Winchester Public Schools

6th Grade Science Unit Guide

Weeks	Unit	PE	SEP	DCI	CCC
4 Weeks	**6.1 Light and Matter**	**MS-PS4-2.** Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials. **MS-LS1-8.** Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories	**Developing and Using Models.** Develop and use a model to describe phenomena. **Engaging in Argument from Evidence** Construct, use, and present oral and written arguments supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon. **Constructing Explanations and Designing Solutions** Construct a scientific explanation based on valid and reliable evidence obtained from	**PS4.B: Electromagnetic Radiation** ● When light shines on an object, it is reflected, absorbed, or transmitted through the object, depending on the object's material and the frequency (color) of the light. ● The path that light travels can be traced as straight lines, except at surfaces between different transparent materials (e.g., air and water, air and glass) where the light path bends. ● A wave model of light is useful for explaining brightness, color, and the frequency-dependent bending of light at a surface between media. ● However, because light can travel through space, it canno	**Structure and Function** Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used. Structures can be designed to serve particular functions. **Systems and System Models** Models can be used to represent systems and their interactions – such as inputs, processes, and outputs – and energy and matter flows within systems **Energy and Matter**

			sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.		Energy may take different forms (e.g. energy in fields, thermal energy, energy of motion).
8 Weeks	**6.2 Thermal Energy**	**MS-PS4-2.** Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials. **MS-PS1-4**. Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed **MS-PS3-3.** Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer. **MS-PS3-4.** Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass,	**Developing and Using Models**. Develop and use a model to describe phenomena **Planning and Carrying Out Investigations** Collect data to produce data to serve as the basis for evidence to answer scientific questions or test design solutions under a range of conditions. **Analyzing and Interpreting Data** Analyze and interpret data to determine similarities and differences in findings.	**PS1.A: Structure and Properties of Matter** ● Substances are made from different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms. ● Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it. ● Gases and liquids are made of molecules or inert atoms that are moving about relative to each other. ● In a liquid, the molecules are constantly in contact with others; in a gas, they are widely spaced except when they happen to collide. In a solid, atoms are closely spaced and may vibrate in position but do not change relative locations. ● Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals). ● The changes of state that occur with variations in temperature or pressure can be described and predicted using	**Structure and Function** Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used. **Systems and System Models** Models can be used to represent systems and their interactions – such as inputs, processes, and outputs – and energy and matter flows within systems. **Energy and Matter** Energy may take different forms (e.g. energy in fields, thermal energy, energy of motion). The transfer of energy can be tracked as energy

		and the change in the average kinetic energy of the particles as measured by the temperature of the sample **MS-PS3-5**. Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.		these models of matter. **PS3.A: Definitions of Energy** ● Motion energy is properly called kinetic energy; it is proportional to the mass of the moving object and grows with the square of its speed. ● A system of objects may also contain stored (potential) energy, depending on their relative positions. ● Temperature is a measure of the average kinetic energy of particles of matter. The relationship between the temperature and the total energy of a system depends on the types, states, and of a system depends on the types, states, and amounts of matter present. **PS3.B: Conservation of Energy and Energy Transfer** ● When the motion energy of an object changes, there is inevitably some other change in energy at the same time. ● The amount of energy transfer needed to change the temperature of a matter sample by a given amount depends on the nature of the matter, the size of the sample, and the environment. ● Energy is spontaneously transferred out of hotter regions or objects and into colder ones. **ETS1.A: Defining and Delimiting an Engineering Problem** ● The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful.	flows through a designed or natural system**.**

				Specification of constraints includes consideration of scientific principles and other relevant knowledge that is likely to limit possible solutions. **ETS1.B: Developing Possible Solutions** ● A solution needs to be tested, and then modified on the basis of the test results in order to improve it. There are systematic processes for evaluating solutions with respect to how well they meet criteria and constraints of a problem.	
5 weeks	**Weather, Climate, and Water Cycling**	**MS-ESS2-4.** Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity. **MS-ESS2-5.** Collect data to provide evidence for how the motions and complex interactions of air masses result in changes in weather conditions. **MS-ESS2-6.** Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine global climates.	**Developing and Using Models.** Develop and use a model to describe phenomena. **Planning and Carrying Out Investigations** Collect data to produce data to serve as the basis for evidence to answer scientific questions or test design solutions under a range of conditions.	**ESS2.C: The Roles of Water in Earth's Surface Processes** ● Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation, as well as downhill flows on land. ● The complex patterns of the changes and the movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns. ● Global movements of water and its changes in form are propelled by sunlight and gravity. ● Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents. **ESS2.D: Weather and Climate**	**Patterns** Patterns in rates of change and other numerical relationships can provide information about natural systems. **Cause and Effect** Cause and effect relationships may be used to predict phenomena in natural or designed systems. **Systems and System Models** Models can be used to represent systems and their interactions—such as inputs, processes and outputs— and energy, matter, and information flows within systems.

				● Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns. ● Because these patterns are so complex, weather can only be predicted probabilistically. ● The ocean exerts a major influence on weather and climate by absorbing energy from the sun, releasing it over time, and globally redistributing it through ocean currents.	**Energy and Matter** Within a natural or designed system, the transfer of energy drives the motion and/or cycling of matter. **Energy and Matter** Energy may take different forms (e.g. energy in fields, thermal energy, energy of motion).
6 Weeks	**6.4 Plate Tectonics and Rock Cycling**	**MS-ESS1-4.** Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history **MS-ESS2-1.** Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process. **MS-ESS2-2.** Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales	**Developing and Using Models.** Develop and use a model to describe phenomena **Constructing Explanations and Designing Solutions** Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in	**ESS1.C: The History of Planet Earth** ● The geologic time scale interpreted from rock strata provides a way to organize Earth's history. Analyses of rock strata and the fossil record provide only relative dates, not an absolute scale. **ESS2.A: Earth's Materials and Systems** ● All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. This energy is derived from the sun and Earth's hot interior. The energy that flows and matter that cycles produce chemical and physical changes in Earth's materials and living organisms. ● The planet's systems interact over scales that range from microscopic to global in size, and they operate over fractions of a second to billions of	**Patterns** Patterns in rates of change and other numerical relationships can provide information about natural systems. **Cause and Effect** Cause and effect relationships may be used to predict phenomena in natural or designed systems. **Scale Proportion and Quantity** Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.

		MS-ESS2-3. Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions **MS-PS4-3.** Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals	the future. **Using Mathematics and Computational Thinking** Use mathematical representations to support scientific conclusions and design solutions.	years. These interactions have shaped Earth's history and will determine its future. **ESS2.B: Plate Tectonics and Large-Scale System Interactions** ● Maps of ancient land and water patterns, based on investigations of rocks and fossils, make clear how Earth's plates have moved great distances, collided, and spread apart. **PS4.C: Information Technologies and Instrumentation** ● Digitized signals (sent as wave pulses) are a more reliable way to encode and transmit information.	**Systems and System Models** Models can be used to represent systems and their interactions—such as inputs, processes and outputs— and energy, matter, and information flows within systems. **Energy and Matter** Within a natural or designed system, the transfer of energy drives the motion and/or cycling of matter. **Stability and Change** Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and processes at different scales, including the atomic scale**.**
4 Weeks	**6.5 Natural Resources**	**MS-ESS3-2.** Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects **MS-ETS1-1.** Define the criteria and constraints of a	**Analyzing and Interpreting Data** Analyze and interpret data to determine similarities and differences in findings. **Constructing Explanations and Designing Solutions**	**ESS3.B: Natural Hazards** ● Mapping the history of natural hazards in a region, combined with an understanding of related geologic forces can help forecast the locations and likelihoods of future events. **ETS1.A: Defining and Delimiting** ● Engineering Problems The more precisely a design task's criteria and	**Structure and Function** Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used.

		design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. **MS-ETS1-2.** Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.	Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. **Using Mathematics and Computational Thinking** Use mathematical representations to support scientific conclusions and design solutions. **Obtaining, Evaluating, and Communicating Information** Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence.	constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that are likely to limit possible solutions. **ETS1.B: Developing Possible Solutions** ● A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. ● There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. ● Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors.	**Cause and Effect** Cause and effect relationships may be used to predict phenomena in natural or designed systems. **Scale Proportion and Quantity** Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. **Stability and Change** Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and processes at different scales, including the atomic scale.

6 Weeks	**7.6 Natural Resources and Human Impact**	**MS-ESS3-1.** Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes **MS-ESS3-3.** Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment. **MS-ESS3-4.** Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems **MS-ESS3-5.** Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century **MS-ETS1-2.** Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.	**Analyzing and Interpreting Data** Analyze and interpret data to determine similarities and differences in findings. **Constructing Explanations and Designing Solutions** Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. **Using Mathematics and Computational Thinking** Use mathematical representations to support scientific conclusions and design solutions. **Engaging in Argument from Evidence** Construct, use, and present oral and written	**ESS3.A: Natural Resources** ● Humans depend on Earth's land, ocean, atmosphere, and biosphere for many different resources. Minerals, fresh water, and biosphere resources are limited, and many are not renewable or replaceable over human lifetimes. These resources are distributed unevenly around the planet as a result of past geologic processes. **ESS3.B: Natural Hazards** ● Mapping the history of natural hazards in a region, combined with an understanding of related geologic forces can help forecast the locations and likelihoods of future events. **ESS3.C: Human Impacts on Earth Systems** ● Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things. ● Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise. **ESS3.D: Global Climate Change** ● Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the	**Systems and System Models** Models can be used to represent systems and their interactions—such as inputs, processes and outputs— and energy, matter, and information flows within systems **Cause and Effect** Cause and effect relationships may be used to predict phenomena in natural or designed systems. **Scale Proportion and Quantity** Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. **Stability and Change** Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and processes at different scales, includi

			arguments supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon.	current rise in Earth's mean surface temperature (global warming). Reducing the level of climate change and reducing human vulnerability to whatever climate changes do occur depend on the understanding of climate science, engineering capabilities, and other kinds of knowledge, such as understanding of human behavior and on applying that knowledge wisely in decisions and activities. **ETS1.B: Developing Possible Solutions** ● A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. ● There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. ● Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors. ● Models of all kinds are important for testing solutions.	