Biology 9-12	Unit 1: What is Biology? What is Life?		Suggested Length:
Essential Questions	***Program of Studies* and Core Content**	**Key Terms and Vocabulary**	**Classroom Instruction and <u>Assessment</u>** ***Student will:***
1. Why is biology important in our daily lives? 2. How do scientists test hypothesis? 3. How do you design an experiment using the scientific method? 4. What are the tools, procedures and measuring systems used in science? 5. What are the characteristics of life? 6. What processes are involved in the flow of matter and energy through and between living systems and the physical environment?	**<u>Program of Studies</u>** ❑ *AC-9 analyze the role science plays in everyday life and compare different careers in science.* ❑ *SI-1 identify and refine questions and identify scientific concepts to guide the design of scientific investigations.* ❑ *SI-2 design and conduct different kinds of scientific investigations for a wide variety of reasons.* ❑ *LS-13 analyze the flow of matter and energy through and between living systems and environments.* **<u>Core Content</u>** ❑ **SC-HS-4.6.1 Students will:** ❑ **explain the relationships and connections between matter, energy, living systems, and the physical environment.** ❑ **give examples of conservation of matter and energy.** **As matter and energy flow through different organizational levels (e.g., cells, organs, organisms, communities) and between living systems and the physical environment, chemical elements are recombined in different ways. Each recombination results in storage and dissipation of energy into the environment as heat. Matter and energy are conserved in each change. DOK 3**	❑ Matter ❑ Parts of an atom and charge ❑ Element ❑ Isotope ❑ Compound ❑ Chemical bonds ❑ Ionic bonds ❑ Covalent bonds ❑ Water molecule ❑ Mixture ❑ Solution ❑ Suspensions ❑ Acid (pH) ❑ Base (pH) ❑ Buffer ❑ Carbohydrates ❑ Lipids ❑ Proteins ❑ Nucleic acids ❑ Chemical reaction ❑ Catalyst	❑ Discuss the importance of biology in class and give examples of biology in real life. ❑ Use mystery bottle lab activity to formulate hypothesis, experiment, infer, predict, & interpret data by following the scientific method steps to solve a problem why the color changed in the bottle. ❑ Examine Redi's experiment and identify the parts to an experimental design (textbook p.8) ❑ Determine the parts of an experiment in an written experiment and how to write a lab report (worksheet) ❑ Design their own experiment using the materials such as a thermometer, three cups, water, stirring rod, and capsules to find out under what conditions will an "animal" in a protective capsule emerge? (handout) ❑ <u>Written assessment over experimental design by doing an open response over the scientific method</u> ❑ Demonstrate lab safety and procedures by practicing various basic skills in a lab sitting (lab booklet) ❑ Identify lab equipment in a lab activity using and observing lab equipment in the classroom. (lab booklet) ❑ Apply the metric system in a lab activity by converting a metric unit to another, and using measuring tool such as

Biology 9-12	Unit 1: What is Biology? What is Life?		Suggested Length:
Essential Questions	***Program of Studies* and Core Content**	**Key Terms and Vocabulary**	**Classroom Instruction and <u>Assessment</u>** ***Student will:***

		❑ Enzyme
		❑ Biology
		❑ Observation
		❑ Inference
		❑ Hypothesis
		❑ Independent variable (manipulated)
		❑ Dependent variable (responding)
		❑ Controlled experiment
		❑ Spontaneous generation
		❑ Theory
		❑ Homeostasis
		❑ Metabolism
		❑ Sexual reproduction
		❑ Asexual reproduction
		❑ Metric system
		❑ Microscope (compound, electron microscope)
		❑ Cell culture
		❑ Scientific method
		❑ Problem
		❑ Observation
		❑ Experiment
		❑ Conclusion
		❑ Theory
		❑ Law
		❑ Technology
		❑ Ethics
			rulers, beakers, graduated cylinders, and balances to obtain measurements. Also solve problems using the density formula by actually taking the mass of objects and finding the volume of regular and irregular objects, then finding the density of the object. (lab booklet)
			❑ Practice using a microscope and be given
			  ❑ Background information on the history, care, types and proper use of microscopes.
			  ❑ Observe the orientation of the e, resolution, and magnification of objects.
			  ❑ Draw what they see in different fields, and give their magnification.
			  ❑ Measure the diameter of the field under each objective lens using the hair.
			❑ Interpret and construct line and bar graphs in a lab setting using the information given (Lab booklet over basic skills)
			❑ <u>Be assess on lab safety and procedures</u>
			❑ Identify the difference between living and nonliving things- list characteristics of life in a lab activity by designing a chart giving examples of each and also give some real life examples and let students determine whether they are living, once living or nonliving and give reasons for their decisions based on life characteristics.
			❑ Analyze data and infer the growth of bacteria from a graph. (textbook p.27)
			❑ Clarify each meaning of the levels of organization and design a graphic organizer that could represent relationships among the terms
			❑ <u>Written assessment - multiple choice, interpreting graphs, and open response over safety rules and procedures</u>
			❑ Identify the parts of an atom (from the periodic table 1-25) by designing a model of their choice using various materials (compass, coloring pencils, hole puncher, paper) and construct giving the number of protons, electrons, and neutrons. Also construct an isotope of this atom. DOK 3

Biology 9-12	Unit 1: What is Biology? What is Life?		Suggested Length:
Essential Questions	***Program of Studies* and Core Content**	**Key Terms and Vocabulary**	**Classroom Instruction and Assessment** ***Student will:***
			❑ Discuss chemical bonding by doing a Venn diagram comparing and contrasting two types of chemical bonds then write an essay. DOK 2 ❑ Compare and contrast each type of mixture, acids, bases, and buffers and give three examples of each (group work) DOK 2 ❑ Open response over mixtures and compounds DOK 3 ❑ Conclude whether foods are acidic or basic- lab activity by taking the ph of different foods in the home, design data table, and answer the analysis questions from the book. (quicklab in book p.42) DOK 4 ❑ Investigate the major types of organic compounds (Lab Manual). Identify tests for carbohydrates, fats, and proteins, follow the procedures in your lab booklet, then the teacher give students an unknown, determine what nutrients found in it and then answer the questions. Write up a lab report from this investigation. DOK 3

Biology 9-12	Ongoing Instruction		Suggested Length:
Essential Questions	***Program of Studies* and Core Content**	**Key Terms and Vocabulary**	**Classroom Instruction and Assessment** ***Student will:***
	Program of Studies ❑ *AC-10 recognize that scientific knowledge comes from empirical standards, logical arguments, skepticism, and is subject to change as new evidence becomes available.* ❑ *AC-11 investigate advances in science and technology that have important and long-lasting effects on science and society (e.g., Newtonian mechanics, plate tectonics, germ theory, medical and health technology).* ❑ *SI-1 identify and refine questions and identify scientific concepts to guide the design of scientific investigations.* ❑ *SI-2 design and conduct different kinds of*		❑ Written assessment with multiple choice and open response over scientific method and interpreting graphs.

Biology 9-12	Ongoing Instruction		Suggested Length:
Essential Questions	***Program of Studies* and Core Content**	**Key Terms and Vocabulary**	**Classroom Instruction and <u>Assessment</u>** ***Student will:***
	scientific investigations for a wide variety of reasons		

Biology 9-12	Unit 2: Ecology		Suggested Length:
Essential Questions	***Program of Studies* and Core Content**	**Key Terms and Vocabulary**	**Classroom Instruction and <u>Assessment</u>** ***Student will:***
1. How does energy flow through living systems? 2. How can you show relationship between food chains, food webs, and ecological pyramids? 3. How does matter move among living and nonliving parts of an ecosystem? 4. What shapes an ecosystem and a biome? 5. What factors affect population size? 6. How do human	**<u>Program of Studies</u>** ❑ *SI-5 communicate designs, procedures, and results of scientific investigations.* ❑ *SI-6 review and analyze scientific investigations and explanations of others.* ❑ *AC-5 use science to analyze the use of natural resources by an increasing human population.* ❑ *AC-6 investigate how science can be used to solve environmental quality problems (e.g., over consumption, food distribution).* ❑ *LS-7 investigate the cycle of atoms (e.g., carbon) and molecules (e.g., nitrogen, carbon dioxide, oxygen) within the biosphere.* ❑ *LS-8 analyze energy flow through ecosystems.* ❑ *LS-9 examine interrelationships and interdependencies of organisms in ecosystems and the factors that influence the interactions between organisms.* ❑ *LS-10 explore how human activities alter ecosystems.* ❑ *LS-13 analyze the flow of matter and energy through and between living systems and environments.* **<u>Core Content</u>** ❑ **SC-HS-4.6.5 Students will describe and explain the role of carbon-containing molecules and chemical reactions in energy**	❑ Ecology ❑ Biogeochemical cycle ❑ Evaporation ❑ Transpiration ❑ Nitrogen fixation ❑ Water cycle ❑ Carbon cycle ❑ Nitrogen cycle ❑ Phosphorus cycle ❑ Biosphere ❑ Species ❑ Population ❑ Community	❑ Identify relationships among various type of organisms (inquiry activity) DOK 2 ❑ Trace the flow of energy through living systems by creating a food web poster, then will give an oral

Biology 9-12	Unit 2: Ecology		Suggested Length:
Essential Questions	***Program of Studies* and Core Content**	**Key Terms and Vocabulary**	**Classroom Instruction and <u>Assessment</u>** ***Student will:***
activities can affect the biosphere?	**transfer in living systems.** **Living systems require a continuous input of energy to maintain their chemical and physical organization since the universal tendency is toward more disorganized states. The energy for life primarily derives from the Sun. Plants capture energy by absorbing light and using it to break weaker bonds in reactants (such as carbon dioxide and water) in chemical reactions that result in the formation of carbon-containing molecules. These molecules can be used to assemble larger molecules (e.g., DNA, proteins, sugars, fats). In addition, the energy released when these molecules react with oxygen to form very strong bonds can be used as sources of energy for life processes. DOK 3** ❑ **SC-HS-4.7.1 Students will:** ❑ **analyze relationships and interactions among organisms in ecosystems.** ❑ **predict the effects on other organisms of changes to one or more components of the ecosystem.** **Organisms both cooperate and compete in ecosystems. Often changes in one component of an ecosystem will have effects on the entire system that are difficult to predict. The interrelationships and interdependencies of these organisms may generate ecosystems that are stable for hundreds or thousands of years. DOK 3** ❑ **SC-HS-4.7.2 Students will:** ❑ **evaluate proposed solutions from multiple perspectives to environmental**	❑ Ecosystem ❑ Biome ❑ Autotrophy ❑ Producer ❑ Heterotrophy ❑ Consumer ❑ Herbivore ❑ Carnivore ❑ Decomposer ❑ Food chain ❑ Trophic level ❑ Ecological pyramid ❑ Biomass ❑ Biotic ❑ Abiotic ❑ Habitat ❑ Niche ❑ Climate ❑ Greenhouse effect ❑ Global warming ❑ Predation ❑ Symbiosis ❑ Mutualism ❑ Commenalism ❑ Parasitism ❑ Primary succession ❑ Secondary succession ❑ Limiting factors ❑ Density-dependent factors ❑ Density-independent factors ❑ Biodiversity ❑ Extinction ❑ Endangered	presentation to the class by identifying five food chains, abiotic factors, predator-prey relationship, and identify the energy relationships. DOK 2 ❑ Construct a food web for animals living in the Great Smokey Mountains. DOK 2 ❑ Analyze data to create a bar graph to compare the effects of legumes to that of growing grass on the yield of corn ❑ <u>Open response in designing an ecosystem.</u> DOK 3 ❑ Scavenger hunt. DOK 2 ❑ Discuss the twp types of succession by reading articles about the fires of Yellowstone National Park, and Mount St. Helens and then compare and contrast the two in a written summary. DOK 2 ❑ <u>Open response over succession.</u> DOK 3 ❑ Identify the causes of climate and explain the greenhouse effect using a graphic and watch a video over the greenhouse effect and write a summary about it. DOK 3 ❑ Discuss special symbiotic relationships complete an activity over this. DOK 2 ❑ Investigate the role of owls in predator-prey relationships –owl pellet lab- determine % of bicreass and number and construct a graph. DOK 4 ❑ Analyze the methods responsible for the changes in the deer population (Kaibab lab) DOK 3 ❑ <u>Written assessment (unit) and open response over predator-prey population</u>. DOK 3 ❑ <u>Performance assessment by creating a power point of an</u>

Biology 9-12	Unit 2: Ecology		Suggested Length:
Essential Questions	***Program of Studies* and Core Content**	**Key Terms and Vocabulary**	**Classroom Instruction and <u>Assessment</u>** ***Student will:***
	problems caused by human interaction; ❑ **justify positions using evidence/data.** **Human beings live within the world's ecosystems. Human activities can deliberately or inadvertently alter the dynamics in ecosystems. These activities can threaten current and future global stability and, if not addressed, ecosystems can be irreversibly affected. DOK 3** ❑ **SC-HS-4.7.5 Students will:** ❑ **predict the consequences of changes in resources to a population;** ❑ **select or defend solutions to real-world problems of population control.** **Living organisms have the capacity to produce populations of infinite size. However, behaviors, environments, and resources influence the size of populations. Models (e.g., mathematical, physical, conceptual) can be used to make predictions about changes in the size or rate of growth of a population. DOK 3**	❑ Conservation ❑ Ozone depletion ❑ Acid rain ❑ Population density ❑ Immigration ❑ Emigration ❑ Exponential growth ❑ Carrying capacity	<u>endangered species and present it to the class.</u> DOK 3 ❑ Investigate water throughout the area by doing water analysis tests. DOK 3 Design an experiment picking an environmental problem and how it affects plant germination ❑ Interpret graphs (activity). Question populate a world population growth order. DOK 1 ❑ <u>Open response over bat populations after a hurricane</u> ❑ Constructs it calculate the population of organisms in a certain area (vegetative). DOK 2 ❑ Determine % of Bio areas and # and construct a graph. DOK 4

Biology 9-12	Unit 3: The Cell, Cycles, and Processes		Suggested Length:
Essential Questions	***Program of Studies* and Core Content**	**Key Terms and Vocabulary**	**Classroom Instruction and <u>Assessment</u>** ***Student will:***
1. What is the cell theory and how did the invention of the microscope	**<u>Program of Studies</u>** ❑ *SI-3 use equipment (e.g., microscopes, lasers), tools (e.g., beakers), techniques (e.g., microscope skills), technology (e.g., computers), and mathematics to improve scientific investigations and communications.*		

Biology 9-12	Unit 3: The Cell, Cycles, and Processes		Suggested Length:
Essential Questions	***Program of Studies* and Core Content**	**Key Terms and Vocabulary**	**Classroom Instruction and <u>Assessment</u>** ***Student will:***
affect/influence what we know about cells? 2. How can I determine if the cell is an animal or plant? 3. Why is cell specialization important to multi-cellular organisms? 4. What can the major events of the cell cycle tell me? 5. What roles do membranes play in maintaining homeostasis and in harvesting energy? 6. Have you ever wonder about the relationship between photosynthesis & respiration? 7. How are fermentation and respiration similar /different?	❑ *SI-4 use evidence, logic, and scientific knowledge to develop and revise scientific explanations and models.* ❑ *SI-5 communicate designs, procedures, and results of scientific investigations.* ❑ *LS-1 investigate cell structures, their functions (e.g., chemical reactions), and how DNA guides their functions.* ❑ *LS-2 investigate cell regulation, differentiation, and how the process of photosynthesis provides a vital connection between the Sun and energy needs of living systems.* ❑ *LS-3 investigate how DNA carries instructions for specifying characteristics of organisms.* ❑ *LS-4 investigate encoding and replication of genetic information.* ❑ *LS-11 recognize that living systems require continuous input of energy.* ❑ *LS-12 investigates photosynthesis, cellular respiration, and the energy relationships among them.* **<u>Core Content</u>** ❑ **SC-08-3.4.1 Students will explain the relationship between structure and function of the cell components using a variety of representations.** **Observations of cells and analysis of cell representations point out that cells have particular structures that underlie their function. Every cell is surrounded by a membrane that separates it from the outside world. Inside the cell is a concentrated mixture of thousands of different molecules that form a variety of**	❑ Cell ❑ Cell theory ❑ Cell membrane ❑ Cell wall ❑ Nucleus ❑ Cytoplasm ❑ Prokaryote ❑ Eukaryote ❑ Organism ❑ Chromatin ❑ Chromosome ❑ Nucleolus ❑ Cytoskeleton	❑ Discuss the history of the cell. Use graphic organizers to compare characteristics of oldest known cells to modern cells. Show an illustrated timeline documenting milestones in the development of the cell theory (book) ❑ Identify the parts of a prokaryotic cell to the eukaryotic cell. Illustrate each and using a Venn-diagram & compare the two. DOK 2 ❑ Describe the functions of cell structures and produce photo essay or drawing of basic cell structures. DOK 2 ❑ Observe, sketch, and compare onion cells, leaf and human cheek cells and others. Identify structural anatomy and function of organelles. DOK 2 ❑ Compare and contrast animal and plant cells by using a

Biology 9-12	Unit 3: The Cell, Cycles, and Processes		Suggested Length:
Essential Questions	***Program of Studies* and Core Content**	**Key Terms and Vocabulary**	**Classroom Instruction and <u>Assessment</u>** ***Student will:***
	specialized structures. These structures carry out specific cell functions. DOK 3	❑ Microtubule ❑ Microfilament ❑ Ribosome ❑ Endoplasmic reticulum ❑ Golgi apparatus ❑ Lysosome ❑ Vacuole ❑ Chloroplast ❑ Mitochondria ❑ Lipid bilayer	Venn-diagram and write an essay about the comparison. DOK 2 ❑ <u>Assess by open response by choosing 4 organelles and comparing them to the parts of a school and a vocabulary quiz over terms</u>. DOK 3
	❑ SC-HS-3.4.2 Students will understand that most cell functions involve chemical reactions. Food molecules taken into cells react to provide the chemical constituents needed to synthesize other molecules. Both breakdown and synthesis are made possible by a large set of protein catalysts, called enzymes. The breakdown of some of the food molecules enables the cell to store energy in specific chemicals that are used to carry out the many functions of the cell.	❑ ATP/ADP	❑ Design an experiment to investigate how temperature affects the rate of enzyme-catalyed reactions. Write up a LAB report on your experimental design detailing all the steps of the scientific process. DOK 4
	❑ **SC-HS-3.4.3 Students will:** ❑ **describe cell regulation (enzyme function, diffusion, osmosis, homeostasis);** ❑ **predict consequences of internal/external environmental change on cell function/regulation.** **Cell functions are regulated. Regulation occurs both through changes in the activity of the functions performed by proteins and through selective expression of individual genes. This regulation allows cells to respond to their internal and external environments and to control and coordinate cell growth and division. DOK**	❑ Diffusion ❑ Osmosis ❑ Active transport ❑ Passive transport ❑ Selective permability ❑ Endocytosis ❑ Exocytosis	❑ Investigate the process of osmosis in how solute concentration affect the movement of water across a biological membrane using two decalcified chicken eggs, and testing each one in corn syrup and distilled water then recording the mass every 10 for an hour. Students will determine the percent mass change then graph the results and infer the changes of the masses in the eggs using the terms isotonic, hypertonic, and hypotonic. (lab manual pg. 85) DOK 3 ❑ <u>Written assessment (MC) with open response.</u> DOK 3 ❑ Investigate life cycles of cells. Examine videos, slides, or photographs of various stages of mitosis and interphase. DOK 2 ❑ Compare each step of cell cycle by illustrating and writing about each. DOK 2

Biology 9-12	Unit 3: The Cell, Cycles, and Processes		Suggested Length:
Essential Questions	***Program of Studies* and Core Content**	**Key Terms and Vocabulary**	**Classroom Instruction and <u>Assessment</u>** ***Student will:***
	2		❑ Investigate the many different faces of cancer. Teacher will discuss about cancer by asking question and do little activity on the probabilities of getting cancer. Students will then work as team and be a fictitious person given by the teacher in an envelope. The team will summarize each person's cancer about the age, risk factors, genetics, etc. each team will discuss their results to other members and will do a class survey about cancer and each person will draw conclusions about their findings. DOK 2 ❑ Assessment - Arrange terms of the cell cycle in a graphic organizer such as concept map. DOK 2 ❑ Identify and describe the phases of the cell cycle in onion root tip plants- lab investigation. DOK 3 ❑ <u>Written assessment and open response over the cell cycle and compare and contrast animal and plant mitosis.</u> DOK 2
	❑ SC-HS-3.4.4 Students will understand that plant cells contain chloroplasts, the site of photosynthesis. Plants and many microorganisms (e.g., Euglena) use solar energy to combine molecules of carbon dioxide and water into complex, energy-rich organic compounds and release oxygen to the environment. This process of photosynthesis provides a vital link between the Sun and energy needs of living systems.	❑ Photosynthesis ❑ Calvin cycle ❑ Light reaction ❑ Photosystem I &II ❑ Stroma ❑ Thylakoids ❑ Chlorophyll	❑ Explain and discuss energy relationships between photosynthesis and respiration. Use video and overhead transparencies to explain both mechanisms of photosynthesis and respiration and complete handouts and a graphic organizer over both. DOK 2 ❑ Design an experiment to investigate the relative effects of light wavelength, temperature, CO2.etc. on the rate of photosynthesis (Biolab handout 10) DOK 3 ❑ Measure time and identify gas using bromothymol blue indicator on aquatic plants or evergreens at different distances. Note: CBLS and dissolved O2 probes maybe used to measure gas production. DOK 2
	❑ SC-08-3.4.2 Students will understand that in the development of multicellular organisms, cells multiply (mitosis) and differentiate to form many specialized cells, tissues, and organs.	❑ Cell specialization ❑ Mitosis ❑ Interphase ❑ Cell cycle ❑ Cytokinesis ❑ Prophase ❑ Metaphase	

Biology 9-12	Unit 3: The Cell, Cycles, and Processes		Suggested Length:
Essential Questions	***Program of Studies* and Core Content**	**Key Terms and Vocabulary**	**Classroom Instruction and <u>Assessment</u>** ***Student will:***
	❑ **SC-HS-4.6.10 Students will:** ❑ **identify the components and mechanisms of energy stored and released from food molecules (photosynthesis and respiration).** ❑ **apply information to real-world situations.** **Energy is released when the bonds of food molecules are broken and new compounds with lower energy bonds are formed. Cells usually store this energy temporarily in the phosphate bonds of adenosine triphosphate (ATP). During the process of cellular respiration, some energy is lost as heat. DOK 3**	❑ Telophase ❑ Aerobic respiration ❑ Anaerobic respiration ❑ Electron transport chain ❑ Fermemtation ❑ Kreb cycle ❑ Lactic acid	❑ Describe fermentation lab to determine rates of fermentation using yeast and sugar, and artificial sweetener in a zip-lock bag. Observe what happens by taking temperature, ph and products produced and write a lab report over your findings. DOK 4 ❑ <u>Written assessment comparing photosynthesi and respiration- open response</u>. ❑ Design an experiment to investigate how temperature affects the rate of enzyme-catalyzed reaction. Write up a lab report on your experimental design detailing all the steps of the scientific process. DOK 4

Biology 9-12	Unit 4: Genetics		Suggested Length:
Essential Questions	***Program of Studies* and Core Content**	**Key Terms and Vocabulary**	**Classroom Instruction and <u>Assessment</u>** ***Student will:***
1. How are inherited traits passed on from parent to offspring? 2. How do the general principles of genetics apply to humans? 3. What are some	**<u>Program of Studies</u>** ❑ *AC-3 explore the impact of scientific knowledge and discoveries on personal and community health.* ❑ *SI-4 use evidence, logic, and scientific knowledge to develop and revise scientific explanations and models.* ❑ *SI-6 review and analyze scientific investigations and explanations of others.* ❑ *LS-3 investigate how DNA carries instructions for specifying characteristics of organisms.* ❑ *LS-4 investigate encoding and replication of genetic information.*		

Biology 9-12	Unit 4: Genetics		Suggested Length:
Essential Questions	***Program of Studies* and Core Content**	**Key Terms and Vocabulary**	**Classroom Instruction and <u>Assessment</u>** ***Student will:***
potential problems associated with genetic engineering? 4. How are the expressions and activity of genes controlled?	**<u>Core Content</u>** ❑ SC-HS-3.4.6 Students will understand that in all organisms and viruses, the instructions for specifying the characteristics are carried in nucleic acids. The chemical and structural properties of nucleic acids determine how the genetic information that underlies heredity is both encoded in genes and replicated.	❑ Gregor Mendel ❑ Heredity ❑ Heterozygous ❑ Homozygous ❑ Phenotype ❑ Genotype ❑ Genes ❑ Hybrid ❑ Law of dominance ❑ Law of segregation ❑ Law of independent assortment ❑ Dominant ❑ Recessive ❑ Monohybrid ❑ Dihybrid ❑ Probability ❑ Punnett square ❑ Pedigree ❑ Incomplete dominance ❑ Codominance ❑ Multiple alleles ❑ Polygenic traits ❑ Polyploidy ❑ Nondisjunction disorders ❑ DNA ❑ RNA ❑ Adenine ❑ Cytosine ❑ Thymine ❑ Guanine ❑ Nucleotide ❑ Uracil ❑ Nitrogenous bases ❑ Protein synthesis	❑ Discuss the experiments of Mendel, genetic terms and write a summary over his three principles of genetics. A video will be shown outlining the his principles and use transparencies to help students understand his principles of heredity and why is known as the "Father of Genetics." DOK 2 ❑ Demonstrate the process of doing Punnett squares and students will practice these for monohybrid and dihybrid crosses. DOK 2 ❑ <u>Assess students doing Punnett squares and genetic vocabulary terms</u>. DOK 2 ❑ Solve genetic problems by solving problems dealing with paternity, hospital mistakes, and criminal cases. DOK 3 ❑ Investigate how traits are inherited by tossing coins and observe how the results of different allele combinations produce certain traits. Students will determine their offspring and draw the face of their child and analyze their findings in written summary. (lab manual pg. 107) DOK 3 ❑ Discuss about pedigrees, diseases, disorders and how genetic counselors use this to determine and to show parents the probability of passing genetic diseases to their offspring. Students will practice doing these pedigree and develop their own pedigree using a specific trait like tongue rolling, etc for three generations. DOK 3 ❑ Examine DNA and RNA structures. Compare and contrast by using a Venn-Diagram, then construct a model of each and demonstrate how DNA replicates. DOK 3 ❑ Investigate protein synthesis including transcription and translation. Show a video about this process and have students construct a flow chart how each works. DOK 2

Biology 9-12	Unit 4: Genetics		Suggested Length:
Essential Questions	***Program of Studies* and Core Content**	**Key Terms and Vocabulary**	**Classroom Instruction and <u>Assessment</u>** ***Student will:***
		❑ Deoxyribose ❑ Ribose ❑ mRNA ❑ tRNA ❑ Transcription ❑ Translation ❑ Anticodon ❑ Codon ❑ Amino acid ❑ Purines ❑ Pyrimidines ❑ Replication ❑ Nucleie Acid	
	❑ **SC-HS-3.5.1 Students will:** ❑ **predict the impact on species of changes to 1) the potential for a species to increase its numbers, (2) the genetic variability of offspring due to mutation and recombination of genes, (3) a finite supply of the resources required for life, or (4) natural selection;** ❑ **propose solutions to real-world problems of endangered and extinct species.** **Species change over time. Biological change over time is the consequence of the interactions of (1) the potential for a species to increase its numbers, (2) the genetic variability of offspring due to mutation and recombination of genes, (3) a finite supply of the resources required for life, and (4) natural selection. The consequences of change over time provide a scientific explanation for the fossil record of ancient life forms and for the striking molecular similarities observed among the diverse species of living organisms.**	❑ Karotype ❑ Mutation ❑ Mutagens ❑ Genetic engineering ❑ Cloning ❑ Selective breeding ❑ Gene mutagen ❑ Chromosomal m. ❑ Frame shift mutation ❑ Inversion	❑ Create an outlandish specimen and will explain why offspring produced in sexual reproduction are not identical to either parent and then describe in their own words the process by which traits are passed along to offspring using the vocabulary in the unit. DOK 3 ❑ Investigate several genetic disorders and diseases to identify specific genetic disorders. Research and report to class the phenotypic results of this disorder. DOK 2 ❑ <u>Written assessment (multiple choice) and open response using punnett squares to interpret genetic problems/mutations</u>. DOK 3 ❑ Identify the type of mutations using diagrams of DNA sequences. DOK 2 ❑ Investigate gene frequency in a population of organisms. DOK 3

Biology 9-12	Unit 4: Genetics		Suggested Length:
Essential Questions	***Program of Studies* and Core Content**	**Key Terms and Vocabulary**	**Classroom Instruction and <u>Assessment</u>** ***Student will:***
	Changes in DNA (mutations) occur spontaneously at low rates. Some of these changes make no difference to the organism, whereas others can change cells and organisms. Only mutations in germ cells have the potential to create the variation that changes an organism's future offspring. DOK 3		

Biology 9-12	Unit 5: Evolution		Suggested Length:
Essential Questions	***Program of Studies* and Core Content**	**Key Terms and Vocabulary**	**Classroom Instruction and <u>Assessment</u>** ***Student will:***
1. How has the current theory of evolution lead to more biodiversity? 2. What role does genetics play in evolution? 3. How do the concepts of "natural selection" fit together in terms of evolution? 4. What evidence suggests that species change over time and how is	**<u>Program of Studies</u>** ❑ *SI-4 use evidence, logic, and scientific knowledge to develop and revise scientific explanations and models.* ❑ *SI-6 review and analyze scientific investigations and explanations of others.* ❑ *AC-4 recognize how science influences human population growth.* ❑ *AC-10 recognize that scientific knowledge comes from empirical standards, logical arguments, skepticism, and is subject to change as new evidence becomes available.* ❑ *LS-5 examine how species change over time.* ❑ *LS-6 examine diversity of organisms and biological classification.* ❑ *LS-15 analyze how patterns of behavior ensure reproductive success.* **<u>Core Content</u>** ❑ **SC-HS-3.5.2 Students will:** ❑ **predict the success of patterns of adaptive behaviors based on evidence/data;**	❑ Evolution ❑ Fossils ❑ Darwin ❑ Malthus	❑ Trace Darwin's voyage and summarize the patterns of diversity among organisms of the Galapagos Islands. DOK 2 ❑ Measure, calculate, and analyze differences in length of

Biology 9-12	Unit 5: Evolution		Suggested Length:
Essential Questions	***Program of Studies* and Core Content**	**Key Terms and Vocabulary**	**Classroom Instruction and <u>Assessment</u>** ***Student will:***
biological classification used to explain relationships among diverse organisms?	❑ **justify explanations of organism survival based on scientific understandings of behavior.** **The broad patterns of behavior exhibited by organisms have changed over time through natural selection to ensure reproductive success. Organisms often live in unpredictable environments, so their behavioral responses must be flexible enough to deal with uncertainty and change. Behaviors often have an adaptive logic. DOK 3** ❑ **SC-HS-3.4.7 Students will:** ❑ **classify organisms into groups based on similarities;** ❑ **infer relationships based on internal and external structures and chemical processes.** **Biological classifications are based on how organisms are related. Organisms are classified into a hierarchy of groups and subgroups based on similarities that reflect their relationships. Species is the most fundamental unit of classification. Different species are classified by the comparison and analysis of their internal and external structures and the similarity of their chemical processes. DOK 2**	❑ Natural selection ❑ Adaptation ❑ Gene pool ❑ Mutations ❑ Relative frequency ❑ Speciation ❑ Reproductive isolation behavioral isolation ❑ Geographic isolation ❑ Temporal isolation ❑ Homologous structures ❑ Vestigial organs	a sample of lima beans and predict how the data are affected by sample size. (lab inquiry) DOK 3 ❑ Research different ideas of other scientists who played in the role of evolution and a summary about their findings by explain their thinking. DOK 3 ❑ <u>Written assessment –open response by</u> illustrating natural selection by using a make-believe scenario and have students pretend that a small group of humans is rocketed at "warp speed" to Planet X has no ozone layer but native plants and animals have evolved to live safely there. Challenge students to describe and sketch specific adaptations how descendants of the group of humans would look and act after evolving for 100,000 years on Planet X. DOK 4 ❑ Model adaptation by investigating how well each family survives in a new environment. Working in groups of three each member will play a Hunter, Seeder, or a Fisher. Students will use a coin to flip to code their habitat and play a game of survival. DOK 3 ❑ <u>Written assessment and open response</u>. DOK 3 ❑ Comparing adaptations of birds and survival benefits. DOK 2 ❑ Observe organisms from various groups and identify structures as homolgous structures/analogous structures and connect structures with convergence /divergence and defend. DOK 2

Biology 9-12	Unit 6: Classification		Suggested Length:
Essential Questions	***Program of Studies* and Core Content**	**Key Terms and Vocabulary**	**Classroom Instruction and <u>Assessment</u>** ***Student will:***
	<u>Program of Studies</u>		

Biology 9-12	**Unit 6: Classification**		**Suggested Length:**
Essential Questions	***Program of Studies* and Core Content**	**Key Terms and Vocabulary**	**Classroom Instruction and <u>Assessment</u>** ***Student will:***
1. Why is it important for scientists to use a universal system of organisms? 2. What role does the classification of organisms play in the study of the earth's diverse life forms? 3. What taxa make up the classification system developed by Linniaus?	❑ *SI-4 use evidence, logic, and scientific knowledge to develop and revise scientific explanations and models.* ❑ *SI-6 review and analyze scientific investigations and explanations of others.* ❑ *AC-10 recognize that scientific knowledge comes from empirical standards, logical arguments, skepticism, and is subject to change as new evidence becomes available.* ❑ *LS-5 examine how species change over time.* ❑ *LS-6 examine diversity of organisms and biological classification.* **<u>Core Content</u>** ❑ **SC-HS-3.5.1 Students will:** ❑ **predict the impact on species of changes to 1) the potential for a species to increase its numbers, (2) the genetic variability of offspring due to mutation and recombination of genes, (3) a finite supply of the resources required for life, or (4) natural selection;** ❑ **propose solutions to real-world problems of endangered and extinct species.** **Species change over time. Biological change over time is the consequence of the interactions of (1) the potential for a species to increase its numbers, (2) the genetic variability of offspring due to mutation and recombination of genes, (3) a finite supply of the resources required for life, and (4) natural selection. The consequences of change over time provide a scientific explanation for the fossil record of ancient life forms and for the striking molecular similarities observed among the**	❑ Fossil ❑ Mutation ❑ Genetic variability	❑ Design genetic diversity in bacteria. DOK 4

Biology 9-12	Unit 6: Classification		Suggested Length:
Essential Questions	***Program of Studies* and Core Content**	**Key Terms and Vocabulary**	**Classroom Instruction and <u>Assessment</u>** ***Student will:***
	diverse species of living organisms. Changes in DNA (mutations) occur spontaneously at low rates. Some of these changes make no difference to the organism, whereas others can change cells and organisms. Only mutations in germ cells have the potential to create the variation that changes an organism's future offspring. DOK 3 ❑ **SC-HS-3.4.7 Students will:** ❑ **classify organisms into groups based on similarities;** ❑ **infer relationships based on internal and external structures and chemical processes.** **Biological classifications are based on how organisms are related. Organisms are classified into a hierarchy of groups and subgroups based on similarities that reflect their relationships. Species is the most fundamental unit of classification. Different species are classified by the comparison and analysis of their internal and external structures and the similarity of their chemical processes. DOK 2**	❑ Class ❑ Dichotomous key ❑ Family ❑ Fungi ❑ Genus ❑ Kingdom ❑ Monera ❑ Order ❑ Phylogeny ❑ Phylum ❑ Plantae ❑ Protista ❑ Scientific names ❑ Species ❑ Taxon ❑ Animalia ❑ Binomial nomenclature	❑ Classify sea shells- group, name, and classify a collection of sea shells and construct a dichotomous key. DOK 3 ❑ Use a dichotomous key to successfully identify various organisms, e.g., trees, flowers insects, fishes, etc. DOK 3 ❑ Compare and contrast by constructing a table (graphic organizer) to compare the different kingdoms. DOK 2 ❑ <u>Written assessment and open response designing a dichotomous key.</u>

Biology 9-12	Unit 7: Behavior of Organisms		Suggested Length:
Essential Questions	***Program of Studies* and Core Content**	**Key Terms and Vocabulary**	**Classroom Instruction and <u>Assessment</u>** ***Student will:***
1. Why do organisms behave the way they do?	**<u>Program of Studies</u>** ❑ *LS-11 recognize that living systems require continuous input of energy.* ❑ *LS-14 investigate behavioral responses to internal changes and external stimuli.*	❑ Habituation ❑ Classical conditioning ❑ Operant conditioning ❑ Imprinting	

Biology 9-12	Unit 7: Behavior of Organisms		Suggested Length:
Essential Questions	***Program of Studies* and Core Content**	**Key Terms and Vocabulary**	**Classroom Instruction and <u>Assessment</u>** ***Student will:***
2. What are the different types of behavior? 3. How is behavior related to evolution? 4. How do environmental changes affect animal behavior?	❑ *LS-15 analyze how patterns of behavior ensure reproductive success.* **<u>Core Content</u>** ❑ SC-HS-3.4.8 Students will understand that multicellular animals have nervous systems that generate behavior. Nerve cells communicate with each other by secreting specific molecules. Specialized cells in sense organs detect light, sound, and specific chemicals enabling animals to monitor what is going on in the world around them. ❑ **SC-08-3.4.3 Students will form or justify conclusions as to whether a response is innate or learned using data/evidence on behavioral responses to internal and external stimuli.** **Behavioral responses to internal changes and external stimuli can be innate or learned. Responses to external stimuli can result from interactions with the organism's own species or other species, as well as environmental changes. DOK 3** ❑ **SC-HS-3.4.7 Students will:** ❑ **classify organisms into groups based**	❑ Migration ❑ Courtship ❑ Communication ❑ Aggression ❑ Circadian rhythm ❑ Hormone ❑ Gibberellins ❑ Thigmotropism ❑ Photoperiodism ❑ Chemical defenses ❑ Social behavior ❑ Behavior ❑ Stimulus ❑ Response ❑ Innate behavior ❑ Learned behavior ❑ Phototropism ❑ Auxin ❑ Gravitropism ❑ Cytokinin	❑ Discuss the different types of behavior and give examples of each. Create a data table of different kinds of animal behavior, give a meaning and example. DOK 2 ❑ Show a videos over animal behavior and classify each. DOK 2 ❑ Conduct an investigation over stimulus and response in a earthworm or pill bug using different stimuli. (lab) DOK 3 ❑ Investigate plant responses to various stimuli (light, temperature, gravity, touch etc. by designing own lab. DOK 4 ❑ Discuss social behavior in insects. Outline the steps in a graphic organizer. DOK 2 ❑ <u>Written assessment with multiple choice and open response.</u> ❑ Conduct an investigation over stimulus and response using yourself to determine reflex actions (lab). DOK 3 ❑ Choose an endangered species and research the status of the species. Then describe the behaviors such as locomotion, protection, level of activity, feeding habits, territory, communication, and sleeping habits and make three suggestions about a preliminary study for a reserve proposal. DOK 3

Biology 9-12	Unit 7: Behavior of Organisms		Suggested Length:
Essential Questions	***Program of Studies* and Core Content**	**Key Terms and Vocabulary**	**Classroom Instruction and <u>Assessment</u>** ***Student will:***
	on similarities; ❑ **infer relationships based on internal and external structures and chemical processes.** **Biological classifications are based on how organisms are related. Organisms are classified into a hierarchy of groups and subgroups based on similarities that reflect their relationships. Species is the most fundamental unit of classification. Different species are classified by the comparison and analysis of their internal and external structures and the similarity of their chemical processes. DOK 2**		

Biology 9-12	Unit 10: Fungi		Suggested Length:
Essential Questions	***Program of Studies* and Core Content**	**Key Terms and Vocabulary**	**Classroom Instruction and <u>Assessment</u>** ***Student will:***
	<u>Program of Studies</u> ❑ *SI-3 use equipment (e.g., microscopes, lasers), tools (e.g., beakers), techniques (e.g., microscope skills), technology (e.g., computers), and mathematics to improve scientific investigations and communications* ❑ *SI-5 communicate designs, procedures, and results of scientific investigations.* ❑ *LS-6 examine diversity of organisms and biological classification.* **<u>Core Content</u>** ❑ **SC-HS-3.4.7 Students will:** ❑ **classify organisms into groups based on similarities;** ❑ **infer relationships based on internal**		

Biology 9-12	Unit 10: Fungi		Suggested Length:
Essential Questions	***Program of Studies* and Core Content**	**Key Terms and Vocabulary**	**Classroom Instruction and <u>Assessment</u>** ***Student will:***
	and external structures and chemical processes. **Biological classifications are based on how organisms are related. Organisms are classified into a hierarchy of groups and subgroups based on similarities that reflect their relationships. Species is the most fundamental unit of classification. Different species are classified by the comparison and analysis of their internal and external structures and the similarity of their chemical processes. DOK 2**		

Biology 9-12	Unit 11: Plants		Suggested Length:
Essential Questions	***Program of Studies* and Core Content**	**Key Terms and Vocabulary**	**Classroom Instruction and <u>Assessment</u>** ***Student will:***
	<u>Program of Studies</u> *Students will:* ❑ *SI-3 use equipment (e.g., microscopes, lasers), tools (e.g., beakers), techniques (e.g., microscope skills), technology (e.g., computers), and mathematics to improve scientific investigations and communications.* ❑ *SI-5 communicate designs, procedures, and results of scientific investigations.* ❑ *LS-6 examine diversity of organisms and biological classification.* ❑ *LS-12 investigate photosynthesis, cellular respiration, and the energy relationships among them.* **<u>Core Content</u>** ❑ **SC-HS-3.4.7 Students will:** ❑ **classify organisms into groups based**		

Biology 9-12	Unit 11: Plants		Suggested Length:
Essential Questions	***Program of Studies* and Core Content**	**Key Terms and Vocabulary**	**Classroom Instruction and Assessment** *Student will:*
	on similarities; ❑ **infer relationships based on internal and external structures and chemical processes.** **Biological classifications are based on how organisms are related. Organisms are classified into a hierarchy of groups and subgroups based on similarities that reflect their relationships. Species is the most fundamental unit of classification. Different species are classified by the comparison and analysis of their internal and external structures and the similarity of their chemical processes. DOK 2** ❑ **SC-HS-4.6.5 Students will describe and explain the role of carbon-containing molecules and chemical reactions in energy transfer in living systems.** **Living systems require a continuous input of energy to maintain their chemical and physical organization since the universal tendency is toward more disorganized states. The energy for life primarily derives from the Sun. Plants capture energy by absorbing light and using it to break weaker bonds in reactants (such as carbon dioxide and water) in chemical reactions that result in the formation of carbon-containing molecules. These molecules can be used to assemble larger molecules (e.g., DNA, proteins, sugars, fats). In addition, the energy released when these molecules react with oxygen to form very strong bonds can be used as sources of energy for life processes. DOK 3**		

Biology 9-12	Unit 12: Invertebrate Animals		Suggested Length:
Essential Questions	***Program of Studies* and Core Content**	**Key Terms and Vocabulary**	**Classroom Instruction and <u>Assessment</u>** ***Student will:***
	<u>Program of Studies</u> ❑ *LS-6 examine diversity of organisms and biological classification.* ❑ *LS-11 recognize that living systems require continuous input of energy.* **<u>Core Content</u>** ❑ **SC-HS-3.4.7 Students will:** ❑ **classify organisms into groups based on similarities;** ❑ **infer relationships based on internal and external structures and chemical processes.** **Biological classifications are based on how organisms are related. Organisms are classified into a hierarchy of groups and subgroups based on similarities that reflect their relationships. Species is the most fundamental unit of classification. Different species are classified by the comparison and analysis of their internal and external structures and the similarity of their chemical processes. DOK 2** ❑ **SC-HS-4.6.5 Students will describe and explain the role of carbon-containing molecules and chemical reactions in energy transfer in living systems.** **Living systems require a continuous input of energy to maintain their chemical and physical organization since the universal tendency is toward more disorganized states. The energy for life primarily derives**		

Biology 9-12	Unit 12: Invertebrate Animals		Suggested Length:
Essential Questions	***Program of Studies* and Core Content**	**Key Terms and Vocabulary**	**Classroom Instruction and Assessment** *Student will:*
	from the Sun. Plants capture energy by absorbing light and using it to break weaker bonds in reactants (such as carbon dioxide and water) in chemical reactions that result in the formation of carbon-containing molecules. These molecules can be used to assemble larger molecules (e.g., DNA, proteins, sugars, fats). In addition, the energy released when these molecules react with oxygen to form very strong bonds can be used as sources of energy for life processes. DOK 3		

Biology 9-12	Unit 13: Vertebrate Animals		Suggested Length:
Essential Questions	***Program of Studies* and Core Content**	**Key Terms and Vocabulary**	**Classroom Instruction and Assessment** *Student will:*