Wyoming Department of Education Required Virtual Education Course Syllabus

Niobrara County School District # 1

Program Name	Wyoming Virtual Academy	Content Area	SC
Course ID	D-SCI-500AV2-K	Grade Level	9-12
Course Name	AP Biology - Semester 1	# of Credits	0.5
SCED Code	03056H0.5012	Curriculum Type	K12 Inc

COURSE DESCRIPTION

Generally offered first semester. This course guides students to a deeper understanding of biological concepts including the diversity and unity of life, energy and the processes of life, homeostasis, and genetics. Students learn about regulation, communication, and signaling in living organisms, as well as interactions of biological systems. Students carry out a number of learning activities, including readings, interactive exercises, extension activities, hands-on laboratory experiments, and practice assessments. These activities are designed to help students gain an understanding of the science process and critical-thinking skills necessary to answer questions on the AP Biology Exam. The content aligns to the sequence of topics recommended by the College Board.

WYOMING CONTENT AND PERFORMANCE STANDARDS

STANDARD#	BENCHMARK (Standard/Indicator) Use the Standards and Benchmarks as Spreadsheets
HS-LS1-1	Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.
HS-LS1-3	Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
HS-LS1-4	Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.
HS-LS1-5	Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.
HS-LS1-6	Construct explanations and revise, as needed, based on evidence for: 1) how carbon, hydrogen, and oxygen may combine with other elements to form amino acids and/or other large carbon-based molecules, and 2) how other hydrocarbons may also combine to form large carbon-based molecules.
HS-LS1-7	Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of sugar molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.
HS-LS3-1	Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions forcharacteristic 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 byenvironmental factors.
HS-LS3-3	Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.
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.

SCOPE AND SEQUENCE

UNIT OUTLINE	STANDARD#	OUTCOMES OBJECTIVES/STUDENT CENTERED GOALS
Unit 1: Evolution: The Diversity and Unity of Life Lesson 1: Course Introduction		Become familiar with the AP Exam, and the organization and format of lessons in this course.
Unit 1: Evolution: The Diversity and Unity of Life Lesson 2: Natural Selection		Describe a number of adaptations, and state that adaptation confers reproductive success for an individual and thus members of a population. Understand that Darwin's theory of natural selection states that the success of individuals and populations is measured in terms of reproductive success. Interpret data tables and analyze graphs that show that traits in a population can change as the environment shifts. Describe the role of genetic variation and mutation in the process of natural selection, and explain that populations with diverse gene pools may have an evolutionary advantage during changes in the environment. Explain that variation in a population's gene pools is acted upon by environmental factors as natural selection proceeds. Give historical evidence showing the contributions of many scientists who have contributed to our knowledge of biological evolution.

Unit 1: Evolution: The Diversity and Unity of Life Lesson 3: Phenotypic Variation in Populations		
Unit 1: Evolution: The Diversity and Unity of Life Lesson 4: Types of Natural Selection		Interpret graphs and data that describe directional selection, and describe how directional selection is affected by environmental change selecting phenotypes (and the underlying genotypes) over time. Interpret graphs and data that describe stabilizing selection, and describe how stabilizing selection is affected by environmental change selecting phenotypes (and the underlying genotypes) over time. Interpret graphs and data that describe disruptive selection, and describe how disruptive selection is affected by environmental change selecting phenotypes (and the underlying genotypes) over time.
Unit 1: Evolution: The Diversity and Unity of Life Lesson 5: Laboratory: Natural Selection 1		bserve and record structural and behavioral characteristics of organisms in their natural environment. Predict the role of various adaptations on an organism's fitness level in its natural environment. Predict the effects environmental change on an organism's fitness level.
Unit 1: Evolution: The Diversity and Unity of Life Lesson 6: Laboratory: Natural Selection 2		Observe and record structural and behavioral characteristics of organisms in their natural environment. Predict the role of various adaptations on an organism's fitness level in its natural environment. Predict the effects

		environmental change on an organism's fitness level.
Unit 1: Evolution: The Diversity and Unity of Life Lesson 7: Laboratory: Natural Selection 3		Observe and record structural and behavioral characteristics of organisms in their natural environment. Predict the role of various adaptations on an organism's fitness level in its natural environment. Predict the effects environmental change on an organism's fitness level.
Unit 1: Evolution: The Diversity and Unity of Life Lesson 8: Application of Mathematics: Graphs		Understand the format and usefulness of various kinds of graphs. Explore the difference between poorly developed graphs and those of superior quality. Learn how to derive important information from graphs about biology.
Unit 1: Evolution: The Diversity and Unity of Life Lesson 9: Genetic Basis of Evolution		State the importance of Hardy-Weinberg equilibrium and how it indicates a population that is not undergoing evolutionary change. List five conditions that must be in effect for Hardy-Weinberg equilibrium (and thus allele frequencies) to remain unchanged. Describe the process of genetic drift and how it changes the gene pool in small populations. Cite examples of artificial selection by humans and relate it to the process of natural selection in terms of reproductive fitness in natural populations.

Unit 1: Evolution: The Diversity and Unity of Life Lesson 10: Application of Mathematics: Hardy-Weinberg Equations		Know the Hardy-Weinberg equations and the meaning of their variables. Learn how data gathered from the Hardy-Weinberg equations can demonstrate evolutionary processes occurring. Learn how to analyze data and graphs to show that evolution is a change in allele frequencies in a population over time
Unit 1: Evolution: The Diversity and Unity of Life Lesson 11: Vertical and Lateral Gene Transfer		Compare and contrast vertical and lateral (horizontal) gene transfer, and cite examples of each. Relate the concepts of sexual reproduction and its associated vertical gene transfer to the evolutionary process. Describe the processes of transformation, transduction, and conjugation in prokaryotes, and relate these forms of gene acquisition to the evolutionary process. Relate vertical and lateral gene transfer to the increased variability in populations, and discuss variability in terms of natural selection and fitness.
Unit 1: Evolution: The Diversity and Unity of Life Lesson 12: Laboratory: Population Genetics 1		Calculate allele and genotype frequencies using the Hardy-Weinberg equation. Determine if a population is in Hardy-Weinberg equilibrium. Discuss the effects of natural selection on allele frequency in a population. Discuss the effects of genetic

		drift on allele frequency in a population.
Unit 1: Evolution: The Diversity and Unity of Life Lesson 13: Laboratory: Population Genetics 2		Calculate allele and genotype frequencies using the Hardy-Weinberg equation. Determine if a population is in Hardy-Weinberg equilibrium. Discuss the effects of natural selection on allele frequency in a population. Discuss the effects of genetic drift on allele frequency in a population.
Unit 1: Evolution: The Diversity and Unity of Life Lesson 14: Laboratory: Population Genetics 3		Calculate allele and genotype frequencies using the Hardy-Weinberg equation. Determine if a population is in Hardy-Weinberg equilibrium. Discuss the effects of natural selection on allele frequency in a population. Discuss the effects of genetic drift on allele frequency in a population.
Unit 1: Evolution: The Diversity and Unity of Life Lesson 15: Origin of Life on Earth		Describe and critique scientific models that account for the origins of life on earth. Explain and critique the organic soup model of the origin of life on earth, considering the significance of the development of monomers of organic molecules. Explain experiments that have shown that early conditions on the earth could have allowed for the formation of important organic monomers.

		Cite geological, chemical, fossil, genetic, and other kinds of data supporting the idea that life originated on earth.
Unit 1: Evolution: The Diversity and Unity of Life Lesson 16: Evidence for Evolution		Cite examples and evaluate evidence from fossil records that provide evidence of biological evolution. Cite examples and evaluate evidence from homologies and vestigial structures that provide evidence of biological evolution. Cite examples and evaluate evidence from biochemistry and genetics that provide evidence for biological evolution. Design a plan to collect data from various sources to support a statement that biological evolution has occurred on the earth.
Unit 1: Evolution: The Diversity and Unity of Life Lesson 17: Test-Taking Strategies: Free Response Lesson 18: Discuss: Free Response		Review and apply test-taking strategies with a focus on free-response writing practice. Apply what you have learned about free-response questions to a question. Communicate your results with others. Critique solutions offered by other students. Participate in a threaded discussion.
Unit 1: Evolution: The Diversity and Unity of Life Lesson 19: Shared Ancestry: Conserved Traits		Support an argument that all living things are related using the fact that certain key biochemical characteristics are conserved and common to many living things. List the key conserved biochemical aspects of living

		things, including the commonness of DNA, RNA, the genetic code, and a number of important metabolic pathways. Cite a number of structural commonalities that unite almost all eukaryotes, including the presence of a nucleus and organelles. Prepare and state an argument showing how all conserved features in all three domains of life indicate a common origin for life on earth.
Unit 1: Evolution: The Diversity and Unity of Life Lesson 20: Phylogeny and the Interrelatedness of Life		Define, interpret, compare, and contrast phylogenetic trees and cladograms, and state that traits change, are gained, and are lost over time. Interpret a phylogenetic tree showing the interrelatedness of all three domains of life, and list the characteristics of each domain. State how modern science develops phylogenetic trees and cladograms using morphological, biochemical, and genetic evidence, including the role of mathematics and the need for computers. Interpret a phylogenetic tree of one genus, showing an understanding of the evolutionary history of the genus.
Unit 1: Evolution: The Diversity and Unity of Life Lesson 21: Speciation and Extinction		Cite evidence from fossil history and other kinds of data to make the argument that species originate and become extinct over time. Provide a model that shows how speciation occurs by both geographical and reproductive

		isolation, and state that speciation can occur over many generations or very rapidly. Cite and interpret evidence that supports the idea that evolution is an ongoing process.
Unit 1: Evolution: The Diversity and Unity of Life Lesson 22: Your Choice		Use this lesson time to review, study, or move ahead.
Unit 1: Evolution: The Diversity and Unity of Life Lesson 23: Evolution: The Diversity and Unity of Life Unit Test	HS-LS3-3	
Unit 2: Energy and the Processes of Life Lesson 1: Energy and Life		Define entropy, and state that for ordered life to exist, energy must continuously enter any system. Explain what free energy means, and discuss how the concept of free energy applies to the chemistry of living things. Explain that the maintenance of life requires energy input into a system to exceed the energy lost to entropy. State that life processes must occur in a sequential manner and orderly manner.
Unit 2: Energy and the Processes of Life Lesson 2: Energy Strategies of Living Things		Describe the strategies that organisms have evolved to obtain energy and sustain their functions.

		Identify the correlation in energy between organism size and metabolic rate. Compare and contrast endothermic and exothermic energy strategies for regulating body temperature. Describe examples of how reproductive mechanisms use energy efficiently.
Unit 2: Energy and the Processes of Life Lesson 3: Photosynthesis		Describe the ecological role of autotrophs, using examples of photosynthetic or chemosynthetic organisms. Describe the purpose and mechanisms of the light-dependent reactions, and interpret a diagram. Explain the role and basic mechanisms of the light-independent reactions, and interpret a diagram.
Unit 2: Energy and the Processes of Life Lesson 4: Laboratory: Photosynthesis 1		Experimentally determine the rate of photosynthetic rates under different conditions. Determine the pigments involved in photosynthesis.

Unit 2: Energy and the Processes of Life Lesson 5: Laboratory: Photosynthesis 2		Experimentally determine the rate of photosynthetic rates under different conditions. Determine the pigments involved in photosynthesis.
Unit 2: Energy and the Processes of Life Lesson 6: Laboratory: Photosynthesis 3		Experimentally determine the rate of photosynthetic rates under different conditions. Determine the pigments involved in photosynthesis.
Unit 2: Energy and the Processes of Life Lesson 7: Glycolysis and Fermentation		Explain the purpose of cellular respiration. Describe the role and process of glycolysis in cellular respiration. Explain the process and purpose of fermentation, and describe the type of organisms that utilize the process.
Unit 2: Energy and the Processes of Life Lesson 8: Test-Taking Strategies: Multiple Choice Lesson 9: Discuss: Multiple Choice		Review and apply test-taking strategies with a focus on multiple-choice items Participate in a threaded discussion.

		Apply what you have learned about multiple-choice questions to write AP-level questions. Post your multiple-choice questions to the threaded discussion board. Answer questions written by other students.
Unit 2: Energy and the Processes of Life Lesson 10: Cellular Respiration		Explain the relationship between pyruvate oxidation and the Krebs cycle. Describe the function and components of the Krebs cycle, including diagram interpretation. Summarize the role of electron carrier molecules in aerobic respiration. Describe the electrochemical gradient mechanism used in the electron transport chain, including diagram interpretation. Compare and contrast the electron transport chain in mitochondria and chloroplasts.

		Compare and contrast energy efficiency production between anaerobic and aerobic respiration.
Unit 2: Energy and the Processes of Life Lesson 11: Laboratory: Cellular Respiration 1		Design and conduct a scientific experiment using appropriate design characteristics. Measure the rate of cellular respiration in yeast. Determine the effects of various environmental factors on the rate of respiration in yeast.
Unit 2: Energy and the Processes of Life Lesson 12: Laboratory: Cellular Respiration 2		Design and conduct a scientific experiment using appropriate design characteristics. Measure the rate of cellular respiration in yeast. Determine the effects of various environmental factors on the rate of respiration in yeast.
Unit 2: Energy and the Processes of Life Lesson 13: Laboratory: Cellular Respiration 3		Design and conduct a scientific experiment using appropriate design characteristics.

		Measure the rate of cellular respiration in yeast. Determine the effects of various environmental factors on the rate of respiration in yeast.
Unit 2: Energy and the Processes of Life Lesson 14: ATP		Compare and contrast the structures and functions of ATP and ADP. Describe the processes of ATP formation and breakdown. Explore the relationship between ATP and the source and transfer of energy in the cell.
Unit 2: Energy and the Processes of Life Lesson 15: Water and Macronutrients		
Unit 2: Energy and the Processes of LifeLesson 16: Cell Death		Describe the positive roles of apoptosis in an organism.Summarize the molecular process of apoptosis.Explain how an organism is affected when it is unable to carry out apoptosis
Unit 2: Energy and the Processes of Life Lesson 17: Your Choice		Use this lesson time to review, study, or move ahead.
Unit 2: Energy and the Processes of Life Lesson 18: Energy and the Processes of Life Unit Test	HS-LS1-5, HS-LS1-7, HS-LS4-1, HS-LS4-2, HS-LS4-3, HS-LS4-4	
Unit 3: Homeostasis Lesson 1: Homeostasis		Define homeostasis and explain its importance to all life forms. Cite examples of the importance of homeostasis at the levels of cells, tissues, organs, organ systems, organisms, populations, and ecosystems. Describe consequences of homeostasis disruption at each level of biological organization. Tell how each disruption results from some change in the

		system's environment. Cite examples showing that similar and different evolutionary strategies for maintaining homeostasis reflect common ancestry and evolutionary divergence.
Unit 3: Homeostasis Lesson 2: Cell Membranes and Walls		Describe how the cell membrane maintains homeostasis. Describe the basic molecule and structure of the cell membrane. Describe the fluid mosaic model and how it allows selective permeability. Study variations in cell membranes between types of cells and types of organisms. Compare and contrast the structure and function of the cell wall in plants, algae, fungi, bacteria, and Archaea.
Unit 3: Homeostasis Lesson 3: Passive and Active Transport		Interpret diagrams and explain the concept of active transport and its function in maintaining concentration gradients. Compare and contrast passive and active transport, and state why both are necessary for the homeostasis of cells. Describe the difference between isotonic, hypotonic, and hypertonic cellular environments. Compare and contrast the processes of osmosis and diffusion, and interpret a diagram of facilitated diffusion.
Unit 3: Homeostasis Lesson 4: Laboratory: Diffusion and Osmosis 1		Gather data on the osmotic properties of cells in various solutions.

		Experiment to determine the effects of osmotic fluctuations on cells of living organisms.
Unit 3: Homeostasis Lesson 5: Laboratory: Diffusion and Osmosis 2		Gather data on the osmotic properties of cells in various solutions. Experiment to determine the effects of osmotic fluctuations on cells of living organisms.
Unit 3: Homeostasis Lesson 6: Laboratory: Diffusion and Osmosis 3		Gather data on the osmotic properties of cells in various solutions. Experiment to determine the effects of osmotic fluctuations on cells of living organisms.
Unit 3: Homeostasis Lesson 7: Exocytosis and Endocytosis		Explain cellular situations in which endocytosis and exocytosis are necessary. Cite a number of biological examples of cells or unicellular organisms engaging in exocytosis and endocytosis. Create and interpret a diagram and a model for the process of endocytosis. Create and interpret a diagram and a model for the process of exocytosis.
Unit 3: Homeostasis Lesson 8: Membranes and Organelles		Interpret a diagram of a eukaryotic cell, citing the presence of internal membranes and membrane-bound organelles. Explain the function of internal membranes and cite specific examples. Explain the function of membrane-bound organelles

		and cite specific examples. Create a diagram and models to show the function of membranes and organelles in eukaryotic cells.
Unit 3: Homeostasis Lesson 9: Application of Mathematics: Data Analysis		Understand the usefulness of data tables for scientific research. Examine and critique various data tables. Learn to differentiate poor quality data tables from superior quality data tables. Interpret data tables of biological phenomena to derive important information. Understand the concepts of descriptive and inferential statistics.
Unit 3: Homeostasis Lesson 10: Positive and Negative Feedback Mechanisms		Compare and contrast positive and negative feedback mechanisms. Describe the role of negative feedback mechanisms in maintaining homeostasis, and cite a number of examples. Describe positive feedback and cite a number of examples. Describe and cite examples of what happens when positive and negative feedback systems are disrupted. Predict what effect positive and negative feedback mechanisms will have when

		presented with new scenarios.
Unit 3: Homeostasis Lesson 11: Behavioral Responses to the Environment		Relate the maintenance of homeostasis at the cellular level to the maintenance of homeostasis at the organism level in terms of behavior. Explain behavioral responses that help maintain homeostasis in some free-living unicellular organisms. Explain behavioral responses that help maintain homeostasis in some multicellular organisms.
Unit 3: Homeostasis Lesson 12: Biotic and Abiotic Factors		Provide examples of biotic and abiotic factors at the cellular level. Provide examples of biotic and abiotic factors at the organism level. Provide examples of biotic and abiotic factors at the population level. Provide examples of biotic and abiotic factors at the ecosystem level.
Unit 3: Homeostasis Lesson 13: Laboratory: Transpiration 1		Design and conduct a scientific experiment using appropriate design characteristics. Measure the rate of transpiration in various plants. Determine the effects of various environmental factors

		on the rate of transpiration in plants.
Unit 3: Homeostasis Lesson 14: Laboratory: Transpiration 2		Design and conduct a scientific experiment using appropriate design characteristics. Measure the rate of transpiration in various plants. Determine the effects of various environmental factors on the rate of transpiration in plants.
Unit 3: Homeostasis Lesson 15: Laboratory: Transpiration 3		Design and conduct a scientific experiment using appropriate design characteristics. Measure the rate of transpiration in various plants. Determine the effects of various environmental factors on the rate of transpiration in plants.
Unit 3: Homeostasis Lesson 16: Obtaining and Eliminating Nutrients		Explain that organisms maintain homeostasis by obtaining nutrients and eliminating wastes. Describe the process of gas exchange in plants, including carbon dioxide and oxygen gasses, and relate the structure of leaves to gas exchange. Compare and contrast the respiratory systems of some animals, explaining what structural and functional features these animals have in common and how they differ. Discuss and compare the excretory systems of different animals, including the elimination of

		nitrogenous wastes. Interpret a diagram of the structure of an amoeba that shows how nutrients are obtained and waste is eliminated.
Unit 3: Homeostasis Lesson 17: Regulating Respiration and Circulation		Compare and contrast the regulation of water balance in aquatic plants and animals. Compare and contrast the circulatory systems of selected invertebrates and vertebrates. Compare and contrast the respiratory systems of selected invertebrates and vertebrates. Relate osmoregulation, respiration, and circulation to the maintenance of homeostasis in living things.
Unit 3: Homeostasis Lesson 18: Laboratory: Circulation 1		Design a method for taking heart rate data. Take heart rate data and analyze the data you collect. Demonstrate how exercise changes heart rate. Provide data showing how changing body position affects heart rate.
Unit 3: Homeostasis Lesson 19: Laboratory: Circulation 2		Design a method for taking heart rate data. Take heart rate data and analyze the data you collect. Demonstrate how exercise changes heart rate. Provide data showing how changing body position affects heart rate.

Unit 3: Homeostasis Lesson 20: Laboratory: Circulation 3 Lesson 21: Discuss: Circulation		Design a method for taking heart rate data. Take heart rate data and analyze the data you collect. Demonstrate how exercise changes heart rate. Provide data showing how changing body position affects heart rate. Communicate the results of your circulation lab. Design an experiment to test additional variables affecting heart rate. Critique lab results and experimental designs done by other students. Participate in a threaded discussion about these experiments.
Unit 3: Homeostasis Lesson 22: Regulating Temperature		Compare and contrast the temperature regulation of selected vertebrates. Discuss and model the feedback mechanisms that regulate temperature in mammals. Explain how different mechanisms for maintaining homeostasis in vertebrates are evidence for common ancestry.
Unit 3: Homeostasis Lesson 23: Defense and the Immune Response		Relate defense and immune systems in plants and animals to the maintenance of homeostasis.

		Compare and contrast specific and non-specific immune responses and cite examples of each in both plants and animals. Describe the immune response of invertebrates, emphasizing their non-specific nature. Describe the plant immune response and other defense mechanisms. Interpret diagrams and critique models that describe the specific immune responses of mammals, including both cell-mediated and humoral responses.
Unit 3: Homeostasis Lesson 24: Timing and Coordination of Life Processes		Cite examples showing that biological mechanisms control the development of organisms and lead to coordinated, sequenced events. Cite examples showing that biological mechanisms control an organism's physiology and lead to coordinated, sequenced events. Cite examples showing that biological mechanisms control an organism's behavior and lead to coordinated, sequenced events. Cite examples showing that that behavioral coordination promotes cooperation in a population. Compare and contrast the timing and coordination of life's processes across life's three domains of Eukarya, Archaea, and Bacteria, citing examples.
Unit 3: Homeostasis Lesson 25: Your Choice		Use this lesson time to review, study, or move ahead.
Unit 3: Homeostasis Lesson 26: Homeostasis Unit Test	HS-LS1-3	

Unit 4: Genetics Lesson 1: History of the Gene		Describe the discovery of the importance of DNA by Avery, MacLeod, and McCarty. Explain the importance of the one-to-one ratio of A to T and C to G in DNA discovered by Chargaff. Identify how Rosalind Franklin helped determine the three-dimensional structure of DNA. Relate the discoveries of Hershey and Chase to the history of the discovery of the structure of DNA. State the importance of the discovery by Watson and Crick that DNA is a double helix molecule with paired bases.
Unit 4: Genetics Lesson 2: DNA and RNA		Interpret diagrams and critique models showing the structure of DNA in detail. Interpret diagrams and critique models showing how DNA is part of a chromosome. Describe the process of DNA replication. Compare and contrast DNA's organization in cells of prokaryotes and eukaryotes. Compare and contrast the structures of DNA and RNA.
Unit 4: Genetics Lesson 3: Protein Synthesis 1		Learn how RNA is synthesized from a DNA template and how mRNA is a complementary sequence of DNA's code. Learn about the modifications that occur to RNA prior to its migration out of the nucleus and into the

		cytoplasm. Understand the structure of a ribosome and relate its structure to its role in protein synthesis.
Unit 4: Genetics Lesson 4: Protein Synthesis 2		Describe the process of protein synthesis from initiation to termination of translation. Explore how a protein folds into its final structure and how each level of structure affects the protein's overall function. Explore the function of retroviruses.
Unit 4: Genetics Lesson 5: Test-Taking Strategies: Grid-In		Review and apply test-taking strategies with a focus on grid-in items.
Unit 4: Genetics Lesson 6: Genetic Code and Unity of Life		Use a table of the genetic code to identify the next amino acid in an mRNA codon sequence. Explain how the genetic code is universal and how it unites all living things. Explain some important discoveries leading to an understanding of the genetic code.
Unit 4: Genetics Lesson 7: Genetic Engineering		Define genetic engineering and cite examples of commercial products that come from genetic engineering research. Interpret diagrams and examine models showing how human insulin and factor X are genetically engineered. Cite examples of both transgenic animals and cloned animals, and consider what these examples imply for society now and in the future.

		Cite examples of food that has been modified by genetic engineering techniques, and consider what this kind of food implies for society now and in the future.
Unit 4: Genetics Lesson 8: Mitosis and Meiosis		Explain why mitosis is important to all living things and why meiosis is important in sexual life cycles. Interpret diagrams of mitosis, comparing the chromosome number of the parent cell to the daughter cells' chromosome numbers. Interpret diagrams of meiosis, comparing the chromosome number of the parent cell to the daughter cells' chromosome numbers, and describe the process of gametogenesis in those daughter cells. Describe how crossing over increases the genetic variability in a population, and why that variability improves reproductive fitness in a population.
Unit 4: Genetics Lesson 9: Laboratory: Mitosis and Meiosis 1		Draw and identify the stages of mitosis. Draw and identify the stages of meiosis. Compare and contrast mitosis in animal and plant cells. State the difference between the results of meiosis in plant and animals cells regarding gametogenesis timing.
Unit 4: Genetics Lesson 10: Laboratory: Mitosis and Meiosis 2	HS-LS1-4	Draw and identify the stages of mitosis.

		Draw and identify the stages of meiosis. Compare and contrast mitosis in animal and plant cells. State the difference between the results of meiosis in plant and animals cells regarding gametogenesis timing.
Unit 4: Genetics Lesson 11: Laboratory: Mitosis and Meiosis 3	HS-LS1-4	Draw and identify the stages of mitosis. Draw and identify the stages of meiosis. Compare and contrast mitosis in animal and plant cells. State the difference between the results of meiosis in plant and animals cells regarding gametogenesis timing.
Unit 4: Genetics Lesson 12: Sexual Reproduction		Interpret diagrams showing the sexual reproduction life cycle in diverse animal species, citing commonalities and differences in the cycles. Interpret a diagram showing the life cycle of a fern, identifying aspects of the heteromorphic alternation of generations in plants. Interpret a diagram of the life cycle of a bacterium showing conjugation and lateral transfer of genetic information, and compare the lateral transfer to the vertical exchange of genetic information in eukaryotes. Explain the contribution of sexual reproduction to variability in a

		population and the subsequent increase in fitness.
Unit 4: Genetics Lesson 13: Asexual Reproduction		Describe the process of asexual reproduction in bacteria and archaea. Describe the process of asexual reproduction in some unicellular eukaryotic organisms involving binary fission. Understand the asexual reproductive processes of budding, fragmentation, and parthenogenesis in higher organisms. Learn about the evolutionary advantages conferred on those populations whose individuals engage in asexual reproduction.
Unit 4: Genetics Lesson 14: Mendelian Inheritance		Describe Gregor Mendel's contribution to the scientific understanding of inheritance. Define and describe the importance of the laws of segregation and independent assortment, and then show how these are achieved via meiosis. Describe a gene, and relate the position of genes on a chromosome to patterns of inheritance, citing examples of how linked genes result in linked traits. Use Punnett squares to solve problems involving monohybrid and dihybrid crosses, stating both genotypic and phenotypic ratios. Describe and define polygenic traits, multifactorial traits, non-nuclear inheritance, sex-linked

		traits, sex-limited traits, and sex-influenced traits.
Unit 4: Genetics Lesson 15: Laboratory: Genetics 1		Use Punnett squares to analyze the results of genetic crosses involving multiple generations. Determine the resulting allele ratios of various conventional monohybrid and dihybrid crosses. Use Punnett squares to explore allele ratios of genetic crosses that vary from those in which alleles are independently assorted.
Unit 4: Genetics Lesson 16: Laboratory: Genetics 2		Use Punnett squares to analyze the results of genetic crosses involving multiple generations. Determine the resulting allele ratios of various conventional monohybrid and dihybrid crosses. Use Punnett squares to explore allele ratios of genetic crosses that vary from those in which alleles are independently assorted.
Unit 4: Genetics Lesson 17: Laboratory: Genetics 3 Lesson 18: Discuss: Genetics		Use Punnett squares to analyze the results of genetic crosses involving multiple generations. Determine the resulting allele ratios of various conventional monohybrid and dihybrid crosses. Use Punnett squares to explore allele ratios of genetic crosses that vary from those in which alleles are independently assorted. Participate in a threaded discussion. Apply what you have learned about

		genetics to solve a real world question. Evaluate other students' responses to the discussion prompt.
Unit 4: Genetics Lesson 19: Application of Mathematics: Probability		Define probability, and give some basic examples of how to determine probabilities. Explain how knowledge of probability is important in the field of genetics.
Unit 4: Genetics Lesson 20: Human Genetic Disorders		Describe the various ways a human disorder can be inherited, including non-disjunction of chromosomes. Describe how Tay-Sachs disease, sickle-cell anemia, and Huntington's chorea are inherited. Describe how SCIDs and colorblindness are inherited. Describe how trisomy disorders such as Down syndrome and Klinefelter syndrome are inherited.
Unit 4: Genetics Lesson 21: Ethical Issues in Genetics		Understand the cause of a genetic disorder and how it affects the function of an organism. Explore the medical issues that surround the prevention and treatment of a genetic disorder. Understand the important social issues that surround the prevention and treatment of a genetic disorder. Explore the ethical issues that surround the prevention and treatment of genetic disorders.
Unit 4: Genetics Lesson 22: Your Choice		

		Use this lesson time to review, study, or move ahead. Use this lesson time to review, study, or move ahead.
Unit 4: Genetics Lesson 23: Genetics Unit Test	HS-LS1-1, HS-LS1-4, HS-LS1-6, HS- LS3-1, HS- LS3-2	
Unit 5: Semester Review and Test Lesson 1: Semester Review		
Unit 5: Semester Review and Test Lesson 2: Your Choice		
Unit 5: Semester Review and Test Lesson 3: Your Choice		
Unit 5: Semester Review and Test Lesson 4: Semester Test		