students will need to illustrate the knowledge they have gained throughout the school year through analytical questions and performance tasks.

Primary Resources

Pearson's REALIZE platform for Miller & Levine Biology text

Supplementary Resources

Additional outside Resources:

- Khan Academy
- Biomanbio- Online Supplements/Games
- Amoeba Sisters Online Videos
- Concord Consortium Online Supplements
- Bozeman Science Online Videos

Technology Integration and Differentiated Instruction

Technology Integration

- **Google Products**
    - Google Classroom - Used for daily interactions with the students covering a vast majority of different educational resources (Daily Notes, Exit Tickets, Classroom Polls, Quick Checks, Additional Resources/ Support, Homework, etc.)
    - GAFE (Google Apps For Education) - Using various programs connected with Google to collaborate within the district, co-teachers, grade level partner teacher, and with students to stay connected with the content that is covered within the topic. Used to collect data in real time and see results upon completion of the assignments to allow for 21st century learning.

● **One to One Student's laptop**

- All students within the West Deptford School District are given a computer, allowing for 21st century learning to occur within every lesson/topic.

● **Additional Support**

- **Pearson REALIZE platform online Biology textbook (Miller & Levine)**
  - **Interactivity**
  - **Interactive Labs**
  - **Online Text**
  - **Science Skill Practice**
  - **Assessments**
    - **Formative and Summative**

Differentiated Instruction

Gifted Students (N.J.A.C.6A:8-3.1)

❑ Within each lesson, the Gifted Students are given choice on topic and subject matter allowing them to explore interests appropriate to their abilities, areas of interest and other courses.

English Language Learners (N.J.A.C.6A:15)

❑ Within each lesson, the English Language Learners are given choice of topic and resources so that their materials are within their ability to grasp the language.

❑ All assignments have been created in the student's native language.

❑ Work with ELL Teacher to allow for all assignments to be completed with extra time.

At-Risk Students (N.J.A.C.6A:8-4.3c)

❑ Within each lesson, the at-risk students are given choice of topic and resources so that their materials are within their ability level and high-interest.

Special Education Students (N.J.A.C.6A:8-3.1)

❑ Within each lesson, special education students are given choice of topic and resources so that their materials are within their ability level and high-interest.

❑ All content will be modeled with examples and all essays are built on a step-by-step basis so modifications for assignments in small chunks are met.

All other IEP modifications will be honored (ie. hard copies of notes, directions restated, etc.)

Interdisciplinary Connections

Math	Science	ELA
MA.9-12.N-Q.A.1 MA.9-12.N-Q.A.2 MA.9-12.N-Q.A.3 MA.9-12.S-ID.A.1 MA.K-12.2 MA.K-12.4 -Use a mathematical model to illustrate the role of cellular division and differentiation in producing and maintaining complex organisms. -Graph functions expressed symbolically showing the role of cellular division and differentiation in producing and maintaining complex organisms and show key features of the graph, by hand in simple cases and using technology for more complicated cases.		LA.9-12.SL LA.11-12.CCSS.ELA-Literacy.RST.11-12.5 LA.11-12.CCSS.ELA-Literacy.RST.11-12.7 LA.11-12.CCSS.ELA-Literacy.RST.11-12.8 LA.11-12.CCSS.ELA-Literacy.WHST.11-12.8 LA. 11-12 CCSS.ELA-Literacy.WHST.9-10.7 -Cite specific textual evidence that supports how the DNA determines the structure of proteins, which carry out the essential functions of life through systems of specialized cells. -Write an explanation that supports how the structure of DNA determines the structure of proteins, which carry out the essential functions of life through systems of specialized cells. -Make strategic use of digital media in presentations to enhance understanding of

		the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.
Fine Arts/ Performing Arts	World Languages Example: Teaching the prefixes “hyper”, “hypo”, and “iso” in terms of tonicity and “hyper” and “hypo” in terms of homeostatic disorders such as hyperglycemia and hypoglycemia	Applied Technology

Social Studies	Careers/Business
	Example:
	• Students work in collaborative groups through
	  ○ In-class activities
	  ○ Labs
	  ○ Projects
	• Through collaborative research, students will understand that individual contribution is imperative to group success
	• Understanding is demonstrated through in-class discussion, formative assessments, and summative assessments
	• Students are expected to apply appropriate academic and technical skills through research using technology in and out of the classroom
		Global Awareness
		Example: Members of a species are not the same size - students can explore the differences in the sizes of Homo sapien in aboriginal people vs. the Tutsi tribes of Rwanda
		(Addresses Framework for 21st Century Learning Standards found at http://www.p21.org/about-us/p21-framework/256)

Learning Plan / Pacing Guide

Week 1-2:

- Introduction
  - **Honors**

        - Lab Safety Poster Project
        - Characteristics of Life Lecture
        - Hierarchy of Life Card Sort
        - Notes Quiz (Week 1 and 2)
    - **CP**
        - Lab Safety Poster
        - Characteristics of Life Picture Walk
        - Hierarchy of Life Card Sort
    - **CP ICR**
        - Safety Scavenger Hunt
        - Safety video with online signature about safety regulations in the lab
        - Characteristics of Life Picture Walk
            - In Groups with Hard Copy of Notes using OneNote
        - *Characteristics of Life/Hierarchy of Life
            - Chunking of information throughout content
            - Break down concepts into smaller parts
        - Hierarchy of Life Card Sort
            - Heterogenous Grouping with individualized teacher assistance
            - Frequent checks of understanding
    - **RC**
        - Scientific Method
            - Notes
            - Edpuzzle
            - Quizizz
            - Make your own scientific experiment assignmetn
        - Characteristics of Life
            - Fill-In Notes /Slides
            - Google Slide project
        - Picture Walk
            - Fill-In Notes
            - Teacher Support
        - Hierarchy of Life Puzzle Game
            - Fill-In Notes
            - Edpuzzle
            - Pick a level project
        - Quiz
            - Students provided with word bank,
            - Important terms on quiz bolded or underlined

Week 3:

- Introduction to cells
    - **Honors**
        - Lecture
        - Prokaryotic vs. Eukaryotic Writing Assignment
            - Given as homework if students didn't finish in class
        - Prokaryotic Vs. Eukaryotic Cells Quiz
            - Students not given word bank for quiz
    - **CP**
        - Prokaryotic and Eukaryotic Cell Webquest
        - Directed Notes
        - Card Sort

        - Prokaryotic vs. Eukaryotic Writing Assignment
    - **CP ICR**
        - Think, Pair, Share (Mansion vs. House)
        - Prokaryotic vs. Eukaryotic Project
            - Provide hard copy of grading rubric
        - Viewed Prokaryotic and Eukaryotic Cells under microscope and on smartboard
            - Discussed as a class characteristics of each (used Smartboard)
        - Venn Diagram
            - Compared and contrasted the types of cells together
        - Notes
            - Hard Copy of Notes Provided
    - **RC**
        - Mansion vs. House (Think-Pair-Share)
        - Prokaryotic vs. Eukaryotic Writing Assignment
            - Teacher Lead
            - Make observation slides
            - RAFT Format writing style
            - Small Groups
        - Viewed Prokaryotic and Eukaryotic Cells as a class on smartboard
            - Discussed as a class characteristics of each
            - Smartboard
        - Venn Diagram/Notes
            - Compared and contrasted the types of cells together
            - Fill-In notes

Week 4:

- Cell Organelles
    - **Honors**
        - Cell Analogy Project
            - Rubric Provided, for homework if not finished in class
        - Plant vs. Animal Cell Lab
            - Lab Report due after lab is completed
        - Cell Structure Quiz
    - **CP**
        - Cell Analogy Project
        - Organelle Graphic Organizer
            - Completed along with notes together as a class
        - Cell Quiz
            - Word bank provided, multiple choice
        - Card Sort for Plant vs. Animal Cell
            - Completed in small groups
    - **CP ICR**
        - Plants vs. Animal Cell Lab
            - Illustrations provided, differentiated sections of lab, color coded parts of the cells
        - Lecture
            - Hard copy of notes provided uploaded into OneNote
        - Cell City Worksheet
            - Teacher directed
            - frequent checks for understanding
            - extra time to complete

        - Cell Organelle Project
            - Students chose 1 of 3 items presented to research, provided step by step requirements and
            - rubrics, simplified instructions for each option
            - teacher circulates room to provide frequent checks of student understanding
            - Extra time provided if needed
        - Cell Organelle Assessment (Pearson Realize)
            - Multiple choice
    - **RC**
        - Lecture
            - Quizizz
            - Amoeba Sisters video
            - Fill-In Notes
        - Plants vs. Animals Plant Lab
            - Illustrations Provided
            - Differentiated Sections
        - Cell City Worksheet
            - Teacher Directed
            - Extended Time
        - Cell Organelle Project
            - Rubric
            - Simplified Directions
            - Extended Time
        - Cell Organelle Trading Card Project
            - Teacher Directed
            - Extended Time

Week 5-6:

- Cell Transport
    - **Honors**
        - Lecture
        - Red Rover Cell Transport Activity
        - Osmosis Worksheet
        - Egg Lab
            - Lab Report completed during and after lab
        - Cell Membrane and Cell Transport Quiz (1 and 2)
        - Cell Transport Webquest
    - **CP**
        - Water Movement Virtual Lab
        - Lecture
            - Guided Notes
            - Cell Transport Graphic Organizer along with notes
        - Egg Lab
            - Completed in Groups
            - Formatted Lab Report together as a class
        - Red Rover Cell Transport Activity
        - Cell Transport Quiz
            - Word Bank Provided, Multiple Choice
    - **CP ICR**
        - Cell Membrane Bubble Lab
            - Analysis Questions provided; Class Discussion

        - Osmosis Lab
            - Teacher directed with steps broken down into simpler tasks
            - Heterogenous grouping
        - Osmosis Worksheet
            - Extra time to complete if necessary
            - Teacher directed
        - Cell Transport Bundle Worksheets (Diffusion, Osmosis, Cell Membrane)
            - Worked in groups
            - Concepts broken down into smaller parts
            - Completed one concept at a time
            - Frequent checks for understanding
    - **RC**
        - Osmosis Lab
            - Teacher Directed
            - Small Group
            - Extended Time
        - Osmosis Worksheet
            - Teacher Directed
            - Extended Time
        - Cell Transport Worksheets
            - Diffusion, Osmosis and Cell Membrane
            - Small Group
            - Extended Time

Week 7:

- Homeostasis
    - **Honors**
        - Homeostasis Vocabulary
            - Students were required to complete the vocabulary terms for homework. They will be quizzed on this vocabulary toward the end of the week.
        - Homeostasis Amoeba Sisters Video
        - Homeostasis Lab (Pulse Lab)
            - Students completed their lab in the lab notebook. They were required to complete a lab report to aid them in completing the lab.
        - Homeostasis and Cell Transport Quiz
            - No word bank was given for the quiz. Quiz encompassed multiple parts of the unit, not just homeostasis
    - **CP**
        - Homeostasis Pulse Lab
            - Lab completed in small groups; lab report not necessary for this lab
        - Negative Feedback Activity
            - Students used card sorts to help organize the information provided
        - Homeostasis Quiz
            - Word bank provided; review prior to quiz
    - **CP ICR**
        - Identify Parts of a Feedback System Group Activity
            - Hard copy of notes provided
            - Graphic organizer provided
            - Small groups assigned
            - Extra time provided
            - Teacher guided activity

        - Fulcrum Lab (Engineering Lab)
            - Students use clothes hanger as fulcrum to balance items representing opposing levels of molecules in homeostasis
            - Analysis Questions provided
            - In-class discussion
    - **RC**
        - Identify Parts of a Feedback System Group Activity
            - PowerPoint
            - Fill-In notes
            - Extended Time
            - Teacher guided activity
            - Bioman Bio/Endocrine Ed game

Week 8:

- Body Systems
    - **Honors**
        - Body Systems Online Activity (Pearson Realize)
        - Body Systems Hierarchical Organization Project and Gallery Walk
        - Body Systems Investigation Lab
    - **CP Biology**
        - Body Systems Online Activity (same as above)
            - Students will be given time in class to complete the assignment
        - Body Systems Hierarchical Organization Project and Gallery Walk
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            - Body Systems Investigation Lab
        - Body Systems Presentation Project
            - Students will be quizzed on this information after the assignment
    - **CP ICR**
        - Body Systems Project
            - Clarified Rubrics Provided
            - Example Project Provided to view as a model
            - Step By Step Instructions provided for completion
            - Extended Time
            - Students will present their findings
            - Will be graded on content of project only, not presentation
    - **RC**
        - Body Systems Project
            - Project Rubric
            - Example Project Provided to view as a model
            - Detailed Instructions provided (Checklist)
            - Extended Time
            - Students will present their findings
            - Will be graded on content of project only, not presentation
            - **Week 9:**
- DNA Structure
    - **Honors**
        - Lecture
        - DNA Candy Model
            - Students were required to write lab report before, during, and after completing the lab
        - DNA Extraction Lab

        - Lab report required
    - DNA and Protein Synthesis Vocabulary
        - Completed for homework; quizzed on information later on in the week
    - DNA Webquest
    - DNA Quiz
        - Word bank not provided
    -
    - **CP**
        - Lecture
        - Fill in Notes provided
        - DNA Model
        - DNA Webquest
        - Clips from Human Genome Project
    - **CP ICR**
        - Lecture
            - Fill in notes provided
        - DNA Candy Model
            - Analysis questions were completed in class
            - Small Groups
        - Banana Extract Lab
        - Analysis questions were completed in class
            - More time provided per activity
            - Teacher guided
            - Small Groups
    - **RC**
        - Lecture
            - PowerPoint
            - Fill in Notes provided
        - DNA Paper Model
            - Small Group Activity
            - Teacher Directed
        - DNA Candy Model
            - Whole Class Activity
            - Teacher Directed
            - Extended Time

Week 10:

- DNA Replication
    - **Honors:**
        - DNA Replication Webquest
        - DNA Replication Project
            - Students required to present the information found to the class
        - DNA Replication Lecture
            - Notes provided
        - Video Clips
            - Class discussion after each video clip
        - DNA Replication Quiz
            - Word bank not provided
        - Protein Synthesis Lecture
        - Protein Synthesis Diagrams
        - Protein Synthesis Quiz

        - Word bank not provided
        - Students put illustrations in order and describe what is happening
    - **CP**
        - DNA Replication Webquest
        - DNA Replication Animation
            - Students required to answer questions during the clips
        - Replication Lecture
            - Fill in Notes Provided
        - Structure and Replication Modeling Lab
    - **CP ICR**
        - Interactive Building Activity with DNA
            - Use of smartboard
            - Done as a whole group with teacher direction
        - Video Clips (Amoeba Sisters)
        - Guided Practice
            - More time provided
            - Class discussion during video clips
    - **RC**
        - DNA Building Activity
            - Small Groups
            - Teacher Directed
            - Activity Worksheet
            - Extended Time
        - Video Clips
            - Worksheet with questions based on the video
            - Think-Pair-Share thoughts of video
            - GATTACA
            - Whole Class Discussion

Week 11:

- Cell Division and Differentiation
    - **Honors**
        - Lecture
            - Notes provided
        - Stages of Mitosis
            - Students draw diagrams to help visualize the stages
        - Stem Cell Debate
        - Mitosis Webquest
            - Completed for homework
        - Cancer Vocabulary
            - Students will be quizzed on this information toward the end of the week
        - Types of Cancer Project
            - Students will choose a cancer to research and create a poster or Power point presentation
    - **CP**
        - Lecture
            - Notes provided
        - Stages of Mitosis
            - Students create illustrations and label to aid in visualization of the stages
        - Stem Cell Debate
            - Students worked in small groups

        - Modeling Stages of Mitosis
        - Mitosis Webquest
        - Cancer documentary
            - Students had to write down facts from the cancer documentary
    - **CP ICR**
        - Lecture
            - Hard copy of notes provided
        - Stages of Mitosis Webquest
        - University of Arizona, Onion Root Lab
            - Analysis Table and Questions
            - Teacher Guided
        - Modeling Stages of Mitosis
            - Use of various materials (Play Dough, Pipe Cleaners, etc.)
        - Kris Carr Youtube video
            - Questions provided for students to answer
            - Frequent checks for understanding
        - Pie Chart of Your Day
            - Students compare their day with the stages of Mitosis (Exel)
            - Extra Time Provided
    - **RC**
        - Lecture
            - PowerPoint
            - Fill in Notes
        - Mitosis Webquest
            - Teacher Guided
            - Extended Time
        - Mitosis Modeling Activity
            - Completed as a class
            - Extended Time

AP Biology follows a separate set of standards set forth by College Board.
This Curriculum Unit would correlate with AP Units 1 and 2, whose standards are identified here:

UNIT AT A GLANCE

Enduring Understanding	Topic	Suggested Skill	Class Periods ~5–7 CLASS PERIODS
SYI-1	**1.1** Structure of Water and Hydrogen Bonding	2.A Describe characteristics of a biological concept, process, or model represented visually.	
ENE-1	**1.2** Elements of Life	2.A Describe characteristics of a biological concept, process, or model represented visually.	
SYI-1	**1.3** Introduction to Biological Macromolecules	2.A Describe characteristics of a biological concept, process, or model represented visually.	
	1.4 Properties of Biological Macromolecules	1.A Describe biological concepts and/or processes.	
	1.5 Structure and Function of Biological Macromolecules	4.B.3 Predict the causes or effects of a change in, or disruption to, one or more components in a biological system based on a visual representation of a biological concept, process, or model.	
IST-1	**1.6** Nucleic Acids	2.A Describe characteristics of a biological concept, process, or model represented visually.	
	Go to AP Classroom to assign the Personal Progress Check for Unit 1. Review the results in class to identify and address any student misunderstandings.		

UNIT 2

Cell Structure and Function

UNIT AT A GLANCE

Enduring Understanding	Topic	Suggested Skill	Class Periods ~11–13 CLASS PERIODS
SYI-1	2.1 Cell Structure: Subcellular Components	1.A Describe biological concepts and/or processes.	
	2.2 Cell Structure and Function	6.A Make a scientific claim.	
ENE-1	2.3 Cell Size	2.A.3 Represent relationships within biological models, including mathematical models. 4.A.1 Perform mathematical calculations, including ratios.	
ENE-2	2.4 Plasma Membranes	2.A Describe characteristics of a biological concept, process, or model represented visually.	
	2.5 Membrane Permeability	5.D Make observations or collect data from representations of laboratory setups or results. 5.A.5 Use data to evaluate a hypothesis (or prediction), including supporting or refuting the alternative hypothesis.	
	2.6 Membrane Transport	5.A.6 Propose a new/next investigation based on an evaluation of the design/methods.	
	2.7 Facilitated Diffusion	6.A.3 Predict the causes or effects of a change in, or disruption to, one or more components in a biological system based on a visual representation of a biological concept, process, or model.	
	2.8 Tonicity and Osmoregulation	4.A Construct a graph, plot, or chart.	
	2.9 Mechanisms of Transport	1.D Explain biological concepts and/or processes.	
	2.10 Cell Compartmentalization	6.A.6 Predict the causes or effects of a change in, or disruption to, one or more components in a biological system based on a biological concepts or processes.	
EVO-1	2.11 Origins of Cell Compartmentalization	6.B Support a claim with evidence from biological principles, concepts, processes, and/or data.	

AP Biology Daily Lessons would be as follows:

Day	Chapter	Pages	Content Area/Topic	Formative/Summative Assessments
1	1	2-10	Discussion: Organizing Themes of Biology	Concept Mapping, *Web Activity 1.2*
2	1	10-14	Discussion: Scientific Method	Presentation of Data/Graphs; Questions from Figs. 1.9 and 1.10
3 4	1	10-14	Lab: Scientific Method/Inquiry	Lab Analysis, *Animated Tutorial 1.1*
5	2	16-21	Discussion: Chemical Context of Life Lab: Acids/Bases/Buffers	Ball and Stick Modeling /Paper Models, *Animated Tutorial 2.1*
	2	21-22	Discussion: Water	Free Response Question
7	2	21-22	Mini Labs: Properties of Water	Lab Analysis
8 9	2	23-29	Discussion: Macromolecules (Carbohydrates and Lipids)	Ball and Stick Modeling, *Web Activity 2.1,* Free Response Question, *Animated Tutorial 2.2, Web Activity 2.2*
10	2	29-33	Discussion: Metabolism/Reactions	Ball and Stick Modeling
11	2	29-33	Lab: Metabolism	Lab Analysis
12	3	35-39	Discussion: Nucleic Acids as Macromolecules	*Web Activities 3.1 and 3.2*

Day	Chapter	Pages	Content Area/Topic	Formative/Summative Assessments
13	3	39-45	Discussion: Structure and Function of Proteins	Pipe Cleaner Proteins/Ball and Stick Modeling, *Web Activity 3.3, Animated Tutorial 3.1*, Investigation Fig 3.10
14 15	3	46-53	Discussion: Enzyme Kinetics	*Web Activity 3.4, Animated Tutorial 3.2 and 3.3,* Free Response Question(s)
16 17	3	46-53	Hands on Activity: Toothpickase Lab	Presentation of Data/Graphs, Lab Analysis
18 19 20	3	46-53	AP Lab #13: Enzyme Activity	Assessments can include question sets that you assign for homework, collaborative activities, and interactive online simulations
21	**Unit Exam: Chemistry, Biochemistry and Enzymes**			
23 24 25	4	57-76	Discussion: Cell Biology	*Web Activity 4.1,* Venn diagrams, concept mapping, *Animated Tutorial 4.1 and 4.2, Web Activity 4.2 and 4.3*
26	4	57-76	Lab: Cell Structure (Microscope)	Lab Drawings/Analysis
27 28	4	57-76	Cell Function Activity	
29	5	78-91	Discussion: Cell Membrane Structure and Function	*Web Activity 5.1, Interactive Tutorial 5.1,* Questions Figure 5.2, *Animated Tutorial 5.1 and 5.2*
30 31 32 33	5	78-91	AP Lab #4: Diffusion and Osmosis	Assessments can include question sets that you assign for homework, collaborative activities, and interactive online simulations
34	5	78-91	Lab: Cell Size and Diffusion	Free Response Question(s) and Scoring
35	5	89	Lab: Cell Membrane Model Making	Lab Analysis/Discussion Questions
36 37	5	91-99	Discussion: Cellular Response to Environmental Signals	*Working with Data 5.2, Animated Tutorial 5.4 and 5.5*
38 39	5	91-99	Case Study: Cell Signaling	Analysis Questions/Diagrams
40	**Unit Exam: Cells**			

Unit 2: DNA & INHERITANCE

Content Area: **Science**
Course(s): **CP BIOLOGY, HON BIOLOGY, BIOLOGY**
Time Period: **Marking Period 2**
Length: **7 weeks**
Status: **Published**

Standards and Phenomena

Science Standards

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

Phenomena

Science and Engineering Practices

Planning and Carrying Out Investigations

Constructing Explanations and Designing Solutions

Obtaining, Evaluating, and Communicating Information

Developing and Using Models

Using Mathematics and Computational Thinking

Asking Questions and Defining Problems

Engaging in Argument from Evidence

Analyzing and Interpreting Data

Disciplinary Core Ideas

SCI.HS-LS1	From Molecules to Organisms: Structures and Processes

Crosscutting Concepts

SCI.HS-LS1	From Molecules to Organisms: Structures and Processes

	Systems and System Models
	Patterns
	Stability and Change
	Scale, Proportion, and Quantity
	Cause and Effect
	Energy and Matter

Transfer Goals, Life Literacy/Key Skills and Social Emotional Learning

Transfer Goals

Students will be able to independently use their learning to:

Know Gregor Mendel is considered the "father of genetics" and discovered Mendelian Inheritance. This topic states that dominant allele always supersedes the recessive allele. He experimented with pea plants in order to make his discovery. Consequently, Non-Mendelian Inheritance was accepted as another form of inheritance. Non-Mendelian Inheritance explains the other types of inheritance such as: codominance, incomplete dominance, multiple alleles, etc. Scientists use multiple models (Punnett Squares/Pedigrees) to illustrate the hereditary ratios of possible offspring.

Life Literacy and Key Skills

-

TECH.9.4.12.CI	Creativity and Innovation
TECH.9.4.12.CT	Critical Thinking and Problem-solving
TECH.9.4.12.DC	Digital Citizenship
TECH.9.4.12.TL	Technology Literacy
TECH.9.4.12.GCA	Global and Cultural Awareness
TECH.9.4.12.IML	Information and Media Literacy

Social Emotional Learning

HE.9-12.2.1.12.EH.1	Recognize one's personal traits, strengths, and limitations and identify how to develop skills to support a healthy lifestyle.
HE.9-12.2.1.12.EH.3	Describe strategies to appropriately respond to stressors in a variety of situations (e.g., academics, relationships, shootings, death, car accidents, illness).

HE.9-12.2.1.12.EH.4	Analyze and adapt mental and emotional health messages and communication techniques to peers and other specific target audience (e.g., dimensions of health).
HE.9-12.2.1.12.CHSS.7	Describe how individuals and local, state, and global advocacy organizations can collaborate to address common local and global health and social issues (e.g., hunger, clean water, organ/tissue donation).
HE.9-12.2.1.12.CHSS.8	Investigate how local, state, and global agencies are addressing health issues caused by climate change and share this information in an appropriate setting.

Concepts

Essential Questions

- How are characteristics from one generation related to the previous generation?
- How can a scientist predict distribution of expressed traits in a population?
- What causes genetic variation in a population?
- Why can't two roses ever be identical?

Understandings

- The process of Meiosis forms gametes leading to more genetic variation in the population and reduces the number of chromosomes in each sex cell
- DNA is the original copy of the blueprint to make proteins in the ribosomes
- Environmental factors are a key influence in genetic mutations that can alter the genes in a population
- Mutations can lead to more genetic variation in populations
- Proteins made from Transcription and Translation eventually form varied characteristics in an organism
- There are many different types of RNA (tRNA, mRNA, rRNA) in order to synthesize certain nucleic acids

Critical Knowledge and Skills

Knowledge

The students will know…

- Gametes are formed through the process of Meiosis
- Punnett squares are a tool used in order to calculate probabilities of traits in offspring
- The process of Meiosis enables cells to have better genetic variation from one cell to the next

- Mendelian inheritance states that some alleles overshadow others
- Mutations occur in many of the processes used to create nucleic acids
- Quantity of DNA can differ within an organism as well as across species
- Traits are inherited from parents to offspring

Skills

Students will be able to:

- Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits from parents to offspring
- Explain how the process of Meiosis results in the passage of traits from parent to offspring, and how that results in increased genetic diversity necessary for evolution
- 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
- Use a model to illustrate the role of cellular division (Mitosis) and differentiation in producing and maintaining complex organisms
- Create a visual representation to illustrate how changes in a DNA nucleotide sequence can result in a change in the polypeptide produced

Assessment and Resources

School Formative Assessment Plan (Other Evidence)

- Quizzes
- Labs
- Classwork
- Homework
- Projects
- Do Nows
- Performance Tasks
    - Meiosis Notes and In-Class Discussion (Honors)
    - Practice with Punnett Squares
    - Blood Typing Lab (Honors)
    - Build a Baby Lab
    - REEBOP Lab
    - Chromosomal Disorders Quiz (Honors)

- Genetics Test Study Guide
- Karyotype Construction/Analysis
- Meiosis Quiz
- Mitosis Quiz
- Pedigree Worksheet/Practice
- Pipe Cleaner Meiosis Lab

School Summative Assessment Plan

To measure mastery of concepts and a collection of units the following will be administered per the discretion of the teacher:

- ***Unit Tests***
- ***Weekly Quizzes***

To show mastery of the concepts within multiple units from the beginning of the year to the end of the year, the following will be administered to the students across all levels within the biology curriculum:

- ***Midterm and Final Assessment***

These summative assessments encompass multiple standards covered throughout the year. Students will need to illustrate the knowledge they have gained throughout the school year through analytical questions and performance tasks.

Primary Resources

Pearson's REALIZE platform for the digital text Biology (Miller & Levine)

Supplementary Resources

- Khan Academy
- Biomanbio- Online Supplements/Games
- Amoeba Sisters Online Videos
- Concord Consortium Online Supplements
- Bozeman Science Online Videos

Technology Integration and Differentiated Instruction

Technology Integration

- **Google Products**
    - Google Classroom - Used for daily interactions with the students covering a vast majority of different educational resources (Daily Notes, Exit Tickets, Classroom Polls, Quick Checks, Additional Resources/ Support, Homework, etc.)
    - GAFE (Google Apps For Education) - Using various programs connected with Google to collaborate within the district, co-teachers, grade level partner teacher, and with students to stay connected with the content that is covered within the topic. Used to collect data in real time and see results upon completion of the assignments to allow for 21st century learning.
- **One to One Student's laptop**
    - All students within the West Deptford School District are given a computer, allowing for 21st century learning to occur within every lesson/topic.
- **Additional Support**
    - **Pearson REALIZE platform online Biology textbook (Miller & Levine)**
        - **Interactivity**
        - **Interactive Labs**
        - **Online Text**
        - **Science Skill Practice**
        - **Assessments**
            - **Formative and Summative**

Differentiated Instruction

Gifted Students (N.J.A.C.6A:8-3.1)

❑ Within each lesson, the Gifted Students are given choice on topic and subject matter allowing them to explore interests appropriate to their abilities, areas of interest and other courses.

English Language Learners (N.J.A.C.6A:15)

❑ Within each lesson, the English Language Learners are given choice of topic and resources so that their

materials are within their ability to grasp the language.

❑ All assignments have been created in the student's native language.

❑ Work with ELL Teacher to allow for all assignments to be completed with extra time.

At-Risk Students (N.J.A.C.6A:8-4.3c)

❑ Within each lesson, the at-risk students are given choice of topic and resources so that their materials are within their ability level and high-interest.

Special Education Students (N.J.A.C.6A:8-3.1)

❑ Within each lesson, special education students are given choice of topic and resources so that their materials are within their ability level and high-interest.

❑ All content will be modeled with examples and all essays are built on a step-by-step basis so modifications for assignments in small chunks are met.

All other IEP modifications will be honored (ie. hard copies of notes, directions restated, etc.)

Interdisciplinary Connections

Interdisciplinary Connections****

Math	Science	ELA
MA.9-12.N-Q.A.1 MA.9-12.N-Q.A.2 MA.9-12.N-Q.A.3 -Represent symbolically evidence that inheritable genetic variation may result from new genetic combinations through meiosis, viable errors occurring during replication, and/or mutations caused by environmental factors, and manipulate the representing symbols. Make sense of quantities and relationships to describe and		LA.11-12.CCSS.ELA-Literacy.RST.11-12.5 LA.11-12.CCSS.ELA-Literacy.WHST.11-12.7 LA.11-12.CCSS.ELA-Literacy.WHST.11-12.8 -Cite specific textual evidence to support analysis of science and technical texts describing the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring, attending to important distinctions

predict the ways in which inheritable genetic variation occurs.

-Represent the variation and distribution of expressed traits in a population symbolically and manipulate the representing symbols. Make sense of quantities and relationships to describe and predict the variation and distribution of expressed traits in a population.

the author makes and to any gaps or inconsistencies in the account.

-Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring, resolving conflicting information when possible.

-Write arguments, based on evidence, that inheritable genetic variations may result from new genetic combinations through meiosis, viable errors occurring during replication, and/or mutations caused by environmental factors.

Fine Arts/ Performing Arts

World Language

Example: Teaching the prefixes "hetero" and "homo" in terms of zygosity

Applied Technology

Social Studies

- The Life of Gregor Mendel
- HeLa Cells: The story of Henrietta Lacks

Careers

Example:

- Students work in collaborative groups through
  - In-class activities
  - Labs
  - Projects
- Through collaborative research, students will understand that individual contribution is imperative to

Global Awareness

Example: Teaching students about the recessive sickle cell allele and its role in the Heterozygote Advantage for people that live in equatorial regions of Africa, India, and Pakistan in that it provides protection against malaria.

(Addresses Framework for 21st Century Learning Standards found at http://www.p21.org/about-us/p21-framework/256)

group success

- Understanding is demonstrated through in-class discussion, formative assessments, and summative assessments

- Students are expected to apply appropriate academic and technical skills through research using technology in and out of the classroom

Learning Plan / Pacing Guide

- **Honors Biology**
    - Week 1- Mitosis and Meiosis
        - Review Mitosis
        - Relay Race
            - Small Groups
        - Mitosis VS Meiosis Graphic Organizer
            - Venn Diagram
        - Quiz on Mitosis
            - Word bank not provided
        - Meiosis Vocabulary
        - Meiosis Lecture
            - Notes provided
        - Meiosis Quiz
            - Word Bank not provided
            - Students responsible for knowing Genetic Variation in Meiosis 1
            - Students responsible for knowing the difference between Mitosis and Meiosis

    - Week 2- Genetic Disorders, Chromosomes
        - Karyotype Activity
            - Students will create a karyotype in an online activity
            - Students will be able to analyze a karyotype to figure out what disorder a person has
        - Genetic Disorders Jigsaw Activity
            - Small groups
            - Analysis Questions
    - Week 3-6 -Mendelian Genetics
        - Lecture
            - Notes Provided
        - Genetics Vocabulary
            - Students complete for homework
            - Quizzed on terms towards the end of the week
        - Practice with Crosses
            - Monohybrid, Dihybrid, (Trihybrid provided as an extra credit question on the

quiz)
        - Complete multiple problems as a class
        - Students required to finish the rest for homework
    - Create your Own Pedigree Project
        - Rubric Provided
    - Blood Typing
        - Antibodies, Antigens, Universal Donor, Universal Recipient
        - Connections to Multiple Alleles and Codominance
- Week 7 Modern Genetics (Non Mendelian)
    - Lecture given
        - Notes provided on Google Classroom
    - Compare and contrast Mendelian and Non Mendelian Genetics
        - Class Discussion
    - Video clips of the types of Mendelian and Non Mendelian Genetics
        - Students provided with questions to answer

- **CP Biology**
    - Week 1- Mitosis
        - Review Mitosis Relay Race
            - Small Groups
        - Mitosis VS Meiosis Graphic Organizer
            - Think-Pair-Share
        - Crossing Over Animation & Drawing
            - Questions assigned
        - Fertilization and Creation of a Zygote
            - Haploid vs Diploid Chart
            - Sex Chromosomes Lecture
                - Fill in notes
                - Drawing Diagram
        - Sex Chromosomal Disorders
            - Research
            - Think-Pair-Share
    - Week 2-5 -Mendelian Genetics
        - Mendel Pea Plant Discussions
        - Research background of Mendel
        - Complete Dominance
        - Dominant and Recessive
            - Practice Identifying/Creating Keys
            - Notes & Punnett Square Practice Problems
        - Genotype and Phenotype
            - Notes & Punnett Square Practice Problems
        - Heterozygous and Homozygous
            - Notes & Practice Problems
        - Monohybrid & Dihybrid Punnett Square Practice Problems
        - Incomplete dominance
        - Notes and Punnett Squares
        - Codominance
        - Notes and Punnett Squares
        - Polygenetic Inheritance Notes
        - Sex-linked Notes and Punnett Squares
        - Multiple Alleles
        - Blood Types - Notes and Punnett Squares
        - Build a Baby Lab

        - REEBOP Lab
    - Week 6-7 Modern Genetics (Non Mendelian)
        - Notes and Discussion on Real-life Examples
- **CP ICR Biology**
    - Week 1- Mitosis
        - Mitosis Introduction
        - Fill-in notes with class discussion
        - PowerPoint presentation
        - Review Mitosis
        - Graphic organizer that showed stages of Mitosis and then showed relationship between Mitosis and Meiosis
        - Amoeba sisters video
        - Crossing Over Drawing
        - Small group modeling activity
            - Steps broken down into smaller steps
            - Frequent checks for understanding
        - Activity questions to be answered individually
            - Small Group
            - Extended time
            - Teacher directed
            - Clarification of directions
            - Use of technology
    - Week 2/Week 3- Fertilization and Creation of a Zygote
        - Haploid vs Diploid Chart
        - Teacher-Guided
        - Graphic organizer
        - Karyotyping activity (colored pencils-only 4 colors): Students are to color code a karyotype to show how crossing over of traits occurs in a zygote.
            - Teacher directed.
            - Students were provided guided instructions for completing/coloring each sheet.
            - Extended time
            - Clarification of instructions
        - Analysis of pre-made abnormal karyotypes vs normal karyotypes
        - Sex Chromosomes Lecture
        - Fill-in notes
        - Graphic Organizer
        - Sex Chromosomal Disorders
        - Group discussion
        - Video clips of various disorders
    - Week 4-8 -Mendelian Genetics
        - Mendel Pea Plant Discussions
        - Research background of Mendel
        - Provided hard copy of chart for Pea Plant traits
        - Worksheets to show dominant and recessive genes
            - Teacher directed
            - Use of hard copy of chart to complete assignment
        - Complete Dominance
        - Dominant and Recessive
            - Practice Identifying/Creating Keys
            - Punnett Squares-monohybrid crosses only
                - Small groups
                - Punnett Square stations (small group, teacher directed, clarified

instructions, extra time if needed)

- Genotype and Phenotype
  - Examples using percentages
  - Provide sample problem
- Heterozygous and Homozygous
  - Practice Problems
    - Incomplete dominance, codominance, sex-linked,
    - Build a Baby Lab: students create a baby based upon traits that they inherit by the flip of a coin
      - Small group (one student is mom and one is considered dad)
      - Extended time
      - Teacher directed
      - Hard copy of chart for students to fill in
      - Colored pencils for drawing their baby
      - Clarified directions for analysis questions

- Week 8-9 Modern Genetics (Non Mendelian)
  - Lecture given
  - Notes provided on student apps to be put into their OneNote
  - Compare and contrast Mendelian and Non Mendelian Genetics
  - Class Discussion
  - Graphic organizers
  - Video clips of the types of Mendelian and Non Mendelian Genetics
  - Students provided with questions to answer
    - Clarified instructions

- **Resource Center Biology**
  - Week 1- Mitosis
    - Mitosis Introduction
      - PowerPoint presentation
        - Fill-in notes with class discussion
    - Graphic Organizer
      - Stages of Mitosis
        - Display relationship between Mitosis and Meiosis
    - Video Clips
      - Amoeba sisters video
    - Mitosis Activities/Interactivity
    - Relay Race
    - Mitosis vs. Meiosis Graphic Organizer
    - Fill-in notes with class discussion
    - Think-Pair-Share with group
    - Crossing Over Drawing
      - Small group modeling activity
      - Activity questions to be answered individually
  - Week 2 / Week 3- Fertilization and Creation of a Zygote
    - Haploid vs Diploid Chart
      - Teacher-Guided
    - Karyotyping activity (colored pencils-only 4 colors): Students are to color code a karyotype to show how crossing over of traits occurs in a zygote.
      - Teacher directed.
      - Students are provided guided instructions for completing each sheet
      - Extended time
    - Sex Chromosomes Lecture
      - Fill-in notes

        - Drawing Diagram
        - Sex Chromosomal Disorders
        - PowerPoint
        - Group discussion
    - Week 3-6 -Mendelian Genetics
        - Mendel Pea Plant Discussions
            - Background of Mendel
                - PowerPoint
                - Fill-in notes
        - Complete Dominance
            - Dominant and Recessive
                - PowerPoint
                    - Fill-in notes
            - Practice Identifying/Creating Keys
            - Genotype and Phenotype
                - PowerPoint
                - Examples
            - Heterozygous and Homozygous
                - Practice Problems
            - Incomplete dominance
            - Codominance
            - Sex-linked
            - Build a Baby Lab
    - Week 7 Modern Genetics (Non Mendelian)
        - Lecture given
        - PowerPoint presentation
            - Notes provided on Google Classroom
        - Compare and contrast Mendelian and Non Mendelian Genetics
            - Class Discussion
        - Graphic Organizer
        - Video clips of the types of Mendelian and Non Mendelian Genetics
            - Students provided with questions to answer in small groups
            - Extended time

AP Biology follows a separate set of standards set forth by College Board.
This Curriculum Unit would correlate with AP Units 4, 5 and 6, whose standards are identified here:

UNIT AT A GLANCE

Enduring Understanding	Topic	Suggested Skill	Class Periods ~9–11 CLASS PERIODS
IST-3	4.1 Cell Communication	1.3 Explain biological concepts and/or processes.	
	4.2 Introduction to Signal Transduction	1.A Describe biological concepts and/or processes.	
	4.3 Signal Transduction	6.C Provide reasoning to justify a claim by connecting evidence to biological theories.	
	4.4 Changes in Signal Transduction Pathways	4.B.b Predict the causes or effects of a change in, or disruption to, one or more components in a biological system based on a visual representation of a biological concept, process, or model.	
ENE-3	4.5 Feedback	4.B.b Predict the causes or effects of a change in, or disruption to, one or more components in a biological system based on a visual representation of a biological concept, process, or model.	
IST-1	4.6 Cell Cycle	4.B.b Describe data from a table or graph, including describing trends and/or patterns in the data. 1.A.a Perform mathematical calculations, including percentages.	
	4.7 Regulation of Cell Cycle	4.B.b Predict the causes or effects of a change in, or disruption to, one or more components in a biological system based on biological concepts or processes.	
	Go to AP Classroom to assign the **Personal Progress Check** for Unit 4. Review the results in class to identify and address any student misunderstandings.		

UNIT AT A GLANCE

Enduring Understanding	Topic	Suggested Skill	Class Periods ~9–11 CLASS PERIODS
IST-1	5.1 Meiosis	1.B Explain biological concepts and/or processes.	
	5.2 Meiosis and Genetic Diversity	3.A Identify or pose a testable question based on an observation, data, or a model.	
EVO-2, IST-1	5.3 Mendelian Genetics	4.C Select and perform appropriate statistical hypothesis testing. 4.B.2 Predict the causes or effects of a change in, or disruption to, one or more components in a biological system based on data.	
IST-1	5.4 Non-Mendelian Genetics	4.A.3 Perform mathematical calculations, including means. 4.C Select and perform appropriate statistical hypothesis testing.	
SYI-3	5.5 Environmental Effects on Phenotype	1.C Explain biological concepts, processes, and/or models in applied contexts.	
	5.6 Chromosomal Inheritance	4.B.3 Predict the causes or effects of a change in, or disruption to, one or more components in a biological system based on a visual representation of a biological concept, process, or model.	

Go to AP Classroom to assign the **Personal Progress Check** for Unit 5.
Review the results in class to identify and address any student misunderstandings.

UNIT 6

Gene Expression and Regulation

UNIT AT A GLANCE

Enduring Understanding	Topic	Suggested Skill	Class Periods ~18–21 CLASS PERIODS
IST-1	6.1 DNA and RNA Structure	1.C Explain biological concepts, processes, and/or models in applied contexts.	
	6.2 Replication	2.B.3 Explain relationships between different characteristics of biological concepts, processes, or models represented visually in applied contexts.	
	6.3 Transcription and RNA Processing	2.B.3 Explain relationships between different characteristics of biological concepts, processes, or models represented visually in applied contexts.	
	6.4 Translation	2.D.3 Represent relationships within biological models, including diagrams. 6.E.2 Predict the causes or effects of a change in, or disruption to, one or more components in a biological system based on biological concepts.	
IST-2	6.5 Regulation of Gene Expression	6.A Make a scientific claim.	
	6.6 Gene Expression and Cell Specialization	6.B Support a claim with evidence from biological principles, concepts, processes, and/or data.	
IST-2, IST-4	6.7 Mutations	2.C Explain how biological concepts or processes represented visually relate to larger biological principles, concepts, processes, or theories. 3.D Make observations or collect data from representations of laboratory setups or results.	
IST-1	6.8 Biotechnology	6.D Explain the relationship between experimental results and larger biological concepts, processes, or theories.	

AP Daily Lessons would be as follows:

23 24 25	4	57-76	Discussion: Cell Biology	*Web Activity 4.1,* Venn diagrams, concept mapping, *Animated Tutorial 4.1 and 4.2, Web Activity 4.2 and 4.3*
26	4	57-76	Lab: Cell Structure (Microscope)	Lab Drawings/Analysis
27 28	4	57-76	Cell Function Activity	

56	7	127-132	Discussion: The Cell Cycle	*Web Activity 7.1 – 7.3, Animated Tutorial 7.1*
57 58 59 60 61	7	127-132	AP Lab #7: Cell Division: Mitosis and Meiosis	Assessments can include question sets that you assign for homework, collaborative activities, and interactive online simulations
62	7	132-134, 140-141	Discussion: Cell Cycle Controls	Concept Map
63	7	134-141	Discussion: Meiosis vs. Mitosis	*Web Activity 7.4, Animated Tutorial 7.2,* Venn diagram
64	8	144-150	Discussion: Mendelian Genetics	Punnett Squares, *Web Activity 8.1*
65 66	8	144-150	Practice Genetics Problems	Genetics Problems; Lab Questions, Free Response Question, *Interactive Tutorial 8.1*
67	8	151-152	Discussion: Pedigree Analysis	Practice Pedigrees, Pedigree Questions
68	8	152-155	Discussion: Beyond Mendelian Genetics	Genetics Problems
69	8	156-160	Discussion: Sex Linkage	Genetics Problems, *Animated Tutorial 8.2,* Free Response Question
70 71 72	8	156-160	AP Lab #2: Mathematical Modeling	Assessments can include question sets that you assign for homework, collaborative activities, and interactive online simulations
73	8	160-163	Discussion: Prokaryotic Gene Exchange	Free Response Question
74	9	166-171	Discussion: DNA Structure and Function	*Animated Tutorial 9.1*
75	9	171-185	Discussion: DNA Replication and Mutation	*Animated Tutorial 9.2-9.4, Web Activity 9.1, Interactive Tutorial 9.1*
75	9	171-185	DNA Replication Activity	Activity Summary or product
76	**Unit Test: Genetics and Replication**			

77	10	188-195	Discussion: Transcription	*Web Activity 10.1, Animated Tutorial 10.1-10.2*
78	10	196-204	Discussion: Translation	*Animated Tutorial 10.3, Working with Data 10.1, Web Activity 10.2, Interactive Tutorial 10.1*
79	10	188-204	Activity/Review: Protein Synthesis	Activity summary or product, written response

Day	Chapter	Pages	Content Area/Topic	Formative/Summative Assessments
80	10	204-206	Discussion: Post-Translational Controls	*Animated Tutorial 10.4*
81 82	11	208-225	Discussion: Viral, Prokaryotic and Eukaryotic Gene Expression	*Web Activity 11.1-11.2, Animated Tutorials 11.1-11.3,* Free Response Question(s)
83 84 85 86 87	11	208-225	Lab #8: Biotechnology: Bacterial Transformation	Assessments can include question sets that you assign for homework, collaborative activities, and interactive online simulations
88 89	11	208-225	Gene Expression Lab Activities *(C. elegans)*	Lab Questions
90	13	244-252	Discussion: Restriction Enzymes and Recombinant DNA	*Animated Tutorial 13.1-13.2, Working with Data 13.1,*
91 92 93	13	244-252	AP Lab #3: Comparing DNA Sequences	Assessments can include question sets that you assign for homework, collaborative activities, and interactive online simulations
94 95 96 97 98	13	252-262	Discussion: Recombinant DNA and AP Lab #9: Biotechnology: Restriction Enzyme	*Web Interactive 13.1;* Assessments can include question sets that you assign for homework, collaborative activities, and interactive online simulations
99	**Test: Protein Synthesis and Biotechnology**			

Unit 3: EVOLUTION & NATURAL SELECTION

Content Area: **Science**
Course(s): **CP BIOLOGY, HON BIOLOGY, BIOLOGY**
Time Period: **Marking Period 3**
Length: **8 weeks**
Status: **Published**

Standards and Phenomena

Science Standards

SCI.HS-LS4-2	Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.
SCI.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.
SCI.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.
SCI.HS-LS4-1	Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.
SCI.HS-LS4-4	Construct an explanation based on evidence for how natural selection leads to adaptation of populations.
SCI.HS-LS2-8	Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.

Phenomena

Science and Engineering Practices

Planning and Carrying Out Investigations

Constructing Explanations and Designing Solutions

Obtaining, Evaluating, and Communicating Information

Developing and Using Models

Using Mathematics and Computational Thinking

Asking Questions and Defining Problems

Engaging in Argument from Evidence

Analyzing and Interpreting Data

Disciplinary Core Ideas

SCI.HS-LS2	Ecosystems: Interactions, Energy, and Dynamics
SCI.HS-LS4	Biological Evolution: Unity and Diversity

Crosscutting Concepts

Cause and Effect

Systems and System Models

Energy and Matter

Patterns

Scale, Proportion, and Quantity

Structure and Function

Stability and Change

Transfer Goals, Life Literacy/Key Skills and Social Emotional Learning

Transfer Goals

High school students investigate patterns to find the relationship between the environment and natural selection. Students demonstrate understanding of the factors causing natural selection and the process of evolution of species over time. They demonstrate understanding of how multiple lines of evidence contribute to the strength of scientific theories of natural selection and evolution. Students can demonstrate an understanding of the processes that change the distribution of traits in a population over time and describe extensive scientific evidence ranging from the fossil record to genetic relationships among species that support the theory of biological evolution. Students can demonstrate an understanding of the processes that change the distribution of traits in a population over time and describe extensive scientific evidence ranging from the fossil record to genetic relationships among species that support the theory of biological evolution. Students can use models, apply statistics, analyze data, and produce scientific communications about evolution. Understanding of the crosscutting concepts of patterns, scale, structure and function, and cause and effect supports the development of a deeper understanding of this topic.

Life Literacy and Key Skills

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TECH.9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
TECH.9.4.12.CI.3	Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1).
TECH.9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).
TECH.9.4.12.DC.6	Select information to post online that positively impacts personal image and future college and career opportunities.
TECH.9.4.12.TL.2	Generate data using formula-based calculations in a spreadsheet and draw conclusions about the data.
TECH.9.4.12.TL.4	Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem (e.g., 7.1.AL.IPERS.6).
TECH.9.4.12.GCA.1	Collaborate with individuals to analyze a variety of potential solutions to climate change effects and determine why some solutions (e.g., political. economic, cultural) may work better than others (e.g., SL.11-12.1., HS-ETS1-1, HS-ETS1-2, HS-ETS1-4, 6.3.12.GeoGI.1, 7.1.IH.IPERS.6, 7.1.IL.IPERS.7, 8.2.12.ETW.3).
TECH.9.4.12.IML.2	Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources (e.g., NJSLSA.W8, Social Studies Practice: Gathering and Evaluating Sources.
TECH.9.4.12.IML.5	Evaluate, synthesize, and apply information on climate change from various sources appropriately (e.g., 2.1.12.CHSS.6, S.IC.B.4, S.IC.B.6, 8.1.12.DA.1, 6.1.12.GeoHE.14.a, 7.1.AL.PRSNT.2).
TECH.9.4.12.IML.6	Use various types of media to produce and store information on climate change for different purposes and audiences with sensitivity to cultural, gender, and age diversity (e.g., NJSLSA.SL5).

Social Emotional Learning

HE.9-12.2.1.12.EH.1	Recognize one's personal traits, strengths, and limitations and identify how to develop skills to support a healthy lifestyle.
HE.9-12.2.1.12.EH.3	Describe strategies to appropriately respond to stressors in a variety of situations (e.g., academics, relationships, shootings, death, car accidents, illness).
HE.9-12.2.1.12.EH.4	Analyze and adapt mental and emotional health messages and communication techniques to peers and other specific target audience (e.g., dimensions of health).
HE.9-12.2.1.12.CHSS.7	Describe how individuals and local, state, and global advocacy organizations can collaborate to address common local and global health and social issues (e.g., hunger, clean water, organ/tissue donation).
HE.9-12.2.1.12.CHSS.8	Investigate how local, state, and global agencies are addressing health issues caused by climate change and share this information in an appropriate setting.

Concepts

Essential Questions

- Why is it so important to take all of the antibiotics in a prescription?
- How are species affected by the changing environmental conditions?
- How can it be proven that birds and dinosaurs are related?
- How can there be so many similarities among organisms yet so many different plants, animals, and microorganisms?
- How does natural selection lead to adaptations of populations?
- What evidence shows that different species are related?
- What is the relationship between natural selection and evolution?
- Why do some species live in groups and others are solitary?

Understandings

Many factors affect variations of traits within species

Scientific evidence supports natural selection as a mechanism for evolution

Species change over time

Critical Knowledge and Skills

Knowledge

Students will know:

- Phylogenetic Trees and Cladograms
- Organisms are related through shared characteristics, evolutionary history, and character data
- Common ancestry and biological evolution which is supported by multiple lines of empirical evidence
- Evolution results from 4 factors: (1) Potential for species increase, (2) Heritable genetic variation due to mutation and sexual reproduction, (3) Competition, (4) Organisms better able to survive and reproduce in the environment
- Artificial Selection
- Natural Selection
- Adaptations of Population
- Statistics and probability of increased advantageous heritable traits
- Cause and effect relationships for how changes to the environment results in an increased number of species, emergence of new species, and the extinction of other species

- How members of a species rely on group behavior in order to survive and reproduce

Skills

Students will be able to:

- Make predictions about the effects of artificial selection on genetic makeup of a population over time
- Construct an explanation based on evidence for how natural selection leads to adaptation of populations
- Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait
- Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) Increases in number of individuals of some species, (2) The emergence of new species over time, and (3) the extinction of other species
- Evaluate the evidence for the role of group behavior on individual and species chances to survive and reproduce
- Examine a group of related organisms using a phylogenetic tree or a cladogram in order to (1) identify shared characteristics, (2) make inferences about the evolutionary history of the group, (3) identify character data that could extend or improve the phylogenetic tree
- Examine a group of related organisms using a phylogenetic tree or a cladogram in order to (1) identify shared characteristics, (2) make inferences about the evolutionary history of the group, (3) identify character data that could extend or improve the phylogenetic tree
- Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence
- Construct an explanation based on evidence that the process of evolution primarily results from 4 factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) Competition for limited resources, (4) the proliferation of those organisms that are better able to survive and reproduce in the environment

Assessment and Resources

School Formative Assessment Plan (Other Evidence)

- Quizzes
- Labs
- Classwork
- Homework
- Projects
- Do Nows

- Performance Tasks
    - Africanized Bee Activity
    - Amino Acid Sequences and Evolutionary Relationships Activity
    - Animal Adaptation Lab
    - Artificial Selection Dog Activity
    - Bird Modification Lab
    - Build a Beak Lab
    - Evolution Webquest
    - Fossil Record Activity
    - Homologous/Analogous Structures Webquest
    - Peppered Moth Webquest
    - Peppered Moth Lab Creation
    - Vertebrate Embryology

School Summative Assessment Plan

To measure mastery of concepts and a collection of units the following will be administered per the discretion of the teacher:

- ***Unit Tests***
- ***Weekly Quizzes***

To show mastery of the concepts within multiple units from the beginning of the year to the end of the year, the following will be administered to the students across all levels within the biology curriculum:

- ***Midterm and Final Assessment***

These summative assessments encompass multiple standards covered throughout the year. Students will need to illustrate the knowledge they have gained throughout the school year through analytical questions and performance tasks.

Primary Resources

Pearsons's REALIZE platform for digital text of Miller & Levine's Biology

Supplementary Resources

Additional outside Resources:

- Khan Academy
- Biomanbio- Online Supplements/Games
- Amoeba Sisters Online Videos
- Concord Consortium Online Supplements
- Bozeman Science Online Videos

Technology Integration and Differentiated Instruction

Technology Integration

- **Google Products**
    - Google Classroom - Used for daily interactions with the students covering a vast majority of different educational resources (Daily Notes, Exit Tickets, Classroom Polls, Quick Checks, Additional Resources/ Support, Homework, etc.)
    - GAFE (Google Apps For Education) - Using various programs connected with Google to collaborate within the district, co-teachers, grade level partner teacher, and with students to stay connected with the content that is covered within the topic. Used to collect data in real time and see results upon completion of the assignments to allow for 21st century learning.

- **One to One Student's laptop**
    - All students within the West Deptford School District are given a computer, allowing for 21st century learning to occur within every lesson/topic.

- **Additional Support**

- **Pearson REALIZE platform online Biology textbook (Miller & Levine)**
    - **Interactivity**
    - **Interactive Labs**
    - **Online Text**
    - **Science Skill Practice**
    - **Assessments**
        - **Formative and Summative**

Differentiated Instruction

Gifted Students (N.J.A.C.6A:8-3.1)

❑ Within each lesson, the Gifted Students are given choice on topic and subject matter allowing them to explore interests appropriate to their abilities, areas of interest and other courses.

English Language Learners (N.J.A.C.6A:15)

❑ Within each lesson, the English Language Learners are given choice of topic and resources so that their materials are within their ability to grasp the language.

❑ All assignments have been created in the student's native language.

❑ Work with ELL Teacher to allow for all assignments to be completed with extra time.

At-Risk Students (N.J.A.C.6A:8-4.3c)

❑ Within each lesson, the at-risk students are given choice of topic and resources so that their materials are within their ability level and high-interest.

Special Education Students (N.J.A.C.6A:8-3.1)

❑ Within each lesson, special education students are given choice of topic and resources so that their materials are within their ability level and high-interest.

❑ All content will be modeled with examples and all essays are built on a step-by-step basis so modifications for assignments in small chunks are met.

All other IEP modifications will be honored (ie. hard copies of notes, directions restated, etc.)

Interdisciplinary Connections

Interdisciplinary Connections****

Math Science ELA

MA.9-12.S-ID.A.1

MA.K-12.2

MA.K-12.4

-Represent how natural selection leads to adaptation of populations symbolically, and manipulate the representing symbols. Make sense of quantities and relationships between specific biotic and abiotic differences in ecosystems and their contributions to a change in gene frequency over time that leads to adaptation of populations.

-Represent symbolically the proportional increase in organisms with an advantageous heritable trait as compared with organisms lacking this trait, and manipulate the representing symbols. Make sense of quantities and relationships between the proportional increase in organisms with an advantageous heritable trait as compared with the numbers of organisms lacking this trait.

-Represent evidence that common ancestry and biological evolution are supported by multiple lines of empirical evidence symbolically, and manipulate the representing symbols. Make sense of quantities and relationships to describe and predict common ancestry and biological evolution.

LA.9-10.CCSS.ELA-Literacy.RST.9-10.2

LA.11-12.CCSS.ELA-Literacy.RST.11-12.1

LA.11-12.CCSS.ELA-Literacy.RST.11-12.4

LA.11-12.CCSS.ELA-Literacy.WHST.11-12.2

LA. 11-12 CCSS.ELA-Literacy.WHST.11-12.9

-Cite specific textual evidence to support analysis of science and technical texts describing how natural selection leads to adaptation of populations; provide explanations that organisms with an advantageous heritable traits tend to increase in proportion to organisms lacking this trait; and the role of group behavior on individual and species' chances to survive and reproduce, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

-Write informative/explanatory texts describing how natural selection leads to adaptation of populations, including the narration of historical events, scientific procedures/experiments, or technical processes.

-Present claims and findings about common ancestry and biological evolution, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details.

Fine Arts/ Performing Arts	World Languages Students will understand how binomial nomenclature is a universal language across countries.	Applied Technology
Social Studies	Careers	Global Awareness To address the EQ: "How are species affected by the changing environmental conditions?", teachers will address the climate changes occurring in various biomes of the world and how that change has impacted the natural selection of certain species, altering the populations.
-History of Evolutionary Thought -Discover the scientist who have made a contribution to the field of evolution -Darwin, Lamarck, Redi, Spallanzi, Pasteur -The life of Charles Darwin and his journey to the Galapagos	Example: • Students work in collaborative groups through ○ In-class activities ○ Labs ○ Projects • Through collaborative research, students will understand that individual contribution is imperative to group success • Understanding is demonstrated through in-class discussion, formative assessments, and summative assessments • Students are expected to apply appropriate academic and technical skills through research using technology in and out of the classroom	To address the EQ: "What evidence shows that different species are related?", students will learn how geographic changes across the Earth over millions of years have separated organisms, causing evolutionary divergence and speciation. For example, armadillos, pangolins, and anteaters are all diverged from a common ancestor but live in various parts of the world due to geographic changes in the Earth. Also, skin pigmentation of humans can be addressed in terms of the benefit of vitamin D and folic acid protection and original geographic location of humans of various skin pigmentation. (i.e. Why was it a benefit that humans from equatorial regions were selected to have darker (Addresses Framework for 21st Century Learning Standards found at http://www.p21.org/about-us/p21-framework/256)

Week 1-3- Natural Selection

- Introduction
    - Darwin's Voyage Notes & Lecture
        - Notes Provided
    - Natural Selection Vocabulary
        - Students will be quizzed on terms at the end of the week
    - Peppered Moth Webquest
    - Peppered Moth Activity
    - Creation of Peppered Moth Lab
        - Small Groups
        - Students had to create full lab in their lab groups to share with peers
    - Bird Modification LabSmall groups
        - Student driven testing of birds
    - Real-life Examples of Natural Selection
        - In-class discussion
        - Student driven
    - Artificial SelectionReal-life Examples
    - Artificially Selecting Dogs Activity
    - Natural Selection Quiz #1
        - Word Bank not provided
    - Adaptations in a PopulationAnimal Adaptation Lab
    - Heterozygote AdvantageReal Life Examples, Discussion
        - Student driven discussion
    - Environmental Conditions Effect on Phenotype
        - Student driven class discussion on examples of this in nature
    - Antibiotic Resistance, microevolution and bacteria paperclip lab
        - Lab reports written in lab notebook
    - Natural Selection Quiz #3
        - Word Bank not provided

Week 4-8 - Reiterate Natural SelectionDarwin's Finches

- Process of Evolution
    - Four factors
        - Detailed Notes and Examples
        - Evidence of Evolution
    - Common Ancestry
        - Homologous, Analogous, Vestigial Structures
            - Notes and Discussion
            - Worksheet
        - DNA Evidence
            - Snork Activity
                - Connection to Protein Synthesis
            - Notes Provided
        - Embryology
            - Embryological Evidence Lab
                - Small Groups
                - Student Driven Discussion
        - Biogeography
            - Notes and real life examples, class discussion
        - Fossil Record

        - Fossil Record Lab
            - Small Groups
        - Cladograms and Phylogenetic Trees
            - Notes
        - Create a Cladogram Project

CP Biology

Week 1-3- Natural Selection

- Introduction
    - Darwin's Voyage Notes & Lecture
        - Guided Notes
    - Peppered Moth Webquest
    - Peppered Moth Activity
        - Creation of Peppered Moth Lab
            - Small Groups
    - Bird Modification Lab
        - Small groups
    - Real-life Examples of Natural Selection
    - Artificial Selection
        - Real-life Examples
    - Artificially Selecting Dogs Activity
    - Adaptations in a Population
        - Animal Adaptation Lab
        - Heterozygous Advantage
            - Real Life Examples, Discussion
    - Environmental Conditions
    - Antibiotic Resistance
        - Discussion

Week 4-8

- Reiterate Natural Selection
    - Darwin's Finches
    - Process of Evolution
        - Four factors
            - Detailed Notes and Examples
        - Evidence of Evolution
            - Common Ancestry
                - Notes and Discussion
            - DNA Evidence
                - Notes
            - Amino Acid Lab
                - Small groups
            - Homologous, Analogous,Vestigial Structures
                - Notes, Webquest, Class Discussion with Examples
            - Embryology
                - Embryological Evidence Lab
                    - Small Groups

        - Biogeography
            - Notes and real life examples, class discussion
        - Fossil Record
            - Fossil Record Lab
                - Small Groups
        - Cladograms and Phylogenetic Trees
            - Notes
            - Create & Analyze Practice Problems

CP ICR BIOLOGY

Week 1-4- Natural Selection

- Introduction
    - Darwin's Voyage Notes & Lecture
        - Hard copy of Notes
        - Powerpoint presentation with whole group discussion
        - Worksheet on Darwin vs. Lamarck (Giraffe scenario)
            - Think-Pair-Share
            - Small group
    - Peppered Moth Webquest
        - Use of technology
        - Powerpoint presentation
        - Teacher modeling webquest
    - Peppered Moth Activity
        - Creation of Peppered Moth Lab
            - Small Groups
            - Extended time
            - Teacher-directed
            - Clarification of directions
            - Grading rubric
    - Bird Modification Lab
        - Small groups
        - Use of multiple manipulatives (clothes pins, paper-clips, popsicle sticks)
        - Hard copy of instructions
        - Clarification of directions
        - Extended time (if needed)
        - Analysis questions
            - Questions modified
    - Real-life Examples of Natural Selection
    - Artificial Selection
        - Real-life Examples (whole group discussion)
        - Artificially Selecting Dogs Activity: Students are to choose the best traits for a dog that would be best suited to hunt. They will choose 2 that would make the best hunting puppy based upon the chosen traits
        - Hard copy of instructions
        - Activity completed one step at a time as per teacher direction
        - Small group
        - Extended time (if needed)
    - Environmental Conditions

        - Whole group discussion
        - Hard copy of notes to upload into OneNote
    - Antibiotic Resistance
        - Discussion with teacher directed worksheet

Week 5-9

- Review Natural Selection
    - Process of Evolution
    - Hard copy of notes to be uploaded into OneNote
- Evolution Stations: Students are placed into groups of 2 and are allowed 2 weeks to complete due to PARCC Testing
        - Clarified instructions for each station
        - Teacher observation and provided individualized assistance when needed
        - List of Evolution Stations below:
            - 1. Evidence of Evolution
                - Common Ancestry
                - DNA Evidence
            - 2. Amino Acid Lab
            - 3. Homologous, Analogous,Vestigial Structures
            - 4. Embryology
            - 5. Antibiotic Resistance
            - 6. Fossil Record
- Cladograms and Phylogenetic Trees
    - Hard copy of notes
    - Telephone cladogram chart
    - Whole group discussion
    - Teacher directed analysis questions

RESOURCE CENTER BIOLOGY

Week 1-4- Natural Selection

- PowerPoint
    - Fill-in notes
    - Discussion
- Peppered Moth Webquest
    - With Partner
- Bird Modification Lab
    - Lab Questions
    - Small Groups
    - Think-Pair-Share
- Real-Life Examples
    - Natural Selection and Artificial Selection
        - Discovery project
        - Darwin's Finches
        - Darwin vs Lamarck
        - Venn Diagram

        - Think-Pair-Share
- Adaptations in a Population
    - Animal Adaptation Lab
        - Small group activity
- Antibiotic Resistance
    - PowerPoint
        - Fill-in notes
        - Discussion

Week 5-9

- Reiterate Natural Selection
    - Darwin's Finches PowerPoint
    - Process of Evolution
        - PowerPoint
            - Fill-in notes
            - Graphic organizer
    - Four Factors
        - Fill-in notes and Examples
    - Evidence of Evolution
        - Common Ancestry
        - DNA Evidence
            - PowerPoint
            - Notes and Discussion
    - Amino Acid Lab
        - Small groups
    - Homologous, Analogous,Vestigial Structures
        - Notes
        - Webquest
        - Class Discussion with Examples
    - Biogeography
        - Fill-in notes
        - Graphic organizer of real life examples
        - Class discussion
    - Fossil Record
        - Fossil Record Lab
            - Small Groups

AP Biology follows a separate set of standards set forth by College Board.
This Curriculum Unit would correlate with AP Units 7, whose standards are identified here:

UNIT AT A GLANCE

Enduring Understanding	Topic	Suggested Skill	Class Periods ~20–23 CLASS PERIODS
EVO-1	7.1 Introduction to Natural Selection	2.A Describe characteristics of a biological concept, process, or model represented visually.	
EVO-1	7.2 Natural Selection	1.B Explain biological concepts and/or processes.	
EVO-1	7.3 Artificial Selection	4.B.a Describe data from a table or graph, including describing relationships between variables.	
EVO-1	7.4 Population Genetics	3.B State the null and alternative hypotheses, or predict the results of an experiment.	
EVO-1	7.5 Hardy-Weinberg Equilibrium	2.A.a Perform mathematical calculations, including mathematical equations in the curriculum. 1.C Explain biological concepts, processes, and/or models in applied contexts.	
EVO-1 EVO-2	7.6 Evidence of Evolution	4.B.a Describe data from a table or graph, including identifying specific data points.	
EVO-2	7.7 Common Ancestry	6.A.b Predict the causes or effects of a change in, or disruption to, one or more components in a biological system based on a visual representation of a biological concept, process, or model.	

continued on next page

UNIT AT A GLANCE *(cont'd)*

Enduring Understanding	Topic	Suggested Skill	Class Periods ~20–23 CLASS PERIODS
EVO-3	7.8 Continuing Evolution	3.A.4 Propose a new/next investigation based on an evaluation of the evidence from an experiment.	
	7.9 Phylogeny	2.B.1 Represent relationships within biological models, including flowcharts.	
	7.10 Speciation	3.A.4 Predict the causes or effects of a change in, or disruption to, one or more components in a biological system based on biological concepts or processes. 2.B.1 Explain relationships between different characteristics of biological concepts, processes, or models represented visually in theoretical contexts.	
	7.11 Extinction	3.E.1 State the null and alternative hypotheses, or predict the results of an experiment.	
SYI-3	7.12 Variations in Populations	6.4 Provide reasoning to justify a claim by connecting evidence to biological theories.	
	7.13 Origin of Life on Earth	3.E.1 State the null and alternative hypotheses, or predict the results of an experiment.	
	Go to AP Classroom to assign the **Personal Progress Check** for Unit 7. Review the results in class to identify and address any student misunderstandings.		

AP Biology Daily Lessons would be as follows:

Day	Chapter	Pages	Content Area/Topic	Formative/Summative Assessments
114	19	366-371	Discussion: Lines of Common Descent	*Animated Tutorial 19.1,*
115	20	389-392	Discussion/Activity: Endosymbiosis	*Animated Tutorial 20.1,* video/flipbook/claymation
116	21	411-420	Discussion/Lab: Plant Adaptations	Lab Questions, Free Response Question(s)
117	21	420-426	Lab: Plants and Seeds	Lab Questions
118	21	426-436	Lab: Flowers, Fruits, and Reproduction	*Web Activity 21.5, Animated Tutorial 21.3*
119	23	457-461	Discussion: Animal Body Plans	*Working with Data 23.1, Web Activity 23.1-23.3,*
120	23	490-503	Discussion: Vertebrate Diversification on Land	*Web Activity 23.4,* Amniotic Egg Analysis
121	23	490-503	Activity: Transition to Land	Activity Questions or product
122	24	504-520	Discussion: Plant Structure and Function	*Web Activities 24.1-24.5,* labeling activity,
123	24	504-520	Lab: Plant Structure and Function	Lab Analysis
124 125	25	521-538	Discussion/Lab: Plant Nutrition and Transport	*Animated Tutorial 25.1-25.3, Working with Data 25.1, Interactive Tutorial 25.1, Web Activity 25.1*
126 127 128 129	25	521-538	AP Lab #11: Transpiration	Assessments can include question sets that you assign for homework, collaborative activities, and interactive online simulations

Unit 4: ECOLOGY: MATTER, ENERGY, & INTERDEPENDENT RELATIONSHIPS

Content Area: **Science**
Course(s): **CP BIOLOGY, HON BIOLOGY, BIOLOGY**
Time Period: **Marking Period 3**
Length: **6 weeks**
Status: **Published**

Standards and Phenomena

Science Standards

SCI.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.
SCI.HS-LS1-5	Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.
SCI.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.
SCI.HS-LS2-4	Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.

Phenomena

Science and Engineering Practices

Planning and Carrying Out Investigations

Constructing Explanations and Designing Solutions

Obtaining, Evaluating, and Communicating Information

Developing and Using Models

Using Mathematics and Computational Thinking

Asking Questions and Defining Problems

Engaging in Argument from Evidence

Analyzing and Interpreting Data

Disciplinary Core Ideas

SCI.HS-LS2	Ecosystems: Interactions, Energy, and Dynamics
SCI.HS-LS1	From Molecules to Organisms: Structures and Processes

Crosscutting Concepts

Cause and Effect

Systems and System Models

Energy and Matter

Patterns

Scale, Proportion, and Quantity

Structure and Function

Stability and Change

Transfer Goals, Life Literacy/Key Skills and Social Emotional Learning

Transfer Goals

Photosynthesis and cellular respiration contribute to the cycling of matter through and ecosystem. Both processes are a biochemical pathway with the products of one being the reactants of the other. Energy flows through trophic levels of an ecosystem and is lost between levels. These trophic levels and energy exchange can be illustrated through models: such as food webs and chains. Due to the change in environmental resources and pressures, populations can be more or less successful leading to changes in the overall gene pool.

Life Literacy and Key Skills

-

TECH.9.4.12.CI	Creativity and Innovation
TECH.9.4.12.CT	Critical Thinking and Problem-solving
TECH.9.4.12.DC	Digital Citizenship
TECH.9.4.12.TL	Technology Literacy
TECH.9.4.12.GCA	Global and Cultural Awareness
TECH.9.4.12.IML	Information and Media Literacy

Social Emotional Learning Standards

HE.9-12.2.1.12.EH.1	Recognize one's personal traits, strengths, and limitations and identify how to develop skills to support a healthy lifestyle.
HE.9-12.2.1.12.EH.3	Describe strategies to appropriately respond to stressors in a variety of situations (e.g., academics, relationships, shootings, death, car accidents, illness).
HE.9-12.2.1.12.EH.4	Analyze and adapt mental and emotional health messages and communication techniques to peers and other specific target audience (e.g., dimensions of health).
HE.9-12.2.1.12.CHSS.7	Describe how individuals and local, state, and global advocacy organizations can collaborate to address common local and global health and social issues (e.g., hunger, clean water, organ/tissue donation).
HE.9-12.2.1.12.CHSS.8	Investigate how local, state, and global agencies are addressing health issues caused by climate change and share this information in an appropriate setting.

Concepts

Essential Questions

- How can the process of photosynthesis and cellular respiration impact all of Earth's systems?
- How do behaviors of organisms affect the stability of an ecosystem?
- How do matter and energy cycle through ecosystems?
- How do organisms obtain and use energy they need to live and grow?

Understandings

Species behavior influences the chance of survival and reproduction

Species can adapt to changes in the environment

Biological molecules are recycled within ecosystems

Energy flows through trophic levels in an ecosystem

Critical Knowledge and Skills

Knowledge

Students will know:

- Photosynthesis is the process plants utilize in order to change light energy into chemical energy
- Photosynthesis and cellular respiration are processes that contribute to the cycling of molecules through the biosphere, atmosphere, hydrosphere, and geosphere
- Cellular respiration is the process both plants and animals utilize in order to break down chemical energy into mechanical energy
- Energy is transferred between organisms through trophic levels which can be illustrated through food webs and food chains
- The 10% rule and energy loss/gain through trophic levels
- Ecosystems have carrying capacities that can limit the number of organisms in a population
- Changing natural resources in an environment can influence changes in the populations in an area

Skills

Students will be able to:

- Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy
- Construct and revise an explanation based on evidence for the cycling of matter and flow of energy
- Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem
- Develop a model to illustrate the role of photosynthesis, cellular respiration, and the cycling of carbon among the biosphere, atmosphere, hydrosphere and geosphere
- Illustrate how interactions among living systems and with their environment result in the movement of matter and energy
- Graph real or simulated populations and analyze the trends to understand consumption patterns and resource availability, and make predictions as to what will happen to the population in the future
- Provide evidence that the growth of populations are limited by access to resources and how selective pressures may reduce the number of organisms or eliminate whole populations
- Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales
- Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales
- Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintains relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem

Assessment and Resources

School Formative Assessment Plan (Other Evidence)

- Quizzes
- Labs
- Classwork
- Homework
- Projects
- Do Nows
- Performance Tasks
    - Photosynthesis Spinach Lab
    - Cell Respiration Lab
    - Biogeochemical Cycles Poster Project
    - Leaf Litter Lab
    - Elks in Yellowstone Activity
    - Create a Terrarium
    - Carrot Rot Lab
    - Create your Own Food Web
    - What's for Dinner? Packet

School Summative Assessment Pan

To measure mastery of concepts and a collection of units the following will be administered per the discretion of the teacher:

- ***Unit Tests***
- ***Weekly Quizzes***

To show mastery of the concepts within multiple units from the beginning of the year to the end of the year, the following will be administered to the students across all levels within the biology curriculum:

- ***Midterm and Final Assessment***

These summative assessments encompass multiple standards covered throughout the year. Students will need to illustrate the knowledge they have gained throughout the school year through analytical questions and performance tasks.

Primary Resources

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Supplementary Resources

Additional outside Resources:

- Khan Academy
- Biomanbio- Online Supplements/Games
- Amoeba Sisters Online Videos
- Concord Consortium Online Supplements
- Bozeman Science Online Videos

Technology Integration and Differentiated Instruction

Technology Integration

- **Google Products**
    - Google Classroom - Used for daily interactions with the students covering a vast majority of different educational resources (Daily Notes, Exit Tickets, Classroom Polls, Quick Checks, Additional Resources/ Support, Homework, etc.)
    - GAFE (Google Apps For Education) - Using various programs connected with Google to collaborate within the district, co-teachers, grade level partner teacher, and with students to stay connected with the content that is covered within the topic. Used to collect data in real time and see results upon completion of the assignments to allow for 21st century learning.

- **One to One Student's laptop**
    - All students within the West Deptford School District are given a computer, allowing for 21st century learning to occur within every lesson/topic.

- **Additional Support**
    - **Pearson REALIZE platform online Biology textbook (Miller & Levine)**
        - **Interactivity**
        - **Interactive Labs**
        - **Online Text**
        - **Science Skill Practice**
        - **Assessments**
            - **Formative and Summative**

Differentiated Instruction

Gifted Students (N.J.A.C.6A:8-3.1)

❑ Within each lesson, the Gifted Students are given choice on topic and subject matter allowing them to explore interests appropriate to their abilities, areas of interest and other courses.

English Language Learners (N.J.A.C.6A:15)

❑ Within each lesson, the English Language Learners are given choice of topic and resources so that their materials are within their ability to grasp the language.

❑ All assignments have been created in the student's native language.

❑ Work with ELL Teacher to allow for all assignments to be completed with extra time.

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All other IEP modifications will be honored (ie. hard copies of notes, directions restated, etc.)

Interdisciplinary Connections

Interdisciplinary Connections****

Math	Science	ELA
MA.9-12.N-Q.A.1		LA.11-12.CCSS.ELA-Literacy.WHST.9-10.7

MA.9-12.N-Q.A.2

-Use a mathematical model to describe the cycling of matter and flow of energy among organisms in an ecosystem. Identify important quantities in the cycling of matter and flow of energy among organisms in an ecosystem and map their relationships using tools. Analyze those relationships mathematically to draw conclusions, reflecting on the results and improving the model if it has not served its purpose.

-Represent the factors that affect carrying capacity of ecosystems at different scales symbolically and manipulate the representing symbols. Make sense of quantities and relationships between different factors that affect carrying capacity of ecosystems at different scales.

-Use units as a way to understand factors that affect biodiversity and populations in ecosystems.

-Represent data relating to complex interactions in ecosystems and their effects on stability and change in ecosystems with plots on the real number line graph.

LA.11-12.CCSS.ELA-Literacy.WHST.11-12.7

LA. 11-12 CCSS.ELA-Literacy.WHST.11-12.8

-Develop and write an explanation, based on evidence, for the cycling of matter and flow of energy in aerobic and anaerobic conditions by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples.

-Cite specific textual evidence to support analysis of science and technical texts supporting explanations of factors that affect carrying capacity of ecosystems at different scales, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

-Assess the extent to which the claim that complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem, is supported by reasoning and evidence.

-Integrate and evaluate multiple sources of information presented in diverse formats and media in order to address claims that complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.

Fine Arts/ Performing Arts

World Languages

Students will learn that the prefix "a-" in front of many scientific terms will mean the opposite of

Applied Technology

	the root word it's attached to. For instance, "abiotic" means "non-living" whereas "biotic" means "living". Students will also learn the root word "vore" to mean "eats" as in herbivore, carnivore, and omnivore. Students will also learn the root word "troph" means "feeds" and be able to apply that word in "autotroph", "heterotroph", and trophic levels.	
Social Studies	Careers	Global Awareness

• Discussion of ecosystems across the globe
  ○ Discussion of food chains and food webs in different ecosystems
	Example:
	• Students work in collaborative groups through
	  ○ In-class activities
	  ○ Labs
	  ○ Projects
	• Through collaborative research, students will understand that individual contribution is imperative to group success
	• Understanding is demonstrated through in-class discussion, formative assessments, and summative assessments
	• Students are expected to apply appropriate academic and technical skills through research
		Example: Students can learn how humans do not have to be omnivores but instead strict herbivores, changing their placement on the trophic level cascade. This is the case for many humans that are from cultures around the world that do not consume meat.
		
		(Addresses Framework for 21st Century Learning Standards found at http://www.p21.org/about-us/p21-framework/256)

using technology in and
out of the classroom

Learning Plan / Pacing Guide

Honors Biology

Week 1- Photosynthesis

- Lecture
  - Notes provided
- Photosynthesis Diagram
  - Completed as a class
  - Quizzed on diagram later in the week
- Photosynthesis Webquest
- Photosynthesis Spinach Leaf Lab
  - Lab report completed in lab notebook
- Photosynthesis Quiz (On LINKIT!)
  - Word bank not provided

Week 2- Cellular Respiration

- Lecture
  - Notes provided
- Cellular Respiration Diagram
  - Completed as a class
  - Diagram is referenced throughout the week to aid in visualization of the process
- Cellular Respiration Clothespin lab
  - Lab Report to be completed in lab notebook
- Cellular Respiration Quiz (On LINKIT!)
  - Word bank not provided

Week 3- Biogeochemical Cycles

- Carbon Dioxide/Oxygen Cycle
  - Diagram done individually
- Nitrogen Cycle Activity

    - Students will need to relate the nitrogen cycle to subjects we have discussed in the past
        - DNA
        - Protein Synthesis
        - Body Systems (Urinary)
    - We will review activity after completion

Week 4-6- Energy Transfer

- Ecology Vocabulary
- Lecture
    - Notes provided
- Food Chains and Food Webs Worksheet
    - Will be completed as homework
    - Reviewed in class
- Energy Transfer between trophic levels in-class discussion
- Carrying Capacity Lab
    - Lab Reports completed in lab notebook

CP Biology

Week 1- Photosynthesis

- Notes and Class Discussion
    - Fill in notes
    - "Dino" Demonstration
- Drawing Graphic Organizer
    - Class Discussion
- Spinach Leaf Lab
    - Lab Analysis Questions
    - Small Groups
- Virtual Color Spectrum Lab
    - Think-Pair-Share
- Review Lab Stations
    - Analysis Questions
    - One Partner

Week 2- Cell Respiration

- Notes and Class Discussion
    - Fill in notes
- Muscle Fatigue Lab
    - Work in pairs
- Review Lab Stations
    - Analysis Questions
    - One Partner

Week 3- Biogeochemical Cycles

- Student Research Poster Project
    - Four cycles
        - Nitrogen
        - Hydrogen
        - Phosphorous
        - Carbon
    - Interaction of cycles with one another
    - Interaction of cycles with the spheres
    - Analysis Questions

Week 4-6- Energy Transfer

- Lecture
    - Guided Notes
- Food Webs and Food Chains
    - Review Worksheets
    - Think-Pair-Share
- Energy Transfer between trophic levels in-class discussion
- Carrying Capacity Lab
    - Small Groups

CP ICR Biology

Weeks 1-2- Photosynthesis

- Powerpoint presentation (whole group discussion)
- Spinach Leaf Disk Lab: Students were able to observe photosynthesis by placing small disks of spinach in water. A heat lamp was placed over the beakers (filled with water and spinach) and the students watch these disks rise to to the top as oxygen is being released.
    - Hard copy of instructions
    - Teacher guided
    - Small groups
    - Clarified instructions
    - Modified analytical questions
    - Frequent checks for understanding
    - "Skittles as Atoms" Representation of Photosynthesis & Cell Respiration Activity
        - Teacher guided
        - Small groups
        - Clarified instructions
        - Modified analytical questions
        - Frequent checks for understanding
- Weeks 3-4- Cell Respiration
    - Power Point presentation (whole group discussion)
    - "Skittles as Atoms" Representation of Photosynthesis & Cell Respiration Activity
    - Fermentation using Yeast and varying sugar concentrations
        - Teacher guided
        - Small groups
        - Clarified instructions
        - Modified analytical questions
        - Frequent checks for understanding
    - Heart Rate lab: Students undergo certain cardiovascular exercises per minute. Students chart their heart rate after each exercise.
        - Microsoft Excel
        - Small group
        - Teacher guided
        - Modified analytical questions

Week 5-7- Energy Transfer

10% Rule

- Hard copy of notes to be uploaded into OneNote

FoodWeb/Food chain project

Introduction to Food chains/food web (hard copy of notes provided)

- Model of expectations
- Grading Rubrics
- Use of technology for research and presentations
- Frequent checks of understanding of expectations

RC Biology

Week 1- Photosynthesis

- PowerPoint
    - Fill-in notes
    - Discussion
- Word Search - Vocabulary words
- Interactivity
- Quizizz
- Web-Quest
    - With Partner
- Spinach Leaf Lab
    - Lab Questions
    - Small Groups
    - Think-Pair-Share
- Review Lab Stations
    - Analysis Questions
    - One Partner

Week 2- Cell Respiration

- PowerPoint
    - Fill-in notes

    - Discussion
- Word Search - Vocabulary words
- Interactivity
- Quizizz
- Web-Quest
    - With Partner
- Muscle Fatigue Lab
    - Lab Questions
    - Small Groups
    - Think-Pair-Share

Week 3- Biogeochemical Cycles

- PowerPoint
    - Fill-in notes
    - Discussion
- Word Search - Vocabulary words
- Web-Quest
    - With Partner
- Student Research Poster Project
    - Four cycles
    - Interaction of cycles with one another
    - Analysis Questions

Week 4-6- Energy Transfer

- PowerPoint
    - Fill-in notes
    - Discussion
- Word Search - Vocabulary words
- Web-Quest
    - With Partner
- Food Web Lab
    - Lab Questions
    - Food web project
    - Small Groups
    - Think-Pair-Share
- Review Worksheets
    - Think-Pair-Share
- Carrying Capacity Lab
    - Lab Questions
    - Small Groups
    - Think-Pair-Share

AP Biology follows a separate set of standards set forth by College Board.
This Curriculum Unit would correlate with AP Units 3 and 8, whose standards are identified here:

UNIT 3

Cellular Energetics

UNIT AT A GLANCE

Enduring Understanding	Topic	Suggested Skill	Class Periods ~14–17 CLASS PERIODS
ENE-1	3.1 Enzyme Structure	1.B Explain biological concepts and/or processes.	
	3.2 Enzyme Catalysis	3.C-1 Identify experimental procedures that are aligned to the question, including identifying appropriate controls. 3.C-2 Identify experimental procedures that are aligned to the question, including justifying appropriate controls.	
	3.3 Environmental Impacts on Enzyme Function	3.A-2 Predict the causes or effects of a change in, or disruption to, one or more components in a biological system based on data.	
	3.4 Cellular Energy	6.C Provide reasoning to justify a claim by connecting evidence to biological theories.	
	3.5 Photosynthesis	6.B Support a claim with evidence from biological principles, concepts, processes, and/or data.	
	3.6 Cellular Respiration	4.A Construct a graph, plot, or chart.	
SYI-3	3.7 Fitness	6.C Provide reasoning to justify a claim by connecting evidence to biological theories.	

Go to AP Classroom to assign the **Personal Progress Check** for Unit 3. Review the results in class to identify and address any student misunderstandings.

UNIT 8

Ecology

UNIT AT A GLANCE

Enduring Understanding	Topic	Suggested Skill	Class Periods ~18–21 CLASS PERIODS
ENE-3, IST-5	8.1 Responses to the Environment	3.C.a Identify experimental procedures that are aligned to the question, including identifying dependent and independent variables.	
ENE-1	8.2 Energy Flow Through Ecosystems	6.D Explain the relationship between experimental results and larger biological concepts, processes, or theories.	
SYI-1	8.3 Population Ecology	4.A Construct a graph, plot, or chart.	
	8.4 Effect of Density of Populations	5.A.a Perform mathematical calculations, including rates.	
ENE-4	8.5 Community Ecology	5.B Use confidence intervals and/or error bars (both determined using standard errors) to determine whether sample means are statistically different.	
SYI-3	8.6 Biodiversity	6.E.a Predict the causes or effects of a change in, or disruption to, one or more components in a biological system based on data.	
EVO-1, SYI-2	8.7 Disruptions to Ecosystems	5.D.a Use data to evaluate a hypothesis (or prediction), including rejecting or failing to reject the null hypothesis. 5.D.b Use data to evaluate a hypothesis (or prediction), including supporting or refuting the alternative hypothesis.	
	Go to AP Classroom to assign the **Personal Progress Check** for Unit 8. Review the results in class to identify and address any student misunderstandings.		

AP Daily Lessons will be as follows:

41	6	101-105	Discussion: ATP and Chemiosmosis	*Web Activity 6.1, Animated Tutorial 6.1,* Free Response Question(s)
42 43	6	106-113	Discussion: Cellular Respiration	*Web Activities 6.2-6.6,* Free Response Question(s)
44 45 46 47	6	106-113	AP Lab #6: Cellular Respiration	Assessments can include question sets that you assign for homework, collaborative activities, and interactive online simulations
48 49	6	113-120	Discussion: Photosynthesis – Light Dependent and Independent Reactions	*Animated Tutorials 6.3-6.5, Web Activity 6.,* Free Response Question(s)

Day	Chapter	Pages	Content Area/Topic	Formative/Summative Assessments
50 51 52 53	6	113-120	AP Lab #5: Photosynthesis	Assessments can include question sets that you assign for homework, collaborative activities, and interactive online simulations
54	6	101-120	Review: Photosynthesis and Respiration	
55	**Test: Photosynthesis and Respiration**			
156	34-40	673-798	Evolution Discussion: Human Systems	
157	41	814-819	Discussion: Social Behaviors	*Animated Tutorials 41.1-41.4, Interactive Tutorial 41.1, Web Activities 41.1-41.2*
158 159 160 161	41	814-819	AP Lab #12: Fruit Fly Behavior	Assessments can include question sets that you assign for homework, collaborative activities, and interactive online simulations
162	41	804-804	Discussion: Development of Social Behaviors	Skits, animations, questions
163	42	823-841	Discussion: Organisms and their Environments	*Animated Tutorial 42.2, Web Activity 42.1*
164 165	43	843-858	Discussion: Population Ecology	*Web Activity 43.1, Animated Tutorials 43.1-43.4, Working with Data 43.1*
166 167	44	860-872	Discussion: Ecology and Evolution	*Animated Tutorial 44.1, Web Activity 44.1*
168 169	45	873-891	Discussion: Community Ecology	*Animated Tutorials 45.1-45.3, Web Activities 45.1-45.2, Working with Data 45.1*
170 171 172 173	42-45	823-891	AP Lab #10: Energy Dynamics	Assessments can include question sets that you assign for homework, collaborative activities, and interactive online simulations
174	46	896-901	Discussion: Biogeochemical Cycles	*Animated Tutorials 46.1-46.4*
175	46	905-907	Discussion: Climate Change	*Web Activities 46.1-46.2*

Unit 5: HUMAN INTERACTIONS

Content Area: **Science**
Course(s): **CP BIOLOGY, HON BIOLOGY, BIOLOGY**
Time Period: **Marking Period 4**
Length: **6 weeks**
Status: **Published**

Standards and Phenomena

Science Standards

SCI.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.
SCI.HS-LS2-1	Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
SCI.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.

Phenomena

Science and Engineering Practices

Planning and Carrying Out Investigations

Constructing Explanations and Designing Solutions

Obtaining, Evaluating, and Communicating Information

Developing and Using Models

Using Mathematics and Computational Thinking

Asking Questions and Defining Problems

Engaging in Argument from Evidence

Analyzing and Interpreting Data

Disciplinary Core Ideas

SCI.HS-LS2	Ecosystems: Interactions, Energy, and Dynamics

Crosscutting Concepts

Cause and Effect

Systems and System Models

Energy and Matter

Patterns

Scale, Proportion, and Quantity

Structure and Function

Stability and Change

Transfer Goals, Life Literacy/Key Skills and Social Emotional Learning

Transfer Goals

Biodiversity is important to the livelihood of animals and humans alike. Stability in an ecosystem can be disrupted by natural and human interactions.

Life Literacy and Key Skills

-

TECH.9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
TECH.9.4.12.CI.3	Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1).
TECH.9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).
TECH.9.4.12.DC.6	Select information to post online that positively impacts personal image and future college and career opportunities.
TECH.9.4.12.GCA.1	Collaborate with individuals to analyze a variety of potential solutions to climate change effects and determine why some solutions (e.g., political. economic, cultural) may work better than others (e.g., SL.11-12.1., HS-ETS1-1, HS-ETS1-2, HS-ETS1-4, 6.3.12.GeoGI.1, 7.1.IH.IPERS.6, 7.1.IL.IPERS.7, 8.2.12.ETW.3).
TECH.9.4.12.IML.2	Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources (e.g., NJSLSA.W8, Social Studies Practice: Gathering and Evaluating Sources.

Social Emotional Learning

HE.9-12.2.1.12.EH.1	Recognize one's personal traits, strengths, and limitations and identify how to develop skills to support a healthy lifestyle.
HE.9-12.2.1.12.EH.3	Describe strategies to appropriately respond to stressors in a variety of situations (e.g., academics, relationships, shootings, death, car accidents, illness).
HE.9-12.2.1.12.EH.4	Analyze and adapt mental and emotional health messages and communication techniques to peers and other specific target audience (e.g., dimensions of health).
HE.9-12.2.1.12.CHSS.7	Describe how individuals and local, state, and global advocacy organizations can collaborate to address common local and global health and social issues (e.g., hunger, clean water, organ/tissue donation).
HE.9-12.2.1.12.CHSS.8	Investigate how local, state, and global agencies are addressing health issues caused by climate change and share this information in an appropriate setting.

Concepts

Essential Questions

- Does reducing human impacts on our global life support system require social engineering or mechanical engineering?
- How and why do humans interact with their environment and what are the effects of these interactions?
- How can the impacts of human activities on natural systems be reduced?
- How do human activities influence the global ecosystem?
- How do humans depend on Earth's resources?
- How might we change habits if we replaced the word "environment" with the word "life support system"?
- Is the damage done to our global life support system permanent? Why or why not?
- What are the relationships among Earth's systems and how are those relationships being modified due to human activity?
- What is the current rate of global or regional climate change and what are the associated future impacts to Earth's systems?

Understandings

Humans have an impact on the environment and biodiversity

Critical Knowledge and Skills

Knowledge

Students will know:

- Examples of key natural resources
- Human activities that affect the relationship among Earth's systems
- Technological solutions that reduce impacts of human activities on natural systems
- Relationships between management of natural resources, sustainability of human populations, and biodiversity
- Anthropogenic changes to the environment including habitat destruction, pollution, introduction of invasive species, overexploitation, and climate change
- Definition of overexploitation
- Sustaining biodiversity
- New technologies that have deep impacts on society and the environment
- Benefits provided by biodiversity
- Costs and benefits of critical decisions about technology
- Definition of Biodiversity
- Past, present, and future forecasts of the current rate of global/regional climate change and possible impacts to Earth's systems
- The relationships among Earth's systems
- Types of natural hazards

Skills

Students will be able to:

- Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants
- 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's systems
- Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity
- Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity
- Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity
- Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering
- Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity
- Evaluate a solution to a complex real-world problem based on prioritized criteria and tradeoffs that account for a range of constraints including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
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account for a range of constraints including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
- Evaluate or refine a technological solution that reduces impacts of human activities on natural systems
- Use a computational representation to illustrate the relationships among Earth's systems and how those relationships are being modified due to human activity
- Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem

Assessment and Resources

School Formative Assessment Plan (Other Evidence)

- Quizzes
- Labs
- Classwork
- Homework
- Projects
- Do Nows
- Performance Tasks
    - Human Impact Essay
    - Human Impact Project
    - Carbon Footprint Activity
    - Species Conservation Activity

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Interdisciplinary Connections****

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MA.9-12.N-Q.A.3		LA.11-12.CCSS.ELA-Literacy.RST.11-12.
MA.9-12.S-IC.A.1		LA.11-12.CCSS.ELA-Literacy.RST.11-12.8
MA.9-12.S-ID.A.1		LA.11-12.CCSS.ELA-Literacy.WHST.11-12.2
-Choose and interpret the scale and the origin in graphs and data displays representing relationships between availability of natural resources, occurrence of natural hazards, and changes in climate and their influence on human activity.		-Use empirical evidence to write an explanation for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
-Represent symbolically the relationships among Earth systems and how these relationships are being modified due to human activity, and manipulate the representing symbols. Make sense of quantities and relationships between Earth systems and human activity.		-Determine and clearly state results from data on global climate models and associated impacts to Earth systems by paraphrasing them in simpler but still accurate terms.
-Define appropriate quantities for the purpose of descriptive modeling of the impacts of human activities		-Cite specific textual evidence to support a technological solution that reduces the impacts of human activities on natural systems, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
		-Conduct short as well as more sustained

on natural systems.

research projects to determine the impacts of human activity on biodiversity and how to mitigate these impacts.

-Represent symbolically the impacts of human activities on the environment and biodiversity, and manipulate the representing symbols. Make sense of quantities and relationships of the impacts of human activities on the environment and biodiversity.

-Synthesize information from a range of sources into a coherent understanding of the impacts of human activities on biodiversity and how to mitigate these impacts.

Social Studies

- Carbon Levels and human population are directly related from looking at the past and present
- Observation of species numbers declining due to human population rising
- Climate Change Laws
- Endangered Species Laws

Careers

Example:

- Students work in collaborative groups through
  - In-class activities
  - Labs
  - Projects
- Through collaborative research, students will understand that individual contribution is imperative to group success
- Understanding is demonstrated through in-class discussion, formative assessments, and summative assessments
- Students are expected to apply appropriate academic and technical skills through research using technology in and out of the classroom
- Students develop solutions to climate change
  - The class discusses natural resources and alternative energy

Global Awareness

Example: Students will compare sustainable energy alternatives that are explored by other countries to the energy resources provided by the United States.

Students will understand the impact of the Paris Climate Agreement.

Students will analyze the impact of energy sources on political sanctions and conflict between countries.

(Addresses Framework for 21st Century Learning Standards found at http://www.p21.org/about-us/p21-framework/256)

sources to aid in combating carbon emissions

- The class discusses how humans directly affect climate change through deforestation, burning fossil fuels, overpopulation, and promotion of monoculture

Learning Plan / Pacing Guide

AP Biology follows a separate set of standards set forth by College Board.

Honors Biology

Week 1-3-Human Activity Causing Disruptions (Human Impact Projects & Gallery Walk/Presentations)

- Human Impact Project
  - Lab partner
  - Rubric Provided
  - Guidelines with dates provided
- Carbon Footprint Project
  - Short-term Action Plan
  - Presentation
  - Rubric
  - Guidelines with dates provided
- Essay
  - Connections to human impact
  - Graphic organizer
  - Essay assigned for homework

Week 4- Environmental Issues

- Lecture and Notes on Environmental Issues
    - Ozone thinning
    - Global Warming
    - Acid Precipitation
    - Land/Water Pollution
    - Ecosystem Destruction
        - Graphic Organizer
        - Guided Notes
        - In-class discussion

Week 5-6 Possible Solutions

- Lecture and Notes on Solutions
    - Saving one species at a time
    - Captive breeding programs
    - Preserving genetic material
    - Zoos, aquariums, parks & gardens
    - Why solutions will not work
        - Graphic Organizer
        - Guided Notes
        - Think-pair-share
        - In-class discussion
- Conservation Strategies, legal protections/acts
    - Student Research
    - Conservation Species Activity
        - Rubric
        - Partner
        - Students will research for homework

C.P Biology

Week 1-3-Human Activity Causing Disruptions (Human Impact Projects & Gallery Walk/Presentations)

- Human impact Project
    - Lab partner
    - Rubric Provided
    - Guidelines with dates provided
- Carbon footprint Project
    - Think-pair-share
    - 10 Day organizer
    - Short-term Action Plan
    - Presentation
    - Rubric
    - Guidelines with dates provided
- Essay
    - Connections to human impact
    - Graphic organizer

Week 4- Environmental Issues

- Lecture and Notes on Environmental Issues
    - Ozone thinning
    - Global Warming
    - Acid Precipitation
    - Land/Water Pollution
    - Ecosystem Destruction
        - Graphic Organizer
        - Guided Notes

Week 5-6 Possible Solutions

- Lecture and Notes on Solutions
    - Saving one species at a time
    - Captive breeding programs
    - Preserving genetic material
    - Zoos, aquariums, parks & gardens
    - Why solutions will not work
        - Graphic Organizer
        - Guided Notes
        - Think-pair-share

- Conservation Strategies, legal protections/acts
    - Student Research
    - Conservation Species Activity
        - Rubric
        - Partner

ICR CP. Biology

Week 1-4-Human Activity Causing Disruptions (Human Impact Projects & Gallery Walk/Presentations)

- Human impact Project (Students work in groups, choose a human impact, explain the how where and when of this impact, explain how to remedy these human impact and relate this to real life understandings: laws, environmental groups, activists, etc)
    - Clear concise expectations
    - Lab partners (or at the teacher's discretion)
    - Rubric Provided
    - Guidelines with dates provided
    - Teacher guided
- Carbon footprint Project (students identify how their lifestyle alters the concentration of carbon emissions on the earth through use of fossil fuels, recycling, etc)
    - Think-pair-share
    - Graphic organizer
    - 10 Day organizer provided by the teacher
    - Short-term Action Plan with guidelines and clear/concise instructions
    - Presentation Online or student present to class
    - Grading Rubric provided
    - Guidelines with dates
- Week 5: Modified Essay (broken down by concepts for each paragraph)
    - Connections to human impact
    - Teacher guided/individualized
    - Frequent checks for understanding
    - Graphic organizer

RESOURCE CENTER BIOLOGY

Week 1 - 4 Human Activity

- Causing Disruptions
    - Human Impact Projects
    - Gallery Walk / Presentations
- Human Impact Project
    - Small Groups
        - Select a human impact
        - Explain the how, where and when of this impact
        - Explain how to remedy these human impacts
- Human Impact Lab
    - Partner Lab
    - Rubric Provided
    - Lab Questions
    - Teacher guided
- Carbon footprint Project
    - Students identify how their lifestyle alters the concentration of carbon emissions on Earth
    - Think-pair-share
    - Graphic organizer
    - Student Presentations
    - Extended time
- Essay
    - Connections to human impact
    - Teacher guided
    - Graphic organizer
    - Extended time

AP Biology follows a separate set of standards set forth by College Board.
This Curriculum Unit would correlate with AP Unit 8, whose standards are identified here:

UNIT 8 Ecology

UNIT AT A GLANCE

Enduring Understanding	Topic	Suggested Skill	Class Periods ~18–21 CLASS PERIODS
ENE-3, IST-5	8.1 Responses to the Environment	3.C.a Identify experimental procedures that are aligned to the question, including identifying dependent and independent variables.	
ENE-1	8.2 Energy Flow Through Ecosystems	6.D Explain the relationship between experimental results and larger biological concepts, processes, or theories.	
SYI-1	8.3 Population Ecology	4.A Construct a graph, plot, or chart.	
	8.4 Effect of Density of Populations	5.A.a Perform mathematical calculations, including rates.	
ENE-4	8.5 Community Ecology	5.B Use confidence intervals and/or error bars (both determined using standard errors) to determine whether sample means are statistically different.	
SYI-3	8.6 Biodiversity	6.E.a Predict the causes or effects of a change in, or disruption to, one or more components in a biological system based on data.	
EVO-1, SYI-2	8.7 Disruptions to Ecosystems	5.D.a Use data to evaluate a hypothesis (or prediction), including rejecting or failing to reject the null hypothesis. 5.D.b Use data to evaluate a hypothesis (or prediction), including supporting or refuting the alternative hypothesis.	
	Go to AP Classroom to assign the **Personal Progress Check** for Unit 8. Review the results in class to identify and address any student misunderstandings.		

AP Daily Lessons would be as follows:

156	34-40	673-798	Evolution Discussion: Human Systems	
157	41	814-819	Discussion: Social Behaviors	*Animated Tutorials 41.1-41.4, Interactive Tutorial 41.1, Web Activities 41.1-41.2*
158 159 160 161	41	814-819	AP Lab #12: Fruit Fly Behavior	Assessments can include question sets that you assign for homework, collaborative activities, and interactive online simulations
162	41	804-804	Discussion: Development of Social Behaviors	Skits, animations, questions
163	42	823-841	Discussion: Organisms and their Environments	*Animated Tutorial 42.2, Web Activity 42.1*
164 165	43	843-858	Discussion: Population Ecology	*Web Activity 43.1, Animated Tutorials 43.1-43.4, Working with Data 43.1*
166 167	44	860-872	Discussion: Ecology and Evolution	*Animated Tutorial 44.1, Web Activity 44.1*
168 169	45	873-891	Discussion: Community Ecology	*Animated Tutorials 45.1-45.3, Web Activities 45.1-45.2, Working with Data 45.1*
170 171 172 173	42-45	823-891	AP Lab #10: Energy Dynamics	Assessments can include question sets that you assign for homework, collaborative activities, and interactive online simulations
174	46	896-901	Discussion: Biogeochemical Cycles	*Animated Tutorials 46.1-46.4*
175	46	905-907	Discussion: Climate Change	*Web Activities 46.1-46.2*

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