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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 1-5HS 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 Life2-2 Photosynthesis2-3 Alternate forms of Photosynthesis2-4 Cellular Respiration |
| PSE | Developing and Using Models |
| CCC | Energy and Matter |
| **Unit 3**Increasing Complexity, Single Cells to Systems | HS LS 1-4HS LS 1-3HS LS 1-2 | DCI | LS1.B: Growth and Development of OrganismsLS1.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 Structure3-2 Homeostasis in Cells3-3 The Cell Cycle and Mitosis3-4 Cell Differentiation3-5 Homeostasis and Organisms |
| PSE | Developing and Using ModelsPlanning and Carrying Out Investigations |
| CCC | Systems and System ModelsStability and Change |
| **Unit 4** Molecular Genetics | HS LS 1-1HS LS 3-1HS LS 3-2 | DCI | LS1.A: Structure and FunctionLS3.A: Inheritance of TraitsLS3.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 DNA4-2 The Structure and Function of DNA4-3 RNA Structure and Function4-4 Protein Synthesis4-5 Mutations4-6 Heredity |
| PSE | Constructing Explanations and Designing SolutionsAsking Questions and Defining ProblemsEngaging in Argument from Evidence |
| CCC | Structure and FunctionCause and Effect |

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| **Evolution** | **Unit 5**Introduction to Evolution | HS LS 4-1HS ESS 1-5 | DCI | LS4.A: Evidence of Common Ancestry and DiversityESS1.C: The History of Planet EarthESS2.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 Earth5-2 The Theory of Plate Tectonics5-3 Introduction to the Theory of Evolution5-4 Evidence for Evolution |
| PSE | Obtaining, Evaluating, and Communicating InformationEngaging in Argument from Evidence |
| CCC | Patterns |
| **Unit 6** Adaptation and Behavior | HS LS 2-8HS LS 4-4 | DCI | LS2.D: Social Interaction and Group BehaviorLS4.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 Evolution6-2 Introduction to Behavior6-3 Group Behavior6-4 Behavior and Evolution |
| PSE | Engaging in Argument from EvidenceConstructing Explanations and Designing Solutions |
| CCC | Cause and Effect |
| **Unit 7** Evolution and the Environment | HS LS 4-5HS LS 4-2HS ESS 2-7 | DCI | LS4.C: AdaptationLS4.B: Natural selectionESS2.D: Weather and ClimateESS2.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 Competition7-2 Genetic Variation and Evolution7-3 Speciation and Extinction7-4 Mass Extinction |
| PSE | Engaging in Argument from EvidenceConstructing Explanations and Designing Solutions |
| CCC | Cause and EffectStability and Change |
| **Unit 8** Measuring Evolution | HS LS 4-3HS LS 3-3 | DCI | LS4.B: Natural SelectionLS4.C: AdaptationLS3.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 Fitness8-2 Qualitative Analysis of Allele Frequencies8-3 Quantitative Analysis of Allele Frequencies8-4 Hardy-Weinberg Equilibrium |
| PSE | Analyzing and Interpreting Data |
| CCC | PatternsScale, Proportion, and Quantity |

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| **Ecology** | **Unit 9** The Ecology of Nutrient Cycling | HS LS 2-4HS LS 2-3HS LS 2-5 | DCI | LS2.B: Cycles of Matter and Energy Transfer in EcosystemsPS3.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 Biomes9-2 Energy Flow and Food Webs9-3 Biogeochemical Cycles |
| PSE | Using Mathematics and Computational ThinkingConstructing Explanations and Designing SolutionsDeveloping and Using Models |
| CCC | Energy and MatterSystems and System Models |
| **Unit 10** Community Interactions | HS LS 2-6HS 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 Anthromes10-2 Succession10-3 Keystone Species10-4 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 2-2HS ESS 3-3HS LS 2-7 | DCI | LS2.A: Interdependent Relationships in EcosystemsLS2.C: Ecosystem Dynamics, Functioning, and ResilienceLS4.C: AdaptationLS4.D: Biodiversity and HumansESS3.C: Human Impacts on Earth SystemsETS1.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 Biodiversity11-2 Human Population Growth11-3 Threats to Biodiversity11-4 Biodiversity Project |
| PSE | Using Mathematics and Computational ThinkingConstructing Explanations and Designing Solutions |
| CCC | Cause and EffectStability and Change |
| **Unit 12**Sustainability and Human Activity | HS-ESS3-1HS-ESS3-4 | DCI | ESS3.A: Natural ResourcesESS3.B: Natural HazardsESS3.C: Human Impacts on Earth SystemsETS1.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 Effect12-2 Climate Change12-3 Climate Change and Humans12-4 Climate Change Project |
| PSE | Constructing Explanations and Designing Solutions |
| CCC | Cause and EffectStability and Change |