NORTH CAROLINA STANDARD COURSE OF STUDY
K-12 Science - Kindergarten

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Kindergarten	
Strand: Matter and its Interactions	
Standard	**Objectives**
PS.K.1 Understand how objects are described based on their physical properties and how they are used.	PS.K.1.1 Analyze and interpret data to classify objects by physical properties (size, color, shape, texture, weight and flexibility).
	PS.K.1.2 Engage in argument from evidence to summarize how different materials (clay, wood, cloth, paper, etc.) are used based on their physical properties.

Strand: Motion and Stability- Forces and Interactions	
Standard	**Objectives**
PS.K.2 Understand the positions and motions of objects and organisms observed in the environment.	PS.K.2.1 Use models to compare the relative position of various objects observed in the classroom and outside using position words such as: in front of, behind, between, on top of, under, above, below, beside.
	PS.K.2.2 Carry out investigations to illustrate different ways objects and organisms move (to include falling to the ground when dropped): straight, zigzag, round and round, back and forth, fast and slow.

Strand: From Molecules to Organisms- Structures and Processes	
Standard	**Objectives**
LS.K.1 Understand the characteristics of living organisms and nonliving things.	LS.K.1.1 Engage in argument from evidence to summarize the characteristics of living organisms and nonliving things in terms of their: structure, growth, changes, movement, basic needs.
	LS.K.1.2 Use models to exemplify how animals use their body parts to obtain food and other resources, protect themselves, and move from place to place.

Strand: Heredity- Inheritance and Variation of Traits	
Standard	**Objectives**
LS.K.2 Understand characteristics of organisms that make them alike and different.	LS.K.2.1 Analyze and interpret data to compare the characteristics of different types of the same animal to determine individual similarities and differences.
	LS.K.2.2 Analyze and interpret data to compare the characteristics of different types of the same plant to determine individual similarities and differences.

Strand: Earth's Systems	
Standard	**Objectives**
ESS.K.1 Understand change and observable patterns of weather that occur from day to day and throughout the year.	ESS.K.1.1 Analyze and interpret data to compare changes in the environment due to weather.
	ESS.K.1.2 Use mathematics and computational thinking to summarize daily weather conditions noting changes that occur from day to day and throughout the year.
	ESS.K.1.3 Obtain, evaluate and communicate information to compare weather patterns that occur from season to season.

NORTH CAROLINA STANDARD COURSE OF STUDY
K-12 Science - First Grade

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First Grade	
Strand: Motion and Stability- Forces and Interactions	
Standard	**Objectives**
PS.1.1 Understand how forces (pushes or pulls) affect the motion of an object.	PS.1.1.1 Use models to explain the effect of a push or pull on the motion of an object, with or without contact.
	PS.1.1.2 Carry out investigations to compare the effects of a given force on the motion of an object.

Strand: Ecosystems- Interactions, Energy, and Dynamics	
Standard	**Objectives**
LS.1.1 Understand the basic needs of a variety of plants and animals in different ecosystems.	LS.1.1.1 Obtain, evaluate and communicate information to summarize the needs of different plants and animals.
	LS.1.1.2 Analyze and interpret data to compare how the needs of plants and animals can be met in different environments.

Strand: Earth's Place in the Universe	
Standard	**Objectives**
ESS.1.1 Recognize the features and patterns of the earth/moon/sun system as observed from Earth.	ESS.1.1.1 Use models to recognize differences in the features of the day and night sky and apparent movement of objects across the sky as observed from Earth.
	ESS.1.1.2 Analyze and interpret data to recognize patterns of observable changes in the moon's appearance from day to day.

Strand: Earth's Systems	
Standard	**Objectives**
ESS.1.2 Understand the physical properties of Earth materials.	ESS.1.2.1 Obtain, evaluate and communicate information to summarize the physical properties of Earth materials, including rocks, minerals, soils, and water.
	ESS.1.2.2 Carry out investigations to compare the properties of different soil samples from local places relating their capacity to retain water, provide nutrients, and support the growth of plants.

Strand: Earth and Human Activity	
Standard	**Objectives**
ESS.1.3 Understand that natural resources are important to humans.	ESS.1.3.1 Obtain, evaluate and communicate information to summarize ways in which humans use natural resources.
	ESS.1.3.2 Engage in argument from evidence to explain ways that humans can protect natural resources in the environment.

NORTH CAROLINA STANDARD COURSE OF STUDY
K-12 Science, Second Grade

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Second Grade	
Strand: Matter and its Interactions	
Standard	**Objectives**
PS.2.1 Understand properties of solids and liquids and the changes they undergo.	PS.2.1.1 Carry out investigations to illustrate examples of matter that can change from a solid to a liquid and from a liquid to a solid by heating and cooling.
	PS.2.1.2 Analyze and interpret data to compare the amount (volume and weight) of water in a container before and after freezing.
	PS.2.1.3 Analyze and interpret data to compare the amount (volume and weight) of water left in an open container over time to the water left in a closed container.

Strand: Waves and Their Applications in Technologies for Information Transfer	
Standard	**Objectives**
PS.2.2 Understand the relationship between sound and vibrating objects.	PS.2.2.1 Carry out investigations to illustrate how sound is produced by vibrating objects and columns of air.
	PS.2.2.2 Use models to summarize the relationship between sound and how sounds are produced and detected by parts of the body that vibrate.

Strand: From Molecules to Organisms- Structures and Processes	
Standard	**Objectives**
LS.2.1 Understand animal life cycles.	LS.2.1.1 Use models to summarize the life cycle of animals including: birth, developing into an adult, reproducing, aging and death.
	LS.2.1.2 Obtain, evaluate and communicate information to compare life cycles of different animals.

Strand: Heredity- Inheritance and Variation of Traits	
Standard	**Objectives**
LS.2.2 Understand that organisms differ from or are similar to their parents and other offspring based on characteristics of the organism.	LS.2.2.1 Obtain, evaluate, and communicate information to summarize ways in which animals closely resemble their parents and ways they are different.
	LS.2.2.2 Analyze and interpret data to illustrate variations among offspring of the same parents.

Strand: Earth's Systems	
Standard	**Objectives**
ESS2.1 Understand patterns of weather and factors that affect weather.	ESS.2.1.1 Obtain, evaluate, and communicate information to summarize how energy from the sun serves as a source of light and warms the land, air, and water.
	ESS.2.1.2 Use mathematics and computational thinking to summarize weather conditions (temperature, wind direction, wind speed, precipitation).
	ESS.2.1.3 Carry out investigations to collect data and compare weather patterns that occur over time and relate observable patterns to time of day and time of year.
	ESS.2.1.4 Obtain, evaluate and communicate information to recognize the tools scientists use for observing, recording, and predicting weather changes from day to day and during the season.

NORTH CAROLINA STANDARD COURSE OF STUDY
K-12 Science, Third Grade

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Third Grade	
Strand: Matter and its Interactions	
Standard	**Objectives**
PS.3.1 Understand the structure and properties of matter before and after they undergo a change.	PS.3.1.1 Engage in argument from evidence to infer that air is a substance that surrounds us, takes up space, and has mass.
	PS.3.1.2 Carry out investigations to classify solids, liquids, and gases based on their basic properties.
	PS.3 1.3 Engage in argument from evidence to explain observable changes to the properties of matter when heated or cooled.

Strand: Motion and Stability- Forces and Interactions	
Standard	**Objectives**
PS.3.2 Understand motion and factors that affect motion.	PS.3.2.1 Carry out investigations to infer changes in speed or direction resulting from forces acting on an object.
	PS.3.2.2 Carry out investigations to compare the relative speeds (faster or slower) of objects that travel the same distance in different amounts of time.
	PS.3.2.3 Use models to explain the effect of Earth's gravity on the motion of any object on or near the Earth.

Strand: Energy	
Standard	**Objectives**
PS.3.3 Understand how energy can be transferred from one object to another.	PS.3.3.1 Ask questions to explain how heat is created by friction.
	PS.3.3.2 Carry out investigations to explain how energy can be transferred from a warmer object to a cooler one by contact or at a distance.

Strand: From Molecules to Organisms- Structures and Processes	
Standard	**Objectives**
LS.3.1 Understand human body systems and how they are essential for life: protection, movement, and	LS.3.1.1 Use models to infer the functions of the skeletal and muscular systems.
	LS.3.1.2 Obtain, evaluate, and communicate scientific information to explain why skin is necessary for protection and for the body to remain healthy.

support.	
Standard	**Objectives**
LS.3.2 Understand how plant structures aid in survival.	LS.3.2.1 Carry out investigations to explain the structures and functions of plants and how they are essential for life.
	LS.3.2.2 Use models to exemplify the distinct stages of the life cycle of seed plants.

Strand: Ecosystems - Interactions, Energy, and Dynamics	
Standard	**Objectives**
LS.3.3 Understand how environmental factors aid in the survival of plants.	LS.3.3.1 Carry out investigations to explain how environmental conditions determine how well plants survive and grow.
	LS.3.3.2 Construct an explanation to infer how the basic properties and components of soil determine its ability to support the growth and survival of many plants.

Strand: Earth's Place in the Universe	
Standard	**Objectives**
ESS.3.1 Remember the major components and patterns observed in the earth/moon/sun system.	ESS.3.1.1 Use models to recognize that the Earth is part of a system called the solar system that includes the sun (a star), planets, and many moons, and that the Earth is the third planet from the sun.
	ESS.3.1.2 Carry out investigations to recognize that changes in the length and direction of an object's shadow indicate the apparent changing position of the sun during the day.
	ESS.3.1.3 Obtain, evaluate and communicate information to recognize the patterns of the stars (including the sun) stay the same as they appear to move across the sky.

Strand: Earth's Systems	
Standard	**Objectives**
ESS.3.2 Understand the structures of the Earth's surface using models.	ESS.3.2.1 Use models to compare Earth's saltwater and freshwater features (including oceans, seas, rivers, lakes, ponds, streams, and glaciers).
	ESS.3.2.2 Use models to compare Earth's land features (including volcanoes, mountains, valleys, canyons, caverns, and islands).

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Fourth Grade	
Strand: Motion and Stability- Forces and Interactions	
Standard	**Objectives**
PS.4.1 Understand how various forces affect the motion of an object.	PS.4.1.1 Ask questions to summarize the relationship of magnetic interactions between two objects not in contact with each other.
	PS.4.1.2 Carry out investigations to explain how electrically charged objects push or pull on other objects to produce motion.

Strand: Energy	
Standard	**Objectives**
PS.4.2 Understand that energy can be transferred from place to place by sound, light, heat, and electric currents.	PS.4.2.1 Ask questions to identify basic forms of energy (light, sound, heat, and electrical) that cause motion or create change.
	PS.4.2.2 Use models to explain a simple electrical circuit and the necessary components.
	PS.4.2.3 Carry out investigations on common materials to classify them as insulators or conductors of electricity.

Strand: Waves and Their Applications in Technologies for Information Transfer	
Standard	**Objectives**
PS.4.3 Understand the nature of light and how light interacts with objects.	PS.4.3.1 Carry out investigations to infer the path light travels from a light source to a mirror and how it is reflected (by the mirror) using different angles.
	PS.4.3.2 Carry out investigations to explain how light is refracted and absorbed.

Strand: From Molecules to Organisms- Structures and Processes	
Standard	**Objectives**
LS.4.1 Understand the effects of environmental changes, adaptations, and behaviors that enable organisms to survive in changing habitats.	LS.4.1.1 Use models to explain that plants and animals have external structures that function to support survival.
	LS.4.1.2 Use models to explain that animals receive different types of information through their senses, process the information, and respond to the information in different ways.
	LS.4.1.3 Engage in argument from evidence to explain how differences among animals of the same population sometimes gives individuals an advantage in surviving and reproducing in changing habitats.

Strand: Biological Evolution- Unity and Diversity	
Standard	**Objectives**
LS.4.2 Understand the use of fossils as evidence of the history of Earth and its changing life forms.	LS.4.2.1 Analyze and interpret data to compare fossils to one another and living organisms.
	LS.4.2.2 Analyze and interpret data to explain how fossils suggest ideas about Earth's early environment.

Strand: Earth's Place in the Universe	
Standard	**Objectives**
ESS.4.1 Understand the causes of day and night and phases of the moon.	ESS.4.1.1 Use models to explain the cause of day and night based on the rotation of the Earth on its axis.
	ESS.4.1.2 Use models to explain the repeating pattern of the phases of the moon (new, crescent, quarter, gibbous, and full).

Strand: Earth's Systems	
Standard	**Objectives**
ESS.4.2 Understand patterns of change in the Earth's surface over time.	ESS.4.2.1 Carry out investigations to classify minerals using tests for the physical properties of hardness, color, luster, cleavage and streak.
	ESS.4.2.2 Carry out investigations to classify rocks as metamorphic, sedimentary, or igneous based on their composition, how they are formed, and the processes that create them.
	ESS.4.2.3 Use models to explain changes in Earth's surface over time (to include slow changes of erosion and weathering, and fast changes of earthquakes, landslides, and volcanic activity).

Strand: Earth and Human Activity	
Standard	**Objectives**
ESS.4.3 Understand changes caused by human impact on the environment.	ESS.4.3.1 Ask questions to infer whether changes in an organism's environment are beneficial or harmful.
	ESS.4.3.2 Engage in argument from evidence to explain how humans can adapt their behavior to live in changing environments (e.g. recycling wastes, establishing rain gardens, planting native species to prevent flooding and erosion).
	ESS.4.3.3 Obtain, evaluate and communicate information to compare solutions to environmental problems impacting plants and animals.

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Fifth Grade	
Strand: Matter and its Interactions	
Standard	**Objectives**
PS.5.1 Understand the interactions of matter and energy and the changes that occur.	PS 5.1.1 Carry out investigations to compare the weight of objects before and after an interaction.
	PS 5.1.2 Carry out investigations to explain whether the mixing of two or more substances results in new substances.
	PS 5.1.3 Carry out investigations to compare how heating and cooling affect some materials and how this relates to their purpose and practical applications.

Strand: Motion and Stability- Forces and Interactions	
Standard	**Objectives**
PS.5.2 Understand force, motion, and the relationship between them.	PS.5.2.1 Carry out investigations to explain how factors such as gravity, friction, and change in mass affect the motion of objects.
	PS.5.2.2 Use mathematics and computational thinking to infer the motion of an object (including position, direction, and speed).

Strand: From Molecules to Organisms- Structures and Processes	
Standard	**Objectives**
LS.5.1 Understand how structures and systems of the human body perform functions necessary for life.	LS.5.1.1 Use models to recognize the organizational structure of humans as a multicellular organism (cell, tissue, organ, system, organism).
	LS.5.1.2 Use models to compare the major systems of the human body (digestive, respiratory, circulatory, muscular, skeletal, nervous) as it relates to their functions necessary for life.

Strand: Ecosystems- Interactions, Energy, and Dynamics	
Standard	**Objectives**
LS.5.2 Understand the interdependence of plants and animals within their ecosystem.	LS.5.2.1 Engage in argument from evidence to compare the characteristics of several common ecosystems (including estuaries and salt marshes, oceans, lakes and ponds, rivers and streams, forests, and grasslands) in terms of their ability to support a variety of populations.
	LS.5.2.2 Use models to classify organisms within an ecosystem according to the function they serve: producers, consumers, or decomposers .
	LS.5.2.3 Use models to infer the effects that may result from the interconnected relationships of plants and animals to their ecosystem.

Strand: Heredity- Inheritance and Variation of Traits	
Standard	**Objectives**
LS.5.3 Understand some characteristics of an organism are inherited and other characteristics are acquired.	LS.5.3.1 Ask questions to compare instincts and learned behaviors.
	LS.5.3.2 Ask questions to compare inherited and acquired traits.

Strand: Earth's Systems	
Standard	**Objectives**
ESS.5.1 Understand how Earth systems (hydrosphere and atmosphere) impact patterns of weather and climate.	ESS.5.1.1 Analyze and interpret data to compare daily and seasonal changes in weather conditions (including wind speed and direction, precipitation, and temperature) and patterns.
	ESS.5.1.2 Analyze and interpret weather data to explain current and upcoming weather conditions (including severe weather such as hurricanes and tornadoes) in a given location.
	ESS.5.1.3 Construct an explanation to summarize the ocean's influences on weather and climate in North Carolina.
	ESS.5.1.4 Use models to explain how the sun's energy drives the processes of the water cycle (including evaporation, transpiration, condensation, precipitation).

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Sixth Grade	
Strand: Matter and its Interactions	
Standard	**Objectives**
PS.6.1 Understand the structure, states, and physical properties of matter.	PS.6.1.1 Use models to illustrate that matter is made of atoms and elements, and are distinguished from each other by the types of atoms that compose them.
	PS.6.1.2 Use models to explain the relationship between changes in thermal energy in a substance and the motion of its particles (including phase changes).
	PS.6.1.3 Carry out investigations to compare the physical properties of pure substances that are independent of the amount of matter present including density, melting point, boiling point and solubility to properties that are dependent on the amount of matter present to include volume, mass and weight.

Strand: Energy	
Standard	**Objectives**
PS.6.2 Understand characteristics of thermal and electrical energy transfer and interactions of matter and energy.	PS.6.2.1 Use models to compare the directional transfer of heat energy of matter through convection, radiation, and conduction.
	PS.6.2.2 Use models to explain how the transfer of heat and resulting change of temperature impacts the behavior of matter to include expansion, and contraction.
	PS.6.2.3 Carry out investigations to compare the transfer of thermal energy in insulated and non-insulated materials (examples could include insulated box, solar cooker, or styrofoam cup).
	PS.6.2.4 Engage in argument from evidence to classify materials as conductors and insulators of energy (both thermal and electrical).
	PS.6.2.5 Carry out investigations to explain the transfer of electrical energy in electrical circuits, to include how a circuit requires a complete loop through which an electrical current can pass.

Strand: Waves and Their Applications in Technologies for Information Transfer	
Standard	**Objectives**
PS.6.3 Understand the properties of waves and the wavelike property of energy in seismic, electromagnetic (including visible light), and sound waves.	PS.6.3.1 Use models of a simple wave to explain wave properties in seismic, light, and sound waves that include: waves having a repeating pattern with a specific amplitude, frequency, and wavelength, and the amplitude of a wave is related to the energy of the wave.
	PS.6.3.2 Carry out investigations to conclude the relationship between the electromagnetic spectrum (including visible light) and sight.
	PS.6.3.3 Carry out investigations to conclude the relationship between sound waves (including rate of vibration, the medium through which vibrations travel) and hearing.
	PS.6.3.4 Use models to explain that various waves (seismic, sound, electromagnetic, including visible light) are reflected, absorbed or transmitted through various materials.

Strand: From Molecules to Organisms- Structures and Processes	
Standard	**Objectives**
LS.6.1 Understand the structures, processes, and behaviors of plants that enable them to survive and reproduce.	LS.6.1.1 Use models to explain how the processes of photosynthesis, respiration, and transpiration work together to meet the needs of plants.
	LS.6.1.2 Construct an explanation to compare how vascular and nonvascular plants obtain, transport, and use nutrients and water necessary for survival.
	LS.6.1.3 Use models to summarize structural adaptations, processes, and responses that flowering plants use for defense, survival and reproduction.

Strand: Ecosystems- Interactions, Energy, and Dynamics	
Standard	**Objectives**
LS.6.2 Understand the flow of energy through ecosystems and the responses of populations to the biotic and abiotic factors in their environment.	LS.6.2.1 Use models to summarize how energy derived from the sun is used by plants to produce sugars (photosynthesis) and is transferred to consumers and decomposers.
	LS.6.2.2 Analyze and interpret data to predict how the abiotic factors (such as temperature, water, sunlight, and soil quality) and biotic factors affect the ability of organisms to grow and survive in different biomes (freshwater, marine, temperate forest, rainforest, grassland, desert, taiga, tundra).

Strand: Earth's Place in the Universe	
Standard	**Objectives**
ESS.6.1 Understand the earth/moon/sun system, and the properties, structures and predictable motions of celestial bodies in the Universe.	ESS.6.1.1 Use models to explain how the relative motion and relative position of the Sun, Earth and moon affect the seasons, tides, phases of the moon, and eclipses.
	ESS.6.1.2 Analyze and interpret data to compare the planets in our solar system in terms of: size and gravitational force relative to Earth, surface and atmospheric features, relative distance from the sun, and ability to support life.
	ESS.6.1.3 Use models to explain how the gravitational forces of the Sun and planets impact the structure of our solar system.
	ESS.6.1.4 Analyze and interpret data from historical and ongoing space exploration to illustrate the size and scale of the components of our solar system, galaxy, and universe.

Strand: Earth's Systems	
Standard	**Objectives**
ESS.6.2 Understand the lithosphere and how interactions of constructive and destructive forces have resulted in changes in the surface of the earth over time.	ESS.6.2.1 Use models to summarize the structure of the earth, including the layers, the mantle and core based on the relative position, composition and density.
	ESS.6.2.2 Construct an explanation to illustrate how the movement of lithospheric plates can create geologic landforms and cause major geologic events such as earthquakes and volcanic eruptions.
	ESS.6.2.3 Use models to explain the rock cycle and its relationship to the formation of soil (including how different types of soil come from different types of rocks).

Strand: Earth and Human Activity	
Standard	**Objectives**
ESS.6.3 Understand the reciprocal relationship between the lithosphere and humans.	ESS.6.3.1 Engage in argument from evidence to explain that the good health of humans and the environment requires: monitoring of the lithosphere, maintaining soil quality and stewardship.
	ESS.6.3.2 Obtain, evaluate, and communicate information to compare the implications of sustainable and unsustainable land use practices (including agriculture and deforestation) and the importance of stewardship.

NORTH CAROLINA STANDARD COURSE OF STUDY
K-12 Science, Seventh Grade

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Seventh Grade	
Strand: Motion and Stability: Forces and Interactions	
Standard	**Objectives**
PS.7.1 Understand motion, the effects of forces on motion, and the graphical representations of motion.	PS.7.1.1 Construct an explanation to summarize the motion of an object by its position, direction of motion, and speed in respect to some other object.
	PS.7.1.2 Use models to illustrate the effects of balanced and unbalanced forces acting on an object (including friction, gravity, and magnetism).
	PS.7.1.3 Analyze and interpret graphical data to summarize the motion of an object to show a change in position over a period of time.
	PS.7.1.4 Analyze and interpret graphical data to summarize the motion of an object to show a change in distance over a period of time for constant speed and variable motion.

Strand: Energy	
Standard	**Objectives**
PS.7.2 Understand forms of energy, energy transfer and transformation, and conservation in mechanical systems.	PS.7.2.1 Construct an explanation to summarize how kinetic and potential energy contribute to the mechanical energy of an object.
	PS.7.2.2 Engage in argument from evidence to explain how energy can be transformed from one form to another, specifically potential energy and kinetic energy (models could include roller coasters, pendulums, or cars on ramps as examples).
	PS.7.2.3 Carry out investigations to conclude that energy can be transferred from one system to another when two objects push or pull on each other over a distance (work) in a mechanical system using qualitative data.
	PS.7.2.4 Carry out investigations to compare the efficiency of simple machines in relation to their advantages for particular purposes (to include inclined planes, pulleys, levers and wheel and axles) using qualitative data.

Strand: From Molecules to Organisms- Structures and Processes	
Standard	**Objectives**
LS.7.1 Understand the processes, structures and functions of living organisms that enable them to survive, reproduce and carry out the basic functions of life.	LS.7.1.1 Construct an explanation to conclude how the structures of single-celled organisms carry out all of the basic functions of life including: Euglena, Amoeba, Paramecium, Volvox.
	LS.7.1.2 Use models to explain how the relevant structures within cells (including cell membrane, cell wall, nucleus, mitochondria, chloroplasts, and vacuoles) function to support the life of plant, animal, and bacterial cells.
	LS.7.1.3 Use models to explain how the hierarchical organization of multicellular organisms from cells to tissues to organs to systems to organisms functions to support life.
	LS.7.1.4 Construct an explanation to summarize how the major systems of the human body interact with each other to support life (including digestion, respiration, reproduction, circulation, excretion, nervous).

Strand: Heredity- Inheritance and Variation of Traits	
Standard	**Objectives**
LS.7.2 Understand the relationship of the mechanisms of reproduction, patterns of inheritance, and potential variation among offspring.	LS.7.2.1 Construct an explanation supported with scientific evidence to summarize the role of genes on chromosomes as inherited cellular structures which contribute to an organism's traits (not to include the structure of DNA).
	LS.7.2.2 Use models to explain how asexual reproduction results in offspring with identical genetic information while sexual reproduction results in offspring with genetic variation (not to include specific phases of mitosis and meiosis).
	LS.7.2.3 Use models (Punnett squares) to infer and predict patterns of the inheritance of single genetic traits from parent to offspring (including dominant and recessive traits).

Strand: Earth's Systems	
Standard	**Objectives**
ESS.7.1 Understand the atmosphere and how the cycling of water relates to Earth's weather and climate.	ESS.7.1.1 Analyze and interpret data to compare the composition, properties and structure of Earth's atmosphere to include: mixtures of gases and differences in temperature and pressure within layers.
	ESS.7.1.2 Use models to explain how the energy of the Sun and Earth's gravity drive the cycling of water, including changes of state, as it moves through multiple pathways in Earth's systems and relates to weather patterns on Earth.
	ESS.7.1.3 Analyze and interpret data to explain the relationship between the movement of air masses, high and low pressure systems, frontal boundaries and weather conditions that may result.
	ESS.7.1.4 Use models to predict weather conditions based on observations (including clouds, air masses, fronts), measurements (wind speed and direction, air temperature, humidity and air pressure), weather maps, satellites and radar.
	ESS.7.1.5 Use models to explain the influence of convection, global winds, and the jet stream on weather and climatic conditions.

Strand: Earth and Human Activity	
Standard	**Objectives**
ESS.7.2 Understand the reciprocal relationship between the atmosphere and humans.	ESS.7.2.1 Engage in argument from evidence to explain that the good health of humans and environment requires: monitoring of the atmosphere, maintaining air quality and stewardship.
	ESS.7.2.2 Analyze and interpret data to explain how changes in the structure and composition of the atmosphere affects the greenhouse effect and global temperatures.
	ESS.7.2.3 Obtain, evaluate, and communicate information to explain the impacts on humans and mitigation strategies of potentially hazardous environmental factors (including air quality index, UV index, Heat Index, Wildfires) and storms (hurricanes, blizzards, tornadoes, severe thunderstorms, floods).

NORTH CAROLINA STANDARD COURSE OF STUDY
K-12 Science, Eighth Grade

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Eighth Grade	
Strand: Matter and its Interactions	
Standard	**Objectives**
PS.8.1 Understand the properties of matter and changes that occur when matter interacts in open and closed systems.	PS.8.1.1 Construct an explanation to classify matter as elements, compounds, or mixtures based on how the atoms are arranged in various substances.
	PS.8.1.2 Use models to illustrate the structure of atoms in terms of the protons, electrons, and neutrons (using the location, charges and comparative size of these subatomic particles), without consideration of isotopes, ions, and energy levels.
	PS.8.1.3 Analyze and interpret data to explain how the physical properties of elements and their reactivity have been used to produce the current model of the Periodic Table of Elements.
	PS.8.1.4 Construct an explanation to classify changes in matter as physical changes (including changes in size, shape, and state) or chemical changes that are the result of a chemical reaction (including changes in energy, color, formation of a gas or precipitate).
	PS.8.1.5 Use models to illustrate how atoms are rearranged during a chemical reaction so that balanced chemical equations support the Law of Conservation of Mass (in both open and closed systems).

Strand: From Molecules to Organisms- Structures and Processes	
Standard	**Objectives**
LS.8.1 Understand the hazards caused by agents of diseases that affect living organisms.	LS.8.1.1 Construct an explanation to compare the basic characteristics of viruses, bacteria, fungi and parasites relating to the spread, treatment and prevention of disease.
	LS.8.1.2 Analyze and interpret data to explain the difference between epidemic and pandemic as it relates to the spread, treatment and prevention of disease.

Strand: Ecosystems- Interactions, Energy, and Dynamics	
Standard	**Objectives**
LS.8.2 Understand how organisms interact with and respond to the biotic and abiotic factors in their environment.	LS.8.2.1 Carry out investigations to explain how changing biotic and abiotic factors such as food, water, shelter, and space affect populations in an ecosystem.
	LS.8.2.2 Construct an explanation to summarize the relationships among producers, consumers, and decomposers including the positive and negative consequences of such interactions including: coexistence and cooperation, competition (predator/prey), parasitism, and mutualism.
	LS.8.2.3 Construct an explanation to summarize how food provides the energy and the building materials required for the growth and survival of all organisms (to include plants).
	LS.8.2.4 Use models to explain how the flow of energy within food webs is interconnected with the cycling of matter (water and carbon).

Strand: Biological Evolution- Unity and Diversity	
Standard	**Objectives**
LS.8.3 Understand the evolution of organisms over time based on evidence and processes.	LS.8.3.1 Analyze and interpret data to infer evolutionary relationships by using evidence drawn from fossils and comparative anatomy.
	LS.8.3.2 Use models to explain the process of natural selection, in which genetic variations in a population affect individuals' likelihood of surviving and reproducing in its environment.

Strand: Earth's Place in the Universe	
Standard	**Objectives**
ESS.8.1 Understand the history of Earth and its life forms based on evidence of change recorded in fossil records and landforms.	ESS.8.1.1 Analyze and interpret data to conclude the relative age of Earth and relative age of rocks and fossils from index fossils and ordering of rock layers.
	ESS.8.1.2 Engage in argument from evidence to explain the use of fossils, composition of sedimentary rocks, faults, and igneous rock formations found in rock layers as evidence of the history of the Earth and its life forms.

Strand: Earth's Systems	
Standard	**Objectives**
ESS.8.2 Understand the hydrosphere including freshwater, estuarine, ocean systems.	ESS.8.2.1 Use models to explain the structure of the hydrosphere including: water distribution on earth, local river basins, estuaries, and water availability.
	ESS.8.2.2 Use models to explain how temperature and salinity drive major ocean currents and how these currents impact climate, ecosystems, and the distribution of nutrients, minerals, dissolved gases, and life forms.

Strand: Earth and Human Activity	
Standard	**Objectives**
ESS.8.3 Understand the reciprocal relationship between the hydrosphere and humans.	ESS.8.3.1 Analyze and interpret data to predict the safety and potability of water supplies in North Carolina based on physical and biological factors, including: temperature, dissolved oxygen, pH, nitrates and phosphates, turbidity, and bio-indicators.
	ESS.8.3.2 Engage in argument from evidence to explain that the good health of humans and the environment requires: monitoring of the hydrosphere, water quality standards, methods of water treatment, maintaining safe water quality, and stewardship.
Standard	**Objectives**
ESS.8.4 Understand the environmental implications associated with the various methods of obtaining, managing, and using energy resources.	ESS.8.4.1 Construct an explanation to classify the primary sources of energy as either renewable (Geothermal, Biomass, Solar, Wind, Hydroelectric) or nonrenewable (Coal, Petroleum, Natural Gas, Nuclear).
	ESS.8.4.2 Engage in argument from evidence to explain the environmental consequences of the various methods of obtaining, transforming, and distributing energy.
	ESS.8.4.3 Analyze and interpret data to illustrate the relationship between human activities and global temperatures since industrialization.
	ESS.8.4.4 Obtain, evaluate, and communicate information to compare the long term implications of the use of renewable and nonrenewable energy resources and the importance of stewardship and conservation.

NORTH CAROLINA STANDARD COURSE OF STUDY
K-12 Science, Biology

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Biology	
Strand: From Molecules to Organisms- Structures and Processes	
Standard	**Objectives**
LS.Bio.1 Analyze how the relationship between structure and function supports life processes within organisms.	LS.Bio.1.1 Construct an explanation to illustrate relationships between structure and function of major macromolecules essential for life.
	LS.Bio.1.2 Carry out investigations to illustrate how enzymes act as catalysts for biochemical reactions and how environmental factors affect enzyme activity.
	LS.Bio.1.3 Use models to explain how the structure of organelles determines its function and supports overall cell processes.
	LS.Bio.1.4 Construct explanations to compare prokaryotic and eukaryotic cells in terms of structures and degree of complexity.
	LS.Bio.1.5 Construct an explanation to summarize how DNA and RNA direct the synthesis of proteins.
Standard	**Objectives**
LS.Bio.2 Analyze the growth and development processes of organisms.	LS.Bio.2.1 Use models to illustrate how cellular division results in the reproduction, growth, and repair of organisms.
	LS.Bio.2.2 Construct an explanation to illustrate that proteins regulate gene expression resulting in cellular differentiation, specialized cells with specific functions, and uncontrolled cell growth.
Standard	**Objectives**
LS.Bio.3 Analyze the relationship between biochemical processes and energy use.	LS.Bio.3.1 Carry out investigations to explain how homeostasis is maintained through feedback mechanisms.
	LS.Bio.3.2 Use models to illustrate how photosynthesis transforms light energy into chemical energy.
	LS.Bio.3.3 Use models to illustrate how cellular respiration [aerobic and anaerobic] transforms chemical energy into ATP.

Strand: Ecosystems- Interactions, Energy, and Dynamics	
Standard	**Objectives**
LS.Bio.4 Analyze the relationships between matter and energy within ecosystems.	LS.Bio.4.1 Use models to illustrate how processes in organisms contribute to the flow of energy and the cycling of matter within an ecosystem.
	LS.Bio.4.2 Use models to explain the relationship between the flow of energy and cycling of matter among organisms in an ecosystem.
Standard	**Objectives**
LS.Bio.5 Understand ecosystem dynamics, functioning, and resilience.	LS.Bio.5.1 Use mathematics and computational thinking to explain how interactions between organisms (predator/prey, competition) affect carrying capacity and maintain stability in an ecosystem.
	LS.Bio.5.2 Engage in argument from evidence to evaluate various solutions to reduce the impact of human activities on biodiversity and ecosystem health.

Strand: Heredity- Inheritance and Variation of Traits	
Standard	**Objectives**
LS.Bio.6 Understand genetic mechanisms for variation.	LS.Bio.6.1 Use models to explain how DNA is passed from parents to offspring through the processes of meiosis and fertilization in sexual reproduction.
	LS.Bio.6.2 Construct an explanation to summarize how inheritable genetic variations may result from: new genetic combinations in meiosis,mutations during replication, or mutations caused by environmental factors.
Standard	**Objectives**
LS.Bio.7 Understand types of inheritance and how the environment can influence traits.	LS.Bio.7.1 Use mathematics and computational thinking to predict the variation and distribution of expressed traits based on: Mendelian inheritance, co-dominance, incomplete dominance, multiple alleles, and sex-linked inheritance.
	LS.Bio.7.2 Analyze and interpret data to explain how polygenic traits result in a wide range of phenotypes.
	LS.Bio.7.3 Construct an explanation to summarize how traits result from interactions of genetic factors (multiple genes and/or alleles) and environmental factors.

Standard	Objectives
LS.Bio.8 Understand applications of genetics and biotechnology.	LS.Bio.8.1 Analyze and interpret data to compare DNA samples.
	LS.Bio.8.2 Obtain and communicate information that summarizes the impact of biotechnology applications on the individual, society, and the environment, including agriculture and medicine.

Strand: Biological Evolution- Unity and Diversity	
Standard	**Objectives**
LS.Bio.9 Understand natural selection as a mechanism for biological evolution.	LS.Bio.9.1 Analyze and interpret data to summarize how various factors such as geographic isolation, pesticide resistance, antibiotic resistance can influence natural selection.
	LS.Bio.9.2 Construct an explanation to illustrate how common ancestry and biological evolution are supported by multiple lines of empirical evidence.
	LS.Bio.9.3 Use models to illustrate the conditions required for natural selection, including the overproduction of offspring, inherited variation, and the struggle to survive.
	LS.Bio.9.4 Construct an explanation to explain how natural selection leads to adaptations within populations.
Standard	**Objectives**
LS.Bio.10 Analyze evolutionary relationships among organisms.	LS.Bio.10.1 Construct explanations to illustrate how varying environmental conditions may result in: changes in the number of individuals of a species, the emergence of new species over time, or the extinction of other species.
	LS.Bio.10.2 Use models (including dichotomous keys, scientific nomenclature, cladograms, phylogenetic trees) to identify organisms and exemplify relationships.

NORTH CAROLINA STANDARD COURSE OF STUDY
K-12 Science, Chemistry

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Chemistry	
Strand: Matter and its Interactions	
Standard	**Objectives**
PS.Chm.1 Analyze the structure of atoms and isotopes.	PS.Chm.1.1 Use models to explain how the scientific understanding of atomic structure has evolved.
	PS.Chm.1.2 Use models to compare nuclear reactions including alpha decay, beta decay and gamma decay; nuclear fusion and nuclear fission.
	PS.Chm.1.3 Use models to explain how electrons are distributed in atoms.
Standard	**Objectives**
PS.Chm.2 Understand the physical and chemical properties of atoms based on their position in the Periodic Table.	PS.Chm.2.1 Use the Periodic Table as a model to predict the relative properties of elements based on the pattern of valence electrons in the outermost energy levels of atoms.
	PS.Chm.2.2 Construct an explanation to infer the atomic size, reactivity, electronegativity, and ionization energy of an element based on its position in the Periodic Table.
Standard	**Objectives**
PS.Chm.3 Understand the bonding that occurs in simple compounds in terms of bond type, strength, and properties.	PS.Chm.3.1 Analyze and interpret data to explain the mechanisms and properties of the two main types of intramolecular (ionic and covalent) bonds.
	PS.Chm.3.2 Construct an explanation to summarize the influences intermolecular forces have on the properties of chemical compounds.
	PS.Chm.3.3 Use models to predict chemical names and formulas including ionic (binary & ternary), acidic, and binary covalent compounds.

Standard	Objectives
PS.Chm.4 Analyze chemical reactions in terms of quantities, product formation, and energy.	PS.Chm.4.1 Use models to explain the exothermic or endothermic nature of chemical changes.
	PS.Chm.4.2 Carry out investigations to predict the outcome of simple chemical reactions that obey the Law of Conservation of Mass.
	PS.Chm.4.3 Use mathematics and computational thinking to analyze quantitatively the composition of a substance (empirical formula, molecular formula, percent composition, and mole conversions).
	PS.Chm.4.4 Use mathematics and computational thinking to apply the mole concept in the stoichiometric relationships inherent in chemical reactions.
Standard	**Objectives**
PS.Chm.5 Understand the factors affecting rate of reaction and chemical equilibrium.	PS.Chm.5.1 Carry out investigations to explain the effects of temperature, surface area, stirring, the concentration of reactants, and the presence of catalysts on the rate of chemical reactions according to Collision Theory.
	PS.Chm.5.2 Analyze and interpret data to predict how stressors on a reaction (concentration, temperature, pressure) would shift equilibrium.
Standard	**Objectives**
PS.Chm.6 Understand solutions and the solution process.	PS.Chm.6.1 Carry out investigations to summarize the factors that affect the formation and properties of solutions.
	PS.Chm.6.2 Use models to explain the quantitative nature of a solution (molarity, dilution, titration).
	PS.Chm.6.3 Carry out investigations to compare properties and behaviors (qualitative and quantitative) of acids and bases.

Strand: Energy	
Standard	**Objectives**
PS.Chm.7 Understand the relationship among pressure, temperature, volume, and phase.	PS.Chm.7.1 Use models to explain how changes in energy affect the arrangement and movement of the particles in solids, liquids, and gases, as well as the relative strengths of their intermolecular forces.
	PS.Chm.7.2 Use mathematics and computational thinking to execute simple calorimetric calculations based on the Law of Conservation of Energy.
	PS.Chm.7.3 Use mathematics and computational thinking to explain the relationships among pressure, temperature, volume, and quantity of gas, both qualitatively and quantitatively.

NORTH CAROLINA STANDARD COURSE OF STUDY
K-12 Science, Earth and Environmental Science

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Earth and Environmental Science	
Strand: Earth's Place in the Universe	
Standard	**Objectives**
ESS.EES.1 Explain how Earth's position relative to the sun influences conditions on Earth.	ESS.EES.1.1 Use models to illustrate the formation of the solar system.
	ESS.EES.1.2 Use mathematics and computational thinking to analyze Earth's motion through space.
	ESS.EES.1.3 Use models to illustrate how the sun produces energy.
	ESS.EES.1.4 Construct an explanation to infer how incoming solar radiation interacts with Earth systems to support life.

Strand: Earth's Systems	
Standard	**Objectives**
ESS.EES.2 Analyze how the geosphere is shaped by plate tectonics and the rock cycle.	ESS.EES.2.1 Use models to explain how mantle convection powers plate tectonics.
	ESS.EES.2.2 Analyze and interpret data to predict locations of volcanoes and earthquakes based on plate boundaries.
	ESS.EES.2.3 Use models to explain how plate tectonics influence topography.
	ESS.EES.2.4 Carry out investigations to explain how the rock cycle and rates of weathering, erosion, and soil formation influence Earth's systems.
	ESS.EES.2.5 Analyze and interpret data to explain how volcanic activity influences changes in Earth's atmosphere, geosphere, biosphere, and hydrosphere.
Standard	**Objectives**
ESS.EES.3 Analyze how the interactions between the hydrosphere and atmosphere transfer energy and influence climate.	ESS.EES.3.1 Carry out investigations to explain the properties of water.
	ESS.EES.3.2 Use models to explain how water is an agent of energy transfer.
	ESS.EES.3.3 Analyze and interpret data to explain how major greenhouse gases influence climate.
	ESS.EES.3.4 Analyze and interpret data to attribute how atmospheric composition and surface conditions influence heat retention in the troposphere.
	ESS.EES.3.5 Construct an explanation to conclude that heat exchange between the ocean and atmosphere results in local, regional, global weather phenomena, and climate patterns.

Standard	Objectives
ESS.EES.4 Analyze the connections between the biosphere and other Earth systems (geosphere, hydrosphere, atmosphere).	ESS.EES.4.1 Use models to explain how abiotic/biotic interactions shape various ecosystems.
	ESS.EES.4.2 Analyze and interpret data to explain how carbon cycling influences various ecosystems.
	ESS.EES.4.3 Analyze and interpret data to explain past climate trends.
	ESS.EES.4.4 Construct an explanation to predict how potential future changes in abiotic factors could impact biodiversity and species distribution.
	ESS.EES.4.5 Obtain, evaluate and communicate information to explain how biodiversity impacts ecosystem resilience.

Strand: Earth and Human Activity	
Standard	**Objectives**
ESS.EES.5 Evaluate how human consumption patterns impact Earth's systems.	ESS.EES.5.1 Analyze and interpret data to explain the impacts of land use on Earth's systems.
	ESS.EES.5.2 Analyze and interpret data to evaluate how human use of ground and surface waters impacts water quality and availability in river basins, wetlands, estuaries, and aquifers.
	ESS.EES.5.3 Construct an argument to evaluate the ways that human activities influence atmospheric composition.
	ESS.EES.5.4 Construct an argument to evaluate the benefits and trade-offs of using non-renewable or renewable energy sources for electricity production and transportation fuels.
	ESS.EES.5.5 Construct an argument to evaluate potential solutions that will ensure sustainable consumption of Earth's resources.
	ESS.EES.5.6 Construct an argument to evaluate a range of solutions to mitigate impacts of human activities on Earth's systems.

Standard	Objectives
ESS.EES.6 Analyze how Earth's systems impact humans and the biosphere.	ESS.EES.6.1 Analyze and interpret data to infer how use of natural resources impacts ecosystems and human populations, including human health.
	ESS.EES.6.2 Construct an argument to infer how some natural hazards (such as flooding and wildfires) are increasing in frequency and intensity due to human activities.
	ESS.EES.6.3 Construct an argument to explain how natural hazards and other environmental problems may impact some human populations more than others.

NORTH CAROLINA STANDARD COURSE OF STUDY

K-12 Science, Physical Science

The North Carolina 2023 K-12 Science Standards are intended to foster conceptual understanding and help develop scientifically literate students. The standards provide foundational knowledge and practices within each grade band and course. The standards are organized within 11 strands which articulate vertical alignment. As students progress from one grade to the next, the depth of knowledge and level of sophistication increases.

Engaging in science encourages students' curiosity, interests, and prepares them for the broadest range of postsecondary opportunities, be it college, career, or military service. The 2023 K-12 Science Standards are designed to allow students to become active participants in science - building their understanding of the natural world through observations and investigations.

The scientific method provides a common framework for introducing the traditional experimental design and hypothesis-testing process. The methodologies or approaches utilized by scientists can vary depending on the nature of their research questions and available tools. Steps that all scientists follow when conducting scientific investigations usually involve asking questions, the collection and analysis of relevant data, the use of logical reasoning, opportunities to communicate and collaborate with others, and the development of explanations.

The Science and Engineering Practices (SEP) are embedded in the standards to support a greater emphasis on how students develop science knowledge and the durable skills within the NC Portrait of a Graduate. While one practice is identified in each objective, teachers should utilize other practices to support students' progress towards mastering the standards.

The North Carolina Science Standards maintain the respect for local control of each Public School Unit (PSU). These standards and objectives are not intended to be the curriculum, nor do they indicate the whole of a curriculum which will be written by a PSU or school. The K-12 Science Standard Course of Study has been developed to serve as the framework for a well-planned science curriculum which provides opportunities for investigations, experimentation, and technological design.

Physical Science	
Strand: Matter and its Interactions	
Standard	**Objectives**
PS.PSc.1 Understand types, properties, and structure of matter.	PS.PSc.1.1 Construct an explanation to classify matter as a pure substance or mixture; homogeneous or heterogeneous; element or compound; solution, colloid or suspension.
	PS.PSc.1.2 Use models to compare the phases of matter and the physical changes they undergo.
	PS.PSc.1.3 Carry out investigations to compare physical and chemical properties of matter.
	PS.PSc.1.4 Use models to interpret the data presented in Bohr diagrams and electron dot diagrams for neutral atoms of elements 1 through 18.
	PS.PSc.1.5 Use models to compare representations of atoms, ions, and isotopes.
	PS.PSc.1.6 Use the Periodic Table as a model to predict the relative properties (metallic/nonmetallic character, ionic charge, and reactivity) and arrangement of elements based on the pattern of valence electrons in the outermost energy levels of atoms.
Standard	**Objectives**
PS.PSc.2 Analyze interactions of matter within a chemical system.	PS.PSc.2.1 Construct an explanation to classify the type of chemical bond that occurs (covalent, ionic, or metallic) in a given substance.
	PS.PSc.2.2 Use models to apply International Union of Pure and Applied Chemistry (IUPAC) conventions to name and write formulas for simple compounds.
	PS.PSc.2.3 Use mathematics and computational thinking to execute the balancing of chemical equations to illustrate the Law of Conservation of Mass.
	PS.PSc.2.4 Obtain, evaluate, and communicate information to classify a chemical reaction as synthesis, decomposition, combustion, single replacement, or double replacement reaction.
	PS.PSc.2.5 Construct an explanation to compare the composition and properties of acids and bases.
	PS.PSc.2.6 Use models to explain the interactions of acids and bases in the process of neutralization.

Standard	Objectives
PS.PSc.3 Understand the role of the nucleus in radiation and radioactivity.	PS.PSc.3.1 Use models to compare nuclear reactions including alpha decay, beta decay, and gamma decay; nuclear fusion and nuclear fission.
	PS.PSc.3.2 Use mathematics and computational thinking to execute simple half-life calculations based on the radioactive decay of unstable nuclei.
	PS.PSc.3.3 Obtain, evaluate, and communicate information to explain the application of nuclear reactions to radioactive dating, medicine, and energy production.

Strand: Motion and Stability- Forces and Interactions	
Standard	**Objectives**
PS.PSc.4 Analyze motion in terms of speed, velocity, acceleration, and momentum.	PS.PSc.4.1 Analyze and interpret data to explain the motion of an object moving with a constant velocity or that is accelerating.
	PS.PSc.4.2 Analyze and interpret data to explain the relationship between impulse and an object's change in momentum.
Standard	**Objectives**
PS.PSc.5 Understand the relationship between forces and motion.	PS.PSc.5.1 Use mathematics and computational thinking to compare the weight and mass of an object.
	PS.PSc.5.2 Use models to explain the velocity of an object in freefall.
	PS.PSc.5.3Construct an explanation to infer the effects of forces (specifically applied force and friction) on objects.
	PS.PSc.5.4 Use models to explain the relationship between an object's motion and the interaction of forces acting on it according to Newton's Three Laws of Motion.
Standard	**Objectives**
PS.PSc.6 Understand electricity and magnetism and their relationship.	PS.PSc.6.1 Carry out investigations to explain static and current electricity.
	PS.PSc.6.2 Construct an explanation to compare simple series and parallel circuits in terms of Ohm's Law.
	PS.PSc.6.3 Obtain, evaluate, and communicate information to explain how current is affected by changes in composition, length, temperature, and diameter of wire.
	PS.PSc.6.4 Use models to explain magnetism in terms of domains, interactions of poles, and magnetic fields.

	PS.PSc.6.5 Obtain, evaluate, and communicate information to explain the application of electromagnets.

Strand: Energy	
Standard	**Objectives**
PS.PSc.7 Analyze energy transfers and transformations within a mechanical system.	PS.PSc.7.1 Use models to explain thermal energy and its transfer.
	PS.PSc.7.2 Use mathematics and computational thinking to explain the Law of Conservation of Energy in a mechanical system in terms of kinetic and potential energy.
	PS.PSc.7.3 Use mathematics and computational thinking to explain work in terms of the relationship among the applied force to an object, the resulting displacement of the object, and the energy transferred to an object.
	PS.PSc.7.4 Construct an explanation to infer the relationship between work and power, both quantitatively and qualitatively.

Strand: Waves and Their Applications	
Standard	**Objectives**
PS.PSc.8 Analyze the nature of waves and their applications.	PS.PSc.8.1 Carry out investigations to explain the quantitative and qualitative relationships among wave frequency, wave velocity, wavelength, and wave energy.
	PS.PSc.8.2 Use models to compare the characteristics of mechanical and electromagnetic waves.
	PS.PSc.8.3 Use models to explain the wave interactions of reflection, refraction, diffraction, and interference.
	PS.PSc.8.4 Obtain, evaluate, and communicate information to explain how instruments that transmit and detect waves are used in everyday life.

NORTH CAROLINA STANDARD COURSE OF STUDY

K-12 Science, Physics

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Physics	
Strand: Motion and Stability- Forces and Interactions	
Standard	**Objectives**
PS.Phy.1 Analyze the motion of objects using time, distance, displacement, speed, velocity, and acceleration.	PS.Phy.1.1 Use models (graphs, equations, diagrams) to infer motion in one dimension.
	PS.Phy.1.2 Use models (graphs, equations, diagrams) to infer motion in two dimensions.
Standard	**Objectives**
PS.Phy.2 Analyze systems of forces and their interaction with matter.	PS.Phy.2.1 Use free body models to qualitatively and quantitatively analyze systems of forces in one dimension and two dimensions.
	PS.Phy.2.2 Carry out investigations to explain the interactions of forces on an object according to Newton's Laws of Motion.
	PS.Phy.2.3 Use models to qualitatively and quantitatively analyze basic forces related to movement of an object in a circular path (centripetal force).
	PS.Phy.2.4 Use models to qualitatively and quantitatively explain the relationship among the force of gravity, the distance between two objects, and the mass of the objects, according to the Law of Universal Gravitation.
	PS.Phy.2.5 Analyze and interpret data to explain the effect of elastic force on objects (Hooke's Law).
Standard	**Objectives**
PS.Phy.3 Analyze the motion of objects based on the principles of conservation of momentum and impulse in one dimension.	PS.Phy.3.1 Use models to analyze inelastic and elastic collisions in terms of the conservation of momentum in one dimension.
	PS.Phy.3.2 Use mathematics and computational thinking to analyze the relationship among impulse, momentum, and Newton's 3rd law.
Standard	**Objectives**
PS.Phy.4 Explain charge interactions in electrostatic systems and in electric circuits.	PS.Phy.4.1 Use models to qualitatively and quantitatively explain the fundamental properties and interactions (Coulomb's Law) of charged objects along with the conservation of charge.

	PS.Phy.4.2 Use models to explain the mechanisms for producing electrostatically charged objects, including charging by friction, conduction, and induction.
	PS.Phy.4.3 Use circuit models to qualitatively and quantitatively analyze the relationships among current, voltage, resistance, and power in series, parallel, and compound circuits.
Standard	**Objectives**
PS.Phy.5 Explain the concept of magnetism.	PS.Phy.5.1 Use models to qualitatively explain the relationship between magnetic domains and magnetism.
	PS.Phy.5.2 Obtain, evaluate, and communicate information about the relationship between magnetism and electric currents to explain the role of magnets in current technology.

Strand: Energy	
Standard	**Objectives**
PS.Phy.6 Understand the relationship among work, energy, and power.	PS.Phy.6.1 Use models to qualitatively and quantitatively analyze the kinetic and potential energy in a system.
	PS.Phy.6.2 Analyze and interpret data to qualitatively and quantitatively explain the relationship among work, power, and energy.

Strand: Waves and Their Applications in Technologies for Information Transfer	
Standard	**Objectives**
PS.Phy.7 Analyze the behavior of waves and their applications.	PS.Phy.7.1 Obtain, evaluate, and communicate information to compare mechanical and electromagnetic waves (specifically light and sound) in terms of wave characteristics (frequency, wavelength, period, amplitude, velocity, and energy).
	PS.Phy.7.2 Use models to qualitatively and quantitatively compare reflection and refraction (Snell's Law).
	PS.Phy.7.3 Obtain, evaluate, and communicate information to summarize how instruments that transmit and detect waves are used in everyday life.