Comparison of Draft NYSSLS and NGSS Performance Expectations Only with DCI notes only for changes
This does not represent the entirety of NYSSLS or NGSS.

Created by OCM BOCES Center for Innovative Science Education

Grade Level	Physical Science	Life Science	Earth & Space Sciences
PreK	***Physical Science*** **PS1-1** Ask questions and use observations to test the claim that different kinds of matter exist as either solid or liquid. **PS2-1** Use tools and materials to design and build a device that causes an object to move faster with a push or a pull. **PS4-1**. Plan and conduct investigations to provide evidence that sound is produced by vibrating materials. Created New DCIs **PS1.A: Structures and Properties of Matter** - Different kinds of matter exist and many of them can be either solid or liquid. Matter can be described, categorized, and sorted by its observable properties. (P-PS1-1) **PS3.C: Relationship Between Energy and Forces** - A push or a pull may cause stationary objects to move, and a stronger push or pull in the same or opposite direction makes an object in motion speed up or slow down more quickly. (secondary to P-PS2-1)	***Life Sciences*** **LS1-1** Observe familiar plants and animals (including humans) and describe what they need to survive. **LS1-2** Plan and conduct an investigation to determine how familiar plants and/or animals use their external parts to help them survive in the environment. **LS3-1** Develop a model to describe that some young plants and animals are similar, but not exactly like, their parents. Created New DCI **LS3.A: Inheritance of Traits** - Some young animals are similar to, but not exactly like their parents. Some young plants are also similar to, but not exactly, like their parents. (P-LS3-1)	***Earth and Space Science*** **ESS1-1** Observe and describe the apparent motions of the sun, moon, and stars to recognize predictable patterns. **ESS2-1** Ask questions, make observations, and collect and record data using simple instruments to recognize patterns about how local weather conditions change daily and seasonally. **PS3-1** Plan and conduct an investigation to determine the effect of sunlight on Earth's surface. PS3-1 in K has overlap with PS3-1. The practice is different.
K	***Matter and Its Interactions*** **PS1-1** Plan and conduct an investigation to test the claim that different kinds of matter exists as either solid or liquid, depending on temperature. ***Forces and Interaction: Pushes and Pulls*** ***PS2-1***. Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object. ***PS2-2.*** Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull. Created New DCI PS3. C – Repeated from PreK	***Interdependent Relationships in Ecosystems: Animals, Plants, and Their Environment*** ***LS1-1***. Use observations to describe patterns of what plants and animals (including humans) need to survive. ***ESS2-2***. Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs. ***ESS3-1***. Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live. ***ESS3-3***. Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment Altered DCI **LS1.C Organization for Matter and Energy Flow in Organisms** – All animals need food, air, and water in order to live, grow, and thrive. Animals ~~They~~ obtain food from plants or form other animals. Plants need water, air, and light to live, grow, and thrive (K-ESS3-1)	***Weather and Climate*** ***ESS2-1***. Use and share observations of local weather conditions to describe patterns over time. ***ESS3-2***. Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather. **PS3-1**. Make observations to determine the effect of sunlight on Earth's surface. **PS3-2.** Use tools and materials to design and build a structure that will reduce the warming effect of sunlight on an area.
1st	***Light and Sound*** ***PS4-1***. Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate. ***PS4-2***. Make observations (firsthand or from media) to construct an evidence-based account that objects can be seen only when illuminated. ***PS4-3.*** Plan and conduct an investigation to determine the effect of placing objects made with different materials in the path of a beam of light. ***PS4-4.*** Use tools and materials to design and build a device that uses light or sound to solve the problem of communication over a distance.	***Structure, Function, and Information Processing*** ***LS1-1***. Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs. ***LS1-2***. Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive. ***LS3-1***. Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents. Created New DCI **LS3.A: Inheritance of Traits** - Some young animals are similar to, but not exactly like their parents. Some young plants are also similar to, but not exactly, like their parents. (P-LS3-1)	***Earth's Place in the Universe*** ***ESS1-1***. Use observations of the sun, moon, and stars to describe patterns that can be predicted. ***ESS1-2***. Make observations at different times of the year to relate the amount of daylight to the time of year. Note relationship between these PEs and the PreK PEs.

Blue text represents new PEs or a part of the PE that is new. Also used to note additions to DCIs.
Black texts represents original NGSS
Text with ~~line through~~ middle indicates a removal.
Performance Expectations from NGSS and Draft NYSSLS. Please note NGSS and NYSSLS includes clarification statements, assessment boundaries and other information. This is supposed to be a tool to illustrate a comparison between the NGSS and NYSSLS.

Grade Level	Physical Science	Life Science	Earth & Space Sciences
2nd	***Structure and Properties of Matter*** ***PS1-1***. Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties. ***PS1-2***. Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose. ***PS1-3***. Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object. ***PS1-4***. Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.	***Interdependent Relationships in Ecosystems*** ***LS2-1***. Plan and conduct an investigation to determine if plants need sunlight and water to grow. ***LS2-2***. Develop a simple model that illustrates how plants and animals depend on each other for survival. ~~mimics the function of an animal in dispersing seeds or pollinating plants.~~ ***LS4-1***. Make observations of plants and animals to compare the diversity of life in different habitats. Alterations to DCI LS2.A • Plants depend on water, light and air to grow. • Some plants depend on animals for pollination and for dispersal of seeds from one location to another. ~~Plants depend on animals for pollination or to move their seeds around.~~	
3rd	***Forces and Interactions*** ***PS2-1***. Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object. ***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. ***PS2-3***. Ask questions to determine cause and effect relationships of electrical or magnetic interactions between two objects. ***PS2-4***. Define a simple design problem that can be solved by applying scientific ideas about magnets.	***Interdependent Relationships in Ecosystems*** ***LS2-1***. Construct an argument that some animals form groups that help members survive. ***LS4-1***. Analyze and interpret data from fossils to provide evidence of the organisms and environments in which they lived long ago. ***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. ***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. ***Inheritance and Variation of Traits: Life Cycles and Traits*** ***LS1-1***. Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death. ***LS3-1***. Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variations of these traits exists in a group of similar organisms. ***LS3-2***. Use evidence to support the explanation that traits can be influenced by the environment. ***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.	***Weather and Climate*** ***ESS2-1***. Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season. ***ESS2-2***. Obtain and combine information to describe climates in different regions of the world. ***ESS3-1***. Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard. **ESS2-2**. Plan and conduct an investigation to determine the connections between weather and water processes in Earth's systems. **Additions to DCI** Earth's processes continuously cycle water, contributing to weather and climate (3-ESS2-3)

Blue text represents new PEs or a part of the PE that is new. Also used to note additions to DCIs.
Black texts represents original NGSS
Text with ~~line through~~ middle indicates a removal.
Performance Expectations from NGSS and Draft NYSSLS. Please note NGSS and NYSSLS includes clarification statements, assessment boundaries and other information. This is supposed to be a tool to illustrate a comparison between the NGSS and NYSSLS.

Grade Level	Physical Science	Life Science	Earth & Space Sciences
4th	***Energy*** ***PS3-1***. Use evidence to construct an explanation relating the speed of an object to the energy of that object. ***PS3-2***. Make observations to provide evidence that energy ~~can be transferred from place to place by sound, light, heat, and electrical currents~~ is conserved as it is transferred and/or converted from one form to another. (Added clarification statement: Examples of forms of energy could include sound, light, heat, and electrical.) ***PS3-3***. Ask questions and predict outcomes about the changes in energy that occur when objects collide. ***PS3-4***. Apply scientific ideas to design, test and refine a device that converts energy from one form to another. ***ESS3-1***. Obtain and combine information to describe that energy and fuels are derived from natural resources and that their uses affect the environment. Altered DCI PS3.A • ~~The faster a given object is moving, the more energy it possesses. (4-PS3-1)~~ A given object possesses more energy of motion when it is moving faster. (4-PS3-1) • Energy can be ~~moved from place to place~~ transferred by moving objects or through sound, light, or electrical currents (4-PS3-2), (4-PS3-3) PS3.B • Light also transfers energy from place to place (4-PS3-2) • Energy can also be transferred from ~~place to place~~ by electrical currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming energy of motion into electrical energy. (4-PS3-2), (4-PS3-4) ***Waves: Waves and Information*** ***PS4-1.*** Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move. ***PS4-3***. Generate and compare multiple solutions that use patterns to transfer information.	***Structure, Function, and Information Processing*** ***PS4-2***. Develop a model to describe that light reflecting from objects and entering the eyes allows objects to be seen. ***LS1-1***. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. ***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.	***Earth's Systems: Processes that Shape the Earth*** ***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. ***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. ***ESS2-2.*** Analyze and interpret data from maps to describe patterns of Earth's features. ***ESS3-2***. Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.
5th	***Structure and Properties of Matter*** ***PS1-1***. Develop a model to describe that matter is made of particles too small to be seen. ***PS1-2***. Measure and graph qualities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing a substance, the total amount ~~weight~~ of matter is conserved. ***PS1-3.*** Make observations and measurement to identify materials based on their properties. ***PS1-4.*** Conduct an investigation to determine whether the mixing of two or more substances results in a new substance. ***Matter and Energy in Organisms and Ecosystems*** ***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 ~~s~~Sun. ***LS1-1.*** Support an argument that plants get the materials they need for growth chiefly from air and water. ***LS2-1.*** Develop a model to describe the movement of matter among plants (producers), animals (consumers), decomposers, and the environment.		***Space Systems: Stars and the Solar System*** ***PS2-1.*** Support an argument that the gravitational force exerted by Earth on objects is directed down. ***ESS1-1***. Support an argument that differences in the apparent brightness of the ~~s~~Sun compared to other stars is due to their relative distances from Earth. ***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 appearances of some stars in the night sky. ***Earth's Systems*** ***ESS2-1.*** Develop a model using an example to describe ways in which the geosphere, biosphere, hydrosphere, and/or atmosphere interact. **ESS2-2**. Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth. ***ESS3-1.*** Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

Blue text represents new PEs or a part of the PE that is new. Also used to note additions to DCIs.
Black texts represents original NGSS
Text with ~~line through~~ middle indicates a removal.
Performance Expectations from NGSS and Draft NYSSLS. Please note NGSS and NYSSLS includes clarification statements, assessment boundaries and other information. This is supposed to be a tool to illustrate a comparison between the NGSS and NYSSLS.

Grade Level	Physical Science	Life Science	Earth & Space Sciences
MS	***Structure and Properties of Matter*** ***PS1-1.*** Develop models to describe the atomic composition of simple molecules and extended structures. ***PS1-3.*** Gather and make sense of information to describe that synthetic materials come from natural resources and impact society. ***PS1-4***. Develop a model that predicts and describes changes in particle motion, temperature, and phase (state) of a substance when thermal energy is added or removed. ~~state of a pure substance when thermal energy is added or removed~~. Adjusted Clarification Statement: Examples of particles could include ions, molecules or ~~inert~~ atoms. Examples of pure substances could include sodium chloride, water, carbon dioxide, and helium. **MS-PS1-7.** Use evidence to illustrate that density is a property that can be used to identify samples of matter. **MS-PS1-8.** Plan and conduct an investigation to demonstrate that mixtures are combinations of substances. DCI Changes PS1.A • Replaced molecules with particles • Added: Mixtures are physical combinations of one or more samples of matter and can be separated by physical means. PS3.A • Temperature is not a form of energy. Temperature is a measurement of the average kinetic energy of the particles in a sample of matter. ~~Temperature is not a measure of energy; the relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present~~. ***Chemical Reactions*** ***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. ***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. ***PS1-6.*** Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy ~~by chemical processes~~ during a chemical and/or physical process. DCI Changes PS1.A – deleted all but one bullet • Each ~~pure~~ substance has characteristics physical and chemical properties (for any bulk quantity under given conductions) that can be used to identify it. PS1.B • Replaced atoms with particles ***Forces and Interactions*** ***PS2-1.*** Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects. ***PS2-2.*** Plan and conduct an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object. ***PS2-3.*** Ask questions about data to determine the factors that affect the strength of electric and magnetic forces. ***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 and the distance between them. ***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.	***Structure, Function, and Information Processing*** ***LS1-1.*** Plan and conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells. ***LS1-2.*** Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function. ***LS1-3***. ~~Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells~~ Construct an explanation supported by evidence for how the body is composed of interacting systems consisting of cells, tissues, and organs working together to maintain homeostasis. ***LS1-8***. Gather and synthesize information that sensory receptors respond to stimuli, ~~by sending messages to the brain for~~ resulting in immediate behavior and/or storage as memories. ***Matter and Energy in Organisms and Ecosystems*** ***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. ***LS1-7.*** Develop a model to describe how food is rearranged through chemical reactions to release energy during cellular respiration and/or forming new molecules that support growth ~~and/or release energy~~ as this matter moves through an organism. ***LS2-1.*** Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. ***LS2-3.*** Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. ***LS2-4.*** Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. ***Interdependent Relationships in Ecosystems*** ***LS2-2.*** Construct an explanation that predicts patterns of interactions among organisms ~~across multiple~~ in a variety of ecosystems. ***LS2-5.*** Evaluate competing design solutions for maintaining biodiversity and ~~ecosystem services~~ protecting ecosystem stability. DCI Changes LS2.C – Removed terrestrial and oceanic ecosystems and just uses ecosystems. LS4.D Added the following: • Humans impact biodiversity both positively and negatively. ***Growth, Development and Reproduction of Organisms*** ***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 plans respectively. ***LS1-5.*** Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms. ***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 the organism. ***LS3-2.*** Develop and use a model to describe ~~why~~ how asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation. ***LS4-5.*** Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms. DCI Changes Added in LS3.B • Mutations may result in changes to the structure and function of proteins.	***Space Systems*** ***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. ***ESS1-2.*** Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system. ***ESS1-3.*** Analyze and interpret data to determine scale properties of objects in the solar system. ***History of Earth*** ***ESS1-4.*** Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history. ***ESS2-2.*** Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying ~~time~~ temporal and spatial scales. ***ESS2-3.*** Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions. ***Earth's Systems*** ***ESS2-1.*** Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process. ***ESS2-4.*** Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity. ***ESS3-1.*** Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes. ***Weather and Climate*** ***ESS2-5.*** Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions. ***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. ***ESS3-5.*** Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century. ***Human Impacts*** ***ESS3-2.*** Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects. ***ESS3-3.*** Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment. ***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.

Blue text represents new PEs or a part of the PE that is new. Also used to note additions to DCIs.
Black texts represents original NGSS
Text with ~~line through~~ middle indicates a removal.
Performance Expectations from NGSS and Draft NYSSLS. Please note NGSS and NYSSLS includes clarification statements, assessment boundaries and other information. This is supposed to be a tool to illustrate a comparison between the NGSS and NYSSLS.

Grade Level	Physical Science	Life Science	Earth & Space Sciences
MS	***Energy*** ***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. ***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. ***PS3-3.*** Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer. ***PS3-4.*** Plan and conduct 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~~ temperature of the sample of matter. ***PS3-5.*** Construct, use, and present arguments to support the claim that when work is done on or by a system, the energy of the system ~~the kinetic energy of an object~~ changes as energy is transferred to or from the ~~object~~ system. PS3-6. Make observations to provide evidence that energy can be transferred by electric currents. DCI Changes Added under PS3.C • An electric circuit is a closed path in which an electric current can exist. ***Waves and Electromagnetic Radiation*** ***PS4-1.*** Develop a model and use mathematical representations to describe waves ~~a simple model for waves~~ that includes frequency, wavelength, and how the amplitude of a wave is related to the energy in a wave. ***PS4-2.*** Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials. ***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.	***Natural Selection and Adaptations*** ***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. ***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. ***LS4-3.*** Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy. ***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. ***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.	

Blue text represents new PEs or a part of the PE that is new. Also used to note additions to DCIs.
Black texts represents original NGSS
Text with ~~line through~~ middle indicates a removal.
Performance Expectations from NGSS and Draft NYSSLS. Please note NGSS and NYSSLS includes clarification statements, assessment boundaries and other information. This is supposed to be a tool to illustrate a comparison between the NGSS and NYSSLS.

Grade Level	Physical Science	Life Science	Earth & Space Sciences
HS	***Structure and Properties of Matter*** ***PS1-1.*** Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms. ***PS1-3.*** Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles. ***PS1-8***. Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay. ***PS2-6.*** Communicate scientific and technical information about why the ~~molecular~~ particulate-level structure is important in the functioning of designed materials. **PS1-9.** Analyze data to support the claim that the combined gas law describes the relationships among volume, pressure, and temperature for a sample of an ideal gas. **PS1-10.** Use evidence to support claims regarding the formation, properties and behaviors of solutions at bulk scale. DCI Changes Added the following to PS1.A • The concept of an ideal gas is a model to explain behavior of gases. A real gas is most like an ideal gas when the real gas is at low pressure and high temperature. • Solutions possess characteristic properties that can be described qualitatively. ***Chemical Reactions*** ***PS1-2.*** Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties. ***PS1-4.*** Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy. ***PS1-5***. Apply scientific principles and evidence to ~~provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs~~ explain how the rate of a physical or chemical change is affected. ***PS1-6.*** Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium. ***PS1-7.*** Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction. **PS1-11**. Plan and conduct an investigation to compare properties and behaviors of acids and basis. **PS1-12**. Use evidence to illustrate that some chemical reactions involve the transfer of electrons as an energy conversion occurs within a system. DCI Changes PS1.B • Replaced molecule with particle Added • Acids and bases play an important role in the daily lives of humans and other organisms (e.g. agricultural applications, environmental impacts (acid rain), animal and plant physiology). • Oxidation-reduction reactions are the prevailing source of power for many of today's modern conveniences.	***Structure and Function*** ***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. ***LS1-2.*** Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. ***LS1-3***. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. DCI Changes Added to LS1.A • Disease is a failure of homeostasis. Organisms have a variety of mechanisms to prevent and combat disease. Technological advances including vaccinations and antibiotics have contributed to the prevention and treatment of disease. ***Matter and Energy in Organisms and Ecosystems*** ***LS1-5.*** Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy. ***LS1-6.*** Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements such as nitrogen, sulfur, and phosphorus to form amino acids and/or other large carbon-based molecules. ***LS1-7.*** Use a model to illustrate that aerobic cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy. ***LS2-3.*** Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in ~~aerobic and anaerobic conditions~~ ecosystems. ***LS2-4.*** Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem. ***LS2-5.*** Develop a model to illustrate the role of various processes ~~photosynthesis and cellular respiration~~ in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere. DCI Changes LS1.C • ~~The~~ Sugar molecules ~~thus formed~~ contain carbon, hydrogen, and oxygen~~:~~. Their hydrocarbon backbones ~~are used~~ combine with other elements 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 a result 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 released the energy needed to maintain body temperature despite ongoing energy transfer to the surrounding environment~~ In this process ATP is produced, which is used to carry out life processes. LS2.B • When matter is cycled through organisms and ecosystems, some of the matter reacts to release energy for life functions, some is stored in newly made structures, and some is eliminated as waste. • Photosynthesis and cellular respiration are important components of the carbon cycle, in which carbon is exchanged among the biosphere, atmosphere, ~~oceans~~ hydrosphere, and geosphere through chemical, physical, geological, can biological processes.	***Space Systems*** ***ESS1-1.*** Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation. ***ESS1-2.*** Construct an explanation of the Big Bang Theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe. ***ESS1-3.*** Communicate scientific ideas about the way stars, over their life cycle, produce elements. ***ESS1-4.*** Use mathematical or computational representations to predict the motion of orbiting objects in the solar system. ESS1-7. Construct an explanation using evidence to support the claim that the phases of the moon, eclipses, tides, and sessions change cyclically. DCI Changes Addition to ESS1.B • Earth and celestial phenomena can be described by principles of relative motion and perspective. (HS-ESS1-7) ***History of Earth*** ***ESS1-5.*** Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks. ***ESS1-6.*** Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history. ***ESS2-1.*** Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features. DCI Changes PS1.C: Nuclear Processes • Spontaneous radioactive decays follow a characteristic exponential decay law allowing an element's half-life to be used for~~. Nuclear lifetimes allow~~ radiometric dating to be used to determine the ages of rocks and other materials. ***Earth's Systems*** ***ESS2-2.*** Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems. ***ESS2-3.*** Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection. ***ESS2-5.*** Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes. ***ESS2-6.*** Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere. ***ESS2-7.*** Construct an argument based on evidence about the ~~simultaneous~~ coevolution of Earth's systems and life on Earth. DCI Changes ESS2.B • ~~The radioactive decay of unstable isotopes continually generates new energy within Earth's crust and mantle, providing the primary source of the heat that drives mantle convection. Plate tectonics can be viewed as the surface expression of mantle convection. (HS-ESS2-3)~~ • Residual heat from Erath's formation and the radioactive decay of unstable isotopes in Earth's interior continually generate energy that is absorbed by Earth's mantle and crust, driving mantle convection. Plate tectonics can be viewed as the surface expression of mantle convection. (HS-ESS2-3) • Minerals are the building blocks of igneous, metamorphic, and sedimentary rocks and can be identified using physical and chemical characteristics. These rock types are evidence of stages of constant recycling of Earth material by surface processes and convection currents in the mantle. (HS-ESS2-5)

Blue text represents new PEs or a part of the PE that is new. Also used to note additions to DCIs.
Black texts represents original NGSS
Text with ~~line through~~ middle indicates a removal.
Performance Expectations from NGSS and Draft NYSSLS. Please note NGSS and NYSSLS includes clarification statements, assessment boundaries and other information. This is supposed to be a tool to illustrate a comparison between the NGSS and NYSSLS.

Grade Level	Physical Science	Life Science	Earth & Space Sciences
HS	***Forces and Interactions*** ***PS2-1.*** Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration. ***PS2-2.*** Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system. ***PS2-3.*** Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision. ***PS2-4.*** Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects. ***PS2-5.*** Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current. ***Energy*** ***PS3-1.*** Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known. ***PS3-2.*** Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative position of particles (objects). ***PS3-3.*** Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy. ***PS3-4.*** Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics). ***PS3-5.*** Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction. **PS3-6**. Analyze data to support the claim that Ohm's Law describes the mathematical relationship among the potential difference, current, and resistance of an electric circuit. DCI Changes PS3.B • Energy cannot be created or destroyed, but it can be ~~transported from one place to another~~ converted from one form to another and transferred between systems. • Electrical power and energy can be determined for electric circuits.	***Interdependent Relationships in Ecosystems*** ***LS2-1.*** Use mathematical and/or computational representations to support explanations of biotic and abiotic factors that affect carrying capacity of ecosystems at different scales. ***LS2-2.*** Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales. ***LS2-6.*** Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem. ***LS2-7.*** Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity. ***LS2-8.*** Evaluate the evidence for the role of group behavior on individual species' chances to survive and reproduce. ~~***LS4-6.*** Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity~~. DCI Changes Addition to LS2.A • Carrying capacity results from the availability of biotic and abiotic factors and from challenges such as predation, competition, and disease. (HS-LS2-1), (HS-LS2-2) Removal – ETS1.B • ~~Both physical models and computers can be used in various ways to aid in the engineering design process. Computers are useful for a variety of purposes, such as running simulations to test different ways of solving a problem or to see which one is most efficient or economical, and in making a persuasive presentation to a client about how a given design will meet his or her needs~~. ***Inheritance and Variation of Traits*** ***LS1-4.*** Use a model to illustrate the role of cellular division (mitosis) and differentiation ~~in producing and maintaining complex organisms~~. ***LS3-1.*** Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring. ***LS3-2.*** Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, ~~and/or~~ (3) mutations caused by environmental factors and/or (4) genetic engineering. ***LS3-3.*** Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population. **LS1-8**. Use models to illustrate how human reproduction and development maintains continuity of life. DCI Changes Addition to LS1.A • The structures and functions of the human female reproductive system produce gametes in ovaries, allow for internal fertilization, support the internal development of the embryo and fetus in the uterus, and provide essential materials through the placenta, and nutrition through mild for the newborn. The structures and functions of the human male reproductive system produce gamete in testes and make possible the delivery of these gametes for fertilizations. (HS-LS1-8). Addition to LS1.B • The continuity of life is sustained through reproduction and development. Human development, birth, and aging should be viewed as a predictable pattern of events influenced by factors such as gene expression, hormones, and the environment. (HS-LS1-8)	***Weather and Climate*** ***ESS2-4.*** Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate. ***ESS3-5.*** Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems. **ESS2-8**. Evaluate data and communicate information to explain how the movement and interactions of air masses result in changes in weather conditions. DCI Changes Addition to ESS2.D • Concepts of density and heat energy can be used to explain observations of weather patterns. ***Human Sustainability*** ***ESS3-1***. Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity. ***ESS3-2.*** Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit rations. ***ESS3-3.*** Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity. ***ESS3-4.*** Evaluate or refine a technological solution that reduces impacts of human activities on natural systems. ***ESS3-6.*** Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.

Blue text represents new PEs or a part of the PE that is new. Also used to note additions to DCIs.
Black texts represents original NGSS
Text with ~~line through~~ middle indicates a removal.
Performance Expectations from NGSS and Draft NYSSLS. Please note NGSS and NYSSLS includes clarification statements, assessment boundaries and other information. This is supposed to be a tool to illustrate a comparison between the NGSS and NYSSLS.

Grade Level	Physical Science	Life Science	Earth & Space Sciences
HS	***Waves and Electromagnetic Radiation*** ***PS4-1.*** Use mathematical representations to support a claim regarding relationships among the period frequency, wavelength, and speed of waves traveling and transferring energy (amplitude, frequency) in various media. ***PS4-2.*** Evaluate questions about the advantages of using a digital transmission and storage of information. ***PS4-3.*** Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model (quantum theory), and that for some situations one model is more useful than the other. ***PS4-4.*** Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter. ***PS4-5.*** Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy. **PS4-6**. Use mathematical models to determine relationships among the size and location of images, size and location of objects, and focal lengths of lenses and mirrors. DCI Changes Additions to PS4.A • The location and size of an image are related to the location and size of an object for a plan mirror. The location and size of an image (real or virtual) are related to the location and size of an object and the focal distance for convex and concave mirrors. • The location and size of an image (real or virtual) are related to the location and size of an object and the focal distance for biconvex and biconcave lenses.	Additions LS3.B • Environmental factors can cause mutations in genes. Only mutations in sex cells can be inherited. (HS-LS3-2) • Advances in biotechnology have allowed organisms to be modified genetically. (HS-LS3-2) ***Natural Selection and Evolution*** ***LS4-1.*** Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence. ***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. ***LS4-3.*** Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait. ***LS4-4.*** Construct an explanation based on evidence for how natural selection leads to adaptation of populations. ***LS4-5.*** 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.	

Blue text represents new PEs or a part of the PE that is new. Also used to note additions to DCIs.
Black texts represents original NGSS
Text with ~~line through~~ middle indicates a removal.
Performance Expectations from NGSS and Draft NYSSLS. Please note NGSS and NYSSLS includes clarification statements, assessment boundaries and other information. This is supposed to be a tool to illustrate a comparison between the NGSS and NYSSLS.