

Dennis-Yarmouth Regional School District
Science Scope and Sequence
Grade 8

Unit Name	Unit Description / Overview	Stage 1: Desired Results Enduring Understandings - Students will understand that...	Essential Questions	Standards
Master Unit 1 Growth and Development of Organisms	Students begin a new journey studying how they can promote the growth and development of organisms and discover how this knowledge can be applied to our world	Genetic as well as environmental factors can affect the growth of plants and animals. Animals consume food and, through digestion and cellular respiration, break it down into molecules they can use for energy and remove waste and carbon dioxide that are produced during the process.	What factors can affect the growth of a plant? How does energy move through organisms?	8.MS-LS1-5. Construct an argument based on evidence for how environmental and genetic factors influence the growth of organisms. 8.MS-LS1-7. Use informational text to describe that food molecules, including carbohydrates, proteins, and fats, are broken down and rearranged through chemical reactions forming new molecules that support cell growth and/or release of energy.
Master Unit 10 Forces and Motion	Forces and Interactions unit with a focus on Newton's 3 Laws	The role of the mass of an object must be qualitatively accounted for in any change of motion due to the application of a force. When two objects interact, each one exerts a force on the other, and these forces can transfer energy between them.	What is motion? How can motion change? What forces exist in our world?	8.MS-ETS2-5(MA). Present information that illustrates how a product can be created using basic processes in manufacturing systems, including forming, separating, conditioning, assembling, finishing, quality control, and safety. Compare the advantages and disadvantages of human vs. computer control of these processes. 8.MS-PS2-1. Develop a model that demonstrates Newton's third law involving the motion of two colliding objects. 8.MS-PS2-2. Provide evidence that the change in an object's speed depends on the sum of the forces on the object (the net force) and the mass of the object.
Master Unit 2 Inheritance and Variation	Students begin a new journey studying how traits are inherited in a species and how mutations to genes impact organisms. As they work toward this goal, they will learn the following concepts: The structural changes to genes located on chromosomes are called mutations. Mutations can cause harmful, beneficial, or neutral effects to the structure and function of the organism. Genes control the production of specific proteins; mutated genes change this production of proteins. Asexual reproduction results in offspring that are genetically identical to the parent organism. Sexual reproduction results in offspring that are genetically diverse from both parents.	In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. Though rare, mutations may result in changes to the structure and function of proteins. Some changes are beneficial, others harmful, and some neutral to the organism. Changes (mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits. Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. In sexually reproducing organisms, each parent gives provides half of the genes (at random) to their offspring. Each distinct gene controls the making of specific proteins, which then affects the traits of the individual. Genes are located in the chromosomes of cells and that each chromosome pair has two variants of each of many distinct genes. Variations of inherited traits between parent and offspring come from genetic differences from the subset of chromosomes (and therefore genes) inherited. Individuals have two of each chromosome and so two alleles of each gene, one from each parent. These versions may be identical or may differ from each other. All life on earth evolved from a common ancestor that first appeared billions of years ago. Variation exists in all species and allows some individuals to be better able to survive in a particular environment than others. Natural selection is the process by which evolution occurs. Long before Darwin and Wallace, farmers and breeders were using the idea of selection to cause major changes in the features of their plants and	What causes mutations? How are traits passed to offspring? Are all illnesses genetically linked? What are examples of beneficial mutations?	8.MS-LS3-1. Develop and use a model to describe that structural changes to genes (mutations) may or may not result in changes to proteins, and if there are changes to proteins there may be harmful, beneficial, or neutral changes to traits. 8.MS-LS3-2. Construct an argument based on evidence for how asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation. Compare and contrast advantages and disadvantages of asexual and sexual reproduction. 8.MS-LS3-3(MA). Communicate through writing and in diagrams that chromosomes contain many distinct genes and that each gene holds the instructions for the production of specific proteins, which in turn affects the traits of an individual. 8.MS-LS3-4(MA). Develop and use a model to show that sexually reproducing organisms have two of each chromosome in their nucleus, and hence two variants (alleles) of each gene that can be the same or different from each other, with one random assortment of each chromosome passed down to offspring from both parents.

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Master Unit 3 Changes in Organisms Over Time	Students begin a new journey studying how certain traits in organisms can be determined by nature or by human influence.	Natural selection leads to the predominance of certain traits in a population and the suppression of others. Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. Traits that support successful survival and reproduction in the new environment become more common; those that do not become less common. In artificial selection, humans selectively breed desired traits in organisms.	How do populations change over time? How do adaptations relate to natural selection? What is the difference between natural selection and artificial selection? What types of people can selectively breed organisms?	8.MS-LS4-4. Use a model to describe the process of natural selection, in which genetic variations of some traits in a population increase some individuals' likelihood of surviving and reproducing in a changing environment. Provide evidence that natural selection occurs over many generations. 8.MS-LS4-5. Synthesize and communicate information about artificial selection, or the ways in which humans have changed the inheritance of desired traits in organisms.
Master Unit 4 The Earth and the Solar System	Students will study the relationships between Earth, the Sun, and the Moon, and the objects in the solar system. During these lessons, they will be learning where space objects are located and how gravity influences their motion.	The Sun is located in the center of the solar system. Earth, the Moon, and everything else that orbits the Sun make up the solar system. Earth revolves around the Sun, and the Moon revolves around Earth. Many planets in the solar system are orbited by moons. Asteroids can be knocked out of their orbit when they are hit by other asteroids.	What objects are in the Earth, Sun, and Moon system, and how do they move in relation to each other? What objects are in the solar system, and how do they move in relation to each other?	8.MS-ESS1-1b. Develop and use a model of the Earth-sun system to explain the cyclical pattern of seasons, which includes the Earth's tilt and differential intensity of sunlight on different areas of Earth across the year. 8.MS-ESS1-2. Explain the role of gravity in ocean tides, the orbital motions of planets, their moons, and asteroids in the solar system.
Master Unit 5 Earth's Materials	In this unit, students will study Earth's materials and discover how this knowledge can be applied to our world. They will create a systematic way of identifying and organizing types of rocks.	The energy that supplies Earth's processes comes from the Sun and Earth's hot interior. Earth's processes can occur slowly or quickly and can range from microscopic to global.	Where does the energy that supplies Earth's processes come from? Does Earth's processes occur quickly or slowly?	8.MS-ESS2-1. Use a model to illustrate that energy from the Earth's interior drives convection which cycles Earth's crust leading to melting, crystallization, weathering, and deformation of large rock formations, including generation of ocean sea floor at ridges, submergence of ocean sea floor at trenches, mountain building, and active volcanic chains. 8.MS-ESS2-5. Interpret basic weather data to identify patterns in air mass interactions and the relationship of those patterns to local weather. 8.MS-ESS2-6. Describe how interactions involving the ocean affect weather and climate on a regional scale, including the influence of the ocean temperature as mediated by energy input from the sun and energy loss due to evaporation or redistribution via ocean currents.
Master Unit 6 The Role of Water in the Earth's Surface, and Weather and Climate	This unit deals with interpreting basic weather data to identify patterns in air mass interactions and the relationship of those patterns to local weather. This unit also deals with how interactions involving the ocean affect weather on a regional scale, including the influence of the ocean temperature as mediated by energy input from the Sun and energy loss due to evaporation or redistribution via ocean currents.	The Sun's energy and the force of gravity drive the global movement of water. Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents. The changes in water and the movement of water in the atmosphere, determined by winds, landforms, ocean temperatures, and ocean currents, are the major determinants of local weather.	What forces drive the movement of water? What factors determine local weather patterns?	8.MS-ESS2-5. Interpret basic weather data to identify patterns in air mass interactions and the relationship of those patterns to local weather. 8.MS-ESS2-6. Describe how interactions involving the ocean affect weather and climate on a regional scale, including the influence of the ocean temperature as mediated by energy input from the sun and energy loss due to evaporation or redistribution via ocean currents.

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Master Unit 7 Natural Resources and Earth Systems	Students will study how the use of natural resources like petroleum can impact the environment and discovering how this knowledge can be applied to our world. As they work toward this goal, they will be learning the following concepts: Both natural activities and human activities can alter global climate. Consumption of natural resources by humans can lead to an increase in global temperatures. Natural resources are unevenly distributed on Earth.	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. Resources are distributed unevenly around the planet as a result of past geologic processes. Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the 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.	How do Earth's resources provide humans with the things they need to live? Which of Earth's resources have become limited because of the actions of humans? How are Earth's resources distributed around the planet unevenly? What factors interact and influence weather and climate? How have human actions affected the biosphere? How does growing human population affect the Earth's resources? In what ways have humans begun to try to protect Earth's resources? In what ways have humans begun to address our effect on climate change? How have these factors led to climate change?	8.MS-ESS3-1. Analyze and interpret data to explain that the Earth's mineral and fossil fuel resources are unevenly distributed as a result of geologic processes. 8.MS-ESS3-5. Examine and interpret data to describe the role that human activities have played in causing the rise in global temperatures over the past century.
Master Unit 8 Chemical Reactions	In this unit the focus is on how atoms combine in a multitude of ways to produce pure substances which make up all of the living and nonliving things that we encounter, (b) atoms form molecules and compounds that range in size from two to thousands of atoms, and (c) mixtures are composed of different proportions of pure substances. It also explains that atoms are rearranged during a chemical reaction to form new substances with new properties. And atoms present in the reactants are all present in the products and thus the total number of atoms is conserved. Students will analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.	All matter is made of atoms. Matter has physical and chemical properties. Matter undergoes physical and chemical changes. A change in thermal energy results in a change in the state of matter. Matter has physical and chemical properties. Matter undergoes physical and chemical changes. Matter undergoes physical and chemical changes. A change in thermal energy results in a change in the state of matter. Matter is conserved during chemical and physical changes. Food molecules are used by the body Food molecules are changed to form new molecules Food molecules are used by the cell for growth and energy	What is all matter made of? What is the difference between physical and chemical properties? What happens to atoms in chemical reactions? How do you describe the law of conservation of mass?	8.MS-ETS2-4(MA). Use informational text to illustrate that materials maintain their composition under various kinds of physical processing; however, some material properties may change if a process changes the particulate structure of a material. 8.MS-PS1-1. Develop a model to describe that (a) atoms combine in a multitude of ways to produce pure substances which make up all of the living and nonliving things that we encounter, (b) atoms form molecules and compounds that range in size from two to thousands of atoms, and (c) mixtures are composed of different proportions of pure substances. 8.MS-PS1-2. Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred. 8.MS-PS1-5. Use a model to explain that atoms are rearranged during a chemical reaction to form new substances with new properties. Explain that the atoms present in the reactants are all present in the products and thus the total number of atoms is conserved.

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Master Unit 9 States of Matter	In this unit the focus is on how atoms combine in a multitude of ways to produce pure substances which make up all of the living and nonliving things that we encounter, (b) atoms form molecules and compounds that range in size from two to thousands of atoms, and (c) mixtures are composed of different proportions of pure substances. It also explains that atoms are rearranged during a chemical reaction to form new substances with new properties. And atoms present in the reactants are all present in the products and thus the total number of atoms is conserved. Students will analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.	All matter is made of atoms. Matter has physical and chemical properties. Matter undergoes physical and chemical changes. A change in thermal energy results in a change in the state of matter. Matter has physical and chemical properties. Matter undergoes physical and chemical changes. Matter undergoes physical and chemical changes. A change in thermal energy results in a change in the state of matter. Matter is conserved during chemical and physical changes. Food molecules are used by the body Food molecules are changed to form new molecules Food molecules are used by the cell for growth and energy	In what direction does heat flow? How does adding or removing thermal energy affect the kinetic energy of matter? Describe the movement of molecules in a solid, liquid, and gas.	8.MS-PS1-4. Develop a model that describes and predicts changes in particle motion, relative spatial arrangement, temperature, and state of a pure substance when thermal energy is added or removed.