District 115

YORKVILLE

Community Unit School District

K-12 Science Curriculum

Revised August 2020

Contents

Acknowledgements

Special thanks to the members of Yorkville CUSD 115 Science Department for their membership and contributions on the Science Subject Area Committee (SAC) in the creation of this curriculum. This team of professionals have demonstrated a passion for their work and a true commitment to the students we serve.

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Yorkville CUSD 115
Science Program Mission Statement

The purpose of the Yorkville CUSD 115 Science Program is to cultivate students who integrate scientific reasoning and critical thinking strategies to investigate, analyze, and evaluate the world around them.

Through the study of physical, life, earth and space sciences, students will:

- demonstrate a sense of wonder and curiosity about their world.
- develop thoughtful and meaningful questions.
- operate both collaboratively and independently.
- utilize engineering processes of design, construction and evaluation of products.
- use resources and technology.
- communicate results to various audiences.

K-12 Science Curriculum at-a-Glance

Kindergarten

Students will evaluate how the sun affects the local weather. Students will investigate the effect of a force applied to an object. Students will use observations to describe relationships between plants and animals and their environments.

- Students will analyze how forces affect an object to determine why an object moves.
- Students will develop questions to use and share information about the weather in order to make decisions about daily life.
- Students will analyze the relationships between plants, animals, and their environment to show how they work with and affect each other.
- Students will analyze a problem to reduce human impact on the environment.

1st Grade

Students will draw conclusions about space system patterns, conduct investigations, and design solutions for communication using light and sound waves. Students will evaluate inherited traits to find patterns.

- Students will demonstrate how light and sound waves are utilized in order to communicate.
- Students will show how traits and behaviors of plant and animal offspring are inherited from their parents and help them survive.
- Students will conduct research to describe patterns and characteristics of Earth and space systems.

2nd Grade

Students will analyze and compare relationships between matter, organisms, and their habitats to show how change occurs over time by designing sketches, models, and investigations.

- Students will apply properties of matter to create a model of a new or improved object to solve a student defined problem.
- Students will compare and contrast the diversity of life in various habitats.
- Students will examine the process of weathering and erosion to analyze solutions designed to slow down or prevent landform changes that occur on Earth.

3rd Grade

Students will design a solution that reduces the impact of weather related hazards. They will use magnets to solve a common problem. Students will evaluate the effectiveness of organisms' adaptations for survival in their environments.

- Students will classify weather and climates in different regions of the world, and design solutions to reduce weather-related hazards.
- Students will gather and analyze information on organisms past and present in order to determine success of survival.
- Students will investigate magnetic and electric interactions to show the relationship between their forces and motion.
- Students will use evidence and data to describe how traits influence organisms.

4th Grade

Students will use evidence to develop models and construct explanations for processes that shape the Earth, the relationship between energy and motion, and the relationship between structure and survival.

- Students will evaluate the processes that shape the earth to support an explanation for changes in the earth's landscape over time.
- Students will examine the relationship between energy and motion to provide evidence that energy can be transferred from place to place.
- Students will examine waves and their functions to develop a model.
- Students will evaluate structure and function of organisms in order to provide evidence that these structures support their survival, growth, behavior, and reproduction.

5th Grade

Students will investigate various types, properties, and structures of matter. Students will compare and contrast Earth's various ecosystems. Students will examine the relationships among Earth's systems.

- Students will evaluate the interactions and relationships between all the parts of an ecosystem.
- Students will compare and contrast the properties of matter through inquiry.
- Students will evaluate a problem and carry out experiments to define a solution using the scientific method.
- Students will examine the effect of sun's light on Earth to demonstrate a pattern.
- Students will show the relationships among the different systems of the Earth.

6th Grade

Students will examine relationships within an ecosystem, as well as the energy flow present within these relationships. Students will identify objects in the solar system and the properties associated with these objects. Students will investigate the interactions between force and motion. Students will explore the properties of matter and the chemical reactions that occur as a result.

- Students will evaluate the different relationships within an ecosystem.
- Students will analyze and critique the transfer and flow of energy within an organism and the ecosystem.
- Students will identify the components of the solar system.
- Students will evaluate forces and motion and how they interact.
- Students will evaluate the structure and properties of matter and how chemicals react.

7th Grade

Students will compare energy transfer and change over time within Earth and within cell structures.

- Students will demonstrate how energy can be transferred from one object or system to another.
- Students will investigate the relationship between thermal energy and temperature.
- Students will analyze and interpret geoscience data to explain how the movement of tectonic plates impacts the surface of the Earth.
- Students will construct explanations for the interactions of cell structures, cells within systems, and how organisms gather and use information from the environment.
- Students will develop models to describe how gene mutations and reproduction contribute to genetic variation.

8th Grade

Students will analyze and interpret data to determine human impact on weather, chemistry, evolution, and resources in order to develop solutions to reduce human impact.

- Students will investigate the properties of waves to differentiate between digital and analog transmission of information.
- Students will determine which waves reach the earth and which ones are absorbed/reflected by the ozone layer and greenhouse gases.
- Students will analyze water and energy cycles to predict weather and climate changes.
- Students will evaluate human use of renewable and nonrenewable resources to determine the impact on humans, the environment, and ecosystem biodiversity.
- Students will distinguish between physical and chemical properties to demonstrate how atoms form compounds.
- Students will use chemical equations to investigate the properties of elements and the interactions between them.
- Students will analyze geological and biological evidence of evolution to construct an explanation for changes in species.
- Students will analyze, gather, and synthesize information to construct an argument for or against artificial selection and genetic engineering

Biology

Students will analyze living things to determine their characteristics, structures, functions, and interdependence through the use of appropriate measurements, tools, and inquiry.

- Students will apply scientific methodology as it relates to living things.
- Students will analyze the levels of organization to summarize how cells function in complex organisms.
- Students will analyze the levels of organization to summarize how they produce complex organisms.
- Students will construct models to illustrate cell processes.
- Students will relate the structure of DNA to its function.
- Students will apply concepts of natural selection to explain the process of adaptation.
- Students will evaluate the correlation between individuals, groups, and the ecosystem.

Chemistry

Students will construct and evaluate models to compare the structure and properties of matter and analyze chemical reactions and energy changes to predict the behavior of matter.

- Students will investigate and evaluate the interactions of matter to show changes that occur during a physical change and chemical change.
- Students will deduce and utilize mathematical models to analyze the behavior of gases and evaluate those behaviors based on the kinetic-molecular theory.
- Students will investigate and calculate energy associated with physical transformation.
- Students will differentiate between the structure and properties of the types of matter.
- Students will use mathematical calculations to demonstrate the relationship between proportions of chemical quantities.
- Students will investigate the structure of atoms and the relationship of their chemical behaviors to the periodic trends and the interactions of matter.
- Students will demonstrate that atoms are conserved during chemical reactions and predict the outcomes of various types of chemical reactions.
- Students will use mathematical calculations to formulate relationships between reactants and products.

Phys/Chem

Students will analyze interactions of matter to evaluate types and patterns, and to predict chemical bonds and reactions. Students will discriminate different forms of energy and forces to describe motion, work, and transfer of energy.

- Students will analyze data to deduce that Newton's Second Law of Motion describes the mathematical relationships among the net force, mass, and acceleration of an object.
- Students will use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force acting on the system.
- Students will apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.
- Students will predict the gravitational forces between objects, using mathematical representations of Newton's Law of Gravitation.
- Students will differentiate between the structure and properties of matter.
- Students will investigate and describe chemical reactions to show the changes that occur.
- Students will create models to explain the flow of energy in chemical and physical systems.

Physics

Students will analyze objects in motion, evaluating forces involved. Students will differentiate between types of energy and how they behave. Students will design and create products or models to demonstrate concepts of motion, force, and the transfer of energy.

- Students will analyze data to deduce that Newton's Second Law of Motion describes the mathematical relationships among the net force, mass, and acceleration of an object.
- Students will use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force acting on the system.
- Students will apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.
- Students will use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to predict the gravitational and electrostatic forces between objects.
- Students will design and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that changing a magnetic field can produce an electric current.
- Students will use mathematical representations to support a claim regarding relationships among frequency, wavelength, and speed of waves traveling in various media.
- Students will evaluate the validity and reliability of claims in published materials regarding the effects that different frequencies of electromagnetic radiation have when absorbed by matter.
- Students will show how technological devices use the principles of wave behavior and interactions with matter to transmit and capture information and energy. Students will evaluate claims of the advantages of digital transmission and storage of information.

Earth Science

Students will analyze past and present geological and astronomical events to develop models in order to predict future events and their impacts on living things.

- Students will produce models showing the interconnections between Earth's interior and its systems.
- Students will evaluate climate change data to make an evidenced based forecast of global climate change.
- Students will investigate and analyze human impact on natural resources to create a solution to reduce that impact.
- Students will examine evidence to construct an argument for or against the simultaneous co-evolution of Earth's systems and life on Earth.
- Students will create a model to show how Earth's surface features are formed and changed.
- Students will develop models to communicate explanations of stars (including our sun), planets, and the Big Bang theory using evidence found in the universe.

Explanation of Coding and Numbering

The following example provides clarification on the coding and numbering used for each of the grade level objectives and components.

Sample of Document

Key Terms:

"Outcome" – a positive statement about what the students themselves will do, verbs that describe specific, measurable action, and that has an end result.

"Component" – knowing and understanding level thinking skills, both simple and complex. These skills are a result of students engaging in activities that may include questioning, research, experiments, collaboration, identification, analysis, summarization, and application.

Explanation for "S.K.1":

"S"= Science (subject area)
"K" = Kindergarten (grade level or course)
"2" = Outcome number

Explanation for "S.K.1.1":

"S"= Science (subject area)
"K" = Kindergarten (grade level or course)
"1" = Outcome number
"1" = Component number

Explanation for (K-PS2-1):

"K" = Grade level
"LS3" = NGSS Domain
"1" = Standard number in that domain

This indicates Next Generation Science Standards (NGSS) alignment.

Upper Right Hand Corner – Quarter/Semester Assessed
"Common Terminology" (K-8 only) – vocabulary taught during the outcome

Next Generation Science Standards
Three Dimensional Learning

The National Research Council's Framework has established that in order to be proficient in science, students must have command of three dimensions of learning:

- **Science & Engineering Practices** – behaviors that scientists exhibit
- **Disciplinary Core Ideas** – key concepts of science
- **Cross-Cutting Concepts** – generalized ideas which apply to multiple science themes

These three dimensions drive science instructional practices in Y115 in addition to the curriculum presented within this document.

Forces				Quarter 1
S.K.1	Outcome: Students will analyze how forces affect an object to determine why an object moves.			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.K.1.1	Identify the forces of a push and pull.	▪ Planning and Carrying Out Investigations ▪ Analyzing and Interpreting Data ***Connections to Nature of Science*** ▪ Scientific Investigations Use a Variety of Methods	▪ Cause and Effect
	S.K.1.2	Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object. **(K-PS2-1)**		
	S.K.1.3	Analyze data to determine if a designed solution works as intended to change the speed or direction of an object with a push or a pull. **(K-PS2-2)**		
	S.K.1.4	Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs. **(K-2-ETS1-3)**		
Common Terminology	force, push, pull, predict, observe, movement, position			

GRADE/COURSE LEVEL: K

Focus: Students will evaluate how the sun affects the local weather. Students will investigate the effect of a force applied to an object. Students will use observations to describe relationships between plants and animals and their environments.

Forces				**Quarter 1**
S.K.1	**Outcome: Students will analyze how forces affect an object to determine why an object moves.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.K.1.1	Identify the forces of a push and pull.	▪ Planning and Carrying Out Investigations ▪ Analyzing and Interpreting Data ***Connections to Nature of Science*** ▪ Scientific Investigations Use a Variety of Methods	▪ Cause and Effect
	S.K.1.2	Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object. **(K-PS2-1)**		
	S.K.1.3	Analyze data to determine if a designed solution works as intended to change the speed or direction of an object with a push or a pull. **(K-PS2-2)**		
	S.K.1.4	Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs. **(K-2-ETS1-3)**		
Common Terminology		force, push, pull, predict, observe, movement, position		

Weather				**Quarter 2**
S.K.2	**Outcome: Students will develop questions to use and share information about the weather in order to make decisions about daily life.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.K.2.1	Make observations to determine the effect of sunlight on Earth's surface. **(K-PS3-1)**	▪ Planning and Carrying Out Investigations ▪ Constructing Explanations and Designing Solutions ▪ Analyzing and Interpreting Data ▪ Asking Questions and Defining Problems ▪ Obtaining, Evaluating, and Communicating Information ***Connections to Nature of Science*** ▪ Scientific Investigations Use a Variety of Methods ▪ Science Knowledge is Based on Empirical Evidence	▪ Cause and Effect ▪ Patterns ***Connections to Engineering, Technology, and Applications of Science*** ▪ Interdependence of Science, Engineering, and Technology ▪ Influence of Engineering, Technology, and Science on Society and the Natural World
	S.K.2.2	Use tools and materials to design and build a structure that will reduce the warming effect of sunlight on an area. **(K-PS3-2)**		
	S.K.2.3	Use and share observations of local weather conditions to describe patterns over time. **(K-ESS2-1)**		
	S.K.2.4	Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather. **(K-ESS3-2)**		
Common Terminology		observations, sunlight, pattern, forecast, types of weather (weather words)		

Ecosystems				**Quarter 3**
S.K.3	**Outcome: Students will analyze the relationships between plants, animals, and their environment to show how they work with and affect each other.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.K.3.1	Use observations to describe patterns of what plants and animals (including humans) need to survive. **(K-LS1-1)**	▪ Analyzing and Interpreting Data ▪ Developing and Using Models ▪ Engaging in Argument from Evidence ***Connections to Nature of Science*** ▪ Scientific Knowledge is Based on Empirical Evidence	▪ Patterns ▪ Systems and Systems Models ▪ Structure and Function
	S.K.3.2	Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live. **(K-ESS3-1)**		
	S.K.3.3	Construct an argument supporting by evidence for how plants and animals (including humans) can change their environment to meet their needs. **(K-ESS2-2)**		
	S.K.3.4	Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem. **(K-2-ETS1-2)**		
Common Terminology		observations, needs, survive, environment, tools, habitat		

Human Impact on the Environment				**Quarter 4**
S.K.4	**Outcome: Students will analyze a problem to reduce human impact on the environment.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.K.4.1	Identify an environmental problem caused by humans. **(K-2-ETS1-1)**	▪ Asking Questions and Defining Problems ▪ Obtaining, Evaluating, and Communicating Information	▪ Cause and Effect
	S.K.4.2	Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment. **(K-ESS3-3)**		
	S.K.4.3	Develop a new or improved object or tool to solve the problem. **(K-2-ETS1-1)**		
Common Terminology		environment, pollution, conservation, impact, solution, recycle, littering, living things		

GRADE/COURSE LEVEL: 1

Focus: Students will draw conclusions about space system patterns, conduct investigations, and design solutions for communication using light and sound waves. Students will evaluate inherited traits to find patterns.

Waves				**Quarter 2**
S.1.1	**Outcome: Students will demonstrate how light and sound waves are utilized in order to communicate.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.1.1.1	Plan and conduct an investigation to provide evidence that vibrating materials can make sound. **(1-PS4-1)**	▪ Planning and Carrying Out Investigations ▪ Constructing Explanations and Designing Solutions ▪ Developing and Using Models ***Connections to Nature of Science*** ▪ Scientific Investigations Use a Variety of Methods	▪ Cause and Effect ▪ Structure and Function ***Connections to Engineering, Technology, and Applications of Science*** ▪ Influence of Engineering, Technology, and Science on Society and the Natural World
	S.1.1.2	Plan and conduct an investigation to provide evidence that sound can make materials vibrate. **(1-PS4-1)**		
	S.1.1.3	Make observations and record evidence that objects can be seen when illuminated (by an external light source and/or by its own light). **(1-PS4-2)**		
	S.1.1.4	Plan and conduct an investigation to determine the effect of placing objects made with different materials in the path of a beam of light (transparent, translucent, opaque, and reflective). **(1-PS4-3)**		
	S.1.1.5	Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance. **(1-PS4-4)(K-2-ETS1-2)**		
Common Terminology	sounds waves, light waves, opaque, translucent, transparent, reflect, vibration, illuminate, energy, luminous, pitch, shadows			

Traits of Living Things				**Quarter 3**
S.1.2	**Outcome: Students will show how traits and behaviors of plant and animal offspring are inherited from their parents and help them survive.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.1.2.1	Make observations to record evidence that plant offspring are similar, but not identical, to their parents. **(1-LS3-1)**	▪ Constructing Explanations and Designing Solutions ▪ Obtaining, Evaluating, and Communicating Information ▪ Asking Questions and Defining Problems ***Connections to Nature of Science*** ▪ Scientific Knowledge is Based on Empirical Evidence	▪ Patterns ▪ Structure and Function ***Connections to Engineering, Technology, and Applications of Science*** ▪ Influence of Engineering, Technology, and Science on Society and the Natural World
	S.1.2.2	Make observations to record evidence that animal offspring are similar, but not identical, to their parents. **(1-LS3-1)**		
	S.1.2.3	Identify patterns of behavior in parents and offspring that help offspring survive (by reading texts and using media). **(1-LS1-2)**		
	S.1.2.4	Develop a new/improved object or tool that can solve a simple problem by mimicking how plants and/or animals use their external parts to help them		

		survive, grow, and meet their needs by using materials (example: keeping out intruders by mimicking thorns on branches and animal quills). **(1-LS1-1)(K-2-ETS1-1)**		
Common Terminology		adapt, parents, offspring, survival, trait, characteristic, habitat, environment, defense, behaviors, root, stem, thorn, flower, change, inherit, genetics, heredity, similar/identical		

Earth and Space Systems				**Quarter 4**
S.1.3	**Outcome: Students will conduct research to describe patterns and characteristics of Earth and space systems.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.1.3.1	Describe patterns that can be predicted using observations of the sun, the moon, and the stars. **(1-ESS1-1)**	▪ Planning and Carrying Out Investigations ▪ Analyzing and Interpreting Data	▪ Patterns ***Connections to Nature of Science*** ▪ Scientific Knowledge Assumes and Order and Consistency in Natural Systems
	S.1.3.2	Explain the relationship between the amount of daylight to the time of year. **(1-ESS1-2)**		
	S.1.3.3	Investigate to describe and illustrate the characteristics of a planet (by reading texts and/or using media).		
	S.1.3.4	Explain characteristics of the sun (by reading texts and/or using media).		
Common Terminology		sun, moon, planets (each name), revolve, orbit, solar system, gravity, rotate, moon phases, seasons, universe, star, craters, astronomer, constellations, reflect, equator, poles, meteorites, meteors, asteroids, comets		

GRADE/COURSE LEVEL: 2

Focus: Students will analyze and compare relationships between matter, organisms, and their habitats to show how change occurs over time by designing sketches, models, and investigations.

Structure and Properties of Matter				**Quarter 3**
S.2.1	**Outcome: Students will apply properties of matter to create a model of a new or improved object to solve a student defined problem.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.2.1.1	Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties (includes color, texture, hardness, and flexibility). **(2-PS1-1)**	▪ Planning and Carrying Out Investigations ▪ Analyzing and Interpreting Data ▪ Constructing Explanations and Designing Solutions ▪ Engaging in Argument from Evidence ▪ Asking Questions and Defining Problems ***Connections to Nature of Science*** ▪ Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena	▪ Patterns ▪ Cause and Effect ▪ Energy and Matter ***Connections to Engineering, Technology, and Applications of Science*** ▪ Influence of Engineering, Technology, and Science in Society and the Natural World
	S.2.1.2	Identify properties of solids, liquids, and gases.		
	S.2.1.3	Observe and explain how changes can or cannot occur through heating and cooling.		
	S.2.1.4	Develop an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot. **(2-PS1-4)**		
	S.2.1.5	Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose to construct multiple solutions for a given problem. **(2-PS1-2)**		
	S.2.1.6	Ask questions, make observations, and gather information on how a solid object made of a small set of pieces can be disassembled and made into a new object and or/improved object to solve a student-defined problem. **(2-PS1-3)(K-2-ETS1-1)**		
Common Terminology	material, property, invisibility, reversed, solid, liquid, gas, matter, hardness, flexibility, strength, texture, absorbency, odor, assemble, disassemble, improve, investigate, reversed, heating, cooling			

Ecosystems: Interactions, Energy, and Dynamics				**Quarter 2**
S.2.2	**Outcome: Students will compare and contrast the diversity of life in various habitats.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.2.2.1	Identify parts of a plant (seeds, roots, stems, leaves, and parts of a flower).	▪ Developing and Using Models ▪ Planning and Carrying Out Investigations ***Connections to Nature of Science*** ▪ Scientific Knowledge is Based on Empirical Evidence	▪ Cause and Effect ▪ Structure and Function
	S.2.2.2	Plan and conduct an investigation to determine if plants need sunlight and water to grow. **(2-LS2-1)**		
	S.2.2.3	Explain the process of pollination.		
	S.2.2.4	Explain the function of an animal in dispersing seeds.		

	S.2.2.5	Develop a simple model to show the function of an animal in dispersing seeds or pollinating plants. **(2-LS2-2)**		
	S.2.2.6	Develop a simple sketch, drawing, or physical model to show how the shape of an object helps it function as needed to solve a problem. **(K-2-ETS1-2)**		
	S.2.2.7	Identify various types of habitats within areas such as forests, freshwater, saltwater, artic, desert, rainforest, or prairies.		
	S.2.2.8	Classify different animals and plants into their habitats.		
	S.2.2.9	Make observations of plants and animals to compare the diversity of life in different habitats. **(2-LS4-1)**		
Common Terminology		root, flower, stem, leaf, pollination, disperse, seed, habitat, forest, freshwater, saltwater, prairie, arctic, desert, grassland, rainforest		

Earth Systems				**Quarter 4**
S.2.3	**Outcome: Students will examine the process of weathering and erosion to analyze solutions designed to slow down or prevent landform changes that occur on Earth.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.2.3.1	Identify the parts of the water cycle (condensation, evaporation, precipitation).	▪ Developing and Using Models ▪ Constructing Explanations and Designing Solutions ▪ Obtaining, Evaluating, and Communicating Information ▪ Analyzing and Interpreting Data	▪ Patterns ▪ Stability and Change ***Connections to Engineering, Technology, and Applications of Science*** ▪ Influence of Engineering, Technology, and Science on Society and the Natural World ***Connections to Nature of Science*** ▪ Science Addresses Questions About the Natural and Material World
	S.2.3.2	Obtain information to identify where water is found on Earth and that it can be solid, liquid, or gas. **(2-ESS2-3)**		
	S.2.3.3	Develop a model to represent the shapes and kinds of land and bodies of water in an area. **(2-ESS2-2)**		
	S.2.3.4	Use information from several sources to provide evidence that Earth events can occur quickly or slowly (plate tectonics, wind/water erosion, natural disasters). **(2-ESS1-1)**		
	S.2.3.5	Determine how wind and water affect the land through erosion.		
	S.2.3.6	Compare multiple solutions designed to slow or prevent wind and water from changing the shape of the land and decide which solution is best by analyzing data. **(2-ESS2-1) (K-2-ETS1-3)**		
Common Terminology		precipitation, evaporation, condensation, collection, water cycle, water vapor, ice crystals, hail, hot spring, salt water, ocean, landform, canyon, mountains, hill, plateau, island, bay, peninsula, valley, refute, erosion, glacier, natural disaster, tornado, volcano, earth quake, tsunami, solution, sand dunes, dirt craters, winter storms, hurricanes, floods, droughts, weather, liquid, solid, gas, arctic, steam, rivers, coast		

GRADE/COURSE LEVEL: 3

Focus: Students will design a solution that reduces the impact of weather related hazards. They will use magnets to solve a common problem. Students will evaluate the effectiveness of organisms' adaptations for survival in their environments.

<table>
<tr><td colspan="3">Weather and Climate</td><td colspan="2">Quarter 1</td></tr>
<tr><td>S.3.1</td><td colspan="4">Outcome: Students will classify weather and climates in different regions of the world, and design solutions to reduce weather-related hazards.</td></tr>
<tr><td></td><td colspan="2">Students will…</td><td>Science & Engineering Practices</td><td>Cross Cutting Concepts</td></tr>
<tr><td></td><td>S.3.1.1</td><td>Collect data on typical weather conditions and arrange the results in tables and graphs to illustrate changes expected during a particular season. (3-ESS2-1)</td><td rowspan="5">▪ Analyzing and Interpreting Data
▪ Obtaining, Evaluating, and Communicating Information
▪ Engaging in Argument from Evidence
▪ Constructing Explanations and Designing Solutions</td><td rowspan="5">▪ Patterns
▪ Cause and Effect

Connections to Engineering, Technology, and Applications of Science
▪ Influence of Engineering, Technology, and Science on Society and the Natural World

Connections to Nature of Science
▪ Science is a Human Endeavor</td></tr>
<tr><td></td><td>S.3.1.2</td><td>Obtain and combine information to describe climates in different regions of the world. (3-ESS2-2)</td></tr>
<tr><td></td><td>S.3.1.3</td><td>Obtain information to describe a variety of weather related hazards.</td></tr>
<tr><td></td><td>S.3.1.4</td><td>Make a claim about the merit of a designed solution that reduces the impact of weather-related hazards. (3-ESS3-1)</td></tr>
<tr><td></td><td>S.3.1.5</td><td>Generate solutions that reduce the impact of the weather related hazards and compare solutions. (3-5-ETS-1-2)</td></tr>
<tr><td colspan="2">Common Terminology</td><td colspan="3">weather, climate, conditions, hazard, blizzard, tornado, precipitation, wind speed, temperate, tropical, polar, season</td></tr>
</table>

<table>
<tr><td colspan="3">Interdependent Relationships in Ecosystems: Environmental Impacts on Organisms</td><td colspan="2">Quarter 2</td></tr>
<tr><td>S.3.2</td><td colspan="4">Outcome: Students will gather and analyze information on organisms past and present in order to determine success of survival.</td></tr>
<tr><td></td><td colspan="2">Students will…</td><td>Science & Engineering Practices</td><td>Cross Cutting Concepts</td></tr>
<tr><td></td><td>S.3.2.1</td><td>Construct an argument that some animals form groups that help members survive. (3-LS2-1)</td><td rowspan="3">▪ Engaging in Argument from Evidence
▪ Analyzing and Interpreting Data
▪ Asking Questions and Defining Problems</td><td rowspan="3">▪ Cause and Effect
▪ Scale, Proportion, and Quantity
▪ Systems and Systems Models

Connections to Engineering, Technology, and Applications of Science
▪ Interdependence of Science Engineering, and Technology
▪ Influence of Engineering, Technology, and Science on Society and the Natural World</td></tr>
<tr><td></td><td>S.3.2.2</td><td>Analyze and interpret data from fossils to provide evidence of the organisms and the environment in which they lived long ago. (3-LS4-1)</td></tr>
<tr><td></td><td>S.3.2.3</td><td>Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all. (3-LS4-3)</td></tr>
</table>

	S.3.2.4	Evaluate a solution to a problem caused when the environment changes and the types of plants and animals that live there may change. **(3-LS4-4)**		***Connections to Nature of Science*** ▪ Scientific Knowledge Assumes an Order and Consistency in Natural Systems
	S.3.2.5	Create a simple design with specific time and materials that depicts what animals need to have a successful habitat. **(3-5-ETS1-1)**		
Common Terminology		Organism, survive, ecosystem, environment, habitat, adaptations, fossil, predator, prey, survival		

Forces and Interactions				**Quarter 3**
S.3.3	**Outcome: Students will investigate magnetic and electric interactions to show the relationship between their forces and motion.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.3.3.1	Plan and conduct an investigation to provide evidence of the effects of forces (balanced and unbalanced) on the motion of an object. **(3-PS2-1)**	▪ Asking Questions and Defining Problems ▪ Planning and Carrying Out Investigations ***Connections to Nature of Science*** ▪ Science Knowledge is Based on Empirical Evidence ▪ Scientific Investigations Use a Variety of Methods	▪ Patterns ▪ Cause and Effect ***Connections to Engineering, Technology, and Applications of Science*** ▪ Interdependence of Science, Engineering, and Technology
	S.3.3.2	Make observations and/ or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion. **(3-PS2-2)**		
	S.3.3.3	Develop questions to determine cause and effect relationship of magnetic or electric interactions between two objects not in contact with each other. **(3-PS2-3)**		
	S.3.3.4	Construct a simple design problem that can be solved by applying scientific ideas about magnets. **(3-PS2-4)**		
	S.3.3.5	Identify aspects of a magnetic or electrical design to be improved and plan and carry out tests to develop a solution. **(3-5-ETS1-3)**		
Common Terminology		magnetism, electricity, force, motion, balance, unbalanced, poles, gravity, pull, push, magnetic field, electricity, interactions, magnets		

Life Cycles and Traits				**Quarter 4**
S.3.4	**Outcome: Students will use evidence and data to describe how traits influence organisms.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.3.4.1	Develop models to describe that organisms have unique and diverse life cycles, but all have birth, growth, reproduction, and death in common. **(3-LS1-1)**	▪ Developing and Using Models ▪ Analyzing and Interpreting Data ▪ Constructing Explanations and Designing Solutions	▪ Patterns ▪ Cause and Effect

	S.3.4.2	Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents. **(3-LS3-1)**	***Connections to Nature of Science*** ▪ Scientific Knowledge is Based on Empirical Evidence	
	S.3.4.3	Analyze and interpret data to provide evidence that variations of inherited traits exist in a group of similar organisms. **(3-LS3-1)**		
	S.3.4.4	Use evidence to support the explanation that traits can be influenced by the environment. **(3-LS3-2)**		
	S.3.4.5	Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates and reproducing. **(3-LS4-2)**		
Common Terminology		traits, organisms, life cycles, inherit, reproduction, environment, variation, advantage, metamorphosis, larva, pupa, egg, adult		

GRADE/COURSE LEVEL: 4

Focus: Students will use evidence to develop models and construct explanations for processes that shape the Earth, the relationship between energy and motion, and the relationship between structure and survival.

Processes That Shape the Earth				**Quarter 1**
S.4.1	**Outcome: Students will evaluate the processes that shape the earth to support an explanation for changes in the earth's landscape over time.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.4.1.1	Describe and identify the layers of the Earth (inner core, outer core, mantle, and crust).	▪ Constructing Explanations and Designing Solutions ▪ Planning and Carrying Out Investigations ▪ Analyzing and Interpreting Data ▪ Obtaining, Evaluation, and Communicating Information	▪ Patterns ▪ Cause and Effect ***Connections to Engineering, Technology, and Applications of Science*** ▪ Interdependence of Science, Engineering, and Technology ▪ Influence of Science, Engineering, and Technology on Society and the Natural World ***Connections to Nature of Science*** ▪ Scientific Knowledge Assumes an Order and Consistency in Natural Systems
	S.4.1.2	Identify properties of sedimentary, igneous, and metamorphic rocks.		
	S.4.1.3	Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time. **(4-ESS1-1)**		
	S.4.1.4	Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation. **(4-ESS2-1)**		
	S.4.1.5	Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment. **(4-ESS3-1)**		
	S.4.1.6	Analyze and interpret data from maps to describe patterns of Earth's features (could include ocean floors, mountains, continental boundaries, volcanoes, and earthquakes). **(4-ESS2-2)**		
	S.4.1.7	Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans based on how well each is likely to meet the criteria and constraints of the problem (i.e. earthquake resistant bridges and buildings, dams). **(4-ESS3-2) (3-5-ETS1-2)**		
Common Terminology		Inner core, outer core, mantle, crust, sedimentary, igneous, metamorphic, fossils, weathering, erosion, natural resources		

Energy				**Quarter 2**
S.4.2	**Outcome: Students will examine the relationship between energy and motion to provide evidence that energy can be transferred from place to place.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.4.2.1	Define and identify forms of energy: sound, light, heat, and electrical.	▪ Asking Questions and Defining Problems ▪ Planning and Carrying Out Investigations	▪ Energy and Matter
	S.4.2.2	Define and identify examples of potential and kinetic energy.		

	S.4.2.3	Use evidence to construct an explanation relating the speed of an object to the energy of the object. **(4-PS3-1)**	▪ Constructing Explanations and Designing Solutions	***Connections to Engineering, Technology, and Applications of Science*** ▪ Influence of Science, Engineering, and Technology on Society and the Natural World ***Connections to Nature of Science*** ▪ Science is a Human Endeavor
	S.4.2.4	Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents. **(4-PS3-2)**		
	S.4.2.5	Ask questions and predict outcomes about the changes in energy when objects collide. **(4-PS3-3)**		
	S.4.2.6	Apply scientific ideas to design, test, and refine a device that converts energy from one form to another based on the specified criteria for success and constraints on materials, time, or cost. **(4-PS3-4) (3-5-ETS1-1)**		
	S.4.2.7	Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved. **(3-5-ETS1-3)**		
Common Terminology		potential energy, kinetic energy, heat energy, light energy, sound energy, electrical energy, transfer of energy		

Waves and Information				**Quarter 3**
S.4.3	**Outcome: Students will examine waves and their functions to develop a model.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.4.3.1	Label parts of a wave and define amplitude and wavelength.	▪ Developing and Using Models ▪ Constructing Explanations and Designing Solutions ***Connections to Nature of Science*** ▪ Scientific Knowledge is Based on Empirical Evidence	▪ Patterns ▪ Cause and Effect ***Connections to Engineering, Technology, and Applications of Science*** ▪ Interdependence of Science, Engineering, and Technology ▪ Influence of Science, Engineering, and Technology on Society and the Natural World
	S.4.3.2	Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move. **(4-PS4-1)**		
	S.4.3.3	Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen. **(4-PS4-2)**		
	S.4.3.4	Generate and compare multiple solutions that use patterns to transfer information. **(4-PS4-3) (3-5-ETS1-2)**		
Common Terminology		waves, amplitude, wavelength, reflection, information transfer		

Structure and Processes				Quarter 4
S.4.4	**Outcome: Students will evaluate structure and function of organisms in order to provide evidence that these structures support their survival, growth, behavior, and reproduction.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.4.4.1	Match body systems to their major components (nervous, circulatory, digestive, skeletal, and respiratory).	▪ Developing and Using Models ▪ Engaging in Argument from Evidence	▪ Systems and Systems Models
	S.4.4.2	Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways. **(4-LS1-2)**		
	S.4.4.3	Relate plant structures to their function (thorns, stems, root, and petals).		
	S.4.4.4	Construct an argument with evidence, data, and/or a model that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. **(4-LS1-1)**		
Common Terminology		senses, digestive system, nervous system, circulatory, respiratory system, skeletal system, circulatory system, roots, stem, thorns, petals, structure, function		

GRADE/COURSE LEVEL: 5

Focus: Students will investigate various types, properties, and structures of matter. Students will compare and contrast Earth's various ecosystems. Students will examine the relationships among Earth's systems.

Matter and Energy in Organisms and Ecosystems				**Quarter 1**
S.5.1	**Outcome: Students will evaluate the interactions and relationships between all the parts of an ecosystem.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.5.1.1	Classify plants according to internal and external structures (ex. vascular/nonvascular, seed/seedless, single/compound leaves).	▪ Engaging in Argument from Evidence ▪ Developing and Using Models	▪ Energy and Matter ▪ Systems and Systems Models
	S.5.1.2	Identify the materials plants need to grow (from the air, water, and soil).		
	S.5.1.3	Support an argument that plants get the materials they need for growth chiefly from air and water (not soil). **(5-LS1-1)**		
	S.5.1.4	Classify animals according to internal and external structures (ex. vertebrates/invertebrates, classes within phyla).		
	S.5.1.5	Define the parts of an ecosystem (ecosystem, habitat, population, decomposers, consumers, producers, food web, predator, prey).		
	S.5.1.6	Construct a diagram of the food web to show how matter moves through the ecosystem. **(5-LS2-1)**		
	S.5.1.7	Design a model to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun. **(5-PS3-1)**		
	S.5.1.8	Investigate characteristics of the nine major biomes (tundra, taiga, tropical rainforest, temperate/deciduous forest, desert, grasslands, wetlands, ocean, and freshwater) to show similarities and differences.		
Common Terminology	vascular plants, nonvascular plants, photosynthesis, vertebrate, invertebrate, all 5.1.5 vocabulary terms, biome			

Structure and Properties of Matter				**Quarter 2**
S.5.2	**Outcome: Students will compare and contrast the properties of matter through inquiry.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.5.2.1	Describe that atoms are building blocks of matter.	▪ Developing and Using Models ▪ Planning and Carrying Out Investigations	▪ Cause and Effect ▪ Scale, Proportion, and Quantity
	S.5.2.2	Develop a model to describe that matter is made of particles too small to be seen. **(5-PS1-1)**		
	S.5.2.3	Define the law of conservation of matter.		

	S.5.2.4	Measure and compare quantities to provide evidence that regardless of type of change that occurs when heating, cooling, or mixing substances, the total mass of matter is conserved. **(5-PS1-2)**	▪ Using Mathematics and Computational Thinking	***Connections to Nature of Science*** ▪ Scientific Knowledge Assumes an Order and Consistency in Natural Systems
	S.5.2.5	List various properties of matter (ex. color, hardness, texture, boiling/melting point, mass, volume, density, and luster).		
	S.5.2.6	Make observations and measurements to identify materials based on their properties. **(5-PS1-3)**		
	S.5.2.7	Define physical and chemical changes.		
	S.5.2.8	Conduct an investigation to determine whether the mixing of two or more substances results in new substances. **(5-PS1-4)**		
Common Terminology		matter, atoms, mass, chemical change, physical change		

Engineering Design				**Quarter 3**
S.5.3	**Outcome: Students will evaluate a problem and carry out experiments to define a solution using the scientific method.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.5.3.1	Identify the steps in the scientific method (question/purpose, research/observation, hypothesis, materials, procedures, results, and conclusion).	▪ Asking Questions and Defining Problems ▪ Planning and Carrying Out Investigations ▪ Constructing Explanations and Designing Solutions	***Connections to Engineering, Technology, and Applications of Science*** ▪ Influence of Science, Engineering, and Technology on Society and the Natural World
	S.5.3.2	Analyze a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost. **(3-5-ETS1-1)**		
	S.5.3.3	Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem. **(3-5-ETS1-2)**		
	S.5.3.4	Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved. **(3-5-ETS1-3)**		
Common Terminology		hypothesis, conclusion		

Earth's Place in the Universe				Quarter 4
S.5.4	**Outcome: Students will examine the effect of sun's light on Earth to demonstrate a pattern.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.5.4.1	Define apparent brightness of stars.	▪ Analyzing and Interpreting Data ▪ Engaging in Argument from Evidence	▪ Patterns ▪ Scale, Proportion, and Quantity ▪ Cause and Effect
	S.5.4.2	Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from the Earth. **(5-ESS1-1)**		
	S.5.4.3	Define orbit, revolution, rotation, axis and poles.		
	S.5.4.4	Identify patterns of daily changes in length and direction of shadows. **(5-ESS1-2)**		
	S.5.4.5	Represent data in a graph to show the length of night and day throughout the year. **(5-ESS1-2)**		
	S.5.4.6	Analyze the seasonal appearance of constellations in the night sky to show Earth's place in the universe. **(5-ESS1-2)**		
	S.5.4.7	Support an argument that the gravitational force exerted by Earth on objects is directed down. **(5-PS2-1)**		
Common Terminology		apparent brightness, 5.4.3 vocabulary terms		

Earth's Systems				Quarter 4
S.5.5	**Outcome: Students will show the relationships among the different systems of the Earth.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.5.5.1	Define geosphere, biosphere, hydrosphere, and atmosphere.	▪ Developing and Using Models ▪ Obtaining, Evaluating, and Communicating Information	▪ Systems and Systems Models ***Connections to Nature of Science*** ▪ Science Addresses Questions About the Natural and Material World
	S.5.5.2	Illustrate the parts of the water cycle (evaporation, condensation, precipitation, runoff, transpiration, and groundwater).		
	S.5.5.3	Develop a model to describe ways the geosphere, biosphere, hydrosphere, and atmosphere interact. **(5-ESS2-1)**		
	S.5.5.4	Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment. **(5-ESS3-1)**		
Common Terminology		atmosphere, biosphere, geosphere, hydrosphere, precipitation, condensation, runoff, transpiration, evaporation		

GRADE/COURSE LEVEL: 6

Focus Statement: Students will examine relationships within an ecosystem, as well as the energy flow present within these relationships. Students will identify objects in the solar system and the properties associated with these objects. Students will investigate the interactions between force and motion. Students will explore the properties of matter and the chemical reactions that occur as a result.

<table>
<tr><td colspan="3">Relationships in an Ecosystem</td><td>Quarter 1</td></tr>
<tr><td>S.6.1</td><td colspan="3">Outcome: Students will evaluate the different relationships within an ecosystem.</td></tr>
<tr><td></td><td>Students will…</td><td>Science & Engineering Practices</td><td>Cross Cutting Concepts</td></tr>
<tr><td></td><td>S.6.1.1</td><td>Identify the populations of organisms and how they are dependent on their environment with living and nonliving factors. (MS-LS2-1)</td><td rowspan="4">▪ Analyzing and Interpreting Data
▪ Constructing Explanations and Designing Solutions
▪ Engaging in Argument from Evidence</td><td rowspan="4">▪ Patterns
▪ Cause and Effect
▪ Stability and Change

Connections to Engineering, Technology, and Applications of Science
▪ Influence of Science, Engineering, and Technology on Society and the Natural World

Connections to Nature of Science
▪ Science Addresses Questions About the Natural and Material World</td></tr>
<tr><td></td><td>S.6.1.2</td><td>Analyze how organisms and populations compete for resources and predict the outcomes for the populations and species (growth and reproduction). (MS-LS2-1)</td></tr>
<tr><td></td><td>S.6.1.3</td><td>Distinguish the different types of symbiotic relationships in an ecosystem such as mutualism, commensalism, and parasitism. (MS-LS2-2)</td></tr>
<tr><td></td><td>S.6.1.4</td><td>Evaluate competing design solutions for maintaining biodiversity and ecosystems services included but not limited to nutrient recycling and prevention of soil erosion. (MS-LS2-5)</td></tr>
<tr><td colspan="2">Common Terminology</td><td colspan="2">abiotic, biotic, commensalism, competition, ecosystem, mutualism, organism, parasitism, population, predation, symbiotic relationship</td></tr>
</table>

<table>
<tr><td colspan="3">Energy Within the Ecosystems</td><td>Quarter 1</td></tr>
<tr><td>S.6.2</td><td colspan="3">Outcome: Students will analyze and critique the transfer and flow of energy within an organism and the ecosystem.</td></tr>
<tr><td></td><td>Students will…</td><td>Science & Engineering Practices</td><td>Cross Cutting Concepts</td></tr>
<tr><td></td><td>S.6.2.1</td><td>Develop a model to describe the interaction between producers, consumers, and decomposers in an ecosystem, as well as how matter and energy are transferred between them. (MS-LS2-3)</td><td rowspan="3">▪ Developing and Using Models
▪ Constructing Explanations and Designing Solutions
▪ Planning and Carrying Out Investigations

Connections to Nature of Science
▪ Scientific Knowledge is Based on Empirical Evidence</td><td rowspan="3">▪ Energy and Matter
▪ Scale, Proportion, and Quantity

Connections to Nature of Science
▪ Scientific Knowledge Assumes an Order and Consistency in Natural Systems</td></tr>
<tr><td></td><td>S.6.2.2</td><td>Develop a model to explain how plants, algae, (including phytoplankton) and other microorganisms make energy through the process of photosynthesis. (MS-LS1-6) (MS-PS3-4)</td></tr>
<tr><td></td><td>S.6.2.3</td><td>Develop a model to illustrate how food is rearranged through chemical reactions and cellular respiration to release energy in organisms. (MS-LS1-7)</td></tr>
<tr><td colspan="2">Common Terminology</td><td colspan="2">carbon dioxide (CO2), carnivores, Cellular respiration, chlorophyll, consumers, decomposers, energy (ATP), energy pyramid, food chain, food web, glucose, herbivores, omnivores, oxygen (O), photosynthesis, primary consumer, producers, scavengers, secondary consumer, tertiary consumer, water (H2O)</td></tr>
</table>

<table>
<tr><td colspan="3">Components of the Solar System</td><td colspan="2">Quarters 2 & 3</td></tr>
<tr><td>S.6.3</td><td colspan="4">Outcome: Students will identify the components of the solar system.</td></tr>
<tr><td></td><td colspan="2">Students will…</td><td>Science & Engineering Practices</td><td>Cross Cutting Concepts</td></tr>
<tr><td></td><td>S.6.3.1</td><td>Identify that Earth and its solar system are part of the Milky Way Galaxy which is one part of many galaxies in the universe. (MS-ESS1-2)</td><td rowspan="11">▪ Developing and Using Models
▪ Analyzing and Interpreting Data
▪ Engaging in Argument from Evidence</td><td rowspan="11">▪ Patterns
▪ Scale, Proportion, and Quantity
▪ Systems and Systems Models
▪ Structure and Function

Connections to Engineering, Technology, and Applications of Science
▪ Interdependence of Science, Engineering, and Technology

Connections to Nature of Science
▪ Scientific Knowledge Assumes and Order and Consistency in Natural Systems</td></tr>
<tr><td></td><td>S.6.3.2</td><td>Compare and contrast and the properties of inner planets versus outer planets.</td></tr>
<tr><td></td><td>S.6.3.3</td><td>Analyze and interpret data to determine the properties of the objects in the solar system. (planets and their layers and features, moons, sun, and asteroids). (MS-ESS1-3)</td></tr>
<tr><td></td><td>S.6.3.4</td><td>Develop a model to determine the scale properties of the objects in the solar system (sun, planets, and moons). (MS-ESS1-3)</td></tr>
<tr><td></td><td>S.6.3.5</td><td>Explain the role of gravity and how its force holds the galaxies and solar system together. (MS-ESS1-2) (MS-PS2-4)</td></tr>
<tr><td></td><td>S.6.3.6</td><td>Compare and contrast rotation of the Earth to the revolution of the Earth around the sun.</td></tr>
<tr><td></td><td>S.6.3.7</td><td>Develop a model of the Earth’s-sun-moon system to describe the cyclic patterns of the lunar phases. (MS-ESS1-3) (MS-ESS1-1)</td></tr>
<tr><td></td><td>S.6.3.8</td><td>Develop a model of the Earth’s-sun-moon system to describe the cyclic patterns of eclipses of the sun and moon. (MS-ESS1-3) (MS-ESS1-1)</td></tr>
<tr><td></td><td>S.6.3.9</td><td>Develop a model of the Earth’s-sun-moon system to describe the cyclic patterns of the seasons. (MS-ESS1-3) (MS-ESS1-1)</td></tr>
<tr><td></td><td>S.6.3.10</td><td>Investigate how the sun's waves travel to the earth (heat and light). (MS-PS4 -2)</td></tr>
<tr><td colspan="2">Common Terminology</td><td colspan="3">gravity, weight, mass, force, orbit, terrestrial, gas, Mercury, Venus, Earth, Mars, Jupiter, Uranus, Neptune, Pluto (dwarf planet), moon phases, crescent, new moon, full moon, solar eclipse, lunar eclipse, penumbra, umbra, moon, total eclipse, partial eclipse, corona, seasonal changes, earth axis, outer planets, Milky Way Galaxy, rotation, revolution, axis, stars, sun, asteroids, comets, meteor, meteorite, meteoroid, satellite, 1st Quarter –Moon, 3rd Quarter –Moon, winter solstice, summer solstice, vernal equinox, autumnal equinox, solar system, galaxy, spiral galaxy, inner planets, eclipse, matter, scale, gaseous, lunar, solar, lunar phases, waxing, waning, gibbous</td></tr>
</table>

Physical Science—Energy Transfer				Quarter 3
S.6.4	**Outcome: Students will demonstrate how energy can be transferred from one object or system to another.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.6.4.1	Categorize and demonstrate examples of potential energy.	▪ Develop and Use Models ▪ Analyzing and Interpreting Data ▪ Engaging in Argument from Evidence ***Connections to Nature of Science*** ▪ Scientific Knowledge is Based on Empirical Evidence	▪ Scale, Proportion, and Quantity ▪ Systems and Systems Models ▪ Energy and Matter
	S.6.4.2	Categorize and demonstrate examples of kinetic energy.		
	S.6.4.3	Develop a model to describe that if the arrangement of two objects changes, the relative amounts of potential energy stored in the system differ. **(MS-PS3-2)**		
	S.6.4.4	Construct, use, and present arguments to support the claim that when the motion energy of an object changes, energy is transferred to or from the object. **(MS-PS3-5)**		
	S.6.4.5	Construct and interpret graphs of data to describe the general relationship of kinetic energy to the mass and speed of an object. **(MS-PS3-1)**		
Common Terminology	energy, Law of Conservation of Energy, potential energy, kinetic energy, gravitational energy, stored mechanical energy, nuclear energy, chemical energy, radiant energy, thermal energy, motion energy, sound energy, electrical energy, mass, speed			

Forces and Motion and Their Interactions				Quarters 3 & 4
S.6.5	**Outcome: Students will evaluate forces and motion and how they interact.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.6.5.1	Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of a problem to explain Newton's Third Law. **(MS-PS2-1) (MS-ETS1-2)**	▪ Asking Questions and Defining Problems ▪ Planning and Carrying Out Investigations ▪ Constructing Explanations and Designing Solutions ▪ Engaging in Argument from Evidence ***Connections to Nature of Science*** ▪ Scientific Knowledge is Based on Empirical Evidence	▪ Cause and Effect ▪ Systems and Systems Models ▪ Stability and Change ***Connections to Engineering, Technology, and Applications of Science*** ▪ Influence of Science, Engineering, and Technology on Society and the Natural World
	S.6.5.2	Plan an investigation to provide evidence that the change in an objects motion depends on the sum of the forces on the object and the mass of the object (Newton's 1st and 2nd Law). **(MS-PS2-2)**		
	S.6.5.3	Ask questions about data to determine the factors (size, charges, strengths, distances, and currents) that affect the electric and magnetic forces within their fields. **(MS-PS2-3) (MS-PS2-5)**		
Common Terminology	force, Law of Universal Gravitation, vectors, net force, balance force, unbalanced force, friction, static friction, sliding friction, rolling friction, fluid friction, motion, reference point, speed direction, distance, momentum, displacement, velocity, acceleration, Newton's First Law - Law of Motion, Newton's Second Law, Newton's Third Law, average, weight net force, inertia, electromagnetism, speed, static, action and reaction, lift, drag, Laws of Motion, atom, nucleus, electron, proton, neutron, neutral, electricity, conductor, static electricity, current electricity, insulator, attract, repel, no			

	charge, positive charge, negative charge, magnets, magnetism, magnetic field, magnetic domain, permanent magnet, temporary magnet, magnetic force, ferromagnetic material, magnetic poles (North and South), demagnetize, unmagnetized, types of magnets, iron, cobalt, nickel, table of elements

GRADE/COURSE LEVEL: 7

Focus: Students will compare energy transfer and change over time within Earth and within cell structures.

Life Science—Cell Structure, Function, and Processing				**Quarter 1**
S.7.1	**Outcome: Students will construct explanations for the interactions of cell structures, cells within systems, and how organisms gather and use information from the environment.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.7.1.1	Conduct an investigation to provide evidence that living things are made up of cells, either one cell or many different numbers and types of cells (nerve cells, muscle cells). **(MS-LS1-1)**	▪ Developing and Using Models ▪ Planning and Carrying Out Investigations ▪ Engaging in Argument from Evidence ▪ Obtaining, Evaluating, and Communicating Information	▪ Cause and Effect ▪ Scale, Proportion, and Quantity ▪ Systems and Systems Models ▪ Structure and Function ***Connections to Engineering, Technology, and Applications of Science*** ▪ Interdependence of Science, Engineering, and Technology ***Connections to Nature of Science*** ▪ Science is a Human Endeavor
	S.7.1.2	Distinguish the cell structures of plant and animals with emphasis on nucleus, chloroplasts, mitochondria, cell membrane, and cell wall.		
	S.7.1.3	Differentiate among the functions of various cell structures.		
	S.7.1.4	Develop and use a model to describe the function of a cell as a whole and the ways parts of cells contribute to the function. **(MS-LS1-2)**		
	S.7.1.5	Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. **(MS-LS1-3)**		
	S.7.1.6	Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories. **(MS-LS1-8)**		
Common Terminology		cell theory, prokaryote, eukaryote, organism, unicellular, multicellular, cell, specialized cell, cell membrane, cell wall, chloroplasts, cytoplasm, mitochondria, chromatin, nucleus, organelle, organs, organ system, tissue, nerve cell, Impulse, stimulus, response		

Life Science—Genetics, Growth and Development				**Quarter 2**
S.7.2	**Outcome: Students will develop models to describe how gene mutations and reproduction contribute to genetic variation.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.7.2.1	Show how chromosomes are paired and contain two alleles of many genes.	▪ Developing and Using Models ▪ Constructing Explanations and Designing Solutions ▪ Engaging in Argument from Evidence	▪ Cause and Effect ▪ Structure and Function
	S.7.2.2	Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism. **(MS-LS3-1)**		

	S.7.2.3	Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation. **(MS-LS3-2)**		
	S.7.2.4	Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affects the probability of successful reproduction of animals and plants respectively. **(MS-LS1-4)**		
	S.7.2.5	Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms. **(MS-LS1-5)**		
Common Terminology		chromosome, allele, gene, DNA, traits, mutation, genotype, phenotype, asexual reproduction, sexual reproduction, offspring, environmental, factors, genetic factors, Mendel, dominant, recessive, Punnett Square, inherit, homozygous, heterozygous		

Structure and Properties of Matter				**Quarter 3**
S.7.3	**Outcome: Students will evaluate the structure and properties of matter.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.7.3.1	Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed. **(MS-PS1-4)**	▪ Planning and Carrying Out Investigations ▪ Constructing Explanations and Designing Solutions ▪ Developing and Using Models ▪ Analyzing and Interpreting Data ***Connections to Nature of Science*** ▪ Scientific Knowledge is Based on Empirical Evidence	▪ Scale, Proportion, and Quantity ▪ Energy and Matter
	S.7.3.2	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. **(MS-PS3-4)**		
	S.7.3.3	Design, construct, and test a device that minimizes or maximizes thermal energy. **(MS-PS3-3)**		
	S.7.3.4	Develop a model to generate data for iterative (repetitive) testing and modification of a proposed object, tool or process such that an optimal design can be achieved. **(MS-ETS1-4)**		
	S.7.3.5	Analyze data from test to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success. **(MS-ETS1-3)**		
	S.7.3.6	Identify basic components of the periodic table and that atoms make up the elements.		

	S.7.3.7	Develop a model that describes atoms.		
Common Terminology		solid, liquid, gas, plasma, Bose-Einstein Condensate, heat, temperature, thermal energy, radiation, conduction, convection, Fahrenheit, Celsius, Kelvin, periodic table, period, symbol, atomic number, family, group, elements, atomic mass, metal, metalloid, nonmetal, protons, neutrons, electrons, properties of matter, molecular structure, volume, shape, atoms, energy, changes of state		

Earth Science—History of the Earth and Plate Tectonics				**Quarter 4**
S.7.4	**Outcome: Students will analyze and interpret geoscience data to explain how the movement of tectonic plates impacts the surface of the Earth.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.7.4.1	Compare and contrast continental drift theory to plate tectonics.	▪ Developing and Using Models ▪ Analyzing and Interpreting Data ▪ Constructing Explanations and Designing Solutions ***Connections to Nature of Science*** ▪ Scientific Knowledge is Open to Revision in Light of New Evidence	▪ Patterns ▪ Scale, Proportion, and Quantity ▪ Stability and Change ***Connections to Engineering, Technology, and Applications of Science*** ▪ Influence of Science, Engineering, and Technology on Society and the Natural World
	S.7.4.2	Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions. **(MS-ESS2-3)**		
	S.7.4.3	Construct a scientific explanation based on evidence from rock strata for how the geological time scale is used to organize Earth's 4.6-billion-year old history. **(MS-ESS1-4)**		
	S.7.4.4	Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales. **(MS-ESS2-2)**		
	S.7.4.5	Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process. **(MS-ESS2-1)**		
	S.7.4.6	Analyze and interpret data on natural hazards (earthquakes and volcanoes) to forecast future catastrophic events and influence the development of technologies to mitigate their effects. **(MS-ESS3-2)**		
Common Terminology		crust, mantle, core, continental crust, oceanic crust, Continental Drift Theory, Seafloor Spreading Theory, Plate Tectonics Theory, convection, currents, convergent boundary, divergent boundary, transform boundary, subduction zone, Ring of Fire		

GRADE/COURSE LEVEL: 8

Focus: Students will analyze and interpret data to determine human impact on weather, chemistry, evolution, and resources in order to develop solutions to reduce human impact.

Wave Properties				**Quarter 1**
S.8.1	**Outcome: Students will investigate the properties of waves to differentiate between digital and analog transmission of information.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.8.1.1	Justify how smaller samples of information create a more reliable picture than the larger samples we used to use in the past.	▪ Using Mathematics and Computational Thinking ▪ Obtaining, Evaluating, and Communicating Information ***Connections to Nature of Science*** ▪ Scientific Knowledge is Based on Empirical Evidence	▪ Patterns ▪ Structure and Function ***Connections to Engineering, Technology, and Applications of Science*** ▪ Influence of Science, Engineering, Technology on Society and the Natural World ***Connections to Nature of Science*** ▪ Science is a Human Endeavor
	S.8.1.2	Integrate qualitative scientific and technical information to support the claim that digitized signals (sent as wave pulses) are a more reliable way to encode and transmit information than analog signals (sent as a continuous wave). **(MS-PS4-3)**		
	S.8.1.3	Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave. **(MS-PS4-1)**		
Common Terminology	digital, analog, amplitude, frequency, wave, wave length, crest, trough			

Layers of the Atmosphere/Ozone/Greenhouse Effect				**Quarter 1**
S.8.2	**Outcome: Students will determine which waves reach the earth and which ones are absorbed/reflected by the ozone layer and greenhouse gases.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.8.2.1	Construct a diagram that illustrates the different layers of the atmosphere and their main characteristics.	▪ Developing and Using Models ▪ Asking Questions and Defining Problems	▪ Structure and Function ▪ Stability and Change
	S.8.2.2	Distinguish among the types of electromagnetic waves, which type is absorbed or reflected by the ozone layer, and the impact of each on humans and other organisms. **(MS-PS4-2)**		
	S.8.2.3	Develop and use a model to describe how infrared radiation is reflected, absorbed, or transmitted by greenhouse gases. **(MS-PS4-2)**		
	S.8.2.4	Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century. **(MS-ESS3-5)**		
Common Terminology	atmosphere, density, altitude, troposphere, stratosphere, mesosphere, thermosphere, exosphere, ozone molecule, ozone layer, ultraviolet radiation, UVA, UVB, UVC, greenhouse effect, infrared radiation, greenhouse gases,			

Weather				Quarter 2
S.8.3	**Outcome: Students will analyze water and energy cycles to predict weather and climate changes.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.8.3.1	Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity. **(MS-ESS2-4)**	▪ Developing and Using Models ▪ Planning and Carrying Out Investigations ▪ Analyzing and Interpreting Data	▪ Patterns ▪ Cause and Effect ▪ Systems and Systems Models ▪ Energy and Matter ***Connections to Engineering, Technology, and Applications of Science*** ▪ Influence of Science, Engineering, and Technology on Society and the Natural World
	S.8.3.2	Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates. **(MS-ESS2-6)**		
	S.8.3.3	Describe an air mass including name, location formed, and characteristics.		
	S.8.3.4	Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions. **(MS-ESS2-5)**		
	S.8.3.5	Analyze and interpret data on natural hazards (hurricanes, tornadoes, tsunamis, volcano eruptions, earthquakes, and/or floods) to forecast future catastrophic events and inform the development of technologies to mitigate their effects. **(MS-ESS3-2)**		
Common Terminology	water cycle, evaporation, condensation, precipitation, runoff, gravity, equator, north and south pole, global winds, local winds, jet stream, density, air pressure, high air pressure, low air pressure, Coriolis Effect, climate, weather, air mass, maritime, continental, polar, tropical, maritime polar, maritime tropical, continental polar, continental tropical, air front, cold front, warm front, stationary front, barometric pressure, barometer, thermometer, lightning, thunder, thunderstorm, tornado, snow, sleet, fog, hail, cloud, rain, interpret data, blizzard, hurricane, tsunami, forest fire, flood, earthquake, precipitation, volcanic eruption, freezing rain, dew, weather, direct sunlight, indirect sunlight, weather cycle, forecast, ground water, North and South Hemisphere, ground water, Richter scale, climate			

Human Impacts on Renewable and Nonrenewable Resources				Quarter 3
S.8.4	**Outcome: Students will evaluate human use of renewable and nonrenewable resources to determine the impact on humans, the environment, and ecosystem biodiversity.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.8.4.1	Contrast renewable and nonrenewable resources using examples of each.	▪ Obtaining, Evaluating, and Communicating Information ▪ Constructing Explanations and Designing Solutions ▪ Engaging in Argument from Evidence	▪ Structure and Function ▪ Cause and Effect ***Connections to Engineering, Technology, and Applications of Science*** ▪ Interdependence of Science, Engineering, and Technology ▪ Influence of Science, Engineering, and Technology on Society and the Natural World
	S.8.4.2	Construct a scientific explanation based on evidence for how resources (renewable/nonrenewable) have changed over time because of human impact. **(MS-ESS3-1)**		
	S.8.4.3	Construct a scientific explanation based on evidence for how resources (renewable/nonrenewable) have changed over time because of natural processes. **(MS-ESS3-1)**		

	S.8.4.4	Gather information and evaluate it to provide real-life examples of synthetic materials made from natural resources (i.e. medicine, foods, alternative fuels) and impact society. **(MS-PS1-3)**		***Connections to Nature of Science*** ▪ Science Answers Questions About the Natural and Material World
	S.8.4.5	Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems. **(MS-ESS3-4)**		
	S.8.4.6	Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment (ex. reduction of carbon footprint and the use of non-renewable resources impacts global warming / climate change). **(MS-ESS3-3)**		
Common Terminology		natural resources, synthetic resources, reuse, recycle, renewable, nonrenewable, fossil fuels, petroleum, nuclear energy, solar energy, wind energy, hydropower, geothermal, biomass, consumption, carbon footprint, conservation, garbage, pollution, turbine, solar panel, source of energy, biodegradable, alternative energy source, nuclear power, conserve or conservation		

Chemical Reactions				**Quarter 4**
S.8.5	**Outcome: Students will use chemical equations to investigate the properties of elements and the interactions between them.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.8.5.1	Evaluate and identify an unknown substance in terms of its physical and chemical properties.	▪ Developing and Using Models ▪ Analyzing and Interpreting Data ▪ Constructing Explanations and Designing Solutions ▪ Asking Questions and Defining Problems ▪ Engaging in Argument from Evidence ***Connections to Nature of Science*** ▪ Scientific Knowledge is Based on Empirical Evidence ▪ Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena	▪ Patterns ▪ Scale, Proportion, and Quantity ▪ Energy and Matter ***Connections to Engineering, Technology, and Applications of Science*** ▪ Influence of Science, Engineering, and Technology on Society and the Natural World
	S.8.5.2	Distinguish among elements, compounds, and mixtures (homogeneous and heterogeneous).		
	S.8.5.3	Develop models to describe the atomic composition of simple molecules and extended structures (ionic and covalent bonds). **(MS-PS1-1)**		
	S.8.5.4	Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved. **(MS-PS1-5)**		
	S.8.5.5	Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred. **(MS-PS1-2)**		
	S.8.5.6	Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes. **(MS-PS1-6)(MS-ETS1-1)(MS-ETS1-2)(MS-ETS1-3)**		
Common Terminology		element, compound, periodic table, metals, nonmetals, metalloids, atomic structure, atomic number, atomic mass, protons, neutrons, electrons, valence electron, charge, oxidation number, ion, Lewis Dot diagram, ionic bonds, covalent bonds, molecule, simple molecule, complex molecule, organic, inorganic, law of conservation of mass, equation, coefficient, subscript, substances, chemical equation, reactant, arrow, product, balanced		

	equation, unbalanced equation, exothermic reaction, endothermic reaction, heat energy, hydrogen, malleable, ductile, positively charged, negatively charged, synthesis, decomposition, single replacement, double replacement, charge, energy releasing process, nuclear fission

Common Ancestry, Natural Selection, and Adaptations				**Quarter 4**
S.8.6	**Outcome: Students will analyze geological and biological evidence of evolution to construct an explanation for changes in species.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.8.6.1	Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past. **(MS-LS4-1)**	▪ Engaging in Argument from Evidence ▪ Analyzing and Interpreting Data ▪ Using Mathematics and Computational Thinking ▪ Constructing Explanations and Designing Solutions ***Connections to Nature of Science*** Scientific Knowledge is Based on Empirical Evidence	▪ Stability and Change ▪ Patterns ▪ Cause and Effect ***Connections to Nature of Science*** ▪ Scientific Knowledge Assumes an Order and Consistency in Natural Systems
	S.8.6.2	Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy. **(MS-LS4-3)**		
	S.8.6.3	Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships (homologous and analogous structures). **(MS-LS4-2)**		
	S.8.6.4	Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time. **(MS-LS4-6)**		
	S.8.6.5	Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. **(MS-LS2-4)**		
	S.8.6.6	Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individual's probability of surviving and reproducing in a specific environment. **(MS-LS4-4)**		
Common Terminology		fossil, body fossil, trace fossil, relative dating, absolute dating, evolution, change over time, theory, homologous structure, analogous structure, vestigial organ, embryology, natural selection, animal adaptation, shared ancestry, fitness, survival of the fittest, genic variation, mutation, DNA, environment, overproduction, speciation, offspring, traits, gene, characteristics, organism, adapted, species, biology, embryo, gametes, observation, half-life, decay, ancestor, generation, geologist, heredity, sediment, sedimentary rock		

Artificial Selection and Genetic Engineering		**Quarter 4**
S.8.7	**Outcome: Students will analyze, gather, and synthesize information to construct an argument for or against artificial selection and genetic engineering**	

	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.8.7.1	Contrast natural selection and artificial selection.	▪ Obtaining, Evaluation, and Communicating Information	▪ Cause and Effect ***Connections to Engineering, Technology, and Applications of Science*** ▪ Interdependence of Science, Engineering, and Technology ***Connections to Nature of Science*** ▪ Science Addresses Questions About the Natural and Material World
	S.8.7.2	Construct an argument for or against artificial selection with plants, animals, or humans.		
	S.8.7.3	Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms. **(MS-LS4-5)**		
	S.8.7.4	Construct an argument for or against genetic engineering with plants, animals, or humans.		
Common Terminology		natural selection, artificial selection, genetic engineering, gender selection, cloning, gene therapy, generation, breeding, GMO (genetically modified organism), reproduce, gene, selective breeding, pure bred		

GRADE/COURSE LEVEL: High School Biology

Focus: Students will analyze living things to determine their characteristics, structures, functions, and interdependence through the use of appropriate measurements, tools, and inquiry.

Scientific Methodology and Characteristics of Life				**Semester 1**
S.B.1	**Outcome: Students will apply scientific methodology as it relates to living things.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.B.1.1	Construct a controlled experiment utilizing scientific methodology.	▪ Developing and Using Models ▪ Planning and Carrying Out Investigations ▪ Analyzing and Interpreting Data ▪ Constructing Explanations and Designing Solutions ▪ Engaging in Argument from Evidence ▪ Obtaining, Evaluating, and Communicating Information ▪ Using Mathematics and Computational Thinking ▪ Engaging in Argument from Evidence ***Connections to Nature of Science*** ▪ Scientific Models, Laws, Mechanisms, and Theories Explain Natural Phenomena ***Connections to Nature of Science*** ▪ Scientific Investigations Use a Variety of Methods	▪ Systems and Systems Models ▪ Stability and Change ▪ Scale, Proportion, and Quantity ▪ Patterns ▪ Cause and Effect ***Connections to Nature of Science*** ▪ Science is a Human Endeavor ▪ Scientific Knowledge Assumes an Order and Consistency in Natural Systems
	S.B.1.2	Construct and interpret graphs based on data.		
	S.B.1.3	Explain the characteristics of living things.		

Cells				**Semester 1**
S.B.2	**Outcome: Students will analyze the levels of organization to summarize how cells function in complex organisms.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.B.2.1	Discriminate among the levels of organization from atom to organism.	▪ Developing and Using Models	▪ Systems and Systems Models
	S.B.2.2	Identify the function of the nucleus, chloroplast, ribosome and mitochondria and their importance to the plant and animal cell.		
	S.B.2.3	Construct a model using the overall process of mitosis to illustrate the role of cell division in producing complex organisms. **(HS-LS1-4)**		

Interacting Systems				Semester 1
S.B.3	**Outcome: Students will analyze the levels of organization to summarize how they produce complex organisms.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.B.3.1	Explain cellular differentiation and its importance in producing complex organisms. **(HS-LS1-4)**	▪ Developing and Using Models ▪ Planning and Carrying Out Investigations ***Connections to Nature of Science*** ▪ Scientific Investigations Use a Variety of Methods	▪ Systems and Systems Models ▪ Stability and Change
	S.B.3.2	Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. **(HS-LS1-2)**		
	S.B.3.3	Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis (i.e. heart rate in response to exercise). **(HS-LS1-3)**		

Energy				Semester 1
S.B.4	**Outcome: Students will construct models to illustrate cell processes.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.B.4.1	Construct an explanation for how carbon, hydrogen and oxygen can be combined in different ways to form different products. **(HS-LS1-6)**	▪ Developing and Using Models ▪ Constructing Explanations and Designing Solutions ***Connections to Nature of Science*** ▪ Scientific Knowledge is Open to Revision in Light of New Evidence	▪ Energy and Matter ▪ Systems and Systems Models
	S.B.4.2	Label a model to illustrate how photosynthesis transforms light energy into stored chemical energy. **(HS-LS1-5)**		
	S.B.4.3	Label a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new components are formed resulting in a net transfer of energy. **(HS-LS1-7)**		
	S.B.4.4	Illustrate the cycling of matter and flow of energy in aerobic and anaerobic conditions resulting in cellular respiration or fermentation. **(HS-LS2-3)**		
	S.B.4.5	Construct a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among between the biosphere and the atmosphere. **(HS-LS2-5)**		

Genetics				Semester 2
S.B.5	**Outcome: Students will relate the structure of DNA to its function.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.B.5.1	Construct a model of the structure of DNA. **(HS-LS1-1)**	▪ Constructing Explanations and Designing Solutions ▪ Asking Questions and Defining Problems ▪ Engaging in Argument from Evidence	▪ Structure and Function ▪ Cause and Effect
	S.B.5.2	Explain how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells. **(HS-LS1-1)**		
	S.B.5.3	Explain the relationship between DNA, chromosomes, and traits passed from parents to offspring. **(HS-LS3-1)**		
	S.B.5.4	Make and defend a claim based on evidence that heritable genetic variations may result from new genetic combinations through the overall process of meiosis, viable errors occurring during replication, and mutations caused by environmental factors. **(HS-LS3-2)**		
	S.B.5.5	Formulate questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring. **(HS-LS3-1)**		

Evolution				Semester 2
S.B.6	**Outcome: Students will apply concepts of natural selection to explain the process of adaptation.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.B.6.1	Construct an explanation based on evidence for how natural selection leads to adaptation of populations. **(HS-LS4-4)**	▪ Analyzing and Interpreting Data ▪ Constructing Explanations and Designing Solutions ▪ Engaging in Argument from Evidence ▪ Obtaining, Evaluating, and Communicating Information ***Connections to Nature of Science*** ▪ Scientific Models, Laws, Mechanisms, and Theories Explain Natural Phenomena	▪ Scale, Proportion, and Quantity ▪ Patterns ▪ Cause and Effect ***Connections to Nature of Science*** ▪ Science is a Human Endeavor ▪ Scientific Knowledge Assumes an Order and Consistency in Natural Systems
	S.B.6.2	Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait, with an emphasis on analyzing shifts in numerical distribution of traits. **(HS-LS4-3) (HS-LS3-3)**		
	S.B.6.3	Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species. Emphasis is on determining cause and effect		

		relationships for how changes affect distribution or disappearance of traits in species. **(HS-LS4-5)**		
	S.B.6.4	Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment. **(HS-LS4-2)**		
	S.B.6.5	Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence, including similarities in DNA sequences, anatomical structures, and order of appearance of structures in embryological development. **(HS-LS4-1)**		

Ecology				**Semester 2**
S.B.7	**Outcome: Students will evaluate the correlation between individuals, groups, and the ecosystem.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.B.7.1	Compute proportions to describe the cycling of matter and flow of energy from one trophic level to another. **(HS-LS2-4)**	▪ Using Mathematics and Computational Thinking ▪ Constructing Explanations and Designing Solutions ▪ Engaging in Argument from Evidence ***Connections to Nature of Science*** ▪ Scientific Knowledge is Open to Revision in Light of New Evidence	▪ Cause and Effect ▪ Scale, Proportion, and Quantity ▪ Energy and Matter ▪ Stability and Change
	S.B.7.2	Explain how boundaries, resources, climate, and competition affect carrying capacity given visual models. **(HS-LS2-1)**		
	S.B.7.3	Analyze graphical comparisons of multiple sets of data to support and revise explanations about factors affecting biodiversity and populations, such as predation, competition, and disease in ecosystems of different scales. **(HS-LS2-2)**		
	S.B.7.4	Contrast group behaviors of flocking, schooling, herding, and migrating with individual behavior. **(HS-LS2-8)**		
	S.B.7.5	Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce. **(HS-LS2-8)**		
	S.B.7.6	Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing		

		conditions (i.e. hunting, seasonal flood, or volcanic eruption) may result in a new ecosystem. **(HS-LS2-6)**		
	S.B.7.7	Design, evaluate, and refine a solution for reducing the impacts of human activities, such as urbanization, building dams, or invasive species, on the environment and biodiversity. **(HS-LS2-7)**		
	S.B.7.8	Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity by designing solutions for a proposed problem related to threatened or endangered species. **(HS-LS4-6)**		

GRADE/COURSE LEVEL: High School Chemistry

Focus: **Students will construct and evaluate models to compare the structure and properties of matter and analyze chemical reactions and energy changes to predict the behavior of matter.**

Matter				**Semester 1**
S.C.1	**Outcome: Students investigate and evaluate the interactions of matter to show changes that occur during a physical change and chemical change.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.C.1.1	Compare and contrast particles and their properties.	▪ Developing and Using Models ▪ Analyzing and Interpreting Data ▪ Constructing Explanations and Designing Solutions ▪ Engaging in Argument from Evidence ▪ Obtaining, Evaluating, and Communicating Information	▪ Energy and Matter ▪ Systems and Systems Models
	S.C.1.2	Develop a model to represent the characteristics and properties of atoms and their function as particles (density, mass, volume).		
	S.C.1.3	Demonstrate their knowledge of particle behavior by verbally defending the components of their pictorial representation.		

Gas Laws				**Semester 1**
S.C.2	**Outcome: Students will deduce and utilize mathematical models to analyze the behavior of gases and evaluate those behaviors based on the kinetic-molecular theory.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.C.2.1	Develop and use models to explain the properties and behaviors of gases based on the kinetic-molecular theory. **(HS-PS3-2)**	▪ Developing and Using Models ▪ Using Mathematics and Computational Thinking ▪ Plan and Carry Out Investigations ▪ Analyzing and Interpreting Data ▪ Constructing Explanations and Designing Solutions ▪ Engaging in Argument from Evidence ▪ Obtaining, Evaluating, and Communicating Information	▪ Energy and Matter ***Connections to Nature of Science*** ▪ Scientific Knowledge Assumes an Order and Consistency in Natural Systems
	S.C.2.2	Calculate the mathematical relationships among volume, temperature, pressure, and a fixed amount of a gas.		
	S.C.2.3	Investigate the behavior of gases under differing environmental and experimental conditions using Boyle's, Charles', and the Combined Gas Laws.		
	S.C.2.4	Develop a model to represent the changes in characteristics and properties of atoms (temperature, pressure, volume, number of particles).		
	S.C.2.5	Develop a model to demonstrate that mass is conserved, and therefore atoms are conserved in chemical reactions. **(HS-PS1-7)**		
	S.C.2.6	Demonstrate their knowledge of gas particle behavior by verbally defending the components of their pictorial representation.		

Energy and States of Matter				**Semester 1**
S.C.3	**Outcome: Students will investigate and calculate energy associated with physical transformation.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.C.3.1	Create a computational model to calculate the relationship of energy changes within a system and between systems. **(HS-PS3-1)**	▪ Developing and Using Models ▪ Planning and Carrying Out Investigations ▪ Using Mathematics and Computational Thinking ▪ Analyzing and Interpreting Data ▪ Constructing Explanations and Designing Solutions ▪ Engaging in Argument from Evidence ▪ Obtaining, Evaluating, and Communicating Information	▪ Patterns ▪ Systems and Systems Models ▪ Energy and Matter ***Connections to Nature of Science*** ▪ Scientific Knowledge Assumes an Order and Consistency in Natural Systems
	S.C.3.2	Plan and conduct an investigation to compare the differences in the structure of particles and the overall strength of force between the particles. **(HS-PS1-3)**		
	S.C.3.3	Develop and execute an investigation to illustrate the transfer of energy between two systems when the components are at different temperatures to verify the second law of thermodynamics. **(HS-PS3-4)**		
	S.C.3.4	Design a model to examine and demonstrate the potential and kinetic energy of molecules and the total energy of a system. **(HS-PS3-2)**		
	S.C.3.5	Compare and contrast the behaviors of gases to other states of matter.		
	S.C.3.6	Demonstrate their knowledge of the energy of particle behavior by verbally defending the components of their pictorial representation.		

Structure and Properties of Matter				**Semester 1**
S.C.4	**Outcome: Students will differentiate between the structure and properties of the types of matter.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.C.4.1	Evaluate models to determine the type of matter.	▪ Developing and Using Models ▪ Analyzing and Interpreting Data ▪ Constructing Explanations and Designing Solutions ▪ Engaging in Argument from Evidence ▪ Obtaining, Evaluating, and Communicating Information	▪ Patterns ▪ Structure and Function
	S.C.4.2	Compare and contrast the types of matter.		
	S.C.4.3	Develop a model to distinguish between the types of matter.		
	S.C.4.4	Demonstrate their knowledge of the types of matter by verbally defending the components of their pictorial representation.		

Molar Quantities				**Semester 2**
S.C.5	**Outcome: Students will use mathematical calculations to demonstrate the relationship between proportions of chemical quantities.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.C.5.1	Calculate the molar mass of a substance.	▪ Using Mathematics and Computational Thinking ▪ Analyzing and Interpreting Data ▪ Constructing Explanations and Designing Solutions ▪ Engaging in Argument from Evidence ▪ Obtaining, Evaluating, and Communicating Information	▪ Scale, Proportion, and Quantity
	S.C.5.2	Explain the concept of the mole as it relates to quantities of a substance.		
	S.C.5.3	Calculate the percent composition of a compound.		
	S.C.5.4	Apply percent composition and sample mass to determine empirical and molecular formulas for a compound.		
	S.C.5.5	Formulate comparisons between units of measurement (i.e. grams, liters, moles, particles).		

Atomic Structure, Periodic Trends and Bonding				**Semester 2**
S.C.6	**Outcome: Students will investigate the structure of atoms and the relationship of their chemical behaviors to the periodic trends and the interactions of matter.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.C.6.1	Compare subatomic particles and their properties.	▪ Developing and Using Models ▪ Using Mathematics and Computational Thinking ▪ Analyzing and Interpreting Data ▪ Constructing Explanations and Designing Solutions ▪ Engaging in Argument from Evidence ▪ Obtaining, Evaluating, and Communicating Information	▪ Patterns
	S.C.6.2	Differentiate between atoms, ions, and isotopes.		
	S.C.6.3	Use the periodic table as a model to predict the properties of elements and their chemical behaviors based on the arrangement of electrons within atoms of given elements. **(HS-PS1-1)**		
	S.C.6.4	Write proper chemical formulas to represent chemical compounds.		
	S.C.6.5	Use chemical nomenclature to properly name chemical formulas.		
	S.C.6.6	Students will demonstrate their knowledge of bond types through pictorial representations of valence electrons.		

Chemical Reactions and Energy				**Semester 2**
S.C.7	**Outcome: Students will demonstrate that atoms are conserved during chemical reactions and predict the outcomes of various types of chemical reactions.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.C.7.1	Describe a chemical reaction by formulating the products and constructing a balanced chemical equation.	▪ Developing and Using Models ▪ Constructing Explanations and Designing Solutions ▪ Using Mathematics and Computational Thinking ▪ Analyzing and Interpreting Data	▪ Patterns ▪ Energy and Matter
	S.C.7.2	Develop a model to show how energy changes during a chemical reaction depend upon the changes in total bond energy. **(HS-PS1-4)**		

	S.C.7.3	Demonstrate their knowledge of particle behavior by verbally defending the components of their pictorial representation.	▪ Engaging in Argument from Evidence ▪ Obtaining, Evaluating, and Communicating Information	
	S.C.7.4	Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties. **(HS-PS1-2)**		

Stoichiometry				**Semester 2**
S.C.8	**Outcome: Students will use mathematical calculations to formulate relationships between reactants and products.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.C.8.1	Calculate the limiting reactant.	▪ Using Mathematics and Computational Thinking ▪ Analyzing and Interpreting Data ▪ Constructing Explanations and Designing Solutions ▪ Engaging in Argument from Evidence ▪ Obtaining, Evaluating, and Communicating Information	▪ Cause and Effect ▪ Stability and Change
	S.C.8.2	Calculate the theoretical yield of a chemical reaction.		
	S.C.8.3	Differentiate between the limiting reagent and the excess reagent in a chemical reaction (moles, grams, liters).		
	S.C.8.4	Compute percent yield based on the theoretical or experimental data (moles, grams, and liters).		
	S.C.8.5	Calculate the amount of a substance (moles, grams, and liters) needed or produced using mathematical relationships in a chemical reaction.		

GRADE/COURSE LEVEL: High School Phys/Chem

FOCUS: Students will analyze interactions of matter to evaluate types and patterns, and to predict chemical bonds and reactions. Students will discriminate different forms of energy and forces to describe motion, work, and transfer of energy.

Motion and Forces				**Semester 1**
S.PC.1	**Outcome: Students will analyze data to deduce that Newton's Second Law of Motion describes the mathematical relationships among the net force, mass, and acceleration of an object.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.PC.1.1	Gather data from an experiment to create tables and graphs of objects in motion.	▪ Analyzing and Interpreting Data ***Connections to Nature of Science*** ▪ Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena	▪ Cause and Effect
	S.PC.1.2	Use equations to calculate velocity and acceleration.		
	S.PC.1.3	Identify the forces acting upon an object, and determine if they are balanced or unbalanced.		
	S.PC.1.4	Explain Newton's First and Third law of motion in terms of balanced and unbalanced forces.		
	S.PC.1.5	Analyze experimental data to determine the relationship between mass and acceleration, and force and acceleration. **(HS-PS2-1)**		

Momentum				**Semester 1**
S.PC.2	**Outcome: Students will use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force acting on the system.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.PC.2.1	Describe momentum and explain conservation of momentum. **(HS-PS2-2)**	▪ Using Mathematics and Computational Thinking	▪ Systems and Systems Models
	S.PC.2.2	Collect data and use that data to calculate the momentum of an object. **(HS-PS2-2)**		
	S.PC.2.3	Analyze data of two colliding objects to demonstrate conservation of momentum. **(HS-PS2-2)**		

Collisions & Engineering				**Semester 1**
S.PC.3	**Outcome: Students will apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.PC.3.1	Identify forces involved in a collision.	▪ Constructing Explanations and Designing Solutions	▪ Cause and Effect
	S.PC.3.2	Calculate the force in a collision when given the appropriate mathematical equations. **(HS-PS2-3)**		
	S.PC.3.3	Design and construct a device to protect an object in a collision. **(HS-PS2-3) (HS-ETS1-2)**		

	S.PC.3.4	Evaluate the effectiveness of the device and make modifications to improve its protective properties. **(HS-PS2-3)**		

Universal Gravitation Law				**Semester 1**
S.PC.4	**Outcome: Students will predict the gravitational forces between objects, using mathematical representations of Newton's Law of Gravitation.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.PC.4.1	Explain gravity and electromagnetism in terms of forces acting between objects. **(HS-PS2-4)**	▪ Using Mathematics and Computational Thinking ***Connections to Nature of Science*** ▪ Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena	▪ Patterns
	S.PC.4.2	Give examples of how Newton's Law of Gravitation is related to mass and distance. **(HS-PS2-4)**		
	S.PC.4.3	Compute the forces between two objects using Newton's Law of Gravitation. **(HS-PS2-4)**		
	S.PC.4.4	Compare and contrast Newton's Law of Gravitation.		

Atomic Structure				**Semester 2**
S.PC.5	**Outcome: Students will differentiate between the structure and properties of matter.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.PC.5.1	Mathematically demonstrate that mass and atoms are conserved in chemical reactions. **(HS-PS1-7)**	▪ Developing and Using Models ▪ Using Mathematics and Computational Thinking ▪ Constructing Explanations and Designing Solutions	▪ Patterns ▪ Energy and Matter ***Connections to Nature of Science*** ▪ Scientific Knowledge Assumes an Order and Consistency in Natural Systems
	S.PC.5.2	Develop a model to show the relationship between energy changes and chemical reactions within a balanced equation. **(HS-PS1-4)**		
	S.PC.5.3	Compare subatomic particles and their properties.		
	S.PC.5.4	Categorize matter as atoms, ions, and isotopes.		
	S.PC.5.5	Construct a model to show the changes in nuclear composition and energy during fission, fusion and radioactive decay. **(HS-PS1-8)**		
	S.PC.5.6	Organize information regarding properties of elements and their chemical activity based on their placement on the Periodic Table.		
	S.PC.5.7	Use the periodic table as a model to predict the properties of elements and their chemical behaviors based on the arrangement of electrons within atoms of given elements. **(HS-PS1-1)**		
	S.PC.5.8	Construct and revise an explanation for the outcome of a simple chemical reaction based on valence electrons, periodic trends, and chemical properties. **(HS-PS1-2)**		

Chemical Reactions				Semester 2
S.PC.6	**Outcome: Students will investigate and describe chemical reactions to show the changes that occur.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.PC.6.1	Demonstrate understanding of chemical bonding by writing proper chemical formulas to represent chemical compounds.	▪ Planning and Carrying Out Investigations ▪ Constructing Explanations and Designing Solutions	▪ Patterns
	S.PC.6.2	Use chemical nomenclature to name chemical formulas.		
	S.PC.6.3	Plan and conduct an investigation to compare the differences in the structure of particles and the overall strength of force between the particles. **(HS-PS1-3)**		
	S.PC.6.4	Apply the relationship between the temperature and/or concentration of particles in a reaction and the rates of reaction. **(HS-PS1-5)**		

Thermochemistry				Semester 2
S.PC.7	**Outcome: Students will create models to explain the flow of energy in chemical and physical systems.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.PC.7.1	Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of the energy associated with the motion of particles and energy associated with the relative position of particles. **(HS-PS3-2)**	▪ Developing and Using Models ▪ Planning and Carrying Out Investigations ▪ Constructing Explanations and Designing Solutions	▪ Systems and Systems Models ▪ Energy and Matter ***Connections to Engineering, Technology, and Applications of Science*** ▪ Influence of Science, Engineering, and Technology on Society and the Natural World
	S.PC.7.2	Illustrate the conversion of energy within a system by the creation, manipulation and refinement of a device/model. **(HS-PS3-3)**		
	S.PC.7.3	Develop and execute an investigation to illustrate the transfer of thermal energy between two systems when the components are at different temperatures to verify the second law of thermodynamics. **(HS-PS3-4)**		

GRADE/COURSE LEVEL: High School Physics

Focus: Students will analyze objects in motion, evaluating forces involved. Students will differentiate between types of energy and how they behave. Students will design and create products or models to demonstrate concepts of motion, force, and the transfer of energy.

Forces and Interactions				**Semester 1**
S.P.1	**Outcome: Students will analyze data to deduce that Newton's Second Law of Motion describes the mathematical relationships among the net force, mass, and acceleration of an object.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.P.1.1	Analyze tables or graphs of objects in motion to determine the velocity and acceleration. **(HS-PS2-1)**	▪ Analyzing and Interpreting Data ▪ Engaging in Argument from Evidence ▪ Obtaining, Evaluating, and Communicating Information ▪ Using Mathematics and Computational Thinking ▪ Constructing Explanations and Designing Solutions ▪ Planning and Carrying Out Investigations ▪ Developing and Using Models ▪ Asking Questions and Defining Problems ***Connections to Nature of Science*** ▪ Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena	▪ Cause and Effect ▪ Systems and Systems Models ***Connections to Engineering, Technology, and Applications of Science*** ▪ Interdependence of Science, Engineering, and Technology ▪ Influence of Engineering, Technology, and Science on Society and the Natural World
	S.P.1.2	Use the kinematic equations to calculate velocity, acceleration, time, or position.		
	S.P.1.3	Identify the forces acting upon an object and determine if they are balanced or unbalanced. **(HS-PS2-1)**		
	S.P.1.4	Use balanced and unbalanced forces to solve for various forces, acceleration, velocity, or the coefficient of friction.		
	S.P.1.5	Analyze experimental data to determine the relationship between: mass and acceleration; and force and acceleration. **(HS-PS2-1)**		

Momentum				**Semester 1**
S.P.2	**Outcome: Students will use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force acting on the system.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.P.2.1	Collect data and use that data to calculate the momentum of an object. **(HS-PS2-2)**	▪ Using Mathematics and Computational Thinking ▪ Constructing Explanations and Designing Solutions ▪ Analyzing and Interpreting Data ▪ Engaging in Argument from Evidence ▪ Obtaining, Evaluating, and Communicating Information	▪ Cause and Effect ▪ Systems and Systems Models ***Connections to Engineering, Technology, and Applications of Science*** ▪ Interdependence of Science, Engineering, and Technology
	S.P.2.2	Demonstrate conservation of momentum by analyzing data of two objects in elastic collisions. **(HS-PS2-2)**		
	S.P.2.3	Demonstrate conservation of momentum by analyzing data of two objects in inelastic collisions. **(HS-PS2-2)**		
	S.P.2.4	Identify forces involved in a collision.		

	S.P.2.5	Calculate the force, momentum, impulse, or velocity in a collision using the appropriate mathematical equations. **(HS-PS2-3)**	▪ Planning and Carrying Out Investigations ▪ Developing and Using Models ▪ Asking Questions and Defining Problems ***Connections to Nature of Science*** ▪ Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena	▪ Influence of Engineering, Technology, and Science on Society and the Natural World
	S.P.2.6	Calculate the potential and kinetic energy using the appropriate mathematical equations.		

Surviving Collisions				**Semester 2**
S.P.3	**Outcome: Students will apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.P.3.1	Design and construct a device to protect an egg when dropped. **(HS-PS2-3)**	▪ Constructing Explanations and Designing Solutions ▪ Analyzing and Interpreting Data ▪ Engaging in Argument from Evidence ▪ Obtaining, Evaluating, and Communicating Information ▪ Using Mathematics and Computational Thinking ▪ Planning and Carrying Out Investigations ▪ Asking Questions and Defining Problems ***Connections to Nature of Science*** ▪ Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena	▪ Cause and Effect ***Connections to Engineering, Technology, and Applications of Science*** ▪ Interdependence of Science, Engineering, and Technology ▪ Influence of Engineering, Technology, and Science on Society and the Natural World
	S.P.3.2	Evaluate the effectiveness of the device and make modifications to improve its protective properties. **(HS-PS2-3)**		
	S.P.3.3	Compare and contrast the effectiveness of various covers used to protect electronic devices (i.e. cell phones or tablets). **(HS-PS2-3)**		

Gravitational and Electromagnetic Forces				**Semester 2**
S.P.4	**Outcome: Students will use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to predict the gravitational and electrostatic forces between objects.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.P.4.1	Define Newton's Law of Gravitation and use it to describe interactions between objects. **(HS-PS2-4)**	▪ Using Mathematics and Computational Thinking ▪ Analyzing and Interpreting Data ▪ Engaging in Argument from Evidence	▪ Patterns ▪ Cause and Effect ▪ Systems and Systems Models
	S.P.4.2	Define Coulomb's Law and use it to describe interactions between objects. **(HS-PS2-4)**		

	S.P.4.3	Compare and contrast Newton's Law of Gravitation and Coulomb's Law.	▪ Obtaining, Evaluating, and Communicating Information ▪ Constructing Explanations and Designing Solutions ▪ Planning and Carrying Out Investigations ▪ Developing and Using Models ▪ Asking Questions and Defining Problems ***Connections to Nature of Science*** ▪ Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena	***Connections to Engineering, Technology, and Applications of Science*** ▪ Interdependence of Science, Engineering, and Technology ▪ Influence of Engineering, Technology, and Science on Society and the Natural World
	S.P.4.4	Compute gravitational and electrostatic charges using the appropriate equations. **(HS-PS2-4)**		
	S.P.4.5	Identify the electric fields of various charges.		

Motors and Generators				**Semester 2**
S.P.5	**Outcome: Students will design and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that changing a magnetic field can produce an electric current.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.P.5.1	Define the flow of electrons, in terms of voltage, amperage, and resistance. **(HS-PS2-5)**	▪ Planning and Carrying Out Investigations ▪ Developing and Using Models ▪ Analyzing and Interpreting Data ▪ Engaging in Argument from Evidence ▪ Obtaining, Evaluating, and Communicating Information ▪ Using Mathematics and Computational Thinking ▪ Constructing Explanations and Designing Solutions ▪ Developing and Using Models ▪ Asking Questions and Defining Problems ***Connections to Nature of Science*** ▪ Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena	▪ Cause and Effect ▪ Systems and Systems Models ▪ ***Connections to Engineering, Technology, and Applications of Science*** ▪ Interdependence of Science, Engineering, and Technology ▪ Influence of Engineering, Technology, and Science on Society and the Natural World
	S.P.5.2	Demonstrate the relationships among voltage, amperage, and resistance experimentally. **(HS-PS2-5)**		
	S.P.5.3	Distinguish between and calculate the components for series and parallel circuits.		
	S.P.5.4	Identify and explain magnets and magnetic fields and their behaviors. **(HS-PS2-5)**		
	S.P.5.5	Produce a drawing or diagram to show what happens when two charges of opposite polarity meet. **(HS-PS3-5)**		
	S.P.5.6	Conduct an investigation to demonstrate the effect electrical current has on a magnetic field. **(HS-PS2-5)**		
	S.P.5.7	Construct a prototype, using simple motors, to show the relationship between motors and generators. **(HS-PS2-5)**		

Waves				**Semester 2**
S.P.6	**Outcome: Students will use mathematical representations to support a claim regarding relationships among frequency, wavelength, and speed of waves traveling in various media.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.P.6.1	Define characteristics of a wave including frequency, period, wavelength, amplitude, and speed.	▪ Using Mathematics and Computational Thinking ▪ Engaging in Argument from Evidence ▪ Analyzing and Interpreting Data ▪ Engaging in Argument from Evidence ▪ Obtaining, Evaluating, and Communicating Information ▪ Planning and Carrying Out Investigations ▪ Developing and Using Models ▪ Asking Questions and Defining Problems ***Connections to Nature of Science*** ▪ Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena	▪ Cause and Effect ▪ Systems and Systems Models ***Connections to Engineering, Technology, and Applications of Science*** ▪ Interdependence of Science, Engineering, and Technology ▪ Influence of Engineering, Technology, and Science on Society and the Natural World
	S.P.6.2	Evaluate the claims that electromagnetic radiation can be described by the wave model and the particle model and that both are valid in different situations. **(HS-PS4-3)**		
	S.P.6.3	Perform an experiment to compare frequency of a wave through a variety of media. **(HS-PS4-1)**		
	S.P.6.4	Verify the relationship between wavelength and frequency in standing waves. **(HS-PS4-1)**		
	S.P.6.5	Compare and contrast the speed of sound waves of various frequencies using resonance in a tube. **(HS-PS4-1)**		
	S.P.6.6	Investigate the properties and characteristics of light and sound waves.		

Effects of Electromagnetic Radiation				**Semester 2**
S.P.7	**Outcome: Students will evaluate the validity and reliability of claims in published materials regarding the effects that different frequencies of electromagnetic radiation have when absorbed by matter.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.P.7.1	Explain the relationship between frequency and energy of an electromagnetic wave.	▪ Obtaining, Evaluating, and Communicating Information ▪ Engaging in Argument from Evidence ▪ Using Mathematics and Computational Thinking ▪ Constructing Explanations and Designing Solutions ▪ Asking Questions and Defining Problems ***Connections to Nature of Science*** ▪ Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena	▪ Cause and Effect ▪ Systems and Systems Models ***Connections to Engineering, Technology, and Applications of Science*** ▪ Interdependence of Science, Engineering, and Technology ▪ Influence of Engineering, Technology, and Science on Society and the Natural World
	S.P.7.2	Examine the effects of various frequencies of electromagnetic waves on a variety of materials. **(HS-PS4-4)**		
	S.P.7.3	Select a published article regarding the effects of electromagnetic radiation when absorbed by matter and evaluate it for validity and reliability based on standard scientific understanding. **(HS-PS4-4)**		

Digital Storage and Transmission				Semester 2
S.P.8	**Outcome: Students will show how technological devices use the principles of wave behavior and interactions with matter to transmit and capture information and energy. Students will evaluate claims of the advantages of digital transmission and storage of information.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.P.8.1	Explain how digital information is transmitted and stored.	▪ Asking Questions and Defining Problems ▪ Engaging in Argument from Evidence ▪ Obtaining, Evaluating, and Communicating Information ▪ Planning and Carrying Out Investigations	▪ Cause and Effect ▪ Stability and Change ***Connections to Engineering, Technology, and Applications of Science*** ▪ Interdependence of Science, Engineering, and Technology ▪ Influence of Engineering, Technology, and Science on Society and the Natural World
	S.P.8.2	Compare and contrast digital and analog transmission and storage of data. **(HS-PS4-2)**		
	S.P.8.3	Evaluate claims of advantages of digital over analog information and storage. **(HS-PS4-5)**		

GRADE/COURSE LEVEL: High School Earth Science

Focus: Students will analyze past and present geological and astronomical events to develop models in order to predict future events and their impacts on living things.

Earths Dynamic System				**Semester 1**
S.ES.1	**Outcome: Students will produce models showing the interconnections between Earth's interior and its systems.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.ES.1.1	Identify and label the compositional layers of the Earth.	▪ Developing and Using Models ▪ Using Mathematics and Computational Thinking ▪ Constructing Explanations and Designing Solutions ▪ ***Connections to Nature of Science*** ▪ Scientific Knowledge is Based on Empirical Evidence ▪ Scientific Investigations Use a Variety of Methods	▪ Stability and Change ▪ Systems and Systems Models ***Connections to Engineering, Technology, and Applications of Science*** ▪ Influence of Engineering, Technology, and Science on Society and the Natural World
	S.ES.1.2	Identify and label the structural layers of the Earth.		
	S.ES.1.3	Generalize changes in Earth's magnetic field including its poles.		
	S.ES.1.4	Differentiate among the hydrosphere, atmosphere, geosphere and biosphere.		
	S.ES.1.5	Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection. **(HS-ESS2-3)**		
	S.ES.1.6	Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere. **(HS-ESS2-6)**		
	S.ES.1.7	Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity (i.e. increase in atmospheric carbon dioxide impacts marine heath and populations). **(HS-ESS3-6)**		

Weather and Climate				**Semester 1**
S.ES.2	**Outcome: Students will evaluate climate change data to make an evidenced based forecast of global climate change.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.ES.2.1	Investigate how the amount of radiant energy is affected by the tilt of the Earth to explain seasonal changes.	▪ Developing and Using Models ▪ Analyzing and Interpreting Data ▪ Constructing Explanations and Designing Solutions ***Connections to Nature of Science*** ▪ Scientific Knowledge is Based on Empirical Evidence ▪ Scientific Investigations Use a Variety of Methods	▪ Cause and Effect ▪ Stability and Change ***Connections to Engineering, Technology, and Applications of Science*** ▪ Influence of Engineering, Technology, and Science on Society and the Natural World
	S.ES.2.2	Illustrate the movement of water in the atmosphere.		
	S.ES.2.3	Explain the role of convection currents in the atmosphere and how global and local winds form because of those currents.		
	S.ES.2.4	Explain the formation of weather fronts.		
	S.ES.2.5	Relate the fluctuations in global ice and changes in sea levels.		

	S.ES.2.6	Describe the major global climates and their geographical locations.		
	S.ES.2.7	Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems. **(HS-ESS2-2)**		
	S.ES.2.8	Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate and biosphere distribution on a global scale including how climate change differs in timescale. **(HS-ESS2-4)**		
	S.ES.2.9	Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity. **(HS-ESS3-1)**		
	S.ES.2.10	Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems. **(HS-ESS3-5)**		

Natural Resources and Human Activity				**Semester 1**
S.ES.3	**Outcome: Students will investigate and analyze human impact on natural resources to create a solution to reduce that impact.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.ES.3.1	Describe the properties of minerals that are found in rocks.	▪ Using Mathematics and Computational Thinking ▪ Constructing Explanations and Designing Solutions ▪ Developing and Using Models ▪	▪ Cause and Effect ▪ Stability and Change ***Connections to Engineering, Technology, and Applications of Science*** ▪ Influence of Engineering, Technology, and Science on Society and the Natural World ***Connections to Nature of Science*** ▪ Science is a Human Endeavor
	S.ES.3.2	Summarize the interactive forces that control the rock cycle.		
	S.ES.3.3	Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity (i.e. fresh water, fertile soil, and high concentrations of minerals and fossil fuels). **(HS-ESS3-1)**		
	S.ES.3.4	Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity (i.e. agricultural efficiency, levels of conservation, and urban planning). **(HS-ESS3-3)**		
	S.ES.3.5	Evaluate or refine a technological solution that reduces impacts of human activities on natural systems (i.e. local efforts to large-scale geo-engineering design solutions). **(HS-ESS3-4)**		

History of the Earth				Semester 2
S.ES.4	**Outcome: Students will examine evidence to construct an argument for or against the simultaneous co-evolution of Earth's systems and life on Earth.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.ES.4.1	Compare and contrast types of tectonic plate boundaries and the forces associated with crustal movement.	▪ Engaging in Argument from Evidence ▪ Developing and Using Models ▪ ***Connections to Nature of Science*** ▪ Scientific Investigations Use a Variety of Methods	▪ Patterns ▪ Stability and Change
	S.ES.4.2	Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks. **(HS-ESS1-5)**		
	S.ES.4.3	Compare and contrast methods of relative and absolute dating.		
	S.ES.4.4	Diagram the geological and biological history of the Earth.		
	S.ES.4.5	Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth. **(HS-ESS2-7)**		

Earth's Materials and Systems				Semester 2
S.ES.5	**Outcome: Students will create a model to show how Earth's surface features are formed and changed.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.ES.5.1	Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes, including physical and chemical weathering. **(HS-ESS2-5)**	▪ Developing and Using Models ▪ Planning and Carrying Out Investigations ▪ Analyzing and Interpreting Data	▪ Structure and Function ▪ Stability and Change ***Connections to Engineering, Technology, and Applications of Science*** ▪ Influence of Engineering, Technology, and Science on Society and the Natural World
	S.ES.5.2	Examine how the constructive forces of volcanism, tectonic uplift and orogeny and the destructive forces of weathering, mass wasting, and coastal erosion create land features.		
	S.ES.5.3	Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features. **(HS-ESS2-1)**		
	S.ES.5.4	Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems, including climate feedbacks and other system interactions. **(HS-ESS2-2)**		

Space Systems				Semester 2
S.ES.6	**Outcome: Students will develop models to communicate explanations of stars (including our sun), planets, and the Big Bang Theory using evidence found in the universe.**			
	Students will…		*Science & Engineering Practices*	*Cross Cutting Concepts*
	S.ES.6.1	Construct an explanation of the Big Bang Theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe. **(HS-ESS1-2)**	▪ Developing and Using Models ▪ Using Mathematics and Computational Thinking ▪ Constructing Explanations and Designing Solutions ▪ Obtaining, Evaluating, and Communicating Information	▪ Scale, Proportion, and Quantity ▪ Energy and Matter ▪ Stability and Change ***Connections to Engineering, Technology, and Applications of Science*** ▪ Interdependence of Science, Engineering, and Technology ***Connections to Nature of Science*** ▪ Scientific Knowledge Assumes an Order and Consistency in Natural Systems
	S.ES.6.2	Use mathematical or computational representations to predict the motion of orbiting objects in the solar system using Newton's gravitational laws. **(HS-ESS1-4)**		
	S.ES.6.3	Explain the transfer of energy from nuclear fusion in the sun to radiant energy that reaches Earth, including changes in radiation due to sudden solar flares, the sunspot cycle and non-cyclical variations. **(HS-ESS1-1)**		
	S.ES.6.4	Develop a model that illustrates the role of nuclear fusion in the sun's core. **(HS-ESS1-1)**		
	S.ES.6.5	Communicate scientific ideas about the way stars, over their life cycle, produce elements. **(HS-ESS1-3)**		
	S.ES.6.6	Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history. **(HS-ESS1-6)**		