Readtopia®

# Essential Elements for Science

## Standards for High School

DON•JOHNSTON
Human Learning Tools

| HIGH SCHOOL SCIENCE STANDARDS | | ADDRESSED WITH READTOPIA |
|---|---|---|
| **PHYSICAL SCIENCE** | | |
| **Matter and Its Interactions** \| Structures and Properties of Matter | | |
| Initial Level | Recognize that a change has occurred during a chemical reaction. | ● |
| Precursor Level | Identify the changes that have occurred during a chemical reaction (e.g., metal-rust, paper-burn). | ● |
| Target Level | Make a claim supported by evidence to explain patterns of chemical properties that occur in a substance during a common chemical reaction (e.g., baking soda and vinegar). | ● |
| General Education | **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. | ◒ |
| **Motion and Stability: Forces and Motion** \| Forces and Motion | | |
| Initial Level | Identify safety equipment devices that minimize the force of a collision (e.g., floor mats, helmets, or steel-toed boots). | ● |
| Precursor Level | Use data to compare the effectiveness of safety devices to determine which best minimizes the force of a collision | ◒ |
| Target Level | Evaluate the effectiveness of safety devices and design a solution that could minimize the force of a collision. | ● |
| General Education | **HS-PS2-3** Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision. | ● |
| **Energy** \| Conservation of Energy and Energy Transfer | | |
| Initial Level | Compare relative difference in temperature (warmth, coldness) of two liquids. | ● |
| Precursor Level | Compare the temperatures of two liquids of different temperatures before and after combining. | |
| Target Level | Investigate and predict the temperatures of two liquids before and after combining to show uniform energy distribution. | |
| General Education | **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. | |

| HIGH SCHOOL SCIENCE STANDARDS | | ADDRESSED WITH READTOPIA |
|---|---|---|
| **PHYSICAL SCIENCE** | | |
| **Waves and Their Applications in Technologies for Information Transfer** \| Wave Properties | | |
| Initial Level | Identify how common technological devices are used for different purposes. | ● |
| Precursor Level | Identify common devices which use light or sound waves to transmit information. | ● |
| Target Level | Make a claim supported by evidence that shows how some devices use light and sound waves to transmit and capture information. | ● |
| General Education | **HS-PS4-5** Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy. | ● |
| **LIFE SCIENCE** | | |
| **From Molecules to Organisms: Structures and Processes** \| Structure and Function | | |
| Initial Level | Recognize that different organs have different functions. | |
| Precursor Level | Identify which organs work for a specific function. | |
| Target Level | Use a model to illustrate the organization and interaction of major organs into systems (e.g., circulatory, respiratory, digestive, sensory) in the body to provide specific functions. | |
| General Education | **HS-LS1-2** Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. | |
| **From Molecules to Organisms: Structures and Processes** \| Growth and Development of Organisms | | |
| Initial Level | Recognize that organisms are composed of cells. | |
| Precursor Level | Use a model to relate the number of cells to the size of a body. | |
| Target Level | Use a model to illustrate how growth occurs when cells multiply. | |
| General Education | **HS-LS1-4** Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms. | |

| HIGH SCHOOL SCIENCE STANDARDS | | ADDRESSED WITH READTOPIA |
|---|---|---|
| **LIFE SCIENCE** | | |
| **Ecosystems: Interactions, Energy, and Dynamics** \| Interdependent Relationships in Ecosystems | | |
| Initial Level | Identify food and shelter needs for familiar wildlife. | ● |
| Precursor Level | Recognize the relationship between population size and available resources for food and shelter from a graphical representation. | ● |
| Target Level | Use a graphical representation to explain the dependence of an animal population on other organisms for food and their environment for shelter. | ● |
| General Education | **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. | |
| **Heredity: Inheritance and Variation of Traits** \| Variation of Traits | | |
| Initial Level | Compare traits of parents and offspring. | ● |
| Precursor Level | Make a claim supported by evidence that parents and offspring may have different traits. | ● |
| Target Level | Defend why reproduction may or may not result in offspring with different traits. | ◒ |
| General Education | **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. | |
| **Biological Evolution: Unity and Diversity** \| Adaptation | | |
| Initial Level | Match particular species to their various environments. | ● |
| Precursor Level | Identify factors in an environment that require special traits to survive. | ● |
| Target Level | Explain how the traits of particular species allow them to survive in their specific environments. | ● |
| General Education | **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. | |

● = Aligned with Standard

◒ = Partially Meets Standard (and/or can be met with additional teacher input)

| HIGH SCHOOL SCIENCE STANDARDS | | ADDRESSED WITH READTOPIA |
|---|---|---|
| **EARTH AND SPACE SCIENCE** | | |
| **Earth's Place in the Universe** \| Earth and the Solar System | | |
| Initial Level | Identify characteristics of the seasons. | |
| Precursor Level | Use a model of Earth and Sun to show how Earth's position in its orbit around the Sun correspond with the four seasons. | |
| Target Level | Use a model of Earth and the Sun to show how Earth's tilt and orbit around the Sun cause changes in seasons. | |
| General Education | **HS-ESS1-4** Use mathematical or computational representations to predict the motion of orbiting objects in the solar system. | |
| **Earth's Systems** \| Earth's Materials and Systems | | |
| Initial Level | Recognize changes (e.g., mountain formation, erosion, and glacial changes) that occurred on Earth's surface. | ● |
| Precursor Level | Recognize if processes that change Earth's surface are constructive or destructive. | ● |
| Target Level | Use a model to show how constructive forces (e.g., volcanoes) and destructive mechanisms (e.g., weathering, coastal erosion) change Earth's surface. | ● |
| General Education | **HS-ESS2-1** Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features. | |
| **Earth's Systems** \| Weather and Climate | | |
| Initial Level | Recognize the differences between geographical climates (e.g., Minnesota versus Florida, desert versus rainforest). | |
| Precursor Level | Recognize climate changes have occurred (e.g., a change in average temperature, precipitation patterns, glacial ice volumes, sea levels). | |
| Target Level | Recognize the differences between geographical climates (e.g., Minnesota versus Florida, desert versus rainforest). | |
| General Education | **HS-ESS2-4** Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate. | |

| HIGH SCHOOL SCIENCE STANDARDS | | ADDRESSED WITH READTOPIA |
|---|---|---|
| **EARTH AND SPACE SCIENCE** | | |
| **Earth and Human Activity** \| Natural Resources | | |
| Initial Level | Recognize characteristics of natural hazards (e.g., floods, earthquakes, tornadoes). | ● |
| Precursor Level | Recognize how natural hazards (e.g., floods, earthquakes, tornadoes) influence human activity. | ● |
| Target Level | Construct an explanation based on evidence for how natural hazards have influenced human activity. | ● |
| General Education | **HS-ESS3-1** Construct an explanation based on evidence on how the availability of natural resources, hazards, and climate have influenced human activity. | ◒ |
| **Earth and Human Activity** \| Natural Resources | | |
| Initial Level | Recognize strategies to manage objects (e.g., dispose, repurpose, or recycle). | ● |
| Precursor Level | Describe the factors that would favor one strategy to conserve, recycle, or reuse resources over another | ● |
| Target Level | Construct an argument for a strategy to conserve, recycle, or reuse resources. | ● |
| General Education | **HS-ESS3-2** Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios. | |
| **Earth and Human Activity** \| Human Impacts on Earth Systems | | |
| Initial Level | Gather data on the effects of a local (e.g., class or school-wide) conservation strategy. | ● |
| Precursor Level | Organize data on the effects of conservation strategies (e.g., using less energy, using rechargeable batteries, recycling or repurposing materials). | ● |
| Target Level | Analyze data to determine the effects of a conservation strategy on the level of a natural resource. | ● |
| General Education | **HS-ESS3-3** Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity. | ◒ |

● = Aligned with Standard

◒ = Partially Meets Standard (and/or can be met with additional teacher input)

| HIGH SCHOOL BIOLOGY STANDARDS | | ADDRESSED WITH READTOPIA |
|---|---|---|
| **LIFE** | | |
| **From Molecules to Organisms: Structures and Processes** \| Structure and Function | | |
| Initial Level | Identify major organs of the body. | |
| Precursor Level | Indicate the function of major organs of the body. | |
| Target Level | Explain how different organs of the body carry out essential functions of life. | |
| General Education | **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. | |
| **From Molecules to Organisms** \| Structure and Function | | |
| Initial Level | Identify changes in the data display (e.g. objects, pictures, graphs, charts, etc.). | |
| Precursor Level | Compare the before and after data on changes that occur to an organism. | |
| Target Level | Collect data from an investigation to show how different organisms react to changes (e.g., heart rate increases with exercise, pupils react to light). | |
| General Education | **HS-LS1-3** Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. | |
| **Ecosystems: Interactions, Energy, and Dynamics** \| Interdependent Relationships in Ecosystems | | |
| Initial Level | Recognize that there was a change in the population size. | ● |
| Precursor Level | Use a graphical representation to show changes in population size. | ● |
| Target Level | Use a graphical representation to explain changes over time in the population size of an animal species (e.g., currently on the endangered list). | ● |
| General Education | **HS-LS2-1** Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales. | |

| HIGH SCHOOL BIOLOGY STANDARDS | | ADDRESSED WITH READTOPIA |
|---|---|---|
| **BIOLOGY** | | |
| **From Molecules to Organisms: Structures and Processes** \| Adaptation | | |
| Initial Level | Recognize that some organisms survive better in certain environments. | ● |
| Precursor Level | Using data sets, identify organisms that would survive better in certain environments. | ◒ |
| Target Level | Interpret data sets to identify an advantageous heritable trait. | ◒ |
| General Education | **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. | |
| **Biological Evolution: Unity and Diversity** \| Adaptation | | |
| Initial Level | Identify a human activity that has an effect on a species. | ● |
| Precursor Level | Using a mathematical model, determine which human actions help or harm a species. | ● |
| Target Level | Evaluate a strategy to protect a species. | ● |
| General Education | **HS-LS4-6** Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity. | ◒ |