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| **Cell Biology and Genetics** | **Unit 1**  Chemicals, the Building Blocks of Life | HS LS 1-6 | DCI | LS1.C: Organization for Matter and Energy Flow in Organisms | 1. Explain how compounds are different from their component elements. 2. Describe the two main types of chemical bonds. 3. Describe the qualities of carbon that allow it to form a great variety of chemical compounds. 4. Use a variety of different molecular models to construct simple carbon compounds. 5. Describe the structure and function of each of the four classes of macromolecules. | * 1. Introduction to Biochemistry   2. 1-2 The Large Biological Molecules   3. Food and Nutrition |
| PSE | Constructing Explanations and Designing Solutions |
| CCC | Energy and Matter |
| **Unit 2**  Energy and Life | HS LS 1-5  HS LS 1-7 | DCI | LS1.C: Organization for Matter and Energy Flow in Organisms | 1. Explain the biological importance of photosynthesis. 2. Use a model to trace the path of a carbon atom through photosynthesis. 3. Use a model to compare the types of photosynthesis (C3, C4, CAM). 4. Explain the biological importance of cellular respiration. 5. Use a model to identify the energy inputs and outputs of the various stages of respiration. 6. Compare the efficacy of respiration using different large biological molecules. 7. Compare aerobic and anaerobic cellular respiration. | 2-1 Energy and Life  2-2 Photosynthesis  2-3 Alternate forms of Photosynthesis  2-4 Cellular Respiration |
| PSE | Developing and Using Models |
| CCC | Energy and Matter |
| **Unit 3**  Increasing Complexity, Single Cells to Systems | HS LS 1-4  HS LS 1-3  HS LS 1-2 | DCI | LS1.B: Growth and Development of Organisms  LS1.A: Structure and Function | 1. Describe the function of mitosis. 2. Define cellular differentiation and explain why it is important. 3. Explain the role of mitosis in growth and tissue repair. 4. Compare the function of organelles in a single celled eukaryote with the organs and organ systems of a multicellular organism. 5. Construct a model that follows the path of a nerve stimulus and response. 6. Construct a model that shows how multiple organ systems interact to maintain homeostasis. 7. Define: positive feedback, negative feedback, and homeostasis. 8. Explain how both positive and negative feedback mechanisms help to maintain homeostasis. 9. Describe how multiple organs and organ systems can interact as part of a feedback system. | 3-1 Cell Structure  3-2 Homeostasis in Cells  3-3 The Cell Cycle and Mitosis  3-4 Cell Differentiation  3-5 Homeostasis and Organisms |
| PSE | Developing and Using Models  Planning and Carrying Out Investigations |
| CCC | Systems and System Models  Stability and Change |
| **Unit 4**  Molecular Genetics | HS LS 1-1  HS LS 3-1  HS LS 3-2 | DCI | LS1.A: Structure and Function  LS3.A: Inheritance of Traits  LS3.B: Variation of Traits | 1. Summarize the scientific work that has led to our understanding of DNA. 2. List the parts of the DNA molecule and describe their function with regard to the storage of information and the replication of DNA. 3. Describe the processes of transcription and translation. 4. Explain the central dogma of molecular biology and analyze the exceptions to this dogma in light of the understanding of how DNA functions. 5. Explain how the redundancy of the genetic code can mitigate the effect of mutations. 6. Describe the different types of mutations. 7. Describe the function of chromosomes in cell division. 8. Predict the phenotype and genotype ratios for genetic crosses. 9. Explain how environmental factors can affect gene expression. | 4-1 Discovering DNA  4-2 The Structure and Function of DNA  4-3 RNA Structure and Function  4-4 Protein Synthesis  4-5 Mutations  4-6 Heredity |
| PSE | Constructing Explanations and Designing Solutions  Asking Questions and Defining Problems  Engaging in Argument from Evidence |
| CCC | Structure and Function  Cause and Effect |

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| **Evolution** | **Unit 5**  Introduction to Evolution | HS LS 4-1  HS ESS 1-5 | DCI | LS4.A: Evidence of Common Ancestry and Diversity  ESS1.C: The History of Planet Earth  ESS2.B: Plate Tectonics and Large-Scale System Interactions | 1. List and describe the various types of evidence that used to support the theory of evolution. 2. Describe how radioisotopes are used to date ancient materials and use data on radioactive decay to select appropriate radioisotopes for dating materials. 3. Describe the nature and findings of the scientific work that helped Darwin and Wallace to begin to define the theory of evolution by natural selection. 4. Use various types of evidence to construct an explanation of the evolutionary origins of a group of species. 5. Describe, in detail, the theory of plate tectonics. 6. Explain the forces that cause sea floor spreading and subduction. 7. Use maps, charts and other data to determine the age of the islands on an island archipelago. 8. Use maps, charts and other data of previous continental arrangements to explain how the Earth's tectonic plates have moved. 9. Construct a scaled timeline of the history of earth from the Big Bang through today that includes major geological and biological events. | 5-1 The History of Earth  5-2 The Theory of Plate Tectonics  5-3 Introduction to the Theory of Evolution  5-4 Evidence for Evolution |
| PSE | Obtaining, Evaluating, and Communicating Information  Engaging in Argument from Evidence |
| CCC | Patterns |
| **Unit 6**  Adaptation and Behavior | HS LS 2-8  HS LS 4-4 | DCI | LS2.D: Social Interaction and Group Behavior  LS4.C: Adaptation | 1. Compare individual behavior and group behavior. 2. Describe how different types of group behavior increase the chances for individuals to survive and reproduce. 3. Develop an argument, based on evidence, for how an assigned group behavior increases the chances of individual survival and reproduction. 4. Describe how environmental changes can lead to adaptation of populations. 5. Apply the three models of natural selection (disruptive, stabilizing, and directional selection) to determine the type of selection that occurred in a given scenario. 6. Apply the three models of natural selection (disruptive, stabilizing, and directional selection) to predict how phenotype frequencies in a population will change in a given scenario. | 6-1 Selection and Evolution  6-2 Introduction to Behavior  6-3 Group Behavior  6-4 Behavior and Evolution |
| PSE | Engaging in Argument from Evidence  Constructing Explanations and Designing Solutions |
| CCC | Cause and Effect |
| **Unit 7**  Evolution and the Environment | HS LS 4-5  HS LS 4-2  HS ESS 2-7 | DCI | LS4.C: Adaptation  LS4.B: Natural selection  ESS2.D: Weather and Climate  ESS2.E: Biogeology | 1. Describe how changes in environmental conditions can cause fluctuations in the number of individuals in a population. 2. Use multiple data sources to predict the impact of environmental fluctuations on a population. 3. Describe how environmental change can lead to speciation and extinction. 4. Relate punctuated equilibrium and gradualism to conditions of environmental change using multiple pieces of evidence as support. 5. Evaluate and select evidence that supports the argument that evolution primarily results from four factors. 6. Explain how genetic variation, introduced through both mutation and genetic recombination during sexual reproduction, leads to evolution. 7. Explain how both intraspecific competition and interspecific competition lead to evolution. 8. Use data and evidence to explain the phase “survival of the fittest”. 9. Explain how mass extinctions caused by biological, geological and astronomical have influenced the evolutionary history of life on Earth. 10. Describe how biological processes, like photosynthesis, have caused changes in earth systems. | 7-1 Intraspecific and Interspecific Competition  7-2 Genetic Variation and Evolution  7-3 Speciation and Extinction  7-4 Mass Extinction |
| PSE | Engaging in Argument from Evidence  Constructing Explanations and Designing Solutions |
| CCC | Cause and Effect  Stability and Change |
| **Unit 8**  Measuring Evolution | HS LS 4-3  HS LS 3-3 | DCI | LS4.B: Natural Selection  LS4.C: Adaptation  LS3.B: Variation of Traits | 1. Explain how natural selection, acting on phenotype, can affect allele frequencies from one generation to the next. 2. Use mathematical data to determine if a heritable trait is advantageous or deleterious. 3. Create a graphical representation showing how allele frequencies change from generation to generation as a result of natural selection. 4. Construct a mathematical model that demonstrates how reproductive advantage changes allele frequencies from generation to generation. 5. Use allele frequency and phenotype frequency data to explain the variation and distribution of traits in a population 6. Use phenotype data to calculate allele frequencies. | 8-1 Changes in Allele Frequencies Not Related to Fitness  8-2 Qualitative Analysis of Allele Frequencies  8-3 Quantitative Analysis of Allele Frequencies  8-4 Hardy-Weinberg Equilibrium |
| PSE | Analyzing and Interpreting Data |
| CCC | Patterns  Scale, Proportion, and Quantity |

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| **Ecology** | **Unit 9**  The Ecology of  Nutrient Cycling | HS LS 2-4  HS LS 2-3  HS LS 2-5 | DCI | LS2.B: Cycles of Matter and Energy Transfer in Ecosystems  PS3.D: Energy in Chemical Processes | 1. Use energy and biomass pyramids to explain how energy is transferred through the trophic structure of an ecosystem. 2. Explain why energy transfer between tropic levels is inefficient and use mathematical models to support this explanation. 3. Describe how matter is conserved as it moves through and among ecosystems. 4. Describe the function of respiration in both the flow of energy and the cycling of matter within an ecosystem. 5. Explain the difference between anaerobic respiration and aerobic respiration with regard to the flow of energy and the cycling of matter within an ecosystem. 6. Explain how photosynthesis and respiration work to move carbon between various reservoirs in the carbon cycle. 7. Use a model of the carbon cycle to predict how changes in one area will impact the remainder of the cycle. | 9-1 Ecosystems and Biomes  9-2 Energy Flow and Food Webs  9-3 Biogeochemical Cycles |
| PSE | Using Mathematics and Computational Thinking  Constructing Explanations and Designing Solutions  Developing and Using Models |
| CCC | Energy and Matter  Systems and System Models |
| **Unit 10**  Community Interactions | HS LS 2-6  HS LS 2-1 | DCI | LS2.C Ecosystem Dynamics, Functioning, and Resilience | 1. Explain the difference between primary and secondary succession. 2. Explain how ecological succession changes the numbers and types of organisms within an ecosystem. 3. Define climax community and explain how modest biological or physical changes can influence community makeup. 4. Define carrying capacity and describe the factors that influence carrying capacity. 5. Explain, using evidence, why populations cannot grow indefinitely. 6. Use data to determine the carrying capacity of an ecosystem. | 10-1 Anthromes  10-2 Succession  10-3 Keystone Species  10-4 Limits to Population Growth |
| PSE | Engaging in Argument from Evidence |
| CCC | Stability and Change |
| **Unit 11**  Humans and Biodiversity | HS LS 4-6  HS LS 2-2  HS ESS 3-3  HS LS 2-7 | DCI | LS2.A: Interdependent Relationships in Ecosystems  LS2.C: Ecosystem Dynamics, Functioning, and Resilience  LS4.C: Adaptation  LS4.D: Biodiversity and Humans  ESS3.C: Human Impacts on Earth Systems  ETS1.B: Developing Possible Solutions | 1. Construct a solution to mitigate one solution to decreasing biodiversity caused by human activity. 2. Specify the qualitative and quantitative constraints of a solution to decreasing biodiversity caused by human activity. 3. Analyze the results of a simulation to determine ways to increase the quality of the data produced. 4. List and describe factors that can affect the biodiversity of an ecosystem. 5. Construct and revise explanations about biodiversity and populations that include multiple types of mathematical data. 6. Describe, using data, the relationship between ecologically sustainable practices and maintenance of biodiversity. 7. Explain, using data, how poor resource management affects the sustainability of the human populations and biodiversity. 8. Develop a proposal for an ecologically sustainable project that takes into account both human and environmental needs. 9. List, define, and prioritize the criteria and constraints that would affect the project and explain how these criteria and constraints could be addressed. 10. Refine and defend revisions to the scope, parameters, and design of the project based on feedback from multiple sources. | 11-1 Biodiversity  11-2 Human Population Growth  11-3 Threats to Biodiversity  11-4 Biodiversity Project |
| PSE | Using Mathematics and Computational Thinking  Constructing Explanations and Designing Solutions |
| CCC | Cause and Effect  Stability and Change |
| **Unit 12**  Sustainability and Human Activity | HS-ESS3-1  HS-ESS3-4 | DCI | ESS3.A: Natural Resources  ESS3.B: Natural Hazards  ESS3.C: Human Impacts on Earth Systems  ETS1.B: Developing Possible Solutions | 1. Identify and use evidence of how human populations are influenced by the availability of resources and occurrence of natural hazards. 2. Explain how climate change will affect human communities. 3. Use information on the availability of natural resources and the occurrence of natural hazards to explain how human communities have developed in different areas. 4. Evaluate the efficacy of a sustainable solution to a pressing issue that either addresses the use of natural resources or mitigates climate change. | 12-1 The Greenhouse Effect  12-2 Climate Change  12-3 Climate Change and Humans  12-4 Climate Change Project |
| PSE | Constructing Explanations and Designing Solutions |
| CCC | Cause and Effect  Stability and Change |