ILLINOIS STATE BOARD OF EDUCATION

SCIENCE GRADE 6-8

Theory of Action: Academic standards represent a collective commitment around what students should learn each year. The state assessment asks students to demonstrate their knowledge, skills, and understanding related to these standards using a common measure. The resulting data allows us to see patterns in performance that should guide school and district improvement, helping identify areas of strength and opportunity.

Role of Performance Level Descriptors in Defining Proficiency: Performance level descriptors bridge the state assessment to classroom instruction and the systems of formative assessments that guide local instruction and choices about individual students. ***Academic proficiency represents a range of observable student performance characteristics***. There are multiple pathways to proficiency, and students rely upon their strengths differently within that range of performance.

Proficiency and Difficulty: A student's ability to demonstrate proficiency is influenced by the complexity of the texts or stimuli presented, tasks they're asked to complete, and the contexts in which they are engaged. As student performance improves, students are typically able to handle more challenging texts/stimuli, tasks, and contexts, and are able to demonstrate their skills and knowledge more accurately and consistently.

Earth and Space Science *Student performance indicates the ability to…*

ESS	Below Proficient	Approaching Proficient	Proficient	Above Proficient
MS - ESS1-1	Identify most of the planets and celestial bodies in the Milky Way galaxy (e.g., sun, moon, planets).	Describe a model of the solar system with slight inaccuracies in explaining or predicting the motion of the sun, moon, and stars; solar and lunar eclipses; and seasonal changes in sunlight and star visibility.	Develop a model of the solar system that accurately explains and predicts the motion of the sun, moon, and stars; the solar and lunar eclipse process; and seasonal changes in sunlight duration and star visibility.	Develop a detailed model of the solar system that accurately explains and predicts the motion of the sun, moon, and stars; the solar and lunar eclipse process; and seasonal changes in sunlight duration and star visibility.
	Recognize that the number of daylight hours changes throughout the year.	Identify all major celestial bodies in the Milky Way galaxy (sun, moon, planets, etc.).		
	Understand that certain stars and galaxies are visible only at specific times of the year.	Explain that certain stars and galaxies are visible only at specific times of the year.		
MS - ESS1-2	Identify key systems, including the Milky Way galaxy, the sun, planets and their moons, and asteroids.	Describe a model illustrating the interactions between objects in the Milky Way galaxy, including the sun, planets, moons, and asteroids, or a model demonstrating the role of gravity in maintaining the positions of celestial objects.	Develop a model that accurately represents the interactions between celestial objects, including the Milky Way galaxy, the sun, planets, moons, and asteroids. The model should illustrate how gravity governs these interactions.	Develop a model that represents and identifies the Milky Way galaxy, the sun, planets, moons, and asteroids, along with their interactions. The model should illustrate how gravity maintains the orbits of these celestial objects, governing their movement within the solar system and the galaxy.
	Identify the role of gravity in keeping celestial objects in orbit, including a recognition that larger objects have more gravity.		Use evidence to explain that other stars in the night sky look smaller and less bright because of their distance from Earth.	

ESS	Below Proficient	Approaching Proficient	Proficient	Above Proficient
MS-ESS1-3	Recognize the sun is larger than planets and moons.	Identify size proportions of solar system objects (e.g., sun, planets, moon, asteroids, etc.).	Analyze data to determine scale and proportions of the sun, planets, moons, and asteroids.	Develop or collect data on the scale and proportions of these celestial objects.
MS - ESS1-4	Identify different rock layers.	Identify that different layers of rock contain different types of fossils.	Construct an evidence-based scientific explanation that illustrates: • The use of rock strata to determine geologic time scale. • How time scale can be used to organize Earth's 4.6-billion-year-old history. • That rock strata and fossil records provide only relative -- not absolute -- dates.	Develop an evidence-based scientific argument that supports: • The use of rock strata to determine geologic time scale. • How time scale can be used to organize Earth's 4.6-billion-year-old history. • That rock strata and fossil records provide only relative -- not absolute -- dates.
MS - ESS2-1	Identify and describe model components of Earth's material cycling and energy flow, including the rock cycle and processes from the sun and Earth's interior.	Develop a model illustrating either Earth's material cycling or the energy flow driving it, including the rock cycle and processes from the Sun and Earth's interior.	Develop a model showing both Earth's material cycling and energy flow, including the rock cycle and processes from the Sun and Earth's interior.	Construct a detailed model explanation using multiple pieces of evidence and prior knowledge of how geoscience processes have shaped Earth's surface at various scales.
MS - ESS2-2	Identify an evidence-based explanation of how geoscience processes change Earth's surface across time and space, including: • Timescales of geoscience processes, including plate movement, mountain building, volcanoes, earthquakes, landslides, and meteor impacts. • Hydrosphere processes and features.	Construct an explanation using some evidence of how geoscience processes shape Earth's surface over varying scales, including:	Construct an explanation based on evidence of how geoscience processes alter Earth's surface across different timescales and spatial scales, including:	Construct a comprehensive explanation using multiple pieces of evidence and prior knowledge of how geoscience processes transform Earth's surface over time and space, including:
MS-ESS2-3	Use fossil and rock distribution, continental shapes, and seafloor structures as evidence of past plate motions, including information about: • Plate tectonic features and processes. • The tectonic processes that create new ocean floors and destroy old seafloor. • Fossil evidence; mountain ranges; ocean structures; and continental shapes, including shelves, may be used to demonstrate past plate movement. • The supercontinent Pangea.	Analyze and interpret most data on fossil and rock distribution, continental shapes, or seafloor structures as evidence of past plate motions, including information about:	Analyze and interpret data on fossils, rocks, continental shapes, and seafloor structures as evidence of past plate motions, including information about:	Analyze and interpret data on fossils, rocks, continental shapes, and seafloor structures to evidence past plate motions and their causes, including information about:

ESS	Below Proficient	Approaching Proficient	Proficient	Above Proficient
MS-ESS2-4	Identify/describe parts of a model of the water cycle through Earth's systems driven by solar energy and gravity, including evidence that:	Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun OR the force of gravity, including evidence that:	Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun AND the force of gravity, including evidence that:	Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity AND use the model to describe the impact of changes in the water cycle on climate, including evidence that:
	• Water cycles between land, ocean, and atmosphere via transpiration, evaporation, condensation, precipitation, and downhill flows. • The state of water changes as it moves through the hydrologic cycle. • Gravity and sunlight influence global water movement and its state changes.			
MS-ESS2-5	Identify data showing how air mass interactions cause weather changes, including that:	Collect data showing how air mass motions OR complex air mass interactions cause weather changes, including that:	Collect data as evidence of how air mass motions AND complex air mass interactions cause weather changes including that:	Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions AND use the evidence to predict weather at a location, including that:
	• Local weather is influenced by wind, landforms, and ocean currents/temperatures. • Weather predictions are probabilistic due to the complexity of patterns.			
MS-ESS2-6	Identify how unequal heating and Earth's rotation create atmospheric and oceanic circulation patterns that shape regional climates, including that:	Use a model to describe how unequal heating and Earth's rotation create atmospheric and oceanic circulation patterns that shape regional climates, including that:	Develop AND use a model to describe how unequal heating and Earth's rotation create atmospheric and oceanic circulation patterns that shape regional climates, including that:	Develop a model to describe how the unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates AND use the model to predict the regional climate of a simulated area, including that:
	• Weather and climate are influenced by interactions between sunlight, ocean, atmosphere, ice, landforms, and living things, varying with latitude and altitude. • Oceans have an impact on the weather and climate by absorbing and releasing solar energy and redistributing energy through currents.			

ESS	Below Proficient	Approaching Proficient	Proficient	Above Proficient
MS-ESS3-1	Identify and gather evidence for how Earth's resources are formed and distributed because of past and current geologic processes, including that:	Construct a scientific explanation based on evidence for how Earth's resources are formed and distributed because of past OR current geologic processes, including that:	Construct a scientific explanation based on evidence for how Earth's resources are formed and distributed because of past AND current geologic processes, including that:	Construct a scientific explanation based on evidence for how Earth's resources are formed and distributed because of past and current geologic processes AND how human processes impact the sustainability of resources, including that:
	• Humans depend on Earth's land, ocean, 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 because of past geologic processes.			
MS-ESS3-2	Identify how data on natural hazards is used to predict future catastrophic events and guide the development of technologies to reduce their impact.	Analyze and interpret data on natural hazards to forecast future catastrophic events OR to inform the development of technologies to mitigate their effects.	Analyze and interpret data on natural hazards to forecast future catastrophic events AND to inform the development of technologies to mitigate their effects.	Analyze and interpret data on natural hazards to forecast future catastrophic events and to inform the development of a prototype of a simulated technological solution to mitigate their effects.
	Identify how 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.	Explain how 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.	Utilize information about how 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.	Demonstrate how 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.
MS-ESS3-3	Apply scientific principles to identify a method for monitoring and minimizing a human impact on the environment, drawing on evidence that:	Apply scientific principles to design a method for monitoring OR minimizing a human impact on the environment, drawing on evidence that:	Apply scientific principles to design a method for monitoring AND minimizing a human impact on the environment, drawing on evidence that:	Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment while identifying unintended consequences, drawing on evidence that:
	• Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. • Changes to Earth's environment can have different impacts (negative and positive) for different living things.			

ESS	Below Proficient	Approaching Proficient	Proficient	Above Proficient
MS-ESS3-4	Identify and gather evidence for how increases in human population and per capita consumption of natural resources impact Earth's systems acknowledging that:	Construct an argument supported by evidence for how increases in human population OR per capita consumption of natural resources impact Earth's systems acknowledging that:	Construct an argument supported by evidence for how increases in human population AND per capita consumption of natural resources impact Earth's systems acknowledging that:	Construct an argument supported by evidence for how increases in human population AND per capita consumption of natural resources impact Earth's systems acknowledging that:
	• 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			
MS-ESS3-5	Ask questions about the factors that have caused the rise in global temperatures over the past century that consider how:	Ask questions to clarify evidence of most factors that have caused the rise in global temperatures over the past century that consider how:	Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century that consider how:	Ask questions to clarify evidence about the relationships between the factors that have caused the rise in global temperatures over the past century that consider how:
	• 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 depends on the understanding of climate science, engineering capabilities, and other kinds of knowledge. • Reducing human vulnerability to whatever climate changes do occur depend on the understanding of other kinds of knowledge, such as understanding of human behavior and on applying that knowledge wisely in decisions and activities.			

Life Sciences *Student performance indicates the ability to…*

LS	Below Proficient	Approaching Proficient	Proficient	Above Proficient
MS-LS1-1	Use pre-generated data to provide evidence that living things are made of cells -- either one cell (unicellular) or many different numbers and types of cells (multicellular).	Conduct an investigation to provide evidence that living things are made of cells -- either one cell (unicellular) or many different numbers and types of cells (multicellular).	Conduct an investigation to provide evidence that living things are made of cells -- either one cell (unicellular) or many different numbers and types of cells (multicellular).	Conduct and analyze a series of iterative investigations to provide evidence that living things are made of cells -- either one cell (unicellular) or many different numbers and types of cells (multicellular).
MS-LS1-2	Identify the parts of a cell indicating that:	Develop and use a model to describe the function of a cell as a whole OR ways parts of cells contribute to the function indicating that:	Develop and use a model to describe the function of a cell as a whole AND ways parts of cells contribute to the function indicating that:	Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function indicating that:
	• Within cells, special structures (specifically the nucleus, chloroplasts, mitochondria, cell membrane, and cell wall) are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell.			

LS	Below Proficient	Approaching Proficient	Proficient	Above Proficient
MS-LS1-3	Explain how the body is a system of interacting subsystems including that:	Analyze arguments supported by evidence for how the body is a system of interacting subsystems composed of groups of cells, including that:	Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells, including that:	Develop an argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells, including that:
	• 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.			
MS-LS1-4	Use argument based on evidence OR scientific reasoning to support an explanation for how characteristic animal behaviors OR specialized plant structures affect the probability of successful reproduction of animals and plants, respectively. Consider that:	Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors OR specialized plant structures affect the probability of successful reproduction of animals and plants, respectively. Consider that:	Use arguments 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. Consider that:	Develop an 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. Consider that:
	• 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.			
MS-LS1-5	Construct an explanation based on provided evidence for how environmental and genetic factors influence the growth of organisms. Include information about how:	Construct a scientific explanation based on evidence for how environmental OR genetic factors influence the growth of organisms. Include information about how:	Construct a scientific explanation based on evidence for how environmental AND genetic factors influence the growth of organisms. Include information about how:	Construct a scientific explanation based on multiple sources of evidence for how environmental and genetic factors work together to influence the growth of organisms. Include information about how:
	• Genetic factors as well as local conditions affect the growth of the adult plant.			
MS-LS1-6	Construct an explanation of photosynthesis. Describe how:	Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter OR flow of energy into and out of organisms. Describe how:	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. Describe how:	Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and the chemical mechanisms responsible for the flow of energy into and out of organisms. Describe how:
	• 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. • 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.			

LS	Below Proficient	Approaching Proficient	Proficient	Above Proficient
MS-LS1-7	Identify parts of a model that describe how food is rearranged through chemical reactions to form new molecules that support growth and/or release energy as this matter moves through an organism. Include that:	Use a model to describe how food is rearranged through chemical reactions to form new molecules that support growth and/or release energy as this matter moves through an organism. Include that:	Develop a model to describe how food is rearranged through chemical reactions to form new molecules that support growth and/or release energy as this matter moves through an organism. Include that:	Develop a model to describe how food is rearranged through chemical reactions to form new molecules that support growth and/or release energy as this matter moves through an organism while explaining the relationships between the inputs and outputs of photosynthesis and cellular respiration. Include that:
	• 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. • Cellular respiration in plants and animals involve 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.			
MS-LS1-8	Synthesize provided information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories. Explain that:	Incomplete gathering OR synthesis of information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories. Explain that:	Gather AND synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories. Explain that:	Gather, evaluate, AND synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories. Explain that:
	• Each sense receptor responds to different inputs (electromagnetic, mechanical, chemical), 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.			
MS-LS2-1	Identify patterns in data to use as evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. Consider that:	Analyze and interpret data to provide evidence for the effects of resource availability on organisms OR populations of organisms in an ecosystem. Consider that:	Analyze and interpret data to provide evidence for the effects of resource availability on organisms AND populations of organisms in an ecosystem. Consider that:	Use tools, technology, and/or models to analyze and explain data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. Consider that:
	• Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with non-living factors. • In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete for limited resources, access to which consequently constrains their growth and reproduction. • Growth of organisms and population increases are limited by access to resources.			

LS	Below Proficient	Approaching Proficient	Proficient	Above Proficient
MS-LS2-2	Construct an explanation of interactions among organisms in one ecosystem, including that:	Construct an explanation of interactions among organisms across multiple ecosystems, including that:	Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems, including that:	Construct an explanation that uses qualitative and quantitative evidence to predict patterns of interactions among organisms across multiple ecosystems, including that:
	• Predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival. • Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments -- both living and nonliving -- are shared.			
MS-LS2-3	Use a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. Include information supporting that:	Develop a model to describe the cycling of matter and flow of energy among living OR nonliving parts of an ecosystem. Include information supporting that:	Develop a model to describe the cycling of matter and flow of energy among living AND nonliving parts of an ecosystem. Include information supporting that:	Develop a computational model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. Include information supporting that:
	• 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. • Transfers of matter into and out of the physical environment occur at every level. • Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments. • The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem.			
MS-LS24	Construct an argument that changes to physical or biological components of an ecosystem affect populations. Consider that:	Construct an argument supported by theoretical evidence that changes to physical or biological components of an ecosystem affect populations. Consider that:	Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. Consider that:	Construct an argument supported by empirical evidence that changes to physical AND biological components of an ecosystem affect populations. Consider that:
	• 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.			
MS-LS2-5	Evaluate a design solution for maintaining biodiversity and ecosystem services that considers how:	Evaluate competing design solutions for maintaining biodiversity OR ecosystem services that consider how:	Evaluate competing design solutions for maintaining biodiversity and ecosystem services that consider how:	Evaluate and improve upon one of many competing design solutions for maintaining biodiversity and ecosystem services that consider how:
	• 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. • 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. • There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem.			

LS	Below Proficient	Approaching Proficient	Proficient	Above Proficient
MS-LS3-1	Use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins OR may result in harmful, beneficial, or neutral effects to the structure and function of the organism. Consider that:	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. Consider that:	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. Consider that:	Develop and use a model to explain how and 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. Consider that:
	• 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 (mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change 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.			
MS-LS3-2	Use a model to describe why asexual reproduction results in offspring with identical genetic information OR sexual reproduction results in offspring with genetic variation. Include information about how:	Use a model to describe why asexual reproduction results in offspring with identical genetic information AND sexual reproduction results in offspring with genetic variation. Include information about how:	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. Include information about how:	Develop and use a model to describe how and why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation. Include information about how:
	• Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. • Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited. • 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.			
MS-LS4-1	Analyze data for patterns in the fossil record that document the existence, diversity, extinction, OR change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past. Acknowledge that:	Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, OR change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past. Acknowledge that:	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. Acknowledge that:	Analyze and interpret multiple sources of 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. Acknowledge that:
	• 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.			

LS	Below Proficient	Approaching Proficient	Proficient	Above Proficient
MS-LS4-2	Apply scientific ideas to construct an explanation for the anatomical similarities OR differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships. Include information about how:	Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms OR between modern and fossil organisms to infer evolutionary relationships. Include information about how:	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. Include information about how:	Apply scientific ideas to construct an explanation relating the anatomical similarities and differences among modern organisms and between modern and fossil organisms to describe evolutionary relationships. Include information about how:
	• Anatomical similarities and differences between various organisms living today and organisms in the fossil record enable the reconstruction of evolutionary history and the inference of lines of evolutionary descent.			
MS-LS4-3	Analyze displays of pictorial data to identify patterns of similarities in the embryological development between two species to identify relationships not evident in the fully formed anatomy. Consider how:	Analyze displays of pictorial data to identify patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy. Consider how:	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. Consider how:	Analyze displays of pictorial data to explain patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy. Consider how:
	• Comparison of the embryological development of different species also reveals similarities that show relationships not evident in the fully formed anatomy.			
MS-LS4-4	Explain how genetic variations of traits in a population increase some individuals' probability of surviving OR reproducing in a specific environment. Consider how:	Explain based on evidence how genetic variations of traits in a population increase some individuals' probability of surviving OR reproducing in a specific environment. Consider how:	Explain based on evidence how genetic variations of traits in a population increase some individuals' probability of surviving AND reproducing in a specific environment. Consider how:	Explain based on multiple sources of evidence how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment. Consider how:
	• Natural selection leads to the predominance of certain traits in a population and the suppression of others.			
MS-LS4-5	Synthesize provided information about technologies that have changed the way humans influence the inheritance of desired traits in organisms. Consider how:	Gather incomplete information OR synthesize information about technologies that have changed the way humans influence the inheritance of desired traits in organisms. Consider how:	Gather AND synthesize information about technologies that have changed the way humans influence the inheritance of desired traits in organisms. Consider how:	Gather, evaluate, AND synthesize information about technologies that have changed the way humans influence the inheritance of desired traits in organisms. Consider how:
	• 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.			

LS	Below Proficient	Approaching Proficient	Proficient	Above Proficient
MS-LS4-6	Use mathematical representations to support explanations of how natural selection may lead to increases OR decreases of a specific trait in a population over time. Consider how:	Use mathematical representations to support explanations of how natural selection may lead to increases OR decreases of specific traits in populations over time. Consider how:	Use mathematical representations to support explanations of how natural selection may lead to increases AND decreases of specific traits in populations over time. Consider how:	Generate AND use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time. Consider how:

- 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.

Physical Sciences *Student performance indicates the ability to…*

PS	Below Proficient	Approaching Proficient	Proficient	Above Proficient
MS-PS1-1	Use a model to describe the atomic composition of a simple molecule OR an extended structure, including that:	Use models to describe the atomic composition of simple molecules OR extended structures, including that:	Develop models to describe the atomic composition of simple molecules AND extended structures, including that:	Develop and revise models to describe the atomic composition of simple molecules and extended structures, including that:

- 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.
- Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals).

MS-PS-1-2	Identify data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred. Consider that:	Analyze data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred. Consider that:	Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred. Consider that:	Analyze, interpret, and evaluate data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred. Consider that:

- Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it.
- Substances react chemically in characteristic ways. 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.

MS-PS1-3	Make sense of provided information to describe that synthetic materials come from natural resources and impact society, including that:	Gather information to describe that synthetic materials come from natural resources and impact society, including that:	Gather and make sense of information to describe that synthetic materials come from natural resources and impact society, including that:	Gather, evaluate, and make sense of information to describe that synthetic materials come from natural resources and impact society, including that:

- Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it.
- Substances react chemically in characteristic ways. 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.

PS	Below Proficient	Approaching Proficient	Proficient	Above Proficient
MS-PS1-4	Use a provided model that describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed. Consider that:	Use a provided model that predicts and describes changes in particle motion, temperature, AND state of a pure substance when thermal energy is added or removed. Consider that:	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. Consider that:	Develop and evaluate a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed. Consider that:
	• Gases and liquids are made of molecules or inert atoms that are moving about relative to each other. • In a liquid, the molecules are constantly in contact with others; in a gas, they are widely spaced except when they happen to collide. In a solid, atoms are closely spaced and may vibrate in position but do not change relative locations. • The changes of state that occur with variations in temperature or pressure can be described and predicted using these models of matter. • The term "heat" as used in everyday language refers both to thermal energy (the motion of atoms or molecules within a substance) and the transfer of that thermal energy from one object to another. In science, heat is used only for this second meaning; it refers to the energy transferred due to the temperature difference between two objects. • The temperature of a system is proportional to the average internal kinetic energy and potential energy per atom or molecule (whichever is the appropriate building block for the system's material). The details of that relationship depend on the type of atom or molecule and the interactions among the atoms in the material. Temperature is not a direct measure of a system's total thermal energy. The total thermal energy (sometimes called the total internal energy) of a system depends jointly on the temperature, the total number of atoms in the system, and the state of the material.			
MS-PS1-5	Use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved. Include at least one of the following:	Use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved. Include that:	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. Include that:	Develop, use, and evaluate a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved. Include that:
	• Substances react chemically in characteristic ways. 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.			
MS-PS1-6	Undertake a design project to test a device that either releases or absorbs thermal energy by chemical processes. Consider that:	Undertake a design project to construct and test, a device that either releases or absorbs thermal energy by chemical processes. Consider that:	Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes. Consider that:	Undertake a design project to construct, test, modify, and compare devices that either releases or absorbs thermal energy by chemical processes. Consider that:
	• Some chemical reactions release energy; others store energy. • A solution needs to be tested and then modified on the basis of the test results in order to improve it. • Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process -- that is, some of the characteristics may be incorporated into the new design. • The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution.			

PS	Below Proficient	Approaching Proficient	Proficient	Above Proficient
MS-PS2-1	Apply Newton's third law to choose a solution from a list to a problem involving the motion of two colliding objects. Consider the following:	Apply Newton's third law to design a solution to a problem involving the motion of two colliding objects in a manner that may be incomplete or contain inaccuracies. In solution design, consider the following:	Apply Newton's third law to design a solution to a problem involving the motion of two colliding objects. In solution design, consider the following:	Apply Newton's third law to design, evaluate, and explain a solution to a problem involving the motion of two colliding objects. In solution design, consider the following:
	• 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 (Newton's third law).			
MS-PS2-2	Analyze a provided 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. Consider the following:	Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object OR the mass of the object. Consider the following:	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. Consider the following:	Plan and evaluate 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. Consider the following:
	• The motion of an object is determined by the sum of the forces acting on it; if the total force on the object is not zero, its motion will change. The greater the mass of the object, the greater the force needed to achieve the same change in motion. For any given object, a larger force causes a larger change in motion. • All positions of objects and the directions of forces and motions must be described in an arbitrarily chosen reference frame and arbitrarily chosen units of size. In order to share information with other people, these choices must also be shared.			
MS-PS2-4	Investigate provided questions about data to determine the factors that affect the strength of electric and magnetic forces, including that:	Ask questions about data to determine the factors that affect the strength of electric OR magnetic forces, including that:	Ask questions about data to determine the factors that affect the strength of electric AND magnetic forces, including that:	Ask and investigate questions about data to determine the factors that affect the strength of electric and magnetic forces, including that:
	• 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 large mass (e.g., Earth and the sun).			
MS-PS2-5	Conduct an investigation to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact. Consider that:	Conduct an investigation and incompletely 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. Consider that:	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. Consider that:	Conduct an investigation and evaluate and modify the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact. Consider that:
	• Forces that act at a distance (electric, magnetic, and gravitational) can be explained by fields that extend through space and can be mapped by their effect on a test object (a charged object or a ball, respectively).			

PS	Below Proficient	Approaching Proficient	Proficient	Above Proficient
MS-PS3-1	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. Acknowledge that:	Construct incomplete and/or partially 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. Acknowledge that:	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. Acknowledge that:	Construct and interpret graphical displays of data to provide an explanation of the relationships of kinetic energy to the mass of an object and to the speed of an object. Acknowledge that:
	• Motion energy is properly called kinetic energy; it is proportional to the mass of the moving object and grows with the square of its speed.			
MS-PS3-2	Use 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. Acknowledge that:	Develop a model to incompletely describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system. Acknowledge that:	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. Acknowledge that:	Develop and evaluate 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. Acknowledge that:
	• A system of objects also may contain stored (potential) energy, depending on their relative positions. • When two objects interact, each one exerts a force on the other that can cause energy to be transferred to or from the object.			
MS-PS3-3	Apply scientific principles to test a provided device that either minimizes or maximizes thermal energy transfer. Consider that:	Apply scientific principles to construct and test a device that either minimizes or maximizes thermal energy transfer. Consider that:	Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer. Consider that:	Apply scientific principles to design, construct, test, and modify a device that either minimizes or maximizes thermal energy transfer. Consider that:
	• 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. • Energy is spontaneously transferred out of hotter regions or objects and into colder ones. • The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that is likely to limit possible solutions. • A solution needs to be tested and then modified on the basis of the test results in order to improve it. There are systematic processes for evaluating solutions with respect to how well they meet criteria and constraints of a problem.			

PS	Below Proficient	Approaching Proficient	Proficient	Above Proficient
MS-PS3-4	Choose an investigation to determine the relationships among the energy transferred and at least two of the following: 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. Consider that:	Plan an investigation to determine the relationships among the energy transferred and two of the following: the type of matter, the mass, the change in the average kinetic energy of the particles as measured by the temperature of the sample. Consider that:	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. Consider that:	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. Consider that:
	• 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. • 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.			
MS-PS3-5	Present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object. Include evidence to support that:	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. Include evidence to support that:	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. Include evidence to support that:	Construct, use, present, and evaluate arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object. Include evidence to support that:
	• When the motion energy of an object changes, there is inevitably some other change in energy at the same time.			
MS-PS4-2	Use a model to describe that waves are reflected, absorbed, or transmitted through various materials, including evidence of an understanding that:	Develop a model to describe that waves are reflected, absorbed, or transmitted through various materials, including evidence of an understanding that:	Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials, including evidence of an understanding that:	Develop, use, and evaluate a model to describe that waves are reflected, absorbed, or transmitted through various materials, including evidence of an understanding that:
	• A sound wave needs a medium through which it is transmitted. • When light shines on an object, it is reflected, absorbed, or transmitted through the object, depending on the object's material and the frequency (color) of the light. • 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. • A wave model of light is useful for explaining brightness, color, and the frequency-dependent bending of light at a surface between media. • However, because light can travel through space, it cannot be a matter wave, like sound or water waves.			

PS	Below Proficient	Approaching Proficient	Proficient	Above Proficient
MS-PS4-3	Describe qualitative scientific and technical information that supports the claim that digitized signals are a more reliable way to encode and transmit information than analog signals.	Combine 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.	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.	Gather and 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.

Engineering & Technology Standards *Student performance indicates the ability to…*

ETS	Below Proficient	Approaching Proficient	Proficient	Above Proficient
MS-ETS-1	Identify a design problem but may not clearly define its criteria and constraints.	Identify some criteria and constraints but may describe them vaguely or incompletely.	Clearly define the criteria and constraints of a design problem with appropriate detail.	Precisely define and justify criteria and constraints with strong reasoning.
	Recognize that solutions have limits but may not explain them clearly.	Recognize relevant scientific principles but may not consistently apply them.	Use scientific principles to explain why certain criteria and constraints are necessary.	Integrate multiple scientific principles to refine the problem definition.
	List general impacts on people or the environment but may not connect them to the design.	Identify potential effects on people and the environment but provides limited detail.	Describe how the solution might impact people and the natural environment.	Analyze and evaluate potential human and environmental impacts, considering trade-offs in design choices.
MS-ETS-2	Compare two or more designs but may not articulate why one is better than another.	Compare design solutions based on general observations.	Evaluate competing design solutions using a structured and systematic process.	Develop and apply a detailed, data-driven evaluation process.
	Identify a few strengths and weaknesses but may not connect them to criteria and constraints.	Describe some strengths and weaknesses but may not use data or a structured approach.	Describe the extent to which each design meets criteria and constraints using supporting evidence.	Compare multiple designs while identifying trade-offs and limitations.
	Make a choice between solutions but without using a clear process.	Recognize that a systematic process is important but may not consistently apply one.	Use data and logical reasoning to justify design choices.	Critically analyze and suggest improvements based on systematic evaluation.

ETS	Below Proficient	Approaching Proficient	Proficient	Above Proficient
MS-ETS-3	Recognize that data is collected from tests but may not accurately interpret it.	Compare data from different designs but may not identify meaningful patterns.	Analyze test data to identify key similarities and differences between designs.	Conduct a detailed analysis of data, identifying trends and patterns.
	Identify basic differences between designs but does not acknowledge the significance of these differences.	Recognize similarities and differences but may not connect them to improving a design.	Determine which characteristics contribute most to success.	Synthesize findings to create an optimized, innovative solution.
	State that some designs work better than others but may not suggest improvements.	Suggest combining characteristics from different designs but lacks clear justification for how doing so would improve the design.	Propose a new design that combines the best features of tested solutions.	Justify design choices with strong evidence and consider efficiency, feasibility, and sustainability.
MS-ETS-4	Create a simple model but may not be able explain how it generates useful data.	Create a model that generates data but may not use the data effectively.	Develop a functional model that produces useful data for testing and modification.	Create a highly effective model for systematic testing and data collection.
	Recognize the need for testing but may not modify the design based on results.	Modify a design based on general observations but does not refine it iteratively.	Analyze test results and make informed improvements to the design.	Use advanced analysis techniques to refine the design efficiently.
	Describe an idea for improvement but may not implement changes systematically.	Recognize that testing is important but may not apply it consistently to improve the design.	Demonstrate an iterative design process with multiple refinements.	Conduct multiple cycles of iteration while considering real-world constraints and future improvements.