HAWAIʻI ALTERNATE ASSESSMENT FOR SCIENCE – NEXT GENERATION SCIENCE STANDARDS (NGSS)

PERFORMANCE LEVEL DESCRIPTORS

REVISED SEPTEMBER 2, 2022

Introduction

Hawaiʻi Board of Education Adoption of NGSS

The Next Generation Science Standards **(NGSS**) were adopted by the Hawaiʻi Board of Education in February 2016 to be fully implemented by school year (SY) 2019-2020. As a result, beginning in SY 2019-2020 the HSA-Alt Science assessments are based upon the NGSS and no longer aligned with the Hawaiʻi Content and Performance Standards III for Science. These assessments are referred to as the HSA-Alt Science (NGSS) tests. They are administered in grades 5, 8, and 11. The tests will assess students' understanding of the NGSS elementary, middle school, and high school life science performance expectations (**PE**s) respectively.

Nature of NGSS

The NGSS PEs integrate three dimensions of learning: science disciplinary core ideas (the fundamental scientific knowledge, for example, life sciences) (**DCI**s); science and engineering practices (**SEP**s) (how science is conducted in the real world, such as through planning and carrying out investigations); and crosscutting concepts (**CCC**s) (science ideas, like *cause and effect*, that cut across all the sciences). An example PE from elementary science would be: "Make observations and measurements to identify materials based on their properties." It should be noted that one or more SEPs and CCCs is interwoven in each PE.

Practices of Science and Engineering
Asking Questions and Defining Problems
Planning and Carrying Out Investigations
Analyzing and Interpreting Data
Developing and Using Models
Constructing Explanations and Designing Solutions
Engaging in Argument from Evidence
Using Mathematics and Computational Thinking
Obtaining, Evaluating, and Communicating Information

Crosscutting Concepts
Patterns
Cause and Effect: Mechanism and Explanation
Scale, Proportion, & Quantity
Systems & System Models
Energy & Matter: Flows, Cycles, & Conservation
Structure & Function
Stability & Change

The Science and Engineering Practices and the development progression of these skills across grades are further explained in Appendix F of the NGSS Standards. Similarly, the Crosscutting Concepts are further explained in Appendix G.

The HSA-Alternate Assessment, Essence Statements, and PLDs

The HSA Alt assessments are intended for the students with significant cognitive disabilities (generally the most challenged 1% of students). The assessments are linked to the corresponding NGSS PEs but have been appropriately reduced in depth, breadth, and complexity so that the target population has access to the test content. The Essence Statements and Performance Level Descriptors (**PLD**s) are not written in "student friendly" language and the scientific terms do not necessarily reflect vocabulary students are expected to know. Student vocabulary expectations are clarified in the Item Specifications.

This document presents each of the NGSS PEs, an associated Essence Statement (the core idea within that PE as reduced in depth and complexity), and PLDs–a progression of levels of understanding of that "essence" for the purposes of the HSA-Alt assessments—Well Below, Approaches, Meets, and Exceeds. Each level includes the understandings at levels for that PE and

adds depth and/or complexity as student progress from Well Below to Exceeds. In the case of a number of PEs, the most basic level of understanding (Well Below) is very similar, so the "Well Below PLDs" for a number of PEs are also very similar. For example: 3-LS3-1 (Many of the traits of organisms are similar to those of their parents) and MS-LS4-4 (Natural selection is a process whereby beneficial traits result in a higher survival rate and lead to adaptations) both have "identify a trait" as the Well Below PLD. The NGSS PE is presented as a point of reference and to provide insights into the expected knowledge, understanding, and skills incorporated in the PE. PLDs at the Well Below and Approaches levels, and therefore items at those levels, incorporate aspects of the Essence Statement but do not show full understanding. PLDs at the Meets or Exceeds level indicate an understanding of the Essence Statement and typically incorporate use of a SEP or recognition of an associated CCC in a given context. Additional information follows.

Essence Statement: The Essence Statement describes a NGSS PE distilled down to a level appropriate for the students participating in the Alternate Assessment. In some instances this distillation of the PE into an Essence Statement was not possible or there was extensive overlap with another PE. In those cases, the PE was not included in the assessment.

PLDs describe the knowledge and skills expected of students related to each Essence Statement at four levels of understanding.

Exceeds: A student who exceeds demonstrates a level of understanding that includes the ability to "bring together" the DCI and/or SEP and/or CCC associated with a PE.

Meets: A student who meets demonstrates an understanding of the DCI and/or SEP and/or CCC within a PE at the level described in the Essence Statement.

Approaches: A student who approaches demonstrates some understanding of the content of the PE, but that understanding is incomplete and does not yet meet the expectations found in the Essence Statement. This student's understanding is partial but emerging.

Well Below: A student who is well below demonstrates a very preliminary level of understanding. This student's understanding is incomplete and may be limited to precursor knowledge and skills* related to the PE. He or she has difficulty meeting the expectations of a student who is at the approaches level.

Note: Performance Expectations (PEs) with Essence Statements and Performance Level Descriptors fields are in gray will not be assessed.

***The HSA-Alt Science Test is computer adaptive and there are test items in the bank to address some of the precursor knowledge and skills.

Selected HSA-Alt Range Performance Level Descriptors include a new symbol, Ⓦ, which denotes standards that may be associated with the workplace, and, therefore, address needs identified in the Workforce Innovation and Opportunity Act (WIOA). The Workforce Innovation and Opportunity Act (WIOA) seeks to increase the employment, career advancement, and economic self-sufficiency of people with disabilities through collaborative federal, state, and local partnerships. The Workforce Innovation and Opportunity Act Appendix lists the identified performance expectations and the associated essence statements, and "Meets" Performance Level Descriptors, as well as the associated skills that students would demonstrate when engaged in postsecondary education and competitive integrated employment.

HSA Alternate Science—Elementary						
Next Generation Science Standards		Essence Statements	Performance-Level Descriptors			
PE	SEP / DCI / CCC		Well Below	Approaches	Meets	Exceeds
Physical Science: PS 1 Matter and Interactions ❖A. Structure and Properties of Matter ❖ B. Chemical Reactions ❖C. Nuclear Processes						
5-PS1-1 Develop a model to describe that matter is made of particles too small to be seen.	**SEP: Developing and Using Models** Use models to describe phenomena. **DCI: Structure and Properties of Matter** Matter of any type can be subdivided into particles that are too small to see, but even then, the matter still exists and can be detected by other means. A model showing that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon and the effects of air on larger particles or objects. **CCC: Scale, Proportion, and Quantity** Natural objects exist from the very small to the immensely large.	Identify that matter can appear as a solid, liquid, or gas and that matter, can be broken down into particles that are too small to see but still exist.	Recognize examples of matter including solids, liquids, and gases.	Identify that if a pure substance[1] is broken up into small pieces, each piece is still a piece of that substance.	Demonstrate an understanding that when a substance is dissolved, the pieces are still present but are too small to see.[2]	Identify models that show matter is present even though it is too small to be seen.[3]
			1. For example: a cube of sugar, pieces of salt 2. For example: Sugar dissolved in water is still present, so the water is sweet. 3. For example: trapping gas in a balloon, tissue moving when you blow on it, evaporation of liquids			
5-PS1-2 Measure and graph quantities to provide evidence that regardless of the type of change that occurs when melting, cooling, or mixing substances, the total weight of matter is conserved.	**SEP: Using Mathematics and Computational Thinking** Measure and graph quantities such as weight to address scientific and engineering questions and problems. **DCI: Structure and Properties of Matter** The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish. **DCI: Chemical Reactions** No matter what reaction or change in properties occurs, the total weight of the substances does not change. **CCC: Scale, Proportion, and Quantity** Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume.	Identify that all matter has weight[1] and that total weight stays the same when materials change by melting, cooling, mixing, or reacting to form new materials.	Recognize that matter (solids or liquids) has weight.	Identify that matter (solids or liquids) has the same weight after a change,[2] showing that matter is conserved.	Identify weight data that show that the total weight of matter before and after heating,[3] cooling, or mixing materials stays the same.	Identify that weight is conserved by determining a missing piece of data when a change occurs (given all the weights except one).
			1. NGSS does not distinguish between mass and weight at this grade level. Weight will be used in items instead of mass. 2. For example: whole apple vs. cut-up pieces of the apple 3. Do not include the boiling of liquids where mass is lost in the form of water vapor.			

HSA Alternate Science—Elementary						
Next Generation Science Standards		**Essence Statements**	**Performance-Level Descriptors**			
PE	**SEP / DCI / CCC**		**Well Below**	**Approaches**	**Meets**	**Exceeds**
5-PS1-3 Make observations and measurements to identify materials based on their properties.	**SEP: Planning and Carrying Out Investigations** Make observations and measurements to produce data as the basis for an explanation of a phenomenon. **DCI: Structure and Properties of Matter** Measurements of a variety of properties can be used to identify materials. **CCC: Scale, Proportion, and Quantity** Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume	Identify properties of substances and differentiate between various materials based on their properties[1] using observations or data.	Recognize a property of a substance.	Identify which substances possess a specified property.	Differentiate substances that have different physical/chemical properties.	Use data from observations to identify a substance based on its properties.
			1. Properties include: color, hardness, texture, luster, melting point, boiling point, response to magnetic forces, conductivity, and solubility.			
5-PS1-4 Conduct an investigation to determine whether the mixing of two or more substances results in new substances.	**SEP: Planning and Carrying Out Investigations** Conduct an investigation in which variables are controlled to produce data, which serve as the evidence. **DCI: Chemical Reactions** When two or more different substances are mixed, a new substance with different properties may be formed. **CCC: Cause and Effect** Cause and effect relationships are routinely identified and used to explain change.	Identify properties of substances that will be mixed and use data or observations to determine whether the mixing of two substances results in a chemical change.[1]	Recognize one or more properties of a substance.	Identify the properties of two substances that are to be mixed.	Use data from observations to determine whether the mixing of two or more substances results in a chemical change.[1]	Use data from observations to identify whether the substance formed by mixing two substances has the same properties as either of the substances that were mixed or different properties.
			1. Signs of a chemical change include: color change, production of a different smell, change of temperature, formation of a gas (bubbles), and/or formation of a solid.			

HSA Alternate Science—Elementary						
Next Generation Science Standards		Essence Statements	Performance-Level Descriptors			
PE	SEP / DCI / CCC		Well Below	Approaches	Meets	Exceeds
Physical Science: PS 2 Motion and Stability: Forces and Interactions ❖A. Forces and Motion ❖B. Types of Interactions ❖C. Stability and Instability in Physical Systems						
3-PS2-1 Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.	**SEP: Planning and Carrying Out Investigations** Plan and conduct an investigation in which variables are controlled to produce data, which serve as the evidence. **DCI: Forces and Motion** Each force acts on one particular object and has both strength and a direction. **DCI: Types of Interactions** Objects in contact exert forces on each other. **CCC: Cause and Effect** Cause and effect relationships are routinely identified.	Identify a force as a push or pull that can cause an object's motion to change and predict how an object's motion would change if a given force is applied.	Recognize that an object may move if a given force is applied.	Identify a force as being a push or a pull.	Identify unbalanced forces as the cause of a change in an object's motion.	Predict how an object's motion would change if the forces acting on it change.
3-PS2-2 Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.	**SEP: Planning and Carrying Out Investigations** Make observations to produce data as evidence for an explanation of a phenomenon. **DCI: Forces and Motion** The patterns of an object's motion can be observed and measured; when the motion exhibits a regular pattern, future motion can be predicted. **CCC: Patterns** Patterns of change can be used to make predictions.	Identify patterns[1] of motion and use data to predict future motion when a pattern exists.	Recognize when an object is moving.	Identify motion that is following a pattern.[1]	Use data (presented pictorially) related to the pattern of an object's motion to predict future motion.	Use data (presented in tabular formation) related to the pattern of an object's motion to predict future motion.
			1. Examples of patterns might include: a child on a seesaw (up/down) or swing (back/forth).			

HSA Alternate Science—Elementary						
Next Generation Science Standards		**Essence Statements**	**Performance-Level Descriptors**			
PE	**SEP / DCI / CCC**		**Well Below**	**Approaches**	**Meets**	**Exceeds**
3-PS2-3 Ask questions to determine cause and effect relationships of electrical or magnetic interactions between two objects not in contact with each other.	**SEP: Asking Questions and Defining Problems** Ask questions that can be investigated based on patterns such as cause and effect relationships. **DCI: Types of Interactions** Electric and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart and, for forces between magnets, on their orientation relative to each other. **CCC: Cause and Effect** Cause and effect relationships can be identified, tested, and used to explain change.	Identify that a magnet can exert a force on other objects without touching them and that the interaction varies based on the strength and orientation of the magnet and its distance from other magnets or metallic objects.	Recognize which objects would be affected by magnetic forces.[1]	Identify that magnets interact with metal objects when they are not in contact with each other.	Recognize that, as well as many metal objects, magnets can pull other magnets toward them and can also push other magnets away (when magnets have similar poles facing each other) without touching them.	Identify questions[2] that could be asked and answered about the interaction of a magnet and a variety of items, including metal objects.[3]
			1. For example: from a pile of objects including an iron clip, paper wrapper, plastic cup, and wooden pencil 2. Questions related to the cause and effect of changes such as a stronger magnet or greater or lesser distance between them 3. Objects that contain iron			
3-PS2-4 Define a simple design problem that can be solved by applying scientific ideas about magnets.	**SEP: Asking Questions and Defining Problems** Define a simple problem that can be solved through the development of a new or improved object or tool. **DCI: Types of Interactions** Electric and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart and, for forces between magnets, on their orientation relative to each other. **CCC: Science, Engineering, and Technology Are Interdependent** Scientific discoveries about the natural world can often lead to new and improved technologies.	This Performance Expectation will not be assessed at the elementary level. It is partially addressed in 3-PS2-3.				

HSA Alternate Science—Elementary						
Next Generation Science Standards		**Essence Statements**	**Performance-Level Descriptors**			
PE	**SEP / DCI / CCC**		**Well Below**	**Approaches**	**Meets**	**Exceeds**
5-PS2-1 Support an argument that the gravitational force exerted by Earth on objects is directed down.	**SEP: Engaging in Argument from Evidence** Support an argument with evidence, data, or a model. **DCI: Types of Interactions** The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center. **CCC: Cause and Effect** Cause and effect relationships are routinely identified and used to explain change.	Identify that gravity[1] pulls all objects on or near Earth toward the ground and use observations to determine gravity's impact on objects.	Recognize that objects are pulled toward the ground.	Identify gravity[1] as a force that affects all objects on or near Earth.[2]	Use observations to determine that objects, regardless of their weight, are pulled towards the ground due to Earth's gravitational force.	Determine whether an observation supports the claim that objects are pulled toward Earth.
			1. This force pulls objects toward center of Earth. 2. A meteorite is pulled into the atmosphere; a dropped ball falls to the ground.			
Physical Science: PS 3 Energy ❖A. Definitions of Energy ❖B. Conservation of Energy and Energy Transfer ❖C. Relationship Between Energy and Forces ❖D. Energy and Chemical Processes in Everyday Life						
4 PS3-1 Use evidence to construct an explanation relating the speed of an object to the energy of that object.	**SEP: Constructing Explanations and Designing Solutions** Use evidence (e.g., measurements, observations, patterns) to construct an explanation. **DCI: Definition of Energy** The faster a given object is moving, the more energy it possesses. **CCC: Energy and Matter** Energy can be transferred in various ways and between objects.	Identify that identical objects[1] moving at different speeds have different amounts of energy and use data[3] to identify when the energy is the greatest or least.[2]	Recognize that an object can move at different speeds (faster, slower).	Identify the conditions under which an object can move.[2]	Recognize that if two identical objects are moving at different speeds, then the one moving faster has more energy.	Use data[3] to identify the instance when energy is greatest or least if similar objects are moving at different speeds.
			1. A "given object" is important here. It is not about comparing the energy of different objects, although two identical objects at different speeds can be compared. 2. For example: A moving object has kinetic energy, and a force (push or pull) can change motion. 3. Data may be information in tables, observations, or patterns.			

HSA Alternate Science—Elementary						
Next Generation Science Standards		**Essence Statements**	**Performance-Level Descriptors**			
PE	**SEP / DCI / CCC**		**Well Below**	**Approaches**	**Meets**	**Exceeds**
4-PS3-2 Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electrical currents.	**SEP: Planning and Carrying Out Investigations** Make observations to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution. **DCI: Definitions of Energy** Energy can be moved from place to place by moving objects or through sound, light, or electric currents. **DCI: Conservation of Energy and Energy Transfer** Energy can be transferred from place to place and also be transformed from one form to another. **CCC: Energy and Matter** Energy can be transferred in various ways and between objects.	Identify the type of energy[1] present in a scenario and identify that energy can move from place to place[2] and change forms.[3]	Recognize motion, sound, light, or electricity as forms of energy.	Identify the type of energy present in different circumstances.[1]	Identify examples of energy moving from place to place.[2]	Identify the transformation when, in a given scenario, energy moves and is changed into a different form.[3]
			1. For example: motion, sound, light, or electricity 2. For example: electrical energy in a circuit, light or sound across a room, a moving object going from one place to another 3. For example: A restaurant uses lamps to keep the food warm. The lamp is plugged into an electrical socket. How does the energy from the socket transform to keep the food warm?			
4-PS3-3 Ask questions and predict outcomes about the changes in energy that occur when objects collide.	**SEP: Asking Questions and Defining Problems** Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships. **DCI: Definitions of Energy** See 4-PS3-2. **DCI: Conservation of Energy and Energy Transfer** See 4-PS3-2. **DCI: Relationship Between Energy and Forces** When objects collide, the contact forces transfer energy so as to change the objects' motions. **CCC: Energy and Matter** Energy can be transferred in various ways and between objects.	Identify that objects move due to motion energy[1] and that the faster similar objects move, the more energy they have and that the changes in motion that occur when energy is transferred as objects collide can be predicted.	Recognize a collision and that a collision of a moving object with a stationary object may cause the stationary object to move.	Identify that objects move due to the motion energy they possess and that the energy in a moving object can be transferred to a stationary object it collides with.	Identify that the harder/stronger the push, the farther and faster an object will move.	Predict the motion of a stationary object as energy is transferred when another object collides with it.
			1. For students at this grade level, "motion energy" may be used instead of "kinetic energy."			

HSA Alternate Science—Elementary						
Next Generation Science Standards		**Essence Statements**	**Performance-Level Descriptors**			
PE	**SEP / DCI / CCC**		**Well Below**	**Approaches**	**Meets**	**Exceeds**
4-PS3-4 Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.	**SEP: Constructing Explanations and Designing Solutions** Apply scientific ideas to solve design problems. **DCI: Conservation of Energy and Energy Transfer** Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. **DCI: Energy in Chemical Processes and Everyday Life** The expression "produce energy" typically refers to the conversion of stored energy into a desired form for practical use. **CCC: Energy and Matter** Energy can be transferred in various ways and between objects.	Identify sources[2] and forms of energy and demonstrate that devices[1] can be used to convert energy from one form to another[4] for a variety of uses.	Recognize a source of energy.[2]	Identify what form of energy is produced by a device (source).[3]	Identify a missing component in a device that changes energy from one form to another.[4]	Use components to "build" a device that changes energy from one form to another.[5]
			1. Examples include common "devices" such as: electric lights, motor vehicles, stoves, and simple electric circuits. 2. For example: battery, moving car 3. For example: sound, light, heat, motion, electricity 4. For example: circuit, a battery lighting a light, a bell ringing 5. For example: a simple circuit to light a bulb			
5-PS3-1 Use models to describe that energy in animals' food (used for body repair, growth, and motion and to maintain body warmth) was once energy from the sun.	**SEP: Developing and Using Models** Use models to describe phenomena. **DCI: Energy: Energy in Chemical Processes and Everyday Life** The energy released from food was once energy from the sun that was captured by plants in the chemical process that forms plant matter. **DCI: Organization for Matter and Energy Flow in Organisms** Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion. **CCC: Energy and Matter** Energy can be transferred in various ways and between objects.	Identify that materials an animal needs for body maintenance, growth, and motion can be traced back to plants, which get energy from the sun[1].	Recognize that animals need food to survive.	Identify the source of an animal's energy as its food. (Complete a two-step food chain.)	Trace the source of the materials an animal needs for body maintenance, growth, and motion to the sun.[1]	Given all the components of a food chain, put them in order starting with the sun and ending with an animal, or recognize the effects of removing the sun from a model.[2]
			1. The models should be limited to 3 components including the sun and the animal. 2. The models should be limited to 3 or 4 components including the sun and the animal.			

HSA Alternate Science—Elementary						
Next Generation Science Standards		Essence Statements	Performance-Level Descriptors			
PE	SEP / DCI / CCC		Well Below	Approaches	Meets	Exceeds
Physical Science: PS 4 Waves and Their Applications in Technologies ❖A. Wave Properties ❖B. Electromagnetic Radiation ❖C. Information Technologies and Instrumentation						
4-PS4-1 Develop a model of waves to describe patterns in terms of amplitude and wavelength, and that waves can cause objects to move.	**SEP: Developing and Using Models** Develop a model using an analogy, example, or abstract representation to describe a scientific principle. **DCI: Wave Properties** Waves have regular patterns of motion. They can be made in water by disturbing the surface. When waves move across the water, the water goes up and down in place; there is no net motion in the direction of the wave except when the water meets a beach. Waves of the same type can differ in amplitude and wavelength. **CCC: Patterns** Similarities and differences in patterns can be used to sort, classify, and analyze simple rates of change for natural phenomena.	Identify that the size of similar objects[1] that fall into water changes the size of a wave and that those waves can be compared and the patterns predicted in terms of amplitude and wavelength.[2]	Recognize that waves are created when an object falls into water.	Identify that the size of a similar object[1] that falls into water can result in bigger or smaller waves.	Compare the pattern of two waves with different amplitudes or wavelengths.[2]	Predict an object's motion based on the pattern of the wave.
			1. For example: a small rock or a large rock dropped from the same height. 2. Items may use "height" for amplitude and "distance between peaks" for wavelength.			
4-PS4-2 Develop a model to describe that light reflecting from objects and entering the eyes allows objects to be seen.	**SEP: Developing and Using Models** Develop a model to describe phenomena. **DCI: Electromagnetic Radiation** An object can be seen when light reflected from its surface enters the eyes. **CCC: Cause and Effect** Cause and effect relationships are routinely identified.	Identify that light allows us to see and use models to demonstrate the reflection of light to enable sight.	Recognize sources of light.	Identify that light is needed to see objects.	Identify a model (diagram) that shows the reflection of light following a path between a light source, the object, and the eye.	Complete the components of a model (diagram) that shows the path of the reflection of light.

HSA Alternate Science—Elementary						
Next Generation Science Standards		**Essence Statements**	**Performance-Level Descriptors**			
PE	**SEP / DCI / CCC**		**Well Below**	**Approaches**	**Meets**	**Exceeds**
4-PS4-3 Generate and compare multiple solutions that use patterns to transfer information.	**SEP: Constructing Explanations and Designing Solutions** Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution. **DCI: Information Technologies and Instrumentation** Digitized information can be transmitted over long distances without significant degradation. High-tech devices can receive and decode information—convert it from digitized form to voice—and vice versa. **DCI: Optimizing the Design Solution** Different solutions need to be tested in order to determine which of them best solves the problem. **CCC: Patterns** Similarities and differences in patterns can be used to sort and classify designed products.	This Performance Expectation will not be assessed at the elementary level.				
Life Science: LS 1 From Molecules to Organisms: Structures and Processes ❖A. Structure and Function ❖B. Growth and Development of Organisms ❖C. Organization for Matter and Energy Flow in Organisms ❖D. Information Processing						
3-LS1-1 Develop models to describe that organisms have unique and diverse life cycles, but all have in common birth, growth, reproduction, and death.	**SEP: Developing and Using Models** Develop models to describe phenomena. **DCI: Growth and Development of Organisms** Reproduction is essential to the continued existence of organisms. Plants and animals have unique and diverse life cycles. **CCC: Patterns** Patterns of change can be used to make predictions.	Identify and sequence the stages of an organism's life cycle[1] and predict the impact on a species if it does not reproduce.	Recognize that all organisms are born and grow.	Identify the stages of an organism's life cycle.[1]	Given the stages of the life cycle of an organism, put them in order (e.g., develop a model).	Make a prediction about what would happen to a species if it did not reproduce.
			1. Stages include birth, growth, reproduction, and eventually death. Human examples should not be used at this level.			

HSA Alternate Science—Elementary						
Next Generation Science Standards		**Essence Statements**	**Performance-Level Descriptors**			
PE	**SEP / DCI / CCC**		**Well Below**	**Approaches**	**Meets**	**Exceeds**
4-LS1-1 Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.	**SEP: Engaging in Argument from Evidence** Construct an argument with evidence, data, and/or a model. **DCI: Structure and Function** Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. **CCC: Systems and System Models** A system can be described in terms of its components and their interactions.	Distinguish between internal and external structures of plants and animals[1] and identify the function of the structure[2] and how the structure can be beneficial in a given situation.[3]	Recognize plant and animal structures.[1]	Distinguish between internal and external structures.	Identify the function of various plant and animal structures.[2]	Given a scenario, identify the plant or animal structure that best meets the plant's or animal's needs in that situation.[3]
			1. Structures could include thorns, stems, roots, colored petals, heart, stomach, lungs, gills, brain, skeleton, skin, fins, feathers, and fur. 2. Functions could support: survival, growth, behavior, and/or reproduction. 3. For example: Ducks have webbed feet, while eagles have "claws."			
4-LS1-2 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.	**SEP: Developing and Using Models** Use a model to test interactions concerning the functioning of a natural system. **DCI: Information Processing** Different senses are specialized for particular kinds of information, which may be then processed by the animal's brain. Animals are able to use their perceptions and memories to guide their actions. **CCC: Systems and System Models** A system can be described in terms of its components and their interactions.	Identify that animals receive information through their senses, process the information, and respond.[1]	Recognize the senses animals use to receive stimuli.	Identify environmental stimuli to which animals respond.	Identify animal structures that enable them to detect, process, and respond to information from their surroundings.	Use a model to explain how an animal responds to information from its surroundings in a given scenario.
			1. For example: a dog hears a siren through its ears, the ears send a message to the brain, and the dog howls in response.			
5-LS1-1 Support an argument that plants get the materials they need for growth chiefly from air and water.	**SEP: Engaging in Argument from Evidence** Support an argument with evidence, data, or a model. **DCI: Organization for Matter and Energy Flow in Organisms** Plants acquire their material for growth chiefly from air and water. **CCC: Energy and Matter** Matter is transported into, out of, and within systems.	Identify that plants need air and water to survive and use data to explain the effect of varying amounts of water and light on growth.	Recognize a plant as a living organism.	Identify either air or water as a plant need.	Identify air and water as the chief sources of growth materials for plants. Soil is much less important.	Use data to explain the effect of various amounts of water on plant growth.

HSA Alternate Science—Elementary						
Next Generation Science Standards		Essence Statements	Performance-Level Descriptors			
PE	SEP / DCI / CCC		Well Below	Approaches	Meets	Exceeds
Life Science: LS 2 Ecosystems: Interactions, Energy, and Dynamics ❖A. Interdependent Relationships in Ecosystems ❖B. Cycles of Matter and Energy Transfer in Ecosystems ❖C. Ecosystem Dynamics, Functioning, and Resilience ❖ D. Social Interactions and Group Behavior						
3-LS2-1 Construct an argument that some animals form groups that help members survive.	**SEP: Engaging in Argument from Evidence** Develop models to describe phenomena. **DCI: Social Interactions and Group Behavior** Being part of a group helps animals obtain food, defend themselves, and cope with changes. **CCC: Cause and Effect** Cause and effect relationships are routinely identified and used to explain change.	Identify animals as predator or prey and determine how group behaviors[1] help animals survive.[2]	Recognize predator and prey animals.	Identify an animal's group behaviors.[1]	Determine how the group behavior helps the animals survive.[2]	Use data to show that a predator or prey group's behaviors help the animals survive.
			1. Examples include: herding, hunting in packs, raising and protecting young, etc. 2. Benefits might include obtaining food and protection.			
5-LS2-1 Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.	**SEP: Developing and Using Models** Develop a model to describe phenomena. **DCI: Interdependent Relationships in Ecosystems** The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem. **DCI: Cycles of Matter and Energy Transfer in Ecosystems** Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. **CCC: Systems and Systems Models** A system can be described in terms of its components and their interactions.	Identify the components of a food web[1] and use models to identify the role of producers, consumers, and decomposers, and to show the movement of matter in a food web.[2]	Recognize plants as producers and animals as consumers.	Identify the components of a food web.[1]	Identify the roles of producers, consumers, and decomposers.	Use a model to show how matter cycles through an ecosystem.[2]
			1. Producers, consumers, and decomposers 2. For example: Given a food chain, identify the cycling of matter between organisms.			

HSA Alternate Science—Elementary						
Next Generation Science Standards		Essence Statements	Performance-Level Descriptors			
PE	SEP / DCI / CCC		Well Below	Approaches	Meets	Exceeds
Life Science: LS 3 Heredity, Inheritance and Variation of Traits ❖A. Inheritance of Traits ❖B. Variation of Traits						
3-LS3-1 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.	**SEP: Analyzing and Interpreting Data** Analyze and interpret data to make sense of phenomena using logical reasoning. **DCI: Inheritance of Traits** Many characteristics of organisms are inherited from their parents. **DCI: Variation of Traits** Different organisms vary in how they look and function because they have different inherited information. **CCC: Patterns** Similarities and differences in patterns can be used to sort and classify natural phenomena.	Identify one or more similarities or differences between parents and their offspring[1] and use data to identify similarities and differences[2] among offspring.[3]	Recognize a trait of a plant or animal.	Identify one similarity between parents and their offspring.	Identify similarities or differences between parents and one offspring.	Given data, identify similarities and differences between parents and a number of offspring or between multiple offspring.[3]
			1. For example: size, color, etc. 2. Human examples should not be used. 3. For example: parent dogs and a litter of puppies or pea plant seedlings			
3-LS3-2 Use evidence to support the explanation that traits can be influenced by the environment.	**SEP: Constructing Explanations and Designing Solutions** Use evidence (e.g., observations, patterns) to support an explanation. **DCI: Inheritance of Traits** Some characteristics result from individuals' interactions with the environment, such as diet and learning. Many characteristics involve both inheritance and environment. **DCI: Variation of Traits** The environment also affects the traits that an organism develops. **CCC: Cause and Effect** Cause and effect relationships are routinely identified and used to explain change.	Identify traits of a plant or animal that can be altered by its interaction with the environment[1] or determine environmental factors that affect traits of organisms of the same type.[2]	Recognize the needs of a plant or animal.	Distinguish between a plant with sufficient light and water and a plant where one of these is lacking, or an animal that is properly fed and getting sufficient exercise and one that is not.	Identify traits of a plant or animal that can be altered by its environment.	Determine environmental factors that affect traits of organisms of the same type.[2]
			1. For example: lack of food, water, or exercise. 2. For example: amount of food, amount of water, and in the case of plants, the amount of fertilizer.			

HSA Alternate Science—Elementary						
Next Generation Science Standards		Essence Statements	Performance-Level Descriptors			
PE	SEP / DCI / CCC		Well Below	Approaches	Meets	Exceeds
Life Science: LS 4 Biological Evolution: Unity and Diversity ❖A. Evidence of Common Ancestry ❖B. Natural Selection ❖C. Adaptation ❖ D. Biodiversity and Humans						
3-LS4-1 Analyze and Interpret data from fossils to provide evidence of the organisms and environments in which they lived long ago.	**SEP: Analyzing and Interpreting Data** Analyze and interpret data to make sense of phenomena. **DCI: Evidence of Common Ancestry and Diversity** Some plants and animals that once lived on Earth are no longer found anywhere. Fossils provide evidence about the types of organisms that lived long ago and also about their environments. **CCC: Scale, Proportion, and Quantity** Some observable phenomena exist for a very short time and others for a very long period.	Identify whether a fossil was a plant or an animal and use data to identify information about the environment[1] the plant or animal may have lived in.[2]	Recognize a fossil.	Identify whether the fossil was an animal or a plant.	Based on data, identify the environment[1] in which a fossilized plant or animal lived.	Based on data, identify a fossil trait that provides information about the environment in which the animal or plant lived.[2]
			1. For example: land or water, forest or desert 2. This may include illustrations.			
3-LS4-2 Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.	**SEP: Constructing Explanations and Designing Solutions** Use evidence (e.g., observations, patterns) to support an explanation. **DCI: Natural Selection** Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing. **CCC: Cause and Effect** Cause and effect relationships are routinely identified and used to explain change.	Identify differences in the characteristics of individuals within a species and determine advantages or disadvantages of a characteristic in a given situation.	Recognize a characteristic of an individual plant or animal.	Identify the differences in the characteristics of individuals within a species.	Determine which variation of a characteristic is most helpful to a plant or animal in a given situation.	Classify variations as likely to be an advantage or disadvantage to an animal's or plant's survival.

HSA Alternate Science—Elementary						
Next Generation Science Standards		Essence Statements	Performance-Level Descriptors			
PE	SEP / DCI / CCC		Well Below	Approaches	Meets	Exceeds
3-LS4-3 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.	**SEP: Engaging in Argument from Evidence** Construct an argument with evidence. **DCI: Adaptation** For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all. **CCC: Cause and Effect** Cause and effect relationships are routinely identified and used to explain change.	Identify the features of a habitat, including organisms living in it, and use data to show that some organisms can survive better in a habitat than others can.	Recognize an organism in a habitat.	Identify the features of a habitat, including the organisms living in it.	Determine the characteristics of an organism that enable it to survive in a particular habitat.	Interpret data to provide evidence that some organisms can survive well in a habitat because their needs are met, and some organisms cannot survive because their needs are not met.
3-LS4-4 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.	**SEP: Engaging in Argument from Evidence** Make a claim about the merit of a solution to a problem by citing relevant evidence. **DCI: Ecosystem Dynamics, Functioning, and Resilience** When an environment changes, some organisms die, others move to new locations, yet others move into the environment, and some die. **DCI: Biodiversity and Humans** Populations live in a variety of habitats, and changes in those habitats affect the organisms living there. **CCC: Systems and System Models** A system can be described in terms of its components and their interactions.	Identify organisms that will be affected, either positively or negatively by a given environmental change and use data to determine whether a solution to the change is effective.[1]	Recognize how the environment changes after a natural event or one caused by human activity.	Identify (an) organism(s) that will be affected by a change in an environment, including pollution.	Determine whether a change in the environment is likely to have a positive or negative impact on a particular organism.	Given a simple data table, determine whether a solution to the environmental change is effective.[1]
			1. For example: Did replanting trees lead to more birds being present?			

HSA Alternate Science—Elementary						
Next Generation Science Standards		Essence Statements	Performance-Level Descriptors			
PE	SEP / DCI / CCC		Well Below	Approaches	Meets	Exceeds
Earth Space Science ESS 1 Earth's Place in the Universe ❖A. The Universe and Its Stars ❖B. Earth and the Solar System ❖C. The History of Planet Earth						
4-ESS1-1 Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.	**SEP: Constructing Explanations and Designing Solutions** Identify the evidence that supports particular points in an explanation. **DCI: The History of Planet Earth** Patterns of rock formations reveal changes over time due to Earth forces, such as earthquakes. The presence and location of fossil types indicate the order in which rock layers were formed. **CCC: Patterns** Patterns can be used as evidence to support an explanation.	Identify that lower rock layers are oldest and the locations of fossils in rock layers provide evidence of changes in the environment over time.	Recognize that there are different rock layers in Earth and that fossils can be found in some rock layers.	Identify that the lower rock layers are the oldest rock layers.	Determine the environment of a given rock layer based on fossil evidence.	Determine (a) change(s) that occurred in an environment based on the patterns/evidence found in the rock layers.
5-ESS1-1 Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from Earth.	**SEP: Engaging in Argument from Evidence** Support an argument with evidence, data, or a model. **DCI: The Universe and Its Stars** The sun is a star that appears larger and brighter than other stars because it is closer. Stars range greatly in their distance from Earth. **CCC: Patterns; Scale, Proportion, and Quantity** Natural objects exist, from the very small to the immensely large.	Identify that the closer a light source is, the brighter it appears[1] and use data to show that for two equally bright stars, the closer one will appear brighter.[2]	Recognize the sun as a star.	Identify that a luminous object close to a person appears much brighter and larger than a similar object that is very far away from a person.[1]	Use data to show that the closer a star is to Earth, the brighter the star appears.[2]	Use data to determine which of two equally bright stars is closest to Earth, based on their apparent brightness.
			1. For example: Nearby streetlights appear bigger and brighter than distant streetlights. 2. This is referred to as the star's apparent brightness.			

HSA Alternate Science—Elementary						
Next Generation Science Standards		Essence Statements	Performance-Level Descriptors			
PE	SEP / DCI / CCC		Well Below	Approaches	Meets	Exceeds
5-ESS1-2 Represent data in graphical displays to reveal patterns of daily changes in the length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.	**SEP: Analyzing and Interpreting Data** Represent data in tables and various graphical displays (bar graphs and pictographs) to reveal patterns that indicate relationships. **DCI: Earth and the Solar System** The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about its axis, cause observable patterns. These include day and night; daily changes in the length and direction of shadows; and different positions of the sun, moon, and stars at different times of the day, month, and year. **CCC: Patterns; Scale, Proportion, and Quantity** Similarities and differences in patterns can be used to sort, classify, communicate, and analyze simple rates of change for natural phenomena.	Use data[1] to identify or predict patterns in the size of shadows, in the phases of the moon, or in lengths of day and night.	Recognize a shadow, the moon, and the sun.	Identify that the size of a shadow changes, that the appearance of the moon changes, and that there are changes in the length of daylight.	Use data[1] to identify patterns in the size of shadows, in the phases of the moon, or in lengths of day and night.	Use data[1] to identify the relationship between the shadow and the position of the sun, to identify a future phase of the moon, or to link Earth's rotation to patterns of night and day.[2]
			1. For example: pictographs, bar graphs, and tables 2. This will require students to have some understanding of the rotation of the Earth and of the revolution of moon around the Earth and Earth around the sun.			
Earth Space Science ESS 2 Earth Systems ❖A. Earth Materials and Systems ❖B. Plate Tectonics and Large-Scale System Interactions ❖C. The Roles of Water in Earth's Surface Processes ❖D. Weather and Climate ❖E. Biogeology						
3-ESS2-1 Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.	**SEP: Analyzing and Interpreting Data** Represent data in tables and various graphical displays (bar graphs and pictographs) to reveal patterns that indicate relationships. **DCI: Earth Systems: Weather and Climate** Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next. **CCC: Patterns** Patterns of change can be used to make predictions.	Identify common weather characteristics[1] and use data to identify weather patterns and make predictions.[2]	Recognize the weather.[1]	Identify common weather factors such as temperature, precipitation, and sky cover.[2]	Use a simple graphical display or data table (limited to 3 or 4 data points) to identify a factor such as the time of the year when it rained the most or when it was hottest.	Use weather data to make predictions of future weather based on patterns.
			1. For example: sunny, windy, rainy 2. For example: clear, partly cloudy, very cloudy			

HSA Alternate Science—Elementary						
Next Generation Science Standards		**Essence Statements**	**Performance-Level Descriptors**			
PE	**SEP / DCI / CCC**		**Well Below**	**Approaches**	**Meets**	**Exceeds**
3-ESS2-2 Obtain and combine information to describe climates in different regions of the world.	**SEP: Obtaining, Evaluating, and Communicating Information** Obtain and combine information from books and other reliable media to explain phenomena. **DCI: Earth Systems: Weather and Climate** Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over years. **CCC: Patterns** Patterns of change can be used to make predictions.	Identify the components of climate and describe and compare climates in different parts of the world.[1]	Given illustrations, recognize winter, spring, summer, or fall based on "typical" conditions in many parts of the world.[1]	Identify temperature, precipitation, and other weather conditions as components of climate.	Describe the climate of a region of the world using weather data.[2]	Identify differences between the climates found in two regions of the world.[3]
			1. Including temperate climates such as much of the mainland United States 2. Can include using data to predict the weather of a region of the world at a given time of year given the climate 3. For example: Hawai'i and the Arctic			
4-ESS2-1 Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.	**SEP: Planning and Carrying Out Investigations; Analyzing and Interpreting Data** Make observations and/or measurements to produce data as evidence for an explanation. **DCI: Earth Materials and Systems** Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. **DCI: Biogeology** Living things affect the physical characteristics of their regions. **CCC: Patterns; Cause and Effect** Cause and effect relationships are routinely identified, tested, and used to explain change.	Identify sources of erosion and the resulting or predicted changes to the landscape caused by erosion and weathering[1] in a given a scenario.	Recognize erosion and/or weathering.	Identify a source of erosion and/or weathering[2] that can cause changes to the landscape.	Identify examples of changes to the landscape caused by erosion and/or weathering.	Given a scenario, predict the effects of weathering and/or erosion on a landscape.
			1. For this group of students, differentiating between weathering and erosion is not necessary. 2. Typical sources are water, including rainfall, wind, and waves.			

HSA Alternate Science—Elementary						
Next Generation Science Standards		**Essence Statements**	**Performance-Level Descriptors**			
PE	**SEP / DCI / CCC**		**Well Below**	**Approaches**	**Meets**	**Exceeds**
4-ESS2-2 Analyze and interpret data from maps to describe patterns of Earth's features.	**SEP: Analyzing and Interpreting Data** Analyze and interpret data to make sense of phenomena using logical reasoning. **DCI: Plate Tectonics and Large-Scale System Interactions** The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns. Most earthquakes and volcanoes occur along the boundaries between continents and oceans. Major mountain chains form inside continents or near their edges. Maps can help locate the different features of the Earth. **CCC: Patterns; Cause and Effect** Patterns can be used as evidence to support an explanation.	Identify the locations of volcanoes, mountain ranges and potential earthquake sites given a map, and use patterns to predict the likely locations of volcanoes relative to plate boundaries.	Recognize a volcano, an earthquake, or a mountain range.	Identify the locations of volcanoes, earthquake sites, and mountain ranges, given a map.	Use a map to identify the pattern of earthquakes, mountain ranges, or volcanoes relative to plate boundaries.	Predict a likely site of a future earthquake, given data such as a map showing plate boundaries.
5-ESS2-1 Develop a model using an example to describe ways in which the geosphere, biosphere, hydrosphere, and/or atmosphere interact.	**SEP: Developing and Using Models** Develop a model using an example to describe a scientific principle. **DCI: Earth Materials and Systems** Earth's major systems are the geosphere, the hydrosphere, the atmosphere, and the biosphere. These systems interact in multiple ways to affect Earth's surface materials and processes. The ocean supports a variety of ecosystems and organisms, shapes landforms, influences climate. **CCC: Systems and System Models** A system can be described in terms of its components and their interactions.	Using a visual aid or model, identify the result of the components of two Earth systems interacting.[1]	Given a visual, recognize a component of the Earth system shown.	Given a visual of two interacting Earth systems, identify the interacting components of the Earth systems.	Given a model,[2] identify the result of the components of two Earth systems interacting.	Develop a model showing the interaction of two Earth systems.[3]

1. Earth systems include: the geosphere, biosphere, hydrosphere, and atmosphere. Students are not expected to memorize these terms, and the terms—except for atmosphere—should not be used in items.
2. Models can be diagrams, drawings, or storyboards.
3. For example: the atmosphere and hydrosphere in evaporation or geosphere and runoff during storms

HSA Alternate Science—Elementary						
Next Generation Science Standards		**Essence Statements**	**Performance-Level Descriptors**			
PE	**SEP / DCI / CCC**		**Well Below**	**Approaches**	**Meets**	**Exceeds**
5-ESS2-2 Describe and graph the amounts of salt water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.	**SEP: Using Mathematics and Computational Thinking** Describe and graph quantities such as area and volume to address scientific questions. **DCI: The Roles of Water in Earth's Surface Processes** Nearly all of Earth's available water is in the ocean. Most fresh water is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere. **CCC: Scale, Proportion, and Quantity; Systems and System Models** Standard units are used to measure and describe physical quantities such as weight and volume.	Identify where fresh water[1] and salt water are typically found and use data to show the amount and distribution of fresh and salt water.	Recognize a body of water.	Identify where fresh water and salt water are found.	Use data to show that the ocean contains most of Earth's water.	Use data to determine the amount of salt water and fresh water on Earth.[1] 1. At the Exceeds level, this includes recognizing that fresh water is limited.
Earth Space Science ESS 3 Earth and Human Activity ❖A. Natural Resources ❖B. Natural Hazards ❖C. Human Impacts on Earth Systems ❖ D. Global Climate Change						
3-ESS3-1 Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.	**SEP: Engaging in Argument from Evidence** Make a claim about the merit of a solution to a problem by citing relevant evidence. **DCI: Natural Hazards** A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts. **CCC: Cause and Effect** Cause and effect relationships are routinely identified, tested, and used to explain change.	Identify the impact of weather hazards, explain that humans can take steps to reduce the impact, and use data to determine whether a solution for reducing the impact or improving safety is effective.[1]	Recognize a weather hazard.[2]	Identify an impact of a weather hazard.	Identify ways to help reduce the impact of a weather hazard, including steps to be taken for personal safety during hazardous weather.	Using data, determine whether a solution to reduce the impact of a weather hazard will help people, animals, and plants remain safe. 1. For this group of students, this performance expectation includes personal safety in hazardous situations. 2. Weather hazards include: heavy rain, high winds, high surf, flooding, hurricanes, etc.

HSA Alternate Science—Elementary						
Next Generation Science Standards		**Essence Statements**	**Performance-Level Descriptors**			
PE	**SEP / DCI / CCC**		**Well Below**	**Approaches**	**Meets**	**Exceeds**
4-ESS3-1 Obtain and combine information to describe that energy and fuels are derived from natural resources and that their uses affect the environment.	**SEP: Obtaining, Evaluating, and Communicating Information** Obtain and combine information from books and other reliable media to explain phenomena. **DCI: Natural Resources** Energy and fuels that humans use come from natural sources, and their use affects the environment in multiple ways. Some resources are renewable, and others are not. **CCC: Cause and Effect** Cause and effect relationships are routinely identified and used to explain change.	Classify energy sources as renewable or nonrenewable and identify the effect of using a particular type of energy on the environment.	Recognize an energy source that is used by people.	Classify an energy source as renewable or non-renewable.	Identify how the use of a given energy source could impact the environment.	Use evidence to determine how the use of a particular energy source might impact the environment.
4-ESS3-2 Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.	**SEP: Constructing Explanations and Designing Solutions** Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution. **DCI: Natural Resources; Natural Hazards** A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts. **DCI: Designing Solutions to Engineering Problems** Testing a solution involves investigating how well it performs under a range of likely conditions. **CCC: Cause and Effect** Cause and effect relationships are routinely identified, tested, and used to explain change.	Identify the potential impact of a natural hazard[1] and choose a design solution that lessens the impact of these hazards,[2] including finding the most effective solution when given options.	Recognize a natural hazard.	Identify the potential impact of a natural hazard.[1]	Given a natural hazard, choose a design that would lessen the impact of the hazard.[2]	Given two design solutions, explain why one of them will be more effective in reducing the impacts of a natural hazard.
			1. For example: a landslide, flooding after heavy rain, strong winds, or high surf 2. For example: a raised house in an area prone to flooding			

HSA Alternate Science—Elementary						
Next Generation Science Standards		Essence Statements	Performance-Level Descriptors			
PE	SEP / DCI / CCC		Well Below	Approaches	Meets	Exceeds
5-ESS3-1 Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.	**SEP: Obtaining, Evaluating, and Communicating Information** Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem. **DCI: Human Impacts on Earth Systems** Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments. **CCC: Systems and System Models** A system can be described in terms of its components and their interactions.	Identify the effects of pollution on air or water quality and explain steps that can be taken to protect or clean up the environment.	Recognize a source of pollution.	Identify the source and effect of pollution on air quality or water quality.	Identify actions humans can take to protect the environment.	Determine a way to clean up the environment in a given situation.

HSA Alternate Science—Middle School						
Next Generation Science Standards		Essence Statements	Performance-Level Descriptors			
PE	SEP / DCI / CCC		Well Below	Approaches	Meets	Exceeds
Physical Science: PS 1 Matter and interactions ❖ A. Structure and Properties of Matter ❖ B. Chemical Reactions ❖C. Nuclear Processes						
MS-PS1-1 Develop models to describe the atomic composition of simple molecules and extended structures.	**SEP: Developing and Using Models** Develop a model to predict and/or describe phenomena. **DCI: Structure and Properties of Matter** Substances are made from different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms. **CCC: Scale, Proportion, and Quantity** Models can be used to study systems that are very large or very small.	Identify that the smallest parts of all molecules are atoms and use models[1] to explain that atoms can combine to form molecules and that those molecules can be classified by their makeup.	Recognize that all things (matter) can be broken up into smaller and smaller pieces until they eventually become too small to see, but even then, they still exist.	Identify that the smallest parts of all molecules are atoms.	Classify molecules by makeup: one type of atom[2] or multiple types of atoms and simple[3] or complex.[4]	Use models[4] to explain that atoms can combine to form molecules, including those made up of the same type of atom[1] and those made up of different types of atoms.[2]
			1. For example: pictures, 3D ball and stick structures 2. For example: nitrogen, oxygen, iron 3. For example: water, ammonia, sodium chloride 4. For example: sugar, plastics, nylon			
MS-PS1-2 Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.	**SEP: Analyzing and Interpreting Data** Analyze and interpret data to determine similarities and differences. **DCI: Structure and Properties of Matter** Each pure substance has characteristic physical and chemical properties. **DCI: Chemical Reactions** In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. **CCC: Patterns** Macroscopic patterns are related to the nature of microscopic and atomic- level structure.	Identify when substances have changed and formed new substances[1] and use data to explain that chemical changes involve changes in molecules and lead to new substances with new properties.	Recognize the properties of a substance.	Identify examples of changes in substances.	Use data to support a claim that properties have changed and a new substance has been formed.[1]	Use data to show that chemical changes involve changes in the molecules (atoms are rearranged), leading to a new substance with properties that are different from the properties of the original substances.
			1. Signs of a chemical change include: color change, temperature change, gas produced, formation of a solid when two liquids are combined			

HSA Alternate Science—Middle School						
Next Generation Science Standards		**Essence Statements**	**Performance-Level Descriptors**			
PE	**SEP / DCI / CCC**		**Well Below**	**Approaches**	**Meets**	**Exceeds**
MS-PS1-3 Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.	**SEP: Obtaining, Evaluating, and Communicating Information** Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported by evidence. **DCI: Structure and Properties of Matter** Each pure substance has characteristic physical and chemical properties. **DCI: Chemical Reactions** In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. **CCC: Structure and Function** Structures can be designed to serve particular functions by taking into account properties of different materials and how materials can be shaped and used.	Identify common natural resources,[1] synthetic materials[2] and products[3] made from those resources and their impact on society.	Recognize common natural resources.	Identify examples of materials that are made from natural resources.[1]	Identify the natural resources used to make a synthetic product.[2]	Use information from a short reading to describe a synthetic material made from natural resources and its impact on society.[3]
			1. For example: iron ore into steel, wood into furniture 2. For example: petroleum into plastics, aluminum into cans 3. For example: plastics			
MS-PS1-4 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.	**SEP: Developing and Using Models** Develop a model to predict and/or describe phenomena. **DCI: Structure and Properties of Matter** Gases and liquids are made of molecules that are moving about relative to each other. In a liquid, the molecules are constantly in contact with each other, while in a gas, they are widely spaced except when they happen to collide. In a solid, atoms are closely spaced and do not change relative locations. Changes of state can occur with variations in temperature. **DCI: Definitions of Energy** The temperature of a system is proportional to the average internal kinetic energy and potential energy per atom or molecule. **CCC: Patterns; Cause and Effect** Cause and effect relationships may be used to predict phenomena.	Identify that a material's state of matter can change[1] when heat is added or removed and that there are predictable changes[2] in the motion of the molecules when the state changes.	Recognize matter as a solid, liquid, or gas.	Identify that a source of heat or of cooling can change the state of common materials.[1]	Use a model to identify that the particles that make up an object move fast or slow depending on the temperature of the object.	Use a model to predict the change in particle motion and state of matter that will occur when heat is introduced or removed.[2]
			1. For example: ice melts, water freezes, etc. 2. Use common occurrences such as water freezing, water boiling, chocolate getting softer, etc.			

HSA Alternate Science—Middle School						
Next Generation Science Standards		**Essence Statements**	**Performance-Level Descriptors**			
PE	**SEP / DCI / CCC**		**Well Below**	**Approaches**	**Meets**	**Exceeds**
MS-PS1-5 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.	**SEP: Developing and Using Models** Develop a model to describe unobservable mechanisms. **DCI: Chemical Reactions** In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. The total number of each type of atom is conserved, and, thus, the mass does not change. **CC: Energy and Matter** Matter is conserved because atoms are conserved in physical and chemical processes.	The DCI in this PE is covered in MS-PS1-2 and MS-PS1-3.				
MS-PS1-6 Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.	**SEP: Constructing Explanations and Designing Solutions** Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints. **DCI: Chemical Reactions** Some chemical reactions release energy; others store energy. **ETS1.B: Developing Possible Solutions** *(Secondary)* **ETS1.C: Optimizing the Design Solution** *(Secondary)* **CCC: Energy and Matter** The transfer of energy can be tracked as energy flows through a designed or natural system.	Identify that, during a chemical reaction, there are sometimes changes in temperature that can be used in the design of helpful devices.[2]	Recognize that chemical reactions create new substances. (Also see MS-PS1-2.)	Identify that chemical reactions sometimes cause temperature changes within the substance.	Use presented evidence to determine whether a reaction has released or absorbed thermal energy.	Use data[1] to determine whether a proposed solution would solve a problem.[2]
			1. Data can be numbers or graphs. 2. Use common objects such as heat packs or ice packs (which produce temperature changes through chemical reactions) and chafing fuel (sterno) that keeps food warm.			

HSA Alternate Science—Middle School						
Next Generation Science Standards		**Essence Statements**	**Performance-Level Descriptors**			
PE	**SEP / DCI / CCC**		**Well Below**	**Approaches**	**Meets**	**Exceeds**
Physical Science: PS 2 Motion and Stability: Forces and Interactions ❖ A. Forces and Motion ❖ B. Types of Interactions ❖ C. Stability and Instability in Physical Systems						
MS-PS2-1 Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.	**SEP: Constructing and Designing Solutions** Apply scientific ideas or principles to design an object, tool, process, or system. **DCI: Forces and Motion** For any pair of interacting objects, the force exerted by the first object on the second object is equal in strength to the force that the second object exerts on the first, but in the opposite direction. **CCC: Systems and System Models** Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy and matter flows within systems.	Relate how the speed of an object affects impact during collisions and use models or data to predict how the motion of objects with different speeds are affected when they collide.[1]	Recognize that force can cause motion. (Also see 3-PS2-1)	Relate the speed of a moving object to the impact of a collision with a stationary object.[1]	Use models to predict how the motion of objects with different speeds will be affected when the objects collide.	Conduct an investigation (simulation or simple data sets provided) to determine how the changing speed of objects affects the motion of the objects when they collide.
			1. For example: toy cars hitting a wall			
MS-PS2-2 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.	**SEP: Planning and Carrying Out Investigations** Plan an investigation individually and collaboratively, and in the design: identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim. **DCI: Forces and Motion** The motion of an object is determined by the sum of the forces acting on it. The greater the mass of the object, the greater the force needed to achieve the same change in motion. **CCC: Stability and Change** Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and forces at different scales.	Identify that a force is needed to change the motion of an object and predict changes in motion of objects when they are acted on by forces of different sizes or when the objects have different masses.[1]	Recognize that an object changed position due to an outside factor.[1]	Identify that a force (push/pull) is needed to change an object's motion.	Predict how the motion of an object will change when acted on by forces of different sizes or when objects have different masses.	Draw conclusions, using data from an investigation in which two objects with different masses are acted on by a series of forces.
			1. For example: A bowling ball hits a pin, and the pin moves.			

HSA Alternate Science—Middle School						
Next Generation Science Standards		Essence Statements	Performance-Level Descriptors			
PE	SEP / DCI / CCC		Well Below	Approaches	Meets	Exceeds
MS-PS2-3 Ask questions about data to determine the factors that affect the strength of electrical and magnetic forces.	**SEP: Asking Questions and Defining Problems** Ask questions that can be investigated within the scope of the classroom and outdoor environment with available resources, and, when appropriate, frame a hypothesis based on observations and scientific principles. **DCI: Types of Interactions** Electric and magnetic (electromagnetic) forces can be attractive or repulsive, and their sizes depend on the magnitudes of the charges, currents, or magnetic strengths involved, and on the distances between the interacting objects. **CCC: Cause and Effect** Cause and effect relationships may be used to predict phenomena in natural or designed systems.	Sort objects based on whether they are attracted by a magnet, use data to make statements about the effect of distance on the interactions between magnets, and identify a question that could be answered by an investigation involving one or more magnets.	Recognize a magnet as something that exerts an attractive force on some materials.	Sort objects based on whether they are attracted by a magnet.	Use data to make statements about the effect of distance on the interactions between magnets.	Identify a question that could be answered by a scientific investigation involving one or more magnets.
MS-PS2-4 Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.	**SEP: Engaging in Argument from Evidence** Construct and present oral and written arguments supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. **DCI: Types of Interactions** Gravitational forces are always attractive. There is a gravitational force between any two masses, but it is very small except when one or both of the objects have a large mass (e.g., Earth and the sun). **CCC: Systems and System Models** Models can be used to represent systems and their interactions—such as inputs and processes.	Use models to illustrate the effect of Earth's gravity on the motion of objects[1] and recognize the effects and interpret data of gravitational forces of two objects with very large masses.[2]	Recognize that objects fall to the ground when dropped.	Use models to illustrate the effect of Earth's gravity on the motion of an object.[1]	Recognize that the force of gravity is greater between massive objects (e.g., Earth and sun).	Interpret data to describe and predict the effects of the gravitational forces of two objects with large masses.[2]
			1. For example: A ball thrown into the air falls toward Earth due to the gravitational force of Earth's being larger. 2. For example: Earth and the sun			

HSA Alternate Science—Middle School						
Next Generation Science Standards		**Essence Statements**	**Performance-Level Descriptors**			
PE	**SEP / DCI / CCC**		**Well Below**	**Approaches**	**Meets**	**Exceeds**
MS-PS2-5 Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other, even though the objects are not in contact.	**SEP: Planning and Carrying Out Investigations** Conduct an investigation and evaluate the experimental design to produce data to serve as the basis for evidence that can meet the goals of the investigation. **DCI: Types of Interactions** Forces that act at a distance (e.g., electric, magnetic, and gravitational) can be explained by fields that extend through space and can be mapped by their effect on a test object (e.g., a charged object or a ball, respectively). **CCC: Cause and Effect** Cause and effect relationships may be used to predict phenomena in natural or designed systems.	Identify that like magnetic poles repel each other and unlike poles attract and use data and observations to relate the orientation of magnets and the distance between them to their behavior.	Recognize the "poles" of a bar magnet.	Identify that like poles repel each other and unlike poles attract.	Relate the orientation of magnets and the distance between them to the behavior of the magnets.	Use data from an experiment to explain the effect of changing the orientation of two magnets or changing the distance between two magnets.
Physical Science: PS 3 Energy ❖ A. Definitions of Energy ❖ B. Conservation of Energy and Energy Transfer ❖ C. Relationship Between Energy and Forces ❖ D. Energy and Chemical Processes in Everyday Life						
MS-PS3-1 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.	**SEP: Analyzing and Interpreting Data** Construct and interpret graphical displays of data to identify linear and nonlinear relationships. **DCI: Definitions of Energy** Kinetic energy is proportional to the mass of the moving object and grows with the square of its speed. **CCC: Scale, Proportion, and Quantity** Proportional relationships among different types of quantities provide information about the magnitude of properties and processes.	Use data to compare the kinetic energy of objects with different masses and speeds[2] and use graphical data to identify that kinetic energy changes as mass or speed changes.[3]	Recognize the mass and speed of an object.	Use data to identify the object with the greatest/least mass or the fastest/slowest speed.	Use mass or speed data[2] to determine the object with the greatest kinetic energy.	Use graphical data to identify that kinetic energy changes as mass or speed changes.[3]
			1. The term kinetic energy is introduced in middle school and should be used, but motion energy, which was introduced in elementary school, is acceptable. 2. Limited to only one variable changing 3. For example: two objects with different masses moving at the same speed or two objects with the same mass moving at different speeds, or a single object whose speed changes			

HSA Alternate Science—Middle School						
Next Generation Science Standards		**Essence Statements**	**Performance-Level Descriptors**			
PE	**SEP / DCI / CCC**		**Well Below**	**Approaches**	**Meets**	**Exceeds**
MS-PS3-2 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.	**SEP: Developing and Using Models** Develop a model to describe unobservable mechanisms. **DCI: Definitions of Energy** A system of objects may also contain stored (potential) energy, depending on the objects' relative positions. **DCI: Relationship Between Energy and Forces** When two objects interact, each one exerts a force on the other that can cause energy to be transferred to or from the object. **CCC: Systems and System Models** Models can be used to represent systems and their interactions—such as inputs, processes, and outputs—and energy and matter flows within systems.	The DCI is covered in MS-ESS1-2.				
MS-PS3-3 Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.	**SEP: Constructing Explanations and Designing Solutions** Apply scientific ideas or principles to design, construct, and test a design of an object, tool, process, or system. **DCI: Definitions of Energy** Temperature is a measure of the average kinetic energy of particles of matter. The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present. **DCI: Conservation of Energy and Energy Transfer** Energy is spontaneously transferred out of hotter regions or objects and into colder ones. **CCC: Energy and Matter** The transfer of energy can be tracked as energy flows through a system.	Identify items used to keep something hot or cold[1] by changing the rate of the transfer of heat energy[2] and use data to identify the "tool" that is most efficient at keeping something hot or cold.[2]	Recognize objects that are hot and cold.	Identify "things" used to keep something hot or cold.	Realize that heat can be transferred.[3]	Use data to identify the "tool" that is most efficient at keeping something hot or cold.[2]
			1. For example: a refrigerator 2. For example: different types of coolers or thermos bottles 3. For example: if ice is added to a cup of water or if water in a pot is heated on a stove			

HSA Alternate Science—Middle School						
Next Generation Science Standards		**Essence Statements**	**Performance-Level Descriptors**			
PE	**SEP / DCI / CCC**		**Well Below**	**Approaches**	**Meets**	**Exceeds**
MS-PS3-4 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.	**SEP: Planning and Carrying Out Investigations** Plan an investigation and in the design: identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim. **DCI: Definitions of Energy** Temperature is a measure of the average kinetic energy of particles of matter. **DCI: Conservation of Energy and Energy Transfer** The amount of energy transfer needed to change the temperature of a matter sample by a given amount depends on the nature of the matter, the size of the sample, and the environment. **CCC: Scale, Proportion, and Quantity** Proportional relationships among different types of quantities provide information about the magnitude of properties and processes.	Determine when an object has changed temperature due to the application or removal of heat or a change in temperature of two objects of the same material but different masses.	Recognize sources of heat.	Use temperature data to determine when an object has changed in temperature due to the application of heat.	Use temperature data to determine the temperature changes of objects of the same material but different masses when heat is applied for a certain period of time.	Draw conclusions using data from an experiment involving adding two cold objects (e.g., ice) of different masses to separate pails of hot water and recording the temperature change of the water over time.
MS-PS3-5 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.	**SEP: Engaging in Argument from Evidence** Construct, use, and present oral and written arguments supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon. **DCI: Conservation of Energy and Energy Transfer** When the motion energy of an object changes, there is inevitably some other change in energy at the same time. **CCC: Energy and Matter** Energy can take different forms (e.g., energy in fields, thermal energy, kinetic energy).	Identify the kinetic energy[1] transfer in given examples[2] and use data or observations to predict what will happen to kinetic energy when objects collide.[3]	Recognize that the kinetic energy of an object can change.	Identify the kinetic energy transfer in presented examples.[2]	Predict what will happen to the kinetic energy between two similar objects when one collides with the other.[3]	Use data to describe the kinetic energy being transferred to or from an object.[4]

1. The term kinetic energy is introduced in middle school and should be used, but motion energy, which was introduced in elementary school, is acceptable.
2. For example: A ball that was moving begins to slow down, so this means that energy was transferred from the object.
3. For example: A ball rolling down a hill collides with a ball that is at rest at the bottom of the hill.
4. For example: When two balls collide, one begins to move due to kinetic (motion) energy being transferred to it.

HSA Alternate Science—Middle School						
Next Generation Science Standards		Essence Statements	Performance-Level Descriptors			
PE	SEP / DCI / CCC		Well Below	Approaches	Meets	Exceeds
Physical Science: PS 4 Waves and Their Applications in Technologies ❖A. Wave Properties ❖B. Electromagnetic Radiation ❖C. Information Technologies and Instrumentation						
MS-PS4-1 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.	**SEP: Using Mathematics and Computational Thinking** Use mathematical representations to describe and/or support scientific conclusions and design solutions. **DCI: Wave Properties** A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude. **CCC: Patterns** Graphs and charts can be used to identify patterns in data.	Identify wave properties[1] and differences in those properties by comparing wave diagrams, and use data or observations to show that a greater wave height results in greater force and impact.	Recognize examples of waves.	Identify a property of a wave.[1]	Compare wave diagrams to identify differences in wavelength and amplitude.	Use data to show that a greater water wave height (amplitude) results in a greater force and more impact if it strikes shore or another object.
			1. For example: its frequency, amplitude, or wavelength			
MS-PS4-2 Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.	**SEP: Developing and Using Models** Develop and use a model to describe phenomena. **DCI: Wave Properties** A sound wave needs a medium through which it is transmitted. **DCI: Electromagnetic Radiation** When light shines on an object, it is reflected, absorbed, or transmitted through the object, depending on the object's material. The path that light travels can be traced as straight lines, except at surfaces between different transparent materials (e.g., air and water, air and glass) where the light path bends. **CCC: Structure and Function** Structures can be designed to serve particular functions by taking into account properties of different materials and how materials can be shaped and used.	Use observations to identify transparent, translucent, and opaque materials,[1] recognize that light can be reflected, absorbed, or transmitted, and that the behavior of light can be described using models in these instances.	Recognize that light travels through some objects and not others.	Use observations to identify transparent materials.	Use models to recognize that light can be reflected, absorbed, or transmitted (light passes through the object).	Use models to describe how light behaves when striking transparent, translucent, and opaque materials.[1]
			1. For example: A regular glass window is transparent, a plastic milk jug is translucent, and a solid door is opaque.			

HSA Alternate Science—Middle School						
Next Generation Science Standards		**Essence Statements**	**Performance-Level Descriptors**			
PE	**SEP / DCI / CCC**		**Well Below**	**Approaches**	**Meets**	**Exceeds**
MS-PS4-3 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.	**SEP: Obtaining, Evaluating, and Communicating Information** Integrate qualitative scientific and technical information in written text with that contained in media and visual displays to clarify claims and findings. **DCI: Information Technologies and Instrumentation** Digitized signals (sent as wave pulses) are a more reliable way to encode and transmit information. **CCC: Structure and Function** Structures can be designed to serve particular functions.	Identify examples[1] of and benefits of using digital technologies for communicating and evaluate the advantages and disadvantages of various means of communication.	Recognize different means of communicating information.	Identify examples of digital technologies used to communicate information.[1]	Identify a benefit of a digital technology used to communicate information.	Given a brief reading or scenario, evaluate advantages or disadvantages of various means of communication.
			1. For example: digital scale or thermometer, smartphone, audio recording			
Life Science: LS 1 From Molecules to Organisms: Structures and Processes ❖ A. Structure and Function ❖ B. Growth and Development of Organisms ❖ C. Organization for Matter and Energy Flow in Organisms ❖ D. Information Processing						
MS-LS1-1 Conduct an investigation to provide evidence that living things are made of cells: either one cell or many different numbers and types of cells.	**SEP: Planning and Carrying Out Investigations** Conduct an investigation to produce data to serve as the basis for evidence that meet the goals of an investigation. **DCI: Structure and Function** All living things are made up of cells, which are the smallest units that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular). **CCC: Scale, Proportion, and Quantity** Phenomena that can be observed at one scale may not be observable at another scale.	Recognize that the cell is the smallest living unit, that all living things have one or more cells, and that there are many different types of cells.[1]	Recognize living and nonliving things.	Recognize that the cell is the smallest living unit.	Recognize that all living things are made up of one or more cells.	Recognize that many organisms have many different types of cells.[1]
			1. Examples of types of cells include skin cells, blood cells, muscle cells, and brain cells.			

HSA Alternate Science—Middle School

Next Generation Science Standards		Essence Statements	Performance-Level Descriptors			
PE	**SEP / DCI / CCC**		**Well Below**	**Approaches**	**Meets**	**Exceeds**
MS-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.	**SEP: Developing and Using Models** Develop and use a model to describe phenomena. **DCI: Structure and Function** Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell. **CCC: Structure and Function** Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the relationships among their parts.	Identify that plant and animal cells are different and consist of several parts[1] which have different functions and use a model to describe the functions of the cell parts and how they contribute to the cell as a whole.[2]	Recognize the cell as the basic component of all living things.	Identify parts of a plant cell and/or animal cell.[1]	Identify the function of one or more of the following cell parts: nucleus, chloroplast, mitochondria, cell membrane, and cell wall.	Use a model to describe how the functions of the parts of a plant or animal cell contribute to the cell as a whole.[2]
			1. For example: nucleus, chloroplast, mitochondria, cell membrane, cell wall 2. The model can be a scenario like a school or a factory, etc.			
MS-LS1-3 Use argument supported by evidence for how the body is a system of interacting sub-systems composed of groups of cells.	**SEP: Engaging in Argument from Evidence** Use an oral and written argument supported by evidence to support or refute an explanation or a model for a phenomenon. **DCI: Structure and Function** In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions. **CCC: Systems and System Models** Systems may interact with other systems; they may have sub-systems and be a part of larger complex systems.	Identify that groups of cells form tissues that in turn form organs[1] and body systems and use models to demonstrate how organs are connected in major body systems.[3]	Recognize a major organ in the body.[1]	Recognize that organs have specialized functions.[2]	Identify that groups of cells create tissues. Tissues come together to create organs, and multiple organs create organ systems.	Use a model to demonstrate how organs are connected in major organ systems.[3]
			1. For example: brain, heart, lungs, stomach 2. For example: The heart pumps blood. 3. For example: circulatory, excretory, digestive, respiratory, muscular, or nervous systems			

HSA Alternate Science—Middle School						
Next Generation Science Standards		Essence Statements	Performance-Level Descriptors			
PE	SEP / DCI / CCC		Well Below	Approaches	Meets	Exceeds
MS-LS1-4 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.	**SEP: Engaging in Argument from Evidence** Use an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon. **DCI: Structure and Function; Growth and Development of Organisms** Animals engage in characteristic behaviors that increase the odds of reproduction. Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction. **CCC: Cause and Effect** Phenomena may have more than one cause, and some cause and effect relationships in systems can be described only by using probability.	Use observations to match structural adaptations or behaviors to survival and identify animal behaviors that further plant survival.	Recognize animal behaviors that contribute to their survival.	Match plant or animal structural adaptations to survival needs.	Use observations to match structural adaptations and/or behaviors to survival needs of plants and animals in an environment.	Read a short passage on animal behaviors that affect plant reproduction and identify the behavior that assists plants.
MS-LS1-5 Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.	**SEP: Constructing Explanations and Designing Solutions** Construct a scientific explanation based on evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do in the future. **DCI: Growth and Development of Organisms** Genetic factors as well as local conditions affect the growth of the adult plant. **CCC: Cause and Effect** Phenomena may have more than one cause, and some cause and effect relationships in systems can be described only using probability.	Identify the factors that can influence an individual organism's growth and use data to identify factors that lead to increases or decreases in potential growth.[1]	Recognize characteristics of an organism's habitat/ environment.	Identify environmental factors that can influence an organism's growth.	Use data to identify environmental factors that lead to optimum organism growth.[1]	Use data to explain an increase or decrease in an organism's potential growth in a specific environment.
			1. For example: availability of light, space, water, food, number of trees for camouflage and nest building, as well as species (type of animal or plant)			

HSA Alternate Science—Middle School						
Next Generation Science Standards		**Essence Statements**	**Performance-Level Descriptors**			
PE	**SEP / DCI / CCC**		**Well Below**	**Approaches**	**Meets**	**Exceeds**
MS-LS1-6 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.	**SEP: Constructing Explanations and Designing Solutions** Construct a scientific explanation based on evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do in the future. **DCI: Organization for Matter and Energy Flow in Organisms** Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use. **DCI: Energy in Chemical Processes and Everyday Life** The chemical reaction by which plants produce complex food molecules (sugars) requires an energy input (i.e., from sunlight) to occur. In this reaction, carbon dioxide and water combine to form carbon-based organic molecules and release oxygen. **CCC: Energy and Matter** Within a natural system, the transfer of energy drives the motion and/or cycling of matter.	Identify that light energy,[1] water, and carbon dioxide are necessary for plants to make food through a process called photosynthesis and explain the process of photosynthesis using models.	Recognize that plants need light and water to live.	Identify that light energy,[1] water, and carbon dioxide are necessary for plants to make food.	Explain that in photosynthesis, light energy[1] is used to combine carbon dioxide and water to produce oxygen, which is released, and food molecules (sugars), which can be used or stored by the plant.	Use a model to describe that the processes of photosynthesis is necessary for plant survival.
			1. Usually sunlight, but can include artificial light			

HSA Alternate Science—Middle School						
Next Generation Science Standards		**Essence Statements**	**Performance-Level Descriptors**			
PE	**SEP / DCI / CCC**		**Well Below**	**Approaches**	**Meets**	**Exceeds**
MS-LS1-7 Develop a model to describe how food is rearranged through chemical reactions, forming new molecules that support growth and/or release energy as this matter moves through an organism.	**SEP: Developing and Using Models** Develop a model to describe unobservable mechanisms. **DCI: Organization for Matter and Energy Flow in Organisms** Within individual organisms, food moves through a series of chemical reactions in which it is broken down and rearranged to form new molecules, to support growth, or to release energy. **DCI: Energy in Chemical Processes and Everyday Life** Cellular respiration in plants and animals involves chemical reactions with oxygen that release stored energy. In these processes, complex molecules containing carbon react with oxygen to produce carbon dioxide and other materials. **CCC: Energy and Matter** Matter is conserved because atoms are conserved in physical and chemical processes.	Identify that food molecules must be broken down during digestion to release energy and form new molecules which are useful to the organism[1] and that diet data can be used to explain differences in size between two organisms of the same species.[2] (Photosynthesis is covered in MS-LS1-6.)	Recognize that organisms eat to survive.	Identify that food must be broken down by chewing and digesting so that the nutrients can be absorbed by the organism.	Identify that food molecules are broken down and put back together during digestion to be useful to the organism.[1]	Use diet data to develop a possible explanation for why two organisms of the same species are different sizes.[2]
			1. For example: to support growth and/or release energy 2. Humans should not be used as examples.			
MS-LS1-8 Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.	**SEP: Obtaining, Evaluating, and Communicating Information** Gather, read, and synthesize information from multiple appropriate sources. Assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence. **DCI: Information Processing** Each sense receptor responds to different inputs, transmitting them as signals that travel along nerve cells to the brain. The signals are then processed in the brain, resulting in immediate behaviors or memories. **CCC: Cause and Effect** Cause and effect relationships may be used to predict phenomena in natural systems.	Identify the type of input received by the various senses and describe the process of that information being transmitted to the brain resulting in a response.	Recognize the five senses.	Identify the inputs each of the senses respond to.	Describe that information received by the senses is transmitted to the brain and leads to a memory and/or an immediate response.	Given a scenario that describes a response to a stimulus, explain the process behind the response.

HSA Alternate Science—Middle School						
Next Generation Science Standards		**Essence Statements**	**Performance-Level Descriptors**			
PE	**SEP / DCI / CCC**		**Well Below**	**Approaches**	**Meets**	**Exceeds**
Life Science: LS 2 Ecosystems: Interactions, Energy, and Dynamics ❖ A. Interdependent Relationships in Ecosystems ❖ B. Cycles of Matter and Energy Transfer in Ecosystems ❖ C. Ecosystem Dynamics, Functioning, and Resilience ❖ D. Social Interactions and Group Behavior						
MS-LS2-1 Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.	**SEP: Analyzing and Interpreting Data** Analyze and interpret data to provide evidence for phenomena. **DCI: Interdependent Relationships in Ecosystems** Organisms are dependent on their environmental interactions with other living things and with nonliving factors. In any ecosystem, organisms with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction. Growth of organisms and population increases are limited by access to resources. **CCC: Cause and Effect** Cause and effect relationships may be used to predict phenomena in natural or designed systems.	Identify factors in an ecosystem[1] that impact organisms, including factors that lead to population changes and how those population changes impact available resources.	Recognize an organism or environmental factor.[1]	Identify factors in an ecosystem that can impact an organism or a population of organisms.[2]	Identify whether a population increases or decreases as a result of a change in the ecosystem.	Use data to describe how the availability of resources in a habitat changes when a population changes.[3]
			1. For example: amount of food or rainfall 2. For example: presence of a predator or lack of rainfall 3. For example: more food, increased competition			
MS-LS2-2 Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.	**SEP: Constructing Explanations and Designing Solutions** Construct an explanation that includes qualitative or quantitative relationships between variables that predict phenomena. **DCI: Interdependent Relationships in Ecosystems** Predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions may become so interdependent that each organism requires the other for survival. Although the species involved in these interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared. **CCC: Patterns** Patterns can be used to identify cause and effect relationships.	Identify interactions[1] within and across ecosystems and use data showing cause-and-effect interactions[3] to predict the impact of a change in the population of a species.	Recognize an example of an organism interacting with its environment.[2]	Identify an interaction between two organisms within an ecosystem.	Describe interactions among organisms across multiple ecosystems.[3]	Describe patterns of interactions[1] to predict the impact of a change in the population of a species.
			1. Including those that are predatory, competitive, and mutually beneficial 2. For example: eating other organisms, drinking water, eating plants, using plants for shelter (nests, beaver dams, etc.), using the sun's warmth, etc. 3. For example: how a predatory, land-based animal interacts with prey in water ecosystems			

HSA Alternate Science—Middle School						
Next Generation Science Standards		Essence Statements	Performance-Level Descriptors			
PE	SEP / DCI / CCC		Well Below	Approaches	Meets	Exceeds
MS-LS2-3 Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.	**SEP: Developing and Using Models** Develop a model to describe phenomena. **DCI: Cycle of Matter and Energy Transfer in Ecosystems** Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem. The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem. **CCC: Energy and Matter** The transfer of energy can be tracked as energy flows through a natural system.	Complete a food web that includes common organisms to demonstrate the transfer of matter and energy in an ecosystem and use models to describe the interactions between living and nonliving parts of an ecosystem.	Recognize parts of a food web (producer, consumer, decomposer).	Complete a food web, given a set of common organisms.	Complete a food web showing the transfer of matter and/or energy between living organisms and nonliving parts of an ecosystem.	Develop a model to describe the transfer of matter and/or energy between living organisms and nonliving parts of an ecosystem.
MS-LS2-4 Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.	**SEP: Engaging in Argument from Evidence** Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. **DCI: Ecosystem Dynamics, Functioning, and Resilience** Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations. **CCC: Stability and Change** Small changes in one part of a system might cause large changes in another part.	Use data to determine the effect of limited resources on a population, recognize that changes to a physical or biological component of an ecosystem can lead to population shifts, and predict the impact of a change in the population or physical environment of an ecosystem.	Recognize an ecosystem.	Identify the biological and physical components of an ecosystem.	Use data to determine the effect on a population when a resource is limited due to environmental conditions.	Predict what would happen to the populations in an ecosystem when a new species is introduced, a predator is removed, or there is a physical change in the environment.

HSA Alternate Science—Middle School						
Next Generation Science Standards		Essence Statements	Performance-Level Descriptors			
PE	SEP / DCI / CCC		Well Below	Approaches	Meets	Exceeds
MS-LS2-5 Evaluate competing design solutions for maintaining biodiversity and ecosystem services.	**SEP: Engaging in Argument from Evidence** Evaluate competing design solutions based on jointly developed and agreed- upon design criteria. **DCI: Ecosystem Dynamics, Functioning, and Resilience** Biodiversity describes the variety of species found in Earth's terrestrial and oceanic ecosystems. The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health. **DCI: Biodiversity and Humans** Changes in biodiversity can influence humans' resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on—for example, water purification and recycling. *(Secondary)* **DCI: Developing Possible Solutions** There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. *(Secondary)* **CCC: Stability and Change** Small changes in one part of a system might cause large changes in another part.	DCI is addressed in MS-LS2-4.				

HSA Alternate Science—Middle School						
Next Generation Science Standards		Essence Statements	Performance-Level Descriptors			
PE	SEP / DCI / CCC		Well Below	Approaches	Meets	Exceeds
Life Science: LS 3 Heredity, Inheritance and Variation of Traits ❖ A. Inheritance of Traits ❖ B. Variation of Traits						
MS-LS3-1 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 an organism.	**SEP: Developing and Using Models** Develop and use a model to describe phenomena. **DCI: Inheritance of Traits** Genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes. Each distinct gene chiefly controls the production of specific proteins, which in turn affects the traits of the individual. Changes to genes can result in changes to proteins, which can affect the structures and functions of the organism and, thereby, change traits. **DCI: Variation of Traits** In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. Though rare, mutations may result in changes to the structure and function of proteins. Some changes are beneficial, others harmful, and some neutral to the organism. **CCC: Structure and Function** Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the composition and relationships among their parts; thus, complex systems can be analyzed to determine how they function.	Identify that genes guide the creation of needed proteins and that changes in the genes cause changes to proteins, which may result in a genetic mutation leading to the development of new traits.	Recognize a gene and the location of a gene.	Recognize that genes create proteins that the body needs.	Identify that changes to gene structures cause changes to the proteins that they create and may lead to the development of new traits that may be helpful or harmful.	Given a scenario, show that any variation in the structure and function of an organism is the result of a genetic mutation.

HSA Alternate Science—Middle School						
Next Generation Science Standards		Essence Statements	Performance-Level Descriptors			
PE	SEP / DCI / CCC		Well Below	Approaches	Meets	Exceeds
MS-LS3-2 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.	**SEP: Developing and Using Models** Develop and use a model to describe phenomena. **DCI: Growth and Development of Organisms** Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. *(Secondary)* **DCI: Inheritance of Traits** Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore, genes) inherited. **DCI: Variation of Traits** In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals have two of each chromosome and, hence, two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from each other. **CCC: Cause and Effect** Cause and effect relationships may be used to predict phenomena in natural systems.	Differentiate between sexual and asexual reproduction and use data or a model to explain trait variation among offspring.	Recognize that all living organisms reproduce.	Differentiate between asexual and sexual reproduction.	Use a model to describe how asexual reproduction differs from sexual reproduction.	Use data or a model to show why sexual reproduction leads to trait variation among offspring.

HSA Alternate Science—Middle School						
Next Generation Science Standards		**Essence Statements**	**Performance-Level Descriptors**			
PE	**SEP / DCI / CCC**		**Well Below**	**Approaches**	**Meets**	**Exceeds**
Life Science: LS 4 Biological Evolution: Unity and Diversity ❖ A. Evidence of Common Ancestry ❖ B. Natural Selection ❖ C. Adaptation ❖ D. Biodiversity and Humans						
MS-LS4-1 Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.	**SEP: Analyzing and Interpreting Data** Analyze and interpret data to determine similarities and differences in findings. **DCI: Evidence of Common Ancestry and Diversity** The collection of fossils and their placement in chronological order (e.g., through the location of the sedimentary layers in which they are found or through radioactive dating) is known as the fossil record. It documents the existence, diversity, extinction, and change of many life forms throughout the history of life on Earth. **CCC: Patterns** Graphs, charts, and images can be used to identify patterns in data.	Identify the relative age of a fossil based on its placement in a rock layer[1] and use fossil data to match present-day organisms to fossils or to explain how an organism changed over time.	Recognize a fossil.	Identify the relative age of fossils based on their location in rock layers.	Match a fossil to a similar organism found on Earth today or identify that organism as extinct.	Use patterns in fossil data or pictorial information to explain how an organism changed over time.
			1. Fossils found deeper are generally older than the ones found near the surface.			
MS-LS4-2 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.	**SEP: Constructing Explanations and Designing Solutions** Apply scientific ideas to construct an explanation for real-world phenomena, examples, or events. **DCI: Evidence of Common Ancestry and Diversity** Anatomical similarities and differences between various organisms living today, and between them and organisms in the fossil record, enable the reconstruction of evolutionary history and the inference of lines of evolutionary descent. **CCC: Patterns** Patterns can be used to identify cause and effect relationships.	Compare and contrast related modern day organisms with fossils and compare present-day organisms with fossils that have similar characteristics.	Recognize a trait or structure.[1]	Match a trait or structure of a living organism to a similar fossil.	Compare fossils with present-day organisms that have similar characteristics.	Compare and contrast similarities and differences among related modern organisms and with those in the fossil record.[2]
			2. Traits and structures include things such as a beak, a tail, wings, webbed feet, bones, thorns, and fins. 3. For example: ancient birds, an eagle, and a pigeon			

HSA Alternate Science—Middle School						
Next Generation Science Standards		**Essence Statements**	**Performance-Level Descriptors**			
PE	**SEP / DCI / CCC**		**Well Below**	**Approaches**	**Meets**	**Exceeds**
MS-LS4-3 Analyze displays of pictorial data to compare patterns of similarities in embryological development across multiple species to identify relationships not evident in the fully formed anatomy.	**SEP: Analyzing and Interpreting Data** Analyze displays of data to identify linear and nonlinear relationships. **DCI: Evidence of Common Ancestry and Diversity** Comparison of the embryological development of different species also reveals similarities that show relationships not evident in the fully formed anatomy. **CCC: Patterns** Graphs, charts, and images can be used to identify patterns in data.	This Performance Expectation will not be assessed at the middle school level.				
MS-LS4-4 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.	**SEP: Constructing Explanations and Designing Solutions** Construct an explanation that includes qualitative or quantitative relationships between variables that describe phenomena. **DCI: Natural Selection** Natural selection leads to the predominance of certain traits in a population and the suppression of others. **CCC: Cause and Effect** Phenomena may have more than one cause, and some cause and effect relationships in systems can be described only using probability.	Understand that certain traits help individuals survive and reproduce in a specific environment and use data showing trait variations to explain population changes in a specific environment.[2]	Recognize a trait.[1]	Identify a trait that helps individuals survive and reproduce in a specific environment.[2]	Explain that some traits help individuals in a population to survive and reproduce in a specific environment.[2]	Explain changes in the population size, given data showing a variation of traits within a population in a specific environment.[3]
			1. For example: speed, strength, size 2. For example: ability of a cactus to survive a drought better than a fern 3. The population size should change based on the trait.			

HSA Alternate Science—Middle School						
Next Generation Science Standards		**Essence Statements**	**Performance-Level Descriptors**			
PE	**SEP / DCI / CCC**		**Well Below**	**Approaches**	**Meets**	**Exceeds**
MS-LS4-5 Gather and synthesize information about technologies that have changed the way humans influence the inheritance of desired traits in organisms.	**SEP: Obtaining, Evaluating, and Communicating Information** Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence. **DCI: Natural Selection** In *artificial* selection, humans have the capacity to influence certain characteristics of organisms by selective breeding. One can choose desired parental traits determined by genes, which are then passed on to offspring. **CCC: Cause and Effect** Phenomena may have more than one cause, and some cause and effect relationships in systems can be described only using probability.	Identify desirable and undesirable traits in organisms and recognize that there are processes that allow humans to influence certain characteristics.	Recognize that traits are passed from an organism's parent to its offspring.	Identify the undesired and desired traits of an organism.[1]	Recognize selective breeding to be a process that allows the desirable traits to be chosen.	Given a brief passage, determine how a desired trait was acquired.
			1. For example: size, taste, color, resistance to disease			
MS-LS4-6 Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.	**SEP: Using Mathematics and Computational Thinking** Use mathematical representations to support scientific conclusions and design solutions. **DCI: Adaptation** Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. Traits that support successful survival and reproduction in the new environment become more common; those that do not become less common. Thus, the distribution of traits in a population changes. **CCC: Cause and Effect** Phenomena may have more than one cause, and some cause and effect relationships in systems can be described only using probability.	Contrast traits among plants or animals of the same species and use a description of an environment to predict whether a trait is likely to increase or decrease based on the survival of organisms with favorable traits.	Recognize the traits of an animal or plant.	Identify the differences in traits among members of the same animal or plant species.[1]	Given a description of an environment, determine whether a trait is likely to increase or decrease in a specific population over time.	Given data, predict future population size based on the survival of organisms with favorable traits.[2]
			1. For example: black, white, and gray mice 2. For example: faster predators or camouflaged prey			

HSA Alternate Science—Middle School						
Next Generation Science Standards		Essence Statements	Performance-Level Descriptors			
PE	SEP / DCI / CCC		Well Below	Approaches	Meets	Exceeds
Earth Space Science ESS 1 Earth's Place in the Universe ❖ A. The Universe and Its Stars ❖ B. Earth and the Solar System ❖ C. The History of Planet Earth						
MS-ESS1-1 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.	**SEP: Developing and Using Models** Develop and use a model to describe phenomena. **DCI: The Universe and Its Stars** Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models. **DCI: Earth and the Solar System** This model of the solar system can explain eclipses of the sun and the moon. Earth's spin axis is fixed in direction over the short term but tilted relative to its orbit around the sun. The seasons are a result of that tilt and are caused by the differential intensity of sunlight on different areas of Earth across the year. **CCC: Patterns** Patterns can be used to identify cause-and-effect relationships.	Identify day, night, and the four seasons using a model or diagram and relate these changes, as well as moon phases, to Earth's tilt, rotation and revolution around the sun.	Recognize the sun, Earth, and the moon in a model.	Identify day, night, and the four seasons using a model or diagram.	Use a model to identify Earth's seasons and relate them to Earth's tilt and revolution around the sun.	Use a model of the sun-moon system (including the motion of these objects if necessary) to explain day and night, seasons, and/or phases of the moon.
MS-ESS1-2 Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.	**SEP: Developing and Using Models** Develop and use a model to describe phenomena. **DCI: The Universe and Its Stars** Earth and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe. **DCI: Earth and the Solar System** The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them. The solar system appears to have formed from a disk of dust and gas, drawn together by gravity. **CCC: Systems and System Models** Models can be used to represent systems and their interactions.	Identify gravity as the attractive force that pulls objects in the solar system together and describe the movement of objects based on the gravitational force of the sun.	Recognize that the solar system consists of the sun, planets, and moons.	Identify gravity as the force that pulls objects in the solar system together.[1]	Describe the motions of objects in the solar system that occur due to the gravitational force of the sun.	Use a model to show that in addition to the gravitational force of the sun, each individual planet also has gravitational force.[2]
			1. For example: Dropped objects fall toward the ground. 2. For example: the motions of moons around the planets and the role of gravity in these motions			

HSA Alternate Science—Middle School						
Next Generation Science Standards		**Essence Statements**	**Performance-Level Descriptors**			
PE	**SEP / DCI / CCC**		**Well Below**	**Approaches**	**Meets**	**Exceeds**
MS-ESS1-3 Analyze and interpret data to determine scale properties of objects in the solar system.	**SEP: Analyzing and Interpreting Data** Analyze and interpret data to determine similarities and differences in findings. **DCI: Earth and the Solar System** The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them. **CCC: Scale, Proportion, and Quantity** Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.	Identify the location of the sun, Earth, and Earth's moon in the solar system and use data[1] to order the planets or compare properties of objects in the solar system at various scales.	Recognize that Earth is part of the solar system.	Locate the sun, Earth, and Earth's moon in a diagram of the solar system.	Use data to order the planets based on their size or distance from the sun.	Use data to compare and contrast objects[1] in the solar system.
			1. Properties include size of surface features, orbits, etc.			
MS-ESS1-4 Construct a scientific explanation based on evidence from rock strata for how the geologic timescale is used to organize Earth's 4 to 6- billion-year-old history.	**SEP: Constructing Explanations and Designing Solutions** Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do in the future. **DCI: The History of Planet Earth** The geologic time scale interpreted from rock strata provides a way to organize Earth's history. Analyses of rock strata and the fossil record provide only relative dates, not an absolute scale. **CCC: Scale, Proportion, and Quantity** Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.	Use fossils and rock layers as a way to organize Earth's history and use data to estimate a fossil's relative age based on its location in a column of rock layers.	Recognize rock layers and fossils.	Identify the youngest and oldest rock layers based on their positions in a column.	Identify the relative ages of fossils based on their locations in a column of rock layers.	Use data to estimate the age of a fossil in a rock layer.

HSA Alternate Science—Middle School						
Next Generation Science Standards		Essence Statements	Performance-Level Descriptors			
PE	SEP / DCI / CCC		Well Below	Approaches	Meets	Exceeds
Earth Space Science ESS 2 Earth Systems ✞ A. Earth Materials and Systems ✞ B. Plate Tectonics and Large-Scale System Interactions ✞ C. The Roles of Water in Earth's Surface Processes ✞ D. Weather and Climate ✞ E. Biogeology						
MS-ESS2-1 Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.	**SEP: Developing and Using Models** Develop and use a model to describe phenomena. **DCI: Earth's Materials and Systems** All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. This energy is derived from the sun and Earth's hot interior. The energy that flows and matter that cycles produce chemical and physical changes in Earth's materials and living organisms. **CCC: Stability and Change** Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and processes at different scales, including the atomic scale.	Identify the rock cycle and different types of rocks[3] and describe how heat from the Earth's core and the Sun powers Earth processes.[1]	Recognize Earth materials.[2]	Identify the rock cycle and different types of rocks.[3]	Describe how heat from Earth's core powers the rock cycle and how heat from the sun powers the weather systems leading to storms and erosion.	Use models to describe the importance of the heat from Earth's core or the sun's energy to drive Earth processes.
			1. Key Earth processes: the rock and water cycles, erosion, and deposition 2. Earth materials include minerals, rocks, soil, and water. 3. Types of rocks include sedimentary, igneous, and metamorphic.			
MS-ESS2-2 Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying times and spatial scales.	**SEP: Constructing Explanations and Designing Solutions** Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe nature operate today as they did in the past and will continue to do in the future. **DCI: Earth's Materials and Systems** The planet's systems interact over scales that range from microscopic to global in size, and they operate over fractions of a second to billions of years. These interactions have shaped Earth's history and will determine its future. **DCI: The Roles of Water in Earth's Surface Processes** Water's movements—both on the land and underground—cause weathering and erosion, which change the land's surface features and create underground formations. **CCC: Scale, Proportion, and Quantity** Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.	Recognize and classify slow and fast processes[1] that modify Earth's surface features, and describe the process that contributed to a change to Earth's surface when given a scenario.	Recognize that Earth's surface features change over time.	Classify processes as slow or fast.[1]	Recognize that surface processes such as erosion, movement of water, weathering, and the deposition of sediment can modify surface features, such as shorelines and mountains, or create new features, such as canyons.	Given a scenario, describe which process (weathering, erosion, or deposition) contributed to the change to Earth's surface.
			1. For example: erosion and weathering, landslides, and earthquakes			

HSA Alternate Science—Middle School						
Next Generation Science Standards		**Essence Statements**	**Performance-Level Descriptors**			
PE	**SEP / DCI / CCC**		**Well Below**	**Approaches**	**Meets**	**Exceeds**
MS-ESS2-3 Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of past plate motions.	**SEP: Analyzing and Interpreting Data** Analyze and interpret data to provide evidence for phenomena. **DCI: The History of the Planet Earth** Tectonic processes continually generate new ocean sea floor at ridges and destroy old sea floor at trenches. *(Secondary)* **DCI: Plate Tectonics and Large-Scale System Interactions** Maps of ancient land and water patterns, based on investigations of rocks and fossils, make clear how Earth's plates have moved great distances, collided, and spread apart. **CCC: Patterns** Patterns in rates of change and other numerical relationships can provide information about natural systems.	Use continent shapes, data, and fossil evidence to link plate movement to changes to Earth's surface such as earthquakes and mountain formation.	Recognize that Earth is divided into plates.	Identify plate movement and recognize how continent shapes fit together as evidence of plate motions.	Use data, usually pictorial information including maps, to link Earth changes such as mountain formation and earthquakes to the movement of Earth's plates.	Use fossil evidence to describe how continental and sea floor structures have changed over time.
MS-ESS2-4 Develop a model to describe the cycling of water though Earth's systems driven by energy from the sun and the force of gravity.	**SEP: Developing and Using Models** Develop a model to describe unobservable mechanisms. **DCI: The Roles of Water in Earth's Surface Processes** Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation, as well as downhill flows on land. Global movements of water and its changes in form are propelled by sunlight and gravity. **CCC: Energy and Matter** Within a natural or designed system, the transfer of energy drives the motion and/or cycling of matter.	Identify the parts of the water cycle and use models to explain the role of the sun in the cycling of water through Earth's systems.	Recognize bodies of water on Earth.	Identify the parts of the water cycle.	Use a model of the water cycle to explain the role of the sun in the water cycle.	Use a model of the water cycle to explain the cycling of water through Earth's systems.

HSA Alternate Science—Middle School						
Next Generation Science Standards		Essence Statements	Performance-Level Descriptors			
PE	SEP / DCI / CCC		Well Below	Approaches	Meets	Exceeds
MS-ESS2-5 Collect data to provide evidence for how the motions and complex interactions of air masses result in changes in weather conditions.	**SEP: Planning and Carrying Out Investigations** Collect data to produce data to serve as the basis for evidence to answer scientific questions or test design solutions under a range of conditions. **DCI: The Roles of Water in Earth's Surface Processes** The complex patterns of the changes and the movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns. **DCI: Weather and Climate** Because these patterns are so complex, weather can be predicted only probabilistically. **CCC: Cause and Effect** Cause and effect relationships may be used to predict phenomena in natural or designed systems.	Use objects, pictures, and data to identify local weather conditions and patterns and correlate changes in weather to the movement of air masses.	Recognize a weather condition.	Use objects and pictures to identify local weather conditions and patterns.	Use observational data, including data tables and graphs, to identify and describe weather conditions and/or to predict local weather patterns.	Use data to link the movement of air masses to changes in weather, including temperature, precipitation, and wind.
MS-ESS2-6 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.	**SEP: Developing and Using Models** Develop and use a model to describe phenomena. **DCI: The Roles of Water in Earth's Surface Processes** Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents. **DCI: Weather and Climate** Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns. The ocean exerts a major influence on weather and climate by absorbing energy from the sun, releasing it over time, and globally redistributing it through ocean currents. **CCC: Systems and System Models** Cause and effect relationships may be used to predict phenomena in natural or designed systems.	Match a climate to an area or region and describe how climate is influenced by location on Earth, the shape of the land, and distance from water.[1]	Recognize a feature of a climate.	Match a climate to an area or region.	Describe how climate in an area or region is influenced by location on Earth, the shape of the land, and distance from water.[1]	Use models to explain how climate is determined in an area or region.
			1. For example: latitude, elevation, shape of land, distance from water, global wind patterns			

HSA Alternate Science—Middle School						
Next Generation Science Standards		**Essence Statements**	**Performance-Level Descriptors**			
PE	**SEP / DCI / CCC**		**Well Below**	**Approaches**	**Meets**	**Exceeds**
Earth Space Science ESS 3 Earth and Human Activity ❖ A. Natural Resources ❖ B. Natural Hazards ❖ C. Human Impacts on Earth Systems ❖ D. Global Climate Change						
MS-ESS3-1 Construct a scientific explanation based on evidence for how the uneven distributions of Earth's minerals, energy, and groundwater resources are the result of past and current geoscience processes.	**SEP: Constructing Explanations and Designing Solutions** Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do in the future. **DCI: Natural Resources** Humans depend on Earth's land, oceans, atmosphere, and biosphere for many different resources. Minerals, fresh water, and biosphere resources are limited, and many are not renewable or replaceable over human lifetimes. These resources are distributed unevenly around the planet as a result of past geologic processes. **CCC: Cause and Effect** Cause and effect relationships may be used to predict phenomena in natural or designed systems.	Identify the source of a natural resource,[1] that some resources are not renewable, and that using non-renewable resources will decrease their availability for future use.	Recognize a natural resource.[1]	Identify the source of natural resources used in daily life.	Use data to show that specific resources are limited.	Describe how the use of nonrenewable resources changes how much of the resources remain for future use.
			1. For example: water, food, metals, and fuel for vehicles			
MS-ESS3-2 Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.	**SEP: Analyzing and Interpreting Data** Analyze and interpret data to determine similarities and differences in findings. **DCI: Natural Hazards** Mapping the history of natural hazards in a region, combined with an understanding of related geologic forces, can help forecast the locations and likelihoods of future events. **CCC: Patterns** Graphs, charts, and images can be used to identify patterns in data.	Identify natural hazards[1] and classify them as predictable or not predictable and use data to describe the effect of a natural hazard[2] or identify a safety measure to mitigate the effect of the hazard.	Recognize examples of a natural hazard.	Identify locally relevant natural hazards.[2]	Classify natural hazards as predictable or not yet predictable.	Use data (graphical or numerical) to describe the effect of a natural hazard and/or associate a technology/safety measure with a given natural hazard to mitigate its effect.
			1. Natural hazards include volcanic eruptions, earthquakes, tsunamis, severe weather, hurricanes, tornadoes, landslides, floods, and forest fires. 2. In Hawai'i's case, these include hurricanes, tsunamis, king tides, flash flooding, and lava flows.			

HSA Alternate Science—Middle School						
Next Generation Science Standards		Essence Statements	Performance-Level Descriptors			
PE	SEP / DCI / CCC		Well Below	Approaches	Meets	Exceeds
MS-ESS3-3 Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.	**SEP: Constructing Explanations and Designing Solutions** Apply scientific principles to design an object, tool, process, or system. **DCI: Earth and Human Activity; Human Impacts on Earth Systems** Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things. Typically, as human populations and consumption of natural resources increase, so do the negative impacts on Earth, unless the activities and technologies involved are engineered otherwise. **CCC: Cause and Effect** Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation.	Identify ways in which human activity can alter the environment and determine solutions to environmental problems caused by human activity.	Recognize the needs of organisms in a specific environment.	Identify human actions that can alter the environment.	Match human activities with their effect on Earth.	Given a scenario, determine a way to solve an environmental problem caused by human activity.
MS-ESS3-4 Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.	**SEP: Engaging in Argument from Evidence** Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. **DCI: Human Impacts on Earth Systems** Typically, as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth, unless the activities and technologies involved are engineered otherwise. **CCC: Cause and Effect** Cause and effect relationships may be used to predict phenomena in natural or designed systems.	Recognize resources that humans need for survival, identify human activities that use resources, and predict the effect of increasing human populations on an environment.	Recognize resources that humans need to survive.	Describe ways in which human activity uses natural resources.	Use evidence to link an environmental change to human population increase.	Predict the effect of human population increase on an environment.

HSA Alternate Science—Middle School						
Next Generation Science Standards		**Essence Statements**	**Performance-Level Descriptors**			
PE	**SEP / DCI / CCC**		**Well Below**	**Approaches**	**Meets**	**Exceeds**
MS-ESS3-5 Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.	**SEP: Asking Questions and Defining Problems** Ask questions to identify and clarify evidence of an argument. **DCI: Global Climate Change** Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the current rise in Earth's mean surface temperature (global warming). Reducing the level of climate change and reducing human vulnerability to whatever climate changes do occur depend on the understanding of climate science, engineering capabilities, and other kinds of knowledge, such as understanding of human behavior, and on applying that knowledge wisely in decisions and activities. **DCI: Stability and Change** Stability might be disturbed either by sudden events or gradual changes that accumulate over time.	Match human activity to factors causing gradual temperature changes, identify questions that could be answered using temperature data, and identify how rising temperatures could impact Hawai'i or other coastal areas.	Recognize human activities that have an impact on the environment.	Match human activities to possible factors causing gradual temperature changes.	Identify a question[1] that could be answered using data that depicts rising temperatures over the last 100 years.	Identify ways in which rising temperatures could have an impact on Hawai'i.
			1. For example: How might weather change? How much warmer would winter be?			

HSA Alternate Science—High School						
Next Generation Science Standards		**Essence Statements**	**Performance-Level Descriptors**			
PE	**SEP / DCI / CCC**		**Well Below**	**Approaches**	**Meets**	**Exceeds**
Life Science: LS 1 From Molecules to Organisms: Structures and Processes ❖ A. Structure and Function ❖ B. Growth and Development of Organisms ❖ C. Organization for Matter and Energy Flow in Organisms ❖ D. Information Processing						
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.	**SEP: Constructing Explanations and Designing Solutions** Construct an explanation based on valid and reliable evidence. **DCI: Structure and Function** Systems of specialized cells within organisms help them perform essential functions. All cells contain genetic information in the form of DNA molecules. **CCC: Structure and Function** Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem.	Recognize that the nucleus of a cell contains DNA which is the genetic code that creates the proteins that determine a cell's function, including the specialized cells that make up body tissues.	Recognize that living things are made up of cells.	Identify the nucleus, and the DNA it contains, as a cell's control center that determines the function of a cell.	Identify that the DNA (nucleic acids) in a cell's nucleus is the genetic code that creates proteins that determine a cell's function.	Identify that body tissues are specialized cells with similar functions.[1]
			1. For example: skin cells, muscle cells, brain cells			
HS-LS1-2 (W) Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.	**SEP: Developing and Using Models** Use a model to illustrate the relationships between systems or between components of a system. **DCI: Structure and Function** Multicellular organisms have a hierarchical structural organization in which any one system is made up of numerous parts and is itself a component of the next level. **CCC: Systems and System Models** Models (e.g., physical, computer) can be used to simulate systems.	Identify a major organ, its function in a body system,[1] and explain how body systems work together to maintain life.	Recognize a body system.[1]	Identify a major organ in a body system[1] and the organ's function.	Identify the function of a body system,[1] its major organ(s), and another system with which it interacts to maintain life.	Use models to explain how two body systems[1] work together to maintain life.
			1. The skeletal, muscular, nervous, respiratory, circulatory, and digestive systems are included here.			

HSA Alternate Science—High School						
Next Generation Science Standards		**Essence Statements**	**Performance-Level Descriptors**			
PE	**SEP / DCI / CCC**		**Well Below**	**Approaches**	**Meets**	**Exceeds**
HS-LS1-3 (W) Plan and conduct investigations to provide evidence that feedback mechanisms maintain homeostasis.	**SEP: Planning and Carrying Out Investigations** Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly. **DCI: Structure and Function** Feedback mechanisms maintain a living system's internal conditions within certain limits, allowing it to remain alive and functional. **CCC: Stability and Change** Feedback (negative or positive) can stabilize or destabilize a system.	Identify the body's reactions to stimuli, use data[3] to identify changes in body systems during physical activity, and sequence steps to show an organism's reactions to stimuli.[5]	Recognize stimuli that lead to reactions in a living system.[1]	Identify ways the body reacts to stimuli to maintain homeostasis.[2]	Use data[3] to identify changes in body systems during exercise or other activities.[4]	Identify the correct sequence of steps necessary in an investigation to show how an organism reacts to stimuli.[5]
			1. For example: temperature, amount of light present, sounds, and smells 2. For example: sweating when hot, increasing heart rate and breathing during exercise, pupils reacting to light 3. Data may be in graphical or tabular form. 4. Graphs should show the body's response and a return to homeostasis. 5. For example: eye reacting to light, heart or lungs reacting to exercise			
HS-LS1-4 Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.	**SEP: Developing and Using Models** Use a model to illustrate the relationships between systems or between components of a system. **DCI: Growth and Development of Organisms** In organisms, individual cells grow and then divide via a process called mitosis, thus allowing the organism to grow. The organism begins as a single cell (fertilized egg) that divides successively to produce many cells. Cellular division and differentiation produce and maintain a complex organism. **CCC: Systems and System Models** Models (e.g., physical, computer models) can be used to simulate systems.	Identify and use a model to illustrate the cellular division process and explain how cellular division[1] contributes to an organism's development.	Recognize that cells divide.	Identify a model of the cell division process.	Use a model to explain what happens during cell division.	Use a model to explain role of cellular division[1] in the growth and development of the organism.
			1. Note: the focus is on mitosis			

HSA Alternate Science—High School						
Next Generation Science Standards		**Essence Statements**	**Performance-Level Descriptors**			
PE	**SEP / DCI / CCC**		**Well Below**	**Approaches**	**Meets**	**Exceeds**
HS-LS1-5 (W) Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.	**SEP: Developing and Using Models** The process of photosynthesis converts light energy to stored chemical energy by converting carbon dioxide and water into sugars plus released oxygen. **DCI: Organization for Matter and Energy Flow in Organisms** The process of photosynthesis converts light energy to stored chemical energy by converting carbon dioxide and water into sugars plus released oxygen. **CCC: Energy and Matter** Changes of energy and matter in a system can be described in terms of energy and matter flowing into, out of, and within that system.	Identify the purpose, inputs,[1] and outputs[2] of photosynthesis and use a model to explain photosynthesis.[3]	Recognize that plants make their own food with energy from the sun.	Identify the purpose of photosynthesis.	Identify what a plant uses[1] and what a plant produces[2] during photosynthesis.[3]	Use a model[3] (words, pictures, etc.) to explain the overall process of photosynthesis.
			1. For example: light, carbon dioxide, and water 2. For example: sugar molecules and oxygen 3. For example: Fill in the missing part of the model.			
HS-LS1-6 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.	**SEP: Constructing Explanations and Designing Solutions** Construct an explanation based on valid and reliable evidence. **DCI: Organization for Matter and Energy Flow in Organisms** Sugar molecules contain carbon, hydrogen, and oxygen: their hydrocarbon backbones are used to make amino acids and other carbon-based molecules that can be assembled into larger molecules (such as proteins or DNA), used, for example, to form new cells. As matter and energy flow through different organizational levels of living systems, chemical elements are recombined in different ways to form different products. **CCC: Energy and Matter** Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system.	Identify sugar molecules as carbohydrates and describe the process of converting the molecules in sugar into other new molecules.[1]	Recognize that plants and animals rely on sugar molecules to create other molecules necessary for survival.	Identify sugars as carbohydrates containing carbon, hydrogen, and oxygen.	Confirm or revise a description of the process of creating other molecules from sugar molecules.	Explain how the elements that make up sugar molecules can be used to form other molecules.[1]
			1. For example: amino acids, DNA, nucleic acids, proteins			

HSA Alternate Science—High School						
Next Generation Science Standards		**Essence Statements**	**Performance-Level Descriptors**			
PE	**SEP / DCI / CCC**		**Well Below**	**Approaches**	**Meets**	**Exceeds**
HS-LS1-7 Use a model to illustrate that cellular respiration is a chemical process that results in the bonds of food molecules and oxygen molecules being broken and the bonds in new compounds being formed, resulting in a net transfer of energy.	**SEP: Developing and Using Models** Use a model based on evidence to illustrate the relationships between systems or between components of a system. **DCI: Organization for Matter and Energy Flow in Organisms** As matter and energy flow through different organizational levels of living systems, chemical elements are recombined in different ways to form different products. Because of these chemical reactions, energy is transferred from one system of interacting molecules to another. Cellular respiration is a chemical process in which the bonds of food molecules and oxygen molecules are broken, and new compounds are formed that can transport energy to muscles. Cellular respiration also releases the energy needed to maintain body temperature despite ongoing energy. **CCC: Energy and Matter** Energy cannot be created or destroyed; it only moves between one place and another place, between objects and/or fields, or between systems.	Identify the molecules involved in cellular respiration[1] and use models to illustrate the inputs and outputs, including energy, of the cellular respiration process.	Recognize that cells convert food molecules into energy.[1]	Identify the molecules that are involved in cellular respiration.[1]	Use a model of cellular respiration to illustrate the inputs and outputs, including energy, of the process.	Given a model, describe how food and oxygen molecules are used in the process of cellular respiration.
			1. Note: Cellular respiration takes place in the cells of plants, animals, and other living things. It involves sugars and oxygen and releases energy, carbon dioxide, and water.			

HSA Alternate Science—High School						
Next Generation Science Standards		Essence Statements	Performance-Level Descriptors			
PE	SEP / DCI / CCC		Well Below	Approaches	Meets	Exceeds
Life Science: LS 2 Ecosystems: Interactions, Energy, and Dynamics ❖ A. Interdependent Relationships in Ecosystems ❖ B. Cycles of Matter and Energy Transfer in Ecosystems ❖ C. Ecosystem Dynamics, Functioning, and Resilience ❖ D. Social Interactions and Group Behavior						
HS-LS2-1 Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.	**SEP: Using Mathematics and Computational Thinking** Use mathematical and/or computational representations of phenomena or design solutions to support explanations. **DCI: Interdependent Relationships in Ecosystems** Ecosystems have carrying capacities, which limit the numbers of organisms and populations they can support. These limits result from such factors as the availability of living and nonliving resources and from such challenges such as predation, competition, and disease. Organisms would have the capacity to produce populations of great size were it not for the fact that environments and resources are finite. This fundamental tension affects the abundance (number of individuals) of species in any given ecosystem. **CCC: Scale, Proportion and Quantity; Stability and Change** The significance of a phenomenon is dependent on the scale, proportion, and quantity at which it occurs.	Identify factors that could affect equilibrium within an ecosystem,[1] use data to determine whether available food can sustain a population, and describe changes in a population or a resource in an ecosystem.	Recognize the organisms that interact in a specific ecosystem.	Identify the factor(s) that could affect the equilibrium in an ecosystem.[1]	Use data to determine whether the food supply present in an ecosystem can sustain a specified increase in the populations eating that particular food.	Use data (including graphical representations) to describe a change in the population of an organism or a change in the resources found in a specific ecosystem.
			1. For example: population increases or decreases, immigration/emigration, invasive species			

HSA Alternate Science—High School						
Next Generation Science Standards		Essence Statements	Performance-Level Descriptors			
PE	SEP / DCI / CCC		Well Below	Approaches	Meets	Exceeds
HS-LS2-2 (W) Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.	**SEP: Using Mathematics and Computational Thinking** Use mathematical representations of phenomena or design solutions to support and revise explanations. **DCI: Interdependent Relationships in Ecosystems** Ecosystems have carrying capacities, limit the numbers of organisms and populations they can support. These limits result from such factors as the availability of resources and from such challenges such as predation, competition, and disease. Organisms would have the capacity to produce populations of great size were it not for the fact that environments and resources are finite. This fundamental tension affects the abundance of species in any given ecosystem. Interactions within an ecosystem can keep its numbers and types of organisms relatively constant under stable conditions. If a modest disturbance to an ecosystem occurs, it may return more or less to its original status. Extreme fluctuations in conditions can challenge the functioning of ecosystems. **DCI: Ecosystem Dynamics, Functioning, and Resilience** A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. If a modest biological or physical disturbance to an ecosystem occurs, it may return to its original status (i.e., the ecosystem is resilient), as opposed to becoming a very different ecosystem. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability. **CCC: Scale, Proportion and Quantity** Using the concept of orders of magnitude allows one to understand how a model at one scale relates to a model at another scale.	Identify the interdependence of organisms and use data[1] to explain patterns and trends between a population and the availability of resources.	Recognize the needs of a common plant or animal.	Identify the interdependence of two or more organisms in an ecosystem.	Use data[1] to explain the patterns and/or trends between population size and the availability of resources.	Given a graphical representation of data, predict the change in the size of a population as another environmental factor changes.
			1. Note: Data may be in the form of tables or graphs.			

HSA Alternate Science—High School						
Next Generation Science Standards		Essence Statements	Performance-Level Descriptors			
PE	SEP / DCI / CCC		Well Below	Approaches	Meets	Exceeds
HS-LS2-3 Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.	**SEP: Constructing Explanations and Designing Solutions** Construct an explanation based on valid and reliable evidence. **DCI: Cycles of Matter and Energy Transfer in Ecosystems** Photosynthesis and cellular respiration (including anaerobic processes) provide most of the energy for life processes **CCC: Energy and Matter** Energy drives the cycling of matter within and between systems	DCI and CCC are covered through HS-LS2.4, where SEP is more appropriate. Aerobic and anaerobic are unnecessary complications for this group of students.				
HS-LS2-4 Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.	**SEP: Using Mathematics and Computational Thinking** Use mathematical representations of phenomena or design solutions to support claims. **DCI: Cycles of Matter and Energy Transfer in Ecosystems** Plants are in the lowest level of the food web. At each link upward in a food web, only a small fraction of the matter consumed at the lower level is transferred upward. Therefore, there are generally fewer organisms at higher levels of a food web. The matter (chemical elements) passes through food webs and into and out of the atmosphere and soil. At each link in an ecosystem, matter and energy are conserved. **CCC: Energy and Matter** Energy cannot be created or destroyed; it only moves between one place and another place.	Identify the types of matter[1] and energy that move through a food web using diagrams and explain why producers outnumber consumers in an ecosystem.	Recognize that matter and energy move through a food chain.	Identify the types[1] of matter and energy that move through an ecosystem.	Diagram the movement of matter and energy through a food web (ecosystem).	Given an example of a food web, explain why there are more producers than consumers in an ecosystem.
			1. For example: oxygen, carbon dioxide, food			

HSA Alternate Science—High School						
Next Generation Science Standards		**Essence Statements**	**Performance-Level Descriptors**			
PE	**SEP / DCI / CCC**		**Well Below**	**Approaches**	**Meets**	**Exceeds**
HS-LS2-5 Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere	**SEP: Developing and Using Models** Develop a model based on evidence to illustrate the relationships between systems or components of a system. **DCI: Cycles of Matter and Energy Transfer in Ecosystems; Energy in Chemical Processes** Photosynthesis and cellular respiration are important components of the carbon cycle. The main way that solar energy is captured and stored on Earth is through the process of photosynthesis. **CCC: Systems and System Models** Models (e.g., physical, mathematical, computer) can be used to simulate systems and interactions—including energy, matter and information flows— within and between systems.	Identify the relationship between the inputs and outputs[1] of photosynthesis and cellular respiration in plants, and use a model to link them to the carbon cycle.	Recognize what a plant needs to make its own food.	Identify the purpose/ importance of photosynthesis and cellular respiration to plants.	Identify that the outputs of photosynthesis are the inputs of cellular respiration, and the outputs of respiration are the inputs of photosynthesis.	Use a model to describe the link between photosynthesis and cellular respiration in the carbon cycle.
			1. Inputs and Outputs are addressed in HS-LS1-5 and HS-LS1-7			
HS-LS2-6 (W) Evaluate 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.	**SEP: Engaging in Argument from Evidence** Evaluate the claims, evidence, and reasoning behind currently accepted explanations or solutions to determine the merits of arguments. **DCI: Ecosystem Dynamics, Functioning, and Resilience** A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient), as opposed to becoming a very different ecosystem. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability. **CCC: Stability and Change** Science deals with constructing explanations of how things change and how they remain stable.	Identify and classify natural and human-initiated changes in the physical environment and how those changes could affect the environment and the populations in an ecosystem.	Recognize a nonliving factor in an ecosystem.	Identify how a nonliving factor affects and changes a population.[1]	Identify and/or classify natural and human-initiated changes in the physical environment that could affect a population.	Describe how a change[2] can affect the physical and biological environment, and in turn, affect the populations in an ecosystem.
			1. For example: sunlight, water, soil 2. For example: lack of rainfall, a landslide, cutting down trees, water diversion			

HSA Alternate Science—High School						
Next Generation Science Standards		Essence Statements	Performance-Level Descriptors			
PE	SEP / DCI / CCC		Well Below	Approaches	Meets	Exceeds
HS-LS2-7 (W) Design, evaluate, and refine a solution for reducing the impact of human activities on the environment and biodiversity.	**SEP: Constructing Explanations and Designing Solutions** Design and refine a solution to a real-world problem based on scientific knowledge, student-generated sources of evidence, and tradeoff considerations. **DCI: Ecosystem Dynamics Functioning and Resilience; Biodiversity and Humans; Developing Possible Solutions** Changes induced by human activity in the environment—including habitat destruction, pollution, introduction of invasive species, overexploitation, and climate change—can disrupt an ecosystem and threaten the survival of some species. Humans depend on the living world for the resources and other benefits provided by biodiversity. **CCC: Stability and Change** Much of science deals with constructing explanations of how things change and how they remain stable.	Match human activities with positive and negative effects on Earth and identify solutions that reduce the negative impacts of human activities.	Recognize human activities that can be harmful to Earth.	Identify human activities that can be harmful to Earth and match the human activity with its effect on Earth.	Identify human activities that can have a negative effect on Earth and then identify a solution that reduces their impact on the environment.	Describe a solution to reduce the impact of human activities on the environment.
HS-LS2-8 (W) Evaluate evidence for the role of group behavior on individuals' and species' chances to survive and reproduce.	**SEP: Engaging in Argument from Evidence** Evaluate the evidence behind currently accepted explanations to determine the merits of arguments. **DCI: Social Interactions and Group Behavior** Group behavior has evolved because membership can increase the chances of survival for individuals and their genetic relatives. **CCC: Cause and Effect** Evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.	Identify and describe group behaviors that increase an animal's chances of survival, and use data[1] to show the positive impact of group behavior.	Recognize potential threats to a population of animals.	Identify a group behavior that helps an animal species survive.	Given a group behavior, describe how that behavior helps individuals and species to survive and reproduce.[2]	Use data[1] to illustrate the positive impact of group behavior on an animal species.
			1. Data may be pictorial, graphical, or information presented in tables. 2. Notes: examples may include communications between dolphins, colonies of bees, schools of fish, cooperative behavior of wolves.			

HSA Alternate Science—High School						
Next Generation Science Standards		Essence Statements	Performance-Level Descriptors			
PE	SEP / DCI / CCC		Well Below	Approaches	Meets	Exceeds
Life Science: LS 3 Heredity, Inheritance and Variation of Traits ❖ A. Inheritance of Traits ❖ B. Variation of Traits						
HS-LS3-1 (W) Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.	**SEP: Asking Questions and Defining Problems** Ask questions that arise from examining models or a theory to clarify relationships. **DCI: Structure and Function; Inheritance of Trait** All cells contain genetic information in the form of DNA molecules. The instructions for forming species' characteristics are carried in DNA. **CCC: Cause and Effect** Evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.	Identify the function of chromosomes, describe how DNA passes traits from one generation to the next, and describe how changes in DNA can impact offspring.	Recognize the traits (characteristics) of an organism.	Identify chromosomes, which are made up of DNA containing genes, as a set of instructions (code) that determine traits (characteristics).	Describe how traits (characteristics) are passed from one generation to the next through DNA containing genes.	Describe how changes in DNA can result in changed traits in the offspring.
HS-LS3-2 (W) 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.	**SEP: Engaging in Argument from Evidence** Make and defend a claim based on evidence about the natural world that reflects scientific knowledge and student-generated evidence. **DCI: Variation of Traits** In sexual reproduction, chromosomes can sometimes swap sections during the process of meiosis (cell division), thereby creating new genetic combinations and, thus, more genetic variation. Environmental factors also affect expression of traits, and hence affect the probability of occurrences of traits in a population. **CCC: Cause and Effect** Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.	Identify factors that cause genetic variation[1] and explain why reproduction may or may not result in offspring with different traits.	Recognize that traits are determined by genetic information that is in the chromosomes.	Identify a reason that two offspring can have different characteristics even though they have the same parents.	Identify the causes of genetic variation.[1]	Given a scenario, explain why reproduction may or may not result in offspring with different traits.
			1. Examples of genetic variation include: genetic combinations as a result of meiosis, DNA replication errors, or mutations caused by environmental factors.			

HSA Alternate Science—High School						
Next Generation Science Standards		Essence Statements	Performance-Level Descriptors			
PE	SEP / DCI / CCC		Well Below	Approaches	Meets	Exceeds
HS-LS3-3 Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.	**SEP: Analyzing and Interpreting Data; Engaging in Argument from Evidence** Apply concepts of statistics and probability to scientific and engineering questions and problems, using digital tools when feasible. **DCI: Variation of Traits** Environmental factors also affect expression of traits and, hence, affect the probability of occurrences of traits in a population. Thus, the variation and distribution of traits observed depends on both genetic and environmental factors. **CCC: Scale, Proportion, and Quantity** Algebraic thinking is used to examine scientific data and predict the effect of a change in one variable on another (e.g., linear growth vs. exponential growth).	Covered through HS-LS3-2, where the SEP is more appropriate.				
Life Science: LS 4 Biological Evolution: Unity and Diversity ❖ A. Evidence of Common Ancestry ❖ B. Natural Selection ❖ C. Adaptation ❖ D. Biodiversity and Humans						
HS-LS4-1 (W) Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.	**SEP: Obtaining, Evaluating, and Communicating Information** Communicate scientific information (e.g., about phenomena and/or the process of development and the design and performance of a proposed process or system) in multiple formats (including orally, graphically, textually, and mathematically). **DCI: Evidence of Common Ancestry and Diversity** Genetic information, like the fossil record, provides evidence of evolution. DNA sequences vary among species. Lines of descent can be inferred by comparing the DNA sequences of different organisms. **CCC: Patterns** Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena.	Recognize a fossil and a present-day organism with similar structures[1] and use multiple ways to determine ancestry[2] and the development pattern from the fossil to the present-day organism.	Recognize two present-day species of organisms that have similar anatomical structures.[1]	Identify a fossil organism and a present-day organism that have similar anatomical structures.	Identify multiple ways to determine the ancestry of an organism.[2]	Using data,[3] determine the evolved development pattern from a fossil to a present-day organism.
			1. For example: pigeons and myna birds, cows and horses 2. For example: fossils or DNA sequence 3. Data includes descriptions or pictures.			

HSA Alternate Science—High School						
Next Generation Science Standards		**Essence Statements**	**Performance-Level Descriptors**			
PE	**SEP / DCI / CCC**		**Well Below**	**Approaches**	**Meets**	**Exceeds**
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.	**SEP: Constructing Explanations and Designing Solutions** Construct an explanation based on valid and reliable evidence. **DCI: Natural Selection; Adaptation** Natural selection occurs only if (1) there is both variation in the genetic information between organisms in a population and (2) there is trait variation that leads to differences in performance among individuals. Evolution is a consequence of the interaction of four factors: (1) the potential for a species to increase in number, (2) the genetic variation of individuals in a species, (3) competition for an environment's limited supply of the resources, and (4) the ensuing proliferation of those organisms that are better able to survive and reproduce in that environment. **CCC: Cause and Effect** Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.	Identify that evolution results in new characteristics, determine why an adaptation occurred within a species,[3] and describe an adaptation that a species may develop and pass on.	Recognize evolution as a process that results in the development of beneficial characteristics in species.	Identify that evolution results in the development of new characteristics in species that increase the chances of survival.	Determine which factor[1] resulted in a specific adaptation within a species.	Given a scenario,[2] describe an adaptation that a specific species may develop and pass on to future generations.

1. For example: an inherited genetic variation, limited resources, organisms that were more fit to survive in an environment
2. For example: limited resources
3. As an environment changes from hot to cold, individuals with thicker coats will survive to reproduce while those with thinner coats will die off, making it more likely that the thicker coated individuals are reproducing.

HSA Alternate Science—High School						
Next Generation Science Standards		**Essence Statements**	**Performance-Level Descriptors**			
PE	**SEP / DCI / CCC**		**Well Below**	**Approaches**	**Meets**	**Exceeds**
HS-LS4-3 (W) 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.	**SEP: Analyzing and Interpreting Data** Apply concepts of statistics and probability (including determining function fits to data, slope, intercept, and correlation coefficient for linear fits) to scientific and engineering questions and problems, using digital tools when feasible. **DCI: Natural Selection; Adaptation** The traits that positively affect survival are more likely to be reproduced and, thus, are more common in the population. Natural selection leads to a population dominated by organisms that are anatomically, behaviorally, and physiologically well suited to survive in a specific environment. Adaptation also means that the distribution of traits in a population can change when conditions change. **CCC: Patterns** Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena.	Identify an advantageous trait, describe why some organisms will likely survive better than other organisms in an environment,[1] and use data[2] to explain why organisms exhibiting an advantageous trait increase over time.	Recognize that some organisms survive better than others in given environments.	Identify an advantageous inheritable trait.	Given a scenario of similar organisms with different traits, explain why an organism will likely survive in a given environment.[1]	Use data[2] to explain why there is an increase of individual organisms exhibiting an advantageous trait over time.
			1. For example: birds with different-shaped beaks trying to eat insects 2. Data may be pictorial, graphical, or tabular.			
HS-LS4-4 (W) Construct an explanation based on evidence for how natural selection leads to adaptation of populations.	**SEP: Constructing Explanations and Designing Solutions** Construct an explanation based on valid and reliable evidence. **DCI: Adaptation** Natural selection leads to adaptation in a population of organisms, well suited to survive in a specific environment. That is, the differential survival and reproduction of organisms in a population that have an advantageous heritable trait leads to an increase in the proportion of individuals in future generations that have the trait and to a decrease in the proportion of individuals that do not. **CCC: Cause and Effect** Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.	Explain why organisms with beneficial traits are more likely to survive and describe how some organisms within a population become better adapted over time.	Recognize a trait.	Identify a trait that would give an organism a better chance of survival in a specific environment.	Explain why organisms with beneficial traits are more likely to survive and reproduce.	Describe how populations become better adapted in a specific environment over time.

HSA Alternate Science—High School						
Next Generation Science Standards		Essence Statements	Performance-Level Descriptors			
PE	SEP / DCI / CCC		Well Below	Approaches	Meets	Exceeds
HS-LS4-5 (W) 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.	**SEP: Engaging in Argument from Evidence** Evaluate the evidence behind currently accepted explanations or solutions to determine the merits of arguments. **DCI: Adaptation** Changes in the physical environment have contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline—and sometimes the extinction—of some species. Species become extinct because they can no longer survive and reproduce in their altered environment. **CCC: Cause and Effect** Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.	Identify that environmental changes[1] may lead to changes in the population of organisms and predict what will happen to a species over time as a result of an environmental change.	Recognize the survival needs of the organisms in a specific environment.	Identify a gradual change in an environment.[1]	Realize that a change in the environment may result in changes in the population of organisms or the emergence of a new species.	Predict what will happen to specific species over time based on an environmental change.
			1. For example: deforestation, fishing, fertilizer application, drought, or flood			
HS-LS4-6 (W) Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.	**SEP: Using Mathematics and Computational Thinking** Create or revise a simulation of a phenomenon, designed device, process, or system. **DCI: Adaptation; Biodiversity and Humans** Changes in the physical environment have contributed to the expansion of some species, the emergence of new species as populations diverge, and the decline and sometimes the extinction of some species. **DCI: Biodiversity and Humans** Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. **CCC: Cause and Effect** Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.	Identify species that have been negatively impacted by human activity,[1] determine strategies to protect species, and use data[2] to show how humans can continue an activity without negatively affecting another species.	Recognize a human activity that negatively impacts another species.	Identify other species that have been significantly impacted by human activity.[1]	Use data[2] to determine the effectiveness of a strategy to protect a species.	Use data[2] to determine alternative ways for humans to continue an activity without negatively affecting another species.
			1. For example: endangered or recently extinct species and the recovery of sea turtle and monk seal populations as a result of regulations and laws. 2. Data may be pictorial, graphical, or tabular.			

HSA Alternate Science—High School						
Next Generation Science Standards		**Essence Statements**	**Performance-Level Descriptors**			
PE	**SEP / DCI / CCC**		**Well Below**	**Approaches**	**Meets**	**Exceeds**
Earth Space Science ESS 2 Earth Systems ❖ A. Earth Materials and Systems ❖ B. Plate Tectonics and Large-Scale System Interactions ❖ C. The Roles of Water in Earth's Surface Processes ❖ D. Weather and Climate ❖ E. Biogeology						
HS-ESS2-6 (W) Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.	**SEP: Developing and Using Models** Develop a model based on evidence to illustrate the relationships between systems or between components of a system. **DCI: Weather and Climate** Gradual atmospheric changes were due to plants and other organisms that captured carbon dioxide and released oxygen. Changes in the atmosphere due to human activity have increased carbon dioxide concentrations and thus affect climate. **CCC: Energy and Matter** The total amount of energy and matter in closed systems is conserved.	Identify and explain the carbon cycle[1] using models and data[2] and describe the changes in the amount of carbon in the atmosphere due to human activities.	Recognize a cycle as a series of events that are regularly repeated in the same order.	Identify a cycle that involves carbon.[1]	Describe the cycling of carbon using a model.	Use data to describe changes in the amount of carbon in the atmosphere due to human activities.
			1. The carbon cycle is the movement of carbon within and across Earth systems through a variety of processes, including photosynthesis, burning fossil fuels, and simply releasing breath from the lungs. 2. Models and data are used to evaluate the changes in the amount of carbon in the atmosphere)			
HS-ESS2-7 (W) Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.	**SEP: Engaging in Argument from Evidence** Construct an oral and written argument or counter-arguments based on data and evidence. **DCI: Weather and Climate** Gradual atmospheric changes were due to plants and other organisms that captured carbon dioxide and released oxygen. **DCI: Biogeology** The many dynamic and delicate feedbacks between the biosphere and other Earth systems cause a continual coevolution of Earth's surface and the life that exists on it. **CCC: Stability and Change** Much of science deals with constructing explanations of how things change and how they remain stable.	Identify changes on Earth that can lead to changes among living things, identify examples of how living things change the environment, and the impact of those changes.	Recognize that gradual and rapid changes to Earth and organisms have occurred over time.	Identify that gradual and rapid changes on land or in the water can lead to changes among living things.	Identify examples of how living things change the characteristics of the environment in their specific region.	Identify the impact of a given change on living things and the environment around them.

HSA Alternate Science—High School						
Next Generation Science Standards		Essence Statements	Performance-Level Descriptors			
PE	SEP / DCI / CCC		Well Below	Approaches	Meets	Exceeds
Earth Space Science ESS 3 Earth and Human Activity A. Natural Resources B. Natural Hazards C. Human Impacts on Earth Systems D. Global Climate Change						
HS-ESS3-3 (W) Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.	**SEP: Using Mathematics and Computational Thinking** Create a computational model or simulation of a phenomenon, designed device, process, or system. **DCI: Human Impacts on Earth Systems** The sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources. **CCC: Stability and Change** Change and rates of change can be quantified and modeled over very short or very long periods of time. Some system changes are irreversible.	Identify ways in which humans use resources, ways humans sustain their populations and other living resources, and use data to show how managing natural resources[1] promotes sustainability.	Recognize a natural resource.	Identify ways in which humans use living and natural resources.	Identify steps that can be taken to sustain human society and living resources.	Use data to show how the management of natural resources promotes the sustainability of human populations and biodiversity.
			1. Sustaining other living resources may include examples such as sustainable fishing, replanting forests.			

Workforce Innovation and Opportunity Act Appendix

The Workforce Innovation and Opportunity Act and the HSA-Alt Range Performance Level Descriptors

Selected HSA-Alt Range Performance Level Descriptors include a new (W) symbol, which denotes standards that may be associated with the workplace, and, therefore, address needs identified in the Workforce Innovation and Opportunity Act (WIOA). The Workforce Innovation and Opportunity Act (WIOA) "seeks to increase the employment, career advancement, and economic self-sufficiency of people with disabilities through collaborative federal, state, and local partnerships" (Thurlow, Nye-Lengerman, and Lazarus, 2019).

Hawaiʻi Department of Education Test Development Specialists and nine community stakeholders convened as a workgroup on April 16, 2019 and May 7, 2019 to discuss content standards that could be associated with employment. Stakeholders included special education advocates, state and local support agency staff, higher education/community leaders with expertise in disability study, adult education, and/or transition services, and organizations that employ and/or support people with disabilities. Stakeholders examined the English Language Arts (ELA), Math, and Science general education standards and the essence statements that distill these standards into achievable performance targets for students who take Hawaiʻi's alternate assessment, the Hawaiʻi State Assessment-Alternate (HSA-Alt). The HSA-Alt Range Performance Level Descriptors served as the single document for committee review. This document contains the general education reference standards, Common Core for ELA and Math and the Next Generation Science Standards for Science, the essence statement for each general education standard, and the four tiers of associated performance that students who take the HSA-Alt would exhibit at each level of achievement: Well-Below, Approaches, Meets, and Exceeds. While it is important to note that all Common Core standards for ELA and Math and NGSS standards for Science have college and career readiness in mind, the workgroup believed that only a subset of these standards would be considered acutely applicable to employment for students with significant cognitive disabilities. For each identified work related standard in this subset, the workgroup developed parallel task exemplars of how the target skill or concept for the applicable standard might be demonstrated in the workplace.

The following document is intended to help guide the development of future items for Hawaiʻi's alternate assessment; it may also prove to be a useful guide to Hawaiʻi's teachers as they plan and design instruction for their students with significant cognitive disabilities.

Science Work-Related NGSS

Range Performance Level Descriptors

Performance Expectation	Essence Statement	Meets Range Performance Level Descriptor	Related Workforce Skills/ Civic Responsibility/ Well-being
HS-LS1-2	Identify a major organ, its function in a body system, and explain how body systems work together to maintain life.	Identify the function of a body system, its major organ(s), and another system with which it interacts to maintain life.	Understand the relationship between body organs and body organ systems to maintain health.
HS-LS1-3	Identify the body's reactions to stimuli, use data to identify changes in body systems during physical activity, and sequence steps to show an organism's reactions to stimuli.	Use data to identify changes in body systems during exercise or other activities.	Understand some basic mechanisms to maintain body homeostasis; for example, sweating to cool the body, heart rate increasing during exercise to match increased muscular output, increased demand for glucose, oxygen, and by-product waste removal. Some workforce examples would be recognizing that environmental stressors can raise heart rate and being able to identify a stimulus that increases heart rate and taking measures to reduce stress by avoiding stimuli or by using coping mechanisms when stimuli arises. Understanding homeostasis might also assist an employee in understanding the impact that room temperature could have on an individual's comfort and knowing what to do when customer has an issue with the temperature of the environment.
HS-LS1-5	Identify the purpose, inputs, and outputs of photosynthesis and use a model to explain photosynthesis.	Identify what a plant uses and what a plant produces during photosynthesis.	Understand that plant growth is tied to light energy is essential when working with plants in an agricultural employment setting.
HS-LS2-2	Identify the interdependence of organisms and use data to explain patterns and trends between a population and the availability of resources.	Use data to explain the patterns and/or trends between population size and the availability of resources.	Understand the balance between the number of animals that an area of land can support and the negative effects of overgrazing on the environment. Relate population growth to the availability of food and resources, including space.
HS-LS2-6	Identify and classify natural and human initiated changes in the physical environment and how those changes could affect the environment and the populations in an ecosystem.	Identify and/or classify natural and human-initiated changes in the physical environment that could affect a population.	Understand the difference between human-initiated and natural changes in the physical environment. For example, humans could start a fire in a dry environment by carelessly disposing of a lit match on the ground, yet fires can also have natural causes such as lightning strikes or volcanic eruptions with lava flows.
HS-LS2-7	Match human activities with positive and negative effects on Earth and identify solutions that reduce the negative impacts of human activities.	Identify human activities that can have a negative effect on Earth and then identify a solution that reduces its impact on the environment.	Understand the negative and positive impacts of individual and group activities on the environment. Examples of negative and positive activities include: polluting vs. cleaning up or litter collection; clearing forests vs. planting trees; use of packaging material, paper products, and plastics vs. recycling and reuse; hunting and fishing vs. species propagation and controlled harvests; chemical pest control vs. natural pest control; etc.

Performance Expectation	Essence Statement	Meets Range Performance Level Descriptor	Related Workforce Skills/ Civic Responsibility/ Well-being
HS-LS2-8	Identify and describe group behaviors that increase an animal's chances of survival, and use data to show the positive impact of group behavior.	Given a group behavior, describe how that behavior helps individuals and species to survive and reproduce.	Understand that fish swim in schools in order to increase their chance of survival.
HS-LS3-1	Identify the function of chromosomes, describe how DNA passes traits from one generation to the next, and describe how changes in DNA can impact offspring.	Describe how traits (characteristics) are passed from one generation to the next through DNA containing genes.	Understand the basis for genetic related disorders.
HS-LS3-2	Identify factors that cause genetic variation and explain why reproduction may or may not result in offspring with different traits.	Identify the causes of genetic variation.	Understand why offspring may look different from each other such as why two kittens in the same litter may have different markings or coloration.
HS-LS4-1	Recognize a fossil and a present-day organism with similar structures and use multiple ways to determine ancestry and the development pattern from the fossil to the present-day organism.	Identify multiple ways to determine the ancestry of an organism.	Understand that fossils can be used to connect organisms living today with organisms that lived long ago.
HS-LS4-3	Identify an advantageous trait, describe why some organisms will likely survive better than other organisms in an environment, and use data to explain why organisms exhibiting an advantageous trait increase over time.	Given a scenario of similar organisms with different traits, explain why an organism will likely survive in a given environment.	Identify that some organisms survive better in certain environments. Understand that specific traits may increase the likelihood that an organism with those traits will survive.
HS-LS4-4	Explain why organisms with beneficial traits are more likely to survive and describe how some organisms within a population become better adapted over time.	Explain why organisms with beneficial traits are more likely to survive and reproduce.	Understand that survival increases the chances of reproducing and that reproducing is an essential component of beneficial traits being passed on.
HS-LS4-5	Identify that environmental changes may lead to changes in the population of organisms and predict what will happen to a species over time as a result of an environmental change.	Realize that a change in the environment may result in changes in the population of organisms or the emergence of a new species.	Identify a gradual change in the environment that may result in changes in the population of organisms or the emergence of a new species.
HS-LS4-6	Identify species that have been negatively impacted by human activity, determine strategies to protect species, and use data to show how humans can continue an activity without negatively affecting another species.	Use data to determine the effectiveness of a strategy to protect a species.	Understand that strategies to correct previous damage to the environment are not always successful; some strategies are effective, others may not be. Be able to look at a pictorial representation of data before and after a strategy has been implemented to determine if a problem has been mitigated, aggravated, or remains unchanged.

Performance Expectation	Essence Statement	Meets Range Performance Level Descriptor	Related Workforce Skills/ Civic Responsibility/ Well-being
HS-ESS2-6	Identify and explain the carbon cycle using models and data and describe the changes in the amount of carbon in the atmosphere due to human activities.	Describe the cycling of carbon using a model.	Identify a cycle as a series of events that are regularly repeated in the same order.
HS-ESS2-7	Identify changes on Earth that can lead to changes among living things, identify examples of how living things change the environment, and the impact of those changes.	Identify examples of how living things change the characteristics of the environment in their specific region.	Recognize that gradual and rapid changes on land or in the water can lead to changes among living things. For example, the recent volcanic activity on the Big Island resulted in some very rapid changes to the landscape that impacted the living things in those regions.
HS-ESS3-3	Identify ways in which humans use resources, ways humans sustain their populations and other living resources, and use data to show how managing natural resources promotes sustainability.	Identify steps that can be taken to sustain human society and living resources.	Identify natural resources and ways in which humans use living and natural resources. Understand that humans are dependent on sustaining living and natural resources. Be able to use data and pictorial representations of data to assess whether management of resources is effective and determine the impact of management on human populations and biodiversity.

ACKNOWLEDGEMENTS

The Hawaiʻi Department of Education would like to acknowledge the contribution of the following WIOA/HSA-Alt Range Performance Level Descriptors

Committee: Kevin Bardsley-Marcial, BAYADA Community Liaison and Project Manager

Rhonda Black, University of Hawaiʻi, Faculty member, Expert in Transition Services

Martha Guinan, Special Education Advisory, Chair

Kristin Hirata, Hawaiʻi Department of Education, Educational Specialist for Adult and Community Education

Chin Lee, University of Hawaiʻi Center on Disability Studies, Faculty member

Beverly Reidy, Leadership in Disabilities and Achievement of Hawaiʻi, Education and Training Manager

Susan Rocco, Special Parent Information Network, Coordinator and Special Education Advisory, Staff member

Shelli Souza-Motta, Goodwill, Program Coordinator

Susan Wood, Hiliopa'a Family to Family Information Center, Project Coordinator