Tunkhannock Area School District
Grade 7 Science

Unit #: The Nature of Science **Section 1**

S.7.A.1 Reasoning and Analysis

S.7.A.1.1 Explain, interpret, and apply scientific, environmental, or technological knowledge presented in a variety of formats (visuals, scenarios, graphs).
S.7.A.1.2 Identify and explain the impacts of applying scientific, environmental, or technological knowledge to address solutions to practical problems.

S.7.A.1.1.1 Distinguish between a scientific theory and a general opinion, explaining how a theory is supported with evidence.
S.7.A.1.1.2 Develop questions that can be answered through scientific inquiry and/or technological design.
S.7.A.1.1.3 Use evidence such as observations or experimental results to support inferences.
S.7.A.1.1.4 Use evidence to develop descriptions, explanations, and models.

Overarching Understandings

- Scientific knowledge is presented in a variety of formats including visuals, scenarios and graphs; students will gain experience interpreting, creating and explaining these different formats.

Topical Understandings	**Essential Questions**
• Asking questions, which arise in a variety of ways is essential to developing scientific habits of mind. • In order to give meaning to their data, scientists and engineers organize and interpret it through tabulating, graphing, and statistical analysis.	• What kinds of questions do scientists ask? • In what ways are data analyzed and interpreted?
Knowledge	**Skills**
• Vocabulary: scientific theory, general opinion, concepts, interactions, phenomena, formulate, empirical, solution, physical system, designed system evidence, summarize, cause-and-effect relationship, pattern, • Questions arise from direct involvement with the material world, classroom interactions written materials and observed phenomena.	• Identify questions and concepts that can be investigated scientifically. • Formulate and refine questions that can be answered empirically. • Review data from a simple experiment, summarize the data, and form a logical argument about the cause-and-effect relationships in the experiment.

• Investigations involve asking and answering questions and comparing answers with what scientists already know about the world. • Scientists usually inquire about how physical, living or designed systems function.	

Unit #: The Nature of Science **Section 2**

S.7.A.1 Reasoning and Analysis

S.7.A.1.3 Identify and analyze evidence that certain variables may have caused measurable changes in natural or human-made systems.

S.7.A.1.3.1 Describe how variables can cause changes in a system over time.
S.7.A.1.3.2 Use evidence, observations, or explanations to make inferences about changes in systems over time (e.g., carrying capacity, succession, fossil evidence in the geologic time scale).

Overarching Understandings

- Analyzing trends and data over periods of time can lead to particular scientific conclusions

Topical Understandings	**Essential Questions**
● Variables cause change in systems over time ● Extended periods of study tend to show patterns	● What is a measureable change? ● How do you determine the impact of change on an environment? ● What inferences can be made to the future trends based on found data?
Knowledge	**Skills**
● Key vocabulary: variables, change, natural system, manmade system, inference ○	● Describe a man made system. ● Describe a natural made system ● Make inferences about changes in systems and how they affect the system

Unit #: The Nature of Science **Section 3**

S.7.A.2 Processes, Procedures, and Tools of Scientific Investigations

S.7.A.2.1 Apply knowledge of scientific investigation or technological design in different contexts to make inferences, solve problems, and/or answer questions.

S.7.A.2.1.1 Use evidence from investigations to clearly describe relationships and communicate and support conclusions.
S.7.A.2.1.2 Identify a design flaw in a simple technological system and devise possible working solutions.

Overarching Understandings

- Investigations are the primary tool to find scientific solutions or draw conclusions.

Topical Understandings	**Essential Questions**
● Investigations are designed and implemented either to systematically describe the world or to develop and test theories and explanations of how the world works.	● How do scientists find out more about our world and how it functions?
Knowledge	**Skills**
● Vocabulary: hypothesis, model, theory, fair test, controls, independent variable, dependent variable, tools, analyze, data ● Inquiry involves asking a simple question, completing an investigation, answering the question and presenting the results to others. ● Scientists use different kinds of investigations depending on the questions they are trying to answer. ● Scientific investigations are conducted in a variety of arenas. ○	• Formulate a question that can be investigated with available resources and, when possible, frames a hypothesis based on a model or theory. • Design and conduct a fair test indentifying relevant independent and dependent variables and, when appropriate, the need for controls. • Use appropriate tools and techniques to gather, analyze, and interpret data.

Unit #: The Nature of Science **Section 4**

S.7.A.2 Processes, Procedures, and Tools of Scientific Investigations

S.7.A.2.2 Select and safely use appropriate tools and describe the information provided by each tool.

S.7.A.2.2.1 Describe the safe and appropriate use of instruments and scales to accurately and safely make measurements under a variety of conditions.
S.7.A.2.2.2 Apply measurement systems to record and interpret observations under a variety of conditions.
S.7.A.2.2.3 Describe ways technology is used to enhance scientific study and/or human life.

Overarching Understandings

- The scientific method provides the format to study and analyze all components of the scientific world

Topical Understandings	**Essential Questions**
● You can use what you know about a problem to predict a solution ● Patterns can assist in making predictions ● Instruments can be used to give scientific measurements an data ● Technology can enhance already existing data	● What is a pattern? ● What is a model? ● What technology is available on topic? ● What instrument would be beneficial to data
Knowledge	**Skills**
● Key vocabulary: pattern, model, technology ○	● Use scientific method to solve a problem ● Measure quantitative values with equipment ● Record observable conditions

S.7.A.3 Systems, Models, and Patterns

S.7.A.3.1 Explain the parts of a simple system, their roles, and their relationships to the system as a whole.

S.7.A.3.1.1 Describe a system (e.g., ecosystem, circulatory system, agricultural system) as a group of related parts with specific roles that work together to achieve an observed result.
S.7.A.3.1.2 Explain the concept of order in a system (e.g., first to last manufacturing steps; trophic levels; simple to complex—levels of biological organization from cell to organism).
S.7.A.3.1.3 Distinguish between system inputs, system processes, system outputs, and system feedback.
S.7.A.3.1.4 Identify examples of open- and closed looped systems.

Overarching Understandings

- The nature of science refers to key principles and ideas which provide a description of science as a way of knowing, as well as describing characteristics of this knowledge

Topical Understandings	**Essential Questions**
• Scientific knowledge can be classified many ways ie. facts, hypotheses, theories • Observations and experiments are instruments used to gain information • Facts are observable phenomenon in particular situations • Systems are often ways of categorizing • All facets of science utilize systems as a way of organizing information	• What makes something a fact? • What is the difference between a hypothesis and a theory? • What is a system? • What is the difference between an open and closed system? • What is the whole process? • What is a quantitative control?
Knowledge	**Skills**

• Key vocabulary: system, ecosystem, circulatory system, input, output, closed system, open system, system feedback, hypothesis, theory, law, observation, quantitative control
  ○ There are different terms used to describe scientific ideas based on the amount of confirmed experimental evidence
  ○ Systems can work alone or with other systems
  ○ Systems are designed to achieve an observed
	• Organize information and facts into a system
	• Differentiate between input and output
	• Assess the value of system feedback
	• Place components into logical order related to system as a whole
	• Identify open and closed loped systems

Unit #: The Nature of Science **Section 6**

S.7.A.3 Systems, Models, and Patterns

S.7.A.3.2 Apply knowledge of models to make predictions, draw inferences, or explain technological concepts.

S.7.A.3.2.1 Make inferences based on scientific models (e.g., charts, graphs, diagrams).
S.7.A.3.2.2 Describe how engineers use models to develop new and improved technologies to improve scientific study and/or human life.

Overarching Understandings

- Visual representations of a concept can aid scientific understanding and expand current knowledge.

Topical Understandings	**Essential Questions**
• Scientists use models to represent current understandings, aid in developing questions and experiments and to communicate ideas to others.	• How do scientists develop and use models? •
Knowledge	**Skills**
• Vocabulary: scale, diagram, events, system, phenomena, model, empirical, evidence, criticism, design, physical, mathematical, technological • Scientists construct models of phenomena. • Models can change. • Models can be physical, conceptual, mathematical, or technological.	• Construct scale drawings or diagrams to represent objects, events, or systems. • Refine a model in light of empirical evidence or criticism to improve its quality. • Construct and use a model to test a design, or aspects of a design or system. • Select and use simulations (simple, computer, or otherwise) to understand and investigate aspects of a system.

Unit #: The Nature of Science **Section 7**

S.7.A.3 Systems, Models, and Patterns

S.7.A.3.3 Describe repeated processes or recurring elements in natural, scientific, and technological patterns.

S.7.A.3.3.1 Describe patterns as repeated processes or recurring elements in natural and human-made systems.

Overarching Understandings

- Patterns of organization are instrumental in the function of our lives

Topical Understandings	**Essential Questions**
● Finding patterns can help solve problems ● Observations and measurements are sometimes necessary to predict patterns	● How many measurements are enough to show a pattern? ● What are the benefits of repeated, identical processes? ● How precise is your problem?
Knowledge	**Skills**
● Key vocabulary: technology, pattern, human-made system, natural system ○ Patterns tend to repeat over time ○ Technology allows for even more thorough investigation of existing information	● Identify elements of a pattern ● Describe a process ● Apply a know pattern to an unknown situation

S.7.B.1 Structure and Function of Organisms

S.7.B.1.1 Describe and compare structural and functional similarities and differences that characterize diverse living things.

S.7.B.1.1.1 Describe levels of biological organization from cell to organism.
S.7.B.1.1.2 Describe how specific structures in living things (from cell to organism) help them function effectively in specific ways (e.g., chlorophyll in plant cells— photosynthesis; root hairs—increased surface area; beak structures in birds— food gathering; cacti spines—protection from predators).
S.7.B.1.1.3 Explain how characteristic similarities and differences (from cell to organism) are used to identify and/or categorize organisms.

Overarching Understandings

- Life begins at the cellular level. Multi-celled organisms have various levels of organization with specific structures performing specific tasks. Organisms are identified and categorized by their individual characteristics.

Topical Understandings	**Essential Questions**
• All organisms are made of cells and can be characterized by common aspects of their structure and functioning. • Organisms are classified according to their structure and characteristics.	• How do organisms live, grow, respond to their environment, and reproduce? • How is life organized? • How do specific structures in living things help them survive? • Why are organisms classified into kingdoms…? How are they classified?
Knowledge	**Skills**
• Vocabulary: Nucleus, chloroplast, mitochondria, cell membrane, cell wall, stable, cell, multicellular, unicellular, organism, algae, phytoplankton, model of energy transfer, carbon-dioxide, receptor • Within cells, special structures are responsible for particular functions. • Organization of life from the cell to organism. • In most animals and plants oxygen reacts with carbon-containing molecules (sugars) to provide energy and produce carbon-dioxide. • Animals obtain food from eating plants or eating other animals. • Within individual organisms, food moves through a series of	• Construct an explanation for the function of specific parts of cells including: nucleus, chloroplasts, and mitochondria and the structure of the cell membrane and cell wall for maintaining a stable internal environment. • Investigate and present evidence that the structure of cells in both unicellular and multicellular organisms is related to how cells function • Use models to explain the transfer of energy into, out of, and within ecosystems. • Investigate how food provides animals with the materials they need for body repair and growth, and is digested by animals to release the

chemical reactions to support growth or to release energy. ● Organisms use sense receptors to respond to different inputs, resulting in immediate behaviors or memories. ○	energy they need to maintain body warmth and allow for motion. ● Use evidence to support an explanation that matter is conserved when molecules from food react with oxygen in the environment and cycle repeatedly between living and nonliving components of ecosystem. ● Provide explanations of how sense receptors respond to stimuli by transmitting messages as signals that travel along the nerve cells to the brain to be processed for immediate behavior or stored as information. ● Communicate an explanation for how the storage of long-term memories requires changes in the structure and function of millions of interconnected nerve cells in the brain.

S.7.B.1 Structure and Function of Organisms

S.7.B.1.2 Compare methods of reproduction.

S.7.B.1.2.1 Explain how cells arise from the division of a pre-existing cell.
S.7.B.1.2.2 Compare various basic sexual and asexual reproductive processes (e.g., budding, cuttings).
S.7.B.1.2.3 Explain why the life cycles of different organisms have varied lengths.

Overarching Understandings

- A cell arises from the division of a pre-existing cell or cells either by sexual or asexual reproduction.

Topical Understandings	**Essential Questions**
• The cell is the most basic unit of life. All cells form from a pre-existing cell. • There are different processes by which cells are created.	• How are cells created? • Why do different organisms have different life cycles and spans?
Knowledge	**Skills**
• Vocabulary: genes, chromosomes, variants, asexual reproduction, sexual reproduction, egg cells, sperm cells, mutations, budding, cuttings, prokaryotic and eukaryotic cells, mitosis, meiosis, • Cells arise from the division of a pre-existing cell • Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. • Plants reproduce in a variety of ways including using animals, wind, and water as a means of seed transfer and pollination. • Life cycles of different organisms have varied lengths. ○	• Illustrate and explain the processes of mitosis and meiosis. • Identify ways in which seeds are transferred or dispersed. • Compare and explain the reasons for variations in the life cycle of different organisms.

S.7.B.2 Continuity of Life

S.7.B.2.1 Explain natural selection and its role in evolution.

S.7.B.2.1.1 Explain how inherited traits (genes) and/or behaviors help organisms survive and reproduce in different environments.
S.7.B.2.1.2 Describe how natural selection is an underlying factor in a population's ability to adapt to change.
S.7.B.2.1.3 Explain that adaptations within species (physical, behavioral, physiological) are developed over long periods of time.

Overarching Understandings

- Species undergo change over long periods of time due to evolution by natural selection.

Topical Understandings	**Essential Questions**
• Heredity refers to specific mechanisms by which characteristics or traits are passed from one generation to the next via genes, and explains why offspring resemble, but are not identical to their parents.	• How are the characteristics of one generation passed to the next? • How can individuals of the same species and even siblings have different characteristics?
Knowledge	**Skills**
• Vocabulary: inherited traits, natural selection, adaptations, evolution • Genetic contribution from each parent through sexual reproduction results in variation in offspring, and asexual reproduction results in offspring with identical genetic information. • Natural selection is an underlying factor in a population's ability to adapt to change. • Adaptations within species (physical, behavioral, physiological) are developed over long periods of time. ○	• Use models to demonstrate genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes. • Use models to demonstrate that sexual reproduction provides for transmission of genetic information to offspring through egg and sperm cells. • Describe how variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited or (more rarely) from mutations.

S.7.B.2 Continuity of Life

S.7.B.2.2 Explain how a set of genetic instructions determines inherited traits of organisms.

S.7.B.2.2.1 Identify and explain differences between inherited and acquired traits.
S.7.B.2.2.2 Recognize evidence that the gene is the basic unit of inheritance and explain the effect of dominant and recessive genes on inherited traits.
S.7.B.2.2.3 Explain how mutations can alter a gene and are a source of new variations in a population.
S.7.B.2.2.4 Describe how selective breeding or biotechnologies can change the genetic makeup of an organism (e.g., domesticated dogs, horses, cows; crops, hybrid plants; integrated pest management).

Overarching Understandings

- Instructions located on genes determine the characteristics of an organism. Mutations can change a gene and create a new variation in an organism. Humans can select desired traits and change the characteristics of a species for their benefit.

Topical Understandings	**Essential Questions**
• Heredity refers to specific mechanisms by which characteristics or traits are passed from one generation to the next via genes, and explains why offspring resemble, but are not identical to, their parents.	• How are the characteristics of one generation passed to the next? • How can individuals of the same species and even siblings have different characteristics?
Knowledge	**Skills**
• Vocabulary: genes, traits, inherited and acquired traits, dominant and recessive genes, purebred, hybrid, mutation, punnett squares, Mendel, selective breeding, biotechnology, • In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations and gene therapy.	• Explain the differences between inherited and acquired traits. • Compare dominant and recessive genes and their effects on an organism. • Complete a punnet square for a selected train showing the possible genetic instructions for offspring • Describe how some genetic mutations are beneficial, others harmful, and some neutral to the organism. • Research organisms that have been undergone selective breeding or biotechnology to benefit humans.

S.7.B.3 Ecological Behavior and Systems

S.7.B.3.1 Compare the biotic and abiotic factors of different ecosystems and explain relationships between and these factors.

S.7.B.3.1.1 Describe relationships (e.g., predator/prey competition, symbiosis) between organisms in different ecosystems.
S.7.B.3.1.2 Identify the major biomes (terrestrial and aquatic) and describe their characteristic biotic and abiotic factors.

Overarching Understandings

- An ecosystem is composed of both biotic and abiotic factors; these factors interact in a variety of ways. Biomes are large areas either of land or water that have similar characteristics.

Topical Understandings	**Essential Questions**
• Organisms grow, reproduce, and perpetuate their species by obtaining necessary resources through interdependent relationships with other organisms and the physical environments.	• How and why do organisms interact with their environment and what are the effects of these interactions?
Knowledge	**Skills**
• Vocabulary: abiotic, biotic, predator, prey, competition, symbiosis, flow of energy, cycling of matter, ecosystem, biodiversity, terrestrial, marine, biome • Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem. • Predatory interactions may reduce the number of organisms or eliminate whole populations. • Mutually beneficial interactions may become so interdependent that each organism requires the other for survival. • Ecosystems are dynamic in nature; their characteristics can vary over time. ○	• Use models to explain the transfer of energy into, out of, and within ecosystems. • Use evidence to support arguments that changing any physical or biological component of an ecosystem may result in shifts in the populations of species in the ecosystem. • Construct explanations to describe competitive, predatory, and mutually beneficial interactions as patterns across various ecosystems. • Characterize the major biomes of the world.

S.7.B.3 Ecological Behavior and Systems

S.7.B.3.2 Explain ways different variables may cause and/or influence changes in natural or human-made systems.

S.7.B.3.2.1 Identify and describe factors that cause and/or influence changes in populations (e.g., deforestation, disease, land use, natural disaster, invasive species).
S.7.B.3.2.2 Explain how diversity affects the integrity of natural ecological systems.
S.7.B.3.2.3 Describe how human interactions with the environment impact an ecosystem (e.g., road construction, pollution, urban development, dam building/removal).
S7.B.3.2.4 Explain how changes in environmental conditions can affect the survival of a population and entire species (e.g., climate, hibernation, migration, coloration).

Overarching Understandings

- Changes in environmental factors can create changes in natural and human-made systems.

Topical Understandings	**Essential Questions**
• Organisms grow, reproduce, and perpetuate their species by obtaining necessary resources through interdependent relationships with other organisms and the physical environments.	• How and why do organisms interact with their environment and what are the effects of these interactions?
Knowledge	**Skills**
• Vocabulary: variable, factor, deforestation, disease, land use, natural disaster, invasive species, diversity, • Biodiversity describes the variety of species found in Earth's terrestrial and marine ecosystems. • Factors can cause and/or influence changes in populations (e.g., deforestation, disease, land use, natural disaster, invasive species). • Human interactions with the environment impact an ecosystem • Changes in environmental conditions can affect the survival of a population and entire species (e.g., climate, hibernation, migration, coloration). ○	• Use models to explain why the completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health. • Identify patterns of environmental changes that result in changes within the population of a species.

S.7.B.3 Ecological Behavior and Systems

S.7.B.3.3 Explain how renewable and nonrenewable resources provide for human needs and how these needs impact the environment.

S.7.B.3.3.1 Explain how renewable and/or nonrenewable resources provide for human needs (i.e., energy, food, water, clothing, and shelter).
S.7.B.3.3.2 Explain how the use of renewable and/or nonrenewable resources affects the environment.

Overarching Understandings

- Renewable and nonrenewable resources are needed to provide for human needs and have both positive and negative impacts on the environment.

Topical Understandings	**Essential Questions**
● There are both renewable and non renewable resources. ● Resources must be managed properly to ensure they are sustainable. ● How humans use and manage resources can affect the environment in both positive and negative ways..	● What types of resources do humans rely on to provide for our basic needs? (food, water, shelter) ● Of the resources we most commonly use, which are renewable vs. nonrenewable? ● How does the use of nonrenewable resources affect our environment? ● How could sustainable harvesting of resources be used to help ensure success for humanity?
Knowledge	**Skills**
● Vocabulary. Renewable resource, nonrenewable resource, fossil fuels, ecosystem, sustainability, sustainable practices ○ Clear cutting ○ Selective cutting ○ Sustainable practices	● Identify renewable and nonrenewable resources ● Identify renewable and nonrenewable resources that are used for human needs ● Explain how using resources can affect the environment in a positive and negative way. ● Identify ways to conserve resources.

Unit #: Physical Sciences **Section 15**

S.7.C.1 Structure, Properties, and Interaction of Matter and Energy

S.7.C.1.1 Describe the structure of matter and its chemical and physical properties.

S.7.C.1.1.1 Use characteristic physical or chemical properties of matter to distinguish one substance from another (e.g., density, freezing/melting points, solubility, ability to rust).
S.7.C.1.1.2 Recognize that the atom is the basic building block for all matter.
S.7.C.1.1.3 Explain the differences between elements, compounds, and mixtures.
S.7.C.1.1.4 Describe the relationship between mass and volume as density.

Overarching Understandings

- Everything that exists is made of matter

Topical Understandings	**Essential Questions**
● The units that make up matter are called atoms ● Atoms are the smallest whole pieces of matter and are considered building blocks of substances ● Atoms that have the same identity are called an element ● Elements and compounds are substances ● Mixtures are two or more substances	● What is an atom? ● What is the difference between substances and mixtures? ● What is a compound? ● What is mass? ● How are density and mass different?
Knowledge	**Skills**
● Key vocabulary: element, compound, substance, heterogeneous and homogeneous, mixture, mass, volume, density, physical properties, chemical properties ○ How is matter classified	● Distinguish between substances and mixtures. ● Compare a solution and a suspension ● Decipher between mass and density ● Distinguish values from labels ● Classify homogeneous versus heterogeneous

S.7.C.1 Structure, Properties, and Interaction of Matter and Energy

S.7.C.1.2 Compare chemical and physical changes of matter.

S.7.C.1.2.1 Identify the reactants and products of simple chemical reactions (e.g., photosynthesis, cellular respiration).
S.7.C.1.2.2 Compare the behavior of particle motion in solids, liquids, and gasses.

Overarching Understandings

- Matter can be changed either physically or chemically

Topical Understandings	**Essential Questions**
● Energy can change its state and therefore change its energy ● Physical changes are alterations in size, shape or state of matter ● Chemical changes are when one substance changes into another ● Particles are in constant motion ● Spacing between particles determines state of matter	● What is the difference between physical and chemical change? ● What are properties of matter? ● What is the Law of Conservation of Mass? ● What is a reactant? ● What is a product? ● What are the states of matter? ● How do particles behave in the different states of matter?
Knowledge	**Skills**
● Key vocabulary: chemical change, physical change, reactants, products, photosynthesis, respiration, states of matter, solid, liquid, gas, plasma, Law of Conservation of Mass ○ The Law of Conservation of Mass states that matter is neither created nor destroyed during a chemical change.	● Distinguish between physical and chemical changes ● Distinguish between physical and chemical properties ● List examples of physical properties ● Compare the behavior of particles in motion in the states of matter ● State and explain the Law of Conservation of Mass

Unit #: Physical Sciences **Section 17**

S.7.C.2 Forms, Sources, Conversion, and Transfer of Energy

S.7.C.2.1 Describe how energy flows through the living world.

S.7.C.2.1.1 Describe how energy is obtained and used by organisms throughout their lives.
S.7.C.2.1.2 Describe how energy is transferred and conserved in a closed system.
S.7.C.2.1.3 Describe energy transformations within an ecosystem.

Overarching Understandings

- Energy is the ability to cause change

Topical Understandings	**Essential Questions**
● Energy can be in the form of motion(kinetic) or stored(potential) ● Energy exists in several different forms ● Energy can change from one form to another with no loss of total energy ● Work is the transfer of energy through motion ● Temperature is the measure of the average kinetic energy of the particles that make up a material ● Thermal energy of a material is the total energy both kinetic and potential	● What is kinetic energy? ● What is potential energy? ● What is a closed sytem? ● What is the Law of Conservation of Energy? ● How does energy transfer from state to state or organism to organism? ● How do you measure work? ● How do you obtain energy?
Knowledge	**Skills**
● Key vocabulary: energy, heat, temperature, kinetic, law of conservation of energy, potential energy, mechanical energy, work, specific heat, thermal energy, closed system ○ Energy can exist in many different forms and can be transferred through work.	● Contrast heat and temperature ● Define a closed system ● Distinguish between kinetic and potential energy ● Explain how energy is conserved when changing from one state to another ● Describe how energy can be transferred and conserved in a closed system

S.7.C.3 Principles of Motion and Force

S.7.C.3.1 Explain the principles of force and motion.

S.7.C.3.1.1 Describe how unbalanced forces acting on an object change its velocity.
S.7.C.3.1.2 Describe forces acting on an object (e.g., friction, gravity, balanced verses unbalanced).
S.7.C.3.1.3 Explain the mechanical advantages of simple machines.

Overarching Understandings

- Forces act on everything in the universe and everything in the universe moves.

Topical Understandings	**Essential Questions**
● Everything in the universe moves to some degree ● Motion is part of mechanics which is governed by laws ● Newton's First Law of Motion states an object in motion will stay in motion unless acted on by an outside force ● Forces act on everything in the universe ● Forces act on objects to either get it moving or change a motion ● Some forces create a mechanical advantage	● What is a force? ● What are the effects of forces? ● What is gravity? ● What is the difference between weight and mass? ● What is Newton's 1st Law of Motion? ● How do friction and inertia affect motion? ● When does a motion change velocity?
Knowledge	**Skills**
● Key vocabulary: force, speed, instantaneous speed, constant speed, average speed, friction, gravity, velocity, acceleration, mechanical advantage, inertia, net force, balanced force, gravity weight , vectors ○ Multiple forces are in action on objects at all times ○ Gravity is an example of such a force	● Define speed as a rate ● Compare and contrast speed, velocity, and acceleration ● Calculate acceleration ● Recognize different examples of forces ● Give examples of inertia ● Recall Newton's First Law of Motion ● Differentiate between weight and mass ● Determine mechanical advantages

Unit #: Earth & Space Sciences **Section 19**

S.7.D.1 Earth Features and Processes that Change Earth and Its Resources

S.7.D.1.1 Describe Earth structures and processes that characterize different biomes on Earth.

S.7.D.1.1.1 Identify and describe soil characteristics (i.e., particle size, porosity, and permeability) of different biomes.
S.7.D.1.1.2 Explain how fossils are formed and how they can provide evidence about plants and animals that once lived on Earth.

Overarching Understandings

- Earths biomes are characterized by Earth's structures and processes that occur within them.

Topical Understandings	**Essential Questions**
● Earth has five major biomes, with many sub-biomes found within each. ● A biome is not an ecosystem, although it may look like a massive ecosystem. ● Fossils are the preserved remains or traces of plants, animals, or other organisms.	● What defines a biome? ● How have Earth's processes created and changed locations of biomes? ● How do soils characteristics help define a biome? ● How can discovery of fossils and types of fossils provide evidence about what biomes may have existed there?
Knowledge	**Skills**
● Biosphere, abiotic, biotic, ecosystem, habitat, climate, soil, geologic column, geologic time scale, ● Biomes are classified by climate, precipitation, geography and other factors such as animals that live there. ● Fossils can help determine what environments/climate/animals/plants had been there in the past.	● Identify and describe the different types of biomes. ● Describe the process by which fossil fuels are formed. ● Identify earth processes that characterize different biomes on Earth. ● Describe the layers of soil and their characteristics.

S.7.D.1 Earth Features and Processes that Change Earth and Its Resources

S.7.D.1.2 Describe characteristic features and significance of Earth's water systems.

S.7.D.1.2.1 Compare the different water systems on Earth (e.g., wetland, watershed, ocean, river).
S.7.D.1.2.2 Compare biotic and abiotic features of freshwater and saltwater systems.
S.7.D.1.2.3 Describe the importance of water systems on the diversity and distribution of life on Earth.

Overarching Understandings

- Earth's water systems are significant for survival on Earth. Our water systems have many purposes.

Topical Understandings	**Essential Questions**
• There are many different water systems on Earth. • Water is essential to life. • Biotic features refers to the living things in an ecosystem while abiotic refers to the nonliving features.	• What characteristics do water systems share? • Why is water important to the diversity and distribution of life on Earth? • How do biotic and abiotic features affect our water systems?
Knowledge	**Skills**
• Abiotic, biotic, ecosystem, wetland, watershed, diversity, • There are many different water systems (wetlands, watersheds, oceans, rivers, lakes, streams, tidal pools, etc) • The Water Cycle	• Identify both biotic and abiotic features in freshwater and saltwater systems. • Identify and compare the different water systems found on earth. • Describe how scientists use models to explore relationships. • Distinguish among different water systems. • Compare the different water systems

S.7.D.2 Weather, Climate, and Atmospheric Processes

S.7.D.2.1 Explain the basic elements of meteorology.

S.7.D.2.1.1 Explain the effect of wind patterns, circulation of oceans currents, atmospheric pressure, and temperature on weather.
S 7.D.2.1.2 Describe changes in atmospheric conditions associated with various weather patterns.

Overarching Understandings

- The basic elements of meteorology include air pressure, humidity, wind, and temperature.

Topical Understandings	**Essential Questions**
• Climate refers to weather patterns/temperature that has developed over time (30 years or more) • Weather refers to the current condition of in the troposphere, weather in the short day (days or weeks).	• How do wind patterns and circulation of ocean currents affect weather? • What effect does atmospheric pressure and temperature have on weather? • What changes in atmospheric conditions cause various weather patterns?
Knowledge	**Skills**
• Barometer, hydrometer, thermometer, atmospheric pressure, anemometer, meteorologist • Circulation of ocean currents affects coastal weather.	• Identify and explain factors that can affect weather. • Identify and describe weather patterns and the atmospheric conditions associated with those patterns. • Identify the instruments that meteorologists use to help predict weather. • Read and interpret weather maps.

S.7.D.3 Composition and Structure of the Universe

S.7.D.3.1 Describe the essential ideas about the composition and structure of the universe and Earth's place in it.

S.7.D.3.1.1 Describe the patterns of Earth's rotation and revolution in relation to the Sun and Moon (i.e., solar eclipse, lunar eclipse, phases of the Moon, and time).
S.7.D.3.1.2 Explain how gravity is the essential force in determining the motions of the planets and other objects in the solar system.
S.7.D.3.1.3 Compare the properties and conditions of objects in the solar system to those of Earth.
S.7.D.3.1.4 Identify and describe instruments that are used to study the universe (e.g., telescope, probes, satellites, space observatories).

Overarching Understandings

- The Universe encompasses all known space. Earth is a small piece of matter in our Universe that relies on gravity and mass to explain the inner workings of the Universe.

Topical Understandings	**Essential Questions**
• The Universe is constantly expanding. • The Universe is made up of matter. • All objects are made of matter. • The Law of Gravity affects everything in our Solar System.	• How does Earth's rotation and revolution affect the phases of the moon? • How does gravity explain how objects interact with each other? • What types of materials make up solar system objects? How do these compare to planet Earth? • How do scientists (astronomer) study the Universe?
Knowledge	**Skills**
• Vocabulary: Universe, Solar System, planets, comets, asteroids, satellites, gravity, lights year. • Objects in space are very far away from each other, distance is measured in light years or AU's, (astronomical units- the distance from Earth to the Sun (93 million miles). • The ISS (International Space Station) is used to do experiments in outer space.	• Describe how Earth's rotation and revolution affects the phases of the Sun and Moon. • Identify instruments that astronomers use to study the universe. • Compare conditions on different solar system objects to that of Earth. • Explain how gravity explains the motion of the planets and other objects in the Universe.