Mendon High School Biology Curriculum Map

Unit #1- Homeostasis and Body Systems

Timeline	Standards/Benchmarks	Learning Targets	Vocab	Assessment
September	**Standard HS LS1.2** Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. *Clarification: Emphasis on functions at organ system level (nutrient uptake, water delivery, response to stimuli, etc.). Assessment should not include interactions and functions at the chemical or molecular level.* **Standard HS LS1.3** Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. *Clarification: Investigations into homeostasis could include heart rate response to exercise, stomate response to moisture, or any similar biological feedback system. Assessment should not include cellular processes involved in these mechanisms.*	**I CAN** develop and use models to show how multicellular organism's systems carry out their functions. **I CAN** design and implement a procedure that shows how homeostasis is maintained.	breakdown of food molecules cellular communication cellular regulation cellular response cellular waste disposal environmental influence enzyme equilibrium feedback inhibition gene expression homeostasis hormone metamorphosis neuron neurotransmitter pH recombination of genes regulatory response	Labs Lab Reports Projects Quizzes Test

Unit #2- Photosynthesis and Cellular Respiration

Timeline	Standards/Benchmarks	Learning Targets	Vocab	Assessment
September/ October	**Standard HS LS1.6** Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy. *Clarification: Emphasis on illustrating inputs and outputs of photosynthesis, and the transfer and transformation of energy. Specific biochemical steps in the process should not be assessed.* **Standard HS LS1.6** Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules. *Clarification: Students should be able to construct explanations regarding the source of the macromolecules resulting from photosynthesis, and how larger carbon molecules such as amino acids result from sugars.* **Standard HS LS1.7** 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.	**I CAN** explain how photosynthesis results in macromolecules with stored chemical energy, which formed from solar energy and less energetic molecules. **I CAN** use a model to show how energy is transferred during cellular respiration, and the resulting molecules that form.	aerobic anaerobic ATP breakdown of food molecules carotenoids cellular energy conversion cellular respiration chemical bond chemical reaction chlorophyll chloroplast enzyme mitochondrion molecular energy molecule photosynthesis potential energy product reactant transforming matter and/or energy	Labs Lab Reports Projects Quizzes Test

	Clarification: When teaching cellular respiration, emphasis is on inputs and outputs, and energy transfers and transformations.			

Unit #3- Energy and Carbon Cycling

Timeline	Standards/Benchmarks	Learning Targets	Vocab	Assessment
October	**Standard HS LS2.3** Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions. *Clarification: Students construct explanations of how photosynthesis and respiration drive cycling of matter and flow of energy, including the presence of anaerobic respiration) in anaerboic environments.* **Standard HS LS2.4** Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem. *Clarification: Students use mathmatical models of energy and biomass at different trophic levels to support their claims regarding energy transfer in food webs. Assessment limited to proportional reasoning when describing flow of matter and energy.* **Standard HS LS2.5** Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the	**I CAN** explain matter and energy cycling in an ecosystem, under aerobic and anaerobic conditions. **I CAN** describe the movement of carbon through the biotic and abiotic systems as it relates to photosynthesis and cellular respiration.	Abiotic components of ecosystems autotroph biological molecule breakdown of food molecules carbon carbon cycle carbon dioxide cellular energy conversion cellular respiration chemical bond chemical organization of organisms consumer decomposition energy requirements of living systems flow of energy flow of matter heterotroph organic compound organic compound synthesis organic matter photosynthesizing	Labs Lab Reports Projects Quizzes Test

	biosphere, atmosphere, hydrosphere, and geosphere. *Clarification: Assessment should not include specific steps of chemical processes or quantitative analysis of carbon cycling.*			

Unit #4- Mitosis and Meiosis

Timeline	Standards/Benchmarks	Learning Targets	Vocab	Assessment
December/ January	**Standard HS LS1.4** Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintain complex organisms. Clarification: Emphasis is on the overall process and its role, not memorizing the names of the steps or specific gene control mechanisms. Include the concept of differentiated cell types in multicellular organisms forming due to different expression of genes, not different genetic content. The models used to describe mitosis should be evaluated by students in terms of accuracy.	I CAN use a model to illustrate the process of mitosis and explain its role in cellular differentiation	Cancer Chromosome Chromosome pair Differentiation Diploid Duplication of genes Haploid Mitosis Multicellular Mutation	Labs Lab Reports Projects Quizzes Test

Unit #5- DNA to Protein

Timeline	Standards/Benchmarks	Learning Targets	Vocab	Assessment
January/ February	**Standard HS LS1.1** Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells. Clarification: This standard includes DNA structure, and relating that structure to the mechanism of protein synthesis. Biochemistry of protein synthesis not assessed While some explanations of proteins is required, assessment should not extend to the details of protein structure. Emphasis is placed on amino acid composition and general functions of proteins in living systems. Genes can be described as regions of DNA that code for proteins or have a regulatory function.	I CAN use evidence to explain the structure of DNA, and how DNA determines the structure of essential proteins	amino acid sequence cell nucleus DNA molecule DNA sequence DNA subunit double helix enzyme gene messenger RNA protein protein structure protein synthesis ribosome specialized cell storage of genetic information tissue transcription transfer RNA translation	Labs Lab Reports Projects Quizzes Test

Unit #6- Inheritance and Variation

Timeline	Standards/Benchmarks	Learning Targets	Vocab	Assessment
February/ March	**Standard HS LS3.1** Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring. Clarification: Explicitly teach the cause and effect relationship between DNA, the proteins it codes for, and the resulting traits.	I CAN use questioning to clarify the roles of DNA and chromosomes in heredity	biological adaptation complementary sequence crossing over degree of kinship deletion DNA DNA replication dominant evidence for unity among organisms Gametes genetic diversity genetic mutation genetic variation genotype heterozygous homozygous inherited trait jumping genes karyotype meiosis new gene combinations phenotype	Labs Lab Reports Projects Quizzes Test

			progeny recessive recombinatio n of genetic material sex cell sex chromosomes	

Unit #7- Ecosystems

Timeline	Standards/Benchmarks	Learning Targets	Vocab	Assessment
April	**Standard HS LS2.1** Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales. Clarification: emphasis on quantitative analysis and comparison among interdependent factors (boundaries, resources, climate etc.) **Standard HS LS2.2** Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales	I CAN use mathematical representations to determine factors affecting carrying capacity and biodiversity I CAN investigate and draw conclusions regarding how environmental stability and behaviors affect species diversity, speciation and extinction	abiotic component of the ecosystem biological adaptations carrying capacity ecosystem stability equilibrium of ecosystems exponential growth population dynamics reproductive capacity succession	Labs Lab Reports Projects Quizzes Test

Unit #8- Human Impacts and Mitigations

Timeline	Standards/Benchmarks	Learning Targets	Vocab	Assessment
April/ May	**Standard HS LS2.7** Design, evaluate, refine a solution for reducing the impacts of human activities on the environment and biodiversity. Clarification: examples of human activities with an environmental impact include urbanization, dam building, dissemination of invasive species and increasing	I CAN design, evaluate and revise methods for reducing adverse human environmental impacts. Use a	climate change conservation desertificatio n extinction global warming invasive	Labs Lab Reports Quizzes Test

	insulation properties of the atmosphere. **Standard HS LS4.6** Create of revise a simulation to test a solution to mitigate adverse impacts of human activity and biodiversity	model to illustrate how photosynthesis transforms light energy into stored chemical energy	species resource management urbanization	

Unit #9- Evolution and Natural Selection

Timeline	Standards/Benchmarks	Learning Targets	Vocab	Assessment
May/June	**Standard HS LS4.1** Communicate scientific information that multiple lines of empirical evidence support common ancestry and biological evolution. Clarification: Students should be able to use at least 2 formats to identify and communicate scientific information regarding common ancestry and biological evolution supported by multiple lines of empirical evidence. **Standard HS LS4.2** Construct an explanation based on evidence that the process of evolution primarily results from our factors **Standard HS LS4.4** Construct an explanation based on evidence for how natural selection leads to adaption of populations. Clarification: Emphasis on how specific biotic and abiotic factors, including the actions of humans, contribute to a change in gene frequency over time. **Standard HS LS4.5** Evaluate the evidence supporting claims that changes in environmental conditions may result in (1) increases in the number of individuals of some	I CAN use genetic, biochemical, anatomical, and embryological information, as well as order of appearance, to provide evidence of evolution I CAN use evidence to explain how different factors can influence an organism's ability to compete for limited resources and subsequent survival and adaption of the species	biodiversity biological evolution chance inherited variants comparative anatomy degree of kinship differential survival DNA DNA molecule embryonic stages of development evidence for the unity among organisms gene pool genetic drift genetic diversity genetic mutation genetic variation homomologous structures molecular structures morphological	Labs Lab Reports Projects Quizzes Test

	species, (2) the emergence of new species over time, and (3) the extinction of other species		structures natural selection origin of life phylogenetics recombination of genetic material speciation	