ELD Standards Mapping
ELD Standard 4: Language for Science
Grades K-12

The English Language Development (ELD) Standards Mapping Documents are designed to show the connections between the ELD Language Expectations for the five ELD Standards and the content standards for English Language Arts, Mathematics, Science and Social Studies, as well as support integration of the ELD Language Expectations and content to support Multilingual Learners' (ML) learning. This specific ELD Standards Mapping Document focuses on ELD *Standard 4: Language for Science*.

The mapping document can be used by all teachers of MLs to explore the connections between language and content for a variety of purposes, such as developing and aligning curriculum, planning instruction, and co-teaching.

Please note that Standard 1 is not included in this Mapping Document. Standard 1 applies across a range of educational settings and is embedded throughout *ELD Standard 4: Language for Science*. This moves beyond the binary view of social language as a precursor to academic language and views students' everyday language as a legitimate component of academic language development and part of the system of choices students make in order to most effectively meet activity purpose and other contextual variables. The emphases in Standard 1 have heightened attention to the notion that language, social-emotional, and cognitive development are interrelated processes that contribute to students' success in school and beyond. As students make their thinking visible, they communicate to learn, to convey personal needs and wants, to affirm their own identities, and to form and maintain relationships (WIDA 2020). Standard 1 can also be interwoven throughout Science instruction.

The charts below appear in order of the ELD SCOS grade-level clusters (K, 1, 2-3, 4-5, 6-8, 9-12) in the left column with the connected Science standards in the right columns. Shading is used throughout the document to assist viewers in identifying mapping for each language expectation. This document does not include an exhaustive list of the possible connections. Educators should use their knowledge of the ELD standards and their professional judgment when selecting ELD language expectations and Science standards for integration.

ELD-SC.K.Inform.Interpretive	Kindergarten
Interpret scientific informational texts by: Determining what text is about	*Note: While there are no specific science standards listed, language instruction for this language expectation can be integrated within all aspects of science instruction.
Interpret scientific informational texts by: Defining or classifying a concept or entity	**K.P.2** Understand how objects are described based on their physical properties and how they are used. K.P.2.1 Classify objects by observable physical properties (including size, color, shape, texture, weight and flexibility). K.P.2.2 Compare the observable physical properties of different kinds of materials (clay, wood, cloth, paper, etc) from which objects are made and how they are used. **K.L.1** Compare characteristics of animals that make them alike and different from other animals and nonliving things. K.L.1.1 Compare different types of the same animal (i.e. different types of dogs, different types of cats, etc.) to determine individual differences within a particular type of animal. K.L.1.2 Compare characteristics of living and nonliving things in terms of their: • Structure • Growth • Changes • Movement • Basic needs

Language Expectation | **Connected Grade-Level or Course-Specific Content Standards**

(annotated format)

ELD Standard 4: Language for Science
Kindergarten

ELD-SC.K.Inform.Interpretive	Kindergarten
Interpret scientific informational texts by: Determining what text is about	*Note: While there are no specific science standards listed, language instruction for this language expectation can be integrated within all aspects of science instruction.
Interpret scientific informational texts by: Defining or classifying a concept or entity	**K.P.2** Understand how objects are described based on their physical properties and how they are used. K.P.2.1 Classify objects by observable physical properties (including size, color, shape, texture, weight and flexibility). K.P.2.2 Compare the observable physical properties of different kinds of materials (clay, wood, cloth, paper, etc) from which objects are made and how they are used. **K.L.1** Compare characteristics of animals that make them alike and different from other animals and nonliving things. K.L.1.1 Compare different types of the same animal (i.e. different types of dogs, different types of cats, etc.) to determine individual differences within a particular type of animal. K.L.1.2 Compare characteristics of living and nonliving things in terms of their: • Structure • Growth • Changes • Movement • Basic needs
ELD-SC.K.Inform.Expressive	**Kindergarten**
Construct scientific informational texts that: Introduce others to a topic or entity	**K.P.2** Understand how objects are described based on their physical properties and how they are used. K.P.2.1 Classify objects by observable physical properties (including

	size, color, shape, texture, weight and flexibility). K.P.2.2 Compare the observable physical properties of different kinds of materials (clay, wood, cloth, paper, etc) from which objects are made and how they are used.
Construct scientific informational texts that: Provide details about an entity	**K.P.1** Understand the positions and motions of objects and organisms observed in the environment. K.P.1.1 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 and beside. K.P.1.2 Give examples of 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 **K.P.2** Understand how objects are described based on their physical properties and how they are used. K.P.2.1 Classify objects by observable physical properties (including size, color, shape, texture, weight and flexibility) K.P.2.2 Compare the observable physical properties of different kinds of materials (clay, wood, cloth, paper, etc) from which objects are made and how they are used.
ELD-SC.K.Explain.Interpretive	**Kindergarten**
Interpret scientific explanations by: Defining investigable questions or simple design problems based on observations and data about a phenomenon	**K.E.1** Understand change and observable patterns of weather that occur from day to day and throughout the year. K.E.1.1 Infer that change is something that happens to many things in the environment based on observations made using one or more of their senses. K.E.1.2 Summarize daily weather conditions noting changes that occur from day to day and throughout the year. K.E.1.3 Compare weather patterns that occur from season to season.

Interpret scientific explanations by: Using information from observations to find patterns and to explain how or why a phenomenon occurs	**K.E.1** Understand change and observable patterns of weather that occur from day to day and throughout the year. K.E.1.1 Infer that change is something that happens to many things in the environment based on observations made using one or more of their senses. K.E.1.2 Summarize daily weather conditions noting changes that occur from day to day and throughout the year. K.E.1.3 Compare weather patterns that occur from season to season.
ELD-SC.K.Explain.Expressive	**Kindergarten**
Describe information from observations about a phenomenon: Relate how a series of events causes something to happen	**K.E.1** Understand change and observable patterns of weather that occur from day to day and throughout the year. K.E.1.1 Infer that change is something that happens to many things in the environment based on observations made using one or more of their senses. K.E.1.2 Summarize daily weather conditions noting changes that occur from day to day and throughout the year. K.E.1.3 Compare weather patterns that occur from season to season.
Describe information from observations about a phenomenon: Compare multiple solutions to a problem	*Note: While there are no specific science standards listed, language instruction for this language expectation can be integrated within all aspects of science instruction.

ELD Standard 4: Language for Science
Grade 1

ELD-SC.1.Inform.Interpretive	Grade 1
Interpret scientific informational texts by: Determining what text is about	**1.E.2** Understand the physical properties of Earth materials that make them useful in different ways. 1.E.2.1 Summarize the physical properties of Earth materials, including rocks, minerals, soils and water that make them useful in different ways **1.L.1** Understand characteristics of various environments and behaviors of humans that enable plants and animals to survive. 1.L.1.3 Summarize ways that humans protect their environment and/or improve conditions for the growth of the plants and animals that live there (e.g., reuse or recycle products to avoid littering). **1.L.2** Summarize the needs of living organisms for energy and growth. 1.L.2.1 Summarize the basic needs of a variety of different plants (including air, water, nutrients, and light) for energy and growth. 1.L.2.2 Summarize the basic needs of a variety of different animals (including air, water, and food) for energy and growth.
Interpret scientific informational texts by: Defining or classifying concept or entity	**1.E.1** Recognize the features and patterns of the earth/moon/sun system as observed from Earth. 1.E.1.1 Recognize differences in the features of the day and night sky and apparent movement of objects across the sky as observed from Earth. 1.E.1.2 Recognize patterns of observable changes in the Moon's appearance from day to day. **1.E.2** Understand the physical properties of Earth materials that make them useful in different ways. 1.E.2.2 Compare the properties of soil samples from different places relating their capacity to retain water, nourish and support the growth of certain plants.

	1.L.1 Understand characteristics of various environments and behaviors of humans that enable plants and animals to survive. 1.L.1.3 Summarize ways that humans protect their environment and/or improve conditions for the growth of the plants and animals that live there (e.g., reuse or recycle products to avoid littering).
ELD-SC.1.Inform.Expressive	**Grade 1**
Construct scientific informational texts that: Introduce others to a topic or entity	**1.P.1** Understand how forces (pushes or pulls) affect the motion of an object. 1.P.1.1 Explain the importance of a push or pull to changing the motion of an object. 1.P.1.2 Explain how some forces (pushes and pulls) can be used to make things move without touching them, such as magnets.
Construct scientific informational texts that: Define, describe, and classify concept, topic, or entity	**1.P.1** Understand how forces (pushes or pulls) affect the motion of an object. 1.P.1.1 Explain the importance of a push or pull to changing the motion of an object. 1.P.1.2 Explain how some forces (pushes and pulls) can be used to make things move without touching them, such as magnets.
Construct scientific informational texts that: Summarize observations or factual information	**1.E.2** Understand the physical properties of Earth materials that make them useful in different ways. 1.E.2.1 Summarize the physical properties of Earth materials, including rocks, minerals, soils and water that make them useful in different ways. **1.L.1** Understand characteristics of various environments and behaviors of humans that enable plants and animals to survive. 1.L.1.3 Summarize ways that humans protect their environment and/or improve conditions for the growth of the plants and animals that live there (e.g., reuse or recycle products to avoid littering). **1.L.2** Summarize the needs of living organisms for energy and growth 1.L.2.1 Summarize the basic needs of a variety of different plants (including air, water, nutrients, and light) for energy and growth. 1.L.2.2 Summarize the basic needs of a variety of different animals

	(including air, water, and food) for energy and growth.
ELD-SC.1.Explain.Interpretive	**Grade 1**
Interpret scientific explanations by: Defining investigable questions or simple design problems based on observations and data about a phenomenon	**1.P.1** Understand how forces (pushes or pulls) affect the motion of an object. 1.P.1.1 Explain the importance of a push or pull to changing the motion of an object. 1.P.1.2 Explain how some forces (pushes and pulls) can be used to make things move without touching them, such as magnets. 1.P.1.3 Predict the effect of a given force on the motion of an object, including balanced forces.
Interpret scientific explanations by: Analyzing several events and observations to help explain how or why a phenomenon occurs	**1.P.1** Understand how forces (pushes or pulls) affect the motion of an object. 1.P.1.1 Explain the importance of a push or pull to changing the motion of an object. 1.P.1.2 Explain how some forces (pushes and pulls) can be used to make things move without touching them, such as magnets.
Interpret scientific explanations by: Identifying information from observations (that supports particular points in explanations)	**1.E.2** Understand the physical properties of Earth materials that make them useful in different ways. 1.E.2.2 Compare the properties of soil samples from different places relating their capacity to retain water, nourish and support the growth of certain plants.
ELD-SC.1.Explain.Expressive	**Grade 1**
Construct scientific explanations that: Describe observations and/or data about a phenomenon	**1.E.2** Understand the physical properties of Earth materials that make them useful in different ways. 1.E.2.2 Compare the properties of soil samples from different places relating their capacity to retain water, nourish and support the growth of certain plants. **1.L.1** Understand characteristics of various environments and behaviors of humans that enable plants and animals to survive. 1.L.1.2 Give examples of how the needs of different plants and animals can be met by their environments in North Carolina or different places

	throughout the world.
Construct scientific explanations that: Relate how a series of events causes something to happen	**1.P.1** Understand how forces (pushes or pulls) affect the motion of an object 1.P.1.1 Explain the importance of a push or pull to changing the motion of an object. 1.P.1.2 Explain how some forces (pushes and pulls) can be used to make things move without touching them, such as magnets.
Construct scientific explanations that: Compare multiple solutions to a problem	**1.E.2** Understand the physical properties of Earth materials that make them useful in different ways. 1.E.2.2 Compare the properties of soil samples from different places relating their capacity to retain water, nourish and support the growth of certain plants.

ELD Standard 4: Language for Science
Grades 2-3

ELD-SC.2-3.Explain.Interpretive	Grade 2	Grade 3
Interpret scientific explanations by: Defining investigable questions or simple design problems based on observations, data, and prior knowledge about a phenomenon	*Note: While there are no specific science standards listed, language instruction for this language expectation can be integrated within all aspects of science instruction.	**3.L.2** Understand how plants survive in their environments. 3.L.2.4 Explain how the basic properties (texture and capacity to hold water) and components (sand, clay and humus) of soil determine the ability of soil to support the growth and survival of many plants.
Interpret scientific explanations by: Obtaining and combining information from observations, and using evidence to help explain how or why a phenomenon occurs	**2.P.1** Understand the relationship between sound and vibrating objects. 2.P.1.1 Illustrate how sound is produced by vibrating objects and columns of air. 2.P.1.2 Summarize the relationship between sound and objects of the body that vibrate – eardrum and vocal cords. **2.P.2** Understand properties of solids and liquids and the changes they undergo. 2.P.2.1 Give examples of matter that change from a solid to a liquid and from a liquid to a solid by heating and cooling. 2.P.2.2 Compare the amount (volume and weight) of water in a container before and after freezing. 2.P.2.3 Compare what happens to water left in an open container over time as to water left in a closed container. **2.E.1** Understand patterns of weather and factors that affect weather.	**3.P.1** Understand motion and factors that affect motion. 3.P.1.2 Compare the relative speeds (faster or slower) of objects that travel the same distance in different amounts of time. 3.P.1.3 Explain the effects of earth's gravity on the motion of any object on or near the earth. **3.P.2** Understand the structure and properties of matter before and after they undergo a change. 3.P.2.3 Summarize changes that occur to the observable properties of materials when different degrees of heat are applied to them, such as melting ice or ice cream, boiling water or an egg, or freezing water. **3.L.1** Understand human body systems and how they are essential for life: protection, movement and support. 3.L.1.2 Explain why skin is necessary for protection and for the body to remain

	2.E.1.3 Compare weather patterns that occur over time and relate observable patterns to time of day and time of year.	healthy. **3.L.2** Understand how plants survive in their environments. 3.L.2.2 Explain how environmental conditions determine how well plants survive and grow. 3.L.2.4 Explain how the basic properties (texture and capacity to hold water) and components (sand, clay and humus) of soil determine the ability of soil to support the growth and survival of many plants.
Interpret scientific explanations by: Identifying information from observations as well as evidence that supports particular points in explanations	**2.P.1** Understand the relationship between sound and vibrating objects. 2.P.1.1 Illustrate how sound is produced by vibrating objects and columns of air. **2.P.2** Understand properties of solids and liquids and the changes they undergo. 2.P.2.1 Give examples of matter that change from a solid to a liquid and from a liquid to a solid by heating and cooling. 2.P.2.2 Compare the amount (volume and weight) of water in a container before and after freezing. 2.P.2.3 Compare what happens to water left in an open container over time as to water left in a closed container. **2.E.1** Understand patterns of weather and factors that affect weather. 2.E.1.3 Compare weather patterns that occur over time and relate observable patterns to time of day and time of year.	**3.P.1** Understand motion and factors that affect motion. 3.P.1.3 Explain the effects of earth's gravity on the motion of any object on or near the earth. **3.P.2** Understand the structure and properties of matter before and after they undergo a change. 3.P.2.3 Summarize changes that occur to the observable properties of materials when different degrees of heat are applied to them, such as melting ice or ice cream, boiling water or an egg, or freezing water. **3.L.1** Understand human body systems and how they are essential for life: protection, movement and support. 3.L.1.2 Explain why skin is necessary for protection and for the body to remain healthy. **3.L.2** Understand how plants survive in their

		environments. 3.L.2.2 Explain how environmental conditions determine how well plants survive and grow. 3.L.2.4 Explain how the basic properties (texture and capacity to hold water) and components (sand, clay and humus) of soil determine the ability of soil to support the growth and survival of many plants.
ELD-SC.2-3.Explain.Expressive	**Grade 2**	**Grade 3**
Construct scientific explanations that: Describe observations and/or data about a phenomenon	**2.P.1** Understand the relationship between sound and vibrating objects. 2.P.1.1 Illustrate how sound is produced by vibrating objects and columns of air. **2.P.2** Understand properties of solids and liquids and the changes they undergo. 2.P.2.1 Give examples of matter that change from a solid to a liquid and from a liquid to a solid by heating and cooling. 2.P.2.2 Compare the amount (volume and weight) of water in a container before and after freezing. 2.P.2.3 Compare what happens to water left in an open container over time as to water left in a closed container. **2.E.1** Understand patterns of weather and factors that affect weather. 2.E.1.1 Summarize how energy from the sun serves as a source of light that warms the land, air and water. 2.E.1.3 Compare weather patterns that occur over time and relate observable patterns to	**3.P.1** Understand motion and factors that affect motion. 3.P.1.3 Explain the effects of earth's gravity on the motion of any object on or near the earth. **3.P.2** Understand the structure and properties of matter before and after they undergo a change. 3.P.2.2 Compare solids, liquids, and gases based on their basic properties. 3.P.2.3 Summarize changes that occur to the observable properties of materials when different degrees of heat are applied to them, such as melting ice or ice cream, boiling water or an egg, or freezing water.

	time of day and time of year. **2.L.1** Understand animal life cycles. 2.L.1.1 Summarize the life cycle of animals: • Birth • Developing into an adult • Reproducing • Aging and death	
Construct scientific explanations that: Develop a logical sequence between data or evidence and claim	**2.P.1** Understand the relationship between sound and vibrating objects. 2.P.1.2 Summarize the relationship between sound and objects of the body that vibrate – eardrum and vocal cords. **2.E.1** Understand patterns of weather and factors that affect weather. 2.E.1.1 Summarize how energy from the sun serves as a source of light that warms the land, air and water. 2.E.1.3 Compare weather patterns that occur over time and relate observable patterns to time of day and time of year.	**3.P.1** Understand motion and factors that affect motion. 3.P.1.3 Explain the effects of earth's gravity on the motion of any object on or near the earth. **3.P.2** Understand the structure and properties of matter before and after they undergo a change. 3.P.2.3 Summarize changes that occur to the observable properties of materials when different degrees of heat are applied to them, such as melting ice or ice cream, boiling water or an egg, or freezing water. **3.L.1** Understand human body systems and how they are essential for life: protection, movement and support. 3.L.1.2 Explain why skin is necessary for protection and for the body to remain healthy. **3.L.2** Understand how plants survive in their environments. 3.L.2.2 Explain how environmental conditions determine how well plants survive and grow.

		3.L.2.3 Summarize the distinct stages of the life cycle of seed plants. 3.L.2.4 Explain how the basic properties (texture and capacity to hold water) and components (sand, clay and humus) of soil determine the ability of soil to support the growth and survival of many plants.
Construct scientific explanations that: Compare multiple solutions to a problem considering how well they meet the criteria and constraints of the design solution	**2.P.1** Understand the relationship between sound and vibrating objects. 2.P.1.1 Illustrate how sound is produced by vibrating objects and columns of air. **2.P.2** Understand properties of solids and liquids and the changes they undergo. 2.P.2.1 Give examples of matter that change from a solid to a liquid and from a liquid to a solid by heating and cooling. 2.P.2.2 Compare the amount (volume and weight) of water in a container before and after freezing. 2.P.2.3 Compare what happens to water left in an open container over time as to water left in a closed container **2.E.1** Understand patterns of weather and factors that affect weather. 2.E.1.1 Summarize how energy from the sun serves as a source of light that warms the land, air and water. 2.E.1.3 Compare weather patterns that occur over time and relate observable patterns to time of day and time of year. **2.L.1** Understand animal life cycles.	**3.P.1** Understand motion and factors that affect motion. 3.P.1.3 Explain the effects of earth's gravity on the motion of any object on or near the earth. **3.P.2** Understand the structure and properties of matter before and after they undergo a change. 3.P.2.3 Summarize changes that occur to the observable properties of materials when different degrees of heat are applied to them, such as melting ice or ice cream, boiling water or an egg, or freezing water. **3.L.1** Understand human body systems and how they are essential for life: protection, movement and support. 3.L.1.2 Explain why skin is necessary for protection and for the body to remain healthy. **3.L.2** Understand how plants survive in their environments. 3.L.2.2 Explain how environmental conditions determine how well plants survive and grow. 3.L.2.3 Summarize the distinct stages of the

	2.L.1.1 Summarize the life cycle of animals: • Birth • Developing into an adult • Reproducing • Aging and death	life cycle of seed plants. 3.L.2.4 Explain how the basic properties (texture and capacity to hold water) and components (sand, clay and humus) of soil determine the ability of soil to support the growth and survival of many plants.
ELD-SELD-SC.2-3.Argue.Interpretive	**Grade 2**	**Grade 3**
Interpret scientific arguments by: Identifying potential evidence from data, models, and/or information from investigations of phenomena or design solutions	**2.E.1** Understand patterns of weather and factors that affect weather. 2.E.1.3 Compare weather patterns that occur overtime and relate observable patterns to time of day and time of year. **2.P.2** Understand properties of solids and liquids and the changes they undergo. 2.P.2.2 Compare the amount (volume and weight) of water in a container before and after freezing. 2.P.2.3 Compare what happens to water left in an open container over time as to water left in a closed container.	**3.P.1** Understand motion and factors that affect motion. 3.P.1.1 Infer changes in speed or direction resulting from forces acting on an object. 3.P.1.2 Compare the relative speeds (faster or slower) of objects that travel the same distance in different amounts of time. **3.P.2** Understand the structure and properties of matter before and after they undergo a change. 3.P.2.2 Compare solids, liquids, and gases based on their basic properties. **3.E.2** Compare the structures of the Earth's surface using models or three-dimensional diagrams. 3.E.2.1 Compare Earth's saltwater and freshwater features (including oceans, seas, rivers, lakes, ponds, streams, and glaciers). 3.E.2.2 Compare Earth's land features (including volcanoes, mountains, valleys, canyons, caverns, and islands) by using models, pictures, diagrams, and maps.
Interpret scientific arguments by: Analyzing whether evidence is relevant or not	**2.P.2** Understand properties of solids and liquids and the changes they undergo. 2.P.2.2 Compare the amount (volume and weight) of water in a container before and	**3.P.1** Understand motion and factors that affect motion. 3.P.1.1 Infer changes in speed or direction resulting from forces acting on an object.

	after freezing. 2.P.2.3 Compare what happens to water left in an open container over time as to water left in a closed container. **2.E.1** Understand patterns of weather and factors that affect weather. 2.E.1.1 Summarize how energy from the sun serves as a source of light that warms the land, air and water. 2.E.1.2 Summarize weather conditions using qualitative and quantitative measures to describe: • Temperature • Wind direction • Wind speed • Precipitation 2.E.1.3 Compare weather patterns that occur over time and relate observable patterns to time of day and time of year.	
Interpret scientific arguments by: Distinguishing between evidence and opinions	*Note: While there are no specific science standards listed, language instruction for this language expectation can be integrated within all aspects of science instruction.	*Note: While there are no specific science standards listed, language instruction for this language expectation can be integrated within all aspects of science instruction.
ELD-SC.2-3.Argue.Expressive	**Grade 2**	**Grade 3**
Construct scientific arguments that: **I**ntroduce topic/phenomenon for an issue related to the natural and designed world(s)	**2.P.1** Understand the relationship between sound and vibrating objects. 2.P.1.1 Illustrate how sound is produced by vibrating objects and columns of air. 2.P.1.2 Summarize the relationship between sound and objects of the body that vibrate – eardrum and vocal cords.	**3.P.1** Understand motion and factors that affect motion. 3.P.1.3 Explain the effects of earth's gravity on the motion of any object on or near the earth. **3.P.2** Understand the structure and properties of matter before and after they undergo a change.

	2.P.2 Understand properties of solids and liquids and the changes they undergo. 2.P.2.1 Give examples of matter that change from a solid to a liquid and from a liquid to a solid by heating and cooling. **2.E.1** Understand patterns of weather and factors that affect weather. 2.E.1.1 Summarize how energy from the sun serves as a source of light that warms the land, air and water. 2.E.1.2 Summarize weather conditions using qualitative and quantitative measures to describe: • Temperature • Wind direction • Wind speed • Precipitation 2.E.1.4 Recognize the tools that scientists use for observing, recording, and predicting weather changes from day to day and during the seasons.	3.P.2.3 Summarize changes that occur to the observable properties of materials when different degrees of heat are applied to them, such as melting ice or ice cream, boiling water or an egg, or freezing water. **3.L.1** Understand human body systems and how they are essential for life: protection, movement and support. 3.L.1.2 Explain why skin is necessary for protection and for the body to remain healthy. **3.L.2** Understand how plants survive in their environments. 3.L.2.2 Explain how environmental conditions determine how well plants survive and grow. 3.L.2.3 Summarize the distinct stages of the life cycle of seed plants. 3.L.2.4 Explain how the basic properties (texture and capacity to hold water) and components (sand, clay and humus) of soil determine the ability of soil to support the growth and survival of many plants.
Construct scientific arguments that: Make a claim supported by relevant evidence	**2.E.1** Understand patterns of weather and factors that affect weather. 2.E.1.1 Summarize how energy from the sun serves as a source of light that warms the land, air and water. **2.L.2** Remember that organisms differ from or are similar to their parents based on the characteristics of the organism.	**3.P.1** Understand motion and factors that affect motion. 3.P.1.3 Explain the effects of earth's gravity on the motion of any object on or near the earth. **3.L.1** Understand human body systems and how they are essential for life: protection, movement and support.

	2.L.2.1 Identify ways in which many plants and animals closely resemble their parents in observed appearance and ways they are different.	3.L.1.2 Explain why skin is necessary for protection and for the body to remain healthy. **3.L.2** Understand how plants survive in their environments. 3.L.2.2 Explain how environmental conditions determine how well plants survive and grow. 3.L.2.4 Explain how the basic properties (texture and capacity to hold water) and components (sand, clay and humus) of soil determine the ability of soil to support the growth and survival of many plants.
Construct scientific arguments that: Establish a neutral tone	**2.P.1** Understand the relationship between sound and vibrating objects. 2.P.1.2 Summarize the relationship between sound and objects of the body that vibrate – eardrum and vocal cords. **2.E.1** Understand patterns of weather and factors that affect weather. 2.E.1.1 Summarize how energy from the sun serves as a source of light that warms the land, air and water. 2.E.1.3 Compare weather patterns that occur over time and relate observable patterns to time of day and time of year. **2.P.1** Understand the relationship between sound and vibrating objects. 2.P.1.1 Illustrate how sound is produced by vibrating objects and columns of air.	**3.P.1** Understand motion and factors that affect motion. 3.P.1.3 Explain the effects of earth's gravity on the motion of any object on or near the earth. **3.P.2** Understand the structure and properties of matter before and after they undergo a change. 3.P.2.3 Summarize changes that occur to the observable properties of materials when different degrees of heat are applied to them, such as melting ice or ice cream, boiling water or an egg, or freezing water. **3.L.1** Understand human body systems and how they are essential for life: protection, movement and support. 3.L.1.2 Explain why skin is necessary for protection and for the body to remain healthy.

	2.P.2 Understand properties of solids and liquids and the changes they undergo. 2.P.2.1 Give examples of matter that change from a solid to a liquid and from a liquid to a solid by heating and cooling. 2.P.2.2 Compare the amount (volume and weight) of water in a container before and after freezing. 2.P.2.3 Compare what happens to water left in an open container over time as to water left in a closed container. **2.E.1** Understand patterns of weather and factors that affect weather. 2.E.1.1 Summarize how energy from the sun serves as a source of light that warms the land, air and water. 2.E.1.3 Compare weather patterns that occur over time and relate observable patterns to time of day and time of year. **2.L.1** Understand animal life cycles. 2.L.1.1 Summarize the life cycle of animals: • Birth • Developing into an adult • Reproducing • Aging and death	**3.L.2** Understand how plants survive in their environments. 3.L.2.2 Explain how environmental conditions determine how well plants survive and grow. 3.L.2.3 Summarize the distinct stages of the life cycle of seed plants. 3.L.2.4 Explain how the basic properties (texture and capacity to hold water) and components (sand, clay and humus) of soil determine the ability of soil to support the growth and survival of many plants.
Construct scientific arguments that: Signal logical relationships among reasoning, evidence, data, and/or a model when making a claim	**2.P.1** Understand the relationship between sound and vibrating objects. 2.P.1.2 Summarize the relationship between sound and objects of the body that vibrate – eardrum and vocal cords. **2.P.2** Understand properties of solids and liquids	**3.P.1** Understand motion and factors that affect motion. 3.P.1.2 Compare the relative speeds (faster or slower) of objects that travel the same distance in different amounts of time. 3.P.1.3 Explain the effects of earth's gravity on the motion of any object on or near the

	and the changes they undergo. 2.P.2.2 Compare the amount (volume and weight) of water in a container before and after freezing. **2.E.1** Understand patterns of weather and factors that affect weather. 2.E.1.1 Summarize how energy from the sun serves as a source of light that warms the land, air and water.	earth. **3.P.2** Understand the structure and properties of matter before and after they undergo a change. 3.P.2.2 Compare solids, liquids, and gases based on their basic properties. 3.P.2.3 Summarize changes that occur to the observable properties of materials when different degrees of heat are applied to them, such as melting ice or ice cream, boiling water or an egg, or freezing water. **3.E.2** Compare the structures of the Earth's surface using models or three-dimensional diagrams. 3.E.2.1 Compare Earth's saltwater and freshwater features (including oceans, seas, rivers, lakes, ponds, streams, and glaciers). 3.E.2.2 Compare Earth's land features (including volcanoes, mountains, valleys, canyons, caverns, and islands) by using models, pictures, diagrams, and maps. **3.L.1** Understand human body systems and how they are essential for life: protection, movement and support. 3.L.1.1 Compare the different functions of the skeletal and muscular system. 3.L.1.2 Explain why skin is necessary for protection and for the body to remain healthy. **3.L.2** Understand how plants survive in their environments. 3.L.2.2 Explain how environmental conditions determine how well plants

		survive and grow. 3.L.2.3 Summarize the distinct stages of the life cycle of seed plants. 3.L.2.4 Explain how the basic properties (texture and capacity to hold water) and components (sand, clay and humus) of soil determine the ability of soil to support the growth and survival of many plants.

ELD Standard 4: Language for Science
Grades 4-5

ELD-SC.4-5.Explain.Interpretive	Grade 4	Grade 5
Interpret scientific explanations by: Defining investigable questions or design problems based on observations, data, and prior knowledge about a phenomenon	**4.P.1** Explain how various forces affect the motion of an object. 4.P.1.1 Explain how magnets interact with all things made of iron and with other magnets to produce motion without touching them. 4.P.1.2 Explain how electrically charged objects push or pull on other electrically charged objects and produce motion. **4.P.2** Understand the composition and properties of matter before and after they undergo a change or interaction. 4.P.2.2 Explain how minerals are identified using tests for the physical properties of hardness, color, luster, cleavage and streak. **4.E.1** Explain the causes of day and night and phases of the moon. 4.E.1.1 Explain the cause of day and night based on the rotation of Earth on its axis. 4.E.1.2 Explain the monthly changes in the appearance of the moon, based on the moon's orbit around the Earth. **4.L.1** Understand the effects of environmental changes, adaptations and behaviors that enable animals (including humans) to survive in changing habitats. 4.L.1.2 Explain how animals meet their needs by using behaviors in response to	**5.P.1** Understand force, motion and the relationship between them. 5.P.1.1 Explain how factors such as gravity, friction, and change in mass affect the motion of objects. 5.P.1.2 Infer the motion of objects in terms of how far they travel in a certain amount of time and the direction in which they travel. 5.P.1.4 Predict the effect of a given force or a change in mass on the motion of an object. **5.P.2** Understand the interactions of matter and energy and the changes that occur. 5.P.2.1 Explain how the sun's energy impacts the processes of the water cycle (including evaporation, transpiration, condensation, precipitation and runoff). 5.P.2.2 Compare the weight of an object to the sum of the weight of its parts before and after an interaction. **5.P.3** Explain how the properties of some materials change as a result of heating and cooling. 5.P.3.1 Explain the effects of the transfer of heat (either by direct contact or at a distance) that occurs between objects at different temperatures. (conduction, convection or radiation). 5.P.3.2 Explain how heating and cooling

	information received from the environment. 4.L1.3 Explain how humans can adapt their behavior to live in changing habitats (e.g., recycling wastes, establishing rain gardens, planting trees and shrubs to prevent flooding and erosion). 4.L.1.4 Explain how differences among animals of the same population sometimes give individuals an advantage in surviving and reproducing in changing habitats. **4.L.2** Understand food and the benefits of vitamins, minerals and exercise. 4.L.2.2 Explain the role of vitamins, minerals and exercise in maintaining a healthy body.	affect some materials and how this relates to their purpose and practical applications. **5.E.1** Understand weather patterns and phenomena, making connections to the weather in a particular place and time. 5.E.1.3 Explain how global patterns such as the jet stream and water currents influence local weather in measurable terms such as temperature, wind direction and speed, and precipitation. **5.L.1** Understand how structures and systems of organisms (to include the human body) perform functions necessary for life. 5.L.1.1 Explain why some organisms are capable of surviving as a single cell while others require many cells that are specialized to survive.
Interpret scientific explanations by: Obtaining and combining evidence and information to help explain how or why a phenomenon occurs	**4.P.1** Explain how various forces affect the motion of an object. 4.P.1.1 Explain how magnets interact with all things made of iron and with other magnets to produce motion without touching them. 4.P.1.2 Explain how electrically charged objects push or pull on other electrically charged objects and produce motion. **4.P.2** Understand the composition and properties of matter before and after they undergo a change or interaction. 4.P.2.2 Explain how minerals are identified using tests for the physical properties of hardness, color, luster, cleavage and streak.	**5.P.1** Understand force, motion and the relationship between them. 5.P.1.1 Explain how factors such as gravity, friction, and change in mass affect the motion of objects. 5.P.1.2 Infer the motion of objects in terms of how far they travel in a certain amount of time and the direction in which they travel. 5.P.1.4 Predict the effect of a given force or a change in mass on the motion of an object. **5.P.2** Understand the interactions of matter and energy and the changes that occur. 5.P.2.1 Explain how the sun's energy

	4.E.1 Explain the causes of day and night and phases of the moon. 4.E.1.1 Explain the cause of day and night based on the rotation of Earth on its axis. 4.E.1.2 Explain the monthly changes in the appearance of the moon, based on the moon's orbit around the Earth. **4.L.1** Understand the effects of environmental changes, adaptations and behaviors that enable animals (including humans) to survive in changing habitats. 4.L.1.2 Explain how animals meet their needs by using behaviors in response to information received from the environment. 4.L1.3 Explain how humans can adapt their behavior to live in changing habitats (e.g., recycling wastes, establishing rain gardens, planting trees and shrubs to prevent flooding and erosion). 4.L.1.4 Explain how differences among animals of the same population sometimes give individuals an advantage in surviving and reproducing in changing habitats. **4.L.2** Understand food and the benefits of vitamins, minerals and exercise. 4.L.2.2 Explain the role of vitamins, minerals and exercise in maintaining a healthy body.	impacts the processes of the water cycle (including evaporation, transpiration, condensation, precipitation and runoff). **5.P.3** Explain how the properties of some materials change as a result of heating and cooling. 5.P.3.1 Explain the effects of the transfer of heat (either by direct contact or at a distance) that occurs between objects at different temperatures. (conduction, convection or radiation) 5.P.3.2 Explain how heating and cooling affect some materials and how this relates to their purpose and practical applications. **5.E.1** Understand weather patterns and phenomena, making connections to the weather in a particular place and time. 5.E.1.3 Explain how global patterns such as the jet stream and water currents influence local weather in measurable terms such as temperature, wind direction and speed, and precipitation. **5.L.1** Understand how structures and systems of organisms (to include the human body) perform functions necessary for life. 5.L.1.1 Explain why some organisms are capable of surviving as a single cell while others require many cells that are specialized to survive. **5.L.2** Understand the interdependence of plants and animals with their ecosystem. 5.L.2.3 Infer the effects that may result

		from the interconnected relationship of plants and animals to their ecosystem. **5.L.3** Understand why organisms differ from or are similar to their parents based on the characteristics of the organism. 5.L.3.1 Explain why organisms differ from or are similar to their parents based on the characteristics of the organism.
Interpret scientific explanations by: Identifying evidence that supports particular points in an explanation	**4.P.1** Explain how various forces affect the motion of an object. 4.P.1.1 Explain how magnets interact with all things made of iron and with other magnets to produce motion without touching them. 4.P.1.2 Explain how electrically charged objects push or pull on other electrically charged objects and produce motion. **4.P.2** Understand the composition and properties of matter before and after they undergo a change or interaction. 4.P.2.2 Explain how minerals are identified using tests for the physical properties of hardness, color, luster, cleavage and streak. **4.E.1** Explain the causes of day and night and phases of the moon. 4.E.1.1 Explain the cause of day and night based on the rotation of Earth on its axis. 4.E.1.2 Explain the monthly changes in the appearance of the moon, based on the moon's orbit around the Earth. **4.L.1** Understand the effects of environmental	**5.P.1** Understand force, motion and the relationship between them. 5.P.1.1 Explain how factors such as gravity, friction, and change in mass affect the motion of objects. 5.P.1.2 Infer the motion of objects in terms of how far they travel in a certain amount of time and the direction in which they travel. 5.P.1.4 Predict the effect of a given force or a change in mass on the motion of an object. **5.P.2** Understand the interactions of matter and energy and the changes that occur. 5.P.2.1 Explain how the sun's energy impacts the processes of the water cycle (including evaporation, transpiration, condensation, precipitation and runoff). 5.P.2.2 Compare the weight of an object to the sum of the weight of its parts before and after an interaction. **5.P.3** Explain how the properties of some materials change as a result of heating and cooling. 5.P.3.1 Explain the effects of the transfer of

	changes, adaptations and behaviors that enable animals (including humans) to survive in changing habitats. 4.L.1.2 Explain how animals meet their needs by using behaviors in response to information received from the environment. 4.L1.3 Explain how humans can adapt their behavior to live in changing habitats (e.g., recycling wastes, establishing rain gardens, planting trees and shrubs to prevent flooding and erosion). 4.L.1.4 Explain how differences among animals of the same population sometimes give individuals an advantage in surviving and reproducing in changing habitats. **4.L.2** Understand food and the benefits of vitamins, minerals and exercise. 4.L.2.2 Explain the role of vitamins, minerals and exercise in maintaining a healthy body.	heat (either by direct contact or at a distance) that occurs between objects at different temperatures. (conduction, convection or radiation) 5.P.3.2 Explain how heating and cooling affect some materials and how this relates to their purpose and practical applications. **5.E.1** Understand weather patterns and phenomena, making connections to the weather in a particular place and time. 5.E.1.3 Explain how global patterns such as the jet stream and water currents influence local weather in measurable terms such as temperature, wind direction and speed, and precipitation. **5.L.1** Understand how structures and systems of organisms (to include the human body) perform functions necessary for life. 5.L.1.1 Explain why some organisms are capable of surviving as a single cell while others require many cells that are specialized to survive. **5.P.1** Understand force, motion and the relationship between them. 5.P.1.1 Explain how factors such as gravity, friction, and change in mass affect the motion of objects. 5.P.1.2 Infer the motion of objects in terms of how far they travel in a certain amount of time and the direction in which they travel. 5.P.1.4 Predict the effect of a given force or

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		others require many cells that are specialized to survive. **5.L.2** Understand the interdependence of plants and animals with their ecosystem. 5.L.2.3 Infer the effects that may result from the interconnected relationship of plants and animals to their ecosystem. **5.L.3** Understand why organisms differ from or are similar to their parents based on the characteristics of the organism. 5.L.3.1 Explain why organisms differ from or are similar to their parents based on the characteristics of the organism.
ELD-SC.4-5.Explain.Expressive	**Grade 4**	**Grade 5**
Construct scientific explanations that: Describe observations and/or data about a phenomenon	**4.P.1** Explain how various forces affect the motion of an object. 4.P.1.1 Explain how magnets interact with all things made of iron and with other magnets to produce motion without touching them. 4.P.1.2 Explain how electrically charged objects push or pull on other electrically charged objects and produce motion. **4.P.2** Understand the composition and properties of matter before and after they undergo a change or interaction. 4.P.2.2 Explain how minerals are identified using tests for the physical properties of hardness, color, luster, cleavage and streak. **4.E.1** Explain the causes of day and night and phases of the moon.	**5.P.1** Understand force, motion and the relationship between them. 5.P.1.1 Explain how factors such as gravity, friction, and change in mass affect the motion of objects. 5.P.1.4 Predict the effect of a given force or a change in mass on the motion of an object. **5.P.2** Understand the interactions of matter and energy and the changes that occur. 5.P.2.1 Explain how the sun's energy impacts the processes of the water cycle (including evaporation, transpiration, condensation, precipitation and runoff). 5.P.2.2 Compare the weight of an object to the sum of the weight of its parts before and after an interaction.

	4.E.1.1 Explain the cause of day and night based on the rotation of Earth on its axis. 4.E.1.2 Explain the monthly changes in the appearance of the moon, based on the moon's orbit around the Earth. **4.L.1** Understand the effects of environmental changes, adaptations and behaviors that enable animals (including humans) to survive in changing habitats. 4.L.1.2 Explain how animals meet their needs by using behaviors in response to information received from the environment. 4.L1.3 Explain how humans can adapt their behavior to live in changing habitats (e.g., recycling wastes, establishing rain gardens, planting trees and shrubs to prevent flooding and erosion). 4.L.1.4 Explain how differences among animals of the same population sometimes give individuals an advantage in surviving and reproducing in changing habitats. **4.L.2** Understand food and the benefits of vitamins, minerals and exercise. 4.L.2.2 Explain the role of vitamins, minerals and exercise in maintaining a healthy body.	**5.P.3** Explain how the properties of some materials change as a result of heating and cooling. 5.P.3.1 Explain the effects of the transfer of heat (either by direct contact or at a distance) that occurs between objects at different temperatures. (conduction, convection or radiation) 5.P.3.2 Explain how heating and cooling affect some materials and how this relates to their purpose and practical applications. **5.E.1** Understand weather patterns and phenomena, making connections to the weather in a particular place and time. 5.E.1.3 Explain how global patterns such as the jet stream and water currents influence local weather in measurable terms such as temperature, wind direction and speed, and precipitation. **5.L.1** Understand how structures and systems of organisms (to include the human body) perform functions necessary for life. 5.L.1.1 Explain why some organisms are capable of surviving as a single cell while others require many cells that are specialized to survive. **5.P.1** Understand force, motion and the relationship between them. 5.P.1.1 Explain how factors such as gravity, friction, and change in mass affect the motion of objects.

		5.P.1.2 Infer the motion of objects in terms of how far they travel in a certain amount of time and the direction in which they travel. 5.P.1.4 Predict the effect of a given force or a change in mass on the motion of an object. **5.P.2** Understand the interactions of matter and energy and the changes that occur. 5.P.2.1 Explain how the sun's energy impacts the processes of the water cycle (including evaporation, transpiration, condensation, precipitation and runoff). **5.P.3** Explain how the properties of some materials change as a result of heating and cooling. 5.P.3.1 Explain the effects of the transfer of heat (either by direct contact or at a distance) that occurs between objects at different temperatures. (conduction, convection or radiation) 5.P.3.2 Explain how heating and cooling affect some materials and how this relates to their purpose and practical applications. **5.E.1** Understand weather patterns and phenomena, making connections to the weather in a particular place and time. 5.E.1.3 Explain how global patterns such as the jet stream and water currents influence local weather in measurable terms such as temperature, wind direction and speed, and precipitation. **5.L.1** Understand how structures and systems of

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Construct scientific explanations that: Establish neutral or objective stance in communicating results	**4.P.1** Explain how various forces affect the motion of an object. 4.P.1.1 Explain how magnets interact with all thing made of iron and with other magnets to produce motion without touching them. 4.P.1.2 Explain how electrically charged objects push or pull on other electrically charged objects and produce motion. **4.P.2** Understand the composition and properties of matter before and after they undergo a change or interaction. 4.P.2.2 Explain how minerals are identified using tests for the physical properties of hardness, color, luster, cleavage and streak.	**5.P.1** Understand force, motion and the relationship between them. 5.P.1.1 Explain how factors such as gravity, friction, and change in mass affect the motion of objects. **5.P.2** Understand the interactions of matter and energy and the changes that occur. 5.P.2.1 Explain how the sun's energy impacts the processes of the water cycle (including evaporation, transpiration, condensation, precipitation and runoff). 5.P.2.2 Compare the weight of an object to the sum of the weight of its parts before and after an interaction.

	4.E.1 Explain the causes of day and night and phases of the moon. 4.E.1.1 Explain the cause of day and night based on the rotation of Earth on its axis. 4.E.1.2 Explain the monthly changes in the appearance of the moon, based on the moon's orbit around the Earth. 4.L.1 Understand the effects of environmental changes, adaptations and behaviors that enable animals (including humans) to survive in changing habitats. 4.L.1.2 Explain how animals meet their needs by using behaviors in response to information received from the environment. 4.L1.3 Explain how humans can adapt their behavior to live in changing habitats (e.g., recycling wastes, establishing rain gardens, planting trees and shrubs to prevent flooding and erosion). 4.L.1.4 Explain how differences among animals of the same population sometimes give individuals an advantage in surviving and reproducing in changing habitats. **4.L.2** Understand food and the benefits of vitamins, minerals and exercise. 4.L.2.2 Explain the role of vitamins, minerals and exercise in maintaining a healthy body.	**5.P.3** Explain how the properties of some materials change as a result of heating and cooling. 5.P.3.1 Explain the effects of the transfer of heat (either by direct contact or at a distance) that occurs between objects at different temperatures. (conduction, convection or radiation) 5.P.3.2 Explain how heating and cooling affect some materials and how this relates to their purpose and practical applications. **5.E.1** Understand weather patterns and phenomena, making connections to the weather in a particular place and time. 5.E.1.3 Explain how global patterns such as the jet stream and water currents influence local weather in measurable terms such as temperature, wind direction and speed, and precipitation. **5.L.1** Understand how structures and systems of organisms (to include the human body) perform functions necessary for life. 5.L.1.1 Explain why some organisms are capable of surviving as a single cell while others require many cells that are specialized to survive. **5.P.1** Understand force, motion and the relationship between them. 5.P.1.1 Explain how factors such as gravity, friction, and change in mass affect the motion of objects.

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Construct scientific explanations that: Develop reasoning to show relationships between evidence and claims	**4.P.1** Explain how various forces affect the motion of an object. 4.P.1.1 Explain how magnets interact with all things made of iron and with other magnets to produce motion without touching them. 4.P.1.2 Explain how electrically charged objects push or pull on other electrically charged objects and produce motion. **4.P.2** Understand the composition and properties of matter before and after they undergo a change or interaction. 4.P.2.2 Explain how minerals are identified using tests for the physical properties of hardness, color, luster, cleavage and streak. **4.E.1** Explain the causes of day and night and phases of the moon.	**5.P.1** Understand force, motion and the relationship between them. 5.P.1.1 Explain how factors such as gravity, friction, and change in mass affect the motion of objects. 5.P.1.2 Infer the motion of objects in terms of how far they travel in a certain amount of time and the direction in which they travel. 5.P.1.4 Predict the effect of a given force or a change in mass on the motion of an object. **5.P.2** Understand the interactions of matter and energy and the changes that occur. 5.P.2.1 Explain how the sun's energy impacts the processes of the water cycle (including evaporation, transpiration, condensation, precipitation and runoff).

	4.E.1.1 Explain the cause of day and night based on the rotation of Earth on its axis. 4.E.1.2 Explain the monthly changes in the appearance of the moon, based on the moon's orbit around the Earth. **4.L.1** Understand the effects of environmental changes, adaptations and behaviors that enable animals (including humans) to survive in changing habitats. 4.L.1.2 Explain how animals meet their needs by using behaviors in response to information received from the environment. 4.L1.3 Explain how humans can adapt their behavior to live in changing habitats (e.g., recycling wastes, establishing rain gardens, planting trees and shrubs to prevent flooding and erosion). 4.L.1.4 Explain how differences among animals of the same population sometimes give individuals an advantage in surviving and reproducing in changing habitats. **4.L.2** Understand food and the benefits of vitamins, minerals and exercise. 4.L.2.2 Explain the role of vitamins, minerals and exercise in maintaining a healthy body.	5.P.2.2 Compare the weight of an object to the sum of the weight of its parts before and after an interaction. **5.P.3** Explain how the properties of some materials change as a result of heating and cooling. 5.P.3.1 Explain the effects of the transfer of heat (either by direct contact or at a distance) that occurs between objects at different temperatures. (conduction, convection or radiation) 5.P.3.2 Explain how heating and cooling affect some materials and how this relates to their purpose and practical applications. **5.E.1** Understand weather patterns and phenomena, making connections to the weather in a particular place and time. 5.E.1.3 Explain how global patterns such as the jet stream and water currents influence local weather in measurable terms such as temperature, wind direction and speed, and precipitation. **5.L.1** Understand how structures and systems of organisms (to include the human body) perform functions necessary for life. 5.L.1.1 Explain why some organisms are capable of surviving as a single cell while others require many cells that are specialized to survive. **5.P.1** Understand force, motion and the relationship between them.

		5.P.1.1 Explain how factors such as gravity, friction, and change in mass affect the motion of objects. 5.P.1.2 Infer the motion of objects in terms of how far they travel in a certain amount of time and the direction in which they travel. 5.P.1.4 Predict the effect of a given force or a change in mass on the motion of an object. **5.P.2** Understand the interactions of matter and energy and the changes that occur. 5.P.2.1 Explain how the sun's energy impacts the processes of the water cycle (including evaporation, transpiration, condensation, precipitation and runoff). **5.P.3** Explain how the properties of some materials change as a result of heating and cooling. 5.P.3.1 Explain the effects of the transfer of heat (either by direct contact or at a distance) that occurs between objects at different temperatures. (conduction, convection or radiation) 5.P.3.2 Explain how heating and cooling affect some materials and how this relates to their purpose and practical applications. **5.E.1** Understand weather patterns and phenomena, making connections to the weather in a particular place and time. 5.E.1.3 Explain how global patterns such as the jet stream and water currents influence local weather in measurable terms such as temperature, wind direction

		and speed, and precipitation. **5.L.1** Understand how structures and systems of organisms (to include the human body) perform functions necessary for life. 5.L.1.1 Explain why some organisms are capable of surviving as a single cell while others require many cells that are specialized to survive. **5.L.2** Understand the interdependence of plants and animals with their ecosystem. 5.L.2.3 Infer the effects that may result from the interconnected relationship of plants and animals to their ecosystem. **5.L.3** Understand why organisms differ from or are similar to their parents based on the characteristics of the organism. 5.L.3.1 Explain why organisms differ from or are similar to their parents based on the characteristics of the organism.
Construct scientific explanations that: Summarize and/or compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution	*Note: While there are no specific science standards listed, language instruction for this language expectation can be integrated within all aspects of science instruction.	*Note: While there are no specific science standards listed, language instruction for this language expectation can be integrated within all aspects of science instruction.
ELD-SC.4-5.Argue.Interpretive	**Grade 4**	**Grade 5**
Interpret scientific arguments by: Identifying relevant evidence from data, models, and/or information from investigations of phenomena or design solutions	**4.P.1** Explain how various forces affect the motion of an object. 4.P.1.1 Explain how magnets interact with all things made of iron and with other magnets to produce motion without touching them.	**5.P.1** Understand force, motion and the relationship between them. 5.P.1.1 Explain how factors such as gravity, friction, and change in mass affect the motion of objects.

	4.P.1.2 Explain how electrically charged objects push or pull on other electrically charged objects and produce motion. **4.P.2** Understand the composition and properties of matter before and after they undergo a change or interaction. 4.P.2.1 Compare the physical properties of samples of matter (strength, hardness, flexibility, ability to conduct heat, ability to conduct electricity, ability to be attracted by magnets, reactions to water and fire). 4.P.2.2 Explain how minerals are identified using tests for the physical properties of hardness, color, luster, cleavage and streak. **4.P.3** Recognize that energy takes various forms that may be grouped based on their interaction with matter. 4.P.3.1 Recognize the basic forms of energy (light, sound, heat, electrical, and magnetic) as the ability to cause motion or create change. 4.P.3.2 Recognize that light travels in a straight line until it strikes an object or travels from one medium to another, and that light can be reflected, refracted, and absorbed. **4.E.1** Explain the causes of day and night and phases of the moon. 4.E.1.1 Explain the cause of day and night based on the rotation of Earth on its axis. 4.E.1.2 Explain the monthly changes in the	**5.P.2** Understand the interactions of matter and energy and the changes that occur. 5.P.2.1 Explain how the sun's energy impacts the processes of the water cycle (including evaporation, transpiration, condensation, precipitation and runoff). 5.P.2.2 Compare the weight of an object to the sum of the weight of its parts before and after an interaction. **5.P.3** Explain how the properties of some materials change as a result of heating and cooling. 5.P.3.1 Explain the effects of the transfer of heat (either by direct contact or at a distance) that occurs between objects at different temperatures. (conduction, convection or radiation) 5.P.3.2 Explain how heating and cooling affect some materials and how this relates to their purpose and practical applications. **5.E.1** Understand weather patterns and phenomena, making connections to the weather in a particular place and time. 5.E.1.3 Explain how global patterns such as the jet stream and water currents influence local weather in measurable terms such as temperature, wind direction and speed, and precipitation. **5.L.1** Understand how structures and systems of organisms (to include the human body) perform functions necessary for life.

	appearance of the moon, based on the moon's orbit around the Earth. **4.E.2** Understand the use of fossils and changes in the surface of the earth as evidence of the history of Earth and its changing life forms. 4.E.2.1 Compare fossils (including molds, casts, and preserved parts of plants and animals) to one another and to living organisms. 4.E.2.2 Infer ideas about Earth's early environments from fossils of plants and animals that lived long ago. 4.E.2.3 Give examples of how the surface of the earth changes due to slow processes such as erosion and weathering, and rapid processes such as landslides, volcanic eruptions, and earthquakes. **4.L.1** Understand the effects of environmental changes, adaptations and behaviors that enable animals (including humans) to survive in changing habitats. 4.L.1.1 Give examples of changes in an organism's environment that are beneficial to it and some that are harmful. 4.L.1.2 Explain how animals meet their needs by using behaviors in response to information received from the environment. 4.L1.3 Explain how humans can adapt their behavior to live in changing habitats (e.g., recycling wastes, establishing rain gardens, planting trees and shrubs to prevent flooding and erosion). 4.L.1.4 Explain how differences among	5.L.1.1 Explain why some organisms are capable of surviving as a single cell while others require many cells that are specialized to survive. **5.P.1** Understand force, motion and the relationship between them. 5.P.1.1 Explain how factors such as gravity, friction, and change in mass affect the motion of objects. 5.P.1.4 Predict the effect of a given force or a change in mass on the motion of an object. **5.P.2** Understand the interactions of matter and energy and the changes that occur. 5.P.2.1 Explain how the sun's energy impacts the processes of the water cycle (including evaporation, transpiration, condensation, precipitation and runoff). **5.P.3** Explain how the properties of some materials change as a result of heating and cooling. 5.P.3.1 Explain the effects of the transfer of heat (either by direct contact or at a distance) that occurs between objects at different temperatures. (conduction, convection or radiation) 5.P.3.2 Explain how heating and cooling affect some materials and how this relates to their purpose and practical applications. **5.E.1** Understand weather patterns and phenomena, making connections to the weather in

	animals of the same population sometimes give individuals an advantage in surviving and reproducing in changing habitats. **4.L.2** Understand food and the benefits of vitamins, minerals and exercise. 4.L.2.1 Classify substances as food or non-food items based on their ability to provide energy and materials for survival, growth and repair of the body. 4.L.2.2 Explain the role of vitamins, minerals and exercise in maintaining a healthy body.	a particular place and time. 5.E.1.3 Explain how global patterns such as the jet stream and water currents influence local weather in measurable terms such as temperature, wind direction and speed, and precipitation. **5.L.1** Understand how structures and systems of organisms (to include the human body) perform functions necessary for life. 5.L.1.1 Explain why some organisms are capable of surviving as a single cell while others require many cells that are specialized to survive. **5.L.2** Understand the interdependence of plants and animals with their ecosystem. 5.L.2.3 Infer the effects that may result from the interconnected relationship of plants and animals to their ecosystem. **5.L.3** Understand why organisms differ from or are similar to their parents based on the characteristics of the organism. 5.L.3.1 Explain why organisms differ from or are similar to their parents based on the characteristics of the organism.
Interpret scientific arguments by: Comparing reasoning and claims based on evidence	**4.P.2** Understand the composition and properties of matter before and after they undergo a change or interaction. 4.P.2.1 Compare the physical properties of samples of matter (strength, hardness, flexibility, ability to conduct heat, ability to conduct electricity, ability to be attracted by	*Note: While there are no specific science standards listed, language instruction for this language expectation can be integrated within all aspects of science instruction.

	magnets, reactions to water and fire). **4.E.2** Understand the use of fossils and changes in the surface of the earth as evidence of the history of Earth and its changing life forms. 4.E.2.1 Compare fossils (including molds, casts, and preserved parts of plants and animals) to one another and to living organisms.	
Interpret scientific arguments by: Distinguishing among facts, reasoned judgment based on research findings, and speculation in an explanation	*Note: While there are no specific science standards listed, language instruction for this language expectation can be integrated within all aspects of science instruction.	*Note: While there are no specific science standards listed, language instruction for this language expectation can be integrated within all aspects of science instruction.
ELD-SC.4-5.Argue.Expressive	**Grade 4**	**Grade 5**
Construct scientific arguments that: Introduce topic/phenomenon in issues related to the natural and designed world(s)	**4.P.1** Explain how various forces affect the motion of an object. 4.P.1.1 Explain how magnets interact with all things made of iron and with other magnets to produce motion without touching them. 4.P.1.2 Explain how electrically charged objects push or pull on other electrically charged objects and produce motion **4.P.2** Understand the composition and properties of matter before and after they undergo a change or interaction. 4.P.2.1 Compare the physical properties of samples of matter (strength, hardness, flexibility, ability to conduct heat, ability to conduct electricity, ability to be attracted by magnets, reactions to water and fire). 4.P.2.2 Explain how minerals are identified using tests for the physical properties of	**5.P.1** Understand force, motion and the relationship between them. 5.P.1.1 Explain how factors such as gravity, friction, and change in mass affect the motion of objects. 5.P.1.3 Illustrate the motion of an object using a graph to show a change in position over a period of time. **5.P.2** Understand the interactions of matter and energy and the changes that occur. 5.P.2.1 Explain how the sun's energy impacts the processes of the water cycle (including evaporation, transpiration, condensation, precipitation and runoff). 5.P.2.3 Summarize properties of original materials, and the new material(s) formed, to demonstrate that a change has occurred.

	hardness, color, luster, cleavage and streak. **4.E.1** Explain the causes of day and night and phases of the moon. 4.E.1.1 Explain the cause of day and night based on the rotation of Earth on its axis. 4.E.1.2 Explain the monthly changes in the appearance of the moon, based on the moon's orbit around the Earth. **4.L.1** Understand the effects of environmental changes, adaptations and behaviors that enable animals (including humans) to survive in changing habitats. 4.L.1.2 Explain how animals meet their needs by using behaviors in response to information received from the environment. 4.L1.3 Explain how humans can adapt their behavior to live in changing habitats (e.g., recycling wastes, establishing rain gardens, planting trees and shrubs to prevent flooding and erosion). 4.L.1.4 Explain how differences among animals of the same population sometimes give individuals an advantage in surviving and reproducing in changing habitats. **4.L.2** Understand food and the benefits of vitamins, minerals and exercise. 4.L.2.2 Explain the role of vitamins, minerals and exercise in maintaining a healthy body.	**5.P.3** Explain how the properties of some materials change as a result of heating and cooling. 5.P.3.1 Explain the effects of the transfer of heat (either by direct contact or at a distance) that occurs between objects at different temperatures. (conduction, convection or radiation) 5.P.3.2 Explain how heating and cooling affect some materials and how this relates to their purpose and practical applications. **5.E.1** Understand weather patterns and phenomena, making connections to the weather in a particular place and time. 5.E.1.3 Explain how global patterns such as the jet stream and water currents influence local weather in measurable terms such as temperature, wind direction and speed, and precipitation. **5.L.1** Understand how structures and systems of organisms (to include the human body) perform functions necessary for life. 5.L.1.1 Explain why some organisms are capable of surviving as a single cell while others require many cells that are specialized to survive. **5.L.2** Understand the interdependence of plants and animals with their ecosystem. 5.L.2.2 Classify the organisms within an ecosystem according to the function they serve: producers, consumers, or decomposers (biotic factors).

		5.L.3 Understand why organisms differ from or are similar to their parents based on the characteristics of the organism. 5.L.3.1 Explain why organisms differ from or are similar to their parents based on the characteristics of the organism. 5.L.3.2 Give examples of likenesses that are inherited and some that are not.
Construct scientific arguments that: Make and define a claim based on evidence, data, and/or model	**4.P.1** Explain how various forces affect the motion of an object. 4.P.1.1 Explain how magnets interact with all things made of iron and with other magnets to produce motion without touching them. 4.P.1.2 Explain how electrically charged objects push or pull on other electrically charged objects and produce motion. **4.P.2** Understand the composition and properties of matter before and after they undergo a change or interaction. 4.P.2.2 Explain how minerals are identified using tests for the physical properties of hardness, color, luster, cleavage and streak. **4.E.1** Explain the causes of day and night and phases of the moon. 4.E.1.1 Explain the cause of day and night based on the rotation of Earth on its axis. 4.E.1.2 Explain the monthly changes in the appearance of the moon, based on the moon's orbit around the Earth. **4.L.1** Understand the effects of environmental	**5.P.1** Understand force, motion and the relationship between them. 5.P.1.1 Explain how factors such as gravity, friction, and change in mass affect the motion of objects. 5.P.1.3 Illustrate the motion of an object using a graph to show a change in position over a period of time. **5.P.2** Understand the interactions of matter and energy and the changes that occur. 5.P.2.1 Explain how the sun's energy impacts the processes of the water cycle (including evaporation, transpiration, condensation, precipitation and runoff). 5.P.2.3 Summarize properties of original materials, and the new material(s) formed, to demonstrate that a change has occurred. **5.P.3** Explain how the properties of some materials change as a result of heating and cooling. 5.P.3.1 Explain the effects of the transfer of heat (either by direct contact or at a distance) that occurs between objects at

	changes, adaptations and behaviors that enable animals (including humans) to survive in changing habitats. 4.L.1.2 Explain how animals meet their needs by using behaviors in response to information received from the environment. 4.L1.3 Explain how humans can adapt their behavior to live in changing habitats (e.g., recycling wastes, establishing rain gardens, planting trees and shrubs to prevent flooding and erosion). 4.L.1.4 Explain how differences among animals of the same population sometimes give individuals an advantage in surviving and reproducing in changing habitats. **4.L.2** Understand food and the benefits of vitamins, minerals and exercise. 4.L.2.2 Explain the role of vitamins, minerals and exercise in maintaining a healthy body.	different temperatures. (conduction, convection or radiation) 5.P.3.2 Explain how heating and cooling affect some materials and how this relates to their purpose and practical applications. **5.E.1** Understand weather patterns and phenomena, making connections to the weather in a particular place and time. 5.E.1.2 Predict upcoming weather events from weather data collected through observation and measurements. 5.E.1.3 Explain how global patterns such as the jet stream and water currents influence local weather in measurable terms such as temperature, wind direction and speed, and precipitation. **5.L.1** Understand how structures and systems of organisms (to include the human body) perform functions necessary for life. 5.L.1.1 Explain why some organisms are capable of surviving as a single cell while others require many cells that are specialized to survive. 5.L.1.2 Compare the major systems of the human body (digestive, respiratory, circulatory, muscular, skeletal, and cardiovascular) in terms of their functions necessary for life. **5.L.2** Understand the interdependence of plants and animals with their ecosystem. 5.L.2.2 Classify the organisms within an ecosystem according to the function they

		serve: producers, consumers, or decomposers (biotic factors). **5.L.3** Understand why organisms differ from or are similar to their parents based on the characteristics of the organism. 5.L.3.1 Explain why organisms differ from or are similar to their parents based on the characteristics of the organism. 5.L.3.2 Give examples of likenesses that are inherited and some that are not.
Construct scientific arguments that: Establish a neutral tone or an objective stance	**4.P.1** Explain how various forces affect the motion of an object. 4.P.1.1 Explain how magnets interact with all things made of iron and with other magnets to produce motion without touching them. 4.P.1.2 Explain how electrically charged objects push or pull on other electrically charged objects and produce motion **4.P.2** Understand the composition and properties of matter before and after they undergo a change or interaction. 4.P.2.2 Explain how minerals are identified using tests for the physical properties of hardness, color, luster, cleavage and streak. **4.E.1** Explain the causes of day and night and phases of the moon. 4.E.1.1 Explain the cause of day and night based on the rotation of Earth on its axis. 4.E.1.2 Explain the monthly changes in the appearance of the moon, based on the moon's orbit around the Earth.	**5.P.1** Understand force, motion and the relationship between them. 5.P.1.1 Explain how factors such as gravity, friction, and change in mass affect the motion of objects. 5.P.1.3 Illustrate the motion of an object using a graph to show a change in position over a period of time. **5.P.2** Understand the interactions of matter and energy and the changes that occur. 5.P.2.1 Explain how the sun's energy impacts the processes of the water cycle (including evaporation, transpiration, condensation, precipitation and runoff). 5.P.2.3 Summarize properties of original materials, and the new material(s) formed, to demonstrate that a change has occurred. **5.P.3** Explain how the properties of some materials change as a result of heating and cooling. 5.P.3.1 Explain the effects of the transfer of

	4.L.1 Understand the effects of environmental changes, adaptations and behaviors that enable animals (including humans) to survive in changing habitats. 4.L.1.2 Explain how animals meet their needs by using behaviors in response to information received from the environment. 4.L1.3 Explain how humans can adapt their behavior to live in changing habitats (e.g., recycling wastes, establishing rain gardens, planting trees and shrubs to prevent flooding and erosion). 4.L.1.4 Explain how differences among animals of the same population sometimes give individuals an advantage in surviving and reproducing in changing habitats. **4.L.2** Understand food and the benefits of vitamins, minerals and exercise. 4.L.2.2 Explain the role of vitamins, minerals and exercise in maintaining a healthy body.	heat (either by direct contact or at a distance) that occurs between objects at different temperatures. (conduction, convection or radiation) 5.P.3.2 Explain how heating and cooling affect some materials and how this relates to their purpose and practical applications. **5.E.1** Understand weather patterns and phenomena, making connections to the weather in a particular place and time. 5.E.1.1 Compare daily and seasonal changes in weather conditions (including wind speed and direction, precipitation, and temperature) and patterns. 5.E.1.2 Predict upcoming weather events from weather data collected through observation and measurements. 5.E.1.3 Explain how global patterns such as the jet stream and water currents influence local weather in measurable terms such as temperature, wind direction and speed, and precipitation. **5.L.1** Understand how structures and systems of organisms (to include the human body) perform functions necessary for life. 5.L.1.1 Explain why some organisms are capable of surviving as a single cell while others require many cells that are specialized to survive. **5.L.2** Understand the interdependence of plants and animals with their ecosystem. 5.L.2.1 Compare the characteristics of

		several common ecosystems, including estuaries and salt marshes, oceans, lakes and ponds, forests, and grasslands 5.L.2.2 Classify the organisms within an ecosystem according to the function they serve: producers, consumers, or decomposers (biotic factors). 5.L.2.3 Infer the effects that may result from the interconnected relationship of plants and animals to their ecosystem. **5.L.3** Understand why organisms differ from or are similar to their parents based on the characteristics of the organism. 5.L.3.1 Explain why organisms differ from or are similar to their parents based on the characteristics of the organism. 5.L.3.2 Give examples of likenesses that are inherited and some that are not.
Construct scientific arguments that: Signal logical relationships among reasoning, relevant evidence, data, and/or a model when making a claim	**4.P.1** Explain how various forces affect the motion of an object. 4.P.1.1 Explain how magnets interact with all things made of iron and with other magnets to produce motion without touching them. 4.P.1.2 Explain how electrically charged objects push or pull on other electrically charged objects and produce motion. **4.P.2** Understand the composition and properties of matter before and after they undergo a change or interaction. 4.P.2.1 Compare the physical properties of samples of matter (strength, hardness, flexibility, ability to conduct heat, ability to	**5.P.1** Understand force, motion and the relationship between them. 5.P.1.1 Explain how factors such as gravity, friction, and change in mass affect the motion of objects. 5.P.1.3 Illustrate the motion of an object using a graph to show a change in position over a period of time. **5.P.2** Understand the interactions of matter and energy and the changes that occur. 5.P.2.1 Explain how the sun's energy impacts the processes of the water cycle (including evaporation, transpiration, condensation, precipitation and runoff).

	conduct electricity, ability to be attracted by magnets, reactions to water and fire). 4.P.2.2 Explain how minerals are identified using tests for the physical properties of hardness, color, luster, cleavage and streak. **4.E.1** Explain the causes of day and night and phases of the moon. 4.E.1.1 Explain the cause of day and night based on the rotation of Earth on its axis. 4.E.1.2 Explain the monthly changes in the appearance of the moon, based on the moon's orbit around the Earth. **4.L.1** Understand the effects of environmental changes, adaptations and behaviors that enable animals (including humans) to survive in changing habitats. 4.L.1.2 Explain how animals meet their needs by using behaviors in response to information received from the environment. 4.L1.3 Explain how humans can adapt their behavior to live in changing habitats (e.g., recycling wastes, establishing rain gardens, planting trees and shrubs to prevent flooding and erosion). 4.L.1.4 Explain how differences among animals of the same population sometimes give individuals an advantage in surviving and reproducing in changing habitats. **4.L.2** Understand food and the benefits of vitamins, minerals and exercise. 4.L.2.2 Explain the role of vitamins, minerals and exercise in maintaining a healthy body.	5.P.2.3 Summarize properties of original materials, and the new material(s) formed, to demonstrate that a change has occurred. **5.P.3** Explain how the properties of some materials change as a result of heating and cooling. 5.P.3.1 Explain the effects of the transfer of heat (either by direct contact or at a distance) that occurs between objects at different temperatures. (conduction, convection or radiation) 5.P.3.2 Explain how heating and cooling affect some materials and how this relates to their purpose and practical applications. **5.E.1** Understand weather patterns and phenomena, making connections to the weather in a particular place and time. 5.E.1.1 Compare daily and seasonal changes in weather conditions (including wind speed and direction, precipitation, and temperature) and patterns. 5.E.1.2 Predict upcoming weather events from weather data collected through observation and measurements. 5.E.1.3 Explain how global patterns such as the jet stream and water currents influence local weather in measurable terms such as temperature, wind direction and speed, and precipitation. **5.L.1** Understand how structures and systems of organisms (to include the human body) perform functions necessary for life.

		5.L.1.1 Explain why some organisms are capable of surviving as a single cell while others require many cells that are specialized to survive. 5.L.1.2 Compare the major systems of the human body (digestive, respiratory, circulatory, muscular, skeletal, and cardiovascular) in terms of their functions necessary for life. **5.L.2** Understand the interdependence of plants and animals with their ecosystem. 5.L.2.1 Compare the characteristics of several common ecosystems, including estuaries and salt marshes, oceans, lakes and ponds, forests, and grasslands. 5.L.2.2 Classify the organisms within an ecosystem according to the function they serve: producers, consumers, or decomposers (biotic factors). **5.L.3** Understand why organisms differ from or are similar to their parents based on the characteristics of the organism. 5.L.3.1 Explain why organisms differ from or are similar to their parents based on the characteristics of the organism. 5.L.3.2 Give examples of likenesses that are inherited and some that are not.

ELD Standard 4: Language for Science
Grades 6-8

ELD-SC.6-8.Explain. Interpretive	Grade 6	Grade 7	Grade 8
Interpret scientific explanations by: Defining investigable questions or design problems based on observations, information, and/or data about a phenomenon	**6.P.1** Understand the properties of waves and the wavelike property of energy in earthquakes, light and sound waves. 6.P.1.2 Explain the relationship among visible light, the electromagnetic spectrum, and sight. 6.P.1.3 Explain the relationship among the rate of vibration, the medium through which vibrations travel, sound and hearing. **6.P.2** Understand the structure, classifications and physical properties of matter. 6.P.2.1 Recognize that all matter is made up of atoms and atoms of the same element are all alike, but are different from the atoms of other elements. 6.P.2.2 Explain the effect of heat on the motion of atoms through a description of what happens to particles during a change in phase. **6.P.3** Understand characteristics of	**7.P.1** Understand motion, the effects of forces on motion and the graphical representations of motion. 7.P.1.1 Explain how the motion of an object can be described by its position, direction of motion, and speed with respect to some other object. 7.P.1.2 Explain the effects of balanced and unbalanced forces acting on an object (including friction, gravity and magnets). 7.P.1.4 Interpret distance versus time graphs for constant speed and variable motion. **7.P.2** Understand forms of energy, energy transfer and transformation and conservation in mechanical systems. 7.P.2.1 Explain how kinetic and potential energy contribute to the mechanical energy of an object. 7.P.2.2 Explain how energy can be transformed from one form to another (specifically potential energy and kinetic energy) using a model or diagram of a	**8.P.1** Understand the properties of matter and changes that occur when matter interacts in an open and closed container. 8.P.1.2 Explain how the physical properties of elements and their reactivity have been used to produce the current model of the Periodic Table of elements. 8.P.1.4 Explain how the idea of atoms and a balanced chemical equation support the law of conservation of mass. **8.P.2** Explain the environmental implications associated with the various methods of obtaining, managing, and using energy resources 8.P.2.1 Explain the environmental consequences of the various methods of obtaining, transforming and distributing energy. 8.P.2.2 Explain the implications of the depletion of renewable and nonrenewable energy resources and the importance of conservation.

	energy transfer and interactions of matter and energy. 6.P.3.2 Explain the effects of electromagnetic waves on various materials to include absorption, scattering, and change in temperature. 6.P.3.3 Explain the suitability of materials for use in technological design based on a response to heat (to include conduction, expansion, and contraction) and electrical energy (conductors and insulators). **6.E.1** Understand the earth/moon/sun system, and the properties, structures and predictable motions of celestial bodies in the Universe. 6.E.1.1 Explain how the relative motion and relative position of the sun, Earth and moon affect the seasons, tides, phases of the moon, and eclipses. 6.E.1.2 Explain why Earth sustains life while other planets do not based on their properties (including types of surface, atmosphere and gravitational force) and location to the Sun. **6.E.2** Understand the structure of the earth and how interactions of	moving object (roller coaster, pendulum, or cars on ramps as examples). 7.P.2.3 Recognize that energy can be transferred from one system to another when two objects push or pull on each other over a distance (work) and electrical circuits require a complete loop through which an electrical current can pass. 7.P.2.4 Explain how simple machines such as inclined planes, pulleys, levers and wheel and axles are used to create mechanical advantage and increase efficiency. **7.E.1** Understand how the cycling of matter (water and gases) in and out of the atmosphere relates to Earth's atmosphere, weather and climate and the effects of the atmosphere on humans. 7.E.1.2 Explain how the cycling of water in and out of the atmosphere and atmospheric conditions relate to the weather patterns on Earth. 7.E.1.3 Explain the relationship between the movement of air masses, high and low pressure systems, and frontal boundaries to storms (including thunderstorms, hurricanes, and	**8.E.1** Understand the hydrosphere and the impact of humans on local systems and the effects of the hydrosphere on humans. 8.E.1.1 Explain the structure of the hydrosphere including: • Water distribution on earth • Local river basins and water availability. 8.E.1.2 Summarize evidence that Earth's oceans are a reservoir of nutrients, minerals, dissolved gases, and life forms: • Estuaries • Marine ecosystems • Upwelling • Behavior of gases in the marine environment • Value and sustainability of marine resources • Deep ocean technology and understandings gained. 8.E.1.3 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

	constructive and destructive forces have resulted in changes in the surface of the Earth over time and the effects of the lithosphere on humans. 6.E.2.2 Explain how crustal plates and ocean basins are formed, move and interact using earthquakes, heat flow and volcanoes to reflect forces within the earth. 6.E.2.3 Explain how the formation of soil is related to the parent rock type and the environment in which it develops. **6.L.1** Understand the structures, processes and behaviors of plants that enable them to survive and reproduce. 6.L.1.1 Summarize the basic structures and functions of flowering plants required for survival, reproduction and defense. 6.L.1.2 Explain the significance of the processes of photo-synthesis, respiration, and transpiration to the survival of green plants and other organisms. **6.L.2** Understand the flow of energy through ecosystems and the responses of populations to the biotic and abiotic factors in their	tornadoes) and other weather conditions that may result. 7.E.1.4 Predict weather conditions and patterns based on information obtained from: • Weather data collected from direct observations and measurement (wind speed and direction, air temperature, humidity and air pressure) • Weather maps, satellites and radar • Cloud shapes and types and associated elevation 7.E.1.5 Explain the influence of convection, global winds and the jet stream on weather and climatic conditions. 7.E.1.6 Conclude that the good health of humans requires: monitoring the atmosphere, maintaining air quality and stewardship. **7.L.2** Understand the relationship of the mechanisms of cellular reproduction, patterns of inheritance and external factors to potential variation among offspring. 7.L.2.1 Explain why offspring that result from sexual reproduction (fertilization and meiosis) have greater variation	• Bio-indicators. **8.E.2** Understand the history of Earth and its life forms based on evidence of change recorded in fossil records and landforms. 8.E.2.1 Infer the age of Earth and relative age of rocks and fossils from index fossils and ordering of rock layers (relative dating and radioactive dating). 8.E.2.2 Explain the use of fossils, ice cores, composition of sedimentary rocks, faults, and igneous rock formations found in rock layers as evidence of the history of the Earth and its changing life forms. **8.L.1** Understand the hazards caused by agents of diseases that effect living organisms. 8.L.1.1 Summarize the basic characteristics of viruses, bacteria, fungi and parasites relating to the spread, treatment and prevention of disease. 8.L.1.2 Explain the difference between epidemic and pandemic as it relates to the spread, treatment and prevention of disease.

	environment. 6.L.2.1 Summarize how energy derived from the sun is used by plants to produce sugars (photosynthesis) and is transferred within food chains and food webs (terrestrial and aquatic) from producers to consumers to decomposers. 6.L.2.2 Explain how plants respond to external stimuli (including dormancy and forms of tropism) to enhance survival in an environment. 6.L.2.3 Summarize how the abiotic factors (such as temperature, water, sunlight, and soil quality) of biomes (freshwater, marine, forest, grasslands, desert, Tundra) affect the ability of organisms to grow, survive and/or create their own food through photosynthesis.	than offspring that result from asexual reproduction (budding and mitosis). 7.L.2.2 Infer patterns of heredity using information from Punnett squares and pedigree analysis. 7.L.2.3 Explain the impact of the environment and lifestyle choices on biological inheritance (to include common genetic diseases) and survival.	**8.L.2** Understand how biotechnology is used to affect living organisms. 8.L.2.1 Summarize aspects of biotechnology including: • Specific genetic information available • Careers • Economic benefits to North Carolina • Ethical issues • Implications for agriculture **8.L.3** Understand how organisms interact with and respond to the biotic and abiotic components of their environment. 8.L.3.1 Explain how factors such as food, water, shelter and space affect populations in an ecosystem. 8.L.3.2 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 • Mutualism 8.L.3.3 Explain how the flow of energy within food webs is

			interconnected with the cycling of matter (including water, nitrogen, carbon dioxide and oxygen). **8.L.4** Understand the evolution of organisms and landforms based on evidence, theories and processes that impact the Earth over time. 8.L.4.1 Summarize the use of evidence drawn from geology, fossils, and comparative anatomy to form the basis for biological classification systems and the theory of evolution. 8.L.4.2 Explain the relationship between genetic variation and an organism's ability to adapt to its environment. **8.L.5** Understand the composition of various substances as it relates to their ability to serve as a source of energy and building materials for growth and repair of organisms. 8.L.5.1 Summarize how food provides the energy and the molecules required for building materials, growth and survival of all organisms (to include plants). 8.L.5.2 Explain the relationship among a healthy diet, exercise, and the general health of the body (emphasis on the

			relationship between respiration and digestion).
Interpret scientific explanations by: Determining central ideas in complex evidence and information to help explain how or why a phenomenon occurs	**6.P.1** Understand the properties of waves and the wavelike property of energy in earthquakes, light and sound waves. 6.P.1.1 Compare the properties of waves to the wavelike property of energy in earthquakes, light and sound. 6.P.1.2 Explain the relationship among visible light, the electromagnetic spectrum, and sight. 6.P.1.3 Explain the relationship among the rate of vibration, the medium through which vibrations travel, sound and hearing. **6.P.2** Understand the structure, classifications and physical properties of matter. 6.P.2.1 Recognize that all matter is made up of atoms and atoms of the same element are all alike, but are different from the atoms of other elements. 6.P.2.2 Explain the effect of heat on the motion of atoms through a description of what happens to particles during a change in phase.	**7.P.1** Understand motion, the effects of forces on motion and the graphical representations of motion. 7.P.1.1 Explain how the motion of an object can be described by its position, direction of motion, and speed with respect to some other object. 7.P.1.2 Explain the effects of balanced and unbalanced forces acting on an object (including friction, gravity and magnets). 7.P.1.4 Interpret distance versus time graphs for constant speed and variable motion. **7.P.2** Understand forms of energy, energy transfer and transformation and conservation in mechanical systems. 7.P.2.1 Explain how kinetic and potential energy contribute to the mechanical energy of an object. 7.P.2.2 Explain how energy can be transformed from one form to another (specifically potential energy and kinetic energy) using a model or diagram of a moving object (roller coaster, pendulum, or cars on ramps as examples).	**8.P.1** Understand the properties of matter and changes that occur when matter interacts in an open and closed container. 8.P.1.2 Explain how the physical properties of elements and their reactivity have been used to produce the current model of the Periodic Table of elements. 8.P.1.4 Explain how the idea of atoms and a balanced chemical equation support the law of conservation of mass. **8.P.2** Explain the environmental implications associated with the various methods of obtaining, managing, and using energy resources. 8.P.2.1 Explain the environmental consequences of the various methods of obtaining, transforming and distributing energy. 8.P.2.2 Explain the implications of the depletion of renewable and nonrenewable energy resources and the importance of conservation. **8.E.1** Understand the hydrosphere and

	6.P.3 Understand characteristics of energy transfer and interactions of matter and energy. 6.P.3.2 Explain the effects of electromagnetic waves on various materials to include absorption, scattering, and change in temperature. 6.P.3.3 Explain the suitability of materials for use in technological design based on a response to heat (to include conduction, expansion, and contraction) and electrical energy (conductors and insulators). **6.E.1** Understand the earth/moon/sun system, and the properties, structures and predictable motions of celestial bodies in the Universe. 6.E.1.1 Explain how the relative motion and relative position of the sun, Earth and moon affect the seasons, tides, phases of the moon, and eclipses. 6.E.1.2 Explain why Earth sustains life while other planets do not based on their properties (including types of surface, atmosphere and gravitational force) and location to the Sun. 6.E.1.3 Summarize space exploration and the	7.P.2.3 Recognize that energy can be transferred from one system to another when two objects push or pull on each other over a distance (work) and electrical circuits require a complete loop through which an electrical current can pass. 7.P.2.4 Explain how simple machines such as inclined planes, pulleys, levers and wheel and axles are used to create mechanical advantage and increase efficiency. **7.E.1** Understand how the cycling of matter (water and gases) in and out of the atmosphere relates to Earth's atmosphere, weather and climate and the effects of the atmosphere on humans. 7.E.1.2 Explain how the cycling of water in and out of the atmosphere and atmospheric conditions relate to the weather patterns on Earth. 7.E.1.3 Explain the relationship between the movement of air masses, high and low pressure systems, and frontal boundaries to storms (including thunderstorms, hurricanes, and tornadoes) and other weather conditions that may result. 7.E.1.4 Predict weather	the impact of humans on local systems and the effects of the hydrosphere on humans. 8.E.1.1 Explain the structure of the hydrosphere including: • Water distribution on earth • Local river basins and water availability. 8.E.1.2 Summarize evidence that Earth's oceans are a reservoir of nutrients, minerals, dissolved gases, and life forms: • Estuaries • Marine ecosystems • Upwelling • Behavior of gases in the marine environment • Value and sustainability of marine resources • Deep ocean technology and understandings gained. **8.E.2** Understand the history of Earth and its life forms based on evidence of change recorded in fossil records and landforms. 8.E.2.1 Infer the age of Earth and relative age of rocks and fossils from index fossils and ordering of rock layers (relative dating and radioactive dating). 8.E.2.2 Explain the use of fossils, ice cores, composition

	understandings gained from them. **6.E.2** Understand the structure of the earth and how interactions of constructive and destructive forces have resulted in changes in the surface of the Earth over time and the effects of the lithosphere on humans. 6.E.2.1 Summarize the structure of the earth, including the layers, the mantle and core based on the relative position, composition and density. 6.E.2.2 Explain how crustal plates and ocean basins are formed, move and interact using earthquakes, heat flow and volcanoes to reflect forces within the earth. 6.E.2.3 Explain how the formation of soil is related to the parent rock type and the environment in which it develops. **6.L.1** Understand the structures, processes and behaviors of plants that enable them to survive and reproduce. 6.L.1.1 Summarize the basic structures and functions of flowering plants required for survival, reproduction and defense. 6.L.1.2 Explain the significance	conditions and patterns based on information obtained from: • Weather data collected from direct observations and measurement (wind speed and direction, air temperature, humidity and air pressure) • Weather maps, satellites and radar • Cloud shapes and types and associated elevation 7.E.1.5 Explain the influence of convection, global winds and the jet stream on weather and climatic conditions. 7.E.1.6 Conclude that the good health of humans requires: monitoring the atmosphere, maintaining air quality and stewardship. **7.L.2** Understand the relationship of the mechanisms of cellular reproduction, patterns of inheritance and external factors to potential variation among offspring. 7.L.2.1 Explain why offspring that result from sexual reproduction (fertilization and meiosis) have greater variation than offspring that result from asexual reproduction (budding and mitosis).	of sedimentary rocks, faults, and igneous rock formations found in rock layers as evidence of the history of the Earth and its changing life forms. **8.L.1** Understand the hazards caused by agents of diseases that effect living organisms. 8.L.1.1 Summarize the basic characteristics of viruses, bacteria, fungi and parasites relating to the spread, treatment and prevention of disease. 8.L.1.2 Explain the difference between epidemic and pandemic as it relates to the spread, treatment and prevention of disease. **8.L.2** Understand how biotechnology is used to affect living organisms. 8.L.2.1 Summarize aspects of biotechnology including: • Specific genetic information available • Careers • Economic benefits to North Carolina • Ethical issues • Implications for agriculture

	of the processes of photo-synthesis, respiration, and transpiration to the survival of green plants and other organisms. **6.L.2** Understand the flow of energy through ecosystems and the responses of populations to the biotic and abiotic factors in their environment. 6.L.2.1 Summarize how energy derived from the sun is used by plants to produce sugars (photosynthesis) and is transferred within food chains and food webs (terrestrial and aquatic) from producers to consumers to decomposers. 6.L.2.2 Explain how plants respond to external stimuli (including dormancy and forms of tropism) to enhance survival in an environment. 6.L.2.3 Summarize how the abiotic factors (such as temperature, water, sunlight, and soil quality) of biomes (freshwater, marine, forest, grasslands, desert, Tundra) affect the ability of organisms to grow, survive and/or create their own food through photosynthesis.	7.L.2.2 Infer patterns of heredity using information from Punnett squares and pedigree analysis. 7.L.2.3 Explain the impact of the environment and lifestyle choices on biological inheritance (to include common genetic diseases) and survival.	**8.L.3** Understand how organisms interact with and respond to the biotic and abiotic components of their environment. 8.L.3.1 Explain how factors such as food, water, shelter and space affect populations in an ecosystem. 8.L.3.2 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 • Mutualism 8.L.3.3 Explain how the flow of energy within food webs is interconnected with the cycling of matter (including water, nitrogen, carbon dioxide and oxygen). **8.L.4** Understand the evolution of organisms and landforms based on evidence, theories and processes that impact the Earth over time. 8.L.4.1 Summarize the use of evidence drawn from geology, fossils, and comparative anatomy to form the basis for

			biological classification systems and the theory of evolution. 8.L.4.2 Explain the relationship between genetic variation and an organism's ability to adapt to its environment. **8.L.5** Understand the composition of various substances as it relates to their ability to serve as a source of energy and building materials for growth and repair of organisms. 8.L.5.1 Summarize how food provides the energy and the molecules required for building materials, growth and survival of all organisms (to include plants). 8.L.5.2 Explain the relationship among a healthy diet, exercise, and the general health of the body (emphasis on the relationship between respiration and digestion).
Interpret scientific explanations by: Evaluating scientific reasoning that shows why data or evidence adequately supports conclusions	**6.P.1** Understand the properties of waves and the wavelike property of energy in earthquakes, light and sound waves. 6.P.1.1 Compare the properties of waves to the wavelike property of energy in earthquakes, light and sound. 6.P.1.2 Explain the relationship among visible light, the	**7.P.1** Understand motion, the effects of forces on motion and the graphical representations of motion. 7.P.1.1 Explain how the motion of an object can be described by its position, direction of motion, and speed with respect to some other object. 7.P.1.2 Explain the effects of balanced and unbalanced	**8.P.1** Understand the properties of matter and changes that occur when matter interacts in an open and closed container. 8.P.1.2 Explain how the physical properties of elements and their reactivity have been used to produce the current model of the Periodic Table of elements.

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	effects of the lithosphere on humans. 6.E.2.1 Summarize the structure of the earth, including the layers, the mantle and core based on the relative position, composition and density. 6.E.2.2 Explain how crustal plates and ocean basins are formed, move and interact using earthquakes, heat flow and volcanoes to reflect forces within the earth. 6.E.2.3 Explain how the formation of soil is related to the parent rock type and the environment in which it develops. 6.E.2.4 Conclude that the good health of humans requires: monitoring the lithosphere, maintaining soil quality and stewardship. **6.L.1** Understand the structures, processes and behaviors of plants that enable them to survive and reproduce. 6.L.1.1 Summarize the basic structures and functions of flowering plants required for survival, reproduction and defense. 6.L.1.2 Explain the significance of the processes of photo-synthesis, respiration, and transpiration to the survival of	7.E.1.5 Explain the influence of convection, global winds and the jet stream on weather and climatic conditions. 7.E.1.6 Conclude that the good health of humans requires: monitoring the atmosphere, maintaining air quality and stewardship. **7.L.2** Understand the relationship of the mechanisms of cellular reproduction, patterns of inheritance and external factors to potential variation among offspring. 7.L.2.1 Explain why offspring that result from sexual reproduction (fertilization and meiosis) have greater variation than offspring that result from asexual reproduction (budding and mitosis). 7.L.2.2 Infer patterns of heredity using information from Punnett squares and pedigree analysis. 7.L.2.3 Explain the impact of the environment and lifestyle choices on biological inheritance (to include common genetic diseases) and survival.	found in rock layers as evidence of the history of the Earth and its changing life forms. **8.L.1** Understand the hazards caused by agents of diseases that effect living organisms. 8.L.1.2 Explain the difference between epidemic and pandemic as it relates to the spread, treatment and prevention of disease. **8.L.3** Understand how organisms interact with and respond to the biotic and abiotic components of their environment. 8.L.3.1 Explain how factors such as food, water, shelter and space affect populations in an ecosystem. 8.L.3.2 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 • Mutualism 8.L.3.3 Explain how the flow of

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			body (emphasis on the relationship between respiration and digestion).
ELD-SC.6-8.Explain. Expressive	**Grade 6**	**Grade 7**	**Grade 8**
Construct scientific explanations that: Describe valid and reliable evidence from sources about a phenomenon	**6.P.1** Understand the properties of waves and the wavelike property of energy in earthquakes, light and sound waves. 6.P.1.2 Explain the relationship among visible light, the electromagnetic spectrum, and sight. 6.P.1.3 Explain the relationship among the rate of vibration, the medium through which vibrations travel, sound and hearing. **6.P.2** Understand the structure, classifications and physical properties of matter. 6.P.2.2 Explain the effect of heat on the motion of atoms through a description of what happens to particles during a change in phase. 6.P.2.3 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	**7.P.1** Understand motion, the effects of forces on motion and the graphical representations of motion. 7.P.1.1 Explain how the motion of an object can be described by its position, direction of motion, and speed with respect to some other object. 7.P.1.2 Explain the effects of balanced and unbalanced forces acting on an object (including friction, gravity and magnets). 7.P.1.4 Interpret distance versus time graphs for constant speed and variable motion. **7.P.2** Understand forms of energy, energy transfer and transformation and conservation in mechanical systems. 7.P.2.1 Explain how kinetic and potential energy contribute to the mechanical energy of an object. 7.P.2.2 Explain how energy can be transformed from one form to another (specifically potential energy and kinetic energy) using a model or diagram of a	**8.P.1** Understand the properties of matter and changes that occur when matter interacts in an open and closed container. 8.P.1.2 Explain how the physical properties of elements and their reactivity have been used to produce the current model of the Periodic Table of elements. 8.P.1.4 Explain how the idea of atoms and a balanced chemical equation support the law of conservation of mass. of conservation of mass. **8.P.2** Explain the environmental implications associated with the various methods of obtaining, managing, and using energy resources. 8.P.2.1 Explain the environmental consequences of the various methods of obtaining, transforming and distributing energy. 8.P.2.2 Explain the implications of the depletion of renewable and nonrenewable energy

	on the amount of matter present to include volume, mass and weight. **6.P.3** Understand characteristics of energy transfer and interactions of matter and energy. 6.P.3.2 Explain the effects of electromagnetic waves on various materials to include absorption, scattering, and change in temperature. 6.P.3.3 Explain the suitability of materials for use in technological design based on a response to heat (to include conduction, expansion, and contraction) and electrical energy (conductors and insulators). **6.E.1** Understand the earth/moon/sun system, and the properties, structures and predictable motions of celestial bodies in the Universe. 6.E.1.1 Explain how the relative motion and relative position of the sun, Earth and moon affect the seasons, tides, phases of the moon, and eclipses. 6.E.1.2 Explain why Earth sustains life while other planets do not based on their properties (including types of surface, atmosphere and	moving object (roller coaster, pendulum, or cars on ramps as examples). 7.P.2.3 Recognize that energy can be transferred from one system to another when two objects push or pull on each other over a distance (work) and electrical circuits require a complete loop through which an electrical current can pass. 7.P.2.4 Explain how simple machines such as inclined planes, pulleys, levers and wheel and axles are used to create mechanical advantage and increase efficiency. **7.E.1** Understand how the cycling of matter (water and gases) in and out of the atmosphere relates to Earth's atmosphere, weather and climate and the effects of the atmosphere on humans. 7.E.1.2 Explain how the cycling of water in and out of the atmosphere and atmospheric conditions relate to the weather patterns on Earth. 7.E.1.3 Explain the relationship between the movement of air masses, high and low pressure systems, and frontal boundaries to storms (including thunderstorms, hurricanes, and	resources and the importance of conservation. **8.E.1** Understand the hydrosphere and the impact of humans on local systems and the effects of the hydrosphere on humans. 8.E.1.1 Explain the structure of the hydrosphere including: • Water distribution on earth • Local river basins and water availability. 8.E.1.2 Summarize evidence that Earth's oceans are a reservoir of nutrients, minerals, dissolved gases, and life forms: • Estuaries • Marine ecosystems • Upwelling • Behavior of gases in the marine environment • Value and sustainability of marine resources • Deep ocean technology and understandings gained. 8.E.1.3 Predict the safety and potability of water supplies in North Carolina based on physical and biological factors, including: • Temperature • Dissolved oxygen • pH

	gravitational force) and location to the Sun. 6.E.1.3 Summarize space exploration and the understandings gained from them. **6.E.2** Understand the structure of the earth and how interactions of constructive and destructive forces have resulted in changes in the surface of the Earth over time and the effects of the lithosphere on humans. 6.E.2.1 Summarize the structure of the earth, including the layers, the mantle and core based on the relative position, composition and density. 6.E.2.2 Explain how crustal plates and ocean basins are formed, move and interact using earthquakes, heat flow and volcanoes to reflect forces within the earth. 6.E.2.3 Explain how the formation of soil is related to the parent rock type and the environment in which it develops. **6.L.1** Understand the structures, processes and behaviors of plants that enable them to survive and reproduce. 6.L.1.1 Summarize the basic structures and functions of	tornadoes) and other weather conditions that may result. 7.E.1.4 Predict weather conditions and patterns based on information obtained from: • Weather data collected from direct observations and measurement (wind speed and direction, air temperature, humidity and air pressure) • Weather maps, satellites and radar • Cloud shapes and types and associated elevation 7.E.1.5 Explain the influence of convection, global winds and the jet stream on weather and climatic conditions. 7.E.1.6 Conclude that the good health of humans requires: monitoring the atmosphere, maintaining air quality and stewardship. **7.L.2** Understand the relationship of the mechanisms of cellular reproduction, patterns of inheritance and external factors to potential variation among offspring. 7.L.2.1 Explain why offspring that result from sexual reproduction (fertilization and meiosis) have greater variation	• Nitrates and phosphates • Turbidity • Bio-indicators. **8.E.2** Understand the history of Earth and its life forms based on evidence of change recorded in fossil records and landforms. 8.E.2.1 Infer the age of Earth and relative age of rocks and fossils from index fossils and ordering of rock layers (relative dating and radioactive dating). 8.E.2.2 Explain the use of fossils, ice cores, composition of sedimentary rocks, faults, and igneous rock formations found in rock layers as evidence of the history of the Earth and its changing life forms. **8.L.1** Understand the hazards caused by agents of diseases that effect living organisms. 8.L.1.2 Explain the difference between epidemic and pandemic as it relates to the spread, treatment and prevention of disease. **8.L.2** Understand how biotechnology is used to affect living organisms. 8.L.2.1 Summarize aspects of biotechnology including:

	flowering plants required for survival, reproduction and defense. 6.L.1.2 Explain the significance of the processes of photo-synthesis, respiration, and transpiration to the survival of green plants and other organisms. **6.L.2** Understand the flow of energy through ecosystems and the responses of populations to the biotic and abiotic factors in their environment. 6.L.2.1 Summarize how energy derived from the sun is used by plants to produce sugars (photosynthesis) and is transferred within food chains and food webs (terrestrial and aquatic) from producers to consumers to decomposers. 6.L.2.2 Explain how plants respond to external stimuli (including dormancy and forms of tropism) to enhance survival in an environment. 6.L.2.3 Summarize how the abiotic factors (such as temperature, water, sunlight, and soil quality) of biomes (freshwater, marine, forest, grasslands, desert, Tundra) affect the ability of organisms to	than offspring that result from asexual reproduction (budding and mitosis). 7.L.2.2 Infer patterns of heredity using information from Punnett squares and pedigree analysis. 7.L.2.3 Explain the impact of the environment and lifestyle choices on biological inheritance (to include common genetic diseases) and survival.	• Specific genetic information available • Careers • Economic benefits to North Carolina • Ethical issues • Implications for agriculture **8.L.3** Understand how organisms interact with and respond to the biotic and abiotic components of their environment. 8.L.3.1 Explain how factors such as food, water, shelter and space affect populations in an ecosystem. 8.L.3.3 Explain how the flow of energy within food webs is interconnected with the cycling of matter (including water, nitrogen, carbon dioxide and oxygen). **8.L.4** Understand the evolution of organisms and landforms based on evidence, theories and processes that impact the Earth over time. 8.L.4.1 Summarize the use of evidence drawn from geology, fossils, and comparative anatomy to form the basis for biological classification systems and the theory of evolution. 8.L.4.2 Explain the relationship

	grow, survive and/or create their own food through photosynthesis.		between genetic variation and an organism's ability to adapt to its environment. **8.L.5** Understand the composition of various substances as it relates to their ability to serve as a source of energy and building materials for growth and repair of organisms. 8.L.5.2 Explain the relationship among a healthy diet, exercise, and the general health of the body (emphasis on the relationship between respiration and digestion)
Construct scientific explanations that: Establish neutral or objective stance in how results are communicated	**6.P.1** Understand the properties of waves and the wavelike property of energy in earthquakes, light and sound waves. 6.P.1.1 Compare the properties of waves to the wavelike property of energy in earthquakes, light and sound. 6.P.1.2 Explain the relationship among visible light, the electromagnetic spectrum, and sight. 6.P.1.3 Explain the relationship among the rate of vibration, the medium through which vibrations travel, sound and hearing. **6.P.2** Understand the structure,	**7.P.1** Understand motion, the effects of forces on motion and the graphical representations of motion. 7.P.1.1 Explain how the motion of an object can be described by its position, direction of motion, and speed with respect to some other object. 7.P.1.2 Explain the effects of balanced and unbalanced forces acting on an object (including friction, gravity and magnets). 7.P.1.4 Interpret distance versus time graphs for constant speed and variable motion. **7.P.2** Understand forms of energy, energy transfer and transformation and	**8.P.1** Understand the properties of matter and changes that occur when matter interacts in an open and closed container. 8.P.1.2 Explain how the physical properties of elements and their reactivity have been used to produce the current model of the Periodic Table of elements. 8.P.1.4 Explain how the idea of atoms and a balanced chemical equation support the law of conservation of mass. **8.P.2** Explain the environmental implications associated with the various methods of obtaining, managing, and using energy

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Construct scientific explanations that: Develop reasoning to show relationships among independent and dependent variables in models and simple systems	**6.P.1** Understand the properties of waves and the wavelike property of energy in earthquakes, light and sound waves. 6.P.1.2 Explain the relationship among visible light, the electromagnetic spectrum, and sight. 6.P.1.3 Explain the relationship among the rate of vibration, the medium through which vibrations travel, sound and hearing. **6.P.2** Understand the structure, classifications and physical properties of matter. 6.P.2.2 Explain the effect of heat on the motion of atoms through a description of what happens to particles during a	**7.P.1** Understand motion, the effects of forces on motion and the graphical representations of motion. 7.P.1.1 Explain how the motion of an object can be described by its position, direction of motion, and speed with respect to some other object. 7.P.1.2 Explain the effects of balanced and unbalanced forces acting on an object (including friction, gravity and magnets). 7.P.1.4 Interpret distance versus time graphs for constant speed and variable motion. **7.P.2** Understand forms of energy, energy transfer and transformation and conservation in mechanical systems. 7.P.2.1 Explain how kinetic and	**8.P.1** Understand the properties of matter and changes that occur when matter interacts in an open and closed container. 8.P.1.2 Explain how the physical properties of elements and their reactivity have been used to produce the current model of the Periodic Table of elements. 8.P.1.4 Explain how the idea of atoms and a balanced chemical equation support the law of conservation of mass. **8.P.2** Explain the environmental implications associated with the various methods of obtaining, managing, and using energy resources. 8.P.2.1 Explain the

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	through ecosystems and the responses of populations to the biotic and abiotic factors in their environment. 6.L.2.1 Summarize how energy derived from the sun is used by plants to produce sugars (photosynthesis) and is transferred within food chains and food webs (terrestrial and aquatic) from producers to consumers to decomposers. 6.L.2.2 Explain how plants respond to external stimuli (including dormancy and forms of tropism) to enhance survival in an environment. 6.L.2.3 Summarize how the abiotic factors (such as temperature, water, sunlight, and soil quality) of biomes (freshwater, marine, forest, grasslands, desert, Tundra) affect the ability of organisms to grow, survive and/or create their own food through photosynthesis.	health of humans requires: monitoring the atmosphere, maintaining air quality and stewardship. **7.L.1** Understand the processes, structures and functions of living organisms that enable them to survive, reproduce and carry out the basic functions of life. 7.L.1.1 Compare the structures and life functions of single-celled organisms that carry out all of the basic functions of life including: • Euglena • Amoeba • Paramecium • Volvox 7.L.1.2 Compare the structures and functions of plant and animal cells, including major organelles (cell membrane, cell wall, nucleus, chloroplasts, mitochondria, and vacuoles). 7.L.1.3 Summarize the hierarchical organization of multi-cellular organisms from cells to tissues to organs to systems to organisms. 7.L.1.4 Summarize the general functions of the major systems of the human body (digestion, respiration, reproduction,	relating to the spread, treatment and prevention of disease. 8.L.1.2 Explain the difference between epidemic and pandemic as it relates to the spread, treatment and prevention of disease. **8.L.3** Understand how organisms interact with and respond to the biotic and abiotic components of their environment. 8.L.3.1 Explain how factors such as food, water, shelter and space affect populations in an ecosystem. 8.L.3.2 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 • Mutualism 8.L.3.3 Explain how the flow of energy within food webs is interconnected with the cycling of matter (including water, nitrogen, carbon dioxide and oxygen).

		circulation, and excretion) and ways that these systems interact with each other to sustain life. **7.L.2** Understand the relationship of the mechanisms of cellular reproduction, patterns of inheritance and external factors to potential variation among offspring. 7.L.2.1 Explain why offspring that result from sexual reproduction (fertilization and meiosis) have greater variation than offspring that result from asexual reproduction (budding and mitosis). 7.L.2.2 Infer patterns of heredity using information from Punnett squares and pedigree analysis. 7.L.2.3 Explain the impact of the environment and lifestyle choices on biological inheritance (to include common genetic diseases) and survival.	**8.L.4** Understand the evolution of organisms and landforms based on evidence, theories and processes that impact the Earth over time. 8.L.4.1 Summarize the use of evidence drawn from geology, fossils, and comparative anatomy to form the basis for biological classification systems and the theory of evolution. 8.L.4.2 Explain the relationship between genetic variation and an organism's ability to adapt to its environment. **8.L.5** Understand the composition of various substances as it relates to their ability to serve as a source of energy and building materials for growth and repair of organisms. 8.L.5.1 Summarize how food provides the energy and the molecules required for building materials, growth and survival of all organisms (to include plants). 8.L.5.2 Explain the relationship among a healthy diet, exercise, and the general health of the body (emphasis on the relationship between respiration and digestion).

Construct scientific explanations that: Summarize patterns in evidence, making trade-offs, revising, and retesting	**6.E.1** Understand the earth/moon/sun system, and the properties, structures and predictable motions of celestial bodies in the Universe. 6.E.1.3 Summarize space exploration and the understandings gained from them. **6.E.2** Understand the structure of the earth and how interactions of constructive and destructive forces have resulted in changes in the surface of the Earth over time and the effects of the lithosphere on humans. 6.E.2.1 Summarize the structure of the earth, including the layers, the mantle and core based on the relative position, composition and density. **6.L.1** Understand the structures, processes and behaviors of plants that enable them to survive and reproduce. 6.L.1.1 Summarize the basic structures and functions of flowering plants required for survival, reproduction and defense. 6.L.1.2 Explain the significance of the processes of photo-synthesis, respiration, and transpiration to the survival of green plants and other organisms.	**7.L.1** Understand the processes, structures and functions of living organisms that enable them to survive, reproduce and carry out the basic functions of life. 7.L.1.3 Summarize the hierarchical organization of multi-cellular organisms from cells to tissues to organs to systems to organisms. 7.L.1.4 Summarize the general functions of the major systems of the human body (digestion, respiration, reproduction, circulation, and excretion) and ways that these systems interact with each other to sustain life.	**8.P.1** Understand the properties of matter and changes that occur when matter interacts in an open and closed container. 8.E.1.2 Summarize evidence that Earth's oceans are a reservoir of nutrients, minerals, dissolved gases, and life forms: • Estuaries • Marine ecosystems • Upwelling • Behavior of gases in the marine environment • Value and sustainability of marine resources • Deep ocean technology and understandings gained. **8.L.1** Understand the hazards caused by agents of diseases that effect living organisms. 8.L.1.1 Summarize the basic characteristics of viruses, bacteria, fungi and parasites relating to the spread, treatment and prevention of disease. 8.L.1.2 Explain the difference between epidemic and pandemic as it relates to the spread, treatment and prevention of disease. **8.L.2** Understand how biotechnology is

	6.L.2 Understand the flow of energy through ecosystems and the responses of populations to the biotic and abiotic factors in their environment. 6.L.2.1 Summarize how energy derived from the sun is used by plants to produce sugars (photosynthesis) and is transferred within food chains and food webs (terrestrial and aquatic) from producers to consumers to decomposers. 6.L.2.3 Summarize how the abiotic factors (such as temperature, water, sunlight, and soil quality) of biomes (freshwater, marine, forest, grasslands, desert, Tundra) affect the ability of organisms to grow, survive and/or create their own food through photosynthesis.		used to affect living organisms. 8.L.2.1 Summarize aspects of biotechnology including: • Specific genetic information available • Careers • Economic benefits to North Carolina • Ethical issues • Implications for agriculture **8.L.3** Understand how organisms interact with and respond to the biotic and abiotic components of their environment. 8.L.3.2 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 • Mutualism **8.L.4** Understand the evolution of organisms and landforms based on evidence, theories and processes that impact the Earth over time. 8.L.4.1 Summarize the use of

			evidence drawn from geology, fossils, and comparative anatomy to form the basis for biological classification systems and the theory of evolution. **8.L.5** Understand the composition of various substances as it relates to their ability to serve as a source of energy and building materials for growth and repair of organisms. 8.L.5.1 Summarize how food provides the energy and the molecules required for building materials, growth and survival of all organisms (to include plants).
ELD-SC.6-8.Argue. Interpretive	**Grade 6**	**Grade 7**	**Grade 8**
Interpret scientific arguments by: Identifying convincing evidence from data, models, and/or information from investigations of phenomena or design solutions	**6.P.1** Understand the properties of waves and the wavelike property of energy in earthquakes, light and sound waves. 6.P.1.1 Compare the properties of waves to the wavelike property of energy in earthquakes, light and sound. 6.P.1.2 Explain the relationship among visible light, the electromagnetic spectrum, and sight. 6.P.1.3 Explain the relationship among the rate of vibration, the medium through which	**7.P.1** Understand motion, the effects of forces on motion and the graphical representations of motion. 7.P.1.1 Explain how the motion of an object can be described by its position, direction of motion, and speed with respect to some other object. 7.P.1.2 Explain the effects of balanced and unbalanced forces acting on an object (including friction, gravity and magnets). 7.P.1.4 Interpret distance versus time graphs for constant	**8.P.1** Understand the properties of matter and changes that occur when matter interacts in an open and closed container. 8.P.1.2 Explain how the physical properties of elements and their reactivity have been used to produce the current model of the Periodic Table of elements. 8.P.1.4 Explain how the idea of atoms and a balanced chemical equation support the law of conservation of mass.

	vibrations travel, sound and hearing. **6.P.2** Understand the structure, classifications and physical properties of matter. 6.P.2.1 Recognize that all matter is made up of atoms and atoms of the same element are all alike, but are different from the atoms of other elements. 6.P.2.2 Explain the effect of heat on the motion of atoms through a description of what happens to particles during a change in phase. 6.P.2.3 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. **6.P.3** Understand characteristics of energy transfer and interactions of matter and energy. 6.P.3.2 Explain the effects of electromagnetic waves on various materials to include absorption, scattering, and change in temperature.	speed and variable motion. **7.P.2** Understand forms of energy, energy transfer and transformation and conservation in mechanical systems. 7.P.2.1 Explain how kinetic and potential energy contribute to the mechanical energy of an object. 7.P.2.2 Explain how energy can be transformed from one form to another (specifically potential energy and kinetic energy) using a model or diagram of a moving object (roller coaster, pendulum, or cars on ramps as examples). 7.P.2.3 Recognize that energy can be transferred from one system to another when two objects push or pull on each other over a distance (work) and electrical circuits require a complete loop through which an electrical current can pass. 7.P.2.4 Explain how simple machines such as inclined planes, pulleys, levers and wheel and axles are used to create mechanical advantage and increase efficiency. **7.E.1** Understand how the cycling of matter (water and gases) in and out of the atmosphere relates to Earth's	**8.P.2** Explain the environmental implications associated with the various methods of obtaining, managing, and using energy resources. 8.P.2.1 Explain the environmental consequences of the various methods of obtaining, transforming and distributing energy. 8.P.2.2 Explain the implications of the depletion of renewable and nonrenewable energy resources and the importance of conservation. **8.E.1** Understand the hydrosphere and the impact of humans on local systems and the effects of the hydrosphere on humans. 8.E.1.1 Explain the structure of the hydrosphere including: • Water distribution on earth • Local river basins and water availability. 8.E.1.2 Summarize evidence that Earth's oceans are a reservoir of nutrients, minerals, dissolved gases, and life forms: • Estuaries • Marine ecosystems • Upwelling • Behavior of gases in the marine environment

	6.P.3.3 Explain the suitability of materials for use in technological design based on a response to heat (to include conduction, expansion, and contraction) and electrical energy (conductors and insulators). **6.E.1** Understand the earth/moon/sun system, and the properties, structures and predictable motions of celestial bodies in the Universe. 6.E.1.1 Explain how the relative motion and relative position of the sun, Earth and moon affect the seasons, tides, phases of the moon, and eclipses. 6.E.1.2 Explain why Earth sustains life while other planets do not based on their properties (including types of surface, atmosphere and gravitational force) and location to the Sun. 6.E.1.3 Summarize space exploration and the understandings gained from them. **6.E.2** Understand the structure of the earth and how interactions of constructive and destructive forces have resulted in changes in the	atmosphere, weather and climate and the effects of the atmosphere on humans. 7.E.1.1 Compare the composition, properties and structure of Earth's atmosphere to include: mixtures of gases and differences in temperature and pressure within layers. 7.E.1.2 Explain how the cycling of water in and out of the atmosphere and atmospheric conditions relate to the weather patterns on Earth. 7.E.1.3 Explain the relationship between the movement of air masses, high and low pressure systems, and frontal boundaries to storms (including thunderstorms, hurricanes, and tornadoes) and other weather conditions that may result. 7.E.1.4 Predict weather conditions and patterns based on information obtained from: • Weather data collected from direct observations and measurement (wind speed and direction, air temperature, humidity and air pressure) • Weather maps, satellites and radar • Cloud shapes and types and associated elevation	• Value and sustainability of marine resources • Deep ocean technology and understandings gained. 8.E.1.3 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 • Bio-indicators. **8.E.2** Understand the history of Earth and its life forms based on evidence of change recorded in fossil records and landforms. 8.E.2.1 Infer the age of Earth and relative age of rocks and fossils from index fossils and ordering of rock layers (relative dating and radioactive dating). 8.E.2.2 Explain the use of fossils, ice cores, composition of sedimentary rocks, faults, and igneous rock formations found in rock layers as evidence of the history of the Earth and its changing life forms.

	surface of the Earth over time and the effects of the lithosphere on humans. 6.E.2.1 Summarize the structure of the earth, including the layers, the mantle and core based on the relative position, composition and density. 6.E.2.2 Explain how crustal plates and ocean basins are formed, move and interact using earthquakes, heat flow and volcanoes to reflect forces within the earth. 6.E.2.3 Explain how the formation of soil is related to the parent rock type and the environment in which it develops. 6.E.2.4 Conclude that the good health of humans requires: monitoring the lithosphere, maintaining soil quality and stewardship. **6.L.1** Understand the structures, processes and behaviors of plants that enable them to survive and reproduce. 6.L.1.1 Summarize the basic structures and functions of flowering plants required for survival, reproduction and defense. 6.L.1.2 Explain the significance	7.E.1.5 Explain the influence of convection, global winds and the jet stream on weather and climatic conditions. 7.E.1.6 Conclude that the good health of humans requires: monitoring the atmosphere, maintaining air quality and stewardship. **7.L.1** Understand the processes, structures and functions of living organisms that enable them to survive, reproduce and carry out the basic functions of life. 7.L.1.1 Compare the structures and life functions of single-celled organisms that carry out all of the basic functions of life including: • Euglena • Amoeba • Paramecium • Volvox 7.L.1.2 Compare the structures and functions of plant and animal cells, including major organelles (cell membrane, cell wall, nucleus, chloroplasts, mitochondria, and vacuoles). **7.L.2** Understand the relationship of the mechanisms of cellular reproduction, patterns of inheritance and external factors to potential	**8.L.1** Understand the hazards caused by agents of diseases that effect living organisms. 8.L.1.1 Summarize the basic characteristics of viruses, bacteria, fungi and parasites relating to the spread, treatment and prevention of disease. 8.L.1.2 Explain the difference between epidemic and pandemic as it relates to the spread, treatment and prevention of disease.evention of disease. **8.L.2** Understand how biotechnology is used to affect living organisms. 8.L.2.1 Summarize aspects of biotechnology including: • Specific genetic information available • Careers • Economic benefits to North Carolina • Ethical issues • Implications for agriculture **8.L.3** Understand how organisms interact with and respond to the biotic and abiotic components of their environment. 8.L.3.1 Explain how factors such as food, water, shelter and

	of the processes of photo-synthesis, respiration, and transpiration to the survival of green plants and other organisms. **6.L.2** Understand the flow of energy through ecosystems and the responses of populations to the biotic and abiotic factors in their environment. 6.L.2.1 Summarize how energy derived from the sun is used by plants to produce sugars (photosynthesis) and is transferred within food chains and food webs (terrestrial and aquatic) from producers to consumers to decomposers. 6.L.2.2 Explain how plants respond to external stimuli (including dormancy and forms of tropism) to enhance survival in an environment. 6.L.2.3 Summarize how the abiotic factors (such as temperature, water, sunlight, and soil quality) of biomes (freshwater, marine, forest, grasslands, desert, Tundra) affect the ability of organisms to grow, survive and/or create their own food through photosynthesis.	variation among offspring. 7.L.2.1 Explain why offspring that result from sexual reproduction (fertilization and meiosis) have greater variation than offspring that result from asexual reproduction (budding and mitosis). 7.L.2.2 Infer patterns of heredity using information from Punnett squares and pedigree analysis. 7.L.2.3 Explain the impact of the environment and lifestyle choices on biological inheritance (to include common genetic diseases) and survival.	space affect populations in an ecosystem. 8.L.3.2 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 • Mutualism 8.L.3.3 Explain how the flow of energy within food webs is interconnected with the cycling of matter (including water, nitrogen, carbon dioxide and oxygen).. **8.L.4** Understand the evolution of organisms and landforms based on evidence, theories and processes that impact the Earth over time. 8.L.4.1 Summarize the use of evidence drawn from geology, fossils, and comparative anatomy to form the basis for biological classification systems and the theory of evolution. 8.L.4.2 Explain the relationship between genetic variation and an organism's ability to adapt to its environment.

			8.L.5 Understand the composition of various substances as it relates to their ability to serve as a source of energy and building materials for growth and repair of organisms. 8.L.5.1 Summarize how food provides the energy and the molecules required for building materials, growth and survival of all organisms (to include plants). 8.L.5.2 Explain the relationship among a healthy diet, exercise, and the general health of the body (emphasis on the relationship between respiration and digestion).
Interpret scientific arguments by: Comparing reasoning and claims based on evidence from two arguments on the same topic	**6.P.1** Understand the properties of waves and the wavelike property of energy in earthquakes, light and sound waves. 6.P.1.1 Compare the properties of waves to the wavelike property of energy in earthquakes, light and sound. **6.P.2** Understand the structure, classifications and physical properties of matter. 6.P.2.3 Compare the physical properties of pure substances that are independent of the amount of matter present	**7.E.1** Understand how the cycling of matter (water and gases) in and out of the atmosphere relates to Earth's atmosphere, weather and climate and the effects of the atmosphere on humans. 7.E.1.1 Compare the composition, properties and structure of Earth's atmosphere to include: mixtures of gases and differences in temperature and pressure within layers. **7.L.1** Understand the processes, structures and functions of living organisms that enable them to survive,	**8.P.1** Understand the properties of matter and changes that occur when matter interacts in an open and closed container. 8.P.1.3 Compare physical changes such as size, shape and state to chemical changes that are the result of a chemical reaction to include changes in temperature, color, formation of a gas or precipitate.

	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.	reproduce and carry out the basic functions of life. 7.L.1.1 Compare the structures and life functions of single-celled organisms that carry out all of the basic functions of life including: ● Euglena ● Amoeba ● Paramecium ● Volvox 7.L.1.2 Compare the structures and functions of plant and animal cells, including major organelles (cell membrane, cell wall, nucleus, chloroplasts, mitochondria, and vacuoles).	
Interpret scientific arguments by: Evaluating whether they emphasize similar or different evidence and/or interpretations of facts	**6.P.1** Understand the properties of waves and the wavelike property of energy in earthquakes, light and sound waves. 6.P.1.2 Explain the relationship among visible light, the electromagnetic spectrum, and sight. 6.P.1.3 Explain the relationship among the rate of vibration, the medium through which vibrations travel, sound and hearing. **6.P.2** Understand the structure, classifications and physical properties of matter.	**7.P.1** Understand motion, the effects of forces on motion and the graphical representations of motion. 7.P.1.1 Explain how the motion of an object can be described by its position, direction of motion, and speed with respect to some other object. 7.P.1.2 Explain the effects of balanced and unbalanced forces acting on an object (including friction, gravity and magnets). 7.P.1.4 Interpret distance versus time graphs for constant speed and variable motion.	*Note: While there are no specific science standards listed, language instruction for this language expectation can be integrated within all aspects of science instruction.

	6.P.2.2 Explain the effect of heat on the motion of atoms through a description of what happens to particles during a change in phase. **6.P.3** Understand characteristics of energy transfer and interactions of matter and energy. 6.P.3.2 Explain the effects of electromagnetic waves on various materials to include absorption, scattering, and change in temperature. 6.P.3.3 Explain the suitability of materials for use in technological design based on a response to heat (to include conduction, expansion, and contraction) and electrical energy (conductors and insulators). **6.E.1** Understand the earth/moon/sun system, and the properties, structures and predictable motions of celestial bodies in the Universe. 6.E.1.1 Explain how the relative motion and relative position of the sun, Earth and moon affect the seasons, tides, phases of the moon, and eclipses. 6.E.1.2 Explain why Earth sustains life while other planets do not based on their	**7.P.2** Understand forms of energy, energy transfer and transformation and conservation in mechanical systems. 7.P.2.1 Explain how kinetic and potential energy contribute to the mechanical energy of an object. 7.P.2.2 Explain how energy can be transformed from one form to another (specifically potential energy and kinetic energy) using a model or diagram of a moving object (roller coaster, pendulum, or cars on ramps as examples). 7.P.2.3 Recognize that energy can be transferred from one system to another when two objects push or pull on each other over a distance (work) and electrical circuits require a complete loop through which an electrical current can pass. 7.P.2.4 Explain how simple machines such as inclined planes, pulleys, levers and wheel and axles are used to create mechanical advantage and increase efficiency. **7.E.1** Understand how the cycling of matter (water and gases) in and out of the atmosphere relates to Earth's atmosphere, weather and climate and the effects of the atmosphere on	

	properties (including types of surface, atmosphere and gravitational force) and location to the Sun. 6.E.1.3 Summarize space exploration and the understandings gained from them. **6.E.2** Understand the structure of the earth and how interactions of constructive and destructive forces have resulted in changes in the surface of the Earth over time and the effects of the lithosphere on humans. 6.E.2.1 Summarize the structure of the earth, including the layers, the mantle and core based on the relative position, composition and density. 6.E.2.2 Explain how crustal plates and ocean basins are formed, move and interact using earthquakes, heat flow and volcanoes to reflect forces within the earth. 6.E.2.3 Explain how the formation of soil is related to the parent rock type and the environment in which it develops. 6.E.2.4 Conclude that the good health of humans requires: monitoring the lithosphere, maintaining soil quality and	humans. 7.E.1.1 Compare the composition, properties and structure of Earth's atmosphere to include: mixtures of gases and differences in temperature and pressure within layers. 7.E.1.2 Explain how the cycling of water in and out of the atmosphere and atmospheric conditions relate to the weather patterns on Earth. 7.E.1.3 Explain the relationship between the movement of air masses, high and low pressure systems, and frontal boundaries to storms (including thunderstorms, hurricanes, and tornadoes) and other weather conditions that may result. 7.E.1.4 Predict weather conditions and patterns based on information obtained from: • Weather data collected from direct observations and measurement (wind speed and direction, air temperature, humidity and air pressure) • Weather maps, satellites and radar • Cloud shapes and types and associated elevation 7.E.1.5 Explain the influence of	

	stewardship. **6.L.1** Understand the structures, processes and behaviors of plants that enable them to survive and reproduce. 6.L.1.1 Summarize the basic structures and functions of flowering plants required for survival, reproduction and defense. 6.L.1.2 Explain the significance of the processes of photo-synthesis, respiration, and transpiration to the survival of green plants and other organisms. **6.L.2** Understand the flow of energy through ecosystems and the responses of populations to the biotic and abiotic factors in their environment. 6.L.2.1 Summarize how energy derived from the sun is used by plants to produce sugars (photosynthesis) and is transferred within food chains and food webs (terrestrial and aquatic) from producers to consumers to decomposers. 6.L.2.2 Explain how plants respond to external stimuli (including dormancy and forms of tropism) to enhance survival in an environment.	convection, global winds and the jet stream on weather and climatic conditions. 7.E.1.6 Conclude that the good health of humans requires: monitoring the atmosphere, maintaining air quality and stewardship. **7.L.1** Understand the processes, structures and functions of living organisms that enable them to survive, reproduce and carry out the basic functions of life. 7.L.1.1 Compare the structures and life functions of single-celled organisms that carry out all of the basic functions of life including: • Euglena • Amoeba • Paramecium • Volvox 7.L.1.2 Compare the structures and functions of plant and animal cells, including major organelles (cell membrane, cell wall, nucleus, chloroplasts, mitochondria, and vacuoles). 7.L.1.3 Summarize the hierarchical organization of multi-cellular organisms from cells to tissues to organs to systems to organisms. 7.L.1.4 Summarize the general	

	6.L.2.3 Summarize how the abiotic factors (such as temperature, water, sunlight, and soil quality) of biomes (freshwater, marine, forest, grasslands, desert, Tundra) affect the ability of organisms to grow, survive and/or create their own food through photosynthesis.	functions of the major systems of the human body (digestion, respiration, reproduction, circulation, and excretion) and ways that these systems interact with each other to sustain life **7.L.2** Understand the relationship of the mechanisms of cellular reproduction, patterns of inheritance and external factors to potential variation among offspring. 7.L.2.1 Explain why offspring that result from sexual reproduction (fertilization and meiosis) have greater variation than offspring that result from asexual reproduction (budding and mitosis). 7.L.2.2 Infer patterns of heredity using information from Punnett squares and pedigree analysis. 7.L.2.3 Explain the impact of the environment and lifestyle choices on biological inheritance (to include common genetic diseases) and survival.	
ELD-SC.6-8.Argue. Expressive	**Grade 6**	**Grade 7**	**Grade 8**
Construct scientific arguments that: Introduce and contextualize topic/	**6.P.1** Understand the properties of waves and the wavelike property of energy in earthquakes, light and sound	**7.P.1** Understand motion, the effects of forces on motion and the graphical representations of motion.	**8.P.1** Understand the properties of matter and changes that occur when matter interacts in an open

phenomenon in issues related to the natural and designed world(s)	waves. 6.P.1.2 Explain the relationship among visible light, the electromagnetic spectrum, and sight. 6.P.1.3 Explain the relationship among the rate of vibration, the medium through which vibrations travel, sound and hearing. **6.P.2** Understand the structure, classifications and physical properties of matter. 6.P.2.1 Recognize that all matter is made up of atoms and atoms of the same element are all alike, but are different from the atoms of other elements. 6.P.2.2 Explain the effect of heat on the motion of atoms through a description of what happens to particles during a change in phase. **6.P.3** Understand characteristics of energy transfer and interactions of matter and energy. 6.P.3.2 Explain the effects of electromagnetic waves on various materials to include absorption, scattering, and change in temperature. 6.P.3.3 Explain the suitability of materials for use in	7.P.1.1 Explain how the motion of an object can be described by its position, direction of motion, and speed with respect to some other object. 7.P.1.2 Explain the effects of balanced and unbalanced forces acting on an object (including friction, gravity and magnets). 7.P.1.4 Interpret distance versus time graphs for constant speed and variable motion. **7.P.2** Understand forms of energy, energy transfer and transformation and conservation in mechanical systems. 7.P.2.1 Explain how kinetic and potential energy contribute to the mechanical energy of an object. 7.P.2.2 Explain how energy can be transformed from one form to another (specifically potential energy and kinetic energy) using a model or diagram of a moving object (roller coaster, pendulum, or cars on ramps as examples). 7.P.2.3 Recognize that energy can be transferred from one system to another when two objects push or pull on each other over a distance (work) and electrical circuits require	and closed container. 8.P.1.2 Explain how the physical properties of elements and their reactivity have been used to produce the current model of the Periodic Table of elements. 8.P.1.3 Compare physical changes such as size, shape and state to chemical changes that are the result of a chemical reaction to include changes in temperature, color, formation of a gas or precipitate. 8.P.1.4 Explain how the idea of atoms and a balanced chemical equation support the law of conservation of mass. **8.P.2** Explain the environmental implications associated with the various methods of obtaining, managing, and using energy resources. 8.P.2.1 Explain the environmental consequences of the various methods of obtaining, transforming and distributing energy. 8.P.2.2 Explain the implications of the depletion of renewable and nonrenewable energy resources and the importance of conservation.

	technological design based on a response to heat (to include conduction, expansion, and contraction) and electrical energy (conductors and insulators). **6.E.1** Understand the earth/moon/sun system, and the properties, structures and predictable motions of celestial bodies in the Universe. 6.E.1.1 Explain how the relative motion and relative position of the sun, Earth and moon affect the seasons, tides, phases of the moon, and eclipses. 6.E.1.2 Explain why Earth sustains life while other planets do not based on their properties (including types of surface, atmosphere and gravitational force) and location to the Sun. 6.E.1.3 Summarize space exploration and the understandings gained from them. **6.E.2** Understand the structure of the earth and how interactions of constructive and destructive forces have resulted in changes in the surface of the Earth over time and the effects of the lithosphere on humans. 6.E.2.1 Summarize the	a complete loop through which an electrical current can pass. 7.P.2.4 Explain how simple machines such as inclined planes, pulleys, levers and wheel and axles are used to create mechanical advantage and increase efficiency. **7.E.1** Understand how the cycling of matter (water and gases) in and out of the atmosphere relates to Earth's atmosphere, weather and climate and the effects of the atmosphere on humans. 7.E.1.1 Compare the composition, properties and structure of Earth's atmosphere to include: mixtures of gases and differences in temperature and pressure within layers. 7.E.1.2 Explain how the cycling of water in and out of the atmosphere and atmospheric conditions relate to the weather patterns on Earth. 7.E.1.3 Explain the relationship between the movement of air masses, high and low pressure systems, and frontal boundaries to storms (including thunderstorms, hurricanes, and tornadoes) and other weather conditions that may result.	**8.E.1** Understand the hydrosphere and the impact of humans on local systems and the effects of the hydrosphere on humans. 8.E.1.1 Explain the structure of the hydrosphere including: • Water distribution on earth • Local river basins and water availability. 8.E.1.2 Summarize evidence that Earth's oceans are a reservoir of nutrients, minerals, dissolved gases, and life forms: • Estuaries • Marine ecosystems • Upwelling • Behavior of gases in the marine environment • Value and sustainability of marine resources • Deep ocean technology and understandings gained. 8.E.1.3 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 • Bio-indicators.

	structure of the earth, including the layers, the mantle and core based on the relative position, composition and density. 6.E.2.2 Explain how crustal plates and ocean basins are formed, move and interact using earthquakes, heat flow and volcanoes to reflect forces within the earth. 6.E.2.3 Explain how the formation of soil is related to the parent rock type and the environment in which it develops. **6.L.1** Understand the structures, processes and behaviors of plants that enable them to survive and reproduce. 6.L.1.1 Summarize the basic structures and functions of flowering plants required for survival, reproduction and defense. 6.L.1.2 Explain the significance of the processes of photo-synthesis, respiration, and transpiration to the survival of green plants and other organisms. **6.L.2** Understand the flow of energy through ecosystems and the responses of populations to the biotic and abiotic factors in their	7.E.1.4 Predict weather conditions and patterns based on information obtained from: • Weather data collected from direct observations and measurement (wind speed and direction, air temperature, humidity and air pressure) • Weather maps, satellites and radar • Cloud shapes and types and associated elevation 7.E.1.5 Explain the influence of convection, global winds and the jet stream on weather and climatic conditions. 7.E.1.6 Conclude that the good health of humans requires: monitoring the atmosphere, maintaining air quality and stewardship. **7.L.1** Understand the processes, structures and functions of living organisms that enable them to survive, reproduce and carry out the basic functions of life. 7.L.1.1 Compare the structures and life functions of single-celled organisms that carry out all of the basic functions of life including: • Euglena	**8.E.2** Understand the history of Earth and its life forms based on evidence of change recorded in fossil records and landforms. 8.E.2.1 Infer the age of Earth and relative age of rocks and fossils from index fossils and ordering of rock layers (relative dating and radioactive dating). 8.E.2.2 Explain the use of fossils, ice cores, composition of sedimentary rocks, faults, and igneous rock formations found in rock layers as evidence of the history of the Earth and its changing life forms. **8.L.1** Understand the hazards caused by agents of diseases that effect living organisms. 8.L.1.1 Summarize the basic characteristics of viruses, bacteria, fungi and parasites relating to the spread, treatment and prevention of disease. 8.L.1.2 Explain the difference between epidemic and pandemic as it relates to the spread, treatment and prevention of disease. **8.L.2** Understand how biotechnology is

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			interconnected with the cycling of matter (including water, nitrogen, carbon dioxide and oxygen). **8.L.4** Understand the evolution of organisms and landforms based on evidence, theories and processes that impact the Earth over time. 8.L.4.1 Summarize the use of evidence drawn from geology, fossils, and comparative anatomy to form the basis for biological classification systems and the theory of evolution. 8.L.4.2 Explain the relationship between genetic variation and an organism's ability to adapt to its environment. **8.L.5** Understand the composition of various substances as it relates to their ability to serve as a source of energy and building materials for growth and repair of organisms. 8.L.5.1 Summarize how food provides the energy and the molecules required for building materials, growth and survival of all organisms (to include plants). 8.L.5.2 Explain the relationship among a healthy diet, exercise, and the general health of the body (emphasis on the

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Construct scientific arguments that: Support or refute a claim based on data and evidence	**6.P.1** Understand the properties of waves and the wavelike property of energy in earthquakes, light and sound waves. 6.P.1.1 Compare the properties of waves to the wavelike property of energy in earthquakes, light and sound. 6.P.1.2 Explain the relationship among visible light, the electromagnetic spectrum, and sight. 6.P.1.3 Explain the relationship among the rate of vibration, the medium through which vibrations travel, sound and hearing.and hearing. **6.P.2** Understand the structure, classifications and physical properties of matter. 6.P.2.2 Explain the effect of heat on the motion of atoms through a description of what happens to particles during a change in phase. 6.P.2.3 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	**7.P.1** Understand motion, the effects of forces on motion and the graphical representations of motion. 7.P.1.1 Explain how the motion of an object can be described by its position, direction of motion, and speed with respect to some other object. 7.P.1.2 Explain the effects of balanced and unbalanced forces acting on an object (including friction, gravity and magnets). 7.P.1.4 Interpret distance versus time graphs for constant speed and variable motion. **7.P.2** Understand forms of energy, energy transfer and transformation and conservation in mechanical systems. 7.P.2.1 Explain how kinetic and potential energy contribute to the mechanical energy of an object. 7.P.2.2 Explain how energy can be transformed from one form to another (specifically potential energy and kinetic energy) using a model or diagram of a moving object (roller coaster, pendulum, or cars on ramps as examples).	**8.P.1** Understand the properties of matter and changes that occur when matter interacts in an open and closed container. 8.P.1.2 Explain how the physical properties of elements and their reactivity have been used to produce the current model of the Periodic Table of elements. 8.P.1.4 Explain how the idea of atoms and a balanced chemical equation support the law of conservation of mass. **8.P.2** Explain the environmental implications associated with the various methods of obtaining, managing, and using energy resources. 8.P.2.1 Explain the environmental consequences of the various methods of obtaining, transforming and distributing energy. 8.P.2.2 Explain the implications of the depletion of renewable and nonrenewable energy resources and the importance of conservation. 8.E.1 Understand the hydrosphere and

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			evidence drawn from geology, fossils, and comparative anatomy to form the basis for biological classification systems and the theory of evolution. 8.L.4.2 Explain the relationship between genetic variation and an organism's ability to adapt to its environment. 8.L.5 Understand the composition of various substances as it relates to their ability to serve as a source of energy and building materials for growth and repair of organisms. 8.L.5.1 Summarize how food provides the energy and the molecules required for building materials, growth and survival of all organisms (to include plants). 8.L.5.2 Explain the relationship among a healthy diet, exercise, and the general health of the body (emphasis on the relationship between respiration and digestion).
Construct scientific arguments that: Signal logical relationships among reasoning, evidence, data, and/or a model when making or defending a claim or counterclaim	**6.P.1** Understand the properties of waves and the wavelike property of energy in earthquakes, light and sound waves. 6.P.1.1 Compare the properties of waves to the wavelike property of energy in	**7.P.1** Understand motion, the effects of forces on motion and the graphical representations of motion. 7.P.1.1 Explain how the motion of an object can be described by its position, direction of motion, and speed with respect	**8.P.1** Understand the properties of matter and changes that occur when matter interacts in an open and closed container. 8.P.1.2 Explain how the physical properties of elements and their reactivity have been

	earthquakes, light and sound. 6.P.1.2 Explain the relationship among visible light, the electromagnetic spectrum, and sight. 6.P.1.3 Explain the relationship among the rate of vibration, the medium through which vibrations travel, sound and hearing. **6.P.2** Understand the structure, classifications and physical properties of matter. 6.P.2.2 Explain the effect of heat on the motion of atoms through a description of what happens to particles during a change in phase. 6.P.2.3 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. **6.P.3** Understand characteristics of energy transfer and interactions of matter and energy. 6.P.3.2 Explain the effects of electromagnetic waves on	to some other object. 7.P.1.2 Explain the effects of balanced and unbalanced forces acting on an object (including friction, gravity and magnets). 7.P.1.4 Interpret distance versus time graphs for constant speed and variable motion. **7.P.2** Understand forms of energy, energy transfer and transformation and conservation in mechanical systems. 7.P.2.1 Explain how kinetic and potential energy contribute to the mechanical energy of an object. 7.P.2.2 Explain how energy can be transformed from one form to another (specifically potential energy and kinetic energy) using a model or diagram of a moving object (roller coaster, pendulum, or cars on ramps as examples). 7.P.2.3 Recognize that energy can be transferred from one system to another when two objects push or pull on each other over a distance (work) and electrical circuits require a complete loop through which an electrical current can pass. 7.P.2.4 Explain how simple machines such as inclined	used to produce the current model of the Periodic Table of elements. 8.P.1.4 Explain how the idea of atoms and a balanced chemical equation support the law of conservation of mass. **8.P.2** Explain the environmental implications associated with the various methods of obtaining, managing, and using energy resources. 8.P.2.1 Explain the environmental consequences of the various methods of obtaining, transforming and distributing energy. 8.P.2.2 Explain the implications of the depletion of renewable and nonrenewable energy resources and the importance of conservation. **8.E.1** Understand the hydrosphere and the impact of humans on local systems and the effects of the hydrosphere on humans. 8.E.1.1 Explain the structure of the hydrosphere including: • Water distribution on earth • Local river basins and water availability. 8.E.1.2 Summarize evidence

	various materials to include absorption, scattering, and change in temperature. 6.P.3.3 Explain the suitability of materials for use in technological design based on a response to heat (to include conduction, expansion, and contraction) and electrical energy (conductors and insulators). **6.E.1** Understand the earth/moon/sun system, and the properties, structures and predictable motions of celestial bodies in the Universe. 6.E.1.1 Explain how the relative motion and relative position of the sun, Earth and moon affect the seasons, tides, phases of the moon, and eclipses. 6.E.1.2 Explain why Earth sustains life while other planets do not based on their properties (including types of surface, atmosphere and gravitational force) and location to the Sun. **6.E.2** Understand the structure of the earth and how interactions of constructive and destructive forces have resulted in changes in the surface of the Earth over time and the	planes, pulleys, levers and wheel and axles are used to create mechanical advantage and increase efficiency. **7.E.1** Understand how the cycling of matter (water and gases) in and out of the atmosphere relates to Earth's atmosphere, weather and climate and the effects of the atmosphere on humans. 7.E.1.1 Compare the composition, properties and structure of Earth's atmosphere to include: mixtures of gases and differences in temperature and pressure within layers. 7.E.1.2 Explain how the cycling of water in and out of the atmosphere and atmospheric conditions relate to the weather patterns on Earth. 7.E.1.3 Explain the relationship between the movement of air masses, high and low pressure systems, and frontal boundaries to storms (including thunderstorms, hurricanes, and tornadoes) and other weather conditions that may result. 7.E.1.4 Predict weather conditions and patterns based on information obtained from: • Weather data collected from direct observations	that Earth's oceans are a reservoir of nutrients, minerals, dissolved gases, and life forms: • Estuaries • Marine ecosystems • Upwelling • Behavior of gases in the marine environment • Value and sustainability of marine resources • Deep ocean technology and understandings gained. 8.E.1.3 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 • Bio-indicators. **8.E.2** Understand the history of Earth and its life forms based on evidence of change recorded in fossil records and landforms. 8.E.2.1 Infer the age of Earth and relative age of rocks and fossils from index fossils and ordering of rock layers (relative dating and radioactive dating). 8.E.2.2 Explain the use of

	effects of the lithosphere on humans. 6.E.2.2 Explain how crustal plates and ocean basins are formed, move and interact using earthquakes, heat flow and volcanoes to reflect forces within the earth. 6.E.2.3 Explain how the formation of soil is related to the parent rock type and the environment in which it develops. **6.L.1** Understand the structures, processes and behaviors of plants that enable them to survive and reproduce. 6.L.1.1 Summarize the basic structures and functions of flowering plants required for survival, reproduction and defense. 6.L.1.2 Explain the significance of the processes of photo-synthesis, respiration, and transpiration to the survival of green plants and other organisms. **6.L.2** Understand the flow of energy through ecosystems and the responses of populations to the biotic and abiotic factors in their environment. 6.L.2.1 Summarize how energy derived from the sun is used by	and measurement (wind speed and direction, air temperature, humidity and air pressure) • Weather maps, satellites and radar • Cloud shapes and types and associated elevation 7.E.1.5 Explain the influence of convection, global winds and the jet stream on weather and climatic conditions. 7.E.1.6 Conclude that the good health of humans requires: monitoring the atmosphere, maintaining air quality and stewardship. **7.L.1** Understand the processes, structures and functions of living organisms that enable them to survive, reproduce and carry out the basic functions of life. 7.L.1.1 Compare the structures and life functions of single-celled organisms that carry out all of the basic functions of life including: • Euglena • Amoeba • Paramecium • Volvox 7.L.1.2 Compare the structures and functions of plant and	fossils, ice cores, composition of sedimentary rocks, faults, and igneous rock formations found in rock layers as evidence of the history of the Earth and its changing life forms. **8.L.1** Understand the hazards caused by agents of diseases that effect living organisms. 8.L.1.1 Summarize the basic characteristics of viruses, bacteria, fungi and parasites relating to the spread, treatment and prevention of disease. 8.L.1.2 Explain the difference between epidemic and pandemic as it relates to the spread, treatment and prevention of disease. **8.L.3** Understand how organisms interact with and respond to the biotic and abiotic components of their environment. 8.L.3.1 Explain how factors such as food, water, shelter and space affect populations in an ecosystem. 8.L.3.2 Summarize the relationships among producers, consumers, and decomposers including the positive and

	plants to produce sugars (photosynthesis) and is transferred within food chains and food webs (terrestrial and aquatic) from producers to consumers to decomposers. 6.L.2.2 Explain how plants respond to external stimuli (including dormancy and forms of tropism) to enhance survival in an environment. 6.L.2.3 Summarize how the abiotic factors (such as temperature, water, sunlight, and soil quality) of biomes (freshwater, marine, forest, grasslands, desert, Tundra) affect the ability of organisms to grow, survive and/or create their own food through photosynthesis.	animal cells, including major organelles (cell membrane, cell wall, nucleus, chloroplasts, mitochondria, and vacuoles). 7.L.1.3 Summarize the hierarchical organization of multi-cellular organisms from cells to tissues to organs to systems to organisms. 7.L.1.4 Summarize the general functions of the major systems of the human body (digestion, respiration, reproduction, circulation, and excretion) and ways that these systems interact with each other to sustain life. **7.L.2** Understand the relationship of the mechanisms of cellular reproduction, patterns of inheritance and external factors to potential variation among offspring. 7.L.2.1 Explain why offspring that result from sexual reproduction (fertilization and meiosis) have greater variation than offspring that result from asexual reproduction (budding and mitosis). 7.L.2.2 Infer patterns of heredity using information from Punnett squares and pedigree analysis. 7.L.2.3 Explain the impact of	negative consequences of such interactions including: • Coexistence and cooperation • Competition (predator/prey) • Parasitism • Mutualism 8.L.3.3 Explain how the flow of energy within food webs is interconnected with the cycling of matter (including water, nitrogen, carbon dioxide and oxygen). **8.L.4** Understand the evolution of organisms and landforms based on evidence, theories and processes that impact the Earth over time. 8.L.4.1 Summarize the use of evidence drawn from geology, fossils, and comparative anatomy to form the basis for biological classification systems and the theory of evolution. 8.L.4.2 Explain the relationship between genetic variation and an organism's ability to adapt to its environment. **8.L.5** Understand the composition of various substances as it relates to their ability to serve as a source of energy and building materials for growth and repair of organisms.

		the environment and lifestyle choices on biological inheritance (to include common genetic diseases) and survival.	8.L.5.1 Summarize how food provides the energy and the molecules required for building materials, growth and survival of all organisms (to include plants). 8.L.5.2 Explain the relationship among a healthy diet, exercise, and the general health of the body (emphasis on the relationship between respiration and digestion).

ELD Standard 4: Language for Science
Grades 9-12

ELD-SC.9-12.Explain. Interpretive.	Biology	Chemistry	Earth and Environmental
Interpret scientific explanations by: Defining investigable questions or problems based on observations, information, and/or data about a phenomenon	**Bio.1.1** Understand the relationship between the structures and functions of cells and their organelles. Bio.1.1.3 Explain how instructions in DNA lead to cell differentiation and result in cells specialized to perform specific functions in multicellular organisms. **Bio.1.2** Analyze the cell as a living system. Bio.1.2.1 Explain how homeostasis is maintained in the cell and within an organism in various environments (including temperature and pH). Bio.1.2.2 Analyze how cells grow and reproduce in terms of interphase, mitosis and cytokinesis. Bio.1.2.3 Explain how specific cell adaptations help cells survive in particular environments (focus on unicellular organisms). **Bio.2.1** Analyze the interdependence of living organisms within their	**Chm.1.1** Analyze the structure of atoms and ions. Chm.1.1.3 Explain the emission of electromagnetic radiation in spectral form in terms of the Bohr model. Chm.1.1.4 Explain the process of radioactive decay by the use of nuclear equations and half-life. **Chm.1.2** Understand the bonding that occurs in simple compounds in terms of bond type, strength, and properties. Chm.1.2.4 Interpret the name and formula of compounds using IUPAC convention. **Chm.2.1** Understand the relationship among pressure, temperature, volume, and phase. Chm.2.1.1 Explain the energetic nature of phase changes. Chm.2.1.2 Explain heating and cooling curves (heat of fusion, heat of vaporization, heat, melting point, and boiling point).	**EEn.1.1** Explain the Earth's role as a body in space. EEn.1.1.1 Explain the Earth's motion through space, including precession, nutation, the barycenter, and its path about the galaxy. EEn.1.1.2 Explain how the Earth's rotation and revolution about the Sun affect its shape and is related to seasons and tides. EEn.1.1.3 Explain how the sun produces energy which is transferred to the Earth by radiation. EEn.1.1.4 Explain how incoming solar energy makes life possible on Earth. **EEn.2.1** Explain how processes and forces affect the lithosphere. EEn.2.1.1 Explain how the rock cycle, plate tectonics, volcanoes, and earthquakes impact the lithosphere. EEn.2.1.2 Predict the locations of volcanoes, earthquakes, and faults based on information

	environments. Bio.2.1.1 Analyze the flow of energy and cycling of matter (water, carbon, nitrogen and oxygen) through ecosystems relating the significance of each to maintaining the health and sustainability of an ecosystem. Bio.2.1.2 Analyze the survival and reproductive success of organisms in terms of behavioral, structural, and reproductive adaptations. Bio.2.1.3 Explain various ways organisms interact with each other (including predation, competition, parasitism, mutualism) and with their environments resulting in stability within ecosystems. Bio.2.1.4 Explain why eco-systems can be relatively stable over hundreds or thousands of years, even though populations may fluctuate (emphasizing availability of food, availability of shelter, number of predators and disease). **Bio.2.2** Understand the impact of human activities on the environment (one generation affects the next). Bio.2.2.1 Infer how human activities (including population growth, pollution, global	Chm.2.1.3 Interpret the data presented in phase diagrams. Chm.2.1.5 Explain the relationships between pressure, temperature, volume, and quantity of gas both qualitative and quantitative. **Chm.2.2** Analyze chemical reactions in terms of quantities, product formation, and energy. Chm.2.2.1 Explain the energy content of a chemical reaction. Chm.2.2.2 Analyze the evidence of chemical change. Chm.2.2.3 Analyze the law of conservation of matter and how it applies to various types of chemical equations (synthesis, decomposition, single replacement, double replacement, and combustion). Chm.2.2.4 Analyze the stoichiometric relationships inherent in a chemical reaction. Chm.2.2.5 Analyze quantitatively the composition of a substance (empirical formula, molecular formula, percent composition, and hydrates). **Chm.3.1** Understand the factors affecting rate of reaction and chemical equilibrium.	contained in a variety of maps. EEn.2.1.3 Explain how natural actions such as weathering, erosion (wind, water and gravity), and soil formation affect Earth's surface. EEn.2.1.4 Explain the probability of and preparation for geohazards such as landslides, avalanches, earthquakes and volcanoes in a particular area based on available data. **EEn.2.2** Understand how human influences impact the Lithosphere. EEn.2.2.1 Explain the consequences of human activities on the lithosphere (such as mining, deforestation, agriculture, overgrazing, urbanization, and land use) past and present. EEn.2.2.2 Compare the various methods humans use to acquire traditional energy sources (such as peat, coal, oil, natural gas, nuclear fission, and wood). **EEn.2.3** Explain the structure and processes within the hydrosphere. EEn.2.3.1 Explain how water is an energy agent (currents and heat transfer).

	warming, burning of fossil fuels, habitat destruction and introduction of nonnative species) may impact the environment. Bio.2.2.2 Explain how the use, protection and conservation of natural resources by humans impact the environment from one generation to the next. **Bio.3.1** Explain how traits are determined by the structure and function of DNA. Bio.3.1.1 Explain the double-stranded, complementary nature of DNA as related to its function in the cell. Bio.3.1.2 Explain how DNA and RNA code for proteins and determine traits. Bio.3.1.3 Explain how mutations in DNA that result from interactions with the environment (i.e. radiation and chemicals) or new combinations in existing genes lead to changes in function and phenotype. **Bio.3.2** Understand how the environment, and/or the interaction of alleles, influences the expression of genetic traits. Bio.3.2.1 Explain the role of	Chm.3.1.1 Explain the factors that affect the rate of a reaction (temperature, concentration, particle size and presence of a catalyst). Chm.3.1.2 Explain the conditions of a system at equilibrium. Chm.3.1.3 Infer the shift in equilibrium when a stress is applied to a chemical system (Le Chatelier's Principle). **Chm.3.2** Understand solutions and the solution process. Chm.3.2.3 Infer the quantitative nature of a solution (molarity, dilution, and titration with a 1:1 molar ratio). Chm.3.2.5 Interpret solubility diagrams. Chm.3.2.6 Explain the solution process.	EEn2.3.2 Explain how ground-water and surface water interact. **EEn.2.4** Evaluate how humans use water. EEn.2.4.1 Evaluate human influences on freshwater availability. EEn.2.4.2 Evaluate human influences on water quality in North Carolina's river basins, wetlands and tidal environ-ments. **EEn.2.5** Understand the structure of and processes within our atmosphere. EEn.2.5.2 Explain the formation of typical air masses and the weather systems that result from air mass interactions. EEn.2.5.3 Explain how cyclonic storms form based on the interaction of air masses. EEn.2.5.4 Predict the weather using available weather maps and data (including surface, upper atmospheric winds, and satellite imagery). EEn.2.5.5 Explain how human activities affect air quality. **EEn.2.6** Analyze patterns of global climate change over time. EEn.2.6.1 Differentiate between

	meiosis in sexual reproduction and genetic variation. Bio.3.2.2 Predict offspring ratios based on a variety of inheritance patterns (including dominance, co-dominance, incomplete dominance, multiple alleles, and sex-linked traits). Bio.3.2.3 Explain how the environment can influence the expression of genetic traits. **Bio.3.3** Understand the application of DNA technology. Bio.3.3.1 Interpret how DNA is used for comparison and identification of organisms. Bio.3.3.2 Summarize how transgenic organisms are engineered to benefit society. Bio.3.3.3 Evaluate some of the ethical issues surrounding the use of DNA technology (including cloning, genetically modified organisms, stem cell research, and Human Genome Project). **Bio.3.4** Explain the theory of evolution by natural selection as a mechanism for how species change over time. Bio.3.4.1 Explain how fossil, biochemical, and anatomical evidence support the theory of evolution.		weather and climate. EEn.2.6.2 Explain changes in global climate due to natural processes. EEn.2.6.3 Analyze the impacts that human activities have on global climate change (such as burning hydrocarbons, greenhouse effect, and deforestation). EEn.2.6.4 Attribute changes in Earth systems to global climate change (temperature change, changes in pH of ocean, sea level changes, etc.). **EEn.2.7** Explain how the lithosphere, hydrosphere, and Atmosphere individually and collectively affect the biosphere. EEn.2.7.1 Explain how abiotic and biotic factors interact to create the various biomes in North Carolina. EEn.2.7.2 Explain why biodiversity is important to the biosphere. EEn.2.7.3 Explain how human activities impact the biosphere. **EEn.2.8** Evaluate human behaviors in terms of how likely they are to ensure the ability to live sustainably on Earth. EEn.2.8.1 Evaluate alternative energy technologies for use in

	Bio.3.4.2 Explain how natural selection influences the changes in species over time. Bio.3.4.3 Explain how various disease agents (bacteria, viruses, chemicals) can influence natural selection. **Bio 3.5** Analyze how classification systems are developed based upon speciation. Bio.3.5.1 Explain the historical development and changing nature of classification systems. Bio.3.5.2 Analyze the classification of organisms according to their evolutionary relationships (including dichotomous keys and phylogenetic trees). **Bio.4.1** Understand how biological molecules are essential to the survival of living organisms. Bio.4.1.2 Summarize the relationship among DNA, proteins and amino acids in carrying out the work of cells and how this is similar in all organisms. Bio.4.1.3 Explain how enzymes act as catalysts for biological reactions. **Bio 4.2** Analyze the relationships		North Carolina. EEn.2.8.3 Explain the effects of uncontrolled population growth on the Earth's resources. EEn.2.8.4 Evaluate the concept of "reduce, reuse, recycle" in terms of impact on natural resources.

	between biochemical processes and energy use in the cell. Bio.4.2.1 Analyze photosynthesis and cellular respiration in terms of how energy is stored, released, and transferred within and between these systems. Bio.4.2.2 Explain ways that organisms use released energy for maintaining homeostasis (active transport).		
Interpret scientific explanations by: Paraphrasing central ideas in complex evidence, concepts, processes, and information to help explain how or why a phenomenon occurs	**Bio.1.1** Understand the relationship between the structures and functions of cells and their organelles. Bio.1.1.1 Summarize the structure and function of organelles in eukaryotic cells (including the nucleus, plasma membrane, cell wall, mitochondria, vacuoles, chloroplasts, and ribosomes) and ways that these organelles interact with each other to perform the function of the cell. Bio.1.1.3 Explain how instructions in DNA lead to cell differentiation and result in cells specialized to perform specific functions in multicellular organisms. **Bio.1.2** Analyze the cell as a living system.	**Chm.1.1** Analyze the structure of atoms and ions. Chm.1.1.3 Explain the emission of electromagnetic radiation in spectral form in terms of the Bohr model. Chm.1.1.4 Explain the process of radioactive decay by the use of nuclear equations and half-life. **Chm.2.1** Understand the relationship among pressure, temperature, volume, and phase. Chm.2.1.1 Explain the energetic nature of phase changes. Chm.2.1.2 Explain heating and cooling curves (heat of fusion, heat of vaporization, heat, melting point, and boiling point).	**EEn.1.1** Explain the Earth's role as a body in space. EEn.1.1.1 Explain the Earth's motion through space, including precession, nutation, the barycenter, and its path about the galaxy. EEn.1.1.2 Explain how the Earth's rotation and revolution about the Sun affect its shape and is related to seasons and tides. EEn.1.1.3 Explain how the sun produces energy which is transferred to the Earth by radiation. EEn.1.1.4 Explain how incoming solar energy makes life possible on Earth. **EEn.2.1** Explain how processes and forces affect the lithosphere.

	Bio.1.2.1 Explain how homeostasis is maintained in the cell and within an organism in various environments (including temperature and pH). Bio.1.2.2 Analyze how cells grow and reproduce in terms of interphase, mitosis and cytokinesis. Bio.1.2.3 Explain how specific cell adaptations help cells survive in particular environments (focus on unicellular organisms). **Bio.2.1** Analyze the interdependence of living organisms within their environments. Bio.2.1.1 Analyze the flow of energy and cycling of matter (water, carbon, nitrogen and oxygen) through ecosystems relating the significance of each to maintaining the health and sustainability of an ecosystem. Bio.2.1.2 Analyze the survival and reproductive success of organisms in terms of behavioral, structural, and reproductive adaptations. Bio.2.1.3 Explain various ways organisms interact with each other (including predation, competition, parasitism, mutualism) and with their	Chm.2.1.5 Explain the relationships between pressure, temperature, volume, and quantity of gas both qualitative and quantitative. **Chm.2.2** Analyze chemical reactions in terms of quantities, product formation, and energy. Chm.2.2.1 Explain the energy content of a chemical reaction. Chm.2.2.2 Analyze the evidence of chemical change. Chm.2.2.3 Analyze the law of conservation of matter and how it applies to various types of chemical equations (synthesis, decomposition, single replacement, double replacement, and combustion). Chm.2.2.4 Analyze the stoichiometric relationships inherent in a chemical reaction. Chm.2.2.5 Analyze quantitatively the composition of a substance (empirical formula, molecular formula, percent composition, and hydrates). **Chm.3.1** Understand the factors affecting rate of reaction and chemical equilibrium.	EEn.2.1.1 Explain how the rock cycle, plate tectonics, volcanoes, and earthquakes impact the lithosphere. EEn.2.1.2 Predict the locations of volcanoes, earthquakes, and faults based on information contained in a variety of maps. EEn.2.1.3 Explain how natural actions such as weathering, erosion (wind, water and gravity), and soil formation affect Earth's surface. EEn.2.1.4 Explain the probability of and preparation for geohazards such as landslides, avalanches, earthquakes and volcanoes in a particular area based on available data **EEn.2.2** Understand how human influences impact the Lithosphere. EEn.2.2.1 Explain the consequences of human activities on the lithosphere (such as mining, deforestation, agriculture, overgrazing, urbanization, and land use) past and present. EEn.2.2.2 Compare the various methods humans use to acquire traditional energy sources (such as peat, coal, oil,

	environments resulting in stability within ecosystems. Bio.2.1.4 Explain why ecosystems can be relatively stable over hundreds or thousands of years, even though populations may fluctuate (emphasizing availability of food, availability of shelter, number of predators and disease). **Bio.2.2** Understand the impact of human activities on the environment (one generation affects the next). Bio.2.2.2 Explain how the use, protection and conservation of natural resources by humans impact the environment from one generation to the next. **Bio.3.1** Explain how traits are determined by the structure and function of DNA. Bio.3.1.1 Explain the double-stranded, complementary nature of DNA as related to its function in the cell. Bio.3.1.2 Explain how DNA and RNA code for proteins and determine traits. Bio.3.1.3 Explain how mutations in DNA that result from interactions with the environment (i.e. radiation and chemicals) or new	Chm.3.1.1 Explain the factors that affect the rate of a reaction (temperature, concentration, particle size and presence of a catalyst). Chm.3.1.2 Explain the conditions of a system at equilibrium. Chm.3.1.3 Infer the shift in equilibrium when a stress is applied to a chemical system (Le Chatelier's Principle). **Chm.3.2** Understand solutions and the solution process. Chm.3.2.4 Summarize the properties of solutions. Chm.3.2.5 Interpret solubility diagrams. Chm.3.2.6 Explain the solution process.	natural gas, nuclear fission, and wood). **EEn.2.3** Explain the structure and processes within the hydrosphere. EEn.2.3.1 Explain how water is an energy agent (currents and heat transfer). EEn2.3.2 Explain how groundwater and surface water interact. **EEn.2.4** Evaluate how humans use water. EEn.2.4.1 Evaluate human influences on freshwater availability. EEn.2.4.2 Evaluate human influences on water quality in North Carolina's river basins, wetlands and tidal environments. **EEn.2.5** Understand the structure of and processes within our atmosphere. EEn.2.5.1 Summarize the structure and composition of our atmosphere. EEn.2.5.2 Explain the formation of typical air masses and the weather systems that result from air mass interactions. EEn.2.5.3 Explain how cyclonic storms form based on the interaction of air masses.

	combinations in existing genes lead to changes in function and phenotype. **Bio.3.2** Understand how the environment, and/or the interaction of alleles, influences the expression of genetic traits. Bio.3.2.1 Explain the role of meiosis in sexual reproduction and genetic variation. Bio.3.2.3 Explain how the environment can influence the expression of genetic traits.. **Bio.3.3** Understand the application of DNA technology. Bio.3.3.1 Interpret how DNA is used for comparison and identification of organisms. Bio.3.3.2 Summarize how transgenic organisms are engineered to benefit society. Bio.3.3.3 Evaluate some of the ethical issues surrounding the use of DNA technology (including cloning, genetically modified organisms, stem cell research, and Human Genome Project). **Bio.3.4** Explain the theory of evolution by natural selection as a mechanism for how species change over time. Bio. Bio.3.4.1 Explain how fossil,		EEn.2.5.4 Predict the weather using available weather maps and data (including surface, upper atmospheric winds, and satellite imagery). EEn.2.5.5 Explain how human activities affect air quality. **EEn.2.6** Analyze patterns of global climate change over time. EEn.2.6.1 Differentiate between weather and climate. EEn.2.6.2 Explain changes in global climate due to natural processes. EEn.2.6.3 Analyze the impacts that human activities have on global climate change (such as burning hydrocarbons, green-house effect, and deforest-ation). EEn.2.6.4 Attribute changes in Earth systems to global climate change (temperature change, changes in pH of ocean, sea level changes, etc.). **EEn.2.7** Explain how the lithosphere, hydrosphere, and Atmosphere individually and collectively affect the biosphere. EEn.2.7.1 Explain how abiotic and biotic factors interact to create the various biomes in North Carolina.

	biochemical, and anatomical evidence support the theory of evolution. Bio.3.4.2 Explain how natural selection influences the changes in species over time. Bio.3.4.3 Explain how various disease agents (bacteria, viruses, chemicals) can influence natural selection. **Bio 3.5** Analyze how classification systems are developed based upon speciation. Bio.3.5.1 Explain the historical development and changing nature of classification systems. **Bio.4.1** Understand how biological molecules are essential to the survival of living organisms. Bio.4.1.2 Summarize the relationship among DNA, proteins and amino acids in carrying out the work of cells and how this is similar in all organisms. Bio.4.1.3 Explain how enzymes act as catalysts for biological reactions **Bio 4.2** Analyze the relationships between biochemical processes and energy use in the cell. Bio.4.2.1 Analyze		EEn.2.7.2 Explain why bio-diversity is important to the biosphere. EEn.2.7.3 Explain how human activities impact the biosphere. **EEn.2.8** Evaluate human behaviors in terms of how likely they are to ensure the ability to live sustainably on Earth. EEn.2.8.1 Evaluate alternative energy technologies for use in North Carolina. EEn.2.8.2 Critique conventional and sustainable agriculture and aquaculture practices in terms of their environmental impacts. EEn.2.8.3 Explain the effects of uncontrolled population growth on the Earth's resources. EEn.2.8.4 Evaluate the concept of "reduce, reuse, recycle" in terms of impact on natural resources.

	photosynthesis and cellular respiration in terms of how energy is stored, released, and transferred within and between these systems. Bio.4.2.2 Explain ways that organisms use released energy for maintaining homeostasis (active transport).		
Interpret scientific explanations by: Evaluating the extent to which reasoning, theory and/or models link evidence to claims and support conclusions	**Bio.1.1** Understand the relationship between the structures and functions of cells and their organelles. Bio.1.1.1 Summarize the structure and function of organelles in eukaryotic cells (including the nucleus, plasma membrane, cell wall, mitochondria, vacuoles, chloroplasts, and ribosomes) and ways that these organelles interact with each other to perform the function of the cell. Bio.1.1.3 Explain how instructions in DNA lead to cell differentiation and result in cells specialized to perform specific functions in multicellular organisms. **Bio.1.2** Analyze the cell as a living system. Bio.1.2.1 Explain how homeostasis is maintained in the cell and within an organism	**Chm.1.1** Analyze the structure of atoms and ions. Chm.1.1.3 Explain the emission of electromagnetic radiation in spectral form in terms of the Bohr model. Chm.1.1.4 Explain the process of radioactive decay by the use of nuclear equations and half-life. **Chm.2.1** Understand the relationship among pressure, temperature, volume, and phase. Chm.2.1.1 Explain the energetic nature of phase changes. Chm.2.1.2 Explain heating and cooling curves (heat of fusion, heat of vaporization, heat, melting point, and boiling point). Chm.2.1.5 Explain the relationships between pressure, temperature, volume, and	**EEn.1.1** Explain the Earth's role as a body in space. EEn.1.1.1 Explain the Earth's motion through space, including precession, nutation, the barycenter, and its path about the galaxy. EEn.1.1.2 Explain how the Earth's rotation and revolution about the Sun affect its shape and is related to seasons and tides. EEn.1.1.3 Explain how the sun produces energy which is transferred to the Earth by radiation. EEn.1.1.4 Explain how incoming solar energy makes life possible on Earth. **EEn.2.1** Explain how processes and forces affect the lithosphere. EEn.2.1.1 Explain how the rock cycle, plate tectonics, volcanoes, and earthquakes

	in various environments (including temperature and pH). Bio.1.2.2 Analyze how cells grow and reproduce in terms of interphase, mitosis and cytokinesis. Bio.1.2.3 Explain how specific cell adaptations help cells survive in particular environments (focus on unicellular organisms). **Bio.2.1** Analyze the interdependence of living organisms within their environments. Bio.2.1.1 Analyze the flow of energy and cycling of matter (water, carbon, nitrogen and oxygen) through ecosystems relating the significance of each to maintaining the health and sustainability of an ecosystem. Bio.2.1.2 Analyze the survival and reproductive success of organisms in terms of behavioral, structural, and reproductive adaptations. Bio.2.1.3 Explain various ways organisms interact with each other (including predation, competition, parasitism, mutualism) and with their environments resulting in stability within ecosystems.	quantity of gas both qualitative and quantitative. **Chm.2.2** Analyze chemical reactions in terms of quantities, product formation, and energy. Chm.2.2.1 Explain the energy content of a chemical reaction. Chm.2.2.2 Analyze the evidence of chemical change. Chm.2.2.3 Analyze the law of conservation of matter and how it applies to various types of chemical equations (synthesis, decomposition, single replacement, double replacement, and combustion). Chm.2.2.4 Analyze the stoichiometric relationships inherent in a chemical reaction. Chm.2.2.5 Analyze quantitatively the composition of a substance (empirical formula, molecular formula, percent composition, and hydrates). **Chm.3.1** Understand the factors affecting rate of reaction and chemical equilibrium. Chm.3.1.1 Explain the factors that affect the rate of a reaction (temperature, concentration, particle size and presence of a catalyst).	impact the lithosphere. EEn.2.1.2 Predict the locations of volcanoes, earthquakes, and faults based on information contained in a variety of maps. EEn.2.1.3 Explain how natural actions such as weathering, erosion (wind, water and gravity), and soil formation affect Earth's surface. EEn.2.1.4 Explain the probability of and preparation for geohazards such as landslides, avalanches, earthquakes and volcanoes in a particular area based on available data. **EEn.2.2** Understand how human influences impact the Lithosphere. EEn.2.2.1 Explain the consequences of human activities on the lithosphere (such as mining, deforestation, agriculture, overgrazing, urbanization, and land use) past and present. EEn.2.2.2 Compare the various methods humans use to acquire traditional energy sources (such as peat, coal, oil, natural gas, nuclear fission, and wood).. **EEn.2.3** Explain the structure and

	Bio.2.1.4 Explain why ecosystems can be relatively stable over hundreds or thousands of years, even though populations may fluctuate (emphasizing availability of food, availability of shelter, number of predators and disease). **Bio.2.2** Understand the impact of human activities on the environment (one generation affects the next). Bio.2.2.1 Infer how human activities (including population growth, pollution, global warming, burning of fossil fuels, habitat destruction and introduction of nonnative species) may impact the environment. Bio.2.2.2 Explain how the use, protection and conservation of natural resources by humans impact the environment from one generation to the next. **Bio.3.1** Explain how traits are determined by the structure and function of DNA. Bio.3.1.1 Explain the double-stranded, complementary nature of DNA as related to its function in the cell. Bio.3.1.2 Explain how DNA and RNA code for proteins and	Chm.3.1.2 Explain the conditions of a system at equilibrium. Chm.3.1.3 Infer the shift in equilibrium when a stress is applied to a chemical system (Le Chatelier's Principle). **Chm.3.2** Understand solutions and the solution process. Chm.3.2.5 Interpret solubility diagrams. Chm.3.2.6 Explain the solution process.	processes within the hydrosphere. EEn.2.3.1 Explain how water is an energy agent (currents and heat transfer). EEn2.3.2 Explain how groundwater and surface water interact. **EEn.2.4** Evaluate how humans use water. EEn.2.4.1 Evaluate human influences on freshwater availability. EEn.2.4.2 Evaluate human influences on water quality in North Carolina's river basins, wetlands and tidal environments. **EEn.2.5** Understand the structure of and processes within our atmosphere. EEn.2.5.1 Summarize the structure and composition of our atmosphere. EEn.2.5.2 Explain the formation of typical air masses and the weather systems that result from air mass interactions. EEn.2.5.3 Explain how cyclonic storms form based on the interaction of air masses. EEn.2.5.4 Predict the weather using available weather maps and data (including surface, upper atmospheric winds, and

	determine traits. Bio.3.1.3 Explain how mutations in DNA that result from interactions with the environment (i.e. radiation and chemicals) or new combinations in existing genes lead to changes in function and phenotype. **Bio.3.2** Understand how the environment, and/or the interaction of alleles, influences the expression of genetic traits. Bio.3.2.1 Explain the role of meiosis in sexual reproduction and genetic variation. Bio.3.2.2 Predict offspring ratios based on a variety of inheritance patterns (including dominance, co-dominance, incomplete dominance, multiple alleles, and sex-linked traits). Bio.3.2.3 Explain how the environment can influence the expression of genetic traits. **Bio.3.3** Understand the application of DNA technology. Bio.3.3.1 Interpret how DNA is used for comparison and identification of organisms. Bio.3.3.2 Summarize how transgenic organisms are engineered to benefit society.		satellite imagery). EEn.2.5.5 Explain how human activities affect air quality. **EEn.2.6** Analyze patterns of global climate change over time. EEn.2.6.1 Differentiate between weather and climate. EEn.2.6.2 Explain changes in global climate due to natural processes. EEn.2.6.3 Analyze the impacts that human activities have on global climate change (such as burning hydrocarbons, green-house effect, and deforest-ation). EEn.2.6.4 Attribute changes in Earth systems to global climate change (temperature change, changes in pH of ocean, sea level changes, etc.). **EEn.2.7** Explain how the lithosphere, hydrosphere, and Atmosphere individually and collectively affect the biosphere. EEn.2.7.1 Explain how abiotic and biotic factors interact to create the various biomes in North Carolina. EEn.2.7.2 Explain why bio-diversity is important to the biosphere. EEn.2.7.3 Explain how human

	Bio.3.3.3 Evaluate some of the ethical issues surrounding the use of DNA technology (including cloning, genetically modified organisms, stem cell research, and Human Genome Project). **Bio.3.4** Explain the theory of evolution by natural selection as a mechanism for how species change over time. Bio. Bio.3.4.1 Explain how fossil, biochemical, and anatomical evidence support the theory of evolution. Bio.3.4.2 Explain how natural selection influences the changes in species over time. Bio.3.4.3 Explain how various disease agents (bacteria, viruses, chemicals) can influence natural selection. **Bio 3.5** Analyze how classification systems are developed based upon speciation. Bio.3.5.1 Explain the historical development and changing nature of classification systems. Bio.3.5.2 Analyze the classification of organisms according to their evolutionary relationships (including dichotomous keys and phylogenetic trees).		activities impact the biosphere. **EEn.2.8** Evaluate human behaviors in terms of how likely they are to ensure the ability to live sustainably on Earth. EEn.2.8.1 Evaluate alternative energy technologies for use in North Carolina. EEn.2.8.2 Critique conventional and sustainable agriculture and aquaculture practices in terms of their environmental impacts. EEn.2.8.3 Explain the effects of uncontrolled population growth on the Earth's resources. EEn.2.8.4 Evaluate the concept of "reduce, reuse, recycle" in terms of impact on natural resources.

	Bio.4.1 Understand how biological molecules are essential to the survival of living organisms. Bio.4.1.2 Summarize the relationship among DNA, proteins and amino acids in carrying out the work of cells and how this is similar in all organisms. Bio.4.1.3 Explain how enzymes act as catalysts for biological reactions **Bio 4.2** Analyze the relationships between biochemical processes and energy use in the cell. Bio.4.2.1 Analyze photosynthesis and cellular respiration in terms of how energy is stored, released, and transferred within and between these systems. Bio.4.2.2 Explain ways that organisms use released energy for maintaining homeostasis (active transport).		
ELD-SC.9-12.Explain. Interpretive	Physical Science	Physics	
Interpret scientific explanations by: Defining investigable questions or problems based on observations, information,	**PSc.1.1** Understand motion in terms of speed, velocity, acceleration and momentum. PSc.1.1.1 Explain motion in terms of frame of reference,	**Phy.1.1** Analyze the motion of objects. Phy.1.1.1 Analyze motion graphically and numerically using vectors, graphs and calculations.	

and/or data about a phenomenon	distance, and displacement. PSc.1.1.2 Compare speed, velocity, acceleration and momentum using investigations, graphing, scalar quantities and vector quantities. **Psc.1.2** Understand the relationship between forces and motion. PSc.1.2.1 Explain how gravitational force affects the weight of an object and the velocity of an object in freefall. PSc.1.2.2 Classify frictional forces into one of four types: static, sliding, rolling, and fluid. PSc.1.2.3 Explain forces using Newton's three laws of motion. **PSc.2.1** Understand types, properties, and structure of matter. PSc.2.1.1 Classify matter as: homogeneous or heterogeneous; pure substance or mixture; element or compound; metals, nonmetals or metalloids; solution, colloid or suspension. PSc.2.1.2 Explain the phases of matter and the physical changes that matter undergoes. PSc.2.1.3 Compare physical and chemical properties of various types of matter.	Phy.1.1.2 Analyze motion in one dimension using time, distance, displacement, velocity, and acceleration. Phy.1.1.3 Analyze motion in two dimensions using angle of trajectory, time, distance, displacement, velocity, and acceleration. **Phy.1.2** Analyze systems of forces and their interaction with matter. Phy.1.2.1 Analyze forces and systems of forces graphically and numerically using vectors, graphs and calculations. Phy.1.2.2 Analyze systems of forces in one dimension and two dimensions using free body diagrams. Phy.1.2.3 Explain forces using Newton's laws of motion as well as the universal law of gravitation. Phy.1.2.4 Explain the effects of forces (including weight, normal, tension and friction) on objects. Phy.1.2.5 Analyze basic forces related to rotation in a circular path (centripetal force). **Phy.1.3** Analyze the motion of objects based on the principles of conservation of momentum, conservation of energy	

	PSc.2.1.4 Interpret data presented in Bohr model diagrams and dot diagrams for atoms and ions of elements 1 through 18. **PSc.2.2** Understand chemical bonding and chemical interactions. PSc.2.2.1 Infer valence electrons, oxidation number, and reactivity of an element based on its location in the Periodic Table. PSc.2.2.2 Infer the type of chemical bond that occurs, whether covalent, ionic or metallic, in a given substance. PSc.2.2.3 Predict chemical formulas and names for simple compounds based on knowledge of bond formation and naming conventions. PSc.2.2.4 Exemplify the law of conservation of mass by balancing chemical equations. **PSc.2.3** Understand the role of the nucleus in radiation and radioactivity. PSc.2.3.1 Compare nuclear reactions including alpha decay, beta decay and gamma decay; nuclear fusion and nuclear fission. PSc.2.3.2 Exemplify the	and Impulse. Phy.1.3.1 Analyze the motion of objects involved in completely elastic and completely inelastic collisions by using the principles of conservation of momentum and conservation of energy. Phy.1.3.2 Analyze the motion of objects based on the relationship between momentum and impulse. **Phy.2.1** Understand the concepts of work, energy, and power, as well as the relationship among them. Phy.2.1.1 Interpret data on work and energy presented graphically and numerically. Phy.2.1.2 Compare the concepts of potential and kinetic energy and conservation of total mechanical energy in the description of the motion of objects. Phy.2.1.3 Explain the relationship among work, power and energy. **Phy.2.2** Analyze the behavior of waves. Phy.2.2.1 Analyze how energy is transmitted through waves, using the fundamental characteristics of waves:	

	radioactive decay of unstable nuclei using the concept of half-life. **PSc.3.1** Understand the types of energy,conservation of energy and energy transfer. PSc.3.1.1 Explain thermal energy and its transfer. PSc.3.1.2 Explain the law of conservation of energy in a mechanical system in terms of kinetic energy, potential energy and heat. PSc.3.1.3 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. PSc.3.1.4 Explain the relationship among work, power and simple machines both qualitatively and quantitatively. **PSc.3.2** Understand the nature of waves. PSc.3.2.1 Explain the relationships among wave frequency, wave period, wave velocity and wavelength through calculation and investigation. PSc.3.2.2 Compare waves	wavelength, period, frequency, amplitude, and wave velocity. Phy.2.2.2 Analyze wave behaviors in terms of transmission, reflection, refraction and interference. Phy.2.2.3 Compare mechanical and electromagnetic waves in terms of wave characteristics and behavior (specifically sound and light). **Phy.2.3** Analyze the nature of moving charges and electric circuits. Phy.2.3.1 Explain Ohm's law in relation to electric circuits. Phy.2.3.3 Compare the general characteristics of AC and DC systems without calculations. Phy.2.3.4 Analyze electric systems in terms of their energy and power. Phy.2.3.5 Analyze systems with multiple potential differences and resistors connected in series and parallel circuits, both conceptually and mathematically, in terms of voltage, current and resistance. **Phy.3.1** Explain charges and electrostatic systems. Phy.3.1.4 Explain the mechanisms for producing electrostatic charges, in-	

	(mechanical, electromagnetic, and surface) using their characteristics. PSc.3.2.3 Classify waves as transverse or compressional (longitudinal). **PSc.3.3** Understand electricity and magnetism and their relationship. PSc.3.3.2 Explain simple series and parallel DC circuits in terms of Ohm's law. PSc.3.3.3 Explain how current is affected by changes in composition, length, temperature, and diameter of wire. PSc.3.3.4 Explain magnetism in terms of domains, interactions of poles, and magnetic fields. PSc.3.3.5 Explain the practical applications of magnetism.	cluding charging by friction, conduction, and induction. Phy.3.1.5 Explain how differences in electrostatic potentials relate to the potential energy of charged objects. **Phy.3.2** Explain the concept of Magnetism. Phy.3.2.1 Explain the relationship between magnetic domains and magnetism. Phy.3.2.2 Explain how electric currents produce various magnetic fields. Phy.3.2.3 Explain how transformers and power distributions are applications of electromagnetism.	
Interpret scientific explanations by: Paraphrasing central ideas in complex evidence, concepts, processes, and information to help explain how or why a phenomenon occurs	**PSc.1.1** Understand motion in terms of speed, velocity, acceleration and momentum. PSc.1.1.1 Explain motion in terms of frame of reference, distance, and displacement. PSc.1.1.2 Compare speed, velocity, acceleration and momentum using investigations, graphing, scalar quantities and vector quantities. **Psc.1.2** Understand the relationship	**Phy.1.2** Analyze systems of forces and their interaction with matter. Phy.1.2.3 Explain forces using Newton's laws of motion as well as the universal law of gravitation. Phy.1.2.4 Explain the effects of forces (including weight, normal, tension and friction) on objects. Phy.1.2.5 Analyze basic forces related to rotation in a circular path (centripetal force).	

	between forces and motion. PSc.1.2.1 Explain how gravitational force affects the weight of an object and the velocity of an object in freefall. PSc.1.2.2 Classify frictional forces into one of four types: static, sliding, rolling, and fluid. PSc.1.2.3 Explain forces using Newton's three laws of motion. **PSc.2.1** Understand types, properties, and structure of matter. PSc.2.1.2 Explain the phases of matter and the physical changes that matter under-goes. PSc.2.1.3 Compare physical and chemical properties of various types of matter. PSc.2.1.4 Interpret data presented in Bohr model diagrams and dot diagrams for atoms and ions of elements 1 through 18. **PSc.2.2** Understand chemical bonding and chemical interactions. PSc.2.2.1 Infer valence electrons, oxidation number, and reactivity of an element based on its location in the Periodic Table. PSc.2.2.2 Infer the type of	**Phy.1.3** Analyze the motion of objects based on the principles of conservation of momentum, conservation of energy and Impulse. Phy.1.3.1 Analyze the motion of objects involved in completely elastic and completely inelastic collisions by using the principles of conservation of momentum and conservation of energy. Phy.1.3.2 Analyze the motion of objects based on the relationship between momentum and impulse. **Phy.2.1** Understand the concepts of work, energy, and power, as well as the relationship among them. Phy.2.1.1 Interpret data on work and energy presented graphically and numerically. Phy.2.1.2 Compare the concepts of potential and kinetic energy and conservation of total mechanical energy in the description of the motion of objects. Phy.2.1.3 Explain the relationship among work, power and energy. **Phy.2.2** Analyze the behavior of waves.	

	chemical bond that occurs, whether covalent, ionic or metallic, in a given substance. PSc.2.2.3 Predict chemical formulas and names for simple compounds based on knowledge of bond formation and naming conventions. PSc.2.2.6 Summarize the characteristics and interactions of acids and bases. **PSc.2.3** Understand the role of the nucleus in radiation and radioactivity. PSc.2.3.1 Compare nuclear reactions including alpha decay, beta decay and gamma decay; nuclear fusion and nuclear fission. **PSc.3.1** Understand the types of energy,conservation of energy and energy transfer. PSc.3.1.1 Explain thermal energy and its transfer. PSc.3.1.2 Explain the law of conservation of energy in a mechanical system in terms of kinetic energy, potential energy and heat. PSc.3.1.3 Explain work in terms of the relationship among the applied force to an object, the resulting displacement of the object and the energy trans-	Phy.2.2.1 Analyze how energy is transmitted through waves, using the fundamental characteristics of waves: wavelength, period, frequency, amplitude, and wave velocity. Phy.2.2.2 Analyze wave behaviors in terms of transmission, reflection, refraction and interference. Phy.2.2.3 Compare mechanical and electromagnetic waves in terms of wave characteristics and behavior (specifically sound and light). **Phy.2.3** Analyze the nature of moving charges and electric circuits. Phy.2.3.1 Explain Ohm's law in relation to electric circuits. Phy.2.3.3 Compare the general characteristics of AC and DC systems without calculations. Phy.2.3.4 Analyze electric systems in terms of their energy and power. Phy.2.3.5 Analyze systems with multiple potential differences and resistors connected in series and parallel circuits, both conceptually and mathema-tically, in terms of voltage, current and resistance. **Phy.3.1** Explain charges and	

	ferred to an object. PSc.3.1.4 Explain the relationship among work, power and simple machines both qualitatively and quantitatively. **PSc.3.2** Understand the nature of waves. PSc.3.2.1 Explain the relationships among wave frequency, wave period, wave velocity and wavelength through calculation and investigation. PSc.3.2.2 Compare waves (mechanical, electromagnetic, and surface) using their characteristics. **PSc.3.3** Understand electricity and magnetism and their relationship. PSc.3.3.1 Summarize static and current electricity. PSc.3.3.2 Explain simple series and parallel DC circuits in terms of Ohm's law. PSc.3.3.3 Explain how current is affected by changes in composition, length, temperature, and diameter of wire. PSc.3.3.4 Explain magnetism in terms of domains, interactions of poles, and magnetic fields. PSc.3.3.5 Explain the practical	electrostatic systems. Phy.3.1.4 Explain the mechanisms for producing electrostatic charges, including charging by friction, conduction, and induction. Phy.3.1.5 Explain how differences in electrostatic potentials relate to the potential energy of charged objects. **Phy.3.2** Explain the concept of Magnetism. Phy.3.2.1 Explain the relationship between magnetic domains and Magnetism. Phy.3.2.2 Explain how electric currents produce various magnetic Fields. Phy.3.2.3 Explain how transformers and power distributions are applications of electromagnetism.	

	applications of magnetism.		
ELD-SC.9-12.Explain. Expressive	**Biology**	**Chemistry**	**Earth and Environmental**
Construct scientific explanations that: Describe reliable and valid evidence from multiple sources about a phenomenon	**Bio.1.1** Understand the relationship between the structures and functions of cells and their organelles. Bio.1.1.1 Summarize the structure and function of organelles in eukaryotic cells (including the nucleus, plasma membrane, cell wall, mitochondria, vacuoles, chloroplasts, and ribosomes) and ways that these organelles interact with each other to perform the function of the cell. Bio.1.1.3 Explain how instructions in DNA lead to cell differentiation and result in cells specialized to perform specific functions in multicellular organisms. **Bio.1.2** Analyze the cell as a living system. Bio.1.2.1 Explain how homeostasis is maintained in the cell and within an organism in various environments (including temperature and pH). Bio.1.2.3 Explain how specific cell adaptations help cells survive in particular environments (focus on	**Chm.1.1** Analyze the structure of atoms and ions. Chm.1.1.3 Explain the emission of electromagnetic radiation in spectral form in terms of the Bohr model. Chm.1.1.4 Explain the process of radioactive decay by the use of nuclear equations and half-life. **Chm.1.2** Understand the bonding that occurs in simple compounds in terms of bond type, strength, and properties. Chm.1.2.2 Infer the type of bond and chemical formula formed between atoms. **Chm.1.3** Understand the physical and chemical properties of atoms based on their position in the Periodic Table. Chm.1.3.2 Infer the physical properties (atomic radius, metallic and nonmetallic characteristics) of an element based on its position on the Periodic Table. Chm.1.3.3 Infer the atomic size, reactivity, electronegativity, and ionization energy of an element from its position in the Periodic	**EEn.1.1** Explain the Earth's role as a body in space. EEn.1.1.1 Explain the Earth's motion through space, including precession, nutation, the barycenter, and its path about the galaxy. EEn.1.1.2 Explain how the Earth's rotation and revolution about the Sun affect its shape and is related to seasons and tides. EEn.1.1.3 Explain how the sun produces energy which is transferred to the Earth by radiation. EEn.1.1.4 Explain how incoming solar energy makes life possible on Earth. **EEn.2.1** Explain how processes and forces affect the lithosphere. EEn.2.1.1 Explain how the rock cycle, plate tectonics, volcanoes, and earthquakes impact the lithosphere. EEn.2.1.2 Predict the locations of volcanoes, earthquakes, and faults based on information contained in a variety of maps. EEn.2.1.3 Explain how natural

	unicellular organisms). **Bio.2.1** Analyze the interdependence of living organisms within their environments. Bio.2.1.1 Analyze the flow of energy and cycling of matter (water, carbon, nitrogen and oxygen) through ecosystems relating the significance of each to maintaining the health and sustainability of an ecosystem. Bio.2.1.2 Analyze the survival and reproductive success of organisms in terms of behavioral, structural, and reproductive adaptations. Bio.2.1.3 Explain various ways organisms interact with each other (including predation, competition, parasitism, mutualism) and with their environments resulting in stability within ecosystems. Bio.2.1.4 Explain why ecosystems can be relatively stable over hundreds or thousands of years, even though populations may fluctuate (emphasizing availability of food, availability of shelter, number of predators and disease). **Bio.2.2** Understand the impact of human activities on the environment	Table. **Chm.2.1** Understand the relationship among pressure, temperature, volume, and phase. Chm.2.1.1 Explain the energetic nature of phase changes. Chm.2.1.2 Explain heating and cooling curves (heat of fusion, heat of vaporization, heat, melting point, and boiling point). Chm.2.1.4 Infer simple calorimetric calculations based on the concepts of heat lost equals heat gained and specific heat. Chm.2.1.5 Explain the relationships between pressure, temperature, volume, and quantity of gas both qualitative and quantitative. **Chm.2.2** Analyze chemical reactions in terms of quantities, product formation, and energy. Chm.2.2.1 Explain the energy content of a chemical reaction. Chm.2.2.2 Analyze the evidence of chemical change. Chm.2.2.3 Analyze the law of conservation of matter and how it applies to various types of chemical equations (synthesis,	actions such as weathering, erosion (wind, water and gravity), and soil formation affect Earth's surface. EEn.2.1.4 Explain the probability of and preparation for geohazards such as landslides, avalanches, earthquakes and volcanoes in a particular area based on available data. **EEn.2.2** Understand how human influences impact the Lithosphere. EEn.2.2.1 Explain the consequences of human activities on the lithosphere (such as mining, deforestation, agriculture, overgrazing, urbanization, and land use) past and present. EEn.2.2.2 Compare the various methods humans use to acquire traditional energy sources (such as peat, coal, oil, natural gas, nuclear fission, and wood). **EEn.2.3** Explain the structure and processes within the hydrosphere. EEn.2.3.1 Explain how water is an energy agent (currents and heat transfer). EEn2.3.2 Explain how groundwater and surface water

	(one generation affects the next). Bio.2.2.1 Infer how human activities (including population growth, pollution, global warming, burning of fossil fuels, habitat destruction and introduction of nonnative species) may impact the environment. Bio.2.2.2 Explain how the use, protection and conservation of natural resources by humans impact the environment from one generation to the next. **Bio.3.1** Explain how traits are determined by the structure and function of DNA. Bio.3.1.1 Explain the double-stranded, complementary nature of DNA as related to its function in the cell. Bio.3.1.2 Explain how DNA and RNA code for proteins and determine traits. Bio.3.1.3 Explain how mutations in DNA that result from interactions with the environment (i.e. radiation and chemicals) or new combinations in existing genes lead to changes in function and phenotype. **Bio.3.2** Understand how the	decomposition, single replacement, double replacement, and combustion). Chm.2.2.4 Analyze the stoichiometric relationships inherent in a chemical reaction. Chm.2.2.5 Analyze quantitatively the composition of a substance (empirical formula, molecular formula, percent composition, and hydrates). **Chm.3.1** Understand the factors affecting rate of reaction and chemical equilibrium. Chm.3.1.1 Explain the factors that affect the rate of a reaction (temperature, concentration, particle size and presence of a catalyst). Chm.3.1.2 Explain the conditions of a system at equilibrium. Chm.3.1.3 Infer the shift in equilibrium when a stress is applied to a chemical system (Le Chatelier's Principle). **Chm.3.2** Understand solutions and the solution process. Chm.3.2.4 Summarize the properties of solutions. Chm.3.2.5 Interpret solubility diagrams.	interact. **EEn.2.4** Evaluate how humans use water. EEn.2.4.1 Evaluate human influences on freshwater availability. EEn.2.4.2 Evaluate human influences on water quality in North Carolina's river basins, wetlands and tidal environments. **EEn.2.5** Understand the structure of and processes within our atmosphere. EEn.2.5.1 Summarize the structure and composition of our atmosphere. EEn.2.5.2 Explain the formation of typical air masses and the weather systems that result from air mass interactions. EEn.2.5.3 Explain how cyclonic storms form based on the interaction of air masses. EEn.2.5.4 Predict the weather using available weather maps and data (including surface, upper atmospheric winds, and satellite imagery). EEn.2.5.5 Explain how human activities affect air quality. **EEn.2.6** Analyze patterns of global climate change over time.

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Construct scientific explanations that: Establish neutral or objective stance in how results are communicated	**Bio.1.1** Understand the relationship between the structures and functions of cells and their organelles. Bio.1.1.1 Summarize the structure and function of organelles in eukaryotic cells (including the nucleus, plasma membrane, cell wall, mitochondria, vacuoles, chloroplasts, and ribosomes) and ways that these organelles interact with each other to perform the function of the cell. Bio.1.1.2 Compare prokaryotic and eukaryotic cells in terms of their general structures (plasma membrane and genetic material) and degree of complexity. Bio.1.1.3 Explain how instructions in DNA lead to cell differentiation and result in cells specialized to perform specific functions in multicellular	**Chm.1.1** Analyze the structure of atoms and ions. Chm.1.1.3 Explain the emission of electromagnetic radiation in spectral form in terms of the Bohr model. Chm.1.1.4 Explain the process of radioactive decay by the use of nuclear equations and half-life. **Chm.1.2** Understand the bonding that occurs in simple compounds in terms of bond type, strength, and properties. Chm.1.2.2 Infer the type of bond and chemical formula formed between atoms. **Chm.1.3** Understand the physical and chemical properties of atoms based on their position in the Periodic Table. Chm.1.3.2 Infer the physical properties (atomic radius,	**EEn.1.1** Explain the Earth's role as a body in space. EEn.1.1.1 Explain the Earth's motion through space, including precession, nutation, the barycenter, and its path about the galaxy. EEn.1.1.2 Explain how the Earth's rotation and revolution about the Sun affect its shape and is related to seasons and tides. EEn.1.1.3 Explain how the sun produces energy which is transferred to the Earth by radiation. EEn.1.1.4 Explain how incoming solar energy makes life possible on Earth. **EEn.2.1** Explain how processes and forces affect the lithosphere. EEn.2.1.1 Explain how the rock cycle, plate tectonics,

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	Bio.3.5.2 Analyze the classification of organisms according to their evolutionary relationships (including dichotomous keys and phylogenetic trees). **Bio.4.1** Understand how biological molecules are essential to the survival of living organisms. Bio.4.1.1 Compare the structures and functions of the major biological molecules (carbohydrates, proteins, lipids, and nucleic acids) as related to the survival of living organisms. Bio.4.1.2 Summarize the relationship among DNA, proteins and amino acids in carrying out the work of cells and how this is similar in all organisms. Bio.4.1.3 Explain how enzymes act as catalysts for biological reactions. **Bio 4.2** Analyze the relationships between biochemical processes and energy use in the cell. Bio.4.2.1 Analyze photosynthesis and cellular respiration in terms of how energy is stored, released, and transferred within and between		

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Construct scientific explanations that: Develop reasoning to illustrate and/ or predict the relationships between variables in a system or between components of a system	**Bio.1.1** Understand the relationship between the structures and functions of cells and their organelles. Bio.1.1.1 Summarize the structure and function of organelles in eukaryotic cells (including the nucleus, plasma membrane, cell wall, mitochondria, vacuoles, chloroplasts, and ribosomes) and ways that these organelles interact with each other to perform the function of the cell. Bio.1.1.2 Compare prokaryotic and eukaryotic cells in terms of their general structures (plasma membrane and genetic material) and degree of complexity. Bio.1.1.3 Explain how instructions in DNA lead to cell differentiation and result in cells specialized to perform specific functions in multicellular organisms. **Bio.1.2** Analyze the cell as a living system. Bio.1.2.1 Explain how	**Chm.1.1** Analyze the structure of atoms and ions. Chm.1.1.3 Explain the emission of electromagnetic radiation in spectral form in terms of the Bohr model. Chm.1.1.4 Explain the process of radioactive decay by the use of nuclear equations and half-life. **Chm.1.2** Understand the bonding that occurs in simple compounds in terms of bond type, strength, and properties. Chm.1.2.1 Compare (qualitatively) the relative strengths of ionic, covalent, and metallic bonds. Chm.1.2.2 Infer the type of bond and chemical formula formed between atoms. Chm.1.2.3 Compare inter- and intra-particle forces. Chm.1.2.5 Compare the properties of ionic, covalent, metallic, and network compound. **Chm.1.3** Understand the physical and	**EEn.1.1** Explain the Earth's role as a body in space. EEn.1.1.1 Explain the Earth's motion through space, including precession, nutation, the barycenter, and its path about the galaxy. EEn.1.1.2 Explain how the Earth's rotation and revolution about the Sun affect its shape and is related to seasons and tides. EEn.1.1.3 Explain how the sun produces energy which is transferred to the Earth by radiation. EEn.1.1.4 Explain how incoming solar energy makes life possible on Earth. **EEn.2.1** Explain how processes and forces affect the lithosphere. EEn.2.1.1 Explain how the rock cycle, plate tectonics, volcanoes, and earthquakes impact the lithosphere. EEn.2.1.2 Predict the locations of volcanoes, earthquakes, and faults based on information

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Construct scientific explanations that: Summarize and refine solutions referencing scientific knowledge, evidence, criteria, and/or trade-offs	**Bio.1.1** Understand the relationship between the structures and functions of cells and their organelles. Bio.1.1.1 Summarize the structure and function of organelles in eukaryotic cells (including the nucleus, plasma membrane, cell wall, mitochondria, vacuoles, chloroplasts, and ribosomes) and ways that these organelles interact with each other to	**Chm.3.2** Understand solutions and the solution process. Chm.3.2.2 Summarize the properties of acids and bases. Chm.3.2.4 Summarize the properties of solutions.	**EEn.2.5** Understand the structure of and processes within our atmosphere. EEn.2.5.5 Explain how human activities affect air quality.

	perform the function of the cell. **Bio.3.3** Understand the application of DNA technology. Bio.3.3.2 Summarize how transgenic organisms are engineered to benefit society. **Bio.4.1** Understand how biological molecules are essential to the survival of living organisms. Bio.4.1.2 Summarize the relationship among DNA, proteins and amino acids in carrying out the work of cells and how this is similar in all organisms.		
ELD-SC.9-12.Explain. Expressive	**Physical Science**	**Physics**	
Construct scientific explanations that: Describe reliable and valid evidence from multiple sources about a phenomenon	**PSc.1.1** Understand motion in terms of speed, velocity, acceleration and momentum. PSc.1.1.1 Explain motion in terms of frame of reference, distance, and displacement. PSc.1.1.2 Compare speed, velocity, acceleration and momentum using investigations, graphing, scalar quantities and vector quantities. **Psc.1.2** Understand the relationship between forces and motion. PSc.1.2.1 Explain how	**Phy.1.1** Analyze the motion of objects. Phy.1.1.1 Analyze motion graphically and numerically using vectors, graphs and calculations. Phy.1.1.2 Analyze motion in one dimension using time, distance, displacement, velocity, and acceleration. Phy.1.1.3 Analyze motion in two dimensions using angle of trajectory, time, distance, displacement, velocity, and acceleration.	

	gravitational force affects the weight of an object and the velocity of an object in freefall. PSc.1.2.2 Classify frictional forces into one of four types: static, sliding, rolling, and fluid. PSc.1.2.3 Explain forces using Newton's three laws of motion. **PSc.2.1** Understand types, properties, and structure of matter. PSc.2.1.1 Classify matter as: homogeneous or heterogeneous; pure substance or mixture; element or compound; metals, nonmetals or metalloids; solution, colloid or suspension. PSc.2.1.2 Explain the phases of matter and the physical changes that matter undergoes. PSc.2.1.3 Compare physical and chemical properties of various types of matter. PSc.2.1.4 Interpret data presented in Bohr model diagrams and dot diagrams for atoms and ions of elements 1 through 18. **PSc.2.2** Understand chemical bonding and chemical interactions. PSc.2.2.1 Infer valence electrons, oxidation number,	**Phy.1.2** Analyze systems of forces and their interaction with matter. Phy.1.2.1 Analyze forces and systems of forces graphically and numerically using vectors, graphs and calculations. Phy.1.2.2 Analyze systems of forces in one dimension and two dimensions using free body diagrams. Phy.1.2.3 Explain forces using Newton's laws of motion as well as the universal law of gravitation. Phy.1.2.4 Explain the effects of forces (including weight, normal, tension and friction) on objects. Phy.1.2.5 Analyze basic forces related to rotation in a circular path (centripetal force). **Phy.1.3** Analyze the motion of objects based on the principles of conservation of momentum, conservation of energy and Impulse. Phy.1.3.1 Analyze the motion of objects involved in completely elastic and completely inelastic collisions by using the principles of conservation of momentum and conservation of energy. Phy.1.3.2 Analyze the motion of objects based on the	

	and reactivity of an element based on its location in the Periodic Table. PSc.2.2.2 Infer the type of chemical bond that occurs, whether covalent, ionic or metallic, in a given substance. PSc.2.2.3 Predict chemical formulas and names for simple compounds based on knowledge of bond formation and naming conventions. PSc.2.2.6 Summarize the characteristics and interactions of acids and bases. **PSc.2.3** Understand the role of the nucleus in radiation and radioactivity. PSc.2.3.1 Compare nuclear reactions including alpha decay, beta decay and gamma decay; nuclear fusion and nuclear fission. **PSc.3.1** Understand the types of energy,conservation of energy and energy transfer PSc.3.1.1 Explain thermal energy and its transfer. PSc.3.1.2 Explain the law of conservation of energy in a mechanical system in terms of kinetic energy, potential energy and heat. PSc.3.1.3 Explain work in terms	relationship between momentum and impulse. **Phy.2.1** Understand the concepts of work, energy, and power, as well as the relationship among them. Phy.2.1.1 Interpret data on work and energy presented graphically and numerically. Phy.2.1.2 Compare the concepts of potential and kinetic energy and conservation of total mechanical energy in the description of the motion of objects. Phy.2.1.3 Explain the relationship among work, power and energy. **Phy.2.2** Analyze the behavior of waves. Phy.2.2.1 Analyze how energy is transmitted through waves, using the fundamental characteristics of waves: wavelength, period, frequency, amplitude, and wave velocity. Phy.2.2.2 Analyze wave behaviors in terms of transmission, reflection, refraction and interference. Phy.2.2.3 Compare mechanical and electromagnetic waves in terms of wave characteristics and behavior (specifically	

	of the relationship among the applied force to an object, the resulting displacement of the object and the energy transferred to an object. PSc.3.1.4 Explain the relationship among work, power and simple machines both qualitatively and quantitatively. **PSc.3.2** Understand the nature of waves. PSc.3.2.1 Explain the relationships among wave frequency, wave period, wave velocity and wavelength through calculation and investigation. PSc.3.2.2 Compare waves (mechanical, electromagnetic, and surface) using their characteristics. PSc.3.2.3 Classify waves as transverse or compressional (longitudinal). **PSc.3.3** Understand electricity and magnetism and their relationship. PSc.3.3.1 Summarize static and current electricity. PSc.3.3.2 Explain simple series and parallel DC circuits in terms of Ohm's law. PSc.3.3.3 Explain how current is affected by changes in	sound and light). **Phy.2.3** Analyze the nature of moving charges and electric circuits. Phy.2.3.1 Explain Ohm's law in relation to electric circuits. Phy.2.3.3 Compare the general characteristics of AC and DC systems without calculations. Phy.2.3.4 Analyze electric systems in terms of their energy and power. Phy.2.3.5 Analyze systems with multiple potential differences and resistors connected in series and parallel circuits, both conceptually and mathematically, in terms of voltage, current and resistance. **Phy.3.1** Explain charges and electrostatic systems. Phy.3.1.4 Explain the mechanisms for producing electrostatic charges, including charging by friction, conduction, and induction. Phy.3.1.5 Explain how differences in electrostatic potentials relate to the potential energy of charged objects. **Phy.3.2** Explain the concept of Magnetism.	

	composition, length, temperature, and diameter of wire. PSc.3.3.4 Explain magnetism in terms of domains, interactions of poles, and magnetic fields. PSc.3.3.5 Explain the practical applications of magnetism.	Phy.3.2.1 Explain the relationship between magnetic domains and Magnetism. Phy.3.2.2 Explain how electric currents produce various magnetic Fields. Phy.3.2.3 Explain how transformers and power distributions are applications of electromagnetism.	
Construct scientific explanations that: Establish neutral or objective stance in how results are communicated	**PSc.1.1** Understand motion in terms of speed, velocity, acceleration and momentum. PSc.1.1.1 Explain motion in terms of frame of reference, distance, and displacement. PSc.1.1.2 Compare speed, velocity, acceleration and momentum using investigations, graphing, scalar quantities and vector quantities. **Psc.1.2** Understand the relationship between forces and motion. PSc.1.2.1 Explain how gravitational force affects the weight of an object and the velocity of an object in freefall. PSc.1.2.2 Classify frictional forces into one of four types: static, sliding, rolling, and fluid. PSc.1.2.3 Explain forces using Newton's three laws of motion.	**Phy.1.1** Analyze the motion of objects. Phy.1.1.1 Analyze motion graphically and numerically using vectors, graphs and calculations. Phy.1.1.2 Analyze motion in one dimension using time, distance, displacement, velocity, and acceleration. Phy.1.1.3 Analyze motion in two dimensions using angle of trajectory, time, distance, displacement, velocity, and acceleration. **Phy.1.2** Analyze systems of forces and their interaction with matter. Phy.1.2.1 Analyze forces and systems of forces graphically and numerically using vectors, graphs and calculations. Phy.1.2.2 Analyze systems of forces in one dimension and two dimensions using free body	

	PSc.2.1 Understand types, properties, and structure of matter. PSc.2.1.1 Classify matter as: homogeneous or heterogeneous; pure substance or mixture; element or compound; metals, nonmetals or metalloids; solution, colloid or suspension. PSc.2.1.2 Explain the phases of matter and the physical changes that matter undergoes. PSc.2.1.3 Compare physical and chemical properties of various types of matter. PSc.2.1.4 Interpret data presented in Bohr model diagrams and dot diagrams for atoms and ions of elements 1 through 18. **PSc.2.2** Understand chemical bonding and chemical interactions. PSc.2.2.1 Infer valence electrons, oxidation number, and reactivity of an element based on its location in the Periodic Table. PSc.2.2.2 Infer the type of chemical bond that occurs, whether covalent, ionic or metallic, in a given substance. PSc.2.2.3 Predict chemical formulas and names for simple	diagrams. Phy.1.2.3 Explain forces using Newton's laws of motion as well as the universal law of gravitation. Phy.1.2.4 Explain the effects of forces (including weight, normal, tension and friction) on objects. Phy.1.2.5 Analyze basic forces related to rotation in a circular path (centripetal force). **Phy.1.3** Analyze the motion of objects based on the principles of conservation of momentum, conservation of energy and Impulse. Phy.1.3.1 Analyze the motion of objects involved in completely elastic and completely inelastic collisions by using the principles of conservation of momentum and conservation of energy. Phy.1.3.2 Analyze the motion of objects based on the relationship between momentum and impulse. **Phy.2.1** Understand the concepts of work, energy, and power, as well as the relationship among them. Phy.2.1.1 Interpret data on work and energy presented graphically and numerically.	

	compounds based on knowledge of bond formation and naming conventions. PSc.2.2.4 Exemplify the law of conservation of mass by balancing chemical equations. PSc.2.2.6 Summarize the characteristics and interactions of acids and bases. **PSc.2.3** Understand the role of the nucleus in radiation and radioactivity. PSc.2.3.1 Compare nuclear reactions including alpha decay, beta decay and gamma decay; nuclear fusion and nuclear fission. PSc.2.3.2 Exemplify the radioactive decay of unstable nuclei using the concept of half-life. **PSc.3.1** Understand the types of energy,conservation of energy and energy transfer. PSc.3.1.1 Explain thermal energy and its transfer. PSc.3.1.2 Explain the law of conservation of energy in a mechanical system in terms of kinetic energy, potential energy and heat. PSc.3.1.3 Explain work in terms of the relationship among the applied force to an object, the	Phy.2.1.2 Compare the concepts of potential and kinetic energy and conservation of total mechanical energy in the description of the motion of objects. Phy.2.1.3 Explain the relationship among work, power and energy. **Phy.2.2** Analyze the behavior of waves. Phy.2.2.1 Analyze how energy is transmitted through waves, using the fundamental characteristics of waves: wavelength, period, frequency, amplitude, and wave velocity. Phy.2.2.2 Analyze wave behaviors in terms of transmission, reflection, refraction and interference. Phy.2.2.3 Compare mechanical and electromagnetic waves in terms of wave characteristics and behavior (specifically sound and light). **Phy.2.3** Analyze the nature of moving charges and electric circuits. Phy.2.3.1 Explain Ohm's law in relation to electric circuits. Phy.2.3.3 Compare the general characteristics of AC and DC systems without calculations.	

	resulting displacement of the object and the energy transferred to an object. PSc.3.1.4 Explain the relationship among work, power and simple machines both qualitatively and quantitatively. **PSc.3.2** Understand the nature of waves. PSc.3.2.1 Explain the relationships among wave frequency, wave period, wave velocity and wavelength through calculation and investigation. PSc.3.2.2 Compare waves (mechanical, electromagnetic, and surface) using their characteristics. PSc.3.2.3 Classify waves as transverse or compressional (longitudinal). **PSc.3.3** Understand electricity and magnetism and their relationship. PSc.3.3.1 Summarize static and current electricity. PSc.3.3.2 Explain simple series and parallel DC circuits in terms of Ohm's law. PSc.3.3.3 Explain how current is affected by changes in composition, length, temperature, and diameter of wire.	Phy.2.3.4 Analyze electric systems in terms of their energy and power. Phy.2.3.5 Analyze systems with multiple potential differences and resistors connected in series and parallel circuits, both conceptually and mathematically, in terms of voltage, current and resistance.. **Phy.3.1** Explain charges and electrostatic systems. Phy.3.1.4 Explain the mechanisms for producing electrostatic charges, including charging by friction, conduction, and induction. Phy.3.1.5 Explain how differences in electrostatic potentials relate to the potential energy of charged objects. **Phy.3.2** Explain the concept of Magnetism. Phy.3.2.1 Explain the relationship between magnetic domains and Magnetism. Phy.3.2.2 Explain how electric currents produce various magnetic Fields. Phy.3.2.3 Explain how transformers and power distributions are applications of electromagnetism.	

	PSc.3.3.4 Explain magnetism in terms of domains, interactions of poles, and magnetic fields. PSc.3.3.5 Explain the practical applications of magnetism.		
Construct scientific explanations that: Develop reasoning to illustrate and/ or predict the relationships between variables in a system or between components of a system	**PSc.1.1** Understand motion in terms of speed, velocity, acceleration and momentum. PSc.1.1.1 Explain motion in terms of frame of reference, distance, and displacement. PSc.1.1.2 Compare speed, velocity, acceleration and momentum using investi-gations, graphing, scalar quantities and vector quantities. **Psc.1.2** Understand the relationship between forces and motion. PSc.1.2.1 Explain how gravitational force affects the weight of an object and the velocity of an object in freefall. PSc.1.2.2 Classify frictional forces into one of four types: static, sliding, rolling, and fluid. PSc.1.2.3 Explain forces using Newton's three laws of motion. **PSc.2.1** Understand types, properties, and structure of matter. PSc.2.1.1 Classify matter as: homogeneous or hetero-geneous; pure substance or	**Phy.1.1** Analyze the motion of objects. Phy.1.1.1 Analyze motion graphically and numerically using vectors, graphs and calculations. Phy.1.1.2 Analyze motion in one dimension using time, distance, displacement, velocity, and acceleration. Phy.1.1.3 Analyze motion in two dimensions using angle of trajectory, time, distance, displacement, velocity, and acceleration. **Phy.1.2** Analyze systems of forces and their interaction with matter. Phy.1.2.1 Analyze forces and systems of forces graphically and numerically using vectors, graphs and calculations. Phy.1.2.2 Analyze systems of forces in one dimension and two dimensions using free body diagrams. Phy.1.2.3 Explain forces using Newton's laws of motion as well as the universal law of gravitation.	

	mixture; element or compound; metals, nonmetals or metalloids; solution, colloid or suspension. PSc.2.1.2 Explain the phases of matter and the physical changes that matter undergoes. PSc.2.1.3 Compare physical and chemical properties of various types of matter. PSc.2.1.4 Interpret data presented in Bohr model diagrams and dot diagrams for atoms and ions of elements 1 through 18. **PSc.2.2** Understand chemical bonding and chemical interactions. PSc.2.2.1 Infer valence electrons, oxidation number, and reactivity of an element based on its location in the Periodic Table. PSc.2.2.2 Infer the type of chemical bond that occurs, whether covalent, ionic or metallic, in a given substance. PSc.2.2.3 Predict chemical formulas and names for simple compounds based on knowledge of bond formation and naming conventions. PSc.2.2.4 Exemplify the law of conservation of mass by	Phy.1.2.4 Explain the effects of forces (including weight, normal, tension and friction) on objects. Phy.1.2.5 Analyze basic forces related to rotation in a circular path (centripetal force). **Phy.1.3** Analyze the motion of objects based on the principles of conservation of momentum, conservation of energy and Impulse. Phy.1.3.1 Analyze the motion of objects involved in completely elastic and completely inelastic collisions by using the principles of conservation of momentum and conservation of energy. Phy.1.3.2 Analyze the motion of objects based on the relationship between momentum and impulse. **Phy.2.1** Understand the concepts of work, energy, and power, as well as the relationship among them. Phy.2.1.1 Interpret data on work and energy presented graphically and numerically. Phy.2.1.2 Compare the concepts of potential and kinetic energy and conservation of total mechanical energy in the description of the motion of	

	balancing chemical equations. PSc.2.2.6 Summarize the characteristics and interactions of acids and bases. **PSc.2.3** Understand the role of the nucleus in radiation and radioactivity. PSc.2.3.1 Compare nuclear reactions including alpha decay, beta decay and gamma decay; nuclear fusion and nuclear fission. **PSc.3.1** Understand the types of energy,conservation of energy and energy transfer. PSc.3.1.1 Explain thermal energy and its transfer. PSc.3.1.2 Explain the law of conservation of energy in a mechanical system in terms of kinetic energy, potential energy and heat. PSc.3.1.3 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. PSc.3.1.4 Explain the relationship among work, power and simple machines both qualitatively and quantitatively. **PSc.3.2** Understand the nature of	objects. Phy.2.1.3 Explain the relationship among work, power and energy. **Phy.2.2** Analyze the behavior of waves. Phy.2.2.1 Analyze how energy is transmitted through waves, using the fundamental characteristics of waves: wavelength, period, frequency, amplitude, and wave velocity. Phy.2.2.2 Analyze wave behaviors in terms of transmission, reflection, refraction and interference. Phy.2.2.3 Compare mechanical and electromagnetic waves in terms of wave characteristics and behavior (specifically sound and light). **Phy.2.3** Analyze the nature of moving charges and electric circuits. Phy.2.3.1 Explain Ohm's law in relation to electric circuits. Phy.2.3.3 Compare the general characteristics of AC and DC systems without calculations. Phy.2.3.4 Analyze electric systems in terms of their energy and power. Phy.2.3.5 Analyze systems with multiple potential differences	

	waves. PSc.3.2.1 Explain the relationships among wave frequency, wave period, wave velocity and wavelength through calculation and investigation. PSc.3.2.2 Compare waves (mechanical, electromagnetic, and surface) using their characteristics. PSc.3.2.3 Classify waves as transverse or compressional (longitudinal). **PSc.3.3** Understand electricity and magnetism and their relationship. PSc.3.3.1 Summarize static and current electricity. PSc.3.3.2 Explain simple series and parallel DC circuits in terms of Ohm's law. PSc.3.3.3 Explain how current is affected by changes in composition, length, temperature, and diameter of wire. PSc.3.3.4 Explain magnetism in terms of domains, interactions of poles, and magnetic fields. PSc.3.3.5 Explain the practical applications of magnetism.	and resistors connected in series and parallel circuits, both conceptually and mathematically, in terms of voltage, current and resistance. **Phy.3.1** Explain charges and electrostatic systems. Phy.3.1.4 Explain the mechanisms for producing electrostatic charges, including charging by friction, conduction, and induction. Phy.3.1.5 Explain how differences in electrostatic potentials relate to the potential energy of charged objects. **Phy.3.2** Explain the concept of Magnetism. Phy.3.2.1 Explain the relationship between magnetic domains and Magnetism. Phy.3.2.2 Explain how electric currents produce various magnetic Fields. Phy.3.2.3 Explain how transformers and power distributions are applications of electromagnetism.	
Construct scientific explanations that: Summarize and refine	**PSc.2.2** Understand chemical bonding and chemical interactions. PSc.2.2.6 Summarize the	*Note: While there are no specific science standards listed, language instruction for this language	

solutions referencing scientific knowledge, evidence, criteria, and/or trade-offs	characteristics and interactions of acids and bases. **PSc.3.3** Understand electricity and magnetism and their relationship. PSc.3.3.1 Summarize static and current electricity.	expectation can be integrated within all aspects of science instruction.	
ELD-SC.9-12.Argue. Interpretive	Biology	Chemistry	Earth and Environmental
Interpret scientific arguments by: Identifying appropriate and sufficient evidence from data, models, and/ or information from investigations of a phenomenon or design solutions	**Bio.1.1** Understand the relationship between the structures and functions of cells and their organelles. Bio.1.1.1 Summarize the structure and function of organelles in eukaryotic cells (including the nucleus, plasma membrane, cell wall, mito-chondria, vacuoles, chloro-plasts, and ribosomes) and ways that these organelles interact with each other to perform the function of the cell. Bio.1.1.2 Compare prokaryotic and eukaryotic cells in terms of their general structures (plasma membrane and genetic material) and degree of complexity. Bio.1.1.3 Explain how instructions in DNA lead to cell differentiation and result in cells specialized to perform specific functions in multicellular organisms..	**Chm.1.1** Analyze the structure of atoms and ions. Chm.1.1.3 Explain the emission of electromagnetic radiation in spectral form in terms of the Bohr model. Chm.1.1.4 Explain the process of radioactive decay by the use of nuclear equations and half-life. **Chm.1.2** Understand the bonding that occurs in simple compounds in terms of bond type, strength, and properties. Chm.1.2.1 Compare (qualitatively) the relative strengths of ionic, covalent, and metallic bonds. Chm.1.2.2 Infer the type of bond and chemical formula formed between atoms. Chm.1.2.3 Compare inter- and intra-particle forces. Chm.1.2.5 Compare the properties of ionic, covalent,	**EEn.1.1** Explain the Earth's role as a body in space. EEn.1.1.1 Explain the Earth's motion through space, including precession, nutation, the barycenter, and its path about the galaxy. EEn.1.1.2 Explain how the Earth's rotation and revolution about the Sun affect its shape and is related to seasons and tides. EEn.1.1.3 Explain how the sun produces energy which is transferred to the Earth by radiation. EEn.1.1.4 Explain how incoming solar energy makes life possible on Earth. **EEn.2.1** Explain how processes and forces affect the lithosphere. EEn.2.1.1 Explain how the rock cycle, plate tectonics, volcanoes, and earthquakes

	Bio.1.2 Analyze the cell as a living system. Bio.1.2.1 Explain how homeostasis is maintained in the cell and within an organism in various environments (including temperature and pH). Bio.1.2.2 Analyze how cells grow and reproduce in terms of interphase, mitosis and cytokinesis. Bio.1.2.3 Explain how specific cell adaptations help cells survive in particular environments (focus on unicellular organisms). **Bio.2.1** Analyze the interdependence of living organisms within their environments. Bio.2.1.1 Analyze the flow of energy and cycling of matter (water, carbon, nitrogen and oxygen) through ecosystems relating the significance of each to maintaining the health and sustainability of an ecosystem. Bio.2.1.2 Analyze the survival and reproductive success of organisms in terms of behavioral, structural, and reproductive adaptations. Bio.2.1.3 Explain various ways organisms interact with each	metallic, and network compound. **Chm.1.3** Understand the physical and chemical properties of atoms based on their position in the Periodic Table. Chm.1.3.2 Infer the physical properties (atomic radius, metallic and nonmetallic characteristics) of an element based on its position on the Periodic Table. Chm.1.3.3 Infer the atomic size, reactivity, electronegativity, and ionization energy of an element from its position in the Periodic Table. **Chm.2.1** Understand the relationship among pressure, temperature, volume, and phase. Chm.2.1.1 Explain the energetic nature of phase changes. Chm.2.1.2 Explain heating and cooling curves (heat of fusion, heat of vaporization, heat, melting point, and boiling point). Chm.2.1.4 Infer simple calorimetric calculations based on the concepts of heat lost equals heat gained and specific heat. Chm.2.1.5 Explain the	impact the lithosphere. EEn.2.1.2 Predict the locations of volcanoes, earthquakes, and faults based on information contained in a variety of maps. EEn.2.1.3 Explain how natural actions such as weathering, erosion (wind, water and gravity), and soil formation affect Earth's surface. EEn.2.1.4 Explain the probability of and preparation for geohazards such as landslides, avalanches, earthquakes and volcanoes in a particular area based on available data. **EEn.2.2** Understand how human influences impact the Lithosphere. EEn.2.2.1 Explain the consequences of human activities on the lithosphere (such as mining, deforestation, agriculture, overgrazing, urbanization, and land use) past and present. EEn.2.2.2 Compare the various methods humans use to acquire traditional energy sources (such as peat, coal, oil, natural gas, nuclear fission, and wood). **EEn.2.3** Explain the structure and

	other (including predation, competition, parasitism, mutualism) and with their environments resulting in stability within ecosystems. Bio.2.1.4 Explain why ecosystems can be relatively stable over hundreds or thousands of years, even though populations may fluctuate (emphasizing availability of food, availability of shelter, number of predators and disease). **Bio.2.2** Understand the impact of human activities on the environment (one generation affects the next). Bio.2.2.1 Infer how human activities (including population growth, pollution, global warming, burning of fossil fuels, habitat destruction and introduction of nonnative species) may impact the environment. Bio.2.2.2 Explain how the use, protection and conservation of natural resources by humans impact the environment from one generation to the next. **Bio.3.1** Explain how traits are determined by the structure and function of DNA. Bio.3.1.1 Explain the double-	relationships between pressure, temperature, volume, and quantity of gas both qualitative and quantitative. **Chm.2.2** Analyze chemical reactions in terms of quantities, product formation, and energy. Chm.2.2.1 Explain the energy content of a chemical reaction. Chm.2.2.2 Analyze the evidence of chemical change. Chm.2.2.3 Analyze the law of conservation of matter and how it applies to various types of chemical equations (synthesis, decomposition, single replacement, double replacement, and combustion). Chm.2.2.4 Analyze the stoichiometric relationships inherent in a chemical reaction. Chm.2.2.5 Analyze quantitatively the composition of a substance (empirical formula, molecular formula, percent composition, and hydrates). **Chm.3.1** Understand the factors affecting rate of reaction and chemical equilibrium. Chm.3.1.1 Explain the factors that affect the rate of a reaction (temperature, concentration,	processes within the hydrosphere. EEn.2.3.1 Explain how water is an energy agent (currents and heat transfer). EEn2.3.2 Explain how groundwater and surface water interact. **EEn.2.4** Evaluate how humans use water. EEn.2.4.1 Evaluate human influences on freshwater availability. EEn.2.4.2 Evaluate human influences on water quality in North Carolina's river basins, wetlands and tidal environments. **EEn.2.5** Understand the structure of and processes within our atmosphere. EEn.2.5.2 Explain the formation of typical air masses and the weather systems that result from air mass interactions. EEn.2.5.3 Explain how cyclonic storms form based on the interaction of air masses. EEn.2.5.4 Predict the weather using available weather maps and data (including surface, upper atmospheric winds, and satellite imagery). EEn.2.5.5 Explain how human activities affect air quality.

	stranded, complementary nature of DNA as related to its function in the cell. Bio.3.1.2 Explain how DNA and RNA code for proteins and determine traits. Bio.3.1.3 Explain how mutations in DNA that result from interactions with the environment (i.e. radiation and chemicals) or new combinations in existing genes lead to changes in function and phenotype. **Bio.3.2** Understand how the environment, and/or the interaction of alleles, influences the expression of genetic traits. Bio.3.2.1 Explain the role of meiosis in sexual reproduction and genetic variation. Bio.3.2.2 Predict offspring ratios based on a variety of inheritance patterns (including dominance, co-dominance, incomplete dominance, multiple alleles, and sex-linked traits). Bio.3.2.3 Explain how the environment can influence the expression of genetic traits. **Bio.3.3** Understand the application of DNA technology. Bio.3.3.1 Interpret how DNA is	particle size and presence of a catalyst). Chm.3.1.2 Explain the conditions of a system at equilibrium. Chm.3.1.3 Infer the shift in equilibrium when a stress is applied to a chemical system (Le Chatelier's Principle). **Chm.3.2** Understand solutions and the solution process. Chm.3.2.5 Interpret solubility diagrams. Chm.3.2.6 Explain the solution process.	**EEn.2.6** Analyze patterns of global climate change over time. EEn.2.6.2 Explain changes in global climate due to natural processes. EEn.2.6.3 Analyze the impacts that human activities have on global climate change (such as burning hydrocarbons, green-house effect, and deforest-ation). EEn.2.6.4 Attribute changes in Earth systems to global climate change (temperature change, changes in pH of ocean, sea level changes, etc.). **EEn.2.7** Explain how the lithosphere, hydrosphere, and Atmosphere individually and collectively affect the biosphere. EEn.2.7.1 Explain how abiotic and biotic factors interact to create the various biomes in North Carolina. EEn.2.7.2 Explain why bio-diversity is important to the biosphere. EEn.2.7.3 Explain how human activities impact the biosphere. **EEn.2.8** Evaluate human behaviors in terms of how likely they are to ensure the ability to live sustainably on Earth.

	used for comparison and identification of organisms. Bio.3.3.2 Summarize how transgenic organisms are engineered to benefit society. Bio.3.3.3 Evaluate some of the ethical issues surrounding the use of DNA technology (including cloning, genetically modified organisms, stem cell research, and Human Genome Project). **Bio.3.4** Explain the theory of evolution by natural selection as a mechanism for how species change over time. Bio. Bio.3.4.1 Explain how fossil, biochemical, and anatomical evidence support the theory of evolution. Bio.3.4.2 Explain how natural selection influences the changes in species over time. Bio.3.4.3 Explain how various disease agents (bacteria, viruses, chemicals) can influence natural selection. **Bio 3.5** Analyze how classification systems are developed based upon speciation. Bio.3.5.1 Explain the historical development and changing nature of classification systems.		EEn.2.8.1 Evaluate alternative energy technologies for use in North Carolina. EEn.2.8.2 Critique conventional and sustainable agriculture and aquaculture practices in terms of their environmental impacts. EEn.2.8.3 Explain the effects of uncontrolled population growth on the Earth's resources. EEn.2.8.4 Evaluate the concept of "reduce, reuse, recycle" in terms of impact on natural resources.

	Bio.4.1 Understand how biological molecules are essential to the survival of living organisms. Bio.4.1.2 Summarize the relationship among DNA, proteins and amino acids in carrying out the work of cells and how this is similar in all organisms. Bio.4.1.3 Explain how enzymes act as catalysts for biological reactions. **Bio 4.2** Analyze the relationships between biochemical processes and energy use in the cell. Bio.4.2.1 Analyze photosynthesis and cellular respiration in terms of how energy is stored, released, and transferred within and between these systems. Bio.4.2.2 Explain ways that organisms use released energy for maintaining homeostasis (active transport).		
Interpret scientific arguments by: Comparing reasoning and claims based on evidence from competing arguments or design solutions	**Bio.1.1** Understand the relationship between the structures and functions of cells and their organelles. Bio.1.1.2 Compare prokaryotic and eukaryotic cells in terms of their general structures (plasma membrane and genetic material) and degree of	**Chm.1.2** Understand the bonding that occurs in simple compounds in terms of bond type, strength, and properties. Chm.1.2.1 Compare (qualitatively) the relative strengths of ionic, covalent, and metallic bonds.	**EEn.2.2** Understand how human influences impact the Lithosphere. EEn.2.2.2 Compare the various methods humans use to acquire traditional energy sources (such as peat, coal, oil, natural gas, nuclear fission, and

	complexity. **Bio.4.1** Understand how biological molecules are essential to the survival of living organisms. Bio.4.1.1 Compare the structures and functions of the major biological molecules (carbohydrates, proteins, lipids, and nucleic acids) as related to the survival of living organisms.	Chm.1.2.3 Compare inter- and intra-particle forces. Chm.1.2.5 Compare the properties of ionic, covalent, metallic, and network compound.	wood).
Interpret scientific arguments by: Evaluating currently accepted explanations, new evidence, limitations (trade-offs), constraints, and ethical issues	**Bio.3.3** Understand the application of DNA technology. Bio.3.3.3 Evaluate some of the ethical issues surrounding the use of DNA technology (including cloning, genetically modified organisms, stem cell research, and Human Genome Project).	*Note: While there are no specific science standards listed, language instruction for this language expectation can be integrated within all aspects of science instruction.	**En.2.4** Evaluate how humans use water. EEn.2.4.1 Evaluate human influences on freshwater availability. EEn.2.4.2 Evaluate human influences on water quality in North Carolina's river basins, wetlands and tidal environments. **EEn.2.8** Evaluate human behaviors in terms of how likely they are to ensure the ability to live sustainably on Earth. EEn.2.8.1 Evaluate alternative energy technologies for use in North Carolina. EEn.2.8.4 Evaluate the concept of "reduce, reuse, recycle" in terms of impact on natural resources.

ELD-SC.9-12.Argue. Interpretive	Physical Science	Physics	
Interpret scientific arguments by: Identifying appropriate and sufficient evidence from data, models, and/ or information from investigations of a phenomenon or design solutions	**PSc.1.1** Understand motion in terms of speed, velocity, acceleration and momentum. PSc.1.1.1 Explain motion in terms of frame of reference, distance, and displacement. PSc.1.1.2 Compare speed, velocity, acceleration and momentum using investigations, graphing, scalar quantities and vector quantities.. **Psc.1.2** Understand the relationship between forces and motion. PSc.1.2.1 Explain how gravitational force affects the weight of an object and the velocity of an object in freefall. PSc.1.2.2 Classify frictional forces into one of four types: static, sliding, rolling, and fluid. PSc.1.2.3 Explain forces using Newton's three laws of motion. **PSc.2.1** Understand types, properties, and structure of matter. PSc.2.1.1 Classify matter as: homogeneous or heterogeneous; pure substance or mixture; element or compound; metals, nonmetals or	**Phy.1.2** Analyze systems of forces and their interaction with matter. Phy.1.2.3 Explain forces using Newton's laws of motion as well as the universal law of gravitation. Phy.1.2.4 Explain the effects of forces (including weight, normal, tension and friction) on objects. **Phy.2.1** Understand the concepts of work, energy, and power, as well as the relationship among them. Phy.2.1.1 Interpret data on work and energy presented graphically and numerically. Phy.2.1.2 Compare the concepts of potential and kinetic energy and conservation of total mechanical energy in the description of the motion of objects. Phy.2.1.3 Explain the relationship among work, power and energy. **Phy.2.2** Analyze the behavior of waves. Phy.2.2.1 Analyze how energy is transmitted through waves, using the fundamental	

	metalloids; solution, colloid or suspension. PSc.2.1.2 Explain the phases of matter and the physical changes that matter undergoes. PSc.2.1.3 Compare physical and chemical properties of various types of matter. PSc.2.1.4 Interpret data presented in Bohr model diagrams and dot diagrams for atoms and ions of elements 1 through 18. **PSc.2.2** Understand chemical bonding and chemical interactions. PSc.2.2.1 Infer valence electrons, oxidation number, and reactivity of an element based on its location in the Periodic Table. PSc.2.2.2 Infer the type of chemical bond that occurs, whether covalent, ionic or metallic, in a given substance. PSc.2.2.3 Predict chemical formulas and names for simple compounds based on knowledge of bond formation and naming conventions. PSc.2.2.6 Summarize the characteristics and interactions of acids and bases.	characteristics of waves: wavelength, period, frequency, amplitude, and wave velocity. Phy.2.2.2 Analyze wave behaviors in terms of transmission, reflection, refraction and interference. Phy.2.2.3 Compare mechanical and electromagnetic waves in terms of wave characteristics and behavior (specifically sound and light). **Phy.2.3** Analyze the nature of moving charges and electric circuits. Phy.2.3.1 Explain Ohm's law in relation to electric circuits. Phy.2.3.3 Compare the general characteristics of AC and DC systems without calculations. Phy.2.3.4 Analyze electric systems in terms of their energy and power. **Phy.3.1** Explain charges and electrostatic systems. Phy.3.1.4 Explain the mechanisms for producing electrostatic charges, including charging by friction, conduction, and induction. Phy.3.1.5 Explain how differences in electrostatic potentials relate to the potential energy of charged objects.	

	PSc.2.3 Understand the role of the nucleus in radiation and radioactivity. PSc.2.3.1 Compare nuclear reactions including alpha decay, beta decay and gamma decay; nuclear fusion and nuclear fission. **PSc.3.1** Understand the types of energy,conservation of energy and energy transfer. PSc.3.1.1 Explain thermal energy and its transfer. PSc.3.1.2 Explain the law of conservation of energy in a mechanical system in terms of kinetic energy, potential energy and heat. PSc.3.1.3 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. PSc.3.1.4 Explain the relationship among work, power and simple machines both qualitatively and quantitatively. **PSc.3.2** Understand the nature of waves. PSc.3.2.1 Explain the relationships among wave frequency, wave period, wave velocity and wavelength	**Phy.3.2** Explain the concept of Magnetism. Phy.3.2.1 Explain the relationship between magnetic domains and Magnetism. Phy.3.2.2 Explain how electric currents produce various magnetic Fields. Phy.3.2.3 Explain how transformers and power distributions are applications of electromagnetism.	

	through calculation and investigation. PSc.3.2.2 Compare waves (mechanical, electromagnetic, and surface) using their characteristics. PSc.3.2.3 Classify waves as transverse or compressional (longitudinal). **PSc.3.3** Understand electricity and magnetism and their relationship. PSc.3.3.1 Summarize static and current electricity. PSc.3.3.2 Explain simple series and parallel DC circuits in terms of Ohm's law. PSc.3.3.3 Explain how current is affected by changes in composition, length, temperature, and diameter of wire. PSc.3.3.4 Explain magnetism in terms of domains, interactions of poles, and magnetic fields. PSc.3.3.5 Explain the practical applications of magnetism.		
Interpret scientific arguments by: Comparing reasoning and claims based on evidence from competing arguments or design solutions	**PSc.1.1** Understand motion in terms of speed, velocity, acceleration and momentum. PSc.1.1.2 Compare speed, velocity, acceleration and momentum using investigations, graphing, scalar quantities and vector quantities.	**Phy.2.1** Understand the concepts of work, energy, and power, as well as the relationship among them. Phy.2.1.1 Interpret data on work and energy presented graphically and numerically. Phy.2.1.2 Compare the concepts of potential and	

	PSc.2.1 Understand types, properties, and structure of matter. PSc.2.1.3 Compare physical and chemical properties of various types of matter. **PSc.2.3** Understand the role of the nucleus in radiation and radioactivity. PSc.2.3.1 Compare nuclear reactions including alpha decay, beta decay and gamma decay; nuclear fusion and nuclear fission. **PSc.3.2** Understand the nature of waves. PSc.3.2.2 Compare waves (mechanical, electromagnetic, and surface) using their characteristics.	kinetic energy and conservation of total mechanical energy in the description of the motion of objects. Phy.2.1.3 Explain the relationship among work, power and energy. **Phy.2.2** Analyze the behavior of waves. Phy.2.2.3 Compare mechanical and electromagnetic waves in terms of wave characteristics and behavior (specifically sound and light). **Phy.2.3** Analyze the nature of moving charges and electric circuits. Phy.2.3.3 Compare the general characteristics of AC and DC systems without calculations.	
Interpret scientific arguments by: Evaluating currently accepted explanations, new evidence, limitations (trade-offs), constraints, and ethical issues	*Note: While there are no specific science standards listed, language instruction for this language expectation can be integrated within all aspects of science instruction.	*Note: While there are no specific science standards listed, language instruction for this language expectation can be integrated within all aspects of science instruction.	
ELD-SC.9-12.Argue. Expressive	**Biology**	**Chemistry**	**Earth and Environmental**
Construct scientific arguments that: Introduce and contextualize topic/	**Bio.2.1** Analyze the interdependence of living organisms within their environments.	**Chm.1.1** Analyze the structure of atoms and ions. Chm.1.1.3 Explain the emission	**EEn.2.1** Explain how processes and forces affect the lithosphere. EEn.2.1.2 Predict the locations

phenomenon in current scientific or historical episodes in science	Bio.2.1.4 Explain why eco-systems can be relatively stable over hundreds or thousands of years, even though populations may fluctuate (emphasizing availability of food, availability of shelter, number of predators and disease). **Bio.2.2** Understand the impact of human activities on the environment (one generation affects the next). Bio.2.2.1 Infer how human activities (including population growth, pollution, global warming, burning of fossil fuels, habitat destruction and introduction of nonnative species) may impact the environment. Bio.2.2.2 Explain how the use, protection and conservation of natural resources by humans impact the environment from one generation to the next. **Bio.3.1** Explain how traits are determined by the structure and function of DNA. Bio.3.1.3 Explain how mutations in DNA that result from interactions with the environment (i.e. radiation and chemicals) or new combinations in existing genes	of electromagnetic radiation in spectral form in terms of the Bohr model. **Chm.3.1** Understand the factors affecting rate of reaction and chemical equilibrium. Chm.3.1.3 Infer the shift in equilibrium when a stress is applied to a chemical system (Le Chatelier's Principle).	of volcanoes, earthquakes, and faults based on information contained in a variety of maps. EEn.2.1.3 Explain how natural actions such as weathering, erosion (wind, water and gravity), and soil formation affect Earth's surface. EEn.2.1.4 Explain the probability of and preparation for geohazards such as landslides, avalanches, earthquakes and volcanoes in a particular area based on available data. **EEn.2.2** Understand how human influences impact the Lithosphere. EEn.2.2.1 Explain the consequences of human activities on the lithosphere (such as mining, deforestation, agriculture, overgrazing, urbanization, and land use) past and present. EEn.2.2.2 Compare the various methods humans use to acquire traditional energy sources (such as peat, coal, oil, natural gas, nuclear fission, and wood). **EEn.2.3** Explain the structure and processes within the hydrosphere.

	lead to changes in function and phenotype. **Bio.3.3** Understand the application of DNA technology. Bio.3.3.3 Evaluate some of the ethical issues surrounding the use of DNA technology (including cloning, genetically modified organisms, stem cell research, and Human Genome Project). **Bio.3.4** Explain the theory of evolution by natural selection as a mechanism for how species change over time. Bio. 3.4.1 Explain how fossil, biochemical, and anatomical evidence support the theory of Evolution. **Bio 3.5** Analyze how classification systems are developed based upon speciation. Bio.3.5.1 Explain the historical development and changing nature of classification systems.		**EEn.2.4** Evaluate how humans use water. EEn.2.4.1 Evaluate human influences on freshwater availability. EEn.2.4.2 Evaluate human influences on water quality in North Carolina's river basins, wetlands and tidal environments. **EEn.2.5** Understand the structure of and processes within our atmosphere. EEn.2.5.5 Explain how human activities affect air quality. **EEn.2.6** Analyze patterns of global climate change over time. EEn.2.6.2 Explain changes in global climate due to natural processes. EEn.2.6.3 Analyze the impacts that human activities have on global climate change (such as burning hydrocarbons, green-house effect, and deforest-ation). EEn.2.6.4 Attribute changes in Earth systems to global climate change (temperature change, changes in pH of ocean, sea level changes, etc.). EEn.2.7.3 Explain how human activities impact the biosphere. **EEn.2.8** Evaluate human behaviors in terms of how likely they are to

			ensure the ability to live sustainably on Earth. EEn.2.8.1 Evaluate alternative energy technologies for use in North Carolina. EEn.2.8.2 Critique conventional and sustainable agriculture and aquaculture practices in terms of their environmental impacts. EEn.2.8.3 Explain the effects of uncontrolled population growth on the Earth's resources. EEn.2.8.4 Evaluate the concept of "reduce, reuse, recycle" in terms of impact on natural resources.
Construct scientific arguments that: Defend or refute a claim based on data and evidence	**Bio.2.1** Analyze the interdependence of living organisms within their environments. Bio.2.1.4 Explain why eco-systems can be relatively stable over hundreds or thousands of years, even though populations may fluctuate (emphasizing availability of food, availability of shelter, number of predators and disease). **Bio.2.2** Understand the impact of human activities on the environment (one generation affects the next). Bio.2.2.1 Infer how human activities (including population growth, pollution, global	**Chm.1.1** Analyze the structure of atoms and ions. Chm.1.1.3 Explain the emission of electromagnetic radiation in spectral form in terms of the Bohr model. Chm.1.1.4 Explain the process of radioactive decay by the use of nuclear equations and half-life. **Chm.1.2** Understand the bonding that occurs in simple compounds in terms of bond type, strength, and properties. Chm.1.2.2 Infer the type of bond and chemical formula formed between atoms.	**EEn.1.1** Explain the Earth's role as a body in space. EEn.1.1.1 Explain the Earth's motion through space, including precession, nutation, the barycenter, and its path about the galaxy. EEn.1.1.2 Explain how the Earth's rotation and revolution about the Sun affect its shape and is related to seasons and tides. EEn.1.1.3 Explain how the sun produces energy which is transferred to the Earth by radiation. EEn.1.1.4 Explain how incoming solar energy makes life possible

	warming, burning of fossil fuels, habitat destruction and introduction of nonnative species) may impact the environment. Bio.2.2.2 Explain how the use, protection and conservation of natural resources by humans impact the environment from one generation to the next. **Bio.3.2** Understand how the environment, and/or the interaction of alleles, influences the expression of genetic traits. Bio.3.2.3 Explain how the environment can influence the expression of genetic traits.. **Bio.3.3** Understand the application of DNA technology. Bio.3.3.3 Evaluate some of the ethical issues surrounding the use of DNA technology (including cloning, genetically modified organisms, stem cell research, and Human Genome Project). **Bio.3.4** Explain the theory of evolution by natural selection as a mechanism for how species change over time. Bio. Bio.3.4.1 Explain how fossil, biochemical, and anatomical evidence support the theory of	**Chm.1.3** Understand the physical and chemical properties of atoms based on their position in the Periodic Table. Chm.1.3.2 Infer the physical properties (atomic radius, metallic and nonmetallic characteristics) of an element based on its position on the Periodic Table. Chm.1.3.3 Infer the atomic size, reactivity, electronegativity, and ionization energy of an element from its position in the Periodic Table. **Chm.2.1** Understand the relationship among pressure, temperature, volume, and phase. Chm.2.1.1 Explain the energetic nature of phase changes. Chm.2.1.2 Explain heating and cooling curves (heat of fusion, heat of vaporization, heat, melting point, and boiling point). Chm.2.1.4 Infer simple calorimetric calculations based on the concepts of heat lost equals heat gained and specific heat. Chm.2.1.5 Explain the relationships between pressure, temperature, volume, and quantity of gas both qualitative	on Earth. **EEn.2.1** Explain how processes and forces affect the lithosphere. EEn.2.1.1 Explain how the rock cycle, plate tectonics, volcanoes, and earthquakes impact the lithosphere. EEn.2.1.2 Predict the locations of volcanoes, earthquakes, and faults based on information contained in a variety of maps. EEn.2.1.3 Explain how natural actions such as weathering, erosion (wind, water and gravity), and soil formation affect Earth's surface. EEn.2.1.4 Explain the probability of and preparation for geohazards such as landslides, avalanches, earthquakes and volcanoes in a particular area based on available data. **EEn.2.2** Understand how human influences impact the Lithosphere. EEn.2.2.1 Explain the consequences of human activities on the lithosphere (such as mining, deforestation, agriculture, overgrazing, urbanization, and land use) past and present. EEn.2.2.2 Compare the various

	evolution. Bio.3.4.2 Explain how natural selection influences the changes in species over time. Bio.3.4.3 Explain how various disease agents (bacteria, viruses, chemicals) can influence natural selection.	and quantitative. **Chm.2.2** Analyze chemical reactions in terms of quantities, product formation, and energy. Chm.2.2.2 Analyze the evidence of chemical change. **Chm.3.1** Understand the factors affecting rate of reaction and chemical equilibrium. Chm.3.1.1 Explain the factors that affect the rate of a reaction (temperature, concentration, particle size and presence of a catalyst). Chm.3.1.2 Explain the conditions of a system at equilibrium. Chm.3.1.3 Infer the shift in equilibrium when a stress is applied to a chemical system (Le Chatelier's Principle). **Chm.3.2** Understand solutions and the solution process. Chm.3.2.3 Infer the quantitative nature of a solution (molarity, dilution, and titration with a 1:1 molar ratio). Chm.3.2.5 Interpret solubility diagrams. Chm.3.2.6 Explain the solution process.	methods humans use to acquire traditional energy sources (such as peat, coal, oil, natural gas, nuclear fission, and wood). **EEn.2.3** Explain the structure and processes within the hydrosphere. EEn.2.3.1 Explain how water is an energy agent (currents and heat transfer). EEn2.3.2 Explain how ground-water and surface water interact. **EEn.2.4** Evaluate how humans use water. EEn.2.4.1 Evaluate human influences on freshwater availability. EEn.2.4.2 Evaluate human influences on water quality in North Carolina's river basins, wetlands and tidal environments. **EEn.2.5** Understand the structure of and processes within our atmosphere. EEn.2.5.2 Explain the formation of typical air masses and the weather systems that result from air mass interactions. EEn.2.5.3 Explain how cyclonic storms form based on the interaction of air masses.

			EEn.2.5.4 Predict the weather using available weather maps and data (including surface, upper atmospheric winds, and satellite imagery). EEn.2.5.5 Explain how human activities affect air quality. **EEn.2.6** Analyze patterns of global climate change over time. EEn.2.6.2 Explain changes in global climate due to natural processes. EEn.2.6.3 Analyze the impacts that human activities have on global climate change (such as burning hydrocarbons, greenhouse effect, and deforestation). EEn.2.6.4 Attribute changes in Earth systems to global climate change (temperature change, changes in pH of ocean, sea level changes, etc.). **EEn.2.7** Explain how the lithosphere, hydrosphere, and Atmosphere individually and collectively affect the biosphere. EEn.2.7.1 Explain how abiotic and biotic factors interact to create the various biomes in North Carolina. EEn.2.7.2 Explain why biodiversity is important to the

			biosphere. EEn.2.7.3 Explain how human activities impact the biosphere. **EEn.2.8** Evaluate human behaviors in terms of how likely they are to ensure the ability to live sustainably on Earth. EEn.2.8.1 Evaluate alternative energy technologies for use in North Carolina. EEn.2.8.2 Critique conventional and sustainable agriculture and aquaculture practices in terms of their environmental impacts. EEn.2.8.3 Explain the effects of uncontrolled population growth onthe Earth's resources. EEn.2.8.4 Evaluate the concept of"reduce, reuse, recycle" in terms of impact on natural resources.
Construct scientific arguments that: Establish and maintain an appropriate tone and stance (neutral/objective or biased/ subjective)	**Bio.1.1** Understand the relationship between the structures and functions of cells and their organelles. Bio.1.1.1 Summarize the structure and function of organelles in eukaryotic cells (including the nucleus, plasma membrane, cell wall, mito-chondria, vacuoles, chloro-plasts, and ribosomes) and ways that these organelles interact with each other to	**Chm.1.1** Analyze the structure of atoms and ions. Chm.1.1.3 Explain the emission of electromagnetic radiation in spectral form in terms of the Bohr model. Chm.1.1.4 Explain the process of radioactive decay by the use of nuclear equations and half-life. **Chm.1.2** Understand the bonding that	**EEn.1.1** Explain the Earth's role as a body in space. EEn.1.1.1 Explain the Earth's motion through space, including precession, nutation, the barycenter, and its path about the galaxy. EEn.1.1.2 Explain how the Earth's rotation and revolution about the Sun affect its shape and is related to seasons and tides.

	perform the function of the cell. Bio.1.1.2 Compare prokaryotic and eukaryotic cells in terms of their general structures (plasma membrane and genetic material) and degree of complexity. Bio.1.1.3 Explain how instructions in DNA lead to cell differentiation and result in cells specialized to perform specific functions in multicellular organisms. **Bio.1.2** Analyze the cell as a living system. Bio.1.2.1 Explain how homeostasis is maintained in the cell and within an organism in various environments (including temperature and pH). Bio.1.2.2 Analyze how cells grow and reproduce in terms of interphase, mitosis and cytokinesis. Bio.1.2.3 Explain how specific cell adaptations help cells survive in particular environments (focus on unicellular organisms). **Bio.2.1** Analyze the interdependence of living organisms within their environments. Bio.2.1.1 Analyze the flow of	occurs in simple compounds in terms of bond type, strength, and properties. Chm.1.2.1 Compare (qualitatively) the relative strengths of ionic, covalent, and metallic bonds. Chm.1.2.2 Infer the type of bond and chemical formula formed between atoms. Chm.1.2.3 Compare inter- and intra-particle forces. Chm.1.2.5 Compare the properties of ionic, covalent, metallic, and network compound. **Chm.1.3** Understand the physical and chemical properties of atoms based on their position in the Periodic Table. Chm.1.3.2 Infer the physical properties (atomic radius, metallic and nonmetallic characteristics) of an element based on its position on the Periodic Table. Chm.1.3.3 Infer the atomic size, reactivity, electronegativity, and ionization energy of an element from its position in the Periodic Table. **Chm.2.1** Understand the relationship among pressure, temperature, volume, and phase. Chm.2.1.1 Explain the	EEn.1.1.3 Explain how the sun produces energy which is transferred to the Earth by radiation. EEn.1.1.4 Explain how incoming solar energy makes life possible on Earth. **EEn.2.1** Explain how processes and forces affect the lithosphere. EEn.2.1.1 Explain how the rock cycle, plate tectonics, volcanoes, and earthquakes impact the lithosphere. EEn.2.1.2 Predict the locations of volcanoes, earthquakes, and faults based on information contained in a variety of maps. EEn.2.1.3 Explain how natural actions such as weathering, erosion (wind, water and gravity), and soil formation affect Earth's surface. EEn.2.1.4 Explain the probability of and preparation for geohazards such as landslides, avalanches, earthquakes and volcanoes in a particular area based on available data. **EEn.2.2** Understand how human influences impact the Lithosphere. EEn.2.2.1 Explain the consequences of human

	energy and cycling of matter (water, carbon, nitrogen and oxygen) through ecosystems relating the significance of each to maintaining the health and sustainability of an ecosystem. Bio.2.1.2 Analyze the survival and reproductive success of organisms in terms of behavioral, structural, and reproductive adaptations. Bio.2.1.3 Explain various ways organisms interact with each other (including predation, competition, parasitism, mutualism) and with their environments resulting in stability within ecosystems. Bio.2.1.4 Explain why ecosystems can be relatively stable over hundreds or thousands of years, even though populations may fluctuate (emphasizing availability of food, availability of shelter, number of predators and disease). **Bio.2.2** Understand the impact of human activities on the environment (one generation affects the next). Bio.2.2.1 Infer how human activities (including population growth, pollution, global warming, burning of fossil fuels, habitat destruction and	energetic nature of phase changes. Chm.2.1.2 Explain heating and cooling curves (heat of fusion, heat of vaporization, heat, melting point, and boiling point). Chm.2.1.4 Infer simple calorimetric calculations based on the concepts of heat lost equals heat gained and specific heat. Chm.2.1.5 Explain the relationships between pressure, temperature, volume, and quantity of gas both qualitative and quantitative. **Chm.2.2** Analyze chemical reactions in terms of quantities, product formation, and energy. Chm.2.2.1 Explain the energy content of a chemical reaction. Chm.2.2.2 Analyze the evidence of chemical change. Chm.2.2.3 Analyze the law of conservation of matter and how it applies to various types of chemical equations (synthesis, decomposition, single replacement, double replacement, and combustion). Chm.2.2.4 Analyze the stoichiometric relationships inherent in a chemical reaction.	activities on the lithosphere (such as mining, deforestation, agriculture, overgrazing, urbanization, and land use) past and present. EEn.2.2.2 Compare the various methods humans use to acquire traditional energy sources (such as peat, coal, oil, natural gas, nuclear fission, and wood). **EEn.2.3** Explain the structure and processes within the hydrosphere. EEn.2.3.1 Explain how water is an energy agent (currents and heat transfer). EEn2.3.2 Explain how ground-water and surface water interact. **EEn.2.4** Evaluate how humans use water. EEn.2.4.1 Evaluate human influences on freshwater availability. EEn.2.4.2 Evaluate human influences on water quality in North Carolina's river basins, wetlands and tidal environments. **EEn.2.5** Understand the structure of and processes within our atmosphere. EEn.2.5.1 Summarize the

	introduction of nonnative species) may impact the environment. Bio.2.2.2 Explain how the use, protection and conservation of natural resources by humans impact the environment from one generation to the next. **Bio.3.1** Explain how traits are determined by the structure and function of DNA. Bio.3.1.1 Explain the double-stranded, complementary nature of DNA as related to its function in the cell. Bio.3.1.2 Explain how DNA and RNA code for proteins and determine traits. Bio.3.1.3 Explain how mutations in DNA that result from interactions with the environment (i.e. radiation and chemicals) or new combinations in existing genes lead to changes in function and phenotype. **Bio.3.2** Understand how the environment, and/or the interaction of alleles, influences the expression of genetic traits. Bio.3.2.1 Explain the role of meiosis in sexual reproduction and genetic variation.	Chm.2.2.5 Analyze quantitatively the composition of a substance (empirical formula, molecular formula, percent composition, and hydrates). **Chm.3.1** Understand the factors affecting rate of reaction and chemical equilibrium. Chm.3.1.1 Explain the factors that affect the rate of a reaction (temperature, concentration, particle size and presence of a catalyst). Chm.3.1.2 Explain the conditions of a system at equilibrium. Chm.3.1.3 Infer the shift in equilibrium when a stress is applied to a chemical system (Le Chatelier's Principle). **Chm.3.2** Understand solutions and the solution process. Chm.3.2.4 Summarize the properties of solutions. Chm.3.2.6 Explain the solution process.	structure and composition of our atmosphere. EEn.2.5.2 Explain the formation of typical air masses and the weather systems that result from air mass interactions. EEn.2.5.3 Explain how cyclonic storms form based on the interaction of air masses. EEn.2.5.4 Predict the weather using available weather maps and data (including surface, upper atmospheric winds, and satellite imagery). EEn.2.5.5 Explain how human activities affect air quality. **EEn.2.6** Analyze patterns of global climate change over time. EEn.2.6.1 Differentiate between weather and climate. EEn.2.6.2 Explain changes in global climate due to natural processes. EEn.2.6.3 Analyze the impacts that human activities have on global climate change (such as burning hydrocarbons, green-house effect, and deforest-ation). EEn.2.6.4 Attribute changes in Earth systems to global climate change (temperature change, changes in pH of ocean, sea level changes, etc.).

	Bio.3.2.2 Predict offspring ratios based on a variety of inheritance patterns (including dominance, co-dominance, incomplete dominance, multiple alleles, and sex-linked traits). Bio.3.2.3 Explain how the environment can influence the expression of genetic traits. **Bio.3.3** Understand the application of DNA technology. Bio.3.3.1 Interpret how DNA is used for comparison and identification of organisms. Bio.3.3.2 Summarize how transgenic organisms are engineered to benefit society. Bio.3.3.3 Evaluate some of the ethical issues surrounding the use of DNA technology (including cloning, genetically modified organisms, stem cell research, and Human Genome Project). **Bio.3.4** Explain the theory of evolution by natural selection as a mechanism for how species change over time. Bio. Bio.3.4.1 Explain how fossil, biochemical, and anatomical evidence support the theory of evolution. Bio.3.4.2 Explain how natural selection influences the		**EEn.2.7** Explain how the lithosphere, hydrosphere, and Atmosphere individually and collectively affect the biosphere. EEn.2.7.1 Explain how abiotic and biotic factors interact to create the various biomes in North Carolina. EEn.2.7.2 Explain why bio-diversity is important to the biosphere. EEn.2.7.3 Explain how human activities impact the biosphere. **EEn.2.8** Evaluate human behaviors in terms of how likely they are to ensure the ability to live sustainably on Earth. EEn.2.8.1 Evaluate alternative energy technologies for use in North Carolina. EEn.2.8.2 Critique conventional and sustainable agriculture and aquaculture practices in terms of their environmental impacts. EEn.2.8.3 Explain the effects of uncontrolled population growth on the Earth's resources. EEn.2.8.4 Evaluate the concept of "reduce, reuse, recycle" in terms of impact on natural resources.

	changes in species over time. Bio.3.4.3 Explain how various disease agents (bacteria, viruses, chemicals) can influence natural selection. **Bio 3.5** Analyze how classification systems are developed based upon speciation. Bio.3.5.1 Explain the historical development and changing nature of classification systems. Bio.3.5.2 Analyze the classification of organisms according to their evolutionary relationships (including dichotomous keys and phylogenetic trees). **Bio.4.1** Understand how biological molecules are essential to the survival of living organisms. Bio.4.1.1 Compare the structures and functions of the major biological molecules (carbohydrates, proteins, lipids, and nucleic acids) as related to the survival of living organisms. Bio.4.1.2 Summarize the relationship among DNA, proteins and amino acids in carrying out the work of cells and how this is similar in all organisms.		

	Bio.4.1.3 Explain how enzymes act as catalysts for biological reactions. **Bio 4.2** Analyze the relationships between biochemical processes and energy use in the cell. Bio.4.2.1 Analyze photosynthesis and cellular respiration in terms of how energy is stored, released, and transferred within and between these systems. Bio.4.2.2 Explain ways that organisms use released energy for maintaining homeostasis (active transport).		
Construct scientific arguments that: Signal logical relationships among reasoning, evidence, data, and/or models when making and defending a claim, counterclaim, and/or rebuttal	**Bio.2.1** Analyze the interdependence of living organisms within their environments. Bio.2.1.4 Explain why eco-systems can be relatively stable over hundreds or thousands of years, even though populations may fluctuate (emphasizing availability of food, availability of shelter, number of predators and disease). **Bio.2.2** Understand the impact of human activities on the environment (one generation affects the next). Bio.2.2.1 Infer how human activities (including population	**Chm.1.1** Analyze the structure of atoms and ions. Chm.1.1.3 Explain the emission of electromagnetic radiation in spectral form in terms of the Bohr model. Chm.1.1.4 Explain the process of radioactive decay by the use of nuclear equations and half-life. **Chm.1.2** Understand the bonding that occurs in simple compounds in terms of bond type, strength, and properties. Chm.1.2.1 Compare (qualitatively) the relative strengths of ionic, covalent, and	**EEn.1.1** Explain the Earth's role as a body in space. EEn.1.1.1 Explain the Earth's motion through space, including precession, nutation, the barycenter, and its path about the galaxy. EEn.1.1.2 Explain how the Earth's rotation and revolution about the Sun affect its shape and is related to seasons and tides. EEn.1.1.3 Explain how the sun produces energy which is transferred to the Earth by radiation. EEn.1.1.4 Explain how incoming

	growth, pollution, global warming, burning of fossil fuels, habitat destruction and introduction of nonnative species) may impact the environment. Bio.2.2.2 Explain how the use, protection and conservation of natural resources by humans impact the environment from one generation to the next. **Bio.3.2** Understand how the environment, and/or the interaction of alleles, influences the expression of genetic traits. Bio.3.2.3 Explain how the environment can influence the expression of genetic traits. **Bio.3.3** Understand the application of DNA technology. Bio.3.3.3 Evaluate some of the ethical issues surrounding the use of DNA technology (including cloning, genetically modified organisms, stem cell research, and Human Genome Project). **Bio.3.4** Explain the theory of evolution by natural selection as a mechanism for how species change over time. Bio.3.4.1 Explain how fossil, biochemical, and anatomical	metallic bonds. Chm.1.2.2 Infer the type of bond and chemical formula formed between atoms. Chm.1.2.3 Compare inter- and intra-particle forces. Chm.1.2.5 Compare the properties of ionic, covalent, metallic, and network compound. **Chm.1.3** Understand the physical and chemical properties of atoms based on their position in the Periodic Table. Chm.1.3.2 Infer the physical properties (atomic radius, metallic and nonmetallic characteristics) of an element based on its position on the Periodic Table. Chm.1.3.3 Infer the atomic size, reactivity, electronegativity, and ionization energy of an element from its position in the Periodic Table. **Chm.2.1** Understand the relationship among pressure, temperature, volume, and phase. Chm.2.1.1 Explain the energetic nature of phase changes. Chm.2.1.2 Explain heating and cooling curves (heat of fusion, heat of vaporization, heat,	solar energy makes life possible on Earth. **EEn.2.1** Explain how processes and forces affect the lithosphere. EEn.2.1.1 Explain how the rock cycle, plate tectonics, volcanoes, and earthquakes impact the lithosphere. EEn.2.1.2 Predict the locations of volcanoes, earthquakes, and faults based on information contained in a variety of maps. EEn.2.1.3 Explain how natural actions such as weathering, erosion (wind, water and gravity), and soil formation affect Earth's surface. EEn.2.1.4 Explain the probability of and preparation for geohazards such as landslides, avalanches, earthquakes and volcanoes in a particular area based on available data. **EEn.2.2** Understand how human influences impact the Lithosphere. EEn.2.2.1 Explain the consequences of human activities on the lithosphere (such as mining, deforestation, agriculture, overgrazing, urbanization, and land use) past and present.

	evidence support the theory of evolution. Bio.3.4.2 Explain how natural selection influences the changes in species over time. Bio.3.4.3 Explain how various disease agents (bacteria, viruses, chemicals) can influence natural selection.	melting point, and boiling point). Chm.2.1.4 Infer simple calorimetric calculations based on the concepts of heat lost equals heat gained and specific heat. Chm.2.1.5 Explain the relationships between pressure, temperature, volume, and quantity of gas both qualitative and quantitative. **Chm.2.2** Analyze chemical reactions in terms of quantities, product formation, and energy. Chm.2.2.1 Explain the energy content of a chemical reaction. Chm.2.2.2 Analyze the evidence of chemical change. Chm.2.2.3 Analyze the law of conservation of matter and how it applies to various types of chemical equations (synthesis, decomposition, single replacement, double replacement, and combustion). Chm.2.2.4 Analyze the stoichiometric relationships inherent in a chemical reaction. Chm.2.2.5 Analyze quantitatively the composition of a substance (empirical formula, molecular formula, percent composition, and	EEn.2.2.2 Compare the various methods humans use to acquire traditional energy sources (such as peat, coal, oil, natural gas, nuclear fission, and wood). **EEn.2.3** Explain the structure and processes within the hydrosphere. EEn.2.3.1 Explain how water is an energy agent (currents and heat transfer). EEn2.3.2 Explain how ground-water and surface water interact. **EEn.2.4** Evaluate how humans use water. EEn.2.4.1 Evaluate human influences on freshwater availability. EEn.2.4.2 Evaluate human influences on water quality in North Carolina's river basins, wetlands and tidal environ-ments. **EEn.2.5** Understand the structure of and processes within our atmosphere. EEn.2.5.2 Explain the formation of typical air masses and the weather systems that result from air mass interactions. EEn.2.5.3 Explain how cyclonic

		hydrates). **Chm.3.1** Understand the factors affecting rate of reaction and chemical equilibrium. Chm.3.1.1 Explain the factors that affect the rate of a reaction (temperature, concentration, particle size and presence of a catalyst). Chm.3.1.2 Explain the conditions of a system at equilibrium. Chm.3.1.3 Infer the shift in equilibrium when a stress is applied to a chemical system (Le Chatelier's Principle). **Chm.3.2** Understand solutions and the solution process. Chm.3.2.5 Interpret solubility diagrams. Chm.3.2.6 Explain the solution process.	storms form based on the interaction of air masses. EEn.2.5.4 Predict the weather using available weather maps and data (including surface, upper atmospheric winds, and satellite imagery). EEn.2.5.5 Explain how human activities affect air quality. **EEn.2.6** Analyze patterns of global climate change over time. EEn.2.6.1 Differentiate between weather and climate. EEn.2.6.2 Explain changes in global climate due to natural processes. EEn.2.6.3 Analyze the impacts that human activities have on global climate change (such as burning hydrocarbons, green-house effect, and deforest-ation). EEn.2.6.4 Attribute changes in Earth systems to global climate change (temperature change, changes in pH of ocean, sea level changes, etc.). **EEn.2.7** Explain how the lithosphere, hydrosphere, and Atmosphere individually and collectively affect the biosphere. EEn.2.7.1 Explain how abiotic and biotic factors interact to

			create the various biomes in North Carolina. EEn.2.7.2 Explain why bio-diversity is important to the biosphere. EEn.2.7.3 Explain how human activities impact the biosphere. **EEn.2.8** Evaluate human behaviors in terms of how likely they are to ensure the ability to live sustainably on Earth. EEn.2.8.1 Evaluate alternative energy technologies for use in North Carolina. EEn.2.8.2 Critique conventional and sustainable agriculture and aquaculture practices in terms of their environmental impacts. EEn.2.8.3 Explain the effects of uncontrolled population growth on the Earth's resources. EEn.2.8.4 Evaluate the concept of "reduce, reuse, recycle" in terms of impact on natural resources.
ELD-SC.9-12.Argue. Expressive	**Physical Science**	**Physics**	
Construct scientific arguments that: Introduce and contextualize topic/ phenomenon in current scientific or historical episodes in science	**Psc.1.2** Understand the relationship between forces and motion. PSc.1.2.3 Explain forces using Newton's three laws of motion. **PSc.2.1** Understand types, properties,	**Phy.1.2** Analyze systems of forces and their interaction with matter. Phy.1.2.3 Explain forces using Newton's laws of motion as well as the universal law of gravitation.	

	and structure of matter. PSc.2.1.4 Interpret data presented in Bohr model diagrams and dot diagrams for atoms and ions of elements 1 through 18.	**Phy.2.3** Analyze the nature of moving charges and electric circuits. Phy.2.3.1 Explain Ohm's law in relation to electric circuits. **Phy.3.1** Explain charges and electrostatic systems. Phy.3.1.5 Explain how differences in electrostatic potentials relate to the potential energy of charged objects. **Phy.3.2** Explain the concept of magnetism. Phy.3.2.1 Explain the relationship between magnetic domains and magnetism.	
Construct scientific arguments that: Defend or refute a claim based on data and evidence	**PSc.1.1** Understand motion in terms of speed, velocity, acceleration and momentum. PSc.1.1.1 Explain motion in terms of frame of reference, distance, and displacement. PSc.1.1.2 Compare speed, velocity, acceleration and momentum using investigations, graphing, scalar quantities and vector quantities. **Psc.1.2** Understand the relationship between forces and motion.	**Phy.1.1** Analyze the motion of objects. Phy.1.1.1 Analyze motion graphically and numerically using vectors, graphs and calculations. Phy.1.1.2 Analyze motion in one dimension using time, distance, displacement, velocity, and acceleration. Phy.1.1.3 Analyze motion in two dimensions using angle of trajectory, time, distance, displacement, velocity, and acceleration.	

	PSc.1.2.1 Explain how gravitational force affects the weight of an object and the velocity of an object in freefall. PSc.1.2.2 Classify frictional forces into one of four types: static, sliding, rolling, and fluid. PSc.1.2.3 Explain forces using Newton's three laws of motion. **PSc.2.1** Understand types, properties, and structure of matter. PSc.2.1.1 Classify matter as: homogeneous or heterogeneous; pure substance or mixture; element or compound; metals, nonmetals or metalloids; solution, colloid or suspension. PSc.2.1.2 Explain the phases of matter and the physical changes that matter undergoes. PSc.2.1.3 Compare physical and chemical properties of various types of matter. PSc.2.1.4 Interpret data presented in Bohr model diagrams and dot diagrams for atoms and ions of elements 1 through 18. **PSc.2.2** Understand chemical bonding and chemical interactions. PSc.2.2.1 Infer valence	**Phy.1.2** Analyze systems of forces and their interaction with matter. Phy.1.2.1 Analyze forces and systems of forces graphically and numerically using vectors, graphs and calculations. Phy.1.2.2 Analyze systems of forces in one dimension and two dimensions using free body diagrams. Phy.1.2.3 Explain forces using Newton's laws of motion as well as the universal law of gravitation. Phy.1.2.4 Explain the effects of forces (including weight, normal, tension and friction) on objects. Phy.1.2.5 Analyze basic forces related to rotation in a circular path (centripetal force). **Phy.1.3** Analyze the motion of objects based on the principles of conservation of momentum, conservation of energy and Impulse. Phy.1.3.1 Analyze the motion of objects involved in completely elastic and completely inelastic collisions by using the principles of conservation of momentum and conservation of energy. Phy.1.3.2 Analyze the motion of	

	electrons, oxidation number, and reactivity of an element based on its location in the Periodic Table. PSc.2.2.2 Infer the type of chemical bond that occurs, whether covalent, ionic or metallic, in a given substance. PSc.2.2.3 Predict chemical formulas and names for simple compounds based on knowledge of bond formation and naming conventions. PSc.2.2.6 Summarize the characteristics and interactions of acids and bases. **PSc.2.3** Understand the role of the nucleus in radiation and radioactivity. PSc.2.3.1 Compare nuclear reactions including alpha decay, beta decay and gamma decay; nuclear fusion and nuclear fission. PSc.2.3.2 Exemplify the radioactive decay of unstable nuclei using the concept of half-life. **PSc.3.1** Understand the types of energy,conservation of energy and energy transfer. PSc.3.1.1 Explain thermal energy and its transfer. PSc.3.1.2 Explain the law of	objects based on the relationship between momentum and impulse. **Phy.2.1** Understand the concepts of work, energy, and power, as well as the relationship among them. Phy.2.1.1 Interpret data on work and energy presented graphically and numerically. Phy.2.1.2 Compare the concepts of potential and kinetic energy and conservation of total mechanical energy in the description of the motion of objects. Phy.2.1.3 Explain the relationship among work, power and energy. **Phy.2.2** Analyze the behavior of waves. Phy.2.2.1 Analyze how energy is transmitted through waves, using The fundamental characteristics of waves: wavelength, period, frequency, amplitude, and wave Velocity. Phy.2.2.2 Analyze wave behaviors in terms of transmission, reflection, refraction and interference. Phy.2.2.3 Compare mechanical and electromagnetic waves in	

	conservation of energy in a mechanical system in terms of kinetic energy, potential energy and heat. PSc.3.1.3 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. PSc.3.1.4 Explain the relationship among work, power and simple machines both qualitatively and quantitatively. **PSc.3.2** Understand the nature of waves. PSc.3.2.1 Explain the relationships among wave frequency, wave period, wave velocity and wavelength through calculation and investigation. PSc.3.2.2 Compare waves (mechanical, electromagnetic, and surface) using their characteristics. PSc.3.2.3 Classify waves as transverse or compressional (longitudinal). **PSc.3.3** Understand electricity and magnetism and their relationship. PSc.3.3.1 Summarize static and current electricity.	terms of wave characteristics and behavior (specifically sound and light). **Phy.2.3** Analyze the nature of moving charges and electric circuits. Phy.2.3.1 Explain Ohm's law in relation to electric circuits. Phy.2.3.3 Compare the general characteristics of AC and DC systems without calculations. Phy.2.3.4 Analyze electric systems in terms of their energy and power. Phy.2.3.5 Analyze systems with multiple potential differences and resistors connected in series and parallel circuits, both conceptually and mathematically, in terms of voltage, current and resistance. **Phy.3.1** Explain charges and electrostatic systems. Phy.3.1.4 Explain the mechanisms for producing electrostatic charges, including charging by friction, conduction, and induction. Phy.3.1.5 Explain how differences in electrostatic potentials relate to the potential energy of charged objects. **Phy.3.2** Explain the concept of	

	PSc.3.3.2 Explain simple series and parallel DC circuits in terms of Ohm's law. PSc.3.3.3 Explain how current is affected by changes in composition, length, temperature, and diameter of wire. PSc.3.3.4 Explain magnetism in terms of domains, interactions of poles, and magnetic fields. PSc.3.3.5 Explain the practical applications of magnetism.	Magnetism. Phy.3.2.1 Explain the relationship between magnetic domains and Magnetism. Phy.3.2.2 Explain how electric currents produce various magnetic Fields. Phy.3.2.3 Explain how transformers and power distributions are applications of electromagnetism.	
Construct scientific arguments that: Establish and maintain an appropriate tone and stance (neutral/objective or biased/ subjective)	**PSc.1.1** Understand motion in terms of speed, velocity, acceleration and momentum. PSc.1.1.1 Explain motion in terms of frame of reference, distance, and displacement. PSc.1.1.2 Compare speed, velocity, acceleration and momentum using investigations, graphing, scalar quantities and vector quantities. **Psc.1.2** Understand the relationship between forces and motion. PSc.1.2.1 Explain how gravitational force affects the weight of an object and the velocity of an object in freefall. PSc.1.2.2 Classify frictional forces into one of four types: static, sliding, rolling, and fluid. PSc.1.2.3 Explain forces using	**Phy.1.1** Analyze the motion of objects. Phy.1.1.1 Analyze motion graphically and numerically using vectors, graphs and calculations. Phy.1.1.2 Analyze motion in one dimension using time, distance, displacement, velocity, and acceleration. Phy.1.1.3 Analyze motion in two dimensions using angle of trajectory, time, distance, displacement, velocity, and acceleration. **Phy.1.2** Analyze systems of forces and their interaction with matter. Phy.1.2.1 Analyze forces and systems of forces graphically and numerically using vectors, graphs and calculations. Phy.1.2.2 Analyze systems of	

	Newton's three laws of motion. **PSc.2.1** Understand types, properties, and structure of matter. PSc.2.1.1 Classify matter as: homogeneous or hetero-geneous; pure substance or mixture; element or compound; metals, nonmetals or metalloids; solution, colloid or Suspension. PSc.2.1.2 Explain the phases of matter and the physical changes that matter under-goes. PSc.2.1.3 Compare physical and chemical properties of various types of matter. PSc.2.1.4 Interpret data presented in Bohr model diagrams and dot diagrams for atoms and ions of elements 1 through 18. **PSc.2.2** Understand chemical bonding and chemical interactions. PSc.2.2.1 Infer valence electrons, oxidation number, and reactivity of an element based on its location in the Periodic Table. PSc.2.2.2 Infer the type of chemical bond that occurs, whether covalent, ionic or metallic, in a given substance.	forces in one dimension and two dimensions using free body diagrams. Phy.1.2.3 Explain forces using Newton's laws of motion as well as the universal law of gravitation. Phy.1.2.4 Explain the effects of forces (including weight, normal, tension and friction) on objects. Phy.1.2.5 Analyze basic forces related to rotation in a circular path (centripetal force). **Phy.1.3** Analyze the motion of objects based on the principles of conservation of momentum, conservation of energy and Impulse. Phy.1.3.1 Analyze the motion of objects involved in completely elastic and completely inelastic collisions by using the principles of conservation of momentum and conservation of energy. Phy.1.3.2 Analyze the motion of objects based on the relationship between momentum and impulse. **Phy.2.1** Understand the concepts of work, energy, and power, as well as the relationship among them. Phy.2.1.1 Interpret data on	

	PSc.2.2.3 Predict chemical formulas and names for simple compounds based on knowledge of bond formation and naming conventions. PSc.2.2.4 Exemplify the law of conservation of mass by balancing chemical equations. PSc.2.2.6 Summarize the characteristics and interactions of acids and bases. **PSc.2.3** Understand the role of the nucleus in radiation and radioactivity. PSc.2.3.1 Compare nuclear reactions including alpha decay, beta decay and gamma decay; nuclear fusion and nuclear fission. PSc.2.3.2 Exemplify the radioactive decay of unstable nuclei using the concept of half-life. **PSc.3.1** Understand the types of energy,conservation of energy and energy transfer. PSc.3.1.1 Explain thermal energy and its transfer. PSc.3.1.2 Explain the law of conservation of energy in a mechanical system in terms of kinetic energy, potential energy and heat. PSc.3.1.3 Explain work in terms	work and energy presented graphically and numerically. Phy.2.1.2 Compare the concepts of potential and kinetic energy and conservation of total mechanical energy in the description of the motion of objects. Phy.2.1.3 Explain the relationship among work, power and energy. **Phy.2.2** Analyze the behavior of waves. Phy.2.2.1 Analyze how energy is transmitted through waves, using The fundamental characteristics of waves: wavelength, period, frequency, amplitude, and wave Velocity. Phy.2.2.2 Analyze wave behaviors in terms of transmission, reflection, refraction and interference. Phy.2.2.3 Compare mechanical and electromagnetic waves in terms of wave characteristics and behavior (specifically sound and light). **Phy.2.3** Analyze the nature of moving charges and electric circuits. Phy.2.3.1 Explain Ohm's law in relation to electric circuits. Phy.2.3.3 Compare the general	

	of the relationship among the applied force to an object, the resulting displacement of the object and the energy transferred to an object. PSc.3.1.4 Explain the relationship among work, power and simple machines both qualitatively and quantitatively. **PSc.3.2** Understand the nature of waves. PSc.3.2.1 Explain the relationships among wave frequency, wave period, wave velocity and wavelength through calculation and investigation. PSc.3.2.2 Compare waves (mechanical, electromagnetic, and surface) using their characteristics. PSc.3.2.3 Classify waves as transverse or compressional (longitudinal). **PSc.3.3** Understand electricity and magnetism and their relationship. PSc.3.3.1 Summarize static and current electricity. PSc.3.3.2 Explain simple series and parallel DC circuits in terms of Ohm's law. PSc.3.3.3 Explain how current is affected by changes in	characteristics of AC and DC systems without calculations. Phy.2.3.4 Analyze electric systems in terms of their energy and power. Phy.2.3.5 Analyze systems with multiple potential differences and resistors connected in series and parallel circuits, both conceptually and mathematically, in terms of voltage, current and resistance. **Phy.3.1** Explain charges and electrostatic systems. Phy.3.1.4 Explain the mechanisms for producing electrostatic charges, including charging by friction, conduction, and induction. Phy.3.1.5 Explain how differences in electrostatic potentials relate to the potential energy of charged objects. **Phy.3.2** Explain the concept of magnetism. Phy.3.2.1 Explain the relationship between magnetic domains and magnetism. Phy.3.2.2 Explain how electric currents produce various magnetic fields. Phy.3.2.3 Explain how transformers and power	

	composition, length, temperature, and diameter of wire. PSc.3.3.4 Explain magnetism in terms of domains, interactions of poles, and magnetic fields. PSc.3.3.5 Explain the practical applications of magnetism.	distributions are applications of electromagnetism.	
Construct scientific arguments that: Signal logical relationships among reasoning, evidence, data, and/or models when making and defending a claim, counterclaim, and/or rebuttal	**PSc.1.1** Understand motion in terms of speed, velocity, acceleration and momentum. PSc.1.1.1 Explain motion in terms of frame of reference, distance, and displacement. PSc.1.1.2 Compare speed, velocity, acceleration and momentum using investigations, graphing, scalar quantities and vector quantities. **Psc.1.2** Understand the relationship between forces and motion. PSc.1.2.1 Explain how gravitational force affects the weight of an object and the velocity of an object in freefall. PSc.1.2.2 Classify frictional forces into one of four types: static, sliding, rolling, and fluid. PSc.1.2.3 Explain forces using Newton's three laws of motion. **PSc.2.1** Understand types, properties, and structure of matter. PSc.2.1.1 Classify matter as:	**Phy.1.1** Analyze the motion of objects. Phy.1.1.1 Analyze motion graphically and numerically using vectors, graphs and calculations. Phy.1.1.2 Analyze motion in one dimension using time, distance, displacement, velocity, and acceleration. Phy.1.1.3 Analyze motion in two dimensions using angle of trajectory, time, distance, displacement, velocity, and acceleration. **Phy.1.2** Analyze systems of forces and their interaction with matter. Phy.1.2.1 Analyze forces and systems of forces graphically and numerically using vectors, graphs and calculations. Phy.1.2.2 Analyze systems of forces in one dimension and two dimensions using free body diagrams. Phy.1.2.3 Explain forces using Newton's laws of motion as well	

	homogeneous or hetero-geneous; pure substance or mixture; element or compound; metals, nonmetals or metalloids; solution, colloid or Suspension. PSc.2.1.2 Explain the phases of matter and the physical changes that matter under-goes. PSc.2.1.3 Compare physical and chemical properties of various types of matter. PSc.2.1.4 Interpret data presented in Bohr model diagrams and dot diagrams for atoms and ions of elements 1 through 18. **PSc.2.2** Understand chemical bonding and chemical interactions. PSc.2.2.1 Infer valence electrons, oxidation number, and reactivity of an element based on its location in the Periodic Table. PSc.2.2.2 Infer the type of chemical bond that occurs, whether covalent, ionic or metallic, in a given substance. PSc.2.2.3 Predict chemical formulas and names for simple compounds based on knowledge of bond formation and naming conventions.	as the universal law of gravitation. Phy.1.2.4 Explain the effects of forces (including weight, normal, tension and friction) on objects. Phy.1.2.5 Analyze basic forces related to rotation in a circular path (centripetal force). **Phy.1.3** Analyze the motion of objects based on the principles of conservation of momentum, conservation of energy and Impulse. Phy.1.3.1 Analyze the motion of objects involved in completely elastic and completely inelastic collisions by using the principles of conservation of momentum and conservation of energy. Phy.1.3.2 Analyze the motion of objects based on the relationship between momentum and impulse. **Phy.2.1** Understand the concepts of work, energy, and power, as well as the relationship among them. Phy.2.1.2 Compare the concepts of potential and kinetic energy and conservation of total mechanical energy in the description of the motion of objects.	

	PSc.2.2.4 Exemplify the law of conservation of mass by balancing chemical equations. PSc.2.2.6 Summarize the characteristics and interactions of acids and bases. **PSc.2.3** Understand the role of the nucleus in radiation and radioactivity. PSc.2.3.1 Compare nuclear reactions including alpha decay, beta decay and gamma decay; nuclear fusion and nuclear fission. PSc.2.3.2 Exemplify the radioactive decay of unstable nuclei using the concept of half-life. **PSc.3.1** Understand the types of energy,conservation of energy and energy transfer. PSc.3.1.1 Explain thermal energy and its transfer. PSc.3.1.2 Explain the law of conservation of energy in a mechanical system in terms of kinetic energy, potential energy and heat. PSc.3.1.3 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.	Phy.2.1.3 Explain the relationship among work, power and energy. **Phy.2.2** Analyze the behavior of waves. Phy.2.2.1 Analyze how energy is transmitted through waves, using the fundamental characteristics of waves: wavelength, period, frequency, amplitude, and wave velocity. Phy.2.2.2 Analyze wave behaviors in terms of transmission, reflection, refraction and interference. Phy.2.2.3 Compare mechanical and electromagnetic waves in terms of wave characteristics and behavior (specifically sound and light). **Phy.2.3** Analyze the nature of moving charges and electric circuits. Phy.2.3.1 Explain Ohm's law in relation to electric circuits. Phy.2.3.3 Compare the general characteristics of AC and DC systems without calculations. Phy.2.3.4 Analyze electric systems in terms of their energy and power. Phy.2.3.5 Analyze systems with multiple potential differences and resistors connected in	

	PSc.3.1.4 Explain the relationship among work, power and simple machines both qualitatively and quantitatively. **PSc.3.2** Understand the nature of waves. PSc.3.2.1 Explain the relationships among wave frequency, wave period, wave velocity and wavelength through calculation and investigation. PSc.3.2.2 Compare waves (mechanical, electromagnetic, and surface) using their characteristics. PSc.3.2.3 Classify waves as transverse or compressional (longitudinal). **PSc.3.3** Understand electricity and magnetism and their relationship. PSc.3.3.1 Summarize static and current electricity. PSc.3.3.2 Explain simple series and parallel DC circuits in terms of Ohm's law. PSc.3.3.3 Explain how current is affected by changes in composition, length, temperature, and diameter of wire. PSc.3.3.4 Explain magnetism in terms of domains, interactions of poles, and magnetic fields.	series and parallel circuits, both conceptually and mathematically, in terms of voltage, current and resistance. **Phy.3.1** Explain charges and electrostatic systems. Phy.3.1.4 Explain the mechanisms for producing electrostatic charges, including charging by friction, conduction, and induction. Phy.3.1.5 Explain how differences in electrostatic potentials relate to the potential energy of charged objects. **Phy.3.2** Explain the concept of magnetism. Phy.3.2.1 Explain the relationship between magnetic domains and magnetism. Phy.3.2.2 Explain how electric currents produce various magnetic fields. Phy.3.2.3 Explain how transformers and power distributions are applications of electromagnetism.	

	PSc.3.3.5 Explain the practical applications of magnetism.		

Works Cited

WIDA. *WIDA English Language Development Standards Framework, 2020 Edition: Kindergarten–Grade 12*. Board of Regents of the University of Wisconsin System, 2020.