MATTER AND ITS INTERACTIONS

Performance Expectation	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, or mixing zinc with hydrogen chloride. Examples of chemical and physical properties to analyze include density, melting point, boiling point, solubility, flammability, or odor.

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
1. Asking questions and defining problems 2. Developing and using models 3. Planning and carrying out investigations **4. Analyzing and interpreting data:** Analyzing data in 6-8 builds on K-5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis. • Analyze and interpret data to determine similarities and differences in findings. 5. Using mathematics and computational thinking 6. Constructing explanations and designing solutions 7. Engaging in argument from evidence 8. Obtaining, evaluating, and communicating information	**STRUCTURE AND PROPERTIES OF MATTER** Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) under normal conditions that can be used to identify it. (MS.PS1A.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. (MS.PS1B.a)	**PATTERNS** Macroscopic patterns are related to the nature of microscopic and atomic-level structure.

MATTER AND ITS INTERACTIONS

Performance Expectation	Develop a model that predicts and describes changes in particle motion, temperature, and the state of a pure substance when thermal energy is added or removed.
Clarification Statement	Emphasis is on qualitative molecular-level models of solids, liquids, and gases to show that adding or removing thermal energy increases or decreases kinetic energy of the particles until a change of state occurs. Examples of models could include drawings or diagrams. Examples of particles could include molecules or inert atoms such as the noble gases. Examples of pure substances could include water, carbon dioxide, or helium.

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
1. Asking questions and defining problems **2. Developing and using models:** Modeling in 6–8 builds on K–5 experiences and progresses to developing, using and revising models to describe, test, and predict more abstract phenomena and design systems. • Develop and/or use a model to predict and/or describe phenomena. 3. Planning and carrying out investigations 4. Analyzing and interpreting data 5. Using mathematics and computational thinking 6. Constructing explanations and designing solutions 7. Engaging in argument from evidence 8. Obtaining, evaluating, and communicating information	**STRUCTURE AND PROPERTIES OF MATTER** Gases and liquids are made of molecules or inert atoms (the noble gases) that are moving about relative to each other. (MS.PS1A.c) In a liquid, the molecules are constantly in motion and 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. (MS.PS1A.d) The changes of state that occur with variations in temperature or pressure can be described and predicted using temperature and pressure models of matter. (MS.PS1A.f) 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.PS.3A.c) 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. (MS.PS3A.e)	**CAUSE AND EFFECT** Cause and effect relationships may be used to predict phenomena in natural or designed systems.

MATTER AND ITS INTERACTIONS

Performance Expectation	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.
Clarification Statement	Emphasis is on the law of conservation of matter and on physical models or drawings, including digital forms, that represent atoms. The use of atomic masses, balancing symbolic equations, or intermolecular forces is not the focus of this performance expectation.

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
1. Asking questions and defining problems 2. **Developing and using models:** Modeling in 6–8 builds on K–5 experiences and progresses to developing, using and revising models to describe, test, and predict more abstract phenomena and design systems. • Develop a model to describe unobservable mechanisms. 3. Planning and carrying out investigations 4. Analyzing and interpreting data 5. Using mathematics and computational thinking 6. Constructing explanations and designing solutions 7. Engaging in argument from evidence 8. Obtaining, evaluating, and communicating information	**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. (MS.PS1B.a) The total number of each type of atom is conserved, and thus the mass does not change. (MS.PS1B.b)	**ENERGY AND MATTER** Matter is conserved because atoms are conserved in physical and chemical processes.

ENERGY

Performance Expectation	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.
Clarification Statement	Emphasis is on observing change in temperature as opposed to calculating total thermal energy transferred. Examples of experiments could include comparing final water temperatures after different masses of ice melted in the same volume of water with the same initial temperature, the temperature change of samples of different materials with the same mass as they cool or heat in the environment, or the same material with different masses when a specific amount of energy is added.

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
1. Asking questions and defining problems 2. Developing and using models **3. Planning and carrying out investigations:** Planning and carrying out investigations to answer questions or test solutions to problems in 6–8 builds on K–5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or solutions. • 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. 4. Analyzing and interpreting data 5. Using mathematics and computational thinking 6. Constructing explanations and designing solutions 7. Engaging in argument from evidence 8. Obtaining, evaluating, and communicating information	**DEFINITIONS OF ENERGY** Temperature is a measure of the average kinetic energy; the relationship between the temperature and the total energy of the system depends on the types, states, and amounts of matter present. (MS.PS3A.d) **CONSERVATION OF ENERGY AND ENERGY TRANSFER** The amount of energy transfer needed to change the temperature of a matter sample by a given amount depends on the nature of the matter, the mass of the sample, and the environment. (MS.PS3B.b) Energy is spontaneously transferred out of hotter regions or objects and into colder ones. (MS.PS3B.c)	**SCALE, PROPORTION, AND QUANTITY** Proportional relationships (e.g. speed as the ratio of distance traveled to time taken) among different types of quantities provide information about the magnitude of properties and processes.

EARTH'S SYSTEMS

Performance Expectation	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 and location as it moves through the multiple pathways of the hydrologic cycle. Examples of models can be conceptual or physical.

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
1. Asking questions and defining problems 2. **Developing and using models:** Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems. • Develop a model to describe unobservable mechanisms. 3. Planning and carrying out investigations 4. Analyzing and interpreting data 5. Using mathematics and computational thinking 6. Constructing explanations and designing solutions 7. Engaging in argument from evidence 8. Obtaining, evaluating, and communicating information	**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. (MS.ESS2C.a) Global movements of water and its changes in form are propelled by sunlight and gravity. (MS.ESS2C.c) **LOUISIANA'S NATURAL RESOURCES** Replenishable resources such as groundwater and oxygen are purified by the movement through Earth's cycles. (MS.EVS1A.c)	**ENERGY AND MATTER** Within a natural or designed system, the transfer of energy drives the motion and/or cycling of matter.

EARTH'S SYSTEMS

Performance Expectation	Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.
Clarification Statement	Emphasis is on how air masses flow from regions of high pressure to low pressure, causing weather (defined by temperature, pressure, humidity, precipitation, and wind) at a fixed location to change over time, and how sudden changes in weather can result when different air masses collide. Emphasis is on how weather can be predicted within probabilistic ranges. Examples of data can be provided to students (such as weather maps, diagrams, and visualizations) or obtained through laboratory experiments (such as condensation).

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
1. Asking questions and defining problems 2. Developing and using models **3. Planning and carrying out investigations:** Planning and carrying out investigations to answer questions (science) or test solutions (engineering) to problems in 6-8 builds on K-5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or solutions. • Collect data to produce data to serve as the basis for evidence to answer scientific questions or test design solutions under a range of conditions. 4. Analyzing and interpreting data 5. Using mathematics and computational thinking 6. Constructing explanations and designing solutions 7. Engaging in argument from evidence 8. Obtaining, evaluating, and communicating information	**THE ROLES OF WATER IN EARTH'S SURFACE PROCESSES:** The complex patterns of the changes and the movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns. (MS.ESS2C.b) **WEATHER AND CLIMATE** Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns. Because these patterns are so complex, weather can only be predicted probabilistically. (MS.ESS2D.a)	**CAUSE AND EFFECT** Cause and effect relationships may be used to predict phenomena in natural or designed systems.

EARTH'S SYSTEMS

Performance Expectation	Develop and use a model to describe how unequal heating and rotation of the Earth causes patterns of atmospheric and oceanic circulation that determine regional climates.
Clarification Statement	Emphasis is on how patterns vary by latitude, altitude, and geographic land distribution. Emphasis of atmospheric circulation is on the sunlight-driven latitudinal banding, the Coriolis effect, and resulting prevailing winds; emphasis of ocean circulation (e.g. el niño/la niña) is on the transfer of heat by the global ocean convection cycle, which is constrained by the Coriolis effect and the outlines of continents. Examples of models can be diagrams, maps and globes, or digital representations.

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
1. Asking questions and defining problems 2. **Developing and using models:** Developing and using models Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems. • Develop and use a model to describe phenomena. 3. Planning and carrying out investigations 4. Analyzing and interpreting data 5. Using mathematics and computational thinking 6. Constructing explanations and designing solutions 7. Engaging in argument from evidence 8. Obtaining, evaluating, and communicating information	**THE ROLES OF WATER IN EARTH'S SURFACE PROCESSES:** Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents. (MS.ESS2C.d) **WEATHER AND CLIMATE** Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns. Because these patterns are so complex, weather can only be predicted probabilistically. (MS.ESS2D.a) The ocean exerts a major influence on weather and climate by absorbing energy from the sun, releasing it over time, and globally redistributing it through ocean currents. (MS.ESS2D.b)	**SYSTEMS AND SYSTEM MODELS** Models can be used to represent systems and their interactions—such as inputs, processes and outputs— and energy, matter, and information flows within systems.

EARTH AND HUMAN ACTIVITY

Performance Expectation	Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.
Clarification Statement	Examples of factors include human activities (such as fossil fuel combustion, cement production, and agricultural activity) and natural processes (such as changes in incoming solar radiation or volcanic activity). Examples of evidence can include tables, graphs, and maps of global and regional temperatures, atmospheric levels of gases such as carbon dioxide and methane, and the rates of human activities. Emphasis is on the major role that human activities play in causing the rise in global temperatures.)

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
1. **Asking questions and defining problems:** Asking questions (science) and defining problems (engineering) in 6-8 builds on K-5 experiences and progresses to specifying relationships between variables, clarifying arguments and making models. • Ask questions to identify and/or clarify evidence and/or the premise(s) of an argument. 2. Developing and using models 3. Planning and carrying out investigations 4. Analyzing and interpreting data 5. Using mathematics and computational thinking 6. Constructing explanations and designing solutions 7. Engaging in argument from evidence 8. Obtaining, evaluating, and communicating information	**GLOBAL CLIMATE CHANGE** Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the current rise in Earth's mean surface temperature. Addressing climate change and reducing human vulnerability to whatever climate changes do occur depend on the understanding of climate science, engineering capabilities, and other kinds of knowledge, such as understanding of human behavior and on applying that knowledge wisely in decisions and activities. (MS.ESS3D.a)	**STABILITY AND CHANGE** Stability might be disturbed either by sudden events or gradual changes that accumulate over time.

FROM MOLECULES TO ORGANISMS: STRUCTURES AND PROCESSES

Performance Expectation	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. Systems could include circulatory, excretory, digestive, respiratory, muscular, endocrine, or nervous systems.

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
1. Asking questions and defining problems 2. Developing and using models 3. Planning and carrying out investigations 4. Analyzing and interpreting data 5. Using mathematics and computational thinking 6. Constructing explanations and designing solutions 7. **Engaging in argument from evidence:** Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s). • Construct, use, and/or present an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. 8. Obtaining, evaluating, and communicating information	**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 in order to maintain homeostasis. (MS.LS1A.c) **INFORMATION PROCESSING** 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.LS1D.a)	**SYSTEMS AND SYSTEM MODELS** Systems may interact with other systems; they may have subsystems and be a part of larger complex systems.

FROM MOLECULES TO ORGANISMS: STRUCTURES AND PROCESSES

Performance Expectation	Construct a scientific explanation based on evidence for the role of photosynthesis and cellular respiration in the cycling of matter and flow of energy into and out of organisms.
Clarification Statement	Emphasis is on tracing movement of matter and flow of energy.

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
1. Asking questions and defining problems 2. Developing and using models 3. Planning and carrying out investigations 4. Analyzing and interpreting data 5. Using mathematics and computational thinking **6. Constructing explanations and designing solutions:** Constructing explanations (science) and designing solutions (engineering) in 6–8 builds on K- 5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories. • 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. 7. Engaging in argument from evidence 8. Obtaining, evaluating, and communicating information	**ORGANIZATION FOR MATTER AND ENERGY FLOW IN ORGANISMS** Plants, plant-like protists (including algae and phytoplankton), and other microorganisms use the energy from light, to make sugars (food) from carbon dioxide from the atmosphere and water from the environment through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use. (MS.LS1C.a) 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. 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.PS3D.a) **LOUISIANA'S NATURAL RESOURCES** Renewable resources have the ability to self maintain due to the processes of photosynthesis. (MS.EVS1A.a)	**ENERGY AND MATTER** Within a natural or designed system, the transfer of energy drives the motion and/or cycling of matter.

FROM MOLECULES TO ORGANISMS: STRUCTURES AND PROCESSES

Performance Expectation	Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.
Clarification Statement	Emphasis is on describing that molecules are broken apart and put back together and that in this process, energy is released.

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
1. Asking questions and defining problems 2. **Developing and using models:** Modeling in 6-8 builds on K-5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems. • Develop a model to describe unobservable mechanisms. 3. Planning and carrying out investigations 4. Analyzing and interpreting data 5. Using mathematics and computational thinking 6. Constructing explanations and designing solutions 7. Engaging in argument from evidence 8. Obtaining, evaluating, and communicating information	**ORGANIZATION FOR MATTER AND ENERGY FLOW IN ORGANISMS** Within individual organisms, food (energy) 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 through aerobic and anaerobic respiration. (MS.LS1C.b) Cellular respiration in plants and animals involves chemical reactions with oxygen that release stored energy. In these processes, complex molecules containing carbon react with oxygen to produce carbon dioxide and other materials. (MS.LS1C.c)	**ENERGY AND MATTER** Matter is conserved because atoms are conserved in physical and chemical processes.

ECOSYSTEMS: INTERACTIONS, ENERGY, AND DYNAMICS

Performance Expectation	Undertake a design project that assists in maintaining diversity and ecosystem services.
Clarification Statement	Examples of ecosystem services could include water purification, nutrient recycling, habitat conservation or soil erosion mitigation. Examples of design solution constraints could include scientific, economic, or social considerations.

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
1. Asking questions and defining problems 2. Developing and using models 3. Planning and carrying out investigations 4. Analyzing and interpreting data 5. Using mathematics and computational thinking **6. Constructing explanations and designing solutions:** Constructing explanations (science) and designing solutions (engineering) in 6–8 builds on K- 5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories. • Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints. 7. Engaging in argument from evidence 8. Obtaining, evaluating, and communicating information	**ECOSYSTEM DYNAMICS, FUNCTIONING, AND RESILIENCE** Biodiversity describes the variety of species found in Earth's terrestrial and aquatic ecosystems. The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health. (MS.LS2C.b) **BIODIVERSITY AND HUMANS** Changes in biodiversity can influence humans' resources, such as food, energy, and medicines, as well as ecosystem services on which humans rely. (MS.LS4D.a) **ENGINEERING DESIGN: DEVELOPING POSSIBLE SOLUTIONS** A solution needs to be tested to prove the validity of the design 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 the criteria and constraints of a problem. Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors. Models of all kinds are important for testing solutions (MS.ETS1B.a)	**STABILITY AND CHANGE** Small changes in one part of a system might cause large changes in another part.

ECOSYSTEMS: INTERACTIONS, ENERGY, AND DYNAMICS

Performance Expectation	Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.
Clarification Statement	Emphasis is on recognizing patterns in data, making inferences about changes in populations, and on evaluating empirical evidence supporting arguments about changes to ecosystems.

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
1. Asking questions and defining problems 2. Developing and using models 3. Planning and carrying out investigations 4. Analyzing and interpreting data 5. Using mathematics and computational thinking 6. Constructing explanations and designing solutions **7. Engaging in argument from evidence:** Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s). • Construct, use, and/or present an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. 8. Obtaining, evaluating, and communicating information	**ECOSYSTEM DYNAMICS, FUNCTIONING, AND RESILIENCE** Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations. (MS.LS2C.a)	**STABILITY AND CHANGE** Small changes in one part of a system might cause large changes in another part.

HEREDITY: INHERITANCE AND VARIATION OF TRAITS

Performance Expectation	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.
Clarification Statement	Emphasis is on using models such as Punnett squares, diagrams, and simulations to describe the cause and effect relationship of gene transmission from parent(s) to offspring and resulting genetic variation.

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
1. Asking questions and defining problems 2. **Developing and using models:** Modeling in 6-8 builds on K-5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems. • Develop and/or use a model to predict and/or describe phenomena. 3. Planning and carrying out investigations 4. Analyzing and interpreting data 5. Using mathematics and computational thinking 6. Constructing explanations and designing solutions 7. Engaging in argument from evidence 8. Obtaining, evaluating, and communicating information	**GROWTH AND DEVELOPMENT OF ORGANISMS** Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. (MS.LS1B.a) Cells divide through the processes of mitosis and meiosis. (LS.MS.1B.b) **INHERITANCE OF TRAITS** Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited. (MS.LS3A.d) In sexually reproducing organisms, each parent contributes to 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.LS3B.a)	**CAUSE AND EFFECT** Cause and effect relationships may be used to predict phenomena in natural or designed systems.

BIOLOGICAL EVOLUTION: UNITY AND DIVERSITY

Performance Expectation	Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.
Clarification Statement	Emphasis is on using simple probability statements and proportional reasoning to construct explanations about why some traits are suppressed and other traits become more prevalent for those individuals better at finding food, shelter, or avoiding predators.

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
1. Asking questions and defining problems 2. Developing and using models 3. Planning and carrying out investigations 4. Analyzing and interpreting data 5. Using mathematics and computational thinking 6. **Constructing explanations and designing solutions:** Constructing explanations (science) and designing solutions (engineering) in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories. • Construct an explanation that includes qualitative or quantitative relationships between variables that predict(s) and/or describe(s) phenomena. 7. Engaging in argument from evidence 8. Obtaining, evaluating, and communicating information	**NATURAL SELECTION** Natural selection leads to the predominance of certain traits in a population and the suppression of others. (MS.LS4B.a)	**CAUSE AND EFFECT** Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability.

BIOLOGICAL EVOLUTION: UNITY AND DIVERSITY

Performance Expectation	Gather, read, and synthesize information about technologies that have changed the way humans influence the inheritance of desired traits in organisms.
Clarification Statement	Emphasis is on synthesizing information from reliable sources about the influence of humans on genetic outcomes in artificial selection (such as genetic modification, animal husbandry, gene therapy) and on the impacts these technologies have on society as well as the technologies leading to these scientific discoveries.

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
1. Asking questions and defining problems 2. Developing and using models 3. Planning and carrying out investigations 4. Analyzing and interpreting data 5. Using mathematics and computational thinking 6. Constructing explanations and designing solutions 7. Engaging in argument from evidence **8. Obtaining, evaluating, and communicating information:** Obtaining, evaluating, and communicating information in 6–8 builds on K–5 experiences and progresses to evaluating the merit and validity of ideas and methods. • Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence.	**NATURAL SELECTION** Genetic engineering techniques can manipulate the DNA within various organisms. Technology has changed the way humans influence the inheritance of desired traits in organisms. (e.g., selective breeding, gene modification, gene therapy, or other methods) (MS.LS4B.b)	**CAUSE AND EFFECT** Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability.