Cognia Science Alternate Assessment

Middle School Grade-Level Standards and Extended Performance Expectations (EPEs) for Maine Department of Education

FINAL

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AdvancED and Measured Progress are now cognia

Middle School Grade-Level Standards

Standards

NGSS Performance Expectation MS-ESS1-1	
MS-ESS1-1 Develop and use a model of the Earth-Sun-Moon system to describe the cyclic patterns of lunar phases, eclipses of the Sun and Moon, and seasons. [Clarification Statement: Examples of models can be physical, graphical, or conceptual.]	
Science and Engineering Practices (SEP)	**Developing and Using Models** • Develop and use a model to describe phenomena.
Disciplinary Core Ideas (DCI)	**ESS1.A: The Universe and Its Stars** • Patterns of the apparent motion of the Sun, the Moon, and stars in the sky can be observed, described, predicted, and explained with models. **ESS1.B: Earth and the Solar System** • This model of the solar system can explain eclipses of the Sun and the Moon. Earth's spin axis is fixed in direction over the short-term but tilted relative to its orbit around the Sun. The seasons are a result of that tilt and are caused by the differential intensity of sunlight on different areas of Earth across the year.
Crosscutting Concepts (CCC)	**Patterns:** • Patterns can be used to identify cause-and-effect relationships.

Extended Performance Expectation MS-ESS1-1			
	Level 1	***Level 2***	***Level 3***
	Less Complex		***More Complex***
	MS-ESS1-1.1 Identify a model that shows the positions of Earth (with its tilt), the Sun, and the Moon as Earth revolves around the Sun and the Moon orbits Earth in the solar system.	**MS-ESS1-1.2** Use a model to describe or compare the positions of objects or amount or path of light in the cyclic patterns of seasons, lunar phases, or eclipses.	**MS-ESS1-1.3** Develop or use a model of the Earth-Sun-Moon system to compare or show patterns in seasons, lunar phases, or eclipses.
Science and Engineering Practices (SEP)	**Developing and Using Models** • Develop and/or use a model to describe phenomena.		
Disciplinary Core Ideas (DCI)	**ESS1.A: The Universe and Its Stars** • Patterns of the apparent motion of the Sun, the Moon, and stars in the sky can be observed, described, predicted, and explained with models. **ESS1.B: Earth and the Solar System** • This model of the solar system can explain eclipses of the Sun and the Moon. Earth's spin axis is fixed in direction over the short-term but tilted relative to its orbit around the Sun. The seasons are a result of that tilt and are caused by the differential intensity of sunlight on different areas of Earth across the year.		
Crosscutting Concepts (CCC)	**Target:** **Patterns**		

	• Patterns can be used to identify cause-and-effect relationships. **Supporting:** **Systems and System Models**

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NGSS Performance Expectation MS-ESS2-2	
MS-ESS2-2 Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales. [Clarification Statement: Emphasis is on how processes change Earth's surface at time and spatial scales that can be large (such as slow plate motions or the uplift of large mountain ranges) or small (such as rapid landslides or microscopic geochemical reactions), and how many geoscience processes (such as earthquakes, volcanoes, and meteor impacts) usually behave gradually but are punctuated by catastrophic events. Examples of geoscience processes include surface weathering and deposition by the movements of water, ice, and wind. Emphasis is on geoscience processes that shape local geographic features, where appropriate.]	
Science and Engineering Practices (SEP)	**Constructing Explanations and Designing Solutions** • Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe nature operate today as they did in the past and will continue to do so in the future.
Disciplinary Core Ideas (DCI)	**ESS2.A: Earth's Materials and Systems** • The planet's systems interact over scales that range from microscopic to global in size, and they operate over fractions of a second to billions of years. These interactions have shaped Earth's history and will determine its future. **ESS2.C: The Roles of Water in Earth's Surface Processes** • Water's movements—both on the land and underground—cause weathering and erosion, which change the land's surface features and create underground formations.
Crosscutting Concepts (CCC)	**Scale Proportion and Quantity** • Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.

Extended Performance Expectation MS-ESS2-2			
	Level 1	***Level 2***	***Level 3***
	Less Complex ←······→		*More Complex*
	MS-ESS2-2.1 Use observations to identify the process or agent that causes a particular change to Earth's surface.	**MS-ESS2-2.2** Use charts or other graphic organizers to identify whether a process or event was small/large scale and/or whether a process or event happened gradually/rapidly.	**MS-ESS2-2.3** Explain how geoscience processes have caused changes to Earth's surface at various time or spatial scales.
Science and Engineering Practices (SEP)	**Target:** **Constructing Explanations** • Construct a scientific explanation based on valid and reliable evidence obtained from sources and the assumption that theories and laws that describe nature operate today as they did in the past and will continue to do so in the future. **Supporting:** **Obtaining, Evaluating, and Communicating Information**		
Disciplinary Core	**SS2.A: Earth's Materials and Systems**		

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Ideas (DCI)	• The planet's systems interact over scales that range from microscopic to global in size, and they operate over fractions of a second to billions of years. These interactions have shaped Earth's history and will determine its future. **ESS2.C: The Roles of Water in Earth's Surface Processes** • Water's movements—both on the land and underground—cause weathering and erosion, which change the land's surface features and create underground formations.
Crosscutting Concepts (CCC)	**Target:** **Scale Proportion and Quantity** • Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. **Supporting:** **Cause and Effect**

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NGSS Performance Expectation MS-ESS2-4	
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. [Clarification Statement: Emphasis is on the ways water changes its state as it moves through the multiple pathways of the hydrologic cycle. Examples of models can be conceptual or physical.] [Assessment Boundary: A quantitative understanding of the latent heats of vaporization and fusion is not assessed.]	
Science and Engineering Practices (SEP)	**Developing and Using Models** • Develop a model to describe unobservable mechanisms.
Disciplinary Core Ideas (DCI)	**ESS2.C: The Roles of Water in Earth's Surface Processes** • Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation, as well as downhill flows on land. • Global movements of water and its changes in form are propelled by sunlight and gravity.
Crosscutting Concepts (CCC)	**Energy and Matter** • Within a natural or designed system, the transfer of energy drives the motion and/or cycling of matter.

Extended Performance Expectation MS-ESS2-4			
	Level 1	***Level 2***	***Level 3***
	Less Complex ⟵ ⟵ ⟵ ⟵ ⟶ ⟶ ⟶ ⟶ ⟶ ***More Complex***		
	MS-ESS2-4.1 Use a model to trace the path of water through Earth's systems.	**MS-ESS2-4.2** Use a model to describe the state of water or state changes in various parts of the water cycle.	**MS-ESS2-4.3** Develop a model to describe how the Sun's energy or the force of gravity moves water through the water cycle.
Science and Engineering Practices (SEP)	**Developing and Using Models** • Develop a model to describe unobservable mechanisms.		
Disciplinary Core Ideas (DCI)	**ESS2.C: The Roles of Water in Earth's Surface Processes** • Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation, as well as downhill flows on land. • Global movements of water and its changes in form are propelled by sunlight and gravity.		
Crosscutting Concepts (CCC)	**Energy and Matter** • Within a natural or designed system, the transfer of energy drives the motion and/or cycling of matter.		

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Standards

NGSS Performance Expectation MS-ESS3-3	
MS-ESS3-3 Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment. * [Clarification Statement: Examples of the design process include examining human environmental impacts, assessing the kinds of solutions that are feasible, and designing and evaluating solutions that could reduce that impact. Examples of human impacts can include water usage (such as the withdrawal of water from streams and aquifers or the construction of dams and levees), land usage (such as urban development, agriculture, or the removal of wetlands), and pollution (such as of the air, water, or land).]	
Science and Engineering Practices (SEP)	**Constructing Explanations and Designing Solutions** • Apply scientific principles to design an object, tool, process, or system.
Disciplinary Core Ideas (DCI)	**ESS3.C: Human Impacts on Earth Systems** • Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things. • Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise.
Crosscutting Concepts (CCC)	**Cause and Effect** • Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation.

Extended Performance Expectation MS-ESS3-3			
	Level 1	***Level 2***	***Level 3***
	Less Complex ⟵ ⟵ ⟵ ⟵ ⟵ ⟵ ⟶ ⟶ ⟶ ⟶ ⟶ ⟶		***More Complex***
	MS-ESS3-3.1 Identify an environmental problem caused by human activities/impact.	**MS-ESS3-3.2** Make a claim about how a particular method would work to reduce human impact on the environment.	**MS-ESS3-3.3** Select or evaluate a design for a method for minimizing a human impact on the environment.
Science and Engineering Practices (SEP)	**Target:** **Constructing Explanations and Designing Solutions** • Apply scientific principles to design an object, tool, process, or system. **Supporting:** **Engaging in Argument from Evidence** **Asking Questions and Defining Problems**		
Disciplinary Core Ideas (DCI)	**ESS3.C: Human Impacts on Earth Systems** • Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's		

	environments can have different impacts (negative and positive) for different living things. • Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise.
Crosscutting Concepts (CCC)	**Cause and Effect** • Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation.

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Standards

NGSS Performance Expectation MS-LS1-3	
MS-LS1-3 Use an argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. [Clarification Statement: Emphasis is on the conceptual understanding that cells form tissues and tissues form organs specialized for particular body functions. Examples could include the interaction of subsystems within a system and the normal functioning of those systems.] [Assessment Boundary: Assessment does not include the mechanism of one body system independent of others. Assessment is limited to the circulatory, excretory, digestive, respiratory, muscular, and nervous systems.]	
Science and Engineering Practices (SEP)	**Engaging in Argument from Evidence** • Use an oral and written argument supported by evidence to support or refute an explanation or a model for a phenomenon.
Disciplinary Core Ideas (DCI)	**LS1.A: Structure and Function** • In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions.
Crosscutting Concepts (CCC)	**Systems and System Models** • Systems may interact with other systems; they may have subsystems and be a part of larger complex systems.

Extended Performance Expectation MS-LS1-3			
	Level 1	***Level 2***	***Level 3***
	Less Complex ⟵ ⟵ ⟵ ⟵ ⟵ ⟶ ⟶ ⟶ ⟶ ⟶		***More Complex***
	MS-LS1-3.1 Use charts or other graphic organizers to identify the classification of structures that are part of human body systems and those that are not.	**MS-LS1-3.2** Use a model to identify or show parts that belong to a particular body system and the organization of those parts.	**MS-LS1-3.3** Use evidence to make a claim about two body systems (e.g., circulatory, respiratory, muscular, digestive, nervous, excretory) working together to carry out various functions.
Science and Engineering Practices (SEP)	**Target:** **Engaging in Argument from Evidence** • Use an oral and written argument supported by evidence to support or refute an explanation or a model for a phenomenon. **Supporting:** **Developing and Using Models** **Obtaining, Evaluating, and Communicating Information**		
Disciplinary Core Ideas (DCI)	**LS1.A: Structure and Function** • In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions.		

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Crosscutting Concepts (CCC)	**Systems and System Models** • Systems may interact with other systems; they may have subsystems and be a part of larger complex systems.

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Standards

NGSS Performance Expectation MS-LS1-5	
MS-LS1-5 Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms. [Clarification Statement: Examples of local environmental conditions could include availability of food, light, space, and water. Examples of genetic factors could include large breed cattle and species of grass affecting growth of organisms. Examples of evidence could include drought decreasing plant growth, fertilizer increasing plant growth, different varieties of plant seeds growing at different rates in different conditions, and fish growing larger in large ponds than they do in small ponds.] [Assessment Boundary: Assessment does not include genetic mechanisms, gene regulation, or biochemical processes.]	
Science and Engineering Practices (SEP)	**Constructing Explanations and Designing Solutions** • Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.
Disciplinary Core Ideas (DCI)	**LS1.B: Growth and Development of Organisms** • Genetic factors as well as local conditions affect the growth of the adult plant.
Crosscutting Concepts (CCC)	**Cause and Effect** • Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability.

Extended Performance Expectation MS-LS1-5			
	Level 1	***Level 2***	***Level 3***
	Less Complex ⟵ ⟵ ⟵ ⟵ ⟵ ⟶ ⟶ ⟶ ⟶ ⟶		***More Complex***
	MS-LS1-5.1 Ask questions to help identify factors that could be affecting the growth of an organism.	**MS-LS1-5.2** Analyze data to determine whether a particular factor is affecting the growth of organisms.	**MS-LS1-5.3** Use provided information to explain how the growth of organisms is influenced by various environmental and/or genetic factors.
Science and Engineering Practices (SEP)	**Target:** **Constructing Explanations and Designing Solutions** • Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. **Supporting:** **Analyzing and Interpreting Data** **Asking Questions and Defining Problems**		
Disciplinary Core Ideas (DCI)	**LS1.B: Growth and Development of Organisms** • Genetic factors as well as local conditions affect the growth of the adult plant.		
Crosscutting	**Cause and Effect**		

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Concepts (CCC)	• Phenomena may have more than one cause, and some cause-and-effect relationships in systems can only be described using probability.

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Standards

NGSS Performance Expectation MS-LS2-1	
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. [Clarification Statement: Emphasis is on cause-and-effect relationships between resources and growth of individual organisms and the numbers of organisms in ecosystems during periods of abundant and scarce resources.]	
Science and Engineering Practices (SEP)	**Analyzing and Interpreting Data** • Analyze and interpret data to provide evidence for phenomena.
Disciplinary Core Ideas (DCI)	**LS2.A: Interdependent Relationships in Ecosystems** • Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors. • In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction. • Growth of organisms and population increases are limited by access to resources.
Crosscutting Concepts (CCC)	**Cause and Effect** • Cause-and-effect relationships may be used to predict phenomena in natural or designed systems.

Extended Performance Expectation MS-LS2-1			
	Level 1	***Level 2***	***Level 3***
	Less Complex ⟵ ⟵ ⟵ ⟵ ⟵ ⟶ ⟶ ⟶ ⟶ ⟶		***More Complex***
	MS-LS2-1.1 Use data or observations to identify resources (e.g., food, water, nutrients, space) that are necessary for organisms and populations of organisms to grow and survive.	**MS-LS2-1.2** Use data or observations to describe the effects of resource availability on organisms and/or populations of organisms.	**MS-LS2-1.3** Analyze data to identify evidence for a cause-effect relationship between resource availability and growth of organisms and/or populations of organisms.
Science and Engineering Practices (SEP)	**Target:** **Analyzing and Interpreting Data** • Analyze and interpret data to provide evidence for phenomena.		
Disciplinary Core Ideas (DCI)	**LS2.A: Interdependent Relationships in Ecosystems** • Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors. • In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction. • Growth of organisms and population increases are limited by access to resources.		

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Crosscutting Concepts (CCC)	**Cause and Effect** • Cause-and-effect relationships may be used to predict phenomena in natural or designed systems.

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Standards

NGSS Performance Expectation MS-LS2-3	
MS-LS2-3 Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. [Clarification Statement: Emphasis is on describing the conservation of matter and flow of energy into and out of various ecosystems, and on defining the boundaries of the system.][Assessment Boundary: Assessment does not include the use of chemical reactions to describe the processes.]	
Science and Engineering Practices (SEP)	**Developing and Using Models** • Develop a model to describe phenomena.
Disciplinary Core Ideas (DCI)	**LS2.B: Cycle of Matter and Energy Transfer in Ecosystems** • Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem. 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.
Crosscutting Concepts (CCC)	**Energy and Matter** • The transfer of energy can be tracked as energy flows through a natural system.

Extended Performance Expectation MS-LS2-3			
	Level 1	***Level 2***	***Level 3***
	Less Complex	⟵ ⟵ ⟵ ⟵ ⟵ ⟶ ⟶ ⟶ ⟶ ⟶	***More Complex***
	MS-LS2-3.1 Use a model to identify the role of organisms (e.g., producer, consumer, decomposer) or nonliving things (e.g., the Sun, water, minerals, air) in cycling energy or matter in an ecosystem.	**MS-LS2-3.2** Use a model to identify that energy is transferred or matter is cycled from one specific part of an ecosystem to another specific part.	**MS-LS2-3.3** Develop a model to describe how energy is transferred or how matter is cycled among living and nonliving parts of ecosystems.
Science and Engineering Practices (SEP)	**Developing and Using Models** • Develop a model to describe phenomena.		
Disciplinary Core Ideas (DCI)	**LS2.B: Cycle of Matter and Energy Transfer in Ecosystems** • Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem. 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.
Crosscutting Concepts (CCC)	**Energy and Matter** • The transfer of energy can be tracked as energy flows through a natural system.

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Standards

NGSS Performance Expectation MS-PS1-2	
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. [Clarification Statement: Examples of reactions could include burning sugar or steel wool, fat reacting with sodium hydroxide, and mixing zinc with hydrogen chloride.] [Assessment Boundary: Assessment is limited to analysis of the following properties: density, melting point, boiling point, solubility, flammability, and odor.]	
Science and Engineering Practices (SEP)	**Analyzing and Interpreting Data** • Analyze and interpret data to determine similarities and differences in findings.
Disciplinary Core Ideas (DCI)	**PS1.A: Structure and Properties of Matter** • Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it. **PS1.B: Chemical Reactions** • 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.
Crosscutting Concepts (CCC)	**Patterns** • Macroscopic patterns are related to the nature of microscopic and atomic-level structure.

Extended Performance Expectation MS-PS1-2			
	Level 1	***Level 2***	***Level 3***
	Less Complex ⟵ ⟵ ⟵ ⟵ ⟵ ⟶ ⟶ ⟶ ⟶ ⟶		***More Complex***
	MS-PS1-2.1 Use observations or informational resources (e.g., charts, data tables) to identify properties of a substance.	**MS-PS1-2.2** Use data on the properties of two or more substances to determine if the samples are the same or different substances.	**MS-PS1-2.3** Use data or observations on the properties of substances before and after an interaction to determine if a chemical reaction occurred.
Science and Engineering Practices (SEP)	**Target:** **Analyzing and Interpreting Data** • Analyze and interpret data to determine similarities and differences in findings. **Supporting:** **Planning and Carrying Out Investigations**		
Disciplinary Core Ideas (DCI)	**PS1.A: Structure and Properties of Matter** • Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it. **PS1.B: Chemical Reactions**		

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	• 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.
Crosscutting Concepts (CCC)	**Target:** **Patterns** • Macroscopic patterns are related to the nature of microscopic and atomic-level structure. **Supporting:** **Scale, Proportion and Quantity**

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Standards

NGSS Performance Expectation MS-PS2-2	
MS-PS2-2 Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object. [Clarification Statement: Emphasis is on balanced (Newton's First Law) and unbalanced forces in a system, qualitative comparisons of forces, mass and changes in motion (Newton's Second Law), frame of reference, and specification of units.] [Assessment Boundary: Assessment is limited to forces and changes in motion in one-dimension in an inertial reference frame and to change in one variable at a time. Assessment does not include the use of trigonometry.]	
Science and Engineering Practices (SEP)	**Planning and Carrying Out Investigations** • Plan an investigation individually and collaboratively, and in the design: identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim.
Disciplinary Core Ideas (DCI)	**PS2.A: Forces and Motion** • 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.
Crosscutting Concepts (CCC)	**Stability and Change** • Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and forces at different scales.

Extended Performance Expectation MS-PS2-2			
	Level 1	***Level 2***	***Level 3***
	Less Complex ⟵ ⟵ ⟵ ⟵ ⟶ ⟶ ⟶ ⟶ ***More Complex***		
	MS-PS2-2.1 Use observations to identify the effects of pushes and pulls on objects.	**MS-PS2-2.2** Use data from an investigation or observations to describe patterns of change in an object's motion that take place when the force on an object changes or the mass of an object is changed.	**MS-PS2-2.3** Describe necessary parts of an investigation to show how differences in the mass of an object or the force on an object will change the motion of the object.
Science and Engineering Practices (SEP)	**Target:** **Planning and Carrying Out Investigations** • Plan an investigation individually and collaboratively, and in the design: identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim. **Supporting:** **Analyzing and Interpreting Data**		

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Disciplinary Core Ideas (DCI)	**PS2.A: Forces and Motion** • 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.
Crosscutting Concepts (CCC)	**Target:** **Stability and Change** • Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and forces at different scales. **Supporting:** **Cause and Effect**

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Standards

NGSS Performance Expectation MS-PS3-5	
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. [Clarification Statement: Examples of empirical evidence used in arguments could include an inventory or other representation of the energy before and after the transfer in the form of temperature changes or motion of object.] [Assessment Boundary: Assessment does not include calculations of energy.]	
Science and Engineering Practices (SEP)	**Engaging in Argument from Evidence** • Construct, use, and present oral and written arguments supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon.
Disciplinary Core Ideas (DCI)	**PS3.B: Conservation of Energy and Energy Transfer** • When the motion energy of an object changes, there is inevitably some other change in energy at the same time.
Crosscutting Concepts (CCC)	**Energy and Matter** • Energy may take different forms (e.g., energy in fields, thermal energy, energy of motion).

Extended Performance Expectation MS-PS3-5			
	Level 1	***Level 2***	***Level 3***
	Less Complex ⟵ ⟵ ⟵ ⟵ ⟶ ⟶ ⟶ ⟶ ⟶		***More Complex***
	MS-PS3-5.1 Identify questions that can help determine whether energy is being transferred in a system.	**MS-PS3-5.2** Use observations or data to identify the forms of energy that increase or decrease when the kinetic energy of an object changes.	**MS-PS3-5.3** Use evidence to make or support a claim that a transfer of energy occurs when the kinetic energy of an object changes.
Science and Engineering Practices (SEP)	**Target:** **Engaging in Argument from Evidence** • Construct, use, and present oral and written arguments supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon. **Supporting:** **Asking Questions and Defining Problems** **Analyzing and Interpreting Data**		
Disciplinary Core Ideas (DCI)	**PS3.B: Conservation of Energy and Energy Transfer** • When the motion energy of an object changes, there is inevitably some other change in energy at the same time.		
Crosscutting Concepts (CCC)	**Energy and Matter** • Energy may take different forms (e.g., energy in fields, thermal energy, energy of motion).		

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Standards

NGSS Performance Expectation MS-PS4-2	
MS-PS4-2 Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials. [Clarification Statement: Emphasis is on both light and mechanical waves. Examples of models could include drawings, simulations, and written descriptions.] [Assessment Boundary: Assessment is limited to qualitative applications pertaining to light and mechanical waves.]	
Science and Engineering Practices (SEP)	**Developing and Using Models** • Develop and use a model to describe phenomena.
Disciplinary Core Ideas (DCI)	**PS4.A: Wave Properties** • A sound wave needs a medium through which it is transmitted. **PS4.B: Electromagnetic Radiation** • 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.
Crosscutting Concepts (CCC)	**Structure and Function** • Structures can be designed to serve particular functions by taking into account properties of different materials and how materials can be shaped and used.

Extended Performance Expectation MS-PS4-2			
	Level 1	***Level 2***	***Level 3***
	Less Complex ⟵ ⟵ ⟵ ⟵ ⟵ ⟶ ⟶ ⟶ ⟶ ***More Complex***		
	MS-PS4-2.1 Use observations to identify whether a wave is being reflected, absorbed, or transmitted through a material.	**MS-PS4-2.2** Use a model to describe the path of a wave that is reflected, absorbed, or transmitted through different materials.	**MS-PS4-2.3** Develop a model to represent what happens to waves when they are reflected, absorbed, or transmitted through different materials.
Science and Engineering Practices (SEP)	**Target:** **Developing and Using Models** • Develop and use a model to describe phenomena. **Supporting:** **Planning and Carrying Out Investigations**		

Middle School Grade-Level Standards

Disciplinary Core Ideas (DCI)	**PS4.A: Wave Properties** • A sound wave needs a medium through which it is transmitted. **PS4.B: Electromagnetic Radiation** • 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.
Crosscutting Concepts (CCC)	**Structure and Function** • Structures can be designed to serve particular functions by taking into account properties of different materials and how materials can be shaped and used.