Kingsway Regional School District

Committed to Excellence

Course Name: Advanced Placement Biology	**Grade Level(s):** 11, 12
Department: Science	**Credits:** 1.3
BOE Adoption Date: September 2014	**Revision Date(s):**October 2019; September 2022

ABSTRACT

AP Biology is an introductory college-level biology course. Students cultivate their understanding of biology through inquiry-based investigations as they explore the following topics: evolution, cellular processes — energy and communication, genetics, information transfer, ecology, and interactions.

The course is based on four Big Ideas, which encompass core scientific principles, theories, and processes that cut across traditional boundaries and provide a broad way of thinking about living organisms and biological systems. The following are Big Ideas:

- The process of evolution explains the diversity and unity of life.
- Biological systems utilize free energy and molecular building blocks to grow, to reproduce, and to maintain dynamic homeostasis.
- Living systems store, retrieve, transmit, and respond to information essential to life processes.
- Biological systems interact, and these systems and their interactions possess complex properties.

Students establish lines of evidence and use them to develop and refine testable explanations and predictions of natural phenomena. Focusing on these disciplinary practices enables teachers to use the principles of scientific inquiry to promote a more engaging and rigorous experience for AP Biology students. Such practices require that students:

- Use representations and models to communicate scientific phenomena and solve scientific problems;

- Use mathematics appropriately;
- Engage in scientific questioning to extend thinking or to guide investigations within the context of the AP course;
- Plan and implement data collection strategies in relation to a particular scientific question;
- Perform data analysis and evaluation of evidence;
- Work with scientific explanations and theories; and
- Connect and relate knowledge across various scales, concepts, and representations in and across domains.

Twenty-five percent of instructional time is devoted to hands-on laboratory work with an emphasis on inquiry-based investigations. Investigations require students to ask questions, make observations and predictions, design experiments, analyze data, and construct arguments in a collaborative setting, where they direct and monitor their progress.

Course Title: AP Biology
Prerequisite(s): Honors Chemistry and Honors Biology

Proficiencies and Pacing:
Course Title: Advanced Placement Biology

Unit Title:	Duration/ Month(s)	Related Standards:	Learning Goals:	Topics and Skills:
Unit 1: Evolution	4 weeks Sept/Oct	**Subject Area:** ***Essential Knowledge:*** 1.A.1, 1.A.2, 1.A.3, 1.A.4, 1.B.1, 1.B.2, 1.C.1, 1.C.2, 1.C.3 ***Science Practices:*** 1.2, 2.1, 2.2, 5.3, 7.1 ***Interdisciplinary:*** **ELA Literacy:** NJSLS-RST-11-12.1 NJSLS-RST-11-12-3 NJSLS-RST-11-12-7 NJSLS-RST-11-12.8 NJSLS-RST-11-12.9 NJSLS-RST-11-12.10 NJSLS.WHST.11-12.1 NJSLS.WHST.11-12.2 NJSLS.WHST.11-12.4 NJSLS.WHST.11-12.5 NJSLS.WHST.11-12.6 NJSLS.WHST.11-12.9 NJSLS.WHST.11-12.10 **Math:** NJSLS.MP.1 NJSLS.MP.2 NJSLS.MP.4	1) The students will be able to describe how natural selection and other factors are the mechanism of evolution and design a plan to answer scientific questions regarding how organisms have changed over time using information from morphology, biochemistry, and geology. 2) The students will be able to pose scientific questions and analyze a phylogenetic tree and students will be able to create a phylogenetic tree from provided data and evidence.	1) Define natural selection and evolution. 2) List and provide examples of the evidence of evolution. 3) Explain how natural selection can lead to adaptive evolution. 4) Compare and contrast different types of natural selection. 5) Discuss the importance of genetic variation to evolution. 6) Compare and contrast various sources of genetic variation. 7) Evaluate and refine evidence based on data from many scientific disciplines that support biological evolution. 8) Construct or refine models of evolution and predict shifts in populations based on changing environmental conditions. 9) Design a plan to answer scientific questions regarding how organisms have changed over time using information from morphology, biochemistry, and geology. 10) Evaluate evidence provided by data to qualitatively and quantitatively investigate the role of natural selection in evolution. 1) Define and draw a basic cladogram or phylogenetic tree. 2) Identify and describe the three domains of life. 3) Justify the scientific claim that organisms share many conserved core processes and features that evolved and are widely distributed among organisms today. 4) Describe specific examples of conserved core biological processes and features shared by all domains or within one

Unit Title:	Duration/ Month(s)	Related Standards:	Learning Goals:	Topics and Skills:
		HSA.REI.C.6 **Career Ready Practices:** NJSLS-CLKS.1 NJSLS-CLKS.4 NJSLS-CLKS.5 **Technology:** NJSLS.8.1.12.AP.9 NJSLS.8.1.12.AP.7 NJSLS.8.1.12.EC.3 NJSLS.8.1.12.DA.1 **Career Awareness:** NJSLS.9.2.12.CAP.8	3) The students will be able to determine the causes of speciation and extinction and students will be able to describe speciation in an isolated population and connect it to change in gene frequency, change in environment, natural selection, and/or genetic drift.	domain of life, and how these shared, conserved core processes and features support the concept of common ancestry for all organisms. 5) Evaluate evidence provided by a data set in conjunction with a phylogenetic tree or a simple cladogram to determine evolutionary history and speciation. 6) Create a phylogenetic tree or simple cladogram that correctly represents evolutionary history and speciation from a provided data set. 7) Pose scientific questions about a group of organisms whose relatedness is described by a phylogenetic tree or cladogram in order to (1) identify shared characteristics, (2) make inferences about the evolutionary history of the group, and (3) identify character data that could extend or improve the phylogenetic tree. 1) Define the prezygotic and postzygotic barriers. 2) Define allopatric and sympatric speciation. 3) Differentiate between gradual and punctual equilibrium. 4) Define mass extinction. 5) Determine the factors that cause extinctions and mass extinctions to occur on Earth. 6) Analyze real or simulated populations, based on graphs or models of types of selection, to predict what will happen to the population in the future. 7) Describe speciation in an isolated population and connect it to change in gene frequency, change in environment, natural selection, and/or genetic drift. 1) List the 5 principles of Hardy-Weinberg equilibrium. 2) Discuss the conditions necessary for H-W equilibrium.

Unit Title:	Duration/ Month(s)	Related Standards:	Learning Goals:	Topics and Skills:
			4) The students will be able to calculate and analyze the allele frequencies in various populations and students will make predictions about the effects of genetic drift, migration, artificial selection, etc. on the genetic make-up of a population.	3) Apply the H-W equation to real world situations. 4) Apply mathematical methods to data from a real or simulated population to predict what will happen to the population in the future. 5) Construct and/or justify mathematical models, diagrams, or simulations that represent processes of biological evolution. 6) Analyze genetic drift and effects of selection in the evolution of specific populations based on data from H-W equilibrium.
Unit 2: Biomolecules, Cells, and Membranes	3.5 weeks October	**Subject Area:** ***Essential Knowledge:*** 1.D.1, 1.D.2, 2.A.3, 2.B.1, 2.B.2, 2.B.3, 2.D.3, 4.A.1, 4.A.2, 4.B.1, 4.B.2, 4.C.1, 4.C.2 ***Science Practices:*** 2.1, 2.2, 4.2, 4.3, 4.4, 5.1, 5.2, 5.3, 6.1, 6.2, 6.4, 7.2 ***Interdisciplinary:*** **ELA Literacy:** NJSLS-RST-11-12.1 NJSLS-RST-11-12-3 NJSLS-RST-11-12-7 NJSLS-RST-11-12.8 NJSLS-RST-11-12.9 NJSLS-RST-11-12.10 NJSLS.WHST.11-12.1	1) The students will describe the structure and function of carbohydrates, lipids, proteins, and nucleic acids and students will determine how changes in environmental conditions disrupt the structure and function of biomolecules. 2) The students will analyze situations and solve problems qualitatively and quantitatively to investigate whether dynamic homeostasis is maintained by the active	1) Describe the structure and function of carbohydrates, lipids, proteins, and nucleic acids. 2) List the subcomponents of carbohydrates, lipids, proteins, and nucleic acids. 3) Describe the structure and function of enzymes. 4) Describe denaturation and list the causes of denaturation. 5) Describe the 4 structures that lead to a proteins conformation. 6) Explain the connection between the sequence and the subcomponents of a biological polymer and its properties. 7) Analyze data to identify how molecular interactions affect structure and function. 8) Use models to predict and justify that changes in the subcomponents of a biological polymer affect the functionality of the molecule. 1) Differentiate between active and passive transport. 2) Determine the optimal tonicity for plant cells and animal cells. 3) Describe how the human kidney and the endocrine system maintain water balance. 4) Predict which cell(s) might eliminate wastes or procure nutrients faster by diffusion using calculated surface area-to-

Unit Title:	Duration/ Month(s)	Related Standards:	Learning Goals:	Topics and Skills:
		NJSLS.WHST.11-12.2 NJSLS.WHST.11-12.4 NJSLS.WHST.11-12.5 NJSLS.WHST.11-12.6 NJSLS.WHST.11-12.9 NJSLS.WHST.11-12.10 **Math:** NJSLS.MP.1 NJSLS.MP.2 NJSLS.MP.4 NJSLS.MP.5 NJSLS.MP.6 HSG.GMD.A.3 HSG.GMD.A.3 **Career Ready Practices:** NJSLS-CLKS.1 NJSLS-CLKS.4 NJSLS-CLKS.5 **Technology:** NJSLS.8.1.12.AP.9 NJSLS.9.3.ST.2 **Career Awareness:** NJSLS.9.2.12.CAP.8	movement of molecules across a membrane.	volume ratios. 5) Explain how cell size and shape affect the overall rate of nutrient intake and the rate of waste elimination. 6) Justify the selection of data regarding the types of molecules that an animal will take up as necessary building blocks and excrete as waste products. 7) Analyze situations and solve problems qualitatively and quantitatively to investigate whether dynamic homeostasis is maintained by the active movement of molecules across a membrane. *Review:* 1) Explain how internal membranes and organelles contribute to cell functions. 2) Use representations and models to describe differences in prokaryotic and eukaryotic cell.
Unit 3: Cellular Communication and Anatomy	4.5 weeks November/ December	Subject Area: Essential Knowledge: 2.C.1, 2.D.1, 2.D.2, 2.D.3, 2.D.4, 2.E.2, 3.D.1, 3.D.2, 3.D.3,	1) Students will be able to explain the signal transduction pathway with examples of each part and analyze how	1) List and describe the three stages of signal transduction. 2) Define homeostasis, positive feedback, and negative feedback. 3) Define apoptosis. 4) Describe the three types of signal receptions: g-protein,

Unit Title:	Duration/ Month(s)	Related Standards:	Learning Goals:	Topics and Skills:
		3.D.4, 3.E.2, 4.A.4, 4.B.2 Science Practices: 1.1, 1.2, 1.3, 1.4, 1.5, 3.1, 3.3, 6.1, 6.2, 6.4, 7.1, 7.2 Interdisciplinary: ELA Literacy: NJSLS-RST-11-12.1 NJSLS-RST-11-12-7 NJSLS-RST-11-12.8 NJSLS-RST-11-12.9 NJSLS-RST-11-12.10 NJSLS.WHST.11-12.1 NJSLS.WHST.11-12.2 NJSLS.WHST.11-12.4 NJSLS.WHST.11-12.5 NJSLS.WHST.11-12.6 NJSLS.WHST.11-12.9 NJSLS.WHST.11-12.10 Career Ready Practices: NJSLS-CLKS.1 NJSLS-CLKS.4 NJSLS-CLKS.5 Technology:	change to the signal transduction pathway alters response. 2) Students will be able to create a visual representation of complex nervous systems to describe/explain how these systems detect external and internal signals, transmit and integrate information, and produce responses. 3) Students will be able to differentiate between innate immunity and acquired immunity and students will create representations or models to describe immune responses.	tyrosine kinase, and ion channels. 5) Describe the process of signal transduction: secondary messengers and phosphorylation cascades. 6) Explain examples of positive and negative feedback. 7) Describe how epinephrine plays a role in cell signaling. 8) Differentiate between local and long distance regulators. 9) Provide examples of how apoptosis regulates homeostasis in living things. 10) Describe how various the various organs of the endocrine system maintain homeostasis in the body. 11) Construct a “Claymation” video of the three types of signal reception. 12) Relate the signal transduction pathway to examples in animal or plant physiology. 13) Explain an example that expresses how change in signal transduction can alter cellular response. 14) Relate the chemical processes of cell communication to its evolutionary lines of descent. 15) Pose a scientific question concerning the behavioral or physiological response of an organism to a change in its environment. 1) Describe the structure and function of a neuron. 2) Describe how an action potential is propagated along a neuron. 3) Describe how the nervous systems detect external and internal signals. 4) Describe how the vertebrate brain integrates information to produce a response. 5) Create a visual representation to describe how the vertebrate brain integrates information to produce a response. 6) Explain how the nervous system detects external and internal

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		NJSLS.8.1.12.AP.9 NJSLS.8.1.12.AP.7 Career Awareness: NJSLS.9.4.12.CI.2 NJSLS.9.2.12.CAP.8		signals, transmit and integrate information, and produce a response. 7) Create a visual representation of complex nervous systems to describe/explain how these systems detect external and internal signals, transmit and integrate information, and produce responses. 1) List and describe the various examples of innate immunity. 2) Differentiate between innate immunity and acquired immunity. 3) Differentiate between humoral response and cell-mediated response. 4) Describe the role of B cells and T cells in the acquired immune response. 5) Describe the difference between a first and second exposure to an antigen. 6) Create representations or models to describe nonspecific immune defenses in plants and animals. 7) Create representations or models to describe immune responses.
Unit 4: Genetics: Mitosis, Meiosis, and Development	3 weeks December/ January	Subject Area: Essential Knowledge: 2.D.1, 2.E.1, 3.A.2, 3.B.2, 3.C.2, 4.A.3 Science Practices: 1.2, 1.3, 1.4, 3.2, 5.3, 6.1, 6.2, 6.4, 7.1, 7.2 Interdisciplinary: NJSLS ELA Literacy: NJSLS-RST-11-12.1	1) Students will be able to construct an explanation, using visual representations and narratives, as to how DNA in chromosomes is transmitted to the next generation via mitosis, or meiosis followed by fertilization.	1) List and describe the steps of mitosis. 2) List and describe the steps of meiosis. 3) Differentiate between mitosis and meiosis. 4) List and describe the various ways in which organisms use asexual or sexual reproduction. 5) Explain and illustrate (or model) the process of how a cell grows and divides. 6) Distinguish between cellular division and cell differentiation. 7) Analyze how the cell cycle control system regulates normal cell growth. 8) Explain how the failure for the cell cycle control system to work properly can cause cancer and other abnormalities.

Unit Title:	Duration/ Month(s)	Related Standards:	Learning Goals:	Topics and Skills:
		NJSLS-RST-11-12-3 NJSLS-RST-11-12-7 NJSLS-RST-11-12.8 NJSLS-RST-11-12.9 NJSLS-RST-11-12.10 NJSLS.WHST.11-12.1 NJSLS.WHST.11-12.2 NJSLS.WHST.11-12.4 NJSLS.WHST.11-12.5 NJSLS.WHST.11-12.6 NJSLS.WHST.11-12.9 NJSLS.WHST.11-12.10 NJSLS Math: NJSLS.MP.1 NJSLS.MP.5 NJSLS.MP.6 Career Ready Practices: NJSLS-CLKS.1 NJSLS-CLKS.4 NJSLS-CLKS.5 Technology: NJSLS.8.1.12.AP.9 NJSLS.9.3.ST.2 NJSLS.8.2.12.ETW.4 Career Awareness: NJSLS.9.2.12.CAP.8		9) Explain the technological processes of cloning and stem cell research. 10) Make predictions about natural phenomena occurring during the cell cycle. 11) Construct a representation that connects the process of meiosis to the passage of traits from parent to offspring.
Unit 5: Genetics:	2.5 January	Subject Area: Essential Knowledge:	1) Students will be able to apply mathematical routines	1) Define phenotype, genotype, dominant, recessive, homozygous, and heterozygous.

Unit Title:	Duration/ Month(s)	Related Standards:	Learning Goals:	Topics and Skills:
Patterns of Inheritance		3.A.3, 3.A.4, 3.C.1 Science Practices: 1.1, 1.2, 2.2, 2.3, 3.1 6.3, 6.5, 7.2 Interdisciplinary: ELA Literacy: NJSLS-RST-11-12.1 NJSLS-RST-11-12.6 NJSLS-RST-11-12-7 NJSLS-RST-11-12.8 NJSLS-RST-11-12.9 NJSLS-RST-11-12.10 NJSLS.WHST.11-12.1 NJSLS.WHST.11-12.2 NJSLS.WHST.11-12.4 NJSLS.WHST.11-12.5 NJSLS.WHST.11-12.6 NJSLS.WHST.11-12.9 NJSLS.WHST.11-12.10 Math: NJSLS.MP.1 NJSLS.MP.2 NJSLS.MP.3 NJSLS.MP.4 NJSLS.MP.5 NJSLS.MP.6 HSS-IC.A.2 Career Ready Practices: NJSLS-CLKS.1 NJSLS-CLKS.4	to determine Mendelian patterns of inheritance provided by data sets and students will be able to predict the patterns of inheritance using pedigree analysis. 2) Students will be able to describe representations and analyze data sets of an appropriate example of inheritance patterns that cannot be explained by Mendel's model of the inheritance of traits.	2) Solve monohybrid crosses with complete dominance using a Punnett square. 3) Solve dihybrid crosses with complete dominance using a Punnett square and the rules of probability. 4) Solve trihybrid crosses with complete dominance using the rules of probability. 5) Discuss various autosomal dominant and recessive disorders that follow Mendelian inheritance. 6) Predict whether a trait is autosomal dominant or recessive based on pedigree analysis. 1) Solve genetics problems regarding incomplete dominance, codominance, epistasis, and multiple alleles. 2) Solve genetics problems regarding sex-linked genes. 3) Discuss sex determination in a variety of different species. 4) Describe how genetic linkage affects inheritance. 5) Determine whether inherited genes are independently assorted or linked on a chromosome. 6) Analyze various data sets that show inheritance and determine whether traits are autosomal dominant, autosomal recessive, or sex-linked. 7) Analyze data sets using Chi square to determine if traits are independently assorted.

Unit Title:	Duration/ Month(s)	Related Standards:	Learning Goals:	Topics and Skills:
		NJSLS-CLKS.5 Technology: NJSLS.8.1.12.AP.9 NJSLS.9.3.ST.2 NJSLS.8.2.12.ETW.4 Career Awareness: NJSLS.9.2.12.CAP.8		
Unit 6: Genetics: From Gene to Protein	3 weeks February	Subject Area: Essential Knowledge: 3.A.1, 3.C.2, 3.C.3 Science Practices: 1.2, 1.4, 4.1, 6.2, 6.4, 6.5, 7.1, 7.2 Interdisciplinary: ELA Literacy: NJSLS-RST-11-12.1 NJSLS-RST-11-12-3 NJSLS-RST-11-12-7 NJSLS-RST-11-12.8 NJSLS-RST-11-12.9 NJSLS-RST-11-12.10 NJSLS.WHST.11-12.1 NJSLS.WHST.11-12.2 NJSLS.WHST.11-12.4 NJSLS.WHST.11-12.5 NJSLS.WHST.11-12.6 NJSLS.WHST.11-12.9	1) Students will be able to describe the processes of replication, transcription, and translation and students will be able to create a visual representation to illustrate how changes in a DNA nucleotide sequence can result in a change in the polypeptide produced. 2) Students will be able to describe how viruses replicate and students will be able to construct an explanation of how viruses introduce genetic variation	1) Describe the structure and function of DNA and RNA. 2) Describe the different types of mutations that occur on DNA. 3) Justify the selection of data from historical investigations that support the claim that DNA is the source of heritable information. 4) Describe representations and models illustrating how genetic information is translated into polypeptides. 5) Construct scientific explanations that use the structures and mechanisms of DNA and RNA to support the claim that DNA and, in some cases, that RNA are the primary sources of heritable information. 6) Create a visual representation to illustrate how changes in a DNA nucleotide sequence can result in a change in the polypeptide produced. 1) Describe the structure and function of a virus. 2) Differentiate between the lytic and lysogenic cycles. 3) Construct an explanation of how viruses introduce genetic variation in host organisms. 4) Use representations and appropriate models to describe how viral replication introduces genetic variation in the viral

Unit Title:	Duration/ Month(s)	Related Standards:	Learning Goals:	Topics and Skills:
		NJSLS.WHST.11-12.10 Math: NJSLS.MP.1 Career Ready Practices: NJSLS-CLKS.1 NJSLS-CLKS.4 NJSLS-CLKS.5 Technology: NJSLS.8.1.12.AP.9 NJSLS.8.1.12.DA.1 NJSLS.9.3.ST.2 NJSLS.8.2.12.ETW.4 Career Awareness: NJSLS.9.4.12.CI.2 NJSLS.9.2.12.CAP.8	in host organisms.	population.
Unit 7: Genetics: Gene Expression and DNA Technology	3 weeks February/March	Subject Area: Essential Knowledge: 3.B.1, 3.B.2, 3.C.2, 3.C.3 Science Practices: 1.4, 6.2, 7.1, 7.2 Interdisciplinary: ELA Literacy: NJSLS-RST-11-12.1 NJSLS-RST-11-12-3	1) Students will be able to predict how a change in a specific DNA or RNA sequence can result in changes in gene expression and students will be able to use representations to describe how gene regulation influences cell products and function.	1) Differentiate between inducible and repressible operons. 2) Describe how gene expression impacts eukaryotic genomes. 3) Describe the connection between the regulation of gene expression and observed differences between different kinds of organisms. 4) Describe the connection between the regulation of gene expression and observed differences between individuals in a population. 5) Explain how the regulation of gene expression is essential for the processes and structures that support efficient cell function. 6) Predict the effects of a change in an environmental factor on gene expression and the resulting phenotype of an organism.

Unit Title:	Duration/ Month(s)	Related Standards:	Learning Goals:	Topics and Skills:
		NJSLS-RST-11-12.6 NJSLS-RST-11-12-7 NJSLS-RST-11-12.8 NJSLS-RST-11-12.9 NJSLS-RST-11-12.10 NJSLS.WHST.11-12.1 NJSLS.WHST.11-12.2 NJSLS.WHST.11-12.4 NJSLS.WHST.11-12.5 NJSLS.WHST.11-12.6 NJSLS.WHST.11-12.9 NJSLS.WHST.11-12.10 Math: NJSLS.MP.1 NJSLS.MP.2 Career Ready Practices: NJSLS-CLKS.1 NJSLS-CLKS.4 NJSLS-CLKS.5 Technology: NJSLS.8.1.12.AP.9 NJSLS.9.3.ST.2 NJSLS.8.2.12.ETW.4 NJSLS. 9.3.ST-ET.4 Career Awareness: NJSLS.9.4.12.CI.2 NJSLS.9.2.12.CAP.8	2) Students will be able to justify the claim that humans can manipulate heritable information by identifying at least two commonly used technologies.	1) List applications of genetic technology and describe their importance in the field of genetics. 2) Describe how the process of gel electrophoresis works. 3) Identify the pros and cons of GMOs, transgenic animals, cloned animals, and pharmaceuticals. 4) Conduct an experiment using gel electrophoresis to determine unknown molecules. 5) Explain how heritable information can be manipulated using common technologies.
Unit 8: Energy in	3 weeks March/	Subject Area: Essential Knowledge:	1) Students will be able to explain the process of how	1) List and describe the basic steps of the light reactions and the Calvin cycle in the process of photosynthesis.

Unit Title:	Duration/ Month(s)	Related Standards:	Learning Goals:	Topics and Skills:
Ecosystems	April	2.A.1, 2.A.2, 2.A.3, 4.A.6 Science Practices: 1.1, 1.4, 2.2, 3.1, 4.1, 6.1, 6.2, 6.4 Interdisciplinary: ELA Literacy: NJSLS-RST-11-12.1 NJSLS-RST-11-12-3 NJSLS-RST-11-12-7 NJSLS-RST-11-12.8 NJSLS-RST-11-12.9 NJSLS-RST-11-12.10 NJSLS.WHST.11-12.1 NJSLS.WHST.11-12.2 NJSLS.WHST.11-12.4 NJSLS.WHST.11-12.5 NJSLS.WHST.11-12.6 NJSLS.WHST.11-12.9 NJSLS.WHST.11-12.10 Math NJSLS.MP.1 NJSLS.MP.2 Career Ready Practices: NJSLS-CLKS.1 NJSLS-CLKS.4 NJSLS-CLKS.5 Technology:	plants can capture energy from the sun and store the energy in the chemical bonds of sugar and investigate the effect of changing environmental conditions on the rate of photosynthesis. 2) Students will be able to trace the elements of sugar through the process of cellular respiration and describe how organisms use different strategies to regulate body temperature and metabolism.	2) Analyze the transfer of energy from light to the chemical bonds of sugar in photosynthesis. 3) Conduct an experiment to test the rate of photosynthesis in light and dark. 4) Analyze how light intensity, carbon dioxide, and temperature impact the rate of photosynthesis. 5) Analyze the various examples of adaptations that save water in hot, dry climates such as C4 and CAM pathways. 6) Analyze data that shows the effectiveness of photosynthesis in different environmental conditions. 7) Construct explanations of the mechanisms and structural features of cells that allow organisms to capture, store or use free energy. 1) Differentiate between aerobic and anaerobic respiration. 2) Explain how the energy in sugar is converted to energy in ATP. 3) Describe how organisms use different strategies to regulate body temperature and metabolism. 4) Explain how photosynthesis and cell respiration relate to one another in plant cells. 5) Compare and contrast the process of chemiosmosis in the chloroplast and mitochondria. 6) Justify a scientific claim that free energy is required for living systems to maintain organization to grow or to reproduce, but that multiple strategies exist in different living systems. 7) Construct explanations of the mechanisms and structural features of cells that allow organisms to capture, store or use free energy. 8) Justify a scientific claim that free energy is required for living systems to maintain organization, to grow, or to reproduce, but that multiple strategies for obtaining and using energy exist in different living systems.

Unit Title:	Duration/ Month(s)	Related Standards:	Learning Goals:	Topics and Skills:
		NJSLS.8.1.12.AP.9 NJSLS.9.3.ST.2 NJSLS.8.2.12.ETW.4 NJSLS. 9.3.ST-ET.4 Career Awareness: NJSLS.9.2.12.CAP.8	3) Students will be able to construct a food web of an ecosystem and analyze how energy flows through the organisms in the food web.	1) Construct a food web and analyze how energy flows through the food web through trophic structures. 2) Apply mathematical routines to quantities that describe interactions among living systems and their environment, which result in the movement of matter and energy. 3) Predict how changes in free energy availability affect organisms, populations, and ecosystems. 4) Represent graphically or model quantitatively the exchange of molecules between an organism and its environment. 5) The student is able to evaluate data to show the relationship between photosynthesis and respiration in the flow of free energy through a system.
Unit 9: Ecology	3 weeks April/May	Subject Area: Essential Knowledge: 2.D.1, 2.D.3, 4.A.5, 4.B.3, 4.B.4, 4.C.4 Science Practices: 1.3, 1.4, 2.2, 3.2, 4.1, 4.2, 5.1, 5.2, 6.3, 6.4, 7.2 Interdisciplinary: ELA Literacy: NJSLS-RST-11-12.1 NJSLS-RST-11-12-3 NJSLS-RST-11-12-7 NJSLS-RST-11-12.8 NJSLS-RST-11-12.9 RST-11-12.10 NJSLS-WHST.11-12.1 NJSLS.WHST.11-12.2 NJSLS.WHST.11-12.4 NJSLS.WHST.11-12.5	1) Students will be able to analyze data regarding the interaction of organisms with their environment and apply mathematical routines to describe communities composed of populations of organisms that interact in complex ways.	1) Predict how variation in a population affects an organism's survival or fitness. 2) Provide examples of how human impact accelerates change at local and global levels. 3) Justify the selection of the kind of data needed to answer scientific questions about the interaction of populations within communities. 4) Apply mathematical routines to quantities that describe communities composed of populations of organisms that interact in complex ways. 5) Predict the effects of a change in the community's populations on the community. 6) Analyze data regarding the effect of population interactions on patterns of species distribution and abundance.

Unit Title:	Duration/ Month(s)	Related Standards:	Learning Goals:	Topics and Skills:
		NJSLS.WHST.11-12.6 NJSLS.WHST.11-12.9 NJSLS.WHST.11-12.10 Math: NJSLS.MP.1 NJSLS.MP.2 NJSLS.MP.3 NJSLS.MP.4 NJSLS.MP.5 NJSLS.MP.6 HSS-IC.A.2 Career Ready Practices: NJSLS-CLKS.1 NJSLS-CLKS.4 NJSLS-CLKS.5 Technology: NJSLS.8.1.12.AP.9 NJSLS.9.3.ST.2 NJSLS.8.2.12.ETW.4 NJSLS. 9.3.ST-ET.4 Career Awareness: NJSLS.9.4.12.CI.2 NJSLS.9.2.12.CAP.8		

Unit 10: Ethology	3 weeks May/June	Subject Area: Essential Knowledge: 2.C.2, 2.E.2, 2.E.3, 3.E.1 Science Practices: 1.1, 4.1, 4.2, 5.1, 6.1, 7.1, 7.2 Interdisciplinary: ELA Literacy: NJSLS-RST-11-12.1 NJSLS-RST-11-12-3 NJSLS-RST-11-12-7 NJSLS-RST-11-12.8 NJSLS-RST-11-12.9 NJSLS-RST-11-12.10 NJSLS.WHST.11-12.1 NJSLS.WHST.11-12.2 NJSLS.WHST.11-12.4 NJSLS.WHST.11-12.5 NJSLS.WHST.11-12.6 NJSLS.WHST.11-12.4 NJSLS.WHST.11-12.5 NJSLS.WHST.11-12.9 NJSLS.WHST.11-12.10 Math: NJSLS.MP.1 NJSLS.MP.2 NJSLS.MP.3 NJSLS.MP.5 NJSLS.MP.6 HSS-IC.A.2 Career Ready	Students will be able to analyze data that indicate how organisms exchange information in response to internal changes and external cues, and which can change behavior.	1) Define and give examples of innate behavior such as fixed action patterns. 2) Differentiate between operant and classical conditioning. 3) Explain how responses to information and communication of information are vital to natural selection and evolution. 4) Connect concepts in and across domain(s) to predict how environmental factors affect responses to information and change behavior. 5) Design a plan for collecting data to support the scientific claim that the timing and coordination of physiological events involve regulation.

		Practices: NJSLS-CLKS.1 NJSLS-CLKS.4 NJSLS-CLKS.5 Technology: NJSLS.8.1.12.AP.9 NJSLS.9.3.ST.2 NJSLS.8.2.12.ETW.4 NJSLS. 9.3.ST-ET.4 Career Awareness: NJSLS.9.2.12.CAP.8		

Unit: 1-Evolution	Recommended Duration: [4 Weeks– September/October]

Unit Description:
Evolution is the foundation of biology and every unit will tie in with the concepts of evolution. Students will study Darwin's theory of natural selection and describe the evidence that Darwin used to formulate his theory. The students will analyze different types of evidence of evolution such as: fossils, embryology, anatomy, biogeography, and molecular biology. Students will also analyze how random events and human events cause evolutionary change. Students will explore the causes of speciation and extinction and students will organize living things based on their anatomical and molecular similarities. The labs in this unit are: Artificial Selection Lab, Hardy-Weinberg Lab, and Cladograms: Comparing DNA Sequences.

Essential Questions:	Enduring Understandings:
• Why is natural selection integral in the process of evolution? • Why is variation essential in the evolution of organisms? • What is the evidence of evolution? • How can the evidence of evolution be used to organize organisms based on their evolutionary relationships? • How do reproductive barriers cause speciation to occur? • How can allele and genotype frequencies be calculated using the Hardy-Weinberg equation? • How do humans shape the evolution of other species through artificial selection and other means?	• Evolution is defined as changes in allele frequencies over time. • Natural selection occurs when individuals with certain alleles and traits produce the most offspring in a population. An adaptation is a genetically based trait that increases an individual's ability to produce offspring in a particular environment. • All adaptations are constrained by genetic and historical factors. • The H-W principle acts as a null hypothesis when researchers want to test whether evolution or nonrandom mating is occurring at a particular gene. • Speciation occurs when populations of the same species become genetically isolated by lack of gene flow and then diverge from each other due to selection, genetic drift, or mutation. • *College Board:* • A: Change in the genetic makeup of a population over time is evolution. • B: Organisms are linked by lines of descent from common ancestry. • C: Life continues to evolve within a changing environment.

Relevant Standards:	Learning Goals:	Learning Objectives:
Content Standards: **Primary(Power):** Essential Knowledge: 1.A.1, 1.A.2, 1.A.3, 1.A.4, 1.B.1, 1.B.2, 1.B.3, 1.C.1, 1.C.2, 1.C.3 **Secondary(Supportive):** Essential Knowledge: 4.B.2, 4.C.3 Science Practices: 1.2, 2.1, 2.2, 5.3, 7.1 ELA Standards: NJSLS-RST-11-12.1, NJSLS-RST-11-12.3, NJSLS-RST-11-12-7, NJSLS-RST-11-12.8, NJSLS-RST-11-12.9, NJSLS-RST-11-12.10, NJSLS-WHST.11-12.1, NJSLS-WHST.11-12.2, NJSLS-WHST.11-12.4, NJSLS-WHST.11-12.5, NJSLS-WHST.11-12.6, NJSLS-WHST.11-12.9, NJSLS-WHST.11-12.10	1) The students will be able to describe how natural selection and other factors are the mechanism of evolution and design a plan to answer scientific questions regarding how organisms have changed over time using information from morphology, biochemistry, and geology. 2) The students will be able to pose scientific questions and analyze a phylogenetic tree and students will be able to create a phylogenetic tree from provided data and evidence.	1) Define natural selection and evolution. 2) List and provide examples of the evidence of evolution. 3) Explain how natural selection can lead to adaptive evolution. 4) Compare and contrast different types of natural selection. 5) Discuss the importance of genetic variation to evolution. 6) Compare and contrast various sources of genetic variation. 7) Evaluate and refine evidence based on data from many scientific disciplines that support biological evolution. 8) Construct or refine models of evolution and predict shifts in populations based on changing environmental conditions. 9) Design a plan to answer scientific questions regarding how organisms have changed over time using information from morphology, biochemistry, and geology. 10) Evaluate evidence provided by data to qualitatively and quantitatively investigate the role of natural selection in evolution. 1) Define and draw a basic cladogram or phylogenetic tree. 2) Identify and describe the three domains of life. 3) Justify the scientific claim that organisms share many conserved core processes and features that evolved and are widely distributed among organisms today. 4) Describe specific examples of conserved core biological processes and features shared by all domains or within one domain of life, and how these shared, conserved core processes and features support the concept of common ancestry for all organisms.

Relevant Standards:	Learning Goals:	Learning Objectives:
		5) Evaluate evidence provided by a data set in conjunction with a phylogenetic tree or a simple cladogram to determine evolutionary history and speciation. 6) Create a phylogenetic tree or simple cladogram that correctly represents evolutionary history and speciation from a provided data set. 7) Pose scientific questions about a group of organisms whose relatedness is described by a phylogenetic tree or cladogram in order to (1) identify shared characteristics, (2) make inferences about the evolutionary history of the group, and (3) identify character data that could extend or improve the phylogenetic tree.
	3) The students will be able to determine the causes of speciation and extinction and students will be able to describe speciation in an isolated population and connect it to change in gene frequency, change in environment, natural selection, and/or genetic drift.	1) Define the prezygotic and postzygotic barriers. 2) Define allopatric and sympatric speciation. 3) Differentiate between gradual and punctual equilibrium. 4) Define mass extinction. 5) Determine the factors that cause extinctions and mass extinctions to occur on Earth. 6) Analyze real or simulated populations, based on graphs or models of types of selection, to predict what will happen to the population in the future. 7) Describe speciation in an isolated population and connect it to change in gene frequency, change in environment, natural selection, and/or genetic drift.
		1) List the 5 principles of Hardy-Weinberg equilibrium. 2) Discuss the conditions necessary for H-W equilibrium. 3) Apply the H-W equation to real world situations. 4) Apply mathematical methods to data from a real or simulated population to predict what will happen to the population in the future.

Relevant Standards:	Learning Goals:	Learning Objectives:
	4) The students will be able to calculate and analyze the allele frequencies in various populations and students will make predictions about the effects of genetic drift, migration, artificial selection, etc. on the genetic make-up of a population.	5) Construct and/or justify mathematical models, diagrams, or simulations that represent processes of biological evolution. 6) Analyze genetic drift and effects of selection in the evolution of specific populations based on data from H-W equilibrium.

Formative Assessments	Summative Assessments:	Performance Assessments:	Major Activities/ Assignments (required):
Summer Assignment Quiz Google Drive Online Quizzes Speciation Quiz Hardy-Weinberg Quiz	Evolution Unit Test	Artificial Selection Lab Hardy-Weinberg Lab	Summer Assignment AP Essay: Evolution

Possible Assessment Adjustments (Modifications /Accommodations/ Differentiation): *How will the teacher provide multiple means for the following student groups to **EXPRESS** their understanding and comprehension of the content/skills taught?*

Special Education Students	English Language Learners (ELLs)	At-Risk Learners	Advanced Learners
• Extended time on Unit 1 Test. • Read directions to students on Unit 1 Test. • Test Corrections for Unit 1 Test. • Provide a template for Brine Shrimp Lab	• Extended time on Unit 1 Test. • Reduced answer choices on Unit 1 Test. • Read directions to students on Unit 1 Test • Test Corrections for Unit 1 Test. • Provide a detailed template for Brine Shrimp Lab.	• Provide additional Hardy-Weinberg Problems	• Extended time on Unit 1 test. • Test Corrections for Unit 1 Test.

Instructional Strategies: *(List and describe.)*

2.6: Identifying critical information
2.7: Organizing students to interact with new knowledge
2.8: Previewing new content
2.9: Chunking content into "digestible bites"
2.10: Processing of new information
2.11: Elaborating on new information
2.12: Recording and representing knowledge
2.13: Reflecting on learning
3.14: Reviewing content
3.15: Organizing students to practice and deepen knowledge
3.16: Using homework
3.17: Examining similarities and differences
3.18: Examining errors in reasoning
3.19; Practicing skills, strategies, and processes
3.20: Revising knowledge
4.21: Organizing students for cognitively complex tasks
4.22: Engaging students in cognitively complex tasks involving hypothesis generation and testing
4.23: Providing resources & guidance

Possible Instructional Adjustments (Modifications /Accommodations/ Differentiation): *How will the teacher provide multiple means for the following student groups to **ACCESS** the content/skills being taught?*

Special Education Students	English Language Learners (ELLs)	At-Risk Learners	Advanced Learners
• Preferential Seating • Textbook for at-home use	• Preferential Seating • Textbook for at-home use • Adjusted assignment timelines • No penalty for spelling errors	• Preferential Seating • Textbook for at-home use	• Addition problems for Unit 1

Unit Vocabulary:

Essential:
evolution, natural selection, adaptation, mutation, convergent evolution, divergent evolution, genetic drift, fitness, biological species concept, hybrids, allopatric speciation, sympatric speciation, extinction, phylogenetic tree, cladogram

Non-Essential:
homologous structures, vestigial structures, biogeography, bottleneck effect, founder effect, gene flow, directional selection, disruptive selection, stabilizing selection, sexual selection, sexual dimorphism, heterozygote advantage, prezygotic barriers (habitat, temporal, behavioral, mechanical, gametic), postzygotic barriers (reduced hybrid viability, reduced hybrid fertility, hybrid breakdown), shared derived characteristic

Interdisciplinary Connections (Applicable Standards):	**Integration of Technology:**	**21st Century Themes:**	**21st Century Skills:**
Mathematics: • NJSLS-MP.1: Make sense of problems and persevere in solving them. • NJSLS-MP.2: Reason abstractly and quantitatively. • NJSLS-MP.4: Model with mathematics. • HSA.REI.C.6: Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables. **Literacy:** • NJSLS-RST-11-12.1 • NJSLS-RST-11-12-3 • NJSLS-RST-11-12-7 • NJSLS-RST-11-12.8 • NJSLS-RST-11-12.9 • NJSLS-RST-11-12.10 • NJSLS-WHST.11-12.1 • NJSLS-WHST.11-12.2 • NJSLS-WHST.11-12.4 • NJSLS-WHST.11-12.5 • NJSLS-WHST.11-12.6 • NJSLS-WHST.11-12.9 • NJSLS-WHST.11-12.10	Technology: • -Students use google drive as a resource for documents, spreadsheets, forms, and videos. (S) • -Students use google sheets or excel to construct graphs using data sets from research or labs. (M) • -Students will use online simulations to study patterns in evolution. (A)	• Environmental Literacy: • -Students will describe how humans have impacted the evolution and natural selection of other living things. • Health Literacy: • -Students will describe how antibiotic resistance is caused by natural selection, is a growing health concern, and propose possible solutions to the problem.	• Critical Thinking and Problem Solving: • -Students will use Hardy-Weinberg equilibrium data and equations to analyze how populations change over time. • Communication and Collaboration: • -Students will work together to design a brine shrimp lab and analyze results. • -Students will work independently on chromebooks to write a lab report.

Interdisciplinary Connections (Applicable Standards):	Integration of Technology:	21st Century Themes:	21st Century Skills:
• **Career Ready Practices:** • NJSLS-CLKS.1 - Act as a responsible and contributing community member and employee. • NJSLS-CLKS.4- Demonstrate creativity and innovation. • NJSLS-CLKS.5 - Utilize critical thinking to make sense of problems and persevere in solving them. • **Technology:** • NJSLS.8.1.12.AP.9 - Collaboratively document and present design decisions in the development of complex programs • NJSLS.8.1.12.DA.1 - Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change. • NJSLS.8.1.12.AP.7 Collaboratively design and develop programs and artifacts for broad audiences by incorporating feedback from users • **Career Awareness:** • NJSLS.9.2.12.CAP.8 Determine job entrance criteria (e.g., education credentials, math/writing/ reading comprehension tests, and drug tests) used by employers in various industry sectors.			

Resources:
Texts/Materials: Campbell's 8th Edition: AP Biology http://www.bozemanscience.com/ap-biology/ CrashCourse Biology: https://www.youtube.com/playlist?list=PL3EED4C1D684D3ADF VanceKite Evolution: https://www.youtube.com/watch?v=jew7W0_UZJI&list=PLbnvwtAGroLs0yDoNFAY5tC-lil9lqSMy Sean Carroll Books: -Remarkable Creatures -The Making of the Fittest -Endless Forms PBS Nova: What Darwin Never Knew Nature: Dueling Trees PBS NewsHour: The Garden of Our Neglect: How Humans Shape the Evolution of Other Species PBS NovaScienceNow: -Where did we come from? -What makes us human? -Decoding Neanderthals Cosmos: Some of the Things that Molecules Do Leveled Reading- Newsela

Unit: 2-Origins of Life: Macromolecules and the Cell	Recommended Duration: [3.5 Weeks–October]
Unit Description: In this unit, we will explore the molecular and cellular components of life. Students will analyze the structure and function of biomolecules and discuss their role in the origins of life. Students will focus on enzymes because of their importance in living things and explore the conditions that disrupt the structure and function of enzymes. Students will review the organelles of a cell and discuss the importance of internal membranes and how organelles work together to perform tasks within a cell. Students will discuss the structure and function of cell membranes and review how passive and active transport move molecules across membranes. Students will discuss the importance of water balance in maintaining homeostasis in organisms. The labs in this unit are: Enzyme Lab and Diffusion and Osmosis Lab.	

Essential Questions:	Enduring Understandings:
• What conditions were necessary for life to begin on early Earth? • How did life originate on Earth? • How is the structure of carbohydrates, lipids, proteins, and nucleic acids related to their function? • How does the shape of proteins relate to the function of proteins? • How do changes in environmental conditions affect proteins? • Why is compartmentalization important in eukaryotic cells? • What is the role of the endomembrane system and what roles do membranes play in the endomembrane system? • Why is it beneficial for structures within living things to have a large surface area to volume ratio? • How does the structure of a cell membrane regulate the types of substances that can pass through the membrane? • How does the tonicity affect plant and animal cells? • How do cells use passive transport, active transport, and bulk transport to move molecules into and out of a cell?	• Biomolecules have subunits that vary in structure and function. As a result, biomolecules vary widely in structure and function. • Growth and dynamic homeostasis are maintained by the constant movement of molecules across membranes • Interactions between molecules affect their structure and function. *College Board:* • D: The origin of living systems is explained by natural processes. • B: Growth, reproduction, and dynamic homeostasis require that cells create and maintain internal environments that are different from their external environments. • D: Growth and dynamic homeostasis of a biological system are influenced by changes in the system's environment. • A: Interactions within biological systems lead to complex properties. • B: Competition and cooperation are important aspects of biological systems. • C: Naturally occurring diversity among and between components within biological systems affects interactions with the environment.

Relevant Standards:	Learning Goals:	Learning Objectives:
Content Standards: **Primary(Power):** Essential Knowledge: 2.B.1, 2.B.2, 2.B.3, 4.A.1, 4.A.2, 4.B.1 **Secondary(Supportive):** Essential Knowledge: 2.A.3, 2.D.3, 4.B.2, 4.C.2 Science Practices: 2.1, 2.2, 4.2, 4.3, 4.4, 5.1, 5.2, 5.3, 6.1, 6.4, 7.2 ELA Standards:	1)The students will describe the structure and function of carbohydrates, lipids, proteins, and nucleic acids and students will determine how changes in environmental conditions disrupt the structure and function of biomolecules.	1)Describe the structure and function of carbohydrates, lipids, proteins, and nucleic acids. 2) List the subcomponents of carbohydrates, lipids, proteins, and nucleic acids. 3) Describe the structure and function of enzymes. 4) Describe denaturation and list the causes of denaturation. 5) Describe the 4 structures that lead to a proteins conformation.0 6) Explain the connection between the sequence and the subcomponents of a biological polymer and its properties.

Relevant Standards:	Learning Goals:	Learning Objectives:
NJSLS-RST-11-12.1, NJSLS-RST-11-12.3, NJSLS-RST-11-12-7, NJSLS-RST-11-12.8, NJSLS-RST-11-12.9, NJSLS-RST-11-12.10, NJSLS-WHST.11-12.1, NJSLS-WHST.11-12.2, NJSLS-WHST.11-12.4, NJSLS-WHST.11-12.5, NJSLS-WHST.11-12.6, NJSLS-WHST.11-12.9, NJSLS-WHST.11-12.10	2) The students will analyze situations and solve problems qualitatively and quantitatively to investigate whether dynamic homeostasis is maintained by the active movement of molecules across a membrane.	7) Analyze data to identify how molecular interactions affect structure and function. 8) Use models to predict and justify that changes in the subcomponents of a biological polymer affect the functionality of the molecule. 1) Differentiate between active and passive transport. 2) Determine the optimal tonicity for plant cells and animal cells. 3) Describe how the human kidney and the endocrine system maintain water balance. 4) Predict which cell(s) might eliminate wastes or procure nutrients faster by diffusion using calculated surface area-to-volume ratios. 5) Explain how cell size and shape affect the overall rate of nutrient intake and the rate of waste elimination. 6) Justify the selection of data regarding the types of molecules that an animal will take up as necessary building blocks and excrete as waste products. 7) Analyze situations and solve problems qualitatively and quantitatively to investigate whether dynamic homeostasis is maintained by the active movement of molecules across a membrane. *Review:* 1) Explain how internal membranes and organelles contribute to cell functions. 2) Use representations and models to describe differences in prokaryotic and eukaryotic cell.

Formative Assessments	Summative Assessments:	Performance Assessments:	Major Activities/ Assignments (required):
Google Drive Online Quizzes	Unit 2 Test	Enzyme Lab	Enzyme Lab

Formative Assessments	Summative Assessments:	Performance Assessments:	Major Activities/ Assignments (required):
Diffusion and Osmosis Lab Quiz		Diffusion and Osmosis Lab	Diffusion and Osmosis Lab AP Essay: Diffusion and Osmosis

Possible Assessment Modifications /Accommodations:

Special Education Students

- Extended time on Unit 2 Test.
- Read directions to students on Unit 2 Test.
- Test Corrections for Unit 2 Test.
- Provide a template for Enzyme and Cell Essay.

English-Language Learners

- Extended time on Unit 2 Test.
- Reduced answer choices on Unit 2 Test.
- Read directions to students on Unit 2 Test
- Test Corrections for Unit 2 Test.
- Provide a detailed template for Enzyme and Cell Essay.

Advanced Learners

- Provide additional water potential problems.

Struggling Learners

- Extended time on Unit 2 test.
- Test Corrections for Unit 2 Test.

Instructional Strategies (refer to *Robert Marzano's* 41 Elements):

2.6: Identifying critical information
2.7: Organizing students to interact with new knowledge
2.8: Previewing new content
2.9: Chunking content into "digestible bites"
2.10: Processing of new information
2.11: Elaborating on new information
2.12: Recording and representing knowledge
2.13: Reflecting on learning
3.14: Reviewing content
3.15: Organizing students to practice and deepen knowledge

Instructional Strategies (refer to *Robert Marzano's* 41 Elements):

3.16: Using homework
3.17: Examining similarities and differences
3.18: Examining errors in reasoning
3.19; Practicing skills, strategies, and processes
3.20: Revising knowledge
4.21: Organizing students for cognitively complex tasks
4.22: Engaging students in cognitively complex tasks involving hypothesis generation and testing
4.23: Providing resources & guidance

Possible Instructional Modifications /Accommodations/Differentiation:

Special Education Students

- Preferential Seating
- Textbook for at-home us

English-Language Learners

- Preferential Seating
- Textbook for at-home use
- Adjusted assignment timelines
- No penalty for spelling errors

Advanced Learners

- Addition problems for Unit 2

Struggling Learners

- Preferential Seating
- Textbook for at-home use

Unit Vocabulary:

Essential:
Enzyme, denaturation, substrate, carbohydrate, lipid, protein, nucleic acid, starch, glycogen, surface area-to-volume ratio, endomembrane system, diffusion, osmosis, hypertonic, hypotonic, isotonic, passive transport, active transport, facilitated diffusion, Na/K pump

Non-Essential:
Active site, dehydration, hydrolysis, monosaccharide, disaccharide, polysaccharide, saturated fat, unsaturated fat, peptide bond, levels of protein structure, DNA, RNA, nucleotide, amino acid, organelles of the endomembrane system, selectively permeable, aquaporins, endocytosis, phagocytosis, pinocytosis, exocytosis

Interdisciplinary Connections (Applicable Standards):	**Integration of Technology:**	**21st Century Themes:**	**21st Century Skills:**
Mathematics: NJSLS-MP.1 Make sense of problems and persevere in solving them. NJSLS-MP.2 Reason abstractly and quantitatively. NJSLS-MP.4 Model with mathematics. NJSLS-MP.5 Use appropriate tools strategically. NJSLS-MP.6 Attend to precision. HSG.GMD.A.3 ELA: NJSLS-RST-11-12.1, NJSLS-RST-11-12-3, NJSLS-RST-11-12-7, NJSLS-RST-11-12.8, NJSLS-RST-11-12.9, NJSLS-RST-11-12.10 NJSLS-WHST.11-12.1, NJSLS-WHST.11-12.2, NJSLS-WHST.11-12.4, NJSLS-NJSLS-WHST.11-12.5, NJSLS-WHST.11-12.6, NJSLS-WHST.11-12.9, NJSLS-WHST.11-12.10 **Career Ready Practices:** NJSLS-CLKS.1 - Act as a responsible and contributing community member and employee.	Technology: -Students use google drive as a resource for documents, spreadsheets, forms, and videos. (S) -Students use google sheets or excel to construct graphs using data sets from research or labs. (M)	Health Literacy: -Students will discuss how changes in water balance in humans and other organisms impacts the homeostasis of those organisms. -Students will discuss the importance of carbohydrates, proteins, and fats in a well-balanced diet.	Critical Thinking and Problem Solving: -Students will analyze the impact of differing tonicities on living things. Communication & Collaboration: Students will work together to complete the various diffusion and osmosis labs in this unit.

Interdisciplinary Connections (Applicable Standards):	Integration of Technology:	21st Century Themes:	21st Century Skills:
NJSLS-CLKS.4- Demonstrate creativity and innovation. NJSLS-CLKS.5 - Utilize critical thinking to make sense of problems and persevere in solving them. **Technology:** NJSLS.8.1.12.AP.9 - Collaboratively document and present design decisions in the development of complex programs NJSLS.8.1.12.AP.7 Collaboratively design and develop programs and artifacts for broad audiences by incorporating feedback from users **Career Awareness:** NJSLS.9.2.12.CAP.8 - Determine job entrance criteria (e.g., education credentials, math/writing/ reading comprehension tests, and drug tests) used by employers in various industry sectors.			

Resources:
Texts/Materials: Campbell's 8th Edition: AP Biology http://www.bozemanscience.com/ap-biology/ CrashCourse Biology: https://www.youtube.com/playlist?list=PL3EED4C1D684D3ADF VanceKite Evolution: https://www.youtube.com/watch?v=jew7W0_UZJI&list=PLbnvwtAGroLs0yDoNFAY5tC-lil9lqSMy PBS NOVA ScienceNOW: Origins of Life

Unit 3-Cell Communication and Anatomy	Recommended Duration: [4.5 Weeks– November/December]

Unit Description:

In this complex unit, students will explore how a cell receives a signal, processes the information from a signal, and responds to a signal. Students will learn about the many signals and reactions that occur in living things from bacteria to humans. Students will connect how signals are evolutionarily related and how cells can be disrupted if the signal pathway fails. Students will define and give many examples of how positive and negative feedback cycles work. We will use the endocrine system to provide examples of cell communication throughout the unit. The major assignment in this unit will be to create a claymation video that displays how a signal receptor works and what occurs when that reception system is damaged. Furthermore, the students will study aspects of the nervous system and the immune system based on the College Board curriculum. The nervous system and immune system will be connected to other units such as evolution, cell communication, and genetics. Students will discuss the basic structure and function of neurons and how the nervous system allows organisms to interact and respond to their environment. Students will model how an action potential transmits along a nerve cell and will compare nervous systems in different organisms. Students will learn about the nonspecific immune system in various organisms. Students will model how the acquired immune system works in humans.

Essential Questions:	Enduring Understandings:
• What are the three stage of signal transduction? • How do positive and negative feedback help maintain homeostasis? • How does epinephrine (and other biomolecules) use the signal transduction pathway? • What are the evolutionary relationships in cell communication? • How do changes to reception or transduction impact the cellular response? • How does apoptosis regulate homeostasis in living things? • What is the structure and function of a neuron? • How is an action potential propagated along a neuron? • How do organisms integrate information and respond to stimuli? • What are examples of nonspecific immunity in various organisms? • What is the role of B cells and T cells in specific immunity? • How does the body react differently to a first exposure to an antigen versus the second exposure to the antigen?	• Neurons are cells that transmit electrical signals using a membrane potential. • Electrical signals are transmitted as all-or-none changes in membrane voltage called action potentials. • The immune system is mediated by innate immune response and acquired immune response. • *College Board:* • 2. C: Organisms use feedback mechanisms to regulate growth and reproduction, and to maintain dynamic homeostasis. • 2. D: Growth and dynamic homeostasis of a biological system are influenced by changes in the system's environment. • 3. D: Cells communicate by generating, transmitting and receiving chemical signals. • 3. E: Transmission of information results in changes within and between biological systems. • A: Interactions within biological systems lead to complex properties.

Relevant Standards:	Learning Goals:	Learning Objectives:
Content Standards: **Primary(Power):** Essential Knowledge: 2.C.1, 2.D.4, 3.D.1, 3.D.2, 3.D.3, 3.D.4, 3.E.2, 4.A.4 **Secondary(Supportive):** Essential Knowledge: 2.D.1, 2.D.2, 2.D.3, 2.E.2, 4.B.2 Science Practices: 1.1, 1.2, 1.3, 1.4, 1.5, 3.1, 3.3, 6.1, 6.2, 6.4, 7.1, 7.2 ELA Standards: NJSLS-RST-11-12.1, NJSLS-RST-11-12-7, NJSLS-RST-11-12.8, NJSLS-RST-11-12.9, NJSLS-RST-11-12.10, NJSLS-WHST.11-12.1, NJSLS-WHST.11-12.2, NJSLS-WHST.11-12.4, NJSLS-WHST.11-12.5, NJSLS-WHST.11-12.6, NJSLS-WHST.11-12.9, NJSLS-WHST.11-12.10	1) Students will be able to explain the signal transduction pathway with examples of each part and analyze how change to the signal transduction pathway alters response.	1) List and describe the three stages of signal transduction. 2) Define homeostasis, positive feedback, and negative feedback. 3) Define apoptosis. 4) Describe the three types of signal receptions: g-protein, tyrosine kinase, and ion channels. 5) Describe the process of signal transduction: secondary messengers and phosphorylation cascades. 6) Explain examples of positive and negative feedback. 7) Describe how epinephrine plays a role in cell signaling. 8) Differentiate between local and long distance regulators. 9) Provide examples of how apoptosis regulates homeostasis in living things. 10) Describe how various the various organs of the endocrine system maintain homeostasis in the body. 11) Construct a “Claymation” video of the three types of signal reception. 12) Relate the signal transduction pathway to examples in animal or plant physiology. 13) Explain an example that expresses how change in signal transduction can alter cellular response. 14) Relate the chemical processes of cell communication to its evolutionary lines of descent. 15) Pose a scientific question concerning the behavioral or physiological response of an organism to a change in its environment.

	2) Students will be able to create a visual representation of complex nervous systems to describe/explain how these systems detect external and internal signals, transmit and integrate information, and produce responses.	1) Describe the structure and function of a neuron. 2) Describe how an action potential is propagated along a neuron. 3) Describe how the nervous systems detect external and internal signals. 4) Describe how the vertebrate brain integrates information to produce a response. 5) Create a visual representation to describe how the vertebrate brain integrates information to produce a response. 6) Explain how the nervous system detects external and internal signals, transmit and integrate information, and produce a response. 7) Create a visual representation of complex nervous systems to describe/explain how these systems detect external and internal signals, transmit and integrate information, and produce responses.
	3) Students will be able to differentiate between innate immunity and acquired immunity and students will create representations or models to describe immune responses.	1) List and describe the various examples of innate immunity. 2) Differentiate between innate immunity and acquired immunity. 3) Differentiate between humoral response and cell-mediated response. 4) Describe the role of B cells and T cells in the acquired immune response. 5) Describe the difference between a first and second exposure to an antigen. 6) Create representations or models to describe nonspecific immune defenses in plants and animals. 7) Create representations or models to describe immune responses.

Formative Assessments	Summative Assessments:	Performance Assessments:	Major Activities/ Assignments (required):
Google Drive Online Quizzes Ion Channel Model	Cell Communication and Anatomy Unit Test	Claymation Video Nervous System Lab Rube Goldberg Immune System	AP Essay: Cell Communication Claymation Video Nervous System Lab Rube Goldberg Immune System

Possible Assessment Modifications /Accommodations:

Special Education Students

- Extended time on Unit 3 Test.
- Read directions to students on Unit 3 Test.
- Test Corrections for Unit 3 Test.
- Provide examples of Claymation video.

English-Language Learners

- Extended time on Unit 3 Test.
- Reduced answer choices on Unit 3 Test.
- Read directions to students on Unit 3 Test
- Test Corrections for Unit 3 Test.
- Provide examples of Claymation video.

Advanced Learners

- Provide signal transduction pathways related to cancer for analysis.

Struggling Learners

- Extended time on Unit 3 test.
- Test Corrections for Unit 3 Test.

Instructional Strategies (refer to *Robert Marzano's* 41 Elements):

2.6: Identifying critical information
2.7: Organizing students to interact with new knowledge
2.8: Previewing new content
2.9: Chunking content into "digestible bites"
2.10: Processing of new information
2.11: Elaborating on new information
2.12: Recording and representing knowledge
2.13: Reflecting on learning

Instructional Strategies (refer to *Robert Marzano's* 41 Elements):
3.14: Reviewing content 3.15: Organizing students to practice and deepen knowledge 3.16: Using homework 3.17: Examining similarities and differences 3.18: Examining errors in reasoning 3.19; Practicing skills, strategies, and processes 3.20: Revising knowledge 4.21: Organizing students for cognitively complex tasks 4.22: Engaging students in cognitively complex tasks involving hypothesis generation and testing 4.23: Providing resources & guidance

Possible Instructional Modifications /Accommodations/Differentiation:
Special Education Students • Preferential Seating • Textbook for at-home use *English-Language Learners* • Preferential Seating • Textbook for at-home use • Adjusted assignment timelines • No penalty for spelling errors *Advanced Learners* • Addition problems for Unit 3 *Struggling Learners* • Preferential Seating • Textbook for at-home use

Unit Vocabulary:
Essential: Signal-transduction, g-protein, tyrosine kinase, ion channel, reception, transduction, positive feedback, negative feedback, homeostasis, apoptosis, neuron, neurotransmitter, action potential, reflex arc, innate immunity, acquired immunity, humoral response, cell-mediated response, antigen, antibody, B cell, T cell **Non-Essential:**

Epinephrine, phosphorylation cascade, endocrine system, hypothalamus, pituitary gland, glands and hormones of endocrine system, schwann cell, axon, dendrites, Na/K pump, myelin sheath, macrophage, inflammation, natural killer cells, antigen-presenting cell, helper T cell, cytotoxic T cell

Interdisciplinary Connections (Applicable Standards):	**Integration of Technology:**	**21st Century Themes:**	**21st Century Skills:**
ELA: NJSLS-RST-11-12.1, NJSLS-RST-11-12-7, NJSLS-RST-11-12.8 NJSLS-RST-11-12.9, NJSLS-RST-11-12.10, NJSLS-WHST.11-12.1, NJSLS-WHST.11-12.2, NJSLS-WHST.11-12.4 NJSLS-WHST.11-12.5, NJSLS-WHST.11-12.6, NJSLS-WHST.11-12.9, NJSLS-WHST.11-12.10 **Career Ready Practices:** NJSLS-CLKS.1 - Act as a responsible and contributing community member and employee. NJSLS-CLKS.4- Demonstrate creativity and innovation. NJSLS-CLKS.5 - Utilize critical thinking to make sense of problems and persevere in solving them. **Technology:** NJSLS.8.1.12.AP.9 - Collaboratively document and present design decisions in the development of complex programs NJSLS.8.1.12.AP.7 Collaboratively design and develop programs and artifacts for broad audiences by incorporating feedback from users **Career Awareness:** NJSLS.9.4.12.CI.2 - Identify career	Technology: -Students use google drive as a resource for documents, spreadsheets, forms, and videos. (S) -Students will use online simulations to study patterns in evolution. (A) -Students will create a Claymation video to show how the signal transduction pathway operates. (R)	Health Literacy: -Students will determine the effects of changes to the signal transduction pathway on the homeostasis of organisms.	Creativity & Innovation: -Students will design a Claymation to simulate how a signal transduction pathway works. Critical Thinking and Problem Solving: -Students will predict how a cell will respond when there are changes to the reception or transduction process. -Students will predict how homeostatic imbalances will effect on organism. Communication & Collaboration -Students will work in groups to design a Claymation where they have to verbally describe the steps of the signal transduction pathway.

Interdisciplinary Connections (Applicable Standards):	Integration of Technology:	21st Century Themes:	21st Century Skills:
pathways that highlight personal talents, skills and abilities NJSLS.9.2.12.CAP.8 - Determine job entrance criteria (e.g., education credentials, math/writing/ reading comprehension tests, and drug tests) used by employers in various industry sectors.			

Resources:
Texts/Materials: Campbell's 8th Edition: AP Biology http://www.bozemanscience.com/ap-biology/ CrashCourse Biology: https://www.youtube.com/playlist?list=PL3EED4C1D684D3ADF VanceKite Cell Regulation: https://www.youtube.com/watch?v=3sSpWtiYWH4&list=PLbnvwtAGroLvfq0sunVtKt7HX8w7BJquw PBS Leveled Reading- Newsela

Unit 4-Mitosis, Meiosis, and Development	Recommended Duration: [3 Weeks - December/January]
Unit Description: The first part of this unit will be a review of mitosis and meiosis from Honors Biology. Students will model both processes and complete many activities to reinforce the similarities and differences between mitosis and meiosis. Students will expand on these topics with higher level topics such as the cell cycle control system, cancer, and embryonic development. Students will model the stages of cloning cells and discuss the bioethics of cloning. Students will relate the processes of evolution and cell communication to this topic.	

Essential Questions:	Enduring Understandings:
• How do cells divide in order to reproduce, grow, and repair tissue?	• Over their life span, cells go through a life cycle that consists of four carefully controlled phases.

• What are the similarities and differences between mitosis and meiosis? • How does the cell cycle regulate the timing and coordination of cell division? • How do errors in the cell cycle cause cancer and other homeostatic imbalances? • How does cell differentiation play a role in embryonic development? • How do various organisms reproduce sexually and asexually? • How does sexual reproduction lead to genetically varied individuals?	• Uncontrolled cell growth leads to cancer. Different types of cancer result from different types of defects in control over the cell cycle. • Meiosis results in cells that have half as many chromosomes as the parent cell. • In animals, the earliest cell divisions divide the fertilized egg into a mass of cells. These cells are not all alike; eventually they give rise to different types of cells and tissues as development proceeds. • The fate of an embryonic cell-what it will become in the juvenile and adult organism is established in a series of steps. • *College Board:* • 2. E: Many biological processes involved in growth, reproduction and dynamic homeostasis include temporal regulation and coordination. • 3. A: Heritable information provides for continuity of life. • 3. B: Expression of genetic information involves cellular and molecular mechanisms.

Relevant Standards:	**Learning Goals:**	**Learning Objectives:**
Content Standards: **Primary(Power):** Essential Knowledge: 2.E.1, 3.A.2, 3.B.2 **Secondary(Supportive):** Essential Knowledge: 2.D.1, 3.C.2, 4.A.3 Science Practices: 1.2, 1.3, 1.4, 3.2, 5.3, 6.1, 6.2, 6.4, 7.1, 7.2 ELA Standards: NJSLS-RST-11-12.1, NJSLS-RST-11-12-3, NJSLS-RST-11-12-7, NJSLS-RST-11-12.8, NJSLS-RST-11-12.9, NJSLS-RST-	1) Students will be able to construct an explanation, using visual representations and narratives, as to how DNA in chromosomes is transmitted to the next generation via mitosis, or meiosis followed by fertilization.	1) List and describe the steps of mitosis. 2) List and describe the steps of meiosis. 3) Differentiate between mitosis and meiosis. 4) List and describe the various ways in which organisms use asexual or sexual reproduction. 5) Explain and illustrate (or model) the process of how a cell grows and divides. 6) Distinguish between cellular division and cell differentiation. 7) Analyze how the cell cycle control system regulates normal cell growth. 8) Explain how the failure for the cell cycle control system to work properly can cause cancer and other abnormalities. 9) Explain the technological processes of cloning and stem cell research. 10) Make predictions about natural phenomena occurring during the cell cycle. 11) Construct a representation that connects the process of meiosis to the passage of traits from parent to offspring.

11-12.10, NJSLS-WHST.11-12.1, NJSLS-WHST.11-12.2, NJSLS-WHST.11-12.4, NJSLS-WHST.11-12.5, NJSLS-WHST.11-12.6, NJSLS-WHST.11-12.9, NJSLS-WHST.11-12.10 NJSLS Math: NJSLS-MP.1 Make sense of problems and persevere in solving them. NJSLS-MP.5 Use appropriate tools strategically. NJSLS- MP.6		

Formative Assessments	**Summative Assessments:**	**Performance Assessments:**	**Major Activities/ Assignments (required):**
Google Drive Online Quizzes Mitosis Quiz Meiosis Quiz	Mitosis, Meiosis, and Development Unit Test	Mitosis/Meiosis modeling Mitosis/Meiosis Lab	-AP Essay: Cell Division -Mitosis/Meiosis Lab

Possible Assessment Modifications /Accommodations:
Special Education Students • Extended time on Unit 4 Test. • Read directions to students on Unit 4 Test. • Test Corrections for Unit 4 Test. • Provide a template for Brine Shrimp Lab/Junk food lab English-Language Learners • Extended time on Unit 3 Test. • Reduced answer choices on Unit 4 Test. • Read directions to students on Unit 4 Test • Test Corrections for Unit 4 Test. • Provide a template for Brine Shrimp Lab/Junk food lab Advanced Learners • Provide signal transduction pathways related to cancer for analysis Struggling Learners • Extended time on Unit 4 test. • Test Corrections for Unit 4 Test.

Instructional Strategies (refer to *Robert Marzano's* 41 Elements):
2.6: Identifying critical information 2.7: Organizing students to interact with new knowledge 2.8: Previewing new content 2.9: Chunking content into "digestible bites" 2.10: Processing of new information 2.11: Elaborating on new information 2.12: Recording and representing knowledge 2.13: Reflecting on learning 3.14: Reviewing content 3.15: Organizing students to practice and deepen knowledge 3.16: Using homework 3.17: Examining similarities and differences 3.18: Examining errors in reasoning 3.19; Practicing skills, strategies, and processes 3.20: Revising knowledge

Instructional Strategies (refer to *Robert Marzano's* 41 Elements):

4.21: Organizing students for cognitively complex tasks
4.22: Engaging students in cognitively complex tasks involving hypothesis generation and testing
4.23: Providing resources & guidance

Possible Instructional Modifications /Accommodations/Differentiation:

Special Education Students
- Preferential Seating
- Textbook for at-home use

English-Language Learners
- Preferential Seating
- Textbook for at-home use
- Adjusted assignment timelines
- No penalty for spelling errors

Advanced Learners
- Addition problems for Unit 4

Struggling Learners
- Preferential Seating
- Textbook for at-home use

Unit Vocabulary:

Essential:
Cell cycle control system, checkpoint, cancer, mitosis, meiosis, differentiation, crossing over, independent assortment, random fertilization, asexual reproduction, sexual reproduction, clone, variation,

Non-Essential:
Somatic cell, gamete, chromosome, chromatin, phases of cell cycle, phases of mitosis/meiosis, binary fission, haploid, diploid, karyotype, autosome, sex chromosome, homologous chromosome, zygote, alternation of generation, sporophyte, spores, gametophyte, synapsis, chiasma, blastula, mesoderm, ectoderm, endoderm, pattern formation

Interdisciplinary Connections (Applicable Standards):	Integration of Technology:	21st Century Themes:	21st Century Skills:
Mathematics: NJSLS-MP.1 Make sense of problems and persevere in solving them. NJSLS-MP.5 Use appropriate tools strategically. NJSLS-MP.6 Attend to precision. ELA: NJSLS-RST-11-12.1, NJSLS-RST-11-12-3, NJSLS-RST-11-12-7 NJSLS-RST-11-12.8, NJSLS-RST-11-12.9, NJSLS-RST-11-12.10, NJSLS-WHST.11-12.1, NJSLS-WHST.11-12.2, NJSLS-WHST.11-12.4, NJSLS-WHST.11-12.5, NJSLS-WHST.11-12.6, NJSLS-WHST.11-12.9, NJSLS-WHST.11-12.10 **Career Ready Practices:** NJSLS-CLKS.1 - Act as a responsible and contributing community member and employee. NJSLS-CLKS.4- Demonstrate creativity and innovation. NJSLS-CLKS.5 - Utilize critical thinking to make sense of problems and persevere in solving them. **Technology:** NJSLS.8.1.12.AP.9 - Collaboratively document and present design decisions in the development of complex	Technology: -Students use google drive as a resource for documents, spreadsheets, forms, and videos. (S) -Students will use simulations to reinforce the concepts of the cell cycle control system, cloning, and stem cells. (M)	Health Literacy: -Students will discuss the various causes to cancer and potential ways to prevent or treat cancer more effectively.	Critical Thinking and Problem Solving: -Students will describe how various mutations to key genes that regulate the cell cycle control system cause cancer. Communication & Collaboration: -Students will work in groups in order to complete simulations of mitosis and meiosis. -Students will analyze the process of mitosis and meiosis through writing and drawings. ICT Literacy: -Students will use online simulations to describe how processes such as cloning and the cell cycle control system work.

Interdisciplinary Connections (Applicable Standards):	Integration of Technology:	21st Century Themes:	21st Century Skills:
programs NJSLS.8.1.12.AP.7 Collaboratively design and develop programs and artifacts for broad audiences by incorporating feedback from users NJSLS.8.2.12.B.4 **Career Awareness:** NJSLS.9.2.12.CAP.8 - Determine job entrance criteria (e.g., education credentials, math/writing/ reading comprehension tests, and drug tests) used by employers in various industry sectors.			

Resources:
Texts/Materials: Campbell's 8th Edition: AP Biology http://www.bozemanscience.com/ap-biology/ CrashCourse Biology: https://www.youtube.com/playlist?list=PL3EED4C1D684D3ADF VanceKite Cell Regulation: https://www.youtube.com/watch?v=3sSpWtiYWH4&list=PLbnvwtAGroLvfq0sunVtKt7HX8w7BJquw VanceKite Genetics: https://www.youtube.com/playlist?list=PLbnvwtAGroLtl4IPZcBorKGl26n7STM1D PBS Leveled Reading- Newsela

Unit 5: Genetics: Patterns of Inheritance	**Recommended Duration: [2.5– December/January]**
Unit Description: The students will review Punnett squares and learn new methods of how to solve genetics problems. Students will study patterns of inheritance in pedigrees and determine how traits are inherited. Students will discuss genetically inherited disorders and bioethical issues in genetic inheritance. Students will explore how a gene's location on a chromosome impacts inheritance and how to determine whether a gene is on a sex chromosome or autosome by analyzing data sets. Students will perform Chi square statistical tests to determine the validity of various data sets.	

Essential Questions:	**Enduring Understandings:**
-How did Gregor Mendel determine the pattern of inheritance in his experiment with pea plants? -How is a Punnett square used to determine patterns of inheritance in monohybrid and dihybrid crosses? -How can the rules of probability be used to complete trihybrid crosses? -What are examples of inheritance that cannot be explained by simple Mendelian genetics? -How can pedigrees be used to analyze and predict the inheritance of traits? -How does the location of genes on chromosomes impact how they are inherited? -How are sex-linked traits inherited? -How can chi-square be used to determine whether genes are linked or not linked?	Genes are located on chromosomes. The separation of homologous chromosomes during meiosis I explains why alleles of the same gene segregate to different gametes. Important exceptions exist to the rules that individuals have two alleles of each gene and that alleles of different genes are transmitted independently. *College Board:* 3. A: Heritable information provides for continuity of life.

Relevant Standards:	**Learning Goals:**	**Learning Objectives:**
Content Standards: **Primary(Power):** Essential Knowledge: 3.A.3, 3.A.4 **Secondary(Supportive):**	1) Students will be able to apply mathematical routines to determine Mendelian patterns of inheritance provided by data sets and students will be able to predict the patterns of inheritance using pedigree analysis.	1) Define phenotype, genotype, dominant, recessive, homozygous, and heterozygous. 2) Solve monohybrid crosses with complete dominance using a Punnett square. 3) Solve dihybrid crosses with complete dominance using a Punnett square and the rules of probability. 4) Solve trihybrid crosses with complete dominance using the rules of probability.

Relevant Standards:	Learning Goals:	Learning Objectives:
Essential Knowledge: 3.C.1 Science Practices: 1.1, 1.2, 2.2, 2.3, 3.1 6.3, 6.5, 7.2 ELA Standards: NJSLS-RST-11-12.1, NJSLS-RST-11-12-6, NJSLS-RST-11-12-7, NJSLS-RST-11-12.8, NJSLS-RST-11-12.9, NJSLS-RST-11-12.10, NJSLS-WHST.11-12.1, NJSLS-WHST.11-12.1, NJSLS-WHST.11-12.2, NJSLS-WHST.11-12.4, NJSLS-WHST.11-12.5, NJSLS-WHST.11-12.6, NJSLS-WHST.11-12.9, NJSLS-WHST.11-12.10	2) Students will be able to describe representations and analyze data sets of an appropriate example of inheritance patterns that cannot be explained by Mendel's model of the inheritance of traits.	5) Discuss various autosomal dominant and recessive disorders that follow Mendelian inheritance. 6) Predict whether a trait is autosomal dominant or recessive based on pedigree analysis. 1) Solve genetics problems regarding incomplete dominance, codominance, epistasis, and multiple alleles. 2) Solve genetics problems regarding sex-linked genes. 3) Discuss sex determination in a variety of different species. 4) Describe how genetic linkage affects inheritance. 5) Determine whether inherited genes are independently assorted or linked on a chromosome. 6) Analyze various data sets that show inheritance and determine whether traits are autosomal dominant, autosomal recessive, or sex-linked. 7) Analyze data sets using Chi square to determine if traits are independently assorted.

Formative Assessments	Summative Assessments:	Performance Assessments:	Major Activities/ Assignments (required):
-Mono/Di/Trihybrid Quiz -Extensions in Mendelian genetics quiz	Genetics Test	-Chi Square Essay	-Genetics Practice Problems Packet -AP Biology Essay

Possible Assessment Modifications /Accommodations:

Special Education Students

- Extended time on Unit 5 Test.
- Read directions to students on Unit 5 Test.
- Test Corrections for Unit 5 Test.

English-Language Learners

- Extended time on Unit 5 Test.
- Reduced answer choices on Unit 5 Test.
- Read directions to students on Unit 5 Test
- Test Corrections for Unit 5 Test.

Advanced Learners

- Provide additional inheritance problems.
- Provide problem sets where the genetics of the parents are unknown.

Struggling Learners

- Extended time on Unit 5 test.
- Test Corrections for Unit 5 Test.

Instructional Strategies (refer to *Robert Marzano's* 41 Elements):

2.6: Identifying critical information
2.7: Organizing students to interact with new knowledge
2.8: Previewing new content
2.9: Chunking content into "digestible bites"
2.10: Processing of new information
2.11: Elaborating on new information
2.12: Recording and representing knowledge
2.13: Reflecting on learning
3.14: Reviewing content
3.15: Organizing students to practice and deepen knowledge
3.16: Using homework
3.17: Examining similarities and differences
3.18: Examining errors in reasoning
3.19; Practicing skills, strategies, and processes

Instructional Strategies (refer to *Robert Marzano's* 41 Elements):
3.20: Revising knowledge 4.21: Organizing students for cognitively complex tasks 4.22: Engaging students in cognitively complex tasks involving hypothesis generation and testing 4.23: Providing resources & guidance

Possible Instructional Modifications /Accommodations/Differentiation:
Special Education Students • Preferential Seating • Textbook for at-home use *English-Language Learners* • Preferential Seating • Textbook for at-home use • Adjusted assignment timelines • No penalty for spelling errors *Advanced Learners* • Addition problems for Unit 5 *Struggling Learners* • Preferential Seating • Textbook for at-home use

Unit Vocabulary:
Essential: Punnett square, sex chromosome, dominant, recessive, phenotype, genotype, allele, heterozygous, homozygous, sex-linked, linked genes, **Non-Essential:** Multiple alleles, incomplete dominance, codominance, test cross, monohybrid, dihybrid, trihybrid, law of independent assortment, pleiotropy, epistasis, pedigree, carrier, genetically inherited disorders, wild type, Barr body, parental types, recombinant types, crossing over

Interdisciplinary Connections (Applicable Standards):	**Integration of Technology:**	**21st Century Themes:**	**21st Century Skills:**
Mathematics:	Technology:	Health Literacy:	Critical Thinking and Problem Solving:

Interdisciplinary Connections (Applicable Standards):	**Integration of Technology:**	**21st Century Themes:**	**21st Century Skills:**
NJSLS-MP.1 Make sense of problems and persevere in solving them. NJSLS-MP.2 Reason abstractly and quantitatively. NJSLS-MP.3 NJSLS-MP.4 Model with mathematics. NJSLS-MP.5 Use appropriate tools strategically. NJSLS-MP.6 Attend to precision. HSS-IC.A.2 ELA: NJSLS-RST-11-12.1, NJSLS-RST-11-12-6, NJSLS-RST-11-12-7, NJSLS-RST-11-12.8, NJSLS-RST-11-12.9, NJSLS-RST-11-12.10, NJSLS-WHST.11-12.1, NJSLS-WHST.11-12.1, NJSLS-WHST.11-12.2, NJSLS-WHST.11-12.4, NJSLS-WHST.11-12.5, NJSLS-WHST.11-12.6, NJSLS-WHST.11-12.9, NJSLS-WHST.11-12.10 **Career Ready Practices:** NJSLS-CLKS.1 - Act as a responsible and contributing community member and employee.	-Students use google drive as a resource for documents, spreadsheets, forms, and videos. (S)	-Students will explore the inheritance of dominantly and recessively inherited traits.	-Students will analyze pedigrees to determine whether a trait is autosomal dominant, autosomal recessive, x-linked dominant, x-linked recessive, or y-linked. -Students will solve various genetics crosses exhibiting one to three traits using Mendelian and non-Mendelian inheritance. Communication & Collaboration: -Students will work together to solve genetics problems and explain the results.

Interdisciplinary Connections (Applicable Standards):	Integration of Technology:	21st Century Themes:	21st Century Skills:
NJSLS-CLKS.4- Demonstrate creativity and innovation. NJSLS-CLKS.5 - Utilize critical thinking to make sense of problems and persevere in solving them. **Technology:** NJSLS.8.1.12.AP.9 - Collaboratively document and present design decisions in the development of complex programs NJSLS.8.1.12.AP.7 Collaboratively design and develop programs and artifacts for broad audiences by incorporating feedback from users NJSLS.8.2.12.B.4 **Career Awareness:** NJSLS.9.2.12.CAP.8 - Determine job entrance criteria (e.g., education credentials, math/writing/ reading comprehension tests, and drug tests) used by employers in various industry sectors.			

Resources:
Texts/Materials: Campbell's 8th Edition: AP Biology http://www.bozemanscience.com/ap-biology/ CrashCourse Biology: https://www.youtube.com/playlist?list=PL3EED4C1D684D3ADF

Resources:
VanceKite Cell Regulation: https://www.youtube.com/watch?v=3sSpWtiYWH4&list=PLbnvwtAGroLvfq0sunVtKt7HX8w7BJquw VanceKite Genetics: https://www.youtube.com/playlist?list=PLbnvwtAGroLtl4IPZcBorKGl26n7STM1D PBS Leveled Reading- Newsela

Unit 6: Genetics: From Gene to Protein	**Recommended Duration: [3 weeks–February]**
Unit Description: The students will describe the structure and function of DNA and RNA and describe the landmark research surrounding molecular genetics. The students will describe the complex process of how genes are converted into proteins inside of a cell. Students will also describe how errors in this process lead to genetic mutations. Students will describe how viruses replicate, reproduce, and infect host cells. Students will complete the Bacterial Transformation lab in this unit.	

Essential Questions:	**Enduring Understandings:**
-How does DNA replicate? -How does a gene transcribe and translate to become a protein? -What experiments prove that DNA is the genetic material? -How can a change in genotype change the phenotype of an organism? -What are the causes of mutations? -How do different mutations impact an organism? -How do viruses change the genome of another organism? -Why can genes of one organism be introduced to another organism?	Most genes code for enzymes that catalyze specific chemical reactions in the cell. In cells, information flows from DNA to RNA to proteins. Mutations can produce changes in the phenotype. *College Board:* 3. A: Heritable information provides for continuity of life. 3. C: The processing of genetic information is imperfect and is a source of genetic variation.

Relevant Standards:	Learning Goals:	Learning Objectives:
Content Standards: **Primary(Power):** Essential Knowledge: 3.A.1, 3.C.3 **Secondary(Supportive):** Essential Knowledge: 3.C.2 Science Practices: 1.2, 1.4, 4.1, 6.2, 6.4, 6.5, 7.1, 7.2 ELA Standards: NJSLS-RST-11-12.1, NJSLS-RST-11-12.3, NJSLS-RST-11-12-6, NJSLS-RST-11-12-7, NJSLS-RST-11-12.8, NJSLS-RST-11-12.9, NJSLS-RST-11-12.10, NJSLS-WHST.11-12.1, NJSLS-WHST.11-12.1, NJSLS-WHST.11-12.2, NJSLS-WHST.11-12.4, NJSLS-WHST.11-12.5, NJSLS-WHST.11-12.6, NJSLS-WHST.11-12.9, NJSLS-WHST.11-12.10	1) Students will be able to describe the processes of replication, transcription, and translation and students will be able to create a visual representation to illustrate how changes in a DNA nucleotide sequence can result in a change in the polypeptide produced. 2) Students will be able to describe how viruses replicate and students will be able to construct an explanation of how viruses introduce genetic variation in host organisms.	1) Describe the structure and function of DNA and RNA. 2) Describe the different types of mutations that occur on DNA. 3) Justify the selection of data from historical investigations that support the claim that DNA is the source of heritable information. 4) Describe representations and models illustrating how genetic information is translated into polypeptides. 5) Construct scientific explanations that use the structures and mechanisms of DNA and RNA to support the claim that DNA and, in some cases, that RNA are the primary sources of heritable information. 6) Create a visual representation to illustrate how changes in a DNA nucleotide sequence can result in a change in the polypeptide produced. 1) Describe the structure and function of a virus. 2) Differentiate between the lytic and lysogenic cycles. 3) Construct an explanation of how viruses introduce genetic variation in host organisms. 4) Use representations and appropriate models to describe how viral replication introduces genetic variation in the viral population.

Formative Assessments	Summative Assessments:	Performance Assessments:	Major Activities/ Assignments (required):
-Google Drive Online Quiz -Chapter 16 Quiz -Chapter 17 Quiz	Genetics Test	-Transformation Lab	-Transformation Lab -AP Biology Essay

Possible Assessment Modifications /Accommodations:
Special Education Students • Extended time on Unit 6 Test. • Read directions to students on Unit 6 Test. • Test Corrections for Unit 6 Test. • Provide videos of the Transformation Lab. *English-Language Learners* • Extended time on Unit 6 Test. • Reduced answer choices on Unit 6 Test. • Read directions to students on Unit 6 Test • Test Corrections for Unit 6 Test. • Provide videos of the Transformation Lab. *Advanced Learners* • Provide additional examples of gene regulation. *Struggling Learners* • Extended time on Unit 6 test. • Test Corrections for Unit 6 Test. • Provide videos of the Transformation Lab.

Instructional Strategies (refer to *Robert Marzano's* 41 Elements):

2.6: Identifying critical information
2.7: Organizing students to interact with new knowledge
2.8: Previewing new content
2.9: Chunking content into "digestible bites"
2.10: Processing of new information
2.11: Elaborating on new information
2.12: Recording and representing knowledge
2.13: Reflecting on learning
3.14: Reviewing content
3.15: Organizing students to practice and deepen knowledge
3.16: Using homework
3.17: Examining similarities and differences
3.18: Examining errors in reasoning
3.19; Practicing skills, strategies, and processes
3.20: Revising knowledge
4.21: Organizing students for cognitively complex tasks
4.22: Engaging students in cognitively complex tasks involving hypothesis generation and testing
4.23: Providing resources & guidance

Possible Instructional Modifications /Accommodations/Differentiation:

Special Education Students

- Preferential Seating
- Textbook for at-home use

English-Language Learners

- Preferential Seating
- Textbook for at-home use
- Adjusted assignment timelines
- No penalty for spelling errors

Advanced Learners

- Addition problems for Unit 6

Struggling Learners

- Preferential Seating
- Textbook for at-home use

Unit Vocabulary:

Essential:
Transformation, DNA polymerase, helicase, ligase, telomeres, transcription, translation, mRNA, tRNA, rRNA, spliceosome, codon, anticodon, primary transcript, RNA polymerase, 5' cap, poly A tail, point mutation, frame shift mutation, lytic cycle, lysogenic cycle,

Non-Essential:
Semiconservative, adenine, thymine, guanine, cytosine, uracil, primase, single-strand binding protein, topoisomerase, Okazaki fragments, "snurp", wobble, SRP, mutagen, bacteriophage, vaccine, viroid, prion

Interdisciplinary Connections (Applicable Standards):	**Integration of Technology:**	**21st Century Themes:**	**21st Century Skills:**
Mathematics: NJSLS-MP.1 Make sense of problems and persevere in solving them. ELA: NJSLS-RST-11-12.1, NJSLS-RST-11-12.3, NJSLS-RST-11-12-6, NJSLS-RST-11-12-7, NJSLS-RST-11-12.8, NJSLS-RST-11-12.9, NJSLS-RST-11-12.10, NJSLS-WHST.11-12.1, NJSLS-WHST.11-12.1, NJSLS-WHST.11-12.2, NJSLS-WHST.11-12.4, NJSLS-WHST.11-12.5, NJSLS-WHST.11-12.6, NJSLS-WHST.11-12.9, NJSLS-WHST.11-12.10 **Career Ready Practices:**	Technology: -Students use google drive as a resource for documents, spreadsheets, forms, and videos. (S) -Students will use online simulations to study patterns in evolution. (A)	Health Literacy: -Students will describe how a virus infect cells and how to prevent viruses. -Students will describe how to use bacterial transformation for common pharmaceutical applications.	Critical Thinking and Problem Solving: -Students will analyze how changes or errors in the DNA or RNA processing can cause changes to the proteins. Communication & Collaboration: -Students will work together to complete the bacterial transformation lab.

Interdisciplinary Connections (Applicable Standards):	Integration of Technology:	21st Century Themes:	21st Century Skills:
NJSLS-CLKS.1 - Act as a responsible and contributing community member and employee. NJSLS-CLKS.4- Demonstrate creativity and innovation. NJSLS-CLKS.5 - Utilize critical thinking to make sense of problems and persevere in solving them. **Technology:** NJSLS.8.1.12.AP.9 -Collaboratively document and present design decisions in the development of complex programs NJSLS.8.1.12.DA.1 Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change NJSLS.8.1.12.AP.7 Collaboratively design and develop programs and artifacts for broad audiences by incorporating feedback from users NJSLS.8.2.12.B.4 **Career Awareness:** NJSLS.9.4.12.CI.2- Identify career pathways that highlight personal talents, skills and abilities NJSLS.9.2.12.CAP.8 - Determine job entrance criteria (e.g., education credentials, math/writing/ reading comprehension tests, and drug tests)			

Interdisciplinary Connections (Applicable Standards):	Integration of Technology:	21st Century Themes:	21st Century Skills:
used by employers in various industry sectors.			

Resources:
Texts/Materials: Campbell's 8th Edition: AP Biology http://www.bozemanscience.com/ap-biology/ CrashCourse Biology: https://www.youtube.com/playlist?list=PL3EED4C1D684D3ADF VanceKite Cell Regulation: https://www.youtube.com/watch?v=3sSpWtiYWH4&list=PLbnvwtAGroLvfq0sunVtKt7HX8w7BJquw VanceKite Genetics: https://www.youtube.com/watch?v=2BxHrrUt1yM&list=PLbnvwtAGroLsWan_iIxanBwgs6q0fauXN PBS

Unit 7: Genetics: Gene Expression and DNA Technology	**Recommended Duration: [3 weeks– February/March]**
Unit Description: The students will describe gene expression in prokaryotic and eukaryotic organisms. The students will discuss and model inducible and repressible operons. Students will discuss how the environment influences how genes are expressed. Students will explore DNA technology and advances in DNA technology and genetics. Students will complete the Gel Electrophoresis lab.	

Essential Questions:	Enduring Understandings:
-How do bacterial genomes express genes? -What is the difference between a repressible and an inducible operon? -How can individuals with the same DNA (i.e. twins) have different phenotypes? -What are the uses of gel electrophoresis and how does the process work? -What are other types of DNA technology?	Changes in gene expression allow bacterial cells to respond to environmental changes. Many regulatory proteins bind to specific sites in DNA. Because different regulatory proteins have different amino acid sequences they bind to different DNA sequences. Changes in gene expression allow eukaryotic cells to respond to changes in the environment and cause distinct cell types to develop.

Essential Questions:	Enduring Understandings:
	Researchers use several strategies to find and characterize the genes responsible for specific traits, such as the alleles associated with certain genetic diseases. *College Board:* 3. A: Heritable information provides for continuity of life. 3. B: Expression of genetic information involves cellular and molecular mechanisms. 3. C: The processing of genetic information is imperfect and is a source of genetic variation.

Relevant Standards:	Learning Goals:	Learning Objectives:
Content Standards: **Primary(Power):** Essential Knowledge: 3.B.1, 3.B.2, 3.C.3 **Secondary(Supportive):** Essential Knowledge: 3.C.2 Science Practices: 1.4, 6.2, 7.1, 7.2 ELA Standards: NJSLS-RST-11-12.1, NJSLS-RST-11-12.3, NJSLS-RST-11-12-6, NJSLS-RST-11-12-7, NJSLS-RST-11-12.8, NJSLS-RST-11-12.9, NJSLS-RST-11-12.10, NJSLS-WHST.11-12.1, NJSLS-WHST.11-12.1,	1) Students will be able to predict how a change in a specific DNA or RNA sequence can result in changes in gene expression and students will be able to use representations to describe how gene regulation influences cell products and function.	1) Differentiate between inducible and repressible operons. 2) Describe how gene expression impacts eukaryotic genomes. 3) Describe the connection between the regulation of gene expression and observed differences between different kinds of organisms. 4) Describe the connection between the regulation of gene expression and observed differences between individuals in a population. 5) Explain how the regulation of gene expression is essential for the processes and structures that support efficient cell function. 6) Predict the effects of a change in an environmental factor on gene expression and the resulting phenotype of an organism.

Relevant Standards:	Learning Goals:	Learning Objectives:
NJSLS-WHST.11-12.2, NJSLS-WHST.11-12.4, NJSLS-WHST.11-12.5, NJSLS-WHST.11-12.6, NJSLS-WHST.11-12.9, NJSLS-WHST.11-12.10	2) Students will be able to justify the claim that humans can manipulate heritable information by identifying at least two commonly used technologies.	1) List applications of genetic technology and describe their importance in the field of genetics. 2) Describe how the process of gel electrophoresis works. 3) Identify the pros and cons of GMOs, transgenic animals, cloned animals, and pharmaceuticals. 4) Conduct an experiment using gel electrophoresis to determine unknown molecules. 5) Explain how heritable information can be manipulated using common technologies.

Formative Assessments	Summative Assessments:	Performance Assessments:	Major Activities/ Assignments (required):
-Operon quiz -Gel Electrophoresis Quiz	Genetics Test	-Gel Electrophoresis Lab -BLAST Lab	-Gel Electrophoresis Lab -BLAST Lab -AP Biology Essay

Possible Assessment Modifications /Accommodations:

Special Education Students

- Extended time on Unit 7 Test.
- Read directions to students on Unit 7 Test.
- Test Corrections for Unit 7 Test.
- Provide videos of the Gel Electrophoresis Lab.

English-Language Learners

- Extended time on Unit 7 Test.
- Reduced answer choices on Unit 7 Test.
- Read directions to students on Unit 7 Test
- Test Corrections for Unit 7 Test.
- Provide videos of the Gel Electrophoresis Lab.

Advanced Learners

- Provide additional examples of gene regulation.

Struggling Learners

- Extended time on Unit 7 test.
- Test Corrections for Unit 7 Test.
- Provide videos of the Gel Electrophoresis Lab.

Instructional Strategies (refer to *Robert Marzano's* 41 Elements):

2.6: Identifying critical information
2.7: Organizing students to interact with new knowledge
2.8: Previewing new content
2.9: Chunking content into "digestible bites"
2.10: Processing of new information
2.11: Elaborating on new information
2.12: Recording and representing knowledge
2.13: Reflecting on learning
3.14: Reviewing content
3.15: Organizing students to practice and deepen knowledge
3.16: Using homework
3.17: Examining similarities and differences
3.18: Examining errors in reasoning
3.19; Practicing skills, strategies, and processes
3.20: Revising knowledge
4.21: Organizing students for cognitively complex tasks
4.22: Engaging students in cognitively complex tasks involving hypothesis generation and testing
4.23: Providing resources & guidance

Possible Instructional Modifications /Accommodations/Differentiation:

Special Education Students

- Preferential Seating
- Textbook for at-home use

English-Language Learners

- Preferential Seating
- Textbook for at-home use
- Adjusted assignment timelines
- No penalty for spelling errors

Advanced Learners
- Addition problems for Unit 7

Struggling Learners
- Preferential Seating
- Textbook for at-home use

Unit Vocabulary:
Essential: Operon, inducible operon, repressible operon, genomic imprinting, genetically modified organism, restriction enzyme, gel electrophoresis **Non-Essential:** lac operon, trp operon, operator, repressor, plasmids, gene cloning

Interdisciplinary Connections (Applicable Standards):	**Integration of Technology:**	**21st Century Themes:**	**21st Century Skills:**
Mathematics: NJSLS-MP.1 Make sense of problems and persevere in solving them. NJSLS-MP.2 Reason abstractly and quantitatively. ELA: NJSLS-RST-11-12.1, NJSLS-RST-11-12.3, NJSLS-RST-11-12-6, NJSLS-RST-11-12-7, NJSLS-RST-11-12.8, NJSLS-RST-11-12.9, NJSLS-RST-11-12.10, NJSLS-WHST.11-	Technology: -Students use google drive as a resource for documents, spreadsheets, forms, and videos. (S) -Students will use simulations to reinforce the concepts of the gel electrophoresis and the lac operon. (M) -Students will use BLAST to compare DNA and proteins in various organisms. (R)	Health Literacy: -Students will describe how DNA technology is used in a variety of topics that relate to health.	Critical Thinking and Problem Solving -Students will analyze the results of gel electrophoresis using restriction enzymes to determine the size of DNA/proteins. Life and Career Skills -Students will explore careers in genetics and research. Information & Communication: -Students will use the BLAST database to compare the DNA and proteins of organisms.

Interdisciplinary Connections (Applicable Standards):	Integration of Technology:	21st Century Themes:	21st Century Skills:
12.1, NJSLS-WHST.11-12.1, NJSLS-WHST.11-12.2, NJSLS-WHST.11-12.4, NJSLS-WHST.11-12.5, NJSLS-WHST.11-12.6, NJSLS-WHST.11-12.9, NJSLS-WHST.11-12.10 **Career Ready Practices:** NJSLS-CLKS.1 - Act as a responsible and contributing community member and employee. NJSLS-CLKS.4- Demonstrate creativity and innovation. NJSLS-CLKS.5 - Utilize critical thinking to make sense of problems and persevere in solving them. **Technology:** NJSLS.8.1.12.AP.9 -Collaboratively document and present design decisions in the development of complex programs NJSLS.8.1.12.AP.7 Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change NJSLS.8.2.12.B.4 NJSLS.8.2.12.C.7 **Career Awareness:** NJSLS.9.4.12.CI.2 - Identify career pathways that highlight personal talents, skills and abilities NJSLS.9.2.12.CAP.8 - Determine job	-Students will use gel electrophoresis to determine the size of DNA after it is introduced to restriction enzymes. (biotechnology)		

Interdisciplinary Connections (Applicable Standards):	Integration of Technology:	21st Century Themes:	21st Century Skills:
entrance criteria (e.g., education credentials, math/writing/ reading comprehension tests, and drug tests) used by employers in various industry sectors.			

Resources:
Texts/Materials: Campbell's 8th Edition: AP Biology http://www.bozemanscience.com/ap-biology/ CrashCourse Biology: https://www.youtube.com/playlist?list=PL3EED4C1D684D3ADF VanceKite Genetics: https://www.youtube.com/watch?v=2BxHrrUt1yM&list=PLbnvwtAGroLsWan_iIxanBwgs6q0fauXN PBS Leveled Reading- Newsela

Unit 8: Energy in Ecosystems	**Recommended Duration: [3 weeks– March/April]**
Unit Description: This unit will cover photosynthesis, cellular respiration, and the ecological interaction between the two processes. The students will explore photosynthesis on a microscopic level by tracing the molecules through the process. Students will discuss how a plant uses sunlight, carbon dioxide, and water to make oxygen and energy-rich sugar molecules. Students will discuss how plants have evolutionarily adapted to survive in hot, dry climates. Students will discuss the overview of cellular respiration and will explore how organisms use various strategies to regulate body temperature and metabolism. After learning the metabolic processes of various organisms, students will create food webs and trophic pyramids to show how energy flows through an ecosystem. The students will complete a Photosynthesis Lab and a Cellular Respiration Lab in this unit. These labs will focus on the rate of metabolic processes in different environmental conditions.	

Essential Questions:	Enduring Understandings:
-How do plants convert energy from the sun to the energy of chemical bonds? -How have plants adapted to hot, dry climates?	Cellular respiration produces ATP from molecules with high potential energy-often glucose.

Essential Questions:	Enduring Understandings:
-How does change in temperature, carbon dioxide, and light intensity affect the rate of photosynthesis? -How do organisms use the energy stored in the chemical bonds of sugar to ATP? -How do organisms use different strategies to regulate body temperature and metabolism? -What is the relationship between metabolic rate and the size of a multicellular organism? -How can you convert the information from a food web to a trophic pyramid? -What happens to energy as you move up the trophic structure?	Photosynthesis harnesses energy from the sun to produce molecules with high potential energy. Energy flows from producers to consumers and decomposers, much of it is lost. *College Board:* 2. A: Growth, reproduction, and maintenance of the organization of living systems require free energy and matter. 4. A: Interactions within biological systems lead to complex properties.

Relevant Standards:	Learning Goals:	Learning Objectives:
Content Standards: **Primary(Power):** Essential Knowledge: 2.A.1, 2.A.2, 2.A.3, 4.A.6 **Secondary(Supportive):** Science Practices: 1.1, 1.4, 2.2, 3.1, 4.1, 6.1, 6.2, 6.4 ELA Standards: NJSLS-RST-11-12.1, NJSLS-RST-11-12.3, NJSLS-RST-11-12-7, NJSLS-RST-11-12.8, NJSLS-RST-11-12.9, NJSLS-RST-11-12.10, NJSLS-WHST.11-12.1, NJSLS-WHST.11-12.2, NJSLS-WHST.11-12.4, NJSLS-WHST.11-12.5, NJSLS-WHST.11-12.6, NJSLS-WHST.11-12.9, NJSLS-WHST.11-12.10	1) Students will be able to explain the process of how plants can capture energy from the sun and store the energy in the chemical bonds of sugar and investigate the effect of changing environmental conditions on the rate of photosynthesis.	1) List and describe the basic steps of the light reactions and the Calvin cycle in the process of photosynthesis. 2) Analyze the transfer of energy from light to the chemical bonds of sugar in photosynthesis. 3) Conduct an experiment to test the rate of photosynthesis in light and dark. 4) Analyze how light intensity, carbon dioxide, and temperature impact the rate of photosynthesis. 5) Analyze the various examples of adaptations that save water in hot, dry climates such as C4 and CAM pathways. 6) Analyze data that shows the effectiveness of photosynthesis in different environmental conditions. 7) Construct explanations of the mechanisms and structural features of cells that allow organisms to capture, store or use free energy.

Relevant Standards:	Learning Goals:	Learning Objectives:
	2) Students will be able to trace the elements of sugar through the process of cellular respiration and describe how organisms use different strategies to regulate body temperature and metabolism.	1) Differentiate between aerobic and anaerobic respiration. 2) Explain how the energy in sugar is converted to energy in ATP. 3) Describe how organisms use different strategies to regulate body temperature and metabolism. 4) Explain how photosynthesis and cell respiration relate to one another in plant cells. 5) Compare and contrast the process of chemiosmosis in the chloroplast and mitochondria. 6) Justify a scientific claim that free energy is required for living systems to maintain organization to grow or to reproduce, but that multiple strategies exist in different living systems. 7) Construct explanations of the mechanisms and structural features of cells that allow organisms to capture, store or use free energy.
	3) Students will be able to construct a food web of an ecosystem and analyze how energy flows through the organisms in the food web.	1) Construct a food web and analyze how energy flows through the food web through trophic structures. 2) Apply mathematical routines to quantities that describe interactions among living systems and their environment, which result in the movement of matter and energy. 3) Predict how changes in free energy availability affect organisms, populations, and ecosystems. 4) Represent graphically or model quantitatively the exchange of molecules between an organism and its environment.

Relevant Standards:	Learning Goals:	Learning Objectives:
		5) The student is able to evaluate data to show the relationship between photosynthesis and respiration in the flow of free energy through a system.

Formative Assessments	Summative Assessments:	Performance Assessments:	Major Activities/ Assignments (required):
-Google Drive Online Quiz -Photosynthesis Quiz	Energy in Ecosystems Test	- Cellular Respiration Lab -Photosynthesis Lab	- Cellular Respiration Lab -Photosynthesis Lab -AP Biology Essay

Possible Assessment Modifications /Accommodations:

Special Education Students

- Extended time on Unit 8 Test.
- Read directions to students on Unit 8 Test.
- Test Corrections for Unit 8 Test.

English-Language Learners

- Extended time on Unit 8 Test.
- Reduced answer choices on Unit 8 Test.
- Read directions to students on Unit 8 Test
- Test Corrections for Unit 8 Test.

Advanced Learners

- Provide students with data from Photosynthesis rate of reaction lab.

Struggling Learners

- Extended time on Unit 8 test.
- Test Corrections for Unit 8 Test.

Instructional Strategies (refer to *Robert Marzano's* 41 Elements):

2.6: Identifying critical information
2.7: Organizing students to interact with new knowledge
2.8: Previewing new content
2.9: Chunking content into "digestible bites"
2.10: Processing of new information
2.11: Elaborating on new information
2.12: Recording and representing knowledge
2.13: Reflecting on learning
3.14: Reviewing content
3.15: Organizing students to practice and deepen knowledge
3.16: Using homework
3.17: Examining similarities and differences
3.18: Examining errors in reasoning
3.19; Practicing skills, strategies, and processes
3.20: Revising knowledge
4.21: Organizing students for cognitively complex tasks
4.22: Engaging students in cognitively complex tasks involving hypothesis generation and testing
4.23: Providing resources & guidance

Possible Instructional Modifications /Accommodations/Differentiation:

Special Education Students

- Preferential Seating
- Textbook for at-home use

English-Language Learners

- Preferential Seating
- Textbook for at-home use
- Adjusted assignment timelines
- No penalty for spelling errors

Advanced Learners

- Addition problems for Unit 8

Struggling Learners

- Preferential Seating
- Textbook for at-home use

Unit Vocabulary:
Essential: Light reactions, Calvin Cycle**,** photorespiration, glycolysis, citric acid cycle, electron transport chain, aerobic respiration, anaerobic respiration, ATP, NADH, food web, trophic level, food chain, autotroph, heterotroph, consumer, producer, decomposer, **Non-Essential:** Cyclic photophosphorylation, noncyclic photophosphorylation, chloroplast, thylakoid, stroma, CAM, C4, fermentation, oxidation, reduction, coenzyme, mitochondria

Interdisciplinary Connections (Applicable Standards):	**Integration of Technology:**	**21st Century Themes:**	**21st Century Skills:**
Mathematics: MP.1, MP.2 ELA: NJSLS-RST-11-12.1, NJSLS-RST-11-12.3, NJSLS-RST-11-12-7, NJSLS-RST-11-12.8, NJSLS-RST-11-12.9, NJSLS-RST-11-12.10, NJSLS-WHST.11-12.1, NJSLS-WHST.11-12.2, NJSLS-WHST.11-12.4, NJSLS-WHST.11-12.5, NJSLS-WHST.11-12.6, NJSLS-WHST.11-12.9, NJSLS-WHST.11-12.10 **Career Ready Practices:** NJSLS-CLKS.1 - Act as a responsible and contributing community member and employee. NJSLS-CLKS.4- Demonstrate creativity and innovation.	Technology: -Students use google drive as a resource for documents, spreadsheets, forms, and videos. (S)	Environmental Literacy: -Students will describe how the increase in carbon emissions is impacting global warming.	Critical Thinking and Problem Solving -Students will design an experiment to test how specific variables effect photosynthesis. -Students will analyze data from the cellular respiration lab. Communication & Collaboration: -Students will work together to complete the photosynthesis and cellular respiration lab.

Interdisciplinary Connections (Applicable Standards):	Integration of Technology:	21st Century Themes:	21st Century Skills:
NJSLS-CLKS.5 - Utilize critical thinking to make sense of problems and persevere in solving them. **Technology:** NJSLS.8.1.12.AP.9 - Collaboratively document and present design decisions in the development of complex programs NJSLS.8.1.12.AP.7 Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change NJSLS.8.2.12.B.3 NJSLS.8.2.12.C.7 **Career Awareness:** NJSLS.9.2.12.CAP.8 - Determine job entrance criteria (e.g., education credentials, math/writing/ reading comprehension tests, and drug tests) used by employers in various industry sectors.			

Resources:
Texts/Materials: Campbell's 8th Edition: AP Biology http://www.bozemanscience.com/ap-biology/ CrashCourse Biology: https://www.youtube.com/playlist?list=PL3EED4C1D684D3ADF VanceKite Energy: https://www.youtube.com/watch?v=Fb8dVNDkoEo&list=PLbnvwtAGroLtBrhWyqNGNHV5s57MQ0cTB PBS

Resources:
Leveled Reading- Newsela

Unit 9: Ecology	**Recommended Duration: [3 weeks– April/May]**
Unit Description: The students will study how organisms interact with their environment and determine the factors that impact population growth. Students will explore how competition for resources impacts population size and will use mathematics to predict changes in population size. Students will discuss the ways in which humans impact the environment. Students will explore many illustrative examples in ecology and connect the concepts in ecology to evolution. The labs in this unit are the Transpiration Lab and the Energy Dynamics Lab.	

Essential Questions:	**Enduring Understandings:**
-How do biotic and abiotic factors impact living things? -What types of factors impact population size over time? -What factors limit population growth? -What are examples of symbiotic relationships? -How can you use mathematics to determine the primary productivity of an ecosystem?	A species' distribution is constrained by a combination of historical, abiotic, and biotic factors. A wide variety of patterns are observed when researchers track changes in population size over time, ranging from no growth, to regular cycles, to continued growth independent of population size. Interactions among species, such as competition and consumption, have two main outcomes: (1) They affect the distribution and abundance of the interacting species, and (2) they are agents of natural selection and thus affect the evolution of the interacting species. *College Board:* 4. A: The subcomponents of biological molecules and their sequences determine the properties of that molecule. 4. B: Competition and cooperation are important aspects of biological systems. 4. C: Naturally occurring diversity among and between components within biological systems affects interactions with the environment.

Relevant Standards:	Learning Goals:	Learning Objectives:
Content Standards: **Primary(Power):** Essential Knowledge: 4.A.5, 4.B.3, 4.B.4, 4.C.4 **Secondary(Supportive):** Essential Knowledge: 2.D.1, 2.D.3, Science Practices: 1.3, 1.4, 2.2, 3.2, 4.1, 4.2, 5.1, 5.2, 6.3, 6.4, 7.2 ELA Standards: NJSLS-RST-11-12.1, NJSLS-RST-11-12.3, NJSLS-RST-11-12-7, NJSLS-RST-11-12.8, NJSLS-RST-11-12.9, NJSLS-RST-11-12.10, NJSLS-WHST.11-12.1, NJSLS-WHST.11-12.2, NJSLS-WHST.11-12.4, NJSLS-WHST.11-12.5, NJSLS-WHST.11-12.6, NJSLS-WHST.11-12.9, NJSLS-WHST.11-12.10	Students will be able to analyze data regarding the interaction of organisms with their environment and apply mathematical routines to describe communities composed of populations of organisms that interact in complex ways.	1) Predict how variation in a population affects an organism's survival or fitness. 2) Provide examples of how human impact accelerates change at local and global levels. 3) Justify the selection of the kind of data needed to answer scientific questions about the interaction of populations within communities. 4) Apply mathematical routines to quantities that describe communities composed of populations of organisms that interact in complex ways. 5) Predict the effects of a change in the community's populations on the community. 6) Analyze data regarding the effect of population interactions on patterns of species distribution and abundance.

Formative Assessments	Summative Assessments:	Performance Assessments:	Major Activities/ Assignments (required):
-Google Drive Online Quiz -Whiteboards	Ecology Test	-Transpiration Lab -Energy Dynamics Lab	-Transpiration Lab -Energy Dynamics Lab -AP Biology Essay

Possible Assessment Modifications /Accommodations:
Special Education Students • Extended time on Unit 9 Test. • Read directions to students on Unit 9 Test. • Test Corrections for Unit 9 Test.

English-Language Learners

- Extended time on Unit 9 Test.
- Reduced answer choices on Unit 9 Test.
- Read directions to students on Unit 9 Test
- Test Corrections for Unit 9 Test.

Advanced Learners

- Provide students with choice in environmental issues.

Struggling Learners

- Extended time on Unit 9 test.
- Test Corrections for Unit 9 Test.

Instructional Strategies (refer to *Robert Marzano's* 41 Elements):

2.6: Identifying critical information
2.7: Organizing students to interact with new knowledge
2.8: Previewing new content
2.9: Chunking content into "digestible bites"
2.10: Processing of new information
2.11: Elaborating on new information
2.12: Recording and representing knowledge
2.13: Reflecting on learning
3.14: Reviewing content
3.15: Organizing students to practice and deepen knowledge
3.16: Using homework
3.17: Examining similarities and differences
3.18: Examining errors in reasoning
3.19; Practicing skills, strategies, and processes
3.20: Revising knowledge
4.21: Organizing students for cognitively complex tasks
4.22: Engaging students in cognitively complex tasks involving hypothesis generation and testing
4.23: Providing resources & guidance

Possible Instructional Modifications /Accommodations/Differentiation:

Special Education Students

- Preferential Seating

- Textbook for at-home use

English-Language Learners
- Preferential Seating
- Textbook for at-home use
- Adjusted assignment timelines
- No penalty for spelling errors

Advanced Learners
- Addition problems for Unit 9

Struggling Learners
- Preferential Seating
- Textbook for at-home use

Unit Vocabulary:
Essential: Population, community, ecosystem, biomes, batesian mimicry, mullerian mimicry, keystone species, niche **Non-Essential:** Global warming, greenhouse effect, ozone layer, nitrogen cycle, examples of biomes

Interdisciplinary Connections (Applicable Standards):	**Integration of Technology:**	**21st Century Themes:**	**21st Century Skills:**
Mathematics: MP.1, MP.2, MP.3, MP.4, MP.5, MP.6, HSS-IC.A.2 ELA: NJSLS-RST-11-12.1, NJSLS-RST-11-12.3, NJSLS-RST-11-12-7, NJSLS-RST-11-12.8, NJSLS-RST-11-12.9, NJSLS-RST-11-12.10, NJSLS-WHST.11-12.1, NJSLS-WHST.11-12.2, NJSLS-WHST.11-12.4, NJSLS-WHST.11-12.5, NJSLS-WHST.11-12.6, NJSLS-WHST.11-12.9, NJSLS-WHST.11-12.10	Technology: -Students use google drive as a resource for documents, spreadsheets, forms, and videos. (S)	Environmental Literacy: -Students will describe how environmental issues impact living things.	Critical Thinking and Problem Solving: -Students will explore many environmental issues and design solutions for the environmental issues. Life and Career Skills: -Students will explore careers in environmental science. Communication & Collaboration: -Students will work together discuss problems and solutions regarding environmental science.

Interdisciplinary Connections (Applicable Standards):	Integration of Technology:	21st Century Themes:	21st Century Skills:
Career Ready Practices: NJSLS-CLKS.1 - Act as a responsible and contributing community member and employee. NJSLS-CLKS.4- Demonstrate creativity and innovation. NJSLS-CLKS.5 - Utilize critical thinking to make sense of problems and persevere in solving them. **Technology:** NJSLS.8.1.12.AP.9 - Collaboratively document and present design decisions in the development of complex programs NJSLS.8.1.12.AP.7 Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change NJSLS.8.2.12.B.3 NJSLS.8.2.12.C.7 **Career Awareness:** NJSLS.9.4.12.CI.2 - Identify career pathways that highlight personal talents, skills and abilities NJSLS.9.2.12.CAP.8 - Determine job entrance criteria (e.g., education credentials, math/writing/ reading comprehension tests, and drug tests) used by employers in various industry sectors.			

Resources:
Texts/Materials: Campbell's 8th Edition: AP Biology http://www.bozemanscience.com/ap-biology/ CrashCourse Biology: https://www.youtube.com/playlist?list=PL3EED4C1D684D3ADF VanceKite Ecology: https://www.youtube.com/watch?v=LyQ3mTpBR40&list=PLbnvwtAGroLuXOPZ1IR1dBErIsBjtFB0p VanceKite Ecology 2: https://www.youtube.com/watch?v=OXgxYw-PYV4&list=PLbnvwtAGroLtlIckLnOFAOLW58pHw8GxG PBS Leveled Reading- Newsela

Unit 10: Ethology	**Recommended Duration: [3 weeks– May/June]**
Unit Description: The students will study innate and learned behavior in animals. Students will use many illustrative examples, videos, and labs to study an individual organism's behavior as well as how organisms interact socially. This unit ties in concepts from evolution, ecology, and psychology. Students will discuss operant and classical conditioning and discuss cognitive functions in different types of animals. Students will be introduced to research and case studies to help understand the concepts of animal behavior. Students will conduct several animal behavior labs in this unit and use Chi square to analyze data.	

Essential Questions:	**Enduring Understandings:**
-What is the difference between innate and learned behavior? -How do different types of animals interact in social groups? -What experiments were important in determining how animals behave?	In a single species, behavior may range from highly stereotyped, invariable responses to highly flexible, conditional responses and from unlearned to learned responses. The types of learning that individuals do, the way that they communicate, and the way that they orient and navigate correlate closely with their habitat and with the challenges they face in trying to survive and reproduce. *College Board:* 3. A: Heritable information provides for continuity of life. 3. B: Expression of genetic information involves cellular and molecular mechanisms. 3. C: The processing of genetic information is imperfect and is a source of genetic variation.

Essential Questions:	Enduring Understandings:

Relevant Standards:	Learning Goals:	Learning Objectives:
Content Standards: **Primary(Power):** Essential Knowledge: 2.C.2, 2.E.2, 2.E.3, 3.E.1 **Secondary(Supportive):** Essential Knowledge: 3.C.2 Science Practices: 1.1, 4.1, 4.2, 5.1, 6.1, 7.1, 7.2 ELA Standards: NJSLS-RST-11-12.1, NJSLS-RST-11-12.3, NJSLS-RST-11-12-7, NJSLS-RST-11-12.8, NJSLS-RST-11-12.9, NJSLS-RST-11-12.10, NJSLS-WHST.11-12.1, NJSLS-WHST.11-12.2, NJSLS-WHST.11-12.4, NJSLS-WHST.11-12.5, NJSLS-WHST.11-12.6, NJSLS-WHST.11-12.9, NJSLS-WHST.11-12.10	Students will be able to analyze data that indicate how organisms exchange information in response to internal changes and external cues, and which can change behavior.	1) Define and give examples of innate behavior such as fixed action patterns. 2) Differentiate between operant and classical conditioning. 3) Explain how responses to information and communication of information are vital to natural selection and evolution. 4) Connect concepts in and across domain(s) to predict how environmental factors affect responses to information and change behavior. 5) Design a plan for collecting data to support the scientific claim that the timing and coordination of physiological events involve regulation.

Formative Assessments	Summative Assessments:	Performance Assessments:	Major Activities/ Assignments (required):
-Google Drive Online Quiz -Whiteboards	Ethology Test	-Animal Behavior Lab	-Animal Behavior Labs

Possible Assessment Modifications /Accommodations:
Special Education Students

Possible Assessment Modifications /Accommodations:
• Extended time on Unit 10 Test. • Read directions to students on Unit 10 Test. • Test Corrections for Unit 10 Test. *English-Language Learners* • Extended time on Unit 10 Test. • Reduced answer choices on Unit 10 Test. • Read directions to students on Unit 10 Test • Test Corrections for Unit 10 Test. *Struggling Learners* • Extended time on Unit 10 test. • Test Corrections for Unit 10 Test.

Instructional Strategies (refer to *Robert Marzano's* 41 Elements):
2.6: Identifying critical information 2.7: Organizing students to interact with new knowledge 2.8: Previewing new content 2.9: Chunking content into "digestible bites" 2.10: Processing of new information 2.11: Elaborating on new information 2.12: Recording and representing knowledge 2.13: Reflecting on learning 3.14: Reviewing content 3.15: Organizing students to practice and deepen knowledge 3.16: Using homework 3.17: Examining similarities and differences 3.18: Examining errors in reasoning 3.19; Practicing skills, strategies, and processes 3.20: Revising knowledge 4.21: Organizing students for cognitively complex tasks 4.22: Engaging students in cognitively complex tasks involving hypothesis generation and testing

Instructional Strategies (refer to *Robert Marzano's* 41 Elements):
4.23: Providing resources & guidance

Possible Instructional Modifications /Accommodations/Differentiation:
Special Education Students • Preferential Seating • Textbook for at-home use *English-Language Learners* • Preferential Seating • Textbook for at-home use • Adjusted assignment timelines • No penalty for spelling errors *Advanced Learners* • Addition problems for Unit 10 *Struggling Learners* • Preferential Seating • Textbook for at-home use

Unit Vocabulary:
Essential: Innate, fixed action pattern, sign stimulus, imprinting, associative learning, classical conditioning, operant conditioning **Non-Essential:** Kinesis, taxis, ultimate causation, proximal causation, habituation, altruism

Interdisciplinary Connections (Applicable Standards):	**Integration of Technology:**	**21st Century Themes:**	**21st Century Skills:**
Mathematics:	**Technology:** NJSLS.8.1.12.AP.9	Environmental Literacy:	Communication & Collaboration:

Interdisciplinary Connections (Applicable Standards):	Integration of Technology:	21st Century Themes:	21st Century Skills:
MP.1, MP.2, MP.3, MP.5, MP.6, HSS-IC.A.2 ELA: RST-11-12.1, RST-11-12.3, RST-11-12-7, RST-11-12.8, RST-11-12.9, RST-11-12.10, WHST.11-12.1, WHST.11-12.2, WHST.11-12.4, WHST.11-12.5, WHST.11-12.6, WHST.11-12.9, WHST.11-12.10 **Career Ready Practices:** NJSLS-CLKS.1 - Act as a responsible and contributing community member and employee. NJSLS-CLKS.4- Demonstrate creativity and innovation. NJSLS-CLKS.5 - Utilize critical thinking to make sense of problems and persevere in solving them. **Technology:** NJSLS.8.1.12.AP.9 - Collaboratively document and present design decisions in the development of complex programs NJSLS.8.1.12.AP.7 **Career Awareness:** NJSLS.9.2.12.C.	NJSLS.8.1.12.AP.7 Technology: -Students use google drive as a resource for documents, spreadsheets, forms, and videos. (S)	-Students will describe how humans can impact organisms based on animal behavior.	-Students will work together to complete the animal behavior lab.

Resources:
Texts/Materials: Campbell's 8th Edition: AP Biology http://www.bozemanscience.com/ap-biology/ CrashCourse Biology: https://www.youtube.com/playlist?list=PL3EED4C1D684D3ADF VanceKite Leveled Reading- Newsela