

Grades 9, 10, 11, 12 Biology

I

Curriculum Standard	Student Learning Goals	Skills from FHS Rubrics	Suggested Instructional Strategies	Suggested Assessment Techniques
<p>LS 1 The Chemistry of Life Broad Concept: Chemical elements form organic molecules that interact to perform the basic functions of life.</p> <p>LS 1.1 Recognize that biological organisms are composed primarily of very few elements. The six most common are C, H, N, O, P, S</p>	<p>Describe the unique properties of carbon that allow it to covalently bond to itself and other atoms.</p> <p>Compare and contrast organic and inorganic compounds.</p>	<p>Reader - Skill 7 Identifies similarities and differences that are complex and abstract, subtle</p>	<ul style="list-style-type: none"> • Testing foods lab • Analyzing food labels • Identifying organic molecules (worksheet) • Bonding and chemical formulas (worksheet) • "Basic Chemistry for Biology Students" video 	
<p>LS 1.2 Describe the basic molecular structures and primary functions of the four major categories of organic molecules (carbohydrates, lipids, proteins, and nucleic acids).</p>	<p>List the most abundant elements in living things</p>	<p>Reader - Skill 3 Infers meaning of the main idea to the whole; paraphrases the main idea; differentiates between useful and non-useful information and makes connections to other texts or contexts</p> <p>Reader - Skill 7 Identifies similarities and differences that are complex and abstract, subtle</p> <p>Problem Solver - Skill 4 Distinguishes subtle differences between fact and opinion; recognizes and gives evidence of subtle bias/point of view</p>	<ul style="list-style-type: none"> • Mystery molecules (building organic molecule models) • Testing foods lab • Analyzing food labels • Identifying organic molecules (worksheet) • Bonding and chemical formulas (worksheet) • "Basic Chemistry for Biology Students" video 	<ul style="list-style-type: none"> • Chapter Test/Quiz • Molecular and atomic models • Film study guide • Lab report

Grades 9, 10, 11, 12 Biology

Curriculum Standard	Student Learning Goals	Skills from FHS Rubrics	Suggested Instructional Strategies	Suggested Assessment Techniques
<p>LS 1.3 Explain the role of enzymes as catalysts that lower the activation energy of biochemical reactions. Identify factors, such as pH and temperature, which have an effect on enzymes.</p>	<p>Identify carbohydrates, lipids, proteins, and nucleic acids by their structural and molecular formulas.</p> <p>Describe the biological function of carbohydrates, lipids, and proteins as energy sources and as the structural components of cells and organisms.</p> <p>Describe the biological function of nucleic acids as carriers of genetic information.</p> <p>Test foods for their nutrient content by comparing unknowns to standard tests for glucose, starch, protein, and lipid.</p>	<p>Reader - Skill 6 Makes multiple connections to personal experience and/or societal issues; thematically groups experiences; uses prior knowledge to deepen comprehension</p> <p>Writer - Skill 1 Demonstrates extensive planning when developing a written assignment</p> <p>Writer - Skill 5 Easily adjusts styles for purposes of assignment</p> <p>Problem Solver - Skill 3 Independently creates and carries out to completion a complex multi-step task</p>	<ul style="list-style-type: none"> • Mystery molecules (building organic molecule models) • Testing foods lab • Analyzing food labels • Identifying organic molecules (worksheet) • Bonding and chemical formulas (worksheet) • "Basic Chemistry for Biology Students" video 	<ul style="list-style-type: none"> • Chapter Test • Quiz • Molecular and atomic Models • Film study guide • Lab report
<p>LS 2 Structure and Function of Cells Broad Concept: Cells have specific structures and functions that make them distinctive. Processes in a cell can be classified broadly as growth, maintenance, and reproduction.</p> <p>LS 2.1 Relate cell parts/organelles (plasma membrane, nuclear envelope,</p>	<p>Describe the contributions of various scientists including Hooke and van Leeuwenhoek in the discovery of the cell and the development of the cell theory.</p> <p>State the cell theory.</p> <p>Define organelle and be able to identify the major cell organelles in cells diagrams,</p>	<p>Reader - Skill 7 Identifies similarities and differences that are complex and abstract, subtle</p> <p>Writer - Skill 7 Uses previous knowledge to identify complex, subtle, or abstract comparisons and contrasts</p>	<ul style="list-style-type: none"> • Cell cooperative activity (small group presentations) - Make your own PowerPoint + Creative Cell Analogies • Using the monocular microscope lab • Study of cell structures lab • Measuring under the microscope lab • Animal and plant cell 	<ul style="list-style-type: none"> • Small group presentations with accompanying models and posters • Film Study Guide • Lab reports • Quizzes • Tests • Letters to van Leeuwenhoek • Graphs of data

Grades 9, 10, 11, 12 Biology

Curriculum Standard	Student Learning Goals	Skills from FHS Rubrics	Suggested Instructional Strategies	Suggested Assessment Techniques
<p>nucleus, nucleolus, cytoplasm, mitochondrion, endoplasmic reticulum, Golgi apparatus, lysosome, ribosome, vacuole, cell wall, chloroplast, cytoskeleton, centriole, cilium, flagellum, pseudopod) to their functions. Explain the role of cell membranes as a highly selective barrier (diffusion, osmosis, facilitated diffusion, and active transport)</p>	<p>microphotographs, and actual cells.</p> <p>List the major cell organelles in eukaryotic cells and describe their structure and function.</p> <p>Demonstrate proper use and care of a light microscope and preparation and staining of wet mount slides.</p> <p>Explain the processes of diffusion and osmosis in terms of solute concentration.</p> <p>Predict then test, what will happen to cells placed in various solutions.</p>	<p>Presenter/Performer - Skill 1 Shows exceptionally in-depth understanding of topic, selects only powerful and appropriate information, makes relevant, meaningful and novel connections, anticipates questions, carefully listens to, interprets, and responds specifically to questions</p>	<p>diagrams</p> <ul style="list-style-type: none"> • Letter to Anton van Leeuwenhoek • "Introduction to Cells" video • Cells CD • Cell size vs. surface area math activity • Starch/sugar diffusion lab • The great egg experiment • Cucumber/Elodea lab (saltwater) • Sipunculid worms lab • Homeostasis and Transport (worksheet) • "Cell Biology: Plasma Membrane" video 	
<p>LS 2.2 Compare and contrast, at the cellular level, prokaryotes and eukaryotes (general structures and degrees of complexity).</p>	<p>Compare and contrast the structures of prokaryotic and eukaryotic cells.</p> <p>Recognize that eukaryotic cells evolved from prokaryotes.</p>	<p>Writer - Skill 7 Uses previous knowledge to identify complex, subtle, or abstract comparisons and contrasts</p> <p>Problem Solver - Skill 5 Recognizes and analyzes unlikely or subtle similarities and differences</p>	<ul style="list-style-type: none"> • "Bacteria" video • "Protista" video • "Algae" video • Ameba/Paramecium lab • Protozoa diagrams • Algae lab • Red tide (worksheet) 	<ul style="list-style-type: none"> • Lab reports • Film Study Guide • Quizzes • Tests • Models • Posters
<p>LS 2.3 Use cellular evidence (such as cell structure, cell number, and cell reproduction) and modes of</p>	<p>Compare and contrast the structures of plants and animal cells.</p>	<p>Reader - Skill 7 Identifies similarities and differences that are complex and abstract, subtle</p>	<ul style="list-style-type: none"> • Study of Cell Structure lab • "Introduction to Cells" video 	<ul style="list-style-type: none"> • Lab reports • Quizzes • Tests • Film Study Guide

Grades 9, 10, 11, 12 Biology

Curriculum Standard	Student Learning Goals	Skills from FHS Rubrics	Suggested Instructional Strategies	Suggested Assessment Techniques
<p>nutrition to describe six kingdoms (Archaeobacteria, Eubacteria, Protista, Fungi, Plantae, Animalia)</p>		<p>Writer - Skill 7 Uses previous knowledge to identify complex, subtle, or abstract comparisons and contrasts</p> <p>Problem Solver - Skill 5 Recognizes and analyzes unlikely or subtle similarities and differences</p>		
<p>LS 2.4 Identify the reactants, products, and basic purposes of photosynthesis and cellular respiration. Explain the interrelated nature of photosynthesis and cellular respiration in the cells of photosynthetic organisms..</p>	<p>Write the balanced equation for photosynthesis and identify the reactants and products in the process.</p> <p>Recognize that photosynthesis is a complex series of chemical reactions divided into the light-dependent and light-independent reactions.</p> <p>Interpret a graph of the chlorophyll absorption spectrum and explain how pigments absorb and reflect light.</p> <p>Distinguish between autotrophs and heterotrophs. Recognize that photoautotrophs absorb solar energy for photosynthesis while heterotrophs are dependent upon autotrophs for food.</p>	<p>Reader - Skill 2 Shows mastery of active reading strategies with sophisticated or unfamiliar material, deriving meaning from a variety of texts across the curriculum</p> <p>Reader - Skill 3 Infers meaning of the main idea to the whole; paraphrases the main idea; differentiates between useful and non-useful information and makes connections to other texts or contexts</p> <p>Problem Solver - Skill 4 Distinguishes subtle differences between fact and opinion; recognizes and gives evidence of subtle bias/point of view</p>	<ul style="list-style-type: none"> • Miracle Gro and corn growth lab • Absorption of chlorophyll (worksheet) • Photosynthesis posters • Plant pigment chromatography • "Photosynthesis: Life Energy" video • Comparing Photosynthesis and Respiration Worksheet • Respiration Graphic Organizer 	<ul style="list-style-type: none"> • Lab reports • Film Study Guide • Photosynthesis posters • Quizzes • Tests • Diagram of interrelationship between photosynthesis and respiration • Graphic organizer

Grades 9, 10, 11, 12 Biology

Curriculum Standard	Student Learning Goals	Skills from FHS Rubrics	Suggested Instructional Strategies	Suggested Assessment Techniques
	<p>Identify bacteria as the first photosynthetic organisms and the role they played in creating oxygen in the Earth’s atmosphere.</p> <p>Compare and contrast the processes of photosynthesis and respiration.</p> <p>Recognize that photosynthesis converts solar energy to chemical energy in the form of glucose and respiration converts glucose into ATP, the energy cells use.</p> <p>Draw the carbon cycle including the exchange of carbon dioxide and oxygen between respiration and photosynthesis.</p>			
<p>LS 2.5 Explain the important role that ATP serves in metabolism</p>	<p>Diagram the process of aerobic respiration including its major components, glycolysis, the Krebs Cycle, and Electron Transport System.</p> <p>Recognize that oxidation of energy-rich molecules in the mitochondria produces more ATP than fermentation.</p>	<p>Reader - Skill 6 Makes multiple connections to personal experience and/or societal issues; thematically groups experiences; uses prior knowledge to deepen comprehension</p> <p>Writer - Skill 7 Uses previous knowledge to identify complex, subtle or</p>	<ul style="list-style-type: none"> • Respiration graphic organizer • Root beer lab • Respiration with and without oxygen (worksheet) • Yeast Fermentation Lab 	<ul style="list-style-type: none"> • Lab Report • Quizzes • Tests

Grades 9, 10, 11, 12 Biology

Curriculum Standard	Student Learning Goals	Skills from FHS Rubrics	Suggested Instructional Strategies	Suggested Assessment Techniques
	<p>Observe the process and products of lactic acid and alcoholic fermentation in producing foods.</p>	<p>abstract comparisons and contrasts.</p>		
<p>LS 2.6 Describe the cell cycle and the process of mitosis. Explain the role of mitosis in the formation of new cells, and its importance in maintaining chromosome number during asexual reproduction.</p>	<p>Explain how the surface to volume ratio of a cell and contact inhibition limits cell size and growth.</p> <p>Describe and illustrate the events that occur during interphase, the four phases of mitosis, and cytokinesis as parts of the cell cycle.</p> <p>Compare and contrast the process of mitosis with that of meiosis.</p> <p>Observe and identify the stages of mitosis in representative plant and animal cells under the microscope.</p> <p>Recognize that cancer cells often lose the factors which control cell division and growth.</p>	<p>Reader - Skill 2 Shows mastery of active reading strategies with sophisticated or unfamiliar material deriving meaning from a variety of texts across the curriculum</p> <p>Problem Solver - Skill 2 Identifies a variety of possible important information; gathers sophisticated, apt. or valid information, organizes information in novel ways</p>	<ul style="list-style-type: none"> • Mitosis puzzles/posters • "Mitosis: Sending the Genetic Code" video • Onion root tip mitosis lab 	<ul style="list-style-type: none"> • Lab drawings • Quizzes • Tests • Film Study Guide • Mitosis poster
<p>LS 2.7 Describe how the process of meiosis results in the formation of haploid cells.</p>	<p>Describe how meiosis results in the reduction in chromosome numbers from</p>	<p>Reader - Skill 6 Makes multiple connections to personal experience</p>	<ul style="list-style-type: none"> • "Meiosis: Key to Genetic Diversity" video • Activity chromosome 	<ul style="list-style-type: none"> • Role playing with rubrics • Quizzes • Tests

Grades 9, 10, 11, 12 Biology

Curriculum Standard	Student Learning Goals	Skills from FHS Rubrics	Suggested Instructional Strategies	Suggested Assessment Techniques
<p>Explain the importance of this process in sexual reproduction, and how gametes form diploid zygotes in the process of fertilization.</p>	<p>diploid to haploid and the random combination of chromosomes in forming gametes.</p> <p>Determine the possible gametes resulting from meiosis and the possible zygotes that can result from them.</p> <p>Describe the process of sex-determination and distinguish between sex chromosomes and autosomes.</p> <p>Describe the processes of independent assortment and crossing-over and how these increase genetic variety.</p>	<p>and/or societal issues; thematically groups experiences; uses prior knowledge to deepen comprehension</p> <p>Reader - Skill 7 Identifies similarities and differences that are complex and abstract, subtle</p> <p>Writer - Skill 7 Uses previous knowledge to identify complex, subtle, or abstract comparisons and contrasts</p> <p>Problem Solver - Skill 5 Recognizes and analyzes unlikely or subtle similarities and differences.</p>	<p>combination</p>	
<p>LS 2.8 Compare and contrast a virus and a cell in terms of genetic material and reproduction.</p>	<p>Describe the structure of a virus as a nucleic acid surrounded by a protein coat. Summarize the lytic cycle by which viruses use cells to reproduce.</p> <p>Cite examples of diseases caused by viruses.</p>	<p>Reader - Skill 6 Makes multiple connections to personal experience and/or societal issues; thematically groups experiences; uses prior knowledge to deepen comprehension</p> <p>Reader - Skill 7 Identifies similarities and differences that are complex and abstract, subtle</p>	<ul style="list-style-type: none"> • "Viruses: What they are and how they work" video • "Understanding viruses" video • "Body Defenses Against Disease" video • Viral/Bacterial diseases research papers 	<ul style="list-style-type: none"> • Research papers and/or presentations on viral and bacterial diseases • Video study guide • Drawing and explanation of steps of lytic and lysogenic cycles

Grades 9, 10, 11, 12 Biology

Curriculum Standard	Student Learning Goals	Skills from FHS Rubrics	Suggested Instructional Strategies	Suggested Assessment Techniques
		<p>Writer - Skill 7 Uses previous knowledge to identify complex, subtle, or abstract comparisons and contrasts</p>		
<p>LS 3 Genetics Broad Concept: Genes allow for the storage and transmission of genetic information. They are a set of instructions encoded in the nucleotide sequence of each organism. Genes code for the specific sequences of amino acids that comprise the proteins that are characteristic of that organism.</p> <p>LS 3.1 Describe the basic structure (double helix, sugar/phosphate backbone, linked by complementary nucleotide pairs) of DNA, and describe its function in genetic inheritance.</p>	<p>Describe the contributions of various scientists (Watson, Crick, Franklin) to the idea that DNA carries the genetic code and in determining the structure of DNA.</p> <p>Construct a three-dimensional model of DNA illustrating its nucleotide structure and complementary base pairing.</p> <p>Summarize the process of DNA replication and production of mRNA through transcription.</p> <p>Compare and contrast the structure and function of DNA, mRNA, and tRNA.</p> <p>Extract DNA from cells and/or conduct gel electrophoresis to observe DNA fragments digested by restriction enzymes.</p> <p>Describe the processes and</p>	<p>Reader - Skill 6 Makes multiple connections to personal experience and/or societal issues; thematically groups experiences; uses prior knowledge to deepen comprehension</p> <p>Reader - Skill 7 Identifies similarities and differences that are complex and abstract, subtle</p> <p>Writer - Skill 7 Uses previous knowledge to identify complex, subtle, or abstract comparisons and contrasts</p> <p>Presenter - Skill 1 Shows exceptionally in-depth understanding of topic; selects only powerful and appropriate information; makes relevant, meaningful and novel connections; anticipates questions; carefully listens to, interprets,</p>	<ul style="list-style-type: none"> • Paper and 3D models of DNA • DNA extraction lab • Discovery of DNA writing assignment • City Lab DNA electrophoresis field trip • DNA sequencing (worksheet) • Readings on DNA fingerprinting and transgenic organisms 	<ul style="list-style-type: none"> • Models • Posters • Quizzes • Tests • Film Study Guide • Lab Report • Discovery of DNA Essay

Grades 9, 10, 11, 12 Biology

Curriculum Standard	Student Learning Goals	Skills from FHS Rubrics	Suggested Instructional Strategies	Suggested Assessment Techniques
	<p>applications of DNA fingerprinting and sequencing.</p> <p>Cite examples of genetic engineering including transgenic organisms, clones, and recombinant DNA.</p>	<p>and responds specifically to questions</p>		
<p>LS 3.2 Describe the basic process of DNA replication and how it relates to the transmission and conservation of the genetic code. Explain the basic processes of transcription and translation, and how they result in the expression of genes. Distinguish among the end products of replication, transcription, and translation.</p>	<p>Summarize the process of protein synthesis/translation in ribosomes.</p> <p>Explain the role of tRNA in decoding mRNA codons to amino acids.</p> <p>Translate DNA code to mRNA codons to tRNA anticodons to amino acids to determine the sequence of amino acids in a protein.</p>	<p>Reader - Skill 6 Makes multiple connections to personal experience and/or societal issues; thematically groups experiences; uses prior knowledge to deepen comprehension</p> <p>Reader - Skill 7 Identifies similarities and differences that are complex and abstract, subtle</p> <p>Writer - Skill 7 Uses previous knowledge to identify complex, subtle, or abstract comparisons and contrasts</p>	<ul style="list-style-type: none"> • Protein synthesis role play (gumdrop proteins) • "Translating the Code: Protein Synthesis" video • Decoding DNA (worksheet) • Nucleic acids and protein synthesis (worksheet) 	<ul style="list-style-type: none"> • Protein Synthesis Open Response Question • Film Study Guide • Quizzes • Tests
<p>LS 3.3 Explain how mutations in the DNA sequence of a gene may or may not result in phenotypic change in an organism. Explain how mutations in gametes may result in phenotypic changes</p>	<p>Recognize that changing one amino acid in a protein may change its structure and ability to function normally.</p> <p>Define mutation and describe the various types of gene</p>	<p>Reader - Skill 6 Makes multiple connections to personal experience and/or societal issues; thematically groups experiences; uses prior knowledge to deepen</p>	<ul style="list-style-type: none"> • Sickle cell anemia lab (slides) • Nondisjunction disorders (Genetics laser disk) • Investigating karyotypes (worksheet) • "Children by Design" 	<ul style="list-style-type: none"> • Lab Reports • PowerPoint presentations of genetic disorders • Film Study Guide • Quizzes • Tests

Grades 9, 10, 11, 12 Biology

Curriculum Standard	Student Learning Goals	Skills from FHS Rubrics	Suggested Instructional Strategies	Suggested Assessment Techniques
<p>in offspring.</p>	<p>mutations and their possible results in the protein and in the organism.</p> <p>Cite sickle-cell anemia, cystic fibrosis, and PKU as examples of gene mutations.</p> <p>Distinguish between germ and somatic mutations and chromosomal and gene mutations.</p> <p>Explain nondisjunction and cite Down, Turner, and Klinefelter Syndromes as examples of chromosomal mutations.</p> <p>Describe methods used to detect genetic disorders during pregnancy and to screen for genetic disorders before conceptions.</p>	<p>comprehension</p> <p>Information Seeker/ Organizer - Skill 4</p> <p>Makes connections to real world and develops new perspectives; creates an original conclusion based on an analysis of appropriate research; is able to paraphrase and put information into own words</p>	<p>video</p> <ul style="list-style-type: none"> • "Marked for Life" video • Genetics research papers (Internet and library research) 	<ul style="list-style-type: none"> • Student responses to bioethical issues • Genetic disorders research papers
<p>LS 3.4 Distinguish among observed inheritance patterns caused by several types of genetic traits (dominant, recessive, incomplete dominance, codominant, sex-linked, polygenic, and multiple alleles).</p>	<p>Cite examples of traits that are codominant, polygenic, sex-linked, or multiple alleles.</p> <p>Use Punnett Squares or family pedigrees to illustrate the inheritance of dominant, codominant, and sex-linked traits.</p>	<p>Reader - Skill 6</p> <p>Makes multiple connections to personal experience and/or societal issues; thematically groups experiences; uses prior knowledge to deepen comprehension</p> <p>Information Seeker/ Organizer - Skill 2</p>	<ul style="list-style-type: none"> • "Amish Family Legacy" video • Constructing a family pedigree (worksheet) 	<ul style="list-style-type: none"> • Personal family pedigrees • Quizzes • Tests

Grades 9, 10, 11, 12 Biology

Curriculum Standard	Student Learning Goals	Skills from FHS Rubrics	Suggested Instructional Strategies	Suggested Assessment Techniques
		<p>Independently identifies and selects appropriate and sophisticated sources; concentrates on primary sources</p> <p>Presenter - Skill 1 Shows exceptionally in-depth understanding of topic; selects only powerful and appropriate information; makes relevant, meaningful and novel connections; anticipates questions; carefully listens to, interprets, and responds specifically to questions</p>		
<p>LS 3.5 Describe how Mendel’s laws of segregation and independent assortment can be observed through patterns of inheritance (such as dihybrid crosses).</p>	<p>Describe the pea breeding experiments of Gregor Mendel.</p> <p>State Mendel’s laws of segregation and independent assortment and the Chromosomal Theory of Heredity.</p>	<p>Reader - Skill 3 Infers meaning of the main idea to the whole; paraphrases the main idea; differentiates between useful and non-useful information and makes connections to other texts or contexts</p> <p>Reader - Skill 6 Makes multiple connections to personal experience and/or societal issues; thematically groups experiences; uses prior knowledge to deepen comprehension</p>	<ul style="list-style-type: none"> • "Observing Patterns of Inheritance" slides • Principles of Heredity (worksheet) • Guinea Pig (penny flipping) lab • Probability (dice) lab • Scrambled genetics (worksheet) • Dihybrid corn cross • Corn genetics lab • Investigating Human Traits (genetic sampling) • Hardy-Weinberg calculations 	<ul style="list-style-type: none"> • Quizzes • Tests • Lab Reports • Hardy-Weinberg calculations

Grades 9, 10, 11, 12 Biology

Curriculum Standard	Student Learning Goals	Skills from FHS Rubrics	Suggested Instructional Strategies	Suggested Assessment Techniques
<p>LS 3.6 Use a Punnett Square to determine the probabilities for genotype and phenotype combinations in monohybrid crosses</p>	<p>Use a Punnett Square to determine the genotypes and phenotypes of monohybrid, dihybrid, and test crosses.</p> <p>Relate probability to genetics and predict expected ratios based on Punnett Squares.</p> <p>Explain why expected results may differ from the observed results.</p> <p>Observe the results of genetic crosses in sample organisms and determine the parents' genotypes based on the offspring.</p>	<p>Writer - Skill 8 Demonstrates clear, error-free written expression</p> <p>Problem Solver - Skill 2 Identifies a variety of possible important information; gathers sophisticated, apt. or valid information, organizes information in novel ways</p> <p>Information Seeker/ Organizer - Skill 5 Evaluates the product and the process throughout the duration of the assignment and independently makes revisions when necessary</p>	<ul style="list-style-type: none"> • "Observing Patterns of Inheritance" slides • Principles of Heredity (worksheet) • Guinea Pig (penny flipping) lab • Probability (dice) lab • Scrambled genetics (worksheet) • Dihybrid corn cross • Corn genetics lab • Investigating Human Traits (genetic sampling) • Hardy-Weinberg calculations 	<ul style="list-style-type: none"> • Lab Reports • Presentations of pedigree production and analysis • PowerPoint presentations on genetic disorders • Research paper on genetic disorders
<p>LS 4 Anatomy and Physiology Broad Concept: There is a relationship between the organization of cells into tissues, and tissues into organs. The structure and function of organs determine their relationships within body systems of an organism. Homeostasis allows the body to perform its normal functions.</p> <p>LS 4.1 Explain generally how the digestive system (mouth, pharynx, esophagus, stomach,</p>	<p>Explain how the human body is organized.</p> <p>Identify the nutrients your body needs</p> <p>Explain why water is such an important nutrient.</p> <p>Identify the organs of the digestive system.</p> <p>Describe the function of the digestive system.</p>	<p>Reader - Skill 3 Infers meaning of the main idea to the whole; paraphrases the main idea; differentiates between useful and non-useful information and makes connections to other texts or contexts</p> <p>Reader - Skill 6 Makes multiple connections to personal experience and/or societal issues; thematically groups experiences; uses prior knowledge to deepen</p>	<ul style="list-style-type: none"> • Inquiry Activity – What are organ systems? • Lab – Observing mechanical and chemical digestion • Design an Experiment – Investigating the Effects of Enzymes on Food Molecules • Analyzing Data - Evaluating Food Labels • Inquiry Activity – What's in a chip? • Design a Brochure for the six nutrients • Food Pyramid Interactive 	<ul style="list-style-type: none"> • Lab Reports • Tests • Quizzes • ORQs

Grades 9, 10, 11, 12 Biology

Curriculum Standard	Student Learning Goals	Skills from FHS Rubrics	Suggested Instructional Strategies	Suggested Assessment Techniques
<p>small and large intestines, rectum) converts macromolecules from food into smaller molecules that can be used by cells for energy and for repair and growth.</p>		<p>comprehension</p> <p>Reader - Skill 7 Identifies similarities and differences that are complex and abstract, subtle</p> <p>Writer - Skill 4 Uses appropriate textual evidence and cites it appropriately, including less obvious or less concrete evidence</p> <p>Writer - Skill 7 Uses previous knowledge to identify complex, subtle, or abstract comparisons and contrasts</p>	<p>art at phschool.com</p> <ul style="list-style-type: none"> • Links on digestion at Scilinks.com • Quick Lab – How do the villi Help the Small Intestine Absorb Nutrients • Models of the GI tract 	
<p>LS 4.2 Explain how the circulatory system (heart, arteries, veins, capillaries, red blood cells) transports nutrients and oxygen to cells and removes cell wastes. Describe how the kidneys and the liver are closely associated with the circulatory system as they perform the excretory function of removing waste from the blood. Recognize that kidneys remove nitrogenous wastes, and the liver removes many toxic</p>	<p>Identify the structures of the circulatory system.</p> <p>Differentiate among the three types of vessels in the circulatory system.</p> <p>Analyze the function of each type of blood cell.</p> <p>Explain the functions of the kidneys.</p> <p>Describe how blood is filtered.</p>		<ul style="list-style-type: none"> • Lab – Investigating the Heart • Inquiry Activity – What Factors Affect Heart Rate? • Online activity – the heart activity at phschool.com • Analyzing Data – Predicting the success of Blood Transfusions • Lab – Simulating Urinalysis • Models of the of the circulatory and excretory system 	

Grades 9, 10, 11, 12 Biology

Curriculum Standard	Student Learning Goals	Skills from FHS Rubrics	Suggested Instructional Strategies	Suggested Assessment Techniques
compounds from blood.			<ul style="list-style-type: none"> Construct a Flowchart – formation of urine 	
LS 4.3 Explain how the respiratory system (nose, pharynx, larynx, trachea, lungs, alveoli) provides exchange of oxygen and carbon dioxide.	Identify the function of the respiratory system. Recognize how smoking affects the respiratory system		<ul style="list-style-type: none"> Lab – Measuring Lung Capacity Design an Experiment – Modeling Breathing 	
LS 4.4 Explain how the nervous system (brain, spinal cord, sensory neurons, motor neurons) mediates communication between different parts of the body and the body’s interactions with the environment. Identify the basic unit of the nervous system, the neuron, and explain generally how it works.	Identify the functions of the nervous system. Explain how the nerve impulse is transmitted. Identify the functions of the central nervous system. Compare and contrast the functions of the two division of the peripheral nervous system. Distinguish among the five types of sensory receptors.		<ul style="list-style-type: none"> Observing Nervous Responses - Lab Real-World Lab – Modeling Corrective Lenses 	
LS 4.5 Explain how the muscular/skeletal system (skeletal, smooth and cardiac muscle, bones, cartilage, ligaments, tendons) works with other systems to support and allow for movement. Recognize that bones produce both red and white blood cells.	Identify the functions of the skeletal system. Describe the structure of a typical bone. Distinguish among the three different types of joints. Differentiate among the three types of muscle tissue.		<ul style="list-style-type: none"> Lab – Comparing Bones, Joints, and Muscles Lab – Observing Bone Composition and Structure Real-World Lab – Making a Model of a Transdermal Patch 	

Grades 9, 10, 11, 12 Biology

Curriculum Standard	Student Learning Goals	Skills from FHS Rubrics	Suggested Instructional Strategies	Suggested Assessment Techniques
	<p>Explain how muscles contract. Recognize why exercise is important</p>			
<p>LS 4.6 Recognize that the sexual reproductive system allows organisms to produce offspring that receive half of their genetic information from their mother and half from their father and that sexually produced offspring resemble, but are not identical to, either of their parents.</p>	<p>Identify the main functions of the male and female reproductive systems.</p> <p>Explain how meiosis is evident in sexual reproduction.</p> <p>Identify the relationship between genetics and sexual reproduction.</p>		<ul style="list-style-type: none"> • Lab - Comparing Ovaries and Testes • Quick Lab – How do Embryos Develop? 	
<p>LS 4.7 Recognize that communication between cells is required for coordination of body functions. The nerves communicate with electrochemical signals, hormones circulate through the blood, and some cells produce signals to communicate only with nearby cells.</p>	<p>Explain how a nerve impulse is transmitted. Identify the function of the endocrine system.</p> <p>Explain how the endocrine system maintains homeostasis.</p> <p>Differentiate among the functions of the major endocrine glands.</p> <p>Recognize that cells are able to communicate with nearby cells.</p>		<ul style="list-style-type: none"> • Inquiry Activity – Where do Cell Hormones go? • Informational Brochure - Diabetes 	
<p>LS 4.8 Recognize that the body's systems interact to maintain homeostasis. Describe the basic function of</p>	<p>Analyze the role of homeostasis in the functions of the various organ systems in the body.</p>		<ul style="list-style-type: none"> • Exploration – Modeling blood glucose regulation 	

Grades 9, 10, 11, 12 Biology

Curriculum Standard	Student Learning Goals	Skills from FHS Rubrics	Suggested Instructional Strategies	Suggested Assessment Techniques
a physiological feedback loop.	Give an example of a physiological feedback loop.			
<p>LS 5 Evolution and Biodiversity Broad Concept: Evolution is the result of genetic changes that occur in constantly changing environments. Over many generations, changes in the genetic make-up of populations may affect biodiversity through speciation and extinction.</p> <p>LS 5.1 Explain how evolution is demonstrated by evidence from the fossil record, comparative anatomy, genetics, molecular biology, and examples of natural selection.</p>	<p>Cite examples of evidence for the theory of evolution including the fossil record, comparative embryology, homologous, analogous, and vestigial structures, and protein and DNA similarities.</p> <p>Describe how radioactive dating can be used to date the age of fossils.</p>	<p>Reader - Skill 3 Infers meaning of the main idea to the whole; paraphrases the main idea; differentiates between useful and non-useful information and makes connections to other texts or contexts</p> <p>Reader - Skill 4 Uses relevant information to solve a problem or complete a task; identifies important information and analyzes significance</p> <p>Writer - Skill 4 Uses appropriate textual evidence and cites it appropriately, including less obvious or less concrete evidence</p>	<ul style="list-style-type: none"> • "Geologic Time" video • C14 dating lab • Geologic timelines (to scale) • Library research on fossils/fossil posters • Evolution wordsplash • Comparing amino acids (paper lab) • Comparative vertebrate anatomy lab 	<ul style="list-style-type: none"> • Quizzes • Tests • Geologic Time Lines • C14 Graphs • Lab Report • Fossil Posters
<p>LS 5.2 Describe species as reproductively distinct groups of organisms. Recognize that species are further classified into a hierarchical taxonomic system (kingdom, phylum, class, order, family, genus, species) based on morphological, behavioral,</p>	<p>Relate Darwin’s observations aboard the Beagle to his development of the theory of evolution by natural selection.</p> <p>State Darwin’s principles of fitness, competition, and adaptation and relate these</p>	<p>Reader - Skill 6 Makes multiple connections to personal experience and/or societal issues; thematically groups experiences; uses prior knowledge to deepen comprehension</p>	<ul style="list-style-type: none"> • Mapping Darwin's voyage • "On the Shoulders of Giants" video • "Odyssey of Life" video • Simulating natural selection in lizards (lab) • Galapagos slides • Lab on finch beak 	<ul style="list-style-type: none"> • Analysis of results related to natural selection lab • Video Study Guide • Quizzes • Tests • Map of Darwin’s voyage

Grades 9, 10, 11, 12 Biology

Curriculum Standard	Student Learning Goals	Skills from FHS Rubrics	Suggested Instructional Strategies	Suggested Assessment Techniques
<p>and molecular similarities. Describe the role that geographic isolation can play in speciation</p>	<p>to natural selection. Explain the relationship between genes and variations and recognize that natural selection works at the individual level but leads to changes in populations and species.</p> <p>Cites examples of evolution by natural selection including Darwin's Finches and Peppered Moths.</p> <p>State the genetic definition for species as organisms that can breed with each other to produce fertile offspring and share a gene pool.</p> <p>Simulate natural selection within a population to observe and calculate changes in gene frequencies within the population.</p> <p>List factors that lead to speciation including competition, niche availability, and geographical and reproductive isolation.</p>	<p>Reader - Skill 9 Reads from a variety of sophisticated/unfamiliar texts, with attention to inflection, audience, and mechanics</p> <p>Problem Solver - Skill 2 Identifies a variety of possible important information; gathers sophisticated, apt., or valid information, organizes information in novel ways</p> <p>Problem Solver - Skill 5 Recognizes and analyzes unlikely or subtle similarities and differences</p>	<p>variations</p> <ul style="list-style-type: none"> • Similarity, natural selection lab (using various beans) 	
<p>LS 5.3 Explain how evolution through natural selection can result in changes in biodiversity through the</p>	<p>Identify the taxa in the classification system devised by Linnaeus and classify sample organisms according</p>	<p>Reader - Skill 3 Infers meaning of the main idea to the whole; paraphrases the main idea;</p>	<ul style="list-style-type: none"> • Making and using a dichotomous key • Five Kingdom Classification (worksheet) 	<ul style="list-style-type: none"> • PowerPoint presentation • Dichotomous Keys • Quiz

Grades 9, 10, 11, 12 Biology

Curriculum Standard	Student Learning Goals	Skills from FHS Rubrics	Suggested Instructional Strategies	Suggested Assessment Techniques
<p>increase or decrease of genetic diversity from a population</p>	<p>to this system.</p> <p>Explain the system of binomial nomenclature and cite examples.</p> <p>Identify the characteristics of organisms belonging to each of the five kingdoms and three domains.</p>	<p>differentiates between useful and non-useful information and makes connections to other texts or contexts</p> <p>Reader - Skill 6 Makes multiple connections to personal experience and/or societal issues; thematically groups experiences; uses prior knowledge to deepen comprehension</p> <p>Writer - Skill 4 Uses appropriate textual evidence and cites it appropriately, including less obvious or less concrete evidence</p> <p>Information Seeker/ Organizer - Skill 4 Makes connections to real world and develops new perspectives; creates an original conclusion based on an analysis of appropriate research; is able to paraphrase and put information into own words</p> <p>Problem Solver - Skill 1 Defines multiple or complex problems and brainstorms a</p>	<ul style="list-style-type: none"> • "Classification" video • Classifying to species (card lab) • Keying out prepared specimens 	

Grades 9, 10, 11, 12 Biology

Curriculum Standard	Student Learning Goals	Skills from FHS Rubrics	Suggested Instructional Strategies	Suggested Assessment Techniques
		variety of solutions		
<p>LS 6 Ecology Broad Concept: Ecology is the interaction among organisms and between organisms and their environment.</p> <p>LS 6.1 Explain how birth, death, immigration, and emigration influence population size.</p>	<p>Define population, limiting factor and carrying capacity.</p> <p>Compare and contrast exponential and logistic growth in a population.</p> <p>Cite examples of factors, both abiotic and biotic, that control the growth and size of populations including competition, predation, parasitism, and disease.</p> <p>Culture a microorganism and test a possible limiting factor on the growth of the population.</p>	<p>Reader - Skill 6 Makes multiple connections to personal experience and/or societal issues; thematically groups experiences; uses prior knowledge to deepen comprehension</p> <p>Reader - Skill 7 Identifies similarities and differences that are complex, abstract, subtle</p> <p>Writer - Skill 7 Uses previous knowledge to identify complex, subtle, or abstract comparisons and contrasts</p>	<ul style="list-style-type: none"> • Nutrient cycling diagrams/worksheets • Miracle Gro lab 	<ul style="list-style-type: none"> • Quizzes • Tests • Worksheets • Lab Reports
<p>LS 6.2 Analyze changes in population size and biodiversity (speciation and extinction) that result from the following: natural causes, changes in climate, human activity, and the introduction of invasive, non-native species.</p>	<p>Explain how ecological succession leads to the development of a climax community.</p> <p>Distinguish between primary and secondary ecological succession.</p> <p>Discuss the effects of increased human population on populations and ecosystems.</p>	<p>Reader - Skill 6 Makes multiple connections to personal experience and/or societal issues; thematically groups experiences; uses prior knowledge to deepen comprehension</p> <p>Information Seeker/ Organizer - Skill 5 Makes connections to real world and develops new</p>	<ul style="list-style-type: none"> • Food Chain Game • Food web posters • "Life in a Pond" video 	<ul style="list-style-type: none"> • Presentation of a student's food web • Food web poster

Grades 9, 10, 11, 12 Biology

Curriculum Standard	Student Learning Goals	Skills from FHS Rubrics	Suggested Instructional Strategies	Suggested Assessment Techniques
		<p>perspectives; creates an original conclusion based on an analysis of appropriate research; is able to paraphrase and put information into own words</p> <p>Problem Solver - Skill 5 Recognizes and analyzes unlikely or subtle similarities and differences</p>		
<p>LS 6.3 Use a food web to identify and distinguish producers, consumers, and decomposers, and explain the transfer of energy through trophic levels. Describe how relationships among organisms (predation, parasitism, competition, commensalism, and mutualism) add to the complexity of biological communities.</p>	<p>Define the term trophic and explain how ecological pyramids are used to represent energy relationships among trophic levels.</p> <p>Recognize that energy in the form of heat is lost going from one trophic level to the next.</p> <p>Illustrate a food chain and a food web showing three levels of consumers.</p> <p>Define and compare parasitism, commensalism, and mutualism and cite examples of each.</p>	<p>Reader - Skill 6 Makes multiple connections to personal experience and/or societal issues; thematically groups experiences; uses prior knowledge to deepen comprehension</p> <p>Problem Solver - Skill 2 Identifies a variety of possible important information; gathers sophisticated, apt, or valid information, organizes information in novel ways.</p>	<ul style="list-style-type: none"> • PH and yogurt bacteria lab with CBLs • Yeast population growth • Oh Deer (Project Wild game) 	<ul style="list-style-type: none"> • Presentation/Game on Limiting Factors and Carrying Capacities • Lab Report
<p>LS 6.4 Explain how water, carbon, and nitrogen cycle between abiotic resources and organic matter in an ecosystem and how oxygen</p>	<p>Explain that materials cycle through ecosystems and are reusable but energy flows through ecosystems and is not.</p>	<p>Reader - Skill 3 Infers meaning of the main idea to the whole; paraphrases the main idea; differentiates between useful</p>	<ul style="list-style-type: none"> • "Succession" video • Biome posters • "World Population" video from Zero Population Growth 	<ul style="list-style-type: none"> • Biome Posters • Video Study Guide • Test • Quiz • ORQ

Grades 9, 10, 11, 12 Biology

Curriculum Standard	Student Learning Goals	Skills from FHS Rubrics	Suggested Instructional Strategies	Suggested Assessment Techniques
<p>cycles through photosynthesis and respiration.</p>	<p>Illustrate the water, carbon and oxygen, and nitrogen cycles showing abiotic and biotic reservoirs.</p>	<p>and non-useful information and makes connections to other texts or contexts</p> <p>Reader - Skill 6 Makes multiple connections to personal experience and/or societal issues; thematically groups experiences; uses prior knowledge to deepen comprehension</p> <p>Reader - Skill 7 Identifies similarities and differences that are complex, abstract, subtle</p> <p>Writer - Skill 7 Uses previous knowledge to identify complex, subtle, or abstract comparisons and contrasts</p>	<ul style="list-style-type: none"> Articles on Invasive species, oil spills, global warming 	<ul style="list-style-type: none"> Environmental Issues Paper

Note: Teachers recommend that the curriculum standard be stated and that numbers NOT be used (i.e. 1.4, 1.6)