3rd Grade

Forces and Interactions
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.
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.
3-PS2-3 Ask questions to determine cause and effect relationships of electrical or magnetic interactions between tow objects not in contact with each other.
3-PS2-4 Define a simple design problem that can be solved by applying scientific ideas about magnets.

Interdependent Relationships in Ecosystems
3-LS2-1 Construct an argument that some animals form groups that help members survive.
3-LS4-1 Analyze and interpret data from fossils to provide evidence of the organisms and environments in which they lived long ago.
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.
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.

Inheritance and Variation of Traits: Life Cycles and Traits
3-LS1-1 Develop models to describe that organisms that unique and diverse life cycles but all have in common birth, growth, and reproduction, and death.
3-LS3-1 Analyze and interpret data to provide evidence that plants and animals have traits inherited form parents and that variation of these traits exists in a group of similar organisms.
3-LS3-2 Use evidence to support the explanation that traits can be influenced by the environment.
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 maters, and reproducing.

Weather and Climate
3-ESS2-1 Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.
3-ESS2-2 Obtain and combine information to describe climates in different regions of the world.
3-ESS3-1 Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.

Engineering Design
3-5-ETS1-1 Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time or costs.
3-5 ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
3-5-ETS1-3 Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

*Refer to evidence statements in www.nextscience.org

Adapted from Achieve. (2016, January 28), from http://www.nextgenscience.org

4th Grade

Energy
4-PS3-1 Use evidence to construct and explanation relating the speed of an object to the energy of that object.
4-PS3-2 Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electrical currents.
4-PS3-3 Ask questions and predict outcomes about the changes in energy that occur when objects collide
4-PS3-4 Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.
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.

Waves: Waves and Information
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.
4-PS4-3 Generate and compare multiple solutions that use patterns to transfer information.

Structure, Function, and Information Processing
4-PS4-2 Develop a model to describe that light reflecting from objects and entering the eyes allows objects to be seen.
4-LS1-1 Construct an argument that plants and animals have internal, and external structures that function to support survival, growth, behavior, and reproduction.
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.

Earth's Systems: Processes that Shape the 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.
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.
4-ESS2-2 Analyze and interpret data from maps to describe patterns of Earth's features.
4-ESS3-2 Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.

Engineering Design
3-5-ETS1-1 Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time or costs.
3-5 ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
3-5-ETS1-3 Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

*Refer to evidence statements in www.nextscience.org

Adapted from Achieve. (2016, January 28), from http://www.nextgenscience.org

5th Grade

Structures and Properties of Matter
5-PS1-1 Develop a model to describe that matter is made of particles too small to be seen
5-PS1-2 Measure and graph quantitates to provide evidence that regardless of the type of change that occurs when hearting, cooling, or mixing, substances, the total weight of matter is conserved.
5-PS1-3 Make observations and measurements to identify materials based on their properties.
5-PS1-4 Conduct an investigation to determine whether the mixing of two or more substances results in new substances.

Matter and Energy
5-PS3-1 Use models to describe that energy in animals' food (use for body repair, growth, and motion and to maintain body warmth) was once energy from the sun.
5-LS1-1 Support an argument that plants get the materials they need for growth chiefly from air and water.
5-LS2-1 Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

Earth's Systems
5-ESS2-1 Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.
5-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.
5-ESS3-1 Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

Space Systems: Stars and the Solar System
5-PS2-1 Support an argument that the gravitational force exerted by Earth on objects is directed down.
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.
5-ESS1-2 Represent data in graphical displays to reveal patterns of daily changes in the length and directions of shadows, day and night, and the seasonal appearance of some stars in the night sky.

Engineering Design
3-5-ETS1-1 Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time or costs.
3-5 ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
3-5-ETS1-3 Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

*Refer to evidence statements in www.nextscience.org

Adapted from Achieve. (2016, January 28), from http://www.nextgenscience.org

6th Grade

How can one describe physical interactions between objects within a system?

MS PS 2-1 Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.

MS PS 2-2 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.

MS PS 2-3 Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.

MS PS 2-4 Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.

MS PS 2-5 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.

Engineering Design-Bundled as Appropriate

MS-ETS1-1 Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking inot account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
MS-ETS1-2 Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
MS-ETS1-3 Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
MS-ETS1-4 Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

Adapted from Achieve. (2016, January 28, 2016), from http://www.nextgenscience.org

6th Grade

Change Over Time
How do people figure out that Earth and life on Earth have changed over time?

MS 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.
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. (1A, 2Ai, ii, iii)*
MS ESS2-1 Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.

Earth Systems
How do the materials in and on the earth change over time?

MS ESS2-1 Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.
MS 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.
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. (related to interior processes and surface processes)

Tectonic Plates
How does the movement of tectonic plates impact the surface of the Earth?

MS ESS2-2 Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.
MS 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.

Solar System
What makes up our solar system?

MS ESS 1-2 Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.
MS ESS 1-3 Analyze and interpret data to determine scale properties of objects in the solar system.

Earth
What is Earth's place in the universe?

MS ESS 1-2 Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.
MS ESS 1-3 Analyze and interpret data to determine scale properties of objects in the solar system.

How can the motion of the Earth explain seasons and eclipses?

MS ESS 1-1 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.
MS ESS 1-2 Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.

*Refer to Evidence Statements in www.nextgenscience.org (revised 7/13/2016)
Adapted from Achieve. (2016, January 28, 2016), from http://www.nextgenscience.org

7th Grade

Processing Information

How is information processed in the body?

MS LS 1-8 Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.

Molecular Structure

How can particles combine to produce a substance with different properties?

MS PS1-1: Develop models to describe the atomic composition of simple molecules and extended structures.
MS PS1-3: Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.

Effects of Thermal Energy

How does thermal Energy affect particles?

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.

What happens when new materials are formed? What stays the same and what changes?

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.

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.
MS PS1-6: Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.

Engineering Design-Bundled as Appropriate

MS-ETS1-1 Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking inot account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
MS-ETS1-2 Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
MS-ETS1-3 Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
MS-ETS1-4 Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

Adapted from Achieve. (2016, January 28), from http://www.nextgenscience.org

7th Grade

Cells
How do the structures of organisms contribute to life's functions?

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.
MS 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.
MS LS1-3: Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.

Growth, Development, and Reproduction of Organisms
How do organisms grow, develop, and reproduce?

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. (2A, @V, 3Ai, #ii, #iii)
MS LS1-5: Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
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 the organism.
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.
MS LS4-5 Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.

Adapted from Achieve. (2016, January 28). From http://www.nextgenscience.org

Natural Selection

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 (Emphasis is on the support for evolutionary relationships; changes in organisms)
MS LS4-2: Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organism and between modern and fossil organisms to infer evolutionary relationships. (Emphasis is on support for evolutionary relationships; changes in organisms)
MS 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.
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.
MS LS4-6: (i, ii, iii)* Use mathematical representations to support explanations of how natural selection many lead to increases and decreases of specific traits in populations over time

Structure/Function Relationships
How do the structures of organisms contribute to life's functions?

MS LS 1-3 Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. {Evidence Statement-2aii, 2aiii, 2aiv,4ai (not cells), 4aii (not cells), 4aiii }
MS LS 1-7 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.

*Refer to evidence statements in www.nextscience.org

8th Grade

Weather & Climate
What factors interact and influence weather and climate?

MS ESS2-5 Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.
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.
MS ESS3-5 Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.
MS ESS2-1 Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.
MS 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.

Human Impact
How can natural hazards be predicted?

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. (related to severe weather events)
How do human activities affect Earth systems?

MS ESS3-3 Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.
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.

Engineering Design-Bundled as Appropriate

MS-ETS1-1 Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking inot account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
MS-ETS1-2 Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
MS-ETS1-3 Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
MS-ETS1-4 Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

Adapted from Achieve. (2016, January 28), from http://www.nextgenscience.org

8th Grade

Energy Transfer
How can energy be transferred from one object or system to another?

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.
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.
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.

Waves & Electromagnetic Radiation

What are the characteristic properties of waves that enable them to transfer energy?

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
MS PS4-2 Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.
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. (not being tested)

Matter and Energy in Organisms and Ecosystems
How do organisms obtain and use matter and energy?

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.
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.
MS LS2-2 Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.
MS LS2-4 Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.
MS LS2-5 Evaluate competing design solutions for maintaining biodiversity and ecosystem services.

How do matter and energy move through an ecosystem?

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.
MS LS2-3 Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.

Energy Transfer
How can energy be transferred from one object or system to another?

MS PS3-3 Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer. (apply to weather and ecosystems unit)
MS PS3-4 Plan an investigation to determine the relations 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. (apply to weather and ecosystems unit)