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| **STANDARD 1. Environmental Issues**  **The student will investigate and analyze environmental issues ranging from local to global perspectives and develop and implement a local action project that protects, sustains, or enhances the natural environment.** | | | |
| **Topic A: Environmental Issue Investigation** | | | |
| 1. Identify an environmental issue. | Obtaining, evaluating and communicating information |  | Systems  Stability and Change |
| 1. Develop and write research questions related to an environmental issue. | Planning and carrying out investigations |  |  |
| 1. Given a specific issue, communicate the issue, the stakeholders involved and the stakeholders’ beliefs and values. | Obtaining, evaluating and communicating information |  |  |
| 1. Design and conduct the research. | Planning and carrying out investigations |  |  |
| 1. Use data and references to interpret findings to form conclusions. | Analyzing and interpreting data |  |  |
| **Topic B: Action Component** | | | |
| 1. Use recommendation(s) to develop and implement an environmental action plan. | Constructing explanations and designing solutions |  |  |
| 1. Communicate, evaluate and justify personal views on environmental issue and alternate ways to address them. | Obtaining, evaluating and communicating information  Engaging in argument from evidence |  |  |
| 1. Analyze the effectiveness of the action plan in terms of achieving the desired outcomes. | Analyzing and interpreting data |  |  |

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| **STANDARD 2. INTERACTIONS OF EARTH’S SYSTEMS**  **The student will analyze and apply the properties of systems thinking and modeling to the study of Earth’s systems.** | | | |
| **Topic A: Earth Systems** | | | |
| 1. The student will analyze and explain the interactions of earth’s systems. | Obtaining, evaluating and communicating information  Constructing explanations and designing solutions  Using Mathematical & Computational Thinking  Engaging in argument from evidence  Analyzing & Interpreting Data | HS-PS2-2. Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system. | Systems and system models  Scale, Proportion & Quantity  Patterns  Stability & Change |
| **Topic B: Systems Thinking** | | | |
| 1. Analyze, explain and apply the properties of systems thinking to earth systems interactions. | Constructing explanations and designing solutions |  | Systems and system models  Energy & Matter |
| 1. Use models and computer simulations to extend his/her understanding of scientific concepts. | Developing and using models  Planning & Carrying Out Investigations  Using Mathematical & Computational Thinking | HS-PS2-4. Use mathematical representations of Newton’s Law of Gravitation and Coulomb’s Law to describe and predict the gravitational and electrostatic forces between objects. | Systems and system models  Structure & Function  Stability & Change  Patterns |

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| **STANDARD 3**  **FLOW OF MATTER & ENERGY**  **The student will analyze and explain the movement of matter and energy through interactions of earth’s systems (*biosphere, geosphere, hydrosphere, atmosphere, and cryosphere*) and the influence of this movement on weather patterns, climatic zones, and the distribution of life.** | | | |
| **Topic A:** **Conservation of Matter within Earth Systems** | | | |
| 1. Demonstrate that matter cycles through and between living systems and the physical environment, constantly being recombined in different ways | Analyzing and interpreting data  Constructing explanations and designing solutions  Developing & Using Models | HS-PS1-2. Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.  HS-PS1-8. Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.  HS-PS3-3. Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy. | Systems and system models  Energy & Matter: Mechanisms and Explanation  Patterns |
| **Topic B: Energy Distribution through Earth Systems** | | | |
| 1. Analyze how the position and movement of the Earth in space determine distribution of heat and light. | Analyzing and interpreting data  Constructing explanations and designing solutions  Developing & Using Models  Using Mathematics & Computational Thinking | HS-PS1-8. Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay. | Cause and effect: Mechanisms and Explanation  Scale, Proportion & Quantity  Energy & Matter |
| 1. Explain that transfer of thermal energy between the atmosphere and the land or oceans produces temperature and density gradients in the atmosphere and the oceans. | Constructing explanations and designing solutions  Analyzing & Interpreting Data | HS-PS1-5. Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs. | Cause and effect: Mechanisms and Explanation  Stability & Change  Patterns |
| 1. Explain that transfer of thermal energy between the atmosphere and the land or oceans influences climate patterns. | Constructing explanations and designing solutions  Developing & Using Models  Planning & Carrying Out Investigations | HS-PS3-2. Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative positions of particles (objects).  HS-PS3-4. Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics). | Cause and effect: Mechanisms and Explanation  Energy & Matter  Systems & System Models |
| **Topic C: Interaction of Physical Systems and the Biosphere** | | | |
| 1. Analyze and explain the movement of matter and energy through earth’s systems and the influence of this movement on the distribution of life. | Analyzing and interpreting data  Constructing explanations and designing solutions  Developing & Using Models  Using Mathematics & Computational Thinking | HS-PS3-1. Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known. | Systems and system models  Energy & Matter: Mechanisms and Explanation |

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| **STANDARD 4**  **POPULATIONS, COMMUNITIES AND ECOSYSTEMS**  **The student will use physical, chemical, biological, and ecological concepts to analyze and explain the interdependence of humans and organisms in populations, communities and ecosystems**. | | | |
| **Topic A: Cycling of Matter and Energy** | | | |
| 1. Explain how organisms are linked by the transfer and transformation of matter and energy at the ecosystem level. | Constructing explanations and designing solutions  Engaging in Argument from Evidence |  | Systems and system models  Energy & Matter: Mechanisms and Explanation  Stability & Change |
| **Topic B: Population Dynamics** | | | |
| 1. Analyze the growth or decline of populations and identify a variety of responsible factors. | Analyzing and interpreting data |  | Cause and effect |
| **Topic C: Community and Ecosystem Dynamics** | | | |
| 1. Explain how the interrelationships and interdependencies of organisms and populations contribute to the dynamics of communities and ecosystems. | Constructing explanations and designing solutions |  | Systems and system models |
| **Topic D: Stability in Populations, Communities and Ecosystems** | | | |
| 1. Use models and provide examples to show how the interaction and interdependence of populations contribute to the stability of populations, communities and ecosystems. | Developing and using models |  | Systems and system models  Scale, proportion and quantity |
| 1. Use models and provide examples to show how species’ interactions may generate ecosystems that are stable for hundreds or thousands of years. | Developing and using models |  | Systems and system models  Scale, proportion and quantity |
| **Topic E: Diversity** | | | |
| 1. Provide examples and evidence to show that a greater diversity of genes, species and/or environments increases the chance that at least some living things will survive in the face of large changes in the environment. | Constructing explanations and designing solutions |  | Scale, proportion and quantity |

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| **Standard 5**  **Humans and Natural Resources**  **The student will use concepts from chemistry, physics, biology, and ecology to analyze and interpret both positive and negative impacts of human activities on earth’s natural systems and resources.** | | | |
| **Topic A: Human Impact on Natural Processes** | | | |
| Analyze the effects of human activities on earth’s natural processes. | Analyzing and interpreting data  Constructing explanations and designing solutions  Using Mathematics & Computational Thinking |  | Cause and effect  Stability and change  Systems & System Models |
| Analyze the effects of human activities that deliberately or inadvertently alter the equilibrium of natural processes. | Analyzing and interpreting data  Constructing explanations and designing solutions  Using Mathematics & Computational Thinking |  | Cause and effect  Stability and change  Systems & System Models |
| **Topic B: Human Impact on Natural Resources** | | | |
| Analyze, from local to global levels, the relationship between human activities and the earth’s resources. | Analyzing and interpreting data  Constructing explanations and designing solutions  Using Mathematics & Computational Thinking |  | Patterns  Scale, proportion & quantity  Energy & matter: flows, cycles and conservation  Stability & change  Systems & System Models |

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| **Standard 6**  **Environment and Health**  **The student will use concepts from science, social studies and health to analyze and interpret both positive and negative impacts of natural events and human activities on human health.** | | | |
| **Topic A: Natural Changes and Human Health** | | | |
| Identify and describe natural changes in the environment that may affect the health of human populations and individuals. | Analyzing and interpreting data |  | Cause and effect  Stability and change |
| **Topic B: Human-Induced Changes and Human Health** | | | |
| Describe and explain that many changes in the environment designed by humans bring benefits to society as well as cause risks. | Obtaining, evaluating and communicating information |  | Cause and effect  Stability and change |
| **Topic C: Hazards and Risk Analysis** | | | |
| Analyze and explain that human activities, products, processes, technologies and inventions can involve some level of risk to human health. | Obtaining, evaluating and communicating information |  | Cause and effect  Stability and change |

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| **Standard 7**  **Environment & Society**  **The student will analyze how the interactions of heredity, experience, learning and culture influence social decisions and social change.** | | | |
| **Topic A: Environmental Quality** | | | |
| Investigate factors that influence environmental quality. | Analyzing and interpreting data |  | Cause and effect: Mechanisms and explanation |
| **Topic B:** **Individual and Group Actions and the Environment** | | | |
| Examine the influence of individual and group actions on the environment and explain how groups and individuals can work to promote and balance interests. | Obtaining, evaluating and communicating information |  | Cause and effect: Mechanisms and explanation |
| **Topic C: Cultural Perspectives and the Environment** | | | |
| Investigate cultural perspectives and dynamics and apply their understanding in context. | Obtaining, evaluating and communicating information |  | Scale, proportion and quantity |
| **Topic D: Political Systems and the Environment** | | | |
| Understand how different political systems account for, manage, and affect natural resources and environmental quality. | Analyzing and interpreting data  Obtaining, evaluating and communicating information |  | Systems and system models |
| **Topic E: Economics and Environment** | | | |
| Analyze and explain global economic and environmental connections. | Obtaining, evaluating and communicating information  Engaging in Argument from Evidence |  | Systems and system models  Connect to ETS-Influence of Science, Engineering & Technology and the Natural World |
| **Topic F:Technology and Environment** | | | |
| Investigate and examine the social and environmental impacts of various technologies and technological systems on the environment. | Analyzing and interpreting data  Planning & Carrying Out Investigations | HS-PS3-4. Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics). | Cause and effect: Mechanisms and explanation  Systems & System Models |
| Investigate a decision involving the implementation of a new technology and present an assessment of risks, costs and benefits, identification of those who suffer, those who pay, those who gain, what the risks are, and who bears them. | Obtaining, evaluating and communicating information |  | Cause and effect: Mechanisms and explanation |

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| **standard 8**  **SUSTAINABILITY**  **The student will make decisions that demonstrate understanding of natural communities and the ecological, economic, political, and social systems of human communities, and examine how their personal and collective actions affect the sustainability of these interrelated systems.** | | | |
| **Topic A: Intergenerational Responsibility** | | | |
| Understand and apply the basic concept of sustainability to natural and human communities. | Obtaining, evaluating and communicating information |  | Stability and change |
| **Topic B: Interconnectedness of Systems** | | | |
| Recognize the concept of sustainability as a dynamic condition characterized by the interdependency among ecological, economic, and social systems and how these interconnected systems affect individual and societal well-being. | Obtaining, evaluating and communicating information  Constructing explanations & Designing Solutions  Using Mathematics & Computational Thinking |  | Cause and effect: mechanisms and explanation Systems and system models  Stability and change |
| **Topic C: Influence of Economic Systems on Sustainability** | | | |
| Investigate and make decisions that demonstrate understanding of how the dynamics of economic systems affect the sustainability of ecological and social systems. | Obtaining, evaluating and communicating information |  | Systems and system models  Stability and change |
| **Topic D: Influence of Social and Cultural Systems on Sustainability** | | | |
| Investigate and make decisions that demonstrate understanding of how the dynamics of social and cultural systems affect the sustainability of ecological and economic systems. | Obtaining, evaluating and communicating information  Engaging in argument from evidence  Using Mathematics & Computational Thinking |  | Systems and system models  Stability and change  Structure and function |
| **Topic E: Limits of Ecological Systems** | | | |
| Investigate and make decisions that demonstrate understanding of how the dynamics of ecological systems affect the sustainability of social, cultural, and economic systems. | Obtaining, evaluating and communicating information  Engaging in argument from evidence  Constructing explanations and designing solutions  Using Mathematics & Computational Thinking |  | Systems and system models  Stability and change  Structure and function |
| **Topic F: Action Component** | | | |
| Apply knowledge and skills to investigate and implement personal and collective decisions and actions on an individual, local community, national, and global levels in order to achieve sustainability. | Planning and carrying out investigations  Constructing explanations and designing solutions |  | Systems and system models  Stability and change  Structure and function |