APPROVED FACILITY SCHOOLS CURRICULUM GUIDE

SUBJECT: Life Science GRADE: HS

Strand/Concept Student Expectation	Student Friendly Learning Objective	Level of Thinking	Academic Vocabulary
TIMELINE: Quarter 1			
From Molecules to Organisms: Structures and Processes 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. **I C M**	I can use observational and experimental evidence to explain how sugar molecules are used to make amino acids and other carbon-based molecules.	Application Synthesis	Amino Acid Carbohydrate Nucleic Acid Protein Saccharide Starch Triglyceride
From Molecules to Organisms: Structures and Processes HS-LS1-5 Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy. **I C M**	I can use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.	Application	Chlorophyll Chloroplast Photosynthesis
From Molecules to Organisms: Structures and Processes 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 C M**	I can use a model to illustrate the chemical processes of aerobic and anaerobic cellular respiration.	Application	ADP Aerobic Anaerobic ATP Cellular respiration Fermentation Glycolysis Lactic Acid
Ecosystems: Interactions, Energy, and Dynamics 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. **I C M**	I can use observational and experimental evidence to explain the cycling of matter in aerobic and anaerobic respiration. I can use observational and experimental evidence to explain how energy flows in aerobic and anaerobic respiration.	Application Synthesis Application Synthesis	ADP ATP Ethyl Alcohol Krebs Cycle Mitochondria Net Gain Pyruvic Acid

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RESOURCES AND NOTES FOR QUARTER 1:

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SUBJECT: Life Science GRADE: HS

Strand/Concept Student Expectation	Student Friendly Learning Objective	Level of Thinking	Academic Vocabulary
TIMELINE: Quarter 2			
From Molecules to Organisms: Structures and Processes HS-LS1-2 Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. **I C M**	I can use a model to illustrate how systems interact together to perform specific functions within multicellular organisms.	Application	Cell Organ Organ System Organism Tissue
From Molecules to Organisms: Structures and Processes HS-LS1-3 Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. **I C M**	I can conduct an investigation to demonstrate that feedback mechanisms maintain homeostasis.	Application Synthesis	Feedback mechanism Homeostasis Response Stimuli
Life Sciences--Matter and Energy in Organisms and Ecosystems HS-LS2-4 Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem. **I C M**	I can model how matter cycles and energy flows among organisms in an ecosystem using mathematical representations for components of the ecological pyramid. I can analyze ecological pyramids to describe the ratio of energy available at each trophic level.	Application Analysis	Biomass Ecological Pyramid Trophic Level
Ecosystems: Interactions, Energy, and Dynamics HS-LS2-5 Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere. **I C M**	I can explain that the chemical elements of organisms pass into and out of the atmosphere and soil, and are combined and recombined in different ways. I can create a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon.	Comprehension Synthesis	Atmosphere Biosphere Carbon Cycle Combustion Decomposition Geosphere Hydrosphere

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Ecosystems: Interactions, Energy, and Dynamics HS-LS2-1 Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales. **I C M**	I can describe which factors affect the carrying capacity of ecosystems (habitat destruction, pollution, climate change, predation, etc.). I can use data represented in graphs, charts, and equations to describe changes in the carrying capacity of ecosystems over time and predict future change.	Comprehension Analysis Synthesis	Carrying capacity Density dependent Density independent Exponential growth Logistic Growth Parasitism
Ecosystems: Interactions, Energy, and Dynamics 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 C M**	I can use data represented in graphs, charts, and equations to describe changes in the biodiversity of ecosystems over time and predict future change.	Analysis Synthesis	Anthropogenic changes Competition Emigration Immigration Predation
Ecosystems: Interactions, Energy, and Dynamics HS-LS2-6 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. **I C M**	I can explain that the numbers and types of organisms in an ecosystem remain relatively consistent in stable conditions. I can explain that ecosystems change or new ecosystems are formed in changing conditions. I can evaluate evidence to support or disclaim that a given change in the condition of an ecosystem may result in a new ecosystem being established.	Comprehension Comprehension Analysis Evaluation	Pioneer Species Succession

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Ecosystems: Interactions, Energy, and Dynamics HS-LS2-7 Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity. **I C M** **Engineering Design Connection:** HS-ETS1-1. Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. **I C M**	I can develop a plan to reduce human impact on the environment (ex. Deforestation, urbanization, invasive species, etc.). I can evaluate proposed arguments or claims involving human impact on the environment.	Synthesis Evaluation	Invasive Species Pollution

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RESOURCES AND NOTES FOR QUARTER 2 :

APPROVED FACILITY SCHOOLS CURRICULUM GUIDE

SUBJECT: Life Science GRADE: HS

Strand/Concept Student Expectation	Student Friendly Learning Objective	Level of Thinking	Academic Vocabulary
TIMELINE: Quarter 3			
From Molecules to Organisms: Structures and Processes HS-LS1-4 Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms. **I C M**	I can use a model to show the role of cell division in cell growth and repair. I can use a model to depict cell differentiation and how it produces and maintains multicellular organisms.	Application Synthesis Application Synthesis	Cell Cycle Cellular Division Chromosomes Differentiation Mitosis Specialization
From Molecules to Organisms: Structures and Processes 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. **I C M**	I can describe the structure of DNA and RNA. I can use evidence and experimentation to develop an explanation for how the structure of DNA determines the structure of proteins (protein synthesis). I can explain that proteins related to specialized cells carry out functions essential to life.	Comprehension Synthesis Comprehension	Anti-codon Codon DNA Double Helix Genetic Code RNA Transcription Translation

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Strand/Concept Student Expectation	Student Friendly Learning Objective	Level of Thinking	Academic Vocabulary
Heredity: Inheritance and Variation of Traits 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. **I C M**	I can develop questions that help clarify the relationship between DNA, chromosomes and genes in determining traits that are passed from parents to offspring. I can apply the relationship between DNA, chromosomes and genes to the inheritance of traits in organisms. I can determine the probability for the inheritance of certain traits using Punnett Squares.	Analysis Application Application	Allele Dominant Gametes Genotype Homologous Pairs Law of Segregation Phenotype Punnett Square Recessive Trait
Heredity: Inheritance and Variation of Traits HS-LS3-2 Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors. **I C M**	I can make and defend a claim that inheritable genetic variations may result from new genetic combinations through meiosis. I can make and defend a claim that inheritable genetic variations may result from errors during replication. I can make and defend a claim that inheritable genetic variations may result from mutations caused by environmental factors.	Synthesis Evaluation Synthesis Evaluation Synthesis Evaluation	Crossing Over Gene Shuffling Meiosis Mutations Nondisjunction Tetrad Variations

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RESOURCES AND NOTES FOR QUARTER 3 :

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SUBJECT: Life Science GRADE: HS

Strand/Concept Student Expectation	Student Friendly Learning Objective	Level of Thinking	Academic Vocabulary
TIMELINE: Quarter 4			
Biological Evolution: Unity and Diversity HS-LS4-1 Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence. **I C M**	I can justify common ancestry and biological evolution of organisms based on the evidence of comparative embryology and communicate my justification using scientific information. I can justify common ancestry and biological evolution of organisms based on the evidence provided by anatomical structures and communicate my justification using scientific information. I can justify common ancestry and biological evolution of organisms based on evidence of biochemical similarities (DNA), and communicate my justification using scientific information.	Synthesis Evaluation Synthesis Evaluation Synthesis Evaluation	Analogous structures Artificial selection Common Ancestry Embryonic development Evolution Homologous structures Natural selection Vestigial structures
Biological Evolution: Unity and Diversity HS-LS4-2 Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment. **I C M**	I can describe the four factors that influence the evolutionary process of any species. I can use evidence to explain the influence of each of four major factors on the evolutionary process of a species.	Comprehension Application Synthesis	Gene Shuffling Mutation Natural Variation Species

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Biological Evolution: Unity and Diversity HS-LS4-3 Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait. **I C M**	I can use statistical and probability mathematical modeling to support and explain how advantageous heritable traits lead to shifts in the numerical distribution of organisms with those traits.	Application Synthesis	Adaptation Adaptive Radiation Allele Frequency Gene Pool Genetic Drift
Biological Evolution: Unity and Diversity HS-LS4-4 Construct an explanation based on evidence for how natural selection leads to adaptation of populations. **I C M**	I can use evidence to defend the idea that natural selection leads to adaptations of populations by analyzing real-world data.	Analysis Evaluation	Natural Selection Proportion
Ecosystems: Interactions, Energy, and Dynamics HS-LS2-8 Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce. **I C M**	I can evaluate the evidence for the role of group behavior (ex. Swarming, herding, flocking, etc.) on individual and species' chances to survive and reproduce.	Analysis Evaluation	Group Behavior Social Affiliation Social Hierarchy
Biological Evolution: Unity and Diversity 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 species, (2) the emergence of new species over time, and (3) the extinction of other species. **I C M**	I can evaluate evidence to explain how the formation of new species results from isolation (reproductive, geographic, temporal, and/or behavioral). I can evaluate evidence that supports the claim that environmental changes may result in the increase, reduction, or elimination of species.	Analysis Analysis Evaluation	Behavioral isolation Emergence Extinction Geographical isolation Reproductive isolation Speciation Temporal isolation

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Heredity: Inheritance and Variation of Traits HS-LS3-3 Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population. **I C M**	I can analyze mathematical data to explain and predict the probability of traits expressed in a population.	Analysis	Advantageous variation Allele frequency Genetic drift
Biological Evolution: Unity and Diversity HS-LS4-6 Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity. **I C M** **Engineering Design Connection:** HS-ETS1-2 Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. **I C M**	I can develop a plan to reduce the impact of human activity on the populations and number of species in an ecosystem.	Synthesis	Biodiversity Overexploitation Overpopulation

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RESOURCES AND NOTES FOR QUARTER 4 :