

High Priority Standards (CCSS, State, National, TILS, CREDE, etc.)

NGSS

CCC [Patterns](#). Observed patterns of forms and events guide organization and classification, and they prompt questions about relationships and the factors that influence them.

<u>Learning Goal</u>	<u>Proficiency Scale</u>
Students will understand how patterns of forms and events guide organization and classification.	<p>4: Student demonstrates an in-depth inference, advanced application or innovates with the learning goal.</p> <p>3: Student demonstrates mastery with the learning goal as evidenced by:</p> <ul style="list-style-type: none">• analyzing micro and macroscopic patterns in rates of change and other numerical relationships.• analyzing graphic representations to identify patterns in data.• differentiating patterns through various types of classification systems.• diagnosing the patterns of failure of a designed system. <p>2: Student demonstrates he/she is nearing proficiency by:</p> <ul style="list-style-type: none">• recognizing and recalling specific vocabulary, such as: microscopic, macroscopic.• performing processes such as:<ul style="list-style-type: none">o making observations using both qualitative and quantitative data.o assessing the validity of the data from the process by which it was collected.o forming a conclusion based on evidence and patterns from data.o organizing data in multiple ways to uncover patterns. <p>1: Student demonstrates limited understanding or skill with the learning goal.</p>

Learning Targets - Waves and Electromagnetic Radiation

- [MS-PS4-1. Using mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.](#)
- Students will be able to use/know and understand/recognize and recall domain specific vocabulary such as: wave, amplitude, frequency, wavelength, crest, trough, medium, energy, compression, rarefaction, reflection, absorption, transmission, disturbance, mechanical wave, electromagnetic wave, digital, analog, signal, fiber optic, transmit, pulse, binary.
- **Wave Energy Learning Target 1-** Students will understand the properties of waves.

Learning Targets - Engineering Design

- [MS-ETS1-3. Analyzing data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.](#)
- Students will be able to use/know and understand/recognize and recall domain specific vocabulary such as: model, test, modification, fair test, bias, tool, design, design solution, engineering, characteristics, solution
- **Foundations Learning Target 3:** Students will use the scientific method to design and evaluate an experiment for any testable question.
- **Foundations Learning Target 1:** Students will use correct tools to measure matter in metric units and label units correctly
- **Chemistry Learning Target 7-** Students will describe heat and how it is transferred
- **Electricity Learning Target 5-** Students will be able to demonstrate advantages and disadvantages of each wired complete circuit.
- **Wave Energy Learning Target 7:** Students will identify and explain types of reflection
- **Wave Energy Learning target 8:** Students will compare refraction of light through different materials

Learning Targets - Energy

- [MS-PS3-1. Constructing and interpreting graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.](#)
- Students will be able to use/know and understand/recognize and recall domain specific vocabulary such as: kinetic energy, potential energy, speed, acceleration, gravity, velocity, mass, force, conservation of energy, potential energy, kinetic energy, thermal energy, heat, temperature, conductor, insulator, conservation of energy, calorie, joule

Learning Targets - Chemical Reactions

- Atomic structure
- MS-PS1-2. Analyzing and interpreting data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.
- Students will be able to use/know and understand/recognize and recall domain specific vocabulary such as: chemical reaction, physical change, chemical change, law of conservation of matter, atom, molecule, mass, matter, exothermic, endothermic, temperature, atom, heat, kinetic molecular theory, conductor, insulator, law of conservation of energy, exothermic, endothermic, temperature
- **Chemistry Learning Target 6** - Student is able to classify chemical reactions and provide evidence of the law of conservation of mass.
- **Chemistry Learning target 5** - Student is able to recognize and classify changes in matter as chemical or physical.
- **Chemistry Learning Target 1:** Student is able to use the periodic table to identify and determine properties of Elements, Compounds, and Molecules.

Learning Targets - Forces and Interactions

- [MS-PS2-2. Planning an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.](#)
- [MS-PS2-5. Conducting 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.](#)
- Students will be able to use/know and understand/recognize and recall domain specific vocabulary such as: electric, magnetic, force, field, balanced, unbalanced, gravity, static, interaction, Newton, inertia, speed, acceleration, interaction, independent variable, dependent variable, control, tools.

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CCC Cause and effect: Mechanism and explanation. Events have causes, sometimes simple, sometimes multifaceted. A major activity of science is investigating and explaining causal relationships and the mechanisms by which they are mediated. Such mechanisms can then be tested across given contexts and used to predict and explain events in new contexts.

<u>Learning Goal</u>	<u>Proficiency Scale</u>
Students will be able to investigate and explain causal relationships.	<p>4: Student demonstrates an in-depth inference, advanced application or innovates with the learning goal.</p> <p>3: Student demonstrates mastery with the learning goal as evidenced by:</p> <ul style="list-style-type: none">• classifying correlational and causal relationships.• explaining that correlation does not necessarily imply causation.• applying cause and effect relationships to predict phenomena in natural or designed systems.• communicating that phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. <p>2: Student demonstrates he/she is nearing proficiency by:</p> <ul style="list-style-type: none">• recognizing and recalling specific vocabulary, such as: predict.• performing processes such as:<ul style="list-style-type: none">o identifying how various factors contribute to a cause and/or different results.o explaining why some events have simple and other events have multifaceted causes. <p>1: Student demonstrates limited understanding or skill with the learning goal.</p>

Learning Targets - Structure and Properties of matter

- [MS-PS1-4. Predicting and describing how adding or removing thermal energy changes particle motion, temperature, and state of a pure substance.](#)
- Students will be able to use/know and understand/recognize and recall domain specific vocabulary such as: temperature, thermal energy, molecule, heat, equilibrium, conduction, convection, radiation, solid, liquid, gas, kinetic molecular theory, phase change, molecule, atoms, natural resource, synthetic resource, solids, liquids, gases, physical properties, chemical properties, mixture, pure substance, matter.
- **Chemistry Learning Target 3:** Students will use the Kinetic Molecular Theory to illustrate particle arrangement and movement in each state of matter.
- **Chemistry Learning Target 4:** Students will use changes in energy to describe volume changes within various states of matter.

Learning Targets - Forces and Interactions

- [MS-PS2-3. Determining the factors that affect the strength of electric and magnetic forces.](#)
- [MS-PS2-5. Proving that fields exist between objects exerting forces on each other even though the objects are not in contact.](#)
- Students will be able to use/know and understand/recognize and recall domain specific vocabulary such as: electric, magnetic, force, field, balanced, unbalanced, gravity, static, interaction, Newton, inertia, speed, acceleration, interaction, independent variable, dependent variable, control, tools.

Learning Targets - Energy

- [MS-PS3-5. Constructing, using, and presenting arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.](#)
- Students will be able to use/know and understand/recognize and recall domain specific vocabulary such as: kinetic energy, potential energy, speed, acceleration, gravity, velocity, mass, force, conservation of energy, potential energy, conservation of energy, thermal energy, heat, temperature, conductor, insulator, conservation of energy, calorie, joule

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CCC [Scale, proportion, and quantity](#). In considering phenomena, it is critical to recognize what is relevant at different measures of size, time, and energy and to recognize how changes in scale, proportion, or quantity affect a system's structure or performance.

<u>Learning Goal</u>	<u>Proficiency Scale</u>
<p>Students will understand how changes in scale, proportion, or quantity affect a system's structure and/or performance</p>	<p>4: Student demonstrates an in-depth inference, advanced application or innovates with the learning goal.</p> <p>3: Student demonstrates mastery with the learning goal as evidenced by:</p> <ul style="list-style-type: none"> • comparing models of time, space, or energy. • explaining how examples observed at one scale may not be observable at another scale, and the function of natural and designed systems may change with scale. • using proportional relationships (e.g., speed as the ratio of distance traveled to time taken) to gather information about the magnitude of properties and processes. • representing scientific relationships through the use of algebraic expressions and equations. <p>2: Student demonstrates he/she is nearing proficiency by:</p> <ul style="list-style-type: none"> • recognizing and recalling specific vocabulary, such as: observable, relationship, ratio, magnitude, algebraic, expression. • performing processes such as: <ul style="list-style-type: none"> o using ratios or scales to relate objects or organisms. o determining ratio or scale from data. o comparing quantities of objects or organisms using data. <p>1: Student demonstrates limited understanding or skill with the learning goal.</p>

Learning Targets - Structure and Properties of Matter

- [MS-PS1-1. Developing models to describe the atomic composition of simple molecules and extended structures.](#)
- Students will be able to use/know and understand/recognize and recall domain specific vocabulary such as: temperature, thermal energy, molecule, heat, equilibrium, conduction, convection, radiation, solid, liquid, gas, kinetic molecular theory, phase change, molecule, atoms, natural resource, synthetic resource, solids, liquids, gases, physical properties, chemical properties, mixture, pure substance, matter.

Learning Targets - Energy

- [MS-PS3-1. Describing the relationships of kinetic energy to the mass of an object and to the speed of an object.](#)
- [MS-PS3-4. Describing 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.](#)
- Students will be able to use/know and understand/recognize and recall domain specific vocabulary such as: kinetic energy, potential energy, speed, acceleration, gravity, velocity, mass, force, conservation of energy, potential energy, kinetic energy, thermal energy, heat, temperature, conductor, insulator, conservation of energy, calorie, joule

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CCC [Systems and system models](#). Defining the system under study—specifying its boundaries and making explicit a model of that system—provides tools for understanding and testing ideas that are applicable throughout science and engineering.

<u>Learning Goal</u>	<u>Proficiency Scale</u>
Students will be able to define systems they are studying.	<p>4: Student demonstrates an in-depth inference, advanced application or innovates with the learning goal.</p> <p>3: Student demonstrates mastery with the learning goal as evidenced by:</p> <ul style="list-style-type: none">● investigating or analyzing a system by defining its boundaries and initial conditions, as well as its inputs and outputs.● using models (e.g., physical, mathematical, computer models) to simulate the flow of energy, matter, and interactions within and between systems at different scales.● using models or simulations to predict the behavior of a system● recognizing that predictions have limited precision and reliability due to the assumptions and approximations inherent in the models.● designing systems to do specific tasks. <p>2: Student demonstrates he/she is nearing proficiency by:</p> <ul style="list-style-type: none">● recognizing and recalling specific vocabulary, such as: scale, behavior, prediction, precision, reliability, assumption, approximation, inherent, tasks.● performing processes such as:<ul style="list-style-type: none">○ use models and simulations to illustrate a system. <p>1: Student demonstrates limited understanding or skill with the learning goal.</p>

Learning Targets - Forces and Interactions

- [MS-PS2-1. Developing or using a system to apply Newton's Third Law involving the motion of two colliding objects.](#)
- Students will be able to use/know and understand/recognize and recall domain specific vocabulary such as: electric, magnetic, force, field, balanced, unbalanced, gravity, static, interaction, Newton, inertia, speed, acceleration, interaction, independent variable, dependent variable, control, tools

Learning Targets - Energy

- [MS-PS3-2. Using a system or system model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.](#)
- Students will be able to use/know and understand/recognize and recall domain specific vocabulary such as: kinetic energy, potential energy, speed, acceleration, gravity, velocity, mass, force, conservation of energy, potential energy, conservation of energy, thermal energy, heat, temperature, conductor, insulator, conservation of energy, calorie, joule

Learning Targets - Engineering Design

- [MS-ETS1-4. Developing a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.](#)
- Students will be able to use/know and understand/recognize and recall domain specific vocabulary such as: model, test, modification, fair test, bias, tool, design, design solution, engineering, characteristics, solution
- Foundations Learning Target 3: Students will use the scientific method to design and evaluate an experiment for any testable question.
- Foundations Learning Target 1: Students will use correct tools to measure matter in metric units and label units correctly
- Chemistry Learning Target 7- Students will describe heat and how it is transferred
- Electricity Learning Target 5- Students will be able to demonstrate advantages and disadvantages of each wired complete circuit.
- Wave Energy Learning Target 7: Students will identify and explain types of reflection
- Wave Energy Learning target 8: Students will compare refraction of light through different materials

Learning Targets - Chemical Reactions

- [MS-PS1-5. Developing and using a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.](#)
- Students will be able to use/know and understand/recognize and recall domain specific vocabulary such as: chemical reaction, physical change, chemical change, law of conservation of matter, atom, molecule, mass, matter, exothermic, endothermic, temperature, atom, heat, kinetic molecular theory, conductor, insulator, law of conservation of energy,

exothermic, endothermic, temperature

- **Chemistry Learning Target 6** - Student is able to classify chemical reactions and provide evidence of the law of conservation of mass.
- **Chemistry Learning target 5** - Student is able to recognize and classify changes in matter as chemical or physical.

Learning Targets - Waves and Electromagnetic Radiation

- [MS-PS4-2. Developing and using a model to describe that waves are reflected, absorbed, or transmitted through various materials.](#)
- Students will be able to use/know and understand/recognize and recall domain specific vocabulary such as: wave, amplitude, frequency, wavelength, crest, trough, medium, energy, compression, rarefaction, reflection, absorption, transmission, disturbance, mechanical wave, electromagnetic wave, digital, analog, signal, fiber optic, transmit, pulse, binary.
- Wave Energy Learning Target 8- Students will compare refraction of light through different materials
- Wave Energy Learning Target 1- Students will understand the properties of waves.

Learning Targets - Structure and Properties of Matter

- [MS-PS1-1. Developing models to describe the atomic composition of simple molecules and extended structures.](#)
- [MS-PS1-4. Developing a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.](#)
- Students will be able to use/know and understand/recognize and recall domain specific vocabulary such as: temperature, thermal energy, molecule, heat, equilibrium, conduction, convection, radiation, solid, liquid, gas, kinetic molecular theory, phase change, molecule, atoms, natural resource, synthetic resource, solids, liquids, gases, physical properties, chemical properties, mixture, pure substance, matter.
- **Chemistry Learning Target 1:** Student is able to use the periodic table to identify and determine properties of Elements, Compounds, and Molecules.
- **Chemistry Learning Target 2:** Student is able to use properties to describe matter as either pure substance or mixture.
- **Chemistry Learning Target 3:** Students will use the Kinetic Molecular Theory to illustrate particle arrangement and movement in each state of matter.
- **Chemistry Learning Target 4:** Students will use changes in energy to describe volume changes within various states of matter.

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CCC *Energy and matter: Flows, cycles, and conservation*. Tracking fluxes of energy and matter into, out of, and within systems helps one understand the systems' possibilities and limitations.

<u>Learning Goal</u>	<u>Proficiency Scale</u>
<p>Students will understand how changes in energy and matter help them define a system's limitations and possibilities.</p>	<p>4: Student demonstrates an in-depth inference, advanced application or innovates with the learning goal.</p> <p>3: Student demonstrates mastery with the learning goal as evidenced by:</p> <ul style="list-style-type: none"> • proving atoms are conserved in physical and chemical processes. • analyzing the transfer of energy, within a natural or designed system, that drives the motion and/or cycling of matter. • classifying forms of energy (e.g. energy in fields, thermal energy, energy of motion). • distinguishing between mass and weight. <p>2: Student demonstrates he/she is nearing proficiency by:</p> <ul style="list-style-type: none"> • recognizing and recalling specific vocabulary, such as: system, atom, physical, chemical. • performing processes such as: <ul style="list-style-type: none"> ○ drawing conclusions from evidence about the law of conservation of matter. ○ demonstrating the energy as it flows into, out of, and within a system. ○ describing forms of energy (e.g. energy in fields, thermal energy, energy of motion). ○ defining the energy stored in a system. <p>1: Student demonstrates limited understanding or skill with the learning goal.</p>

Learning Targets - Chemical Reactions

- [MS-PS1-5. Developing and using a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.](#)
- [MS-PS1-6. Demonstrating that either thermal energy is released or absorbed by chemical processes.](#)
- Students will be able to use/know and understand/recognize and recall domain specific vocabulary such as: chemical reaction, physical change, chemical change, law of conservation of matter, atom, molecule, mass, matter, exothermic, endothermic, temperature, atom, heat, kinetic molecular theory, conductor, insulator, law of conservation of energy, exothermic, endothermic, temperature
- **Chemistry Learning Target 6** - Student is able to classify chemical reactions and provide evidence of the law of conservation of mass.
- **Chemistry Learning target 5** - Student is able to recognize and classify changes in matter as chemical or physical.
- **Chemistry Learning Target 7**- Students will describe heat and how it is transferred

Learning Targets - Energy

- [MS-PS3-5. Proving that when the kinetic energy of an object changes, energy is transferred to or from the object.](#)
- Students will be able to use/know and understand/recognize and recall domain specific vocabulary such as: kinetic energy, potential energy, speed, acceleration, gravity, velocity, mass, force, conservation of energy, potential energy, conservation of energy, thermal energy, heat, temperature, conductor, insulator, conservation of energy, calorie, joule

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CCC *Structure and function*. The way in which an object or living thing is shaped and its substructure determine many of its properties and functions.

<u>Learning Goal</u>	<u>Proficiency Scale</u>
<p>Students will understand that the way in which an object or living thing is shaped determines its properties and functions.</p>	<p>4: Student demonstrates an in-depth inference, advanced application or innovates with the learning goal.</p> <p>3: Student demonstrates mastery with the learning goal as evidenced by:</p> <ul style="list-style-type: none"> • modeling complex structures and systems to visualize how their function depends on the shape, composition, and relationships among its parts. • understanding complex natural and designed structures and systems to determine how they function. • designing structures to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used. • evaluating the composition of material to improve the function. <p>2: Student demonstrates he/she is nearing proficiency by:</p> <ul style="list-style-type: none"> • recognizing and recalling specific vocabulary, such as structure, function, shape, composition, substructure, relationship. • performing processes such as: <ul style="list-style-type: none"> o modeling simple systems. o evaluating how the function depends on the shapes, composition, and relationships among its parts. o analyzing a simple structures and system to determine how they function. o designing structures to serve particular functions. <p>1: Student demonstrates limited understanding or skill with the learning goal.</p>

Learning Targets - Waves and Electromagnetic Radiation

- [MS-PS4-2. Describe that waves are reflected, absorbed, or transmitted through various materials.](#)
- Students will be able to use/know and understand/recognize and recall domain specific vocabulary such as: wave, amplitude, frequency, wavelength, crest, trough, medium, energy, compression, rarefaction, reflection, absorption, transmission, disturbance, mechanical wave, electromagnetic wave, digital, analog, signal, fiber optic, transmit, pulse, binary.

Learning Targets - Structure and Properties of Matter

- [MS-PS1-3. Gathering and making sense of information to describe that synthetic materials come from natural resources.](#)
- [MS-PS1-3. Proving how synthetic materials have impacted society.](#)
- Students will be able to use/know and understand/recognize and recall domain specific vocabulary such as: temperature, thermal energy, molecule, heat, equilibrium, conduction, convection, radiation, solid, liquid, gas, kinetic molecular theory, phase change, molecule, atoms, natural resource, synthetic resource, solids, liquids, gases, physical properties, chemical properties, mixture, pure substance, matter.

Learning Targets - Engineering Design

- [MS-ETS1-2. Evaluating competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.](#)
- Students will be able to use/know and understand/recognize and recall domain specific vocabulary such as: model, test, modification, fair test, bias, tool, design, design solution, engineering, characteristics, solution.

Learning Targets - Energy

- [MS-PS3-3. Designing, constructing, and testing a device that either minimizes or maximizes thermal energy transfer.](#)
- Students will be able to use/know and understand/recognize and recall domain specific vocabulary such as: kinetic energy, potential energy, speed, acceleration, gravity, velocity, mass, force, conservation of energy, potential energy, kinetic energy, thermal energy, heat, temperature, conductor, insulator, conservation of energy, calorie, joule
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Learning Targets - Chemical Reactions

- [MS-PS1-6. Undertaking a design project to construct, test, and modify a device that either releases or absorbs thermal](#)

[energy by chemical processes.](#)

- Students will be able to use/know and understand/recognize and recall domain specific vocabulary such as: chemical reaction, physical change, chemical change, law of conservation of matter, atom, molecule, mass, matter, exothermic, endothermic, temperature, atom, heat, kinetic molecular theory, conductor, insulator, law of conservation of energy, exothermic, endothermic, temperature

Learning Targets - Waves and Electromagnetic Radiation

- [MS-PS4-3. Integrating 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.](#)
- Students will be able to use/know and understand/recognize and recall domain specific vocabulary such as: wave, amplitude, frequency, wavelength, crest, trough, medium, energy, compression, rarefaction, reflection, absorption, transmission, disturbance, mechanical wave, electromagnetic wave, digital, analog, signal, fiber optic, transmit, pulse, binary.

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CCC *Stability and change*. For natural and built systems alike, conditions of stability and determinants of rates of change or evolution of a system are critical elements of study.

<u>Learning Goal</u>	<u>Proficiency Scale</u>
Students will understand conditions of stability and rates of change.	<p>4: Student demonstrates an in-depth inference, advanced application or innovates with the learning goal.</p> <p>3: Student demonstrates mastery with the learning goal as evidenced by:</p> <ul style="list-style-type: none">• critiquing stability and change in natural or designed systems by considering forces at different scales.• determining cause and effect of changes in one part of a system on another part.• proving how a system in dynamic equilibrium is stable due to a balance of feedback mechanisms.• connecting how the stability might be disturbed by either sudden events or gradual changes that accumulate over time. <p>2: Student demonstrates he/she is nearing proficiency by:</p> <ul style="list-style-type: none">• recognizing and recalling specific vocabulary, such as: feedback mechanism, gradual, balance.• performing processes such as:<ul style="list-style-type: none">○ developing an argument about how factors influence the stability or change in various systems.○ summarizing how forces impact the larger system.○ comparing systems in dynamic equilibrium. <p>1: Student demonstrates limited understanding or skill with the learning goal.</p>

Learning Targets - Forces and Interactions

- [MS-PS2-2. Proving an object's motion depends on the sum of the forces on the object and the mass of the object.](#)
- Students will be able to use/know and understand/recognize and recall domain specific vocabulary such as: electric, magnetic, force, field, balanced, unbalanced, gravity, static, interaction, Newton, inertia, speed, acceleration, interaction, independent variable, dependent variable, control, tools.