# SCIENCE

GRADUATION PROFICIENCIES AND SUPPORTING STANDARDS

## GRADUATION PROFICIENCY

**GRADUATION PROFICIENCY #1**:

### PHYSICAL SCIENCE: Matter and its Interactions

Students will understand the structure and properties of matter and reactions.

K - 6 Supporting Standards

7 - 8 Supporting Standards

9 - 12 Supporting Standards

**GRADUATION PROFICIENCY #2:**

### PHYSICAL SCIENCE: Forces and Energy

Students will understand and explain how the interactions among objects can be described and represented by the motion, forces, and energy of the objects.

K - 6 Supporting Standards
7 - 8 Supporting Standards
9 - 12 SupportingStandards

**GRADUATION PROFICIENCY #3:**

### LIFE SCIENCE: Organism's Structure, Function, and Information Processing

Students will understand how organisms live, grow, respond to their environment, and reproduce.

K - 6 Supporting Standards

7 - 8 Supporting Standards

9 - 12 Supporting Standards

**GRADUATION PROFICIENCY #4:**

### LIFE SCIENCE: Matter and Energy in Ecosystems

Students will understand the characteristics and functions of organisms and the physical and behavioral interactions between matter and organisms within an ecosystem.

K - 6 Supporting Standards

7 - 8 Supporting Standards

9 - 12 Supporting Standards

**GRADUATION PROFICIENCY #5:**

### LIFE SCIENCE: Heredity, Natural Selection and Biodiversity of Organisms

Students will understand genetics, variation of traits, adaptation, natural selection, and biodiversity.

K - 6 Supporting Standards

6 - 8 Supporting Standards

9 - 12 Supporting Standards

**GRADUATION PROFICIENCY #6:**

### EARTH AND SPACE SCIENCE: Earth's Origin, Systems, and Human Impact

Students will understand Earth's origin and how Earth's surface processes and human activities affect each other.

K - 6 Supporting Standards

7 - 8 Supporting Standards

9 - 12 Supporting Standards

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**GRADUATION PROFICIENCY #7:**

## Engineering, Technology, and Application of Science

ML and HS students will apply scientific thinking to collect, construct, and evaluate information, ideas, and solutions.

| COURSE STANDARD |
| --- |
| **Design and Conduct an experiment:** I can design and conduct a controlled scientific experiment. |
| **Use Scientific Equipment:** I can use scientific equipment to collect information. |
| **Use Evidence in a Scientific Explanation:** I can use evidence to construct and revise a scientific explanation. |
| **Analyze a Major Global Challenge:** I can analyze a major global challenge and its impact on the natural world. |
| **Design a Solution to a Complex Real World Problem:** I can use the engineering process to design, refine, and evaluate a solution to a complex real world problem. |
| **Evaluate an Application of Science:** I can use knowledge of natural systems to evaluate the intended, potential, and observed impacts of scientific ideas, inventions, and other innovations. |

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## 1 PHYSICAL SCIENCE: Matter and its Interactions

Students will understand the structure and properties of matter and reactions.

## #1 SUPPORTING STANDARDS K - 6

Students will…

| | K | 1 (Sight and Sound) | 2 (Properties of Matter) | 3 | 4 | 5 (Structure of Matter) | 6 (Light and Matter) |
|---|---|---|---|---|---|---|---|
| A | | Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate. | Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties. | | | Develop a model to describe that matter is made of particles too small to be seen. | Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials. (PS4-2)<br>● Light waves are reflected, absorbed, or transmitted through the object, depending on the object's material.<br>● Light waves travel in a straight line, except at the surfaces between different transparent materials. |

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| | | | | | | | |
|---|---|---|---|---|---|---|---|
| B | | Plan and conduct an investigation to determine the effect of placing objects made with different materials in the path of a beam of light. | Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose. | | | Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling or mixing substances, the total weight of matter is conserved. | Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals. (PS4-3) |
| C | | Make observations to construct an evidence-based account that objects can be seen only when illuminated. | Construct and argument with evidence that some changes caused by heating and cooling can be reversed and some cannot. | | | Conduct an investigation to determine whether the mixing of two or more substances results in new substances. | |

## #1 PHYSICAL SCIENCE: Matter and its Interactions

Students will understand the structure and properties of matter and reactions.

## #1 SUPPORTING STANDARDS 7 - 8

Students will…

| | 7<br>(Chemical Reactions, Matter, and Energy) | 8<br>(Contact Forces) |
|---|---|---|
| A | Develop models to describe the atomic composition of simple molecules and extended structures. (PS1-1) | ** Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects. (PS2-1) |
| B | Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred. (PS1-2) | Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object. (PS2-2) |

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| | | |
|---|---|---|
| C | Gather and make sense of information to describe that synthetic materials come from natural resources and impact society. (PS1-3) | Ask questions about data to determine the factors that affect the strength of electric and magnetic forces. (PS2-3) |
| D | Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved. (PS1-5) | Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects. (PS2-4) |
| E | ** Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes. (PS1-6) | Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object. (PS3-1) |
| F | | Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system. PS3-2) |

## #1 PHYSICAL SCIENCE: Matter and its Interactions

Students will understand the structure and properties of matter and reactions.

## #1 SUPPORTING STANDARDS 9 - 12

Students will…

| | Disciplinary Core Idea | Course(s) |
|---|---|---|
| A | Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms. (PS1-1) | Chemistry |
| B | 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. (PS1-2) | Chemistry |
| C | 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. (PS1-5) | Chemistry |
| D | ** Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium. (PS1-6) | Chemistry |
| E | Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction. (PS1-7) | Chemistry |

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| | Disciplinary Core Idea | Course(s) |
|---|---|---|
| F | 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 (PS1-8) | Chemistry |
| G | Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials. (PS2-6) | Chemistry |
| H | 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). (PS3-4) | Chemistry, Earth Science |

## #2 PHYSICAL SCIENCE: Forces and Energy

Students will understand and explain how the interactions among objects can be described and represented by the motion, forces, and energy of the objects.

## #2 Supporting Standards K - 6

Students will…

| | K (Pushes and Pulls) | 1 | 2 | 3 (Forces and Interactions) | 4 (Energy) | 5 | 6 (Thermal Energy) |
|---|---|---|---|---|---|---|---|
| A | Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object. | | | Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object. | Use evidence to construct an explanation relating the speed of an object to the energy of that object. | | Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed. (PS1-4) |

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| | | | | | | | |
|---|---|---|---|---|---|---|---|
| B | ** Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull. | | | Make observations and/ or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion. | Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.* | | ** Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.* (PS3-3) |
| | | | | Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other. | Obtain information to describe that energy and fuels are derived from natural resources and that their uses affect the environment. | | Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample. (PS3-4) |
| | | | | ** Define a simple design problem that can be solved by applying scientific ideas about magnets | Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents. | | Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object. (PS3-5) |
| | | | | | Develop a model that demonstrates waves can cause objects to move. | | |

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## #2 PHYSICAL SCIENCE: Forces and Energy

Students will understand and explain how the interactions among objects can be described and represented by the motion, forces, and energy of the objects.

## #2 Supporting Standards 7 - 8

Students will…

| | 7 | 8<br>(Sound Waves) |
|---|---|---|
| A | | Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave. (PS4-1) |
| B | | Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials. (PS4-2)<br>• Sound waves need a medium through which it is transmitted but that light can travel through space.<br>• Different colors of light can be combined and separated, and different colors of light bend at different amounts (refract) as that light enters of exists different media. |

## #2 PHYSICAL SCIENCE: Forces and Energy

Students will understand and explain how the interactions among objects can be described and represented by the motion, forces, and energy of the objects.

## #2 Supporting Standards 9 - 12

Students will…

| | Disciplinary Core Idea | Course(s) |
|---|---|---|
| A | Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration. (PS2-1) | Physics |
| B | ** Apply science and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision. (PS2-3) | Physics |

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| | Disciplinary Core Idea | Course(s) |
|---|---|---|
| C | Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects. (PS2-4) | Chemistry, Physics |
| D | Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current. (PS2-5) | Physics |
| E | 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. (PS3-1) | Chemistry, Earth Science, Physics |
| F | Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motion of particles (objects) and energy associated with the relative positions of particles (objects). (PS3-2) | Chemistry, Physics |
| G | Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction. (PS3-5) | Chemistry, Physics |
| H | Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media. (PS4-1) | Physics |
| I | Evaluate questions about the advantages of using digital transmission and storage of information. (PS4-2) | Physics |
| J | Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other. (PS4-3) | Physics |
| K | ** 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. (PS4-4) | Physics |

## #3 LIFE SCIENCE: Structure, Function, and Information Processing

Students will understand how organisms live, grow, respond to their environment, and reproduce using molecular, structural, and chemical biology.

## #3 SUPPORTING STANDARDS K - 6

Students will...

| | K | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|

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| | | (Survival Needs) | | (Life Cycles and Traits) | (Structures and Senses) | | (Cells and Systems) |
|---|---|---|---|---|---|---|---|
| A | | ** Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs. | | Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death. | Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. | | Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells. (LS1-1) |
| B | | | | | Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways. | | Develop and use a model to describe the function of a cell as a whole and ways the parts of cells contribute to the function. (LS1-2) |
| | | | | | | | Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. LS1-3) |
| | | | | | | | Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories. (LS1-8) |

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## #3 LIFE SCIENCE: Structure, Function, and Information Processing

Students will understand how organisms live, grow, respond to their environment, and reproduce using molecular, structural, and chemical biology.

## #3 SUPPORTING STANDARDS 7 - 8

Students will...

| | 7<br>(Matter Cycling and Photosynthesis)<br>(Metabolic Reactions) | 8<br>(Genetics) |
|---|---|---|
| A | Develop and use a model to describe the function of a cell as a whole and ways the parts of cells contribute to the function. (LS1-2) | Develop and use a model to describe the function of a cell as a whole and ways the parts of cells contribute to the function. (LS1-2) |
| B | Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. LS1-3) | Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively. (LS1-4) |
| C | Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms. (LS1 - 5) | Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms. (LS1 - 5) |
| D | Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms. (LS1-6) | |

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## #3 LIFE SCIENCE: Structure, Function, and Information Processing

Students will understand how organisms live, grow, respond to their environment, and reproduce using molecular, structural, and chemical biology.

## #3 SUPPORTING STANDARDS 9 - 12

Students will…

| | Disciplinary Core Idea | Course(s) |
|---|---|---|
| A | 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. (LS1-1) | Biology, AP Bio |
| B | Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. (LS1-2) | AP Biology, A&P |
| C | Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. (LS1-3) | Biology, AP Bio, A&P |
| D | Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms. (LS1-4) | Biology, AP Bio |
| E | Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy. (LS1-5) | Biology, AP Bio, Environmental Studies |
| F | 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. (LS1-6) | Biology, Chemistry, Environmental Studies |
| G | 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. (LS1-7) | Biology, A&P, Environmental Studies |

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## #4 LIFE SCIENCE: Matter and Energy in Organisms and Ecosystems

Students will understand the characteristics and functions of organisms and the physical and behavioral interactions between matter and organisms within an ecosystem.

## #4 SUPPORTING STANDARDS K - 6

Students will...

| | K (Animals, Plants, and Their Environment) | 1 | 2 (Interdependence in Ecosystems) | 3 (Environmental Impacts on Organisms) | 4 | 5 (Matter and Energy in Organisms and Ecosystems) | 6 |
|---|---|---|---|---|---|---|---|
| A | Use observations to describe patterns of what plants and animals (including humans) need to survive. | | Plan and conduct an investigation to determine if plants need sunlight and water to grow. | Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all. | | Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun. | |
| B | | | ** Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants. | ** Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change. | | Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment. | |

## #4 LIFE SCIENCE: Matter and Energy in Organisms and Ecosystems

Students will understand the characteristics and functions of organisms and the physical and behavioral interactions between matter and organisms within an ecosystem.

## #4 SUPPORTING STANDARDS 7 - 8

Students will...

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| | 7<br>(Matter Cycling and Photosynthesis)<br>(Metabolic Reactions) | 8 |
|---|---|---|
| A | Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. (LS2-1) | |
| B | Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems. (LS2-2) | |
| C | Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. (LS2-3) | |

## #4 LIFE SCIENCE: Matter and Energy in Organisms and Ecosystems

Students will understand the characteristics and functions of organisms and the physical and behavioral interactions between matter and organisms within an ecosystem.

## #4 SUPPORTING STANDARDS 9 - 12

Students will...

| | Disciplinary Core Idea Performance Expectation | Course(s) |
|---|---|---|
| A | Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales. (LS2-1) | Biology, Environmental Studies |
| B | Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem. (LS2-4) | Biology, Environmental Studies |
| C | Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere. (LS2-5) | Biology, Environmental Studies, Earth Science |
| D | 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. (LS2-6) | Biology, Science and Society, Environmental Studies |

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| | Disciplinary Core Idea Performance Expectation | Course(s) |
|---|---|---|
| E | ** Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity. (LS2-7) | Biology, Environmental Studies |
| F | Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce. (LS2-8) | Biology, Environmental Studies |

## #5 LIFE SCIENCE: Heredity, Natural Selection, and Biodiversity of Organisms

Students will understand the processes and influences on individual organisms, populations, and communities on the survival and diversity of organisms.

## #5 SUPPORTING STANDARDS K - 6

Students will...

| | K | 1 | 2 (Interdependence in Ecosystems) | 3 (Life Cycles and Traits) | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| A | | | Make observations of plants and animals to compare the diversity of life in different habitats. | Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms. | | | |
| B | | | | Use evidence to support the explanation that traits can be influenced by the environment. | | | |

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## #5 LIFE SCIENCE: Heredity, Natural Selection, and Biodiversity of Organisms

Students will understand the processes and influences on individual organisms, populations, and communities on the survival and diversity of organisms.

## #5 SUPPORTING STANDARDS 7 - 8

Students will...

| | 7<br>(Ecosystem Dynamics & Biodiversity) | 8<br>(Genetics)<br>(Natural Selection and Common Ancestry) |
|---|---|---|
| A | Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. (LS2-4) | Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism. (LS3-1) |
| B | ** Evaluate competing design solutions for maintaining biodiversity and ecosystem services. (LS2-5) | Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation. (LS3-2) |
| C | | Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships. (LS4-2) |
| D | | Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment. (LS4-4) |
| E | | Gather and synthesize information about technologies that have changed the way humans influence the inheritance of desired traits in organisms. (LS4-5) |

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## #5 LIFE SCIENCE: Heredity, Natural Selection, and Biodiversity of Organisms

Students will understand the processes and influences on individual organisms, populations, and communities on the survival and diversity of organisms.

## #5 SUPPORTING STANDARDS 9 - 12

Students will...

| | Disciplinary Core Idea | Course(s) |
|---|---|---|
| A | 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. (LS3-2) | Biology |
| B | Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population. (LS3-3) | Biology, Environmental Studies |
| C | 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. (LS4-2) | Biology |
| D | 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. (LS4-3) | Biology, Environmental Studies |
| E | Construct an explanation based on evidence for how natural selection leads to the adaptation of populations. (LS4-4) | Biology |
| F | 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. (LS4-5) | Biology |
| G | ** Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity. (LS4-6) | Biology, Environmental Studies |

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## #6 EARTH AND SPACE SCIENCE: Earth's Origin, Systems, and Human Impact

Students will understand Earth's origin and how Earth's surface processes and human activities affect each other.

## #6 SUPPORTING STANDARDS K - 6

Students will...

| | K (Weather and Climate) | 1 (Patterns and Cycles) | 2 (Wind and Water) | 3 (Weather Patterns) | 4 (Processes that Shape the Earth) | 5 (Earth's Systems) | 6 (Rock Cycling and Plate Tectonics) (Natural Hazards) |
|---|---|---|---|---|---|---|---|
| A | Use and share observations of local weather conditions to describe patterns over time. | Use observations of the sun, moon, and stars to describe patterns that can be predicted. | Use information from several sources to provide evidence that Earth events can occur quickly or slowly. | Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season. | Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time. | Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment. | Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process. (ESS2-1) |
| B | Ask questions about the purpose of weather forecasting to prepare for and respond to severe weather. | Make observations at different times of year to relate the amount of daylight to the time of year. | ** Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land. | ** Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard. | ** Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans. | Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. | Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales. (ESS2-2) |

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| | K (Weather and Climate) | 1 (Patterns and Cycles) | 2 (Wind and Water) | 3 (Weather Patterns) | 4 (Processes that Shape the Earth) | 5 (Earth's Systems) | 6 (Rock Cycling and Plate Tectonics) (Natural Hazards) |
|---|---|---|---|---|---|---|---|
| C | Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live. | | Develop a model to represent the shapes and kinds of land and bodies of water in an area. | | I can make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation. | Support an argument that the gravitational force exerted by Earth on objects is directed down. | Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity. (ESS2-4) |
| D | Make observations to determine the effect of sunlight on Earth's surface. | | | | | Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky. | Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates. (ESS2-6) |
| E | | | | | | | Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects. (ESS3-2) |

## #6 EARTH AND SPACE SCIENCE: Earth's Origin, Systems and Human Impact

Students will understand Earth's origin and how Earth's surface processes and human activities affect each other.

Last Modified Spring 2023
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# SCIENCE

GRADUATION PROFICIENCIES AND SUPPORTING STANDARDS

Supervisory Union & School District
LAMOILLE NORTH
Equity, Access, and Opportunity

## #6 SUPPORTING STANDARDS 7 - 8

Students will...

| | 7<br>(Natural Resources and Human Impact) | 8<br>(Earth in Space) |
|---|---|---|
| A | Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes. (ESS3-1) | Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons. (ESS1-1) |
| B | ** Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment. (ESS3-3) | Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system. (ESS1-2) |
| C | Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems. (ESS3-4) | Analyze and interpret data to determine scale properties of objects in the solar system. (ESS1-3) |
| D | Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century. (ESS3-5) | |

## #6 EARTH AND SPACE SCIENCE: Earth's Origin, Systems and Human Impact

Students will understand Earth's origin and how Earth's surface processes and human activities affect each other.

## #6 SUPPORTING STANDARDS 9 - 12

| | Disciplinary Core Idea | Course(s) |
|---|---|---|
| A | Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems. (ESS2-2) | Chemistry, Earth Science |
| B | Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes. (ESS2-5) | Chemistry, Earth Science |

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| | Disciplinary Core Idea | Course(s) |
|---|---|---|
| C | Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere. (ESS2-6) | Biology, Environmental Studies, Earth Science |
| D | Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth. (ESS2-7) | Biology, Earth Science |
| E | ** Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefits ratios. (ESS3-2) | Chemistry, Environmental Studies, Earth Science, Physics |
| F | Create a computational simulation to illustrate the relationships among the management of natural resources, the sustainability of human populations, and biodiversity. (ESS3-3) | Environmental Studies, Earth Science |
| G | ** Evaluate or refine a technological solution that reduces the impacts of human activities on natural systems. (ESS3-4) | Chemistry, Environmental Studies, Earth Science, Physics |
| H | Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity. (ESS3-6) | Environmental Studies, Earth Science |
| I | Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe. (ESS1-2) | Earth Science, Physics |
| J | Use mathematical or computational representations to predict the motion of orbiting objects in the solar system. (ESS1-4) | Earth Science, Physics |
| K | Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks. (ESS1-5) | Earth Science, |
| L | Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history. (ESS1-6) | Earth Science, Physics |