|  |  |
| --- | --- |
| Unit | S.B:1 Study of Biology* Students will differentiate between living and non-living things.
 |
| “I Can” Learning Targets and Objectives (NGSS) | S.B:1-1 List and define the characteristics of all living things. S.B:1-2 Define homeostasis and how it is achieved and maintained.S.B:1-3 Differentiate living and non-living things using the living characteristics.S.B:1-4 Critically read scientific literature and produce scientific writing and/ or oral presentations that communicate how the structure and function of systems of specialized cells within organisms help perform the essential functions of life. S:B:1-5. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. (LS1-3)S:B:1-6 Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. (LS1-2) |
| Activities: | CDC theme Exercise/homeostasis lab (LS1-3)Tests for living characteristics: Metabolism, DNA (heredity), Cells, Reproduction to determine if an unknown is livingLiving/non-living field tripAlka-Seltzer lab (level 3 inquiry)Hierarchical posters of cellular organization to biome (LS1-2) |

|  |  |
| --- | --- |
| Unit | S.B:2 Ecology* Students will examine and compare the interactions of organisms in their environment
 |
| “I Can” Learning Targets and Objectives (NGSS) | S.B:2-1 Describe (II) relationships between organisms and their environment.S.B:2-2 Describe the trends (IV) and effects that relative rates of birth, immigration, emigration and death have on the fluctuation of population size. (12.11.32)S.B:2-3 Demonstrate (III) how interdependent relationships affect populations.S.B:2-4 Examine (IV) the effects of non-biodegradable pollutants (e.g. pesticides) have on the environment and trophic levels of a food chain. (12.11.33)S.B:2-5 Use evidence to explain the effects of agricultural run-off and pollution entering groundwater and surface water on drinking water and local wildlife. (12.11.34)S.B:2-6 Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem. (LS2-6)S.B:2-7 Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales. (LS2-1)S.B:2-8 Evaluate the evidence for the role of group behavior on individual and species’ chances to survive and reproduce. (LS2-8)S.B:2-9 Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity. (LS4-6)S.B:2-10 Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity. (LS2-7)S.B:2-11 Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere. (LS2-5)S.B:2-12 Use a mathematical representation to support claims for the cycling of matter and flow of energy among organisms in an ecosystem. (LS2-4)S.B:2-13 Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales. (LS2-2)S.B:2-14 Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions. (LS2-3) |
| Activities: | “Oh Dear” Carrying capacity lab (food, water, shelter) (LS2-1)Population pyramids (LS2-1)Ecological footprint activity (LS2-7, LS4-6)Reading about a disturbed habitat and predict what will happen to surrounding habitats (LS2-6)Pick and environmental problem and propose a solution project (LS2-6, LS2-7)Food chain/web/keystone species project (LS2-4)10% rule/trophic levels (LS2-4)Nutrient cycle posters (LS2-5) |

|  |  |
| --- | --- |
| Unit | S.B:3 Evolution* Students will analyze and describe how organisms change over time and adapt to their environment.
 |
| “I Can” Learning Targets and Objectives (NGSS) | S.B:3-1 Explain (II) how the concept of natural selection acts on phenotype, not the genotype, of an organism. (12.11.25)S.B:3-2 Demonstrate (III) how a variation within a species increases the likelihood that at least some members of a species will survive and reproduce under changed environmental conditions. (12.11.27)S.B:3-3 Use fossil evidence to debate (VI) the theories of mass extinction, episodic speciation and biological diversity. (12.11.30)S.B:3-4 Use evidence to analyze (VI) the theory that the millions of different species of plants, animals, and microorganisms that live on Earth today are related to each other by descent from common ancestors and that biological classifications are based on how organisms are related. (12.11.29)S.B:3-5 Relate (III) a cladogram to a theory of evolution. (12.11.02)S.B:3-6 Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment. (LS4-2)S.B:3-7 Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait. (LS4-3)S.B:3-8 Construct an explanation based on evidence for how natural selection leads to adaptation of populations. (LS4-4)S.B:3-9 Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species. (LS4-5)S:B:3-10 Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence. (LS4-1)  |
| Activities: | Bird beaks simulation or guppy simulation (LS4-2, LS4-5)Peppered moth (or similar) lab (LS4-4)Population genetics lab (LS4-3)Evolutionary arms race video & discussion (LS4-4)Homology and DNA sequence lab, use to show relatedness of different species (LS4-1) |

|  |  |
| --- | --- |
| Unit | S.B:4 Cells Processes* Students will apply an understanding of cell functions to demonstrate their relationship in living things.
 |
| “I Can” Learning Targets and Objectives (NGSS) | S.B:4-1 Differentiate (IV) between prokaryotic cells, eukaryotic cells (whether of animals or plants and whether unicellular or multicellular), and viruses in complexity and structure. In particular…• Prokaryotes are organisms whose cells lack nuclei. They are usually small and unicellular. • Eukaryotes are organisms whose cells have nuclei and membrane bound organelles. • A virus is a non-cellular particle usually made up of genetic material and protein that can invade living cells. Viruses are also much smaller than any unicellular organism (such as a bacterium) and cannot be seen with light microscopes but only with electron microscopes. (12.11.11)S.B:4-2 Relate (III) the role of the cellular organelles (DNA, ribosome, endoplasmic reticulum and the Golgi apparatus) to the production and secretion of proteins. (12.11.06)S.B:4-3 Compare and contrast (IV) the structure and function of plant and animal cells (i.e., know the various fundamental organelles of plant and animal cells and be able to distinguish these organelles in diagrams). (12.11.04)S.B:4-4 Compare and contrast (IV) mitosis and meiosis. (12.11.13)S.B:4-5 Demonstrate (III) and describe (II) how the semi-permeable membranes regulate the flow of substances in and out of the cell body by using the concepts of diffusion, osmosis, facilitated diffusion and active transport. (12.11.05)S.B:4-6 Describe (II) the role the mitochondria has in making stored chemical (bond) energy available to cells by breaking down glucose into carbon dioxide and water. (ie., cellular respiration) (12.11.08)S.B:4-7 Relate (III) the role of the mitochondria, chloroplast and ATP to basic cell processes and the functions. (12.11.07-09)S.B:4-8 Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy. (LS1-7)S.B:4-9 Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules. (LS1-6)S. B: 4-10 Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy. (LS1-5)S.B: 4-11 Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms. (LS1-4) |
| Activities: | Respiration lab (LS1-7) Light color and photosynthesis lab (LS1-5)Pipe cleaner mitosis model import photos into PPT. (LS1-4)  |

|  |  |
| --- | --- |
| Unit | S.B:5 DNA/RNA* Students will illustrate the pathway from template DNA to proteins.
 |
| “I Can” Learning Targets and Objectives (NGSS) | S.B:5-1 Relate (III) how the structure of DNA (deoxyribonucleic acid) to its function of carrying instructions for specifying the characteristics of each organism. • Structureo Nucleotides:  adenine (A), guanine (G), cytosine (C), thymine (T),  Deoxyribose: a 5-carbon sugar  phosphate groupo each DNA molecule in a cell is a single chromosome• a gene is a set of instructions in the DNA sequence of each organism that specifies the sequence of amino acids in polypeptides characteristic of that organism.• genetic information that underlies heredity is both encoded in genes (as a string of molecular letters) and replicated (by a templating mechanism). S.B:5-2 Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells. (LS 1-1)S.B:5-3 Demonstrate DNA replication. (12.11.21)S.B:5-4 Explain (I) general steps by which ribosomes synthesize proteins, using information from mRNA and from amino acids delivered by tRNA. (12.11.23)S.B:5-5 Describe (I) that specialization of cells in multicellular organisms is usually due to different patterns of gene expression rather than to differences of the genes themselves. (12.11.24)S.B: 5-6 Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring. (LS3-1) |
| Activities: | Survey parents traits and identify which you have or do not have and explain why(LS3-1)Decoding sentences (LS1-1) |

|  |  |
| --- | --- |
| Unit | S.B:6 Heredity* Students will describe and apply the processes used in the field of heredity.
 |
| “I Can” Learning Targets and Objectives (NGSS) | S.B:6-1 Describe (II) the history of heredity and Mendel's experiments.S.B:6-2 Demonstrate (III) through the use of models and explain (II) how meiosis (which only occurs in certain cells of multicellular organisms) is an early step in sexual reproduction in which the pairs of chromosomes separate and segregate randomly during cell division to produce gametes containing one chromosome of each pair. (12.11.15)S.B:6-3 Describe (II) that a multicellular organism develops from a single zygote, and its phenotype (i.e. its outward appearance) depends on its genotype (i.e. its genetic makeup), which is established at fertilization, and the how possible combinations of alleles in a zygote can be predicted from the genetic makeup of the parents for simple dominant/recessive traits through the analysis of Punnett Squares and Pedigrees. (12.11.19-20)S.B:6-4 Relate (III) Mendel’s law of segregation and independent assortment to the separation of genes to create gametes in meiosis and genetically predict the offspring. (12.11.12 & 16)S.B:6-5 Apply (III) the concepts of trait, alleles, dominant allele, recessive allele, gametes, genotype, homozygous, heterozygous, chromosome to meiosis and genetics. (12.11.13)S.B:6-6 Solve (III) genetic problems (complete dominance, incomplete dominance, co-dominance, multiple alleles and dihybrid crosses) through the use of Punnett Squares. (12.11.14)S.B:6-7 Construct (III) and evaluate a human Karotype [(22 different pairs of autosomal and one pair of sex chromosomes (males = XY and females = XX)] to identify common recognizable genetic disorders (ie. Down syndrome). (12.11.17)S.B:6-8 Relate (III) the use of the Human Genome Project to its implications on human genetic disorders.S.B:6-9 Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors. (LS3-2)S.B:6-10 Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population. (LS3-3) |
| Activities: | Genetic disease projects explain which of the 3 is the cause of the disease(LS3-2)Punnett squares (LS3-3)Modified old AP population genetics lab (LS3-3)Debate of the value/ethics of GMO’s (LS3-2) |