Course Name:	Biology 1		
Credits:	1		
Prerequisites:	N/A		
Description:	This introductory course is designed to build the foundations needed for basic knowledge of life sciences as well as capture the interest of those looking to challenge themselves in more advanced science department offerings. Lab work and group presentations will be included to develop critical thinking and organizational skills.		
Academic Standards:	Next Generation Science Standards (NGSS)		
Units:	**Length:**	**Unit Standards:**	**Unit Outcomes:**
Intro to Biology	2 weeks	HS-LS1-2: Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. HS-LS1-3: Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. HS-LS2-3: Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.	Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.
Principles of Ecology	3 weeks	HS-LS2-3: Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions. HS-LS2-4: Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales. HS-LS2-5: Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.	Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions. Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales. Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.

Communities and Biomes	2 weeks	HS-LS4-2: Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment. HS-LS4-5: Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species. HS-LS4-6: Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.	Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment. Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species. Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.
Populations	2 weeks	HS-LS2-1: Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales. HS-LS2-2: Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales. HS-LS2-6: Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem. HS-LS4-5: Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.	Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.
Biodiversity	2 weeks	HS-LS2-2: Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales. HS-LS2-7: Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity. HS-ETS1-1: Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.	Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

Chemistry of Life	5 weeks	HS-LS1-3: Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. HS-LS1-6: Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules. HS-ETS-4: Use a computer simulation to model the impact of proposed solutions to a complex real world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.	Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem
Life of a Cell	2 weeks	HS-LS1-6: Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules. HS-LS1-2: Develop a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. HS-LS1-3: Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. HS-ETS1-4: Use a computer simulation to model the impact of proposed solutions to a complex real world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.	Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules. Develop a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.
Cell Transport and Cell Cycle	3 weeks	HS-LS1-4: Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms. HS-LS1-3: Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. HS-LS2-3: Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.	Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.

Need for Energy	2 weeks	HS-LS2-5: Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere. HS-LS1-5: Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy. HS-LS1-3: Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. HS-LS1-7: Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions. HS-LS2-3: Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.	Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere. Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.
Mendel and Meiosis	3 weeks	HS-LS2-8: Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce. HS-LS3-2: Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors. HS-LS3-3: Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population. HS-LS4-3: Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.	Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors. Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population. Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.

DNA to Genes: Biochemistry	2 weeks	HS-LS2-8: Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce. HS-LS3-1: Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring. HS-LS3-2: Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental HS-LS3-3: Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population. HS-LS4-3: Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait. HS-ETS1-1: Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.	Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce. Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring. Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors. Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait. Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
Patterns of Heredity and Human Genetics	2 weeks	HS-LS1-1: Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells. HS-LS3-1: Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring. HS-LS3-2: Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors. HS-LS3-3: Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population. HS-LS4-3: Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait. HS-LS4-6: Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.	Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells. Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring. Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors. Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait. Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.

The Influences on Evolution	3 weeks	HS-LS2-8: Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce. HS-LS4-1: Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence. HS-LS4-2: Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment. HS-LS4-3: Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait. HS-LS4-4: Construct an explanation based on evidence for how natural selection leads to adaptation of populations. HS-LS4-5: Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.	Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce. Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence. Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment. Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait. Construct an explanation based on evidence for how natural selection leads to adaptation of populations. Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.

Unit Name: **Intro to Biology**	**Length:** 2 weeks
Standards: HS-LS1-2 HS-LS1-3 HS-LS2-3	**Outcomes:** Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.
Essential Questions: How can you relate Homeostasis to all of the Topics/Chapters in biology? What impact does each Level of Organization have on Homeostasis? What is the direct relationship between the Characteristics of Livings to the Levels of Organization? How does the use of non- linguistic representations of data allow us to analyze and conclude upon data? Why do scientists study/collect data on one variable vs. many variables? Why is it important to utilize the “correct tool for the job” in the science lab? **Academic Vocabulary:** Biology, Organism, Organization, Reproduction, Species, Growth, Development, Environment, Stimulus, Response, Adaptation, Homeostasis, Energy, Evolution, Scientific Methods, Hypothesis, Control, Independent Variable, Dependent Variable	**Learning Targets:** Students will be able to: (Skills) Compare and contrast the Levels of Organization of Living Things. Recall the characteristics of displaying organization. Students will know: (Concepts) Examples of Adaptations and Homeostasis Scientific Methods Interpretation and application of terminology. Data collection techniques Graphing Techniques
Topic 1: **What is Biology**	**Length:** 1 week
Lesson Frame: Characteristics of Living Things	We will:
	I will:
Lesson Frame: PHEOC	We will:
	I will:
Lesson Frame: Lab Protocols/ Procedures/Safety	We will:
	I will:

Performance Tasks: Mini Lab: Is Mildew Alive? Mini Lab: Microscope Sketch and Review Writing a Lab Report Lab Safety Quiz/Agreement	Notes: Collect leaf samples afflicted with fall mildew Walk About: ID Characteristics of Living Things
Topic 2: **Observations and Conclusions**	**Length:** 1 week
Lesson Frame: Proper Tool For the Job	We will:
	I will:
Lesson Frame: Data Collection/Types of Data	We will:
	I will:
Lesson Frame: The Best Way to Make a Conclusion: Graphing	We will:
	I will:
Performance Tasks: Practical Exam: ID Lab Equipment Parts of the Microscope Measurements - Data Collection - Graphing Lab Reflective Literacy: Current Event Google Classroom Turn In	Notes: Review Game Day: Kahoots Mind Jogger Pictionary
We will.., I will... statements:	
define biology.	define and give an example of a theory.
identify the 5 characteristics of life.	define independent variable.
use the 5 characteristics of life to determine if an object is alive.	identify the independent variable in an experiment.
define homeostasis and give an example.	define dependent variable.
list the two processes an organism uses to maintain homeostasis.	identify the dependent variable in an experiment.
define an negative feedback system.	define constants.
explain how a negative feedback system works.	identify the constants in an experiment.
identify the steps of scientific thinking.	define control.
give an example of what a student would be doing at each step.	identify the control of an experiment.
define and give an example of an observation using senses.	define a species.
define and give an example of an observation as data.	define biotechnology.
define and give an example of data.	determine if ethical behavior was followed during an investigation.
define and give an example of an experiment.	define Qualitative observation/data and give an example.
define and give an example of hypothesis.	

Unit Name: **Principles of Ecology**	**Length:** 3 weeks
Standards: HS-LS2-3: HS-LS2-4: HS-LS2-5:	**Outcomes:** Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions. Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales. Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.
Essential Questions: How can you distinguish between the 3 types of symbiosis? How can you determine situational interactions in nature? What is the relevance of knowing and applying limiting factors to various ecosystems or other levels of organization? How will biome mapping help to reinforce learning through visual context? Why do Ecological Pyramids depicting changes in energy flow, population size, and biomasses have relevance to food chains and food webs? Why is it important to utilize the “correct tool for the job” in the science lab? **Academic Vocabulary:** Ecology, Biosphere, Abiotic Factor, Biotic Factor, Population, Biological Community, Ecosystem, Habitat, Niche, Symbiosis, Commensalism, Mutualism, Parasitism, Autotroph, Heterotroph, Decomposer, Food Chain, Trophic Level, Food Web, Biomass	**Learning Targets:** Students will be able to: (Skills) Compare and contrast the different levels of biological organization and living relationships important in ecology. Implement ecological pyramids to various food chains. Trace the path of energy and matter in an ecosystem. Recall symbiotic relationships citing several examples. Students will know: (Concepts) Biotic and abiotic factors in the environment. The three types of interactions. The difference between niche and habitat. How organisms satisfy their nutritional needs. How matter is “cycled” in the parts of the biosphere.
Topic 1: **Limiting Factors**	**Length: 2** weeks
Lesson Frame: Biotic vs.Abiotic	We will:
	I will:
Lesson Frame: Levels of Organization	We will:
	I will:
Lesson Frame: Units of Measure	We will:
	I will:

Performance Tasks: Venn Diagramming Mini Lab: Salt Tolerance of Seeds Problem Solving: How Cowbirds Affect Populations Metric System LAb	Notes: Milkweed (or similar) Community on site
Topic 2: **Ecological Pyramids**	**Length:** 1 week
Lesson Frame: Populations	We will:
	I will:
Lesson Frame: Energy	We will:
	I will:
Lesson Frame: Biomass	We will:
	I will:
Performance Tasks: Organisms and Their Environment Nutrition and Energy Flow Practical Exam: Cycling In Nature Reflective Literacy: Current Event Google Classroom Turn In	Notes: Review Game Day: Kahoots Mind Jogger Pictionary
We will..., I will... statements for Units 2-5	
define ecology and know the difference between a species, population, and community -abiotic factors -population -ecosytems -biotic factors - community -biome -organism -biosphere	know how matter transfers through an ecosystem.
the 4 factors involved in determiniing biomes	define biodiversity.
know how energy transfers through an ecosystem -trophic level -autotroph/producer -heterotroph/consumer and the different orders/ herbivore, carnivore, omnivore, decomposer, scavenger	locate where on Earth has more biodiversity.
know 4 parts of population dynamics	give an example of biodiversity.
compare a food chain and a food web and know what the arrows mean!	compare and contrast the levels of organization.
know how to interpret a pyramid of energy, numbers, or biomass	

Unit Name: **Communities and Biomes**	**Length:** 2 weeks
Standards: HS-LS4-2 HS-LS4-5 HS-LS4-6	**Outcomes:** Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment. Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species. Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.
Essential Questions: How do you determine limiting factors like precipitation, temperature, latitude in non-linguistic representations of specific biome data? How will biome mapping help to reinforce learning through visual context? Why does ecological succession get confused with evolution? How do you distinguish between the major land biomes through those biomes abiotic/biotic characteristic? What is the relevance of knowing and applying knowledge of aquatic biomes zones to the 4 sphere layers (biosphere, atmosphere, hydrosphere, and lithosphere)? **Academic Vocabulary:** Limiting Factor, Tolerance, Succession, Primary Succession, Climax Community, Secondary Succession, Biome, Photic Zone, Aphotic Zone, Estuary, Intertidal Zone, Plankton, Tundra, Taiga, Desert, Grassland, Temperate/Deciduous Forest, Tropical Rainforest	**Learning Targets:** Students will be able to: (Skills) Explain how Limiting Factors and Ranges of Tolerance affect the distribution of organisms in biomes. Describe the conditions under which primary and secondary succession take place. Students will know: (Concepts) Limiting Factors that make biomes imperfect. The sequence and stages of ecological succession. All Major Aquatic and Terrestrial Biomes. The various Aquatic Biome “zones” Photic, Aphotic and Intertidal.
Topic 1: Communities	**Length:**
Lesson Frame: Review Levels of Organization	We will:
	I will:
Lesson Frame: Symbiosis Examples	We will:
	I will:
Lesson Frame: the 4 Spheres	We will:
	I will:

Performance Tasks: Mini-Lab: Looking at Lichens/Pioneer Species Walk-About: 3 Levels of Succession Concept Mapping: Primary vs. Secondary Succession	Notes: Identify Pioneer Species and collect samples on site Compare and Contrast Three Levels of Succession on site
Topic 2: **Biomes**	**Length:**
Lesson Frame: Precipitation and Temperature	We will:
	I will:
Lesson Frame: Latitude Longitude	We will:
	I will:
Lesson Frame: Flora / Fauna	We will:
	I will:
Performance Tasks: Limiting Factors Activity Critical Thinking: Where am I? Practical Exam: Biome Ranges of Tolerance: Temp/Precip	Notes: Review Game Day: Kahoots Mind Jogger Pictionary
We will..., I will... statements for Units 2-5	
define ecology and know the difference between a species, population, and community -abiotic factors -population -ecosytems -biotic factors - community -biome -organism -biosphere	know how matter transfers through an ecosystem.
the 4 factors involved in determiniing biomes	define biodiversity.
know how energy transfers through an ecosystem -trophic level -autotroph/producer -heterotroph/consumer and the different orders/ herbivore, carnivore, omnivore, decomposer, scavenger	locate where on Earth has more biodiversity.
know 4 parts of population dynamics	give an example of biodiversity.
compare a food chain and a food web and know what the arrows mean!	compare and contrast the levels of organization.
know how to interpret a pyramid of energy, numbers, or biomass	

Unit Name: **Populations**	**Length:** 2 weeks
Standards: HS-LS2-1: HS-LS2-2: HS-LS2-6: HS-LS4-5:	**Outcomes:** Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.
Essential Questions: What are limiting factors for individual populations (including humans)? How can you distinguish between the five influences on population dynamics? (Cornell Notes Section 4.1) How can you put a “face to the name” when describing examples of Population Distribution? What is the relevance of knowing and applying the Effects of Population Growth Rate when studying Human Populations? (Cornell Notes Section 4.2) **Academic Vocabulary:** Population, Exponential Growth, Carrying Capacity, Life History Pattern, Density Dependent Factor, Density Independent Factor, Limiting Factor, Demography, Birth Rate, Death Rate, Doubling Time, Age Structure	**Learning Targets:** Students will be able to: (Skills) Predict the effects of environmental factors on population growth. Compare the Age Structure of human population growth rates. Explain the relationship between populations (humans included) and their environment. Identify how the birth rate and the death rate affect the rate at which a population changes. Students will know: (Concepts) How to Compare and Contrast Exponential Growth, and Linear Growth? How Carrying Capacity plays a major role in population dynamics? Relationships of reproductive patterns for different populations of organisms to the population models of population growth. The World and US Population calculations and outlooks.
Topic 1: **Population Dynamics**	**Length:** 1 week
Lesson Frame: Independent vs Dependent Density Factors	We will:
	I will:
Lesson Frame: Exponential vs Linear Growth	We will:
	I will:
Lesson Frame: Hardy Weinberg Equation	We will:
	I will:

Performance Tasks: BioLab: How to Determine Population Size? (Catch and Release) Critical Thinking: Effects of Predators on Prey Populations One acre plot calculations on site: Maple Tree Population vs Oak Tree Population Three age groups according to diameter Sub categories to consider red/white/bur oak and sugar/red/silver maple Graph Data	Notes:
Topic 2: **Human Population**	**Length:** 1 week
Lesson Frame: Age Structure Charts	We will:
	I will:
Lesson Frame: Immigration vs. Emigration	We will:
	I will:
Performance Tasks Mini-Lab: Calculating Doubling Time Practical Exam: Populations Reflective Literacy: Current Event Google Classroom Turn In	Notes: Review Game Day Kahoots Mind Jogger Pictionary
We will..., I will... statements for Units 2-5	
define ecology and know the difference between a species, population, and community -abiotic factors -population -ecosytems -biotic factors - community -biome -organism -biosphere	know how matter transfers through an ecosystem.
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know how energy transfers through an ecosystem -trophic level -autotroph/producer -heterotroph/consumer and the different orders/ herbivore, carnivore, omnivore, decomposer, scavenger	locate where on Earth has more biodiversity.
know 4 parts of population dynamics	give an example of biodiversity.
compare a food chain and a food web and know what the arrows mean!	compare and contrast the levels of organization.
know how to interpret a pyramid of energy, numbers, or biomass	

Unit Name: **Biodiversity**	**Length:** 2 weeks
Standards: HS-LS2-2 HS-LS2-7 HS-ETS1-1	**Outcomes:** Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
Essential Questions: How do you identify the 3 ways/methods in which Biodiversity can be studied? Citing several examples for each. What is the real life lesson to understanding and applying the importance of Biodiversity to nature and humans? (Cornell Notes Section 5.1) How do you recognize the difference between the loss or threat to biodiversity while describing examples? Does the threat of biodiversity hold long term or short term effects? Cite examples of habitat fragmentation vs habitat degradation. How can you relate to the 6 interventions that are the backbone of Conservation Biology and how will they practice them upon their departure from secondary education? **Academic Vocabulary:** Biodiversity, Extinction, Endangered Species, Threatened Species, Habitat Fragmentation, Edge Effect, Habitat Degradation, Acid Precipitation, Ozone Layer, Exotic Species, Conservation Biology, Natural Resources, Habitat Corridors, Sustainable Use, Reintroduction Programs, Captivity	**Learning Targets:** Students will be able to: (Skills) Describe strategies used in conservation biology. Relate the success in protecting an Endangered Species to the methods used to protect it. Personalize and Rank Order the 6 conservation interventions. Students will know: (Concepts) That having base knowledge of Biodiversity will influence their actions toward conservation. The various threats to the loss of biodiversity. How to distinguish between the changes the changes that may result in the loss of a species.
Topic 1: **Vanishing Species**	**Length:** 1 week
Lesson Frame: Threatened, Endangered vs Extinct Species	We will:
	I will:
Lesson Frame: Geographical literacy.	We will:
	I will:
Lesson Frame: Pollution, Recycling and Conservancy	We will:
	I will:

Performance Tasks: Mini-Lab: Measuring Species Diversity: I.D. Eye on the Environment: Habitat Degradation vs. Habitat Fragmentation Critical Thinking: DDT and the Food Chain Habitat Fragmentation Examples on site	Notes:
Topic 2: **Conservation Biology**	**Length:** 1 week
Lesson Frame: Habitat Degradation vs Habitat Fragmentation	We will:
	I will:
Lesson Frame: The 6 Interventions to Conservation Biology	We will:
	I will:
Lesson Frame: Conservation License WI DNR	We will:
	I will:
Performance Tasks Topic/Chapter Notes (Cornell) Lab Practical - Picture ID RAFT Writing Project: Losing or Lost our Habitat and Critters that Belong Index of Diversity Calculation (Tree Species) on site Reflective Literacy: Current Event Google Classroom Turn In	Notes: Review Game Day Kahoots Mind Jogger Pictionary
We will..., I will... statements for Units 2-5	
define ecology and know the difference between a species, population, and community -abiotic factors -population -ecosytems -biotic factors - community -biome -organism -biosphere	know how matter transfers through an ecosystem.
the 4 factors involved in determiniing biomes	define biodiversity.
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know 4 parts of population dynamics	give an example of biodiversity.
compare a food chain and a food web and know what the arrows mean!	compare and contrast the levels of organization.
know how to interpret a pyramid of energy, numbers, or biomass	

Unit Name: **Chemistry of Life**	**Length:** 5 weeks
Standards: HS-LS1-3: HS-LS1-6: HS-ETS-4:	**Outcomes:** Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules. Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem
Essential Questions: How does the does the Language of Chemistry have an impact on Living Things? What are the trends and history of the periodic table? Is there a direct relationship between the atomic structure and stability? If so, then how? Why is water the most influential and most important molecule on the planet? How do the 4 key factors affecting the rate of diffusion have a bearing on living things? Why do we concern ourselves so readily to the Essential Life Substances? Why do we get to promote the building of and breaking down life substances (meaning… the entire metabolic process)? What do we have to gain by emphasizing the 4 properties of water: Polarity, Resistant to Temp Change, Diffusion, and Capillary Action? Where did all life on earth come from? **Academic Vocabulary:** Element, Atom, Nucleus, Isotope, Compound, Covalent Bond, Molecule, Ion, Ionic Bond, Metabolism, Mixture, Solution, pH, Acid, Base, Polar Molecule, Hydrogen Bond, Diffusion, Dynamic equilibrium, Isomer, Polymer, Carbohydrate, Lipid, Protein, Amino acid, Peptide bond, Enzyme, Nucleic acid, Nucleotide	**Learning Targets:** Students will be able to: (Skills) Reflect upon such topics as presented in their Current Event. Identify how the process of diffusion occurs and why it is important to cells. Classify the variety of organic compounds. Describe how polymers are formed and broken down in organisms. Compare the chemical structures of carbohydrates, lipids, proteins, and nucleic acids, and relate their importance to living things. Students will know: (Concepts) The structure of an atom to the identity of elements. The formation of covalent and ionic chemical bonds to the stability of atoms. How to distinguish mixtures and solutions. When and how to define acids and bases and relate their importance to biological systems. To identify the effects of enzymes. How to relate water's unique features to its polarity
Topic 1: **The Language of Chemistry**	**Length:** 2 weeks
Lesson Frame: Atomic Structure	We will:
	I will:
Lesson Frame: Trends of the Periodic Table	We will:

	I will:
Lesson Frame: Bonding, Equations and Reactions	We will:
	I will:
Performance Tasks: BioLab: Chemical Reactions in Animals Lab Practical: ID Element Symbols Types of Bonding Balancing Equations 6 types of Chemical Reactions	**Notes:**
Topic 2: **Properties of Water**	**Length:** 1 week
Lesson Frame: Brownian Motion/Polarity	We will:
	I will:
Lesson Frame: Diffusion/ Osmosis	We will:
	I will:
Lesson Frame: Density of Water in States	We will:
	I will:
Performance Tasks: Mini Lab: Determining pH Mini Lab: Measuring the Rate of Diffusion Surface Tension Contest Density Testing Properties of Water Lab Practical #2	Notes: Soil Analysis (pH, moisture content, texture, and color) from various locations on site
Topic 3: **Life Substances (Biomolecules)**	**Length:** 2 weeks
Lesson Frame: Carbohydrates	We will:
	I will:
Lesson Frame: Lipids	We will:
	I will:
Lesson Frame: Proteins	We will:
	I will:
Lesson Frame: Nucleic Acids	We will:
	I will:

Performance Tasks: Mini Lab: Determining monomer vs. polymer Biomolecule Identification Building Biomolecules Lab Practical #3 Reflective Literacy: Current Event Google Classroom Turn In	Notes: Review Game Day Kahoots Mind Jogger Pictionary
We will..., I will... statements:	
follow the Language of Chemistry.	define macromolecule.
know and use the trends of the periodic table.	list all four carbon based macromolecules.
explain iodine turns black in the presence of..…	list the monomer for each of the four macromolecules.
explain benedicts (when heated) will turn red in the presence of…	list the atoms in each of the four macromolecules.
explain biuret turns purple/violet in the presence of …..	list the functions of each of the four macromolecules.
explain how lipids will look on a paper towel.	list several examples of each of the four macromolecule.
explain why living things are carbon based.	explain how carbohydrates are different from lipids.
explain why carbon is unique.	analyze the results of several different indicator tests to determine what macromolecule is in ordinary foods.
define monomer.	explain why enzymes are important to living things.
define polymer.	

Unit Name: **Life of a Cell**	**Length**: 2 weeks
Standards: HS-LS1-6 HS-LS1-2 HS-LS1-3 HS-ETS1-4	**Outcomes:** Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules. Develop a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.
Essential Questions: How do we utilize non-traditional measuring devices/tools in microscopy labs? What has the history of the cell and technology provided for science? What role(s) does Chemistry and Bio-Molecules play in microbiology (cellular) concepts? How does the composition of the plasma membrane allow the cell to function and survive in various environments? What impact does selective permeability have on survival of the cell? What is the correlation between surface area and volume of a cell and its ability to survive? How do the subtle differences in plant and animal cell structure enable survival? Why is it important for organelles to have separate roles in cellular functions? **Academic Vocabulary:** Part 1 - Cell, Organelle, Prokaryote, Eukaryote, Nucleus Part 2 - Plasma membrane, Selective permeability, Phospholipid, Fluid mosaic model, Transport protein Part 3 - Cell wall, Chromatin, Nucleolus, Ribosomes, Cytoplasm, Endoplasmic reticulum, Golgi apparatus, Vacuole, Lysosome, Chloroplast, Chlorophyll, Plastid, Mitochondria: Cytoskeleton, Microtubule, Microfilament, Cilia, Flagella	**Learning Targets:** Students will be able to: (Skills) Compare the operation of a compound light microscope with that of an electron microscope. Identify the main ideas of the cell theory. Describe how a cell's plasma membrane functions. Compare and contrast the structures of plant and animal cells. Students will know: (Concepts) How to relate advances in microscope technology to discoveries about cells and cell structure. What the relationship between the function of the plasma membrane to the fluid mosaic model. The identity, structure and function of the parts of a typical eukaryotic cell. Explain the advantages of highly folded membranes in cells. Relationships with the function of a cell to its organization and role in tissues, organs, and organ systems.
Topic 1: **Discovery of Cells and the Plasma Membrane**	**Length:** 1 week
Lesson Frame: Timeline of the Microscope	We will:

	I will:
Lesson Frame: Cell Theory	We will:
	I will:
Lesson Frame: The Plasma Membrane/Fluid Mosaic Model	We will:
	I will:
Performance Tasks: Microscopy Lab - Measuring Objects Shell off the Egg - Lab Practical Exam: 4 Parts/Functions of Fluid Mosaic	Notes:
Topic 2: **Eukaryotic Cell Structure**	**Length:** 1 week
Lesson Frame: Structure and Function of Organelles	We will:
	I will:
Lesson Frame: Plant Cells	We will:
	I will:
Lesson Frame: Animal Cells	We will:
	I will:
Performance Tasks: Mini Lab: Cell Organelles Multiple Species Leaf Sample Chloroplast Counting Decomposition Rates Comparison: Plants Tissue vs. Animal Tissue Practical Exam: Identify Parts of Plant Cell and Animal Cell (color code) Reflective Literacy: Current Event Google Classroom Turn In	Notes: Review Game Day Kahoots Mind Jogger Pictionary
We will.., I will... statements:	
list the 3 main principles of the cell theory	identify and list the function of the receptor protein.
list the contributions of Hooke, Leewenhooke, and Virchow to the cell theory	label the polar head and nonpolar tail of a phospholipid.
define and give an example of a prokaryotic cell.	explain why organ donors and recipients must be carefully matched.
define and give an example of a eukaryotic cell.	match an organelle with its function.
list the similarities and differences between a eukaryotic and prokaryotic cell	identify an organelle from a diagram
identify a prokaryotic cell from a diagram	identify a plant cell
identify a eukaryotic cell from a diagram.	identify an animal cell
identify and list the function of the cell membrane.	list the similarities and differences between an animal and plant cell.

identify and list the function of the Phospholipid.	list the organelles unique to an animal cell
identify and list the function of the channel protein.	list the features found in plant cells.
identify and list the function of the marker protein.	list the organelles found in both animal and plant cells.

Unit Name: **Cellular Transport and the Cell Cycle**	**Length**: 2 weeks
Standards: HS-LS1-4 HS-LS1-3 HS-LS2-3	**Outcomes:** Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.
Essential Questions: How does the composition of the plasma membrane allow it to function in varied environments? What impact does energy have on selective permeability? Is there a direct relationship between the surface area and volume of a cell? If so, explain. What does the cell's size have to do with its limitations? How does the length of the cell cycle vary? How does functionality of specific cells relate to its cell cycle duration? How do the subtle differences in plant and animal cell structure promote or inhibit stages of the cell cycle? **Academic Vocabulary:** Part 1 - Osmosis, Isotonic Solution, Hypotonic Solution, Hypertonic Solution, Passive Transport, Facilitated Diffusion, Active Transport, Endocytosis, Exocytosis Part 2 - Chromosome, Chromatin, Interphase, Mitosis, Prophase, Sister Chromatid, Centromere, Centriole, Spindle, Metaphase, Anaphase, Telophase, Cytokinesis, Tissue, Organ, Organ System	**Learning Targets:** The process of diffusion, passive transport, and active transport occur and why they are important to the cell. The role of enzymes in the regulation of the cell cycle. Relationships with the function of a cell to its organization and role in tissues, organs, and organ systems. interpretation and application of terminology Predict the effects of a isotonic, hypertonic and hypotonic solutions on cells. Model the structure of a chromosome from DNA – Sister Chromatid. Sequence the events of the Cell Cycle using tissue samples. Distinguish between the events of a normal cell cycle and the abnormal events that result in cancer.
Topic 1: **Cellular Transport (plasma membrane)**	**Length:** 1 week
Lesson Frame: Passive Transport	We will:
	I will:
Lesson Frame: Active Transport	We will:
	I will:
Lesson Frame: Endocytosis vs. Exocytosis	We will:
	I will:

Performance Tasks: Mini Lab: Cell Membrane Simulation Cell Membrane Stress Test Tonicity Tests using chicken egg	Notes:
Topic 2: **Cell Cycles**	**Length:** 1 week
Lesson Frame: Interphase (G1-S-G2-G0)	We will:
	I will:
Lesson Frame: Mitosis (prophase metaphase anaphase telophase)	We will:
	I will:
Lesson Frame: Cytokinesis	We will:
	I will:
Performance Tasks: ID Lab: Find Phases of Cell Cycle in Plant vs. Animal Cell Mini Lab: Seeing Asters BioLab: Where is Mitosis Most Observed in Root Tissue Sample? Practical Exam: ID the Cell Cycle Reflective Literacy: Current Event Google Classroom Turn In	Notes: Review Game Day Kahoots Mind Jogger Pictionary
We will..., I will... statements:	
define active transport and give an example	define and give an example of exocytosis
define passive transport and give an example	define and give an example of exocytosis
define osmosis and give an example	define and give an example of phagocytosis
define diffusion and give an example	identify a diagram of facilitated diffusion
define and identify an isotonic solution d	identify a diagram of osmosis
define and identify an hypertonic solution	compare size limitations of cell (surface area to volume ratio)
define and identify an hypotonic solution	Id cell reproduction…why and how?
predict what will happen if a cell is put into a hypotonic solution	know the order IPMATC Cell Cycle
predict what will happen if a cell is put into a hypertonic solution	locate the Gap phases, Synthesis phase and mitosis
predict what will happen if a cell is put into an isotonic solution	know Mitosis details – do you know the major event of each phase
define concentration gradient	look at what causes a tumor?
define facilitated diffusion	know what happens to neighboring cells
compare and contrast facilitated diffusion and diffusion	list environmental risk factors?
compare and contrast active and passive transport	highlight risk Prevention of cancer

define and give an example of endocytosis	

Unit Name: **Need for Energy**	**Length**: 2 weeks
Standards: HS-LS2-5 HS-LS1-5 HS-LS1-3 HS-LS2-3 HS-LS1-7	**Outcomes:** Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere. Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.
Essential Questions: How do the products of one biological process (photosynthesis) become the reactants for another biological process (cell respiration)? How does the Law of Conservation of Energy relate to the biological processes in eukaryotic cells? Where and how does the surface increase energy production in chloroplasts and mitochondria? What are the limiting factors involved in the photosynthesis and cell respiration/fermentation? **Academic Vocabulary:** Part 1 - ATP (adenosine triphosphate), ADP (adenosine diphosphate) Part 2 - Photosynthesis, Pigment, Chlorophyll, Photolysis, Calvin Cycle Part 3 - Cellular Respiration, Anaerobic, Aerobic, Glycolysis, Krebs Cycle, Alcoholic Fermentation, Lactic Acid Fermentation	**Learning Targets:** Students will be able to: (Skills) Model how energy is stored and released by ATP. Relate the structure of Chloroplasts to the events of Photosynthesis. Illustrate Light Dependent and Light Independent reactions in conjunction with Chemical Equation of Photosynthesis. Compare and Contrast cellular respiration and fermentation. Explain how cells obtain energy from cellular respiration. Students will know: (Concepts) Why organisms need a supply of energy? How energy is stored and released by ATP? All aspects of Light Dependent Reactions. Reactants and products of the Calvin Cycle. Aerobic and anaerobic metabolism.
Topic 1: **Photosynthesis**	**Length:** 1 week
Lesson Frame: Light Dependent Reactions	We will:
	I will:
Lesson Frame: Light Independent Reactions	We will:
	I will:
Lesson Frame: Analysis of Balanced Equation for Photosynthesis	We will:
	I will:

Performance Tasks: Production of Starches: Plant Tattoos Mini Lab: Separating Pigments from chlorophyll Bioluminescent Behaviors (ATP)	Notes: Compare and Contrast Energy Molecules: ATP-ADP-AMP
Topic 2: Cell Respiration	**Length:** 1 week
Lesson Frame: Aerobic Respiration (Normal Oxygen)	We will:
	I will:
Lesson Frame: Lactic Acid Fermentation (Run-out of Oxygen)	We will:
	I will:
Lesson Frame: Alcohol Fermentation (Oxygen was never present)	We will:
	I will:
Performance Tasks: Mini Lab 9.3: Determine if Apple Juice Ferments Lab Practical - ch 9 Reflective Literacy: Current Event Google Classroom Turn In	Notes: Review Game Day Kahoots Mind Jogger Pictionary
We will..., I will... statements:	know the Balanced equation
Id what is the energy used for?	Id how does photosynthesis provide energy and matter for all living things?
know the reaction on how to make and break ATP.	define cellular respiration
know photosynthesis	know the different stages and the molecules required/generated in each
Id pigments are used in photosynthesis	know where does it take place?
know the different stages and the molecules required/generated in each	know the Balanced equation
Id Light Dependent and Independent Reactions	Locate how many ATPs are produced: glycolysis, Krebs (citric acid) cycle, electron transport chain.
define where does it takes place?	be able to compare/contrast fermentation to photosynthesis
explain why are plants green?	

Unit Name: **Mendel's Laws and Meiosis**	**Length**: 3 weeks
Standards: HS-LS2-8 HS-LS3-2 HS-LS3-3 HS-LS4-3	**Outcomes:** Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors. Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population. Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.
Essential Questions: What is genetic variation and why has it been so important to humanity? How do Mendel's Laws of Heredity present themselves in Punnett Squares? Why are mathematical representations important in studying genetics? Where and how does gamete cell division (meiosis) increase variation? What are the limiting factors involved in meiosis? **Academic Vocabulary:** Part 1 - Heredity, Trait, Genetics, Gamete, Fertilization, Zygote, Pollination, Hybrid, Allele, Dominant, Recessive, Law of Segregation, Phenotype, Genotype, Homozygous, Heterozygous, Law of Independent Assortment Part 2 - Diploid, Haploid, Homologous Chromosome, Meiosis, Sperm, Egg, Sexual Reproduction, Crossing Over, Genetic Recombination, Nondisjunction	**Learning Targets:** Students will be able to: (Skills) Relate Mendel's two laws to the results he obtained in his experiments with garden peas. Analyze how meiosis maintains a constant number of chromosomes within a species. Students will know: (Concepts) The possible offspring of a genetic cross by using a Punnett square. How meiosis leads to variation in a species. Mendel's laws of heredity to the events of meiosis.

Topic 1: **Mendel's Laws**	**Length:** 2 weeks
Lesson Frame: Law of Dominance	We will:
	I will:
Lesson Frame: Law of Segregation	We will:
	I will:
Lesson Frame: Law of Independent Assortment	We will:
	I will:

Performance Tasks: Mini Lab: Looking at Pollen Vocab Series 1- 2 Punnett Square Series 1-2-3 DiHybrid Cross Gizmo: Two Trait Cross in Mice Simulation	Notes: Collect pollen samples for Mini-Lab
Topic 2: **Meiosis**	**Length:** 1 week
Lesson Frame: Cell Cycle Review	We will:
	I will:
Lesson Frame: Meiosis 1 vs. Meiosis 2	We will:
	I will:
Lesson Frame: Overlay Meiosis, Mendel's Laws and Punnett Squares	We will:
	I will:
Performance Tasks: Mini Lab: Modeling Crossing Over Problem Solving: Tracing a Family Tree Gizmo: Meiosis Lab Simulation Heredity Lab - Gamete Production to Reproduction to Offspring Production Chapter 10 Exam Reflective Literacy: Current Event Google Classroom Turn In	Notes: Review Game Day Kahoots Mind Jogger Pictionary
We will..., I will... statements:	
define haploid and diploid	explain the purpose of meiosis
give an example of a haploid and a diploid cell	identify the steps of meiosis
define somatic cell and give examples	give a brief description of the events at each step of meiosis.
define a chromosome	list the number of gametes produced during meiosis, both male and female
explain sister chromatids and identify them	explain the term nondisjunction
distinguish between an autosome and a sex chromosome	explain how nondisjunction can lead to a genetic disorder
explain how gender is determined in humans	give an example of a common genetic disorder caused by nondisjunction
list the number of chromosomes in an human somatic cell	compare and contrast mitosis and meiosis
list the number of chromosomes in an human sex cell.	define crossing over
define gamete and give two examples.	explain what happens to chromosomes during crossing over
list the number of chromosomes in a human gamete	identify a diagram sister chromatids, non-sister chromatids, and crossing over

define meiosis	

Unit Name: **DNA and Genes**	**Length**: 2 weeks
Standards: HS-LS2-8 HS-LS3-1 HS-LS3-2 HS-LS3-3 HS-LS4-3 HS-ETS1-1	**Outcomes:** Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce. Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring. Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors. Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait. Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
Essential Questions: Why biotechnology so important in scientific study? What is the order in which protein synthesis occurs? How to genetic mutations have positive and negative impacts on our society? Why are the respective locations for the steps in protein synthesis so important? What are the limiting factors involved in protein synthesis (replication, transcription and translation)? **Academic Vocabulary:** Part 1 - Nucleotides, Nitrogenous Base, Purines, Pyrimidines, Double Helix, DNA Replication Part 2 - Messenger RNA, Ribosomal RNA, Transfer RNA, Transcription, Codon, Translation Part 3 - Mutation, Point Mutation, Frameshift Mutation, Chromosomal Mutation, Mutagen	**Learning Targets:** Students will be able to: (Skills) Determine how the structure of DNA enables it to reproduce itself accurately. Relate the concept of the gene to the sequence of nucleotide in DNA. Categorize the different types of mutations that occur in DNA. Students will know: (Concepts) How to analyze the structure of DNA. When and where to (model) sequence the steps involved in protein synthesis. And compare the effects of different kinds of mutations on cells and organisms.
Topic 1: **From DNA to Protein**	**Length:** 1 week
Lesson Frame: DNA the Molecule of Heredity	We will:
	I will:
Lesson Frame: Transcription	We will:

	I will:
Lesson Frame: Translation	We will:
	I will:
Performance Tasks: Mini Lab: Transcription Translation DNA Replication Dominoes Pizza Analogy Concept Mapping: DNA vs. RNA	Notes: Search for Plant of Animal Mutations and whether they are helpful or harmful.
Topic 2: **Genetic Changes**	**Length:** 1 week
Lesson Frame: Gene Mutations - Point and Frameshift Mutations	We will:
	I will:
Lesson Frame: Chromosomal Mutations - Deletion, Inversion, Duplication, Translocation	We will:
	I will:
Performance Tasks: Mini Lab: Gene Mutations and Proteins Protein Synthesis Simulation Classroom Chapter 11 Exam Reflective Literacy: Current Event Google Classroom Turn In	Notes: Review Game Day Kahoots Mind Jogger Pictionary
We will..., I will... statements:	
know the difference between nitrogen bases (purine - pyramidine)	ID the locations of the RNA's and what their main jobs are?
review how nucleic acids are assembled.	define and identify transcription and translation.
locate and ID all the components of DNA Replication	know all the important locations within the cell that assist in protein synthesis.
know the nitrogen bases that make DNA unique	know these connections (transcription-codon-mRNA-Amino Acid and tranlation-anti codon-tRNA-Amino Acid.
locate the weak hydrogen bonds in DNA and why they are located there?	learn to read mRNA codons to locate amino acids
differentiate between DNA and RNA nitrogen bases.	practice and create analogies for DNA Replication, Transcription, Translation
compare and contrast the 2 main types of RNA (mRNA and tRNA)	make the connections between S-phase of Interphase (cell cycle = mitosis or mieosis) and transcription

Unit Name: **Patterns of Heredity and Human Genetics**	**Length**: 2 weeks	
Standards: HS-LS1-1 HS-LS3-1 HS-LS3-2 HS-LS3-3 HS-LS4-3 HS-LS4-6	**Outcomes:** Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells. Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring. Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors. Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait. Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.	
Essential Questions: How do genetic Mutations have positive and negative impacts on our society? Why is karyotyping so important in the diagnosis of genetic anomalies? What are the limiting factors involved in the Six Human Inheritance Patterns? Why was the completion of the Human Genome Project so important to geneticists? What is the importance of stem cell research? Why is stem cell research so controversial? **Academic Vocabulary:** Part 1 - Pedigree, Carrier, Fetus Part 2 - Incomplete Dominance, Codominant Allele, Multiple Allele, Autosome, Sex Chromosome, Sex Linked Trait, Polygenic Inheritance Part 3 - Karyotype, Syndromes	**Learning Targets:** Students will be able to: (Skills) Interpret a pedigree. Identify human genetic disorders caused by inherited recessive alleles. Distinguish between alleles for incomplete dominance and codominance. Explain the patterns of multiple allelic and polygenic inheritance. Analyze the pattern of sex linked inheritance. Summarize how internal and external environments affect gene expression. Distinguish among conditions that result from extra autosomal or sex chromosomes.	
Topic 1: Heredity Follows Different Rules	**Length:** 1 week	
Lesson Frame: Mendelian Inheritance	We will:	
	I will:	
Lesson Frame: Incomplete Dominance	We will:	
	I will:	
Lesson Frame: CoDominance	We will:	
	I will:	
Performance Tasks: Mini Lab: Illustrating a Pedigree Concept Mapping: Patterns of Heredity and Human Genetics CF vs Huntington's Disease Chicken Coupe Genetics Human Blood Associations	Notes:	
Topic 2: **Complex Human Patterns**	**Length:** 1 week	
Lesson Frame: Multiple Alleles	We will:	
	I will:	
Lesson Frame: X - Linked Inheritance	We will:	
	I will:	
Lesson Frame: Polygenic Inheritance	We will:	
	I will:	

Performance Tasks: Mini Lab: Detecting Colors and Patterns in Eyes Karyotyping Investigation Human Blood Associations Labrador Retriever Study Reflective Literacy: Current Event Google Classroom Turn In	Notes: Review Game Day Kahoots Mind Jogger Pictionary	
We will..., I will... statements:		
define and provide examples: incomplete dominance. co-dominance, multiple alleles, X linked (sex linked) Inheritance, and polygenic inheritance.	list at least threes processes that lead to genetic variation.	
compare and contrast the 5 complex Inheritance Paterns impacting humans (blood is the connection).	define karyotype.	
define and explain genetic variation.	explain why scientists use a karyotype.	
explain the importance of genetic variation.	make a karyotype.	

Unit Name: **Influences on Evolution**	**Length**: 3 weeks	
Standards: HS-LS2-8 HS-LS4-1 HS-LS4-2 HS-LS4-3 HS-LS4-4 HS-LS4-5	**Outcomes:** Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce. Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence. Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment. Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait. Construct an explanation based on evidence for how natural selection leads to adaptation of populations. Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.	
Essential Questions: How does Natural Selection affect allelic frequency? What are the limiting factors involved with the Influences on Evolution? Why are the mechanisms for determining evolution geographical in nature? What is the connection between what we have already learned and the Theory of Evolution? When to organisms "ensure" survival? **Academic Vocabulary:** Part 1 - Artificial Selection, Natural Selection, Mimicry, Camouflage, Homologous Structure, Analogous Structure, Vestigial Structure, Embryo Part 2 - Gene Pool, Allelic Frequency, Genetic Equilibrium, Genetic Drift, Stabilizing Selection, Directional Selection, Disruptive Selection, Speciation, Geographic Isolation, Reproductive Isolation, Polyploidy, Gradualism, Punctuated Equilibrium, Adaptive Radiation, Divergent Evolution, Convergent Evolution	**Learning Targets:** Students will be able to: (Skills) Explain the role of natural selection in convergent and divergent evolution. Distinguish among the types of evidence for evolution. Summarize the effects of the different types of natural selection on gene pools. Students will know: (Concepts) Summarize Darwin's theory of natural selection. How to explain the structural and physiological adaptations of organisms and where they apply to natural selection. When to relate changes in genetic equilibrium to mechanisms of speciation.	
Topic 1: **Geologic Time**	**Length:** 1 week	
Lesson Frame: Fossil Records	We will:	
	I will:	
Lesson Frame: Adaptations	We will:	
	I will:	
Performance Tasks: Charles Darwin Bio and Timeline Mini Lab: Camouflage Provides an Adaptive Advantage BioLab: Natural Selection and Allelic Frequency	Notes: Camouflage Contest Scavenger Hunt	
Topic 2: **Recent Influences**	**Length:** 1 week	
Lesson Frame: Anatomical Features	We will:	
	I will:	
Lesson Frame: Embryology	We will:	
	I will:	
Lesson Frame: BioChemistry	We will:	
	I will:	

Performance Tasks: Mini Lab: Detecting a Variation Planet Earth Series: Limiting Factors and Influences on Evolution Concept Mapping: The Influences on Evolution Final Exam Reflective Literacy: Current Event Google Classroom Turn In	Notes: Review Game Day Kahoots Mind Jogger Pictionary	
We will..., I will... statements:		
know the influences on Evolution and who proposed the theory of Evolution.	define Natural selection.	
know the evidences to support the theory of evolution.	know the differences between the various types and examples of each: -directional selection -stabilizing selection -disruptive selection -sexual selection -artificial selection.	
know Comparative Structures: homologous and vestigial, analogous.	define adaptation, mimicry, and camouflage.	
Id Embryonic Development.	explain the statement that “Populations evolve, not individuals.”	
know Biochemical: DNA and Protein Synthesis.	define Fitness ❑ Variation ❑ Adaptation ❑ Speciation.	
study fossils (how do they form and know the various examples).		