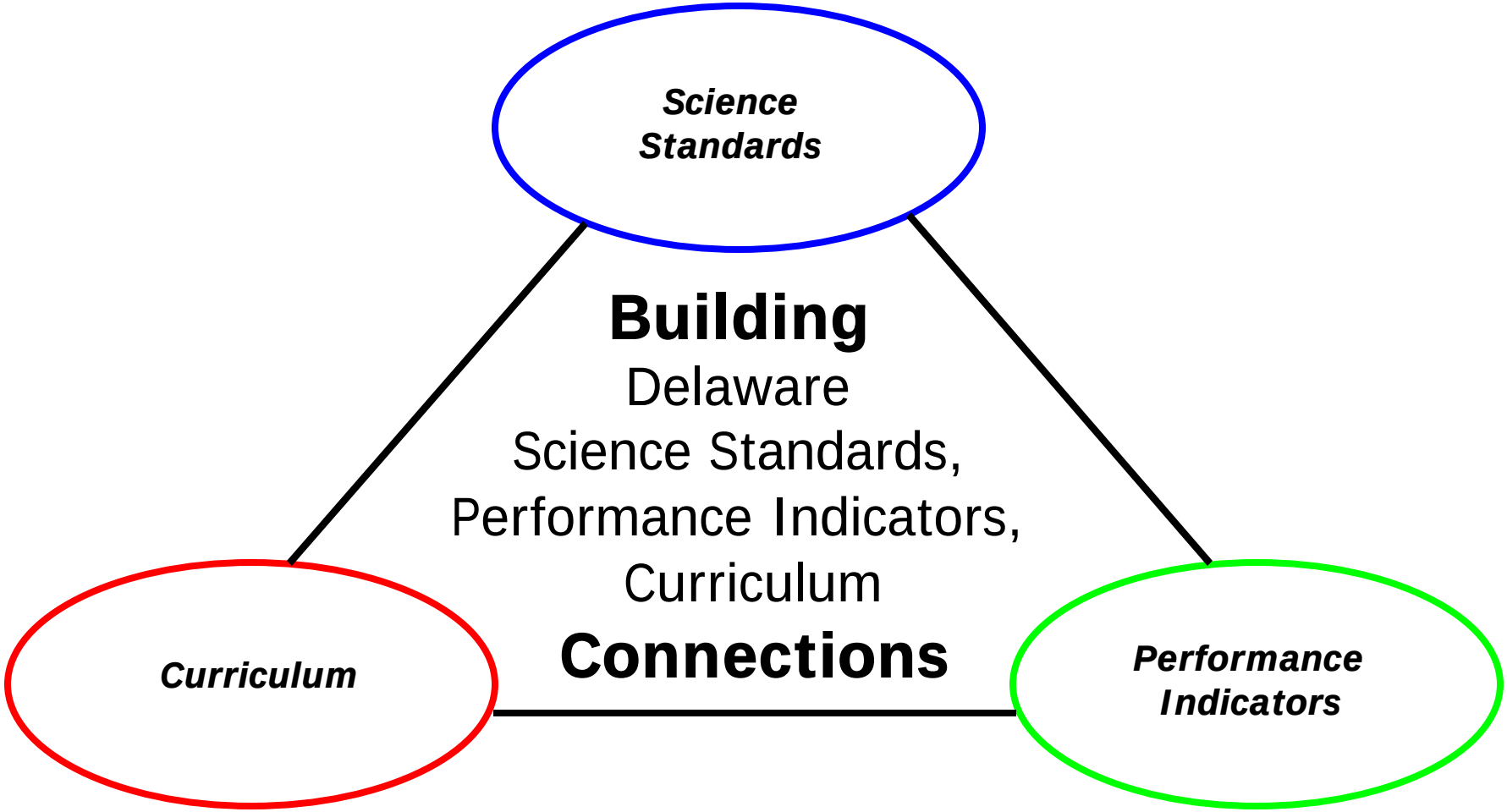

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Grades 6-8 Science Standards, Performance Indicators, and Units

Standard 1 – Nature and Application of Science and Technology

Science Standard	Performance Indicator	Concept	Unit
Science As Inquiry 1.1 1 The design of an investigation, in many cases, is determined by the type of questions asked. Therefore, the thoughtful and informed structuring of such questions is an important part of scientific inquiry. For example, a question such as, "What are the similarities and differences among the plants that grow in this region?" requires a taxonomic investigation in which plants are collected, identified, and classified. On the other hand, answering p "What was the reaction of Marie Curie's contemporaries to her work and accomplishments?" – may involve consulting, reviewing, and discussing both contemporary and historical publications as part of an investigative design. However, an experimental investigation in which systematic observations are made and where data are used and analyzed to construct an explanation could result from a question such as, "How do the physical properties of local soil samples lead to differences in drainage or percolation?"	6.301, 7.349, 8.350 Identify reasonable, relevant, and testable questions that can be answered through scientific investigations.	Formulating a testable question	Variables (6th) Forces that Cause Motion (6th) Earth's History (6th) Classification (6th) Watersheds (7th) Properties of Matter(7th) Human Body, Cells, and Genetics (7th) Weather (8th) Planetary Systems(8th) Ecosystems(8th) Transformation of Energy (8th- in production)
1.12 The ultimate goal of any scientific investigation is to obtain evidence precise and thorough enough to answer a question. Various experimental designs and strategies can be developed to answer the same question. The comprehensiveness and sophistication of the investigation depend on the tools and technologies used.	6.302 , 7.350, 8.351 Design and conduct simple scientific investigations. 6.304, 7.352, 8.353 select and use appropriate tools, technology, and mathematical techniques to gather, analyze and interpret data.	Experimental Design	Variables (6th) Forces that Cause Motion (6th) Earth's History (6th) Classification (6th) Watersheds (7th) Properties of Matter(7th) Human Body, Cells, and Genetics (7th) Weather (8th)

			Planetary Systems(8th) Ecosystems(8th) Transformation of Energy (8th- in production
1.13 Explanations in science result from careful and logical analysis of evidence gained from an investigation. Unlike descriptions, explanations relate causes to effects and develop relationships based on evidence and logical arguments. Critical analysis of data and the conclusions, claims, and recommendations developed are necessary to judge the quality and validity of the proposed explanation. The critical analysis skills learned in the classroom can be applied to judge the validity of claims and propositions made in everyday life.	6.303, 7.351, 8.352 compare and contrast observations of the same object or phenomena and discuss why difference in observations exist. 6.305, 7.353, 8.354 develop descriptions, explanations, predictions, and models based on evidence. 6.306, 7.354, 8.355 form logical explanations about the cause and effect relationship in an investigation. 6.307, 7.355, 8.356 present and defend experimental results by describing observations and methods, summarizing data, and generating reasonable explanations. 6.308, 7.356, 8.357 evaluate and provide appropriate feedback regarding experimental results and explanations proposed by other students. 6.309, 7.357, 8.358 explain what makes science different from other disciplines (e.g., science is the study of nature; science has established rules for acquiring evidence; science verifies claims, assertions, and theories). Describe what science tells us that other disciplines do not.	Analysis of Evidence	Variables (6th) Forces that Cause Motion (6th) Earth's History (6th) Classification (6th) Watersheds (7th) Properties of Matter(7th) Human Body, Cells, and Genetics (7th) Weather (8th) Planetary Systems(8th) Ecosystems(8th) Transformation of Energy (8th- in production
Science, Technology and Society 1.21 Social, cultural, environmental, scientific and technological strengths and economic factors influence which scientific and technological areas are pursued and invested in. At the same time, the scientific discoveries made and technologies developed directly influence society and its habits, organization, and cultural values.	None	Technology and its affects on society	Forces That Cause Motion(6th) Classification(6th) Human Body, Cells and Genetics(7th) Transformation of Energy (8th) (Tentative)
1.22 The issues surrounding science, technology and society are complex and involve many risk/benefit considerations. Even though new technology may provide	None	Technology's affects on human health and the environment	Forces That Cause Motion(6th) Watersheds(7th)

a solution to an important problem, its impact on human health, the environment, and social dynamics needs to be analyzed.			Human Body, Cells and Genetics(7th) Ecosystems(8th)
History and Context of Science 1.31 Over the course of human history, science has been practiced by different people in different cultures. Unfortunately, women and minorities have often been discouraged or denied the opportunity of participating in science because of education and employment prejudices or restrictions.	6.310, 7.358, 8.359 cite examples of important contributions made in science and technology by diverse cultures over time. 6.311, 7.359, 8.360 identify barriers women and minorities have experienced in their attempts to become scientists. 6.312, 7.360, 8.361 research contributions and discoveries made by Delaware scientists and describe their impact.	Multiculturalism within science	
1.32 People engaged in doing science are found in many occupations and institutions such as hospitals, universities, classrooms, industry, and farms. The nature of scientific investigation often requires that teams of individuals with different abilities work together to solve a problem or to understand the natural world.	None	Science in various occupations	Earth's History(6th) Properties of Matter(7th) Ecosystems(8th)

Standard 2 - Materials and Their Properties

Science Standard	Performance Indicator	Concept	Unit
Properties and Structure of Matter 2.11 Elements are substances that cannot be decomposed into simple materials by chemical reaction. However, elements can react with other elements or materials to form compounds. There are more than 100 known elements which combine in a multitude of ways to produce compounds, which account for all living and nonliving substances.	None	Definition of Elements	
2.12 The three states or phases of matter (solid, liquid, gas) are determined by the arrangement, motion, and interaction of molecules. In the solid state, molecules are packed tightly together and their movement is restricted to vibrations. In the liquid state, molecules are more loosely packed and can slide past each other. In the gaseous state, molecules are less restricted and move freely. Changes in state require the addition or removal of heat but result in no change in the chemical structure of the material. Changes in either the temperature, pressure, or volume of a gas result in predictable changes in the other properties.	None	States or phases of matter and their characteristics	Properties of Matter(7^{th})
2.13 Some physical properties such as mass and volume depend upon the amount of material; others such as density and melting point, known as characteristic properties, are independent of the quantity and are unique to the material.	6.342 distinguish between the physical properties and characteristic properties of an object or material. 6.343 conduct investigations to determine the difference between melting and dissolving (characteristic properties). Recognize that melting requires only one substance while dissolving requires two substances. 6.344 conduct investigations to determine that different pure substances melt or boil at different temperatures and that these differences can be used to classify or sort objects, materials, or substances. 7.301 distinguish between the physical properties (e.g., size, shape, color, texture, hardness) and	Physical and characteristic properties	Properties of Matter(7^{th})

	characteristic properties (e.g., boiling point, melting point, solubility, density, conductivity, pH) of a substance or material. 7.302 observe, measure, and compare characteristic properties of a variety of substances (e.g., how does an object's density determine whether it sinks or floats).		
Mixtures and Solutions 2.21 Mixtures have component parts. Most natural materials such as milk, blood, mineral ores, seawater, soil and air; and man-made materials, such as processed foods, cosmetics, and paints are physical mixtures consisting of a variety of components in a wide range of concentrations. The individual components can be analyzed and separated by making use of their unique chemical and physical properties.	6.341 explain how physical properties (e.g., size, shape, color, texture, hardness) and characteristic properties (e.g., boiling points, melting points, solubility, density, conductivity, pH) can be used to classify and sort objects or nonliving things. 7.303 use physical and characteristic properties to distinguish and separate on substance or material from another. 7.304 identify common materials found in the classroom or at home which are mixtures or solutions and conduct investigations to determine the components of those mixtures or solutions (e.g., chromatography, reading labels).	Mixtures and their components	Earth's History(6th) Properties of Matter(7th)
2.22 Solutions are homogenous mixtures of two or more components. The properties of a solution depend on the nature and concentration of the solute(s) (the material being dissolved) and the nature of the solvent(s) (the medium in which the solutes are dissolved).	6.343 conduct investigations to determine the difference between melting and dissolving (characteristic properties). Recognize that melting requires only one substance while dissolving requires two substances. 6.345 classify a variety of materials or substances according to whether or not they dissolve in specific solvents. 7.304 identify common materials found in the classroom or at home which are mixtures or solutions and conduct investigations to determine the components of those mixtures or solutions (e.g., chromatography, reading labels). 7.305 conduct investigations to identify factors that affect the rate of solubility. 7.306 use ratios and percentages to prepare solutions of different concentrations. 7.307 demonstrate that when a solute dissolves in a	Solutions made up of solvents and solutes	Properties of Matter(7th) Watersheds(7th)

	solvent the dissolved substance does not disappear but is added to the mass of the solvent. 7.339 recognize that water is a solvent and as it passes through the water cycle it dissolves minerals, gases, and pollutants and carries them to surface water and ground water supplies.		
Transformation and Conservation of Matter 2.31 Substances react chemically in characteristic ways with other substances for form new substances. In all chemical reactions the total mass is conserved. Substances can be categorized and grouped based on similarity in reactivity, for example metals. (National Science Education Standards, November 1994.)	None	Chemical Reactions	Properties of Matter(7^{th})
Material Technology 2.41 Societies use the understanding of physical and chemical change to create new and useful products. The production of these materials has social, environmental, and other implications that require analyses of the risks and benefits.	None	Creation of new products through physical and chemical changes	

Standard 3 - Energy and Its Effects

Science Standard	Performance Indicator	Concept	Unit
Forms and Sources of Energy 3.11 The electromagnetic spectrum is composed of different wavelength domains. The radiation in this spectrum comes from various sources and spans energy levels from radio waves (longest wavelengths, lowest energy) through microwaves, infrared, visible, ultraviolet, x-rays, to gamma rays (shortest wavelengths, highest energy). White light from the Sun consists of a mixture of wavelengths and energies in the visible part of the electromagnetic spectrum (red to violet).	8.301 explain that the source of almost all of the Earth's energy is light from the Sun which travels to Earth in a range of wavelengths. 8.302 identify and describe the differences in energy levels associated with visible light, infrared, and ultraviolet radiation. 8.303 demonstrate the existence of the color components of visible light using a prism or diffraction grating. Explain the colors and their order in terms of energy and wavelengths.	Electromagnetic Spectrum and waves	Ecosystems(8th) Transformation of Energy (8th) (tentative)
3.12 Electrical energy results from the movement of electric charges (electrons) driven by a voltage through a complete circuit. Electrical energy can be readily generated, transmitted over great distances, and transformed into heat, light, sound and motion. Electrical systems can be designed to perform a variety of tasks, using series, parallel, or combination circuits.	6.330 construct series, parallel, and combination circuits to demonstrate the flow of electricity. 6.331 demonstrate that an electric current moving through a wire produces magnetism and that an electric current can be generated by placing a rotating coil of wire near a magnet. 6.332 design simple investigations to determine the effect different variables (number of turns of wire around the core, the material that the core is made of, diameter of the core) have on electromagnetic strength. 6.333 describe how the motors in electrical appliances operate to convert electricity into mechanical work. 6.334 compile a list of ways electric motors can be used to perform different kinds of hard work and describe how the use of electricity has changed our lives.	Electrical Energy	Forces that Cause Motion(6th)
3.13 Static electricity represents potential energy stored in a collection of separated negative and positive charges. Similar charges repel each other; opposite charges attract	6.329 conduct investigations to determine how invisible forces such as magnetism and static electricity can cause objects to move.	Static Electricity	Forces that Cause Motion(6th)

each other and can lead to a sudden flow of electrons (e.g., a spark, a lightning bolt).			
3.14 Chemical energy is stored in elements and compounds. In most chemical reactions, energy is released or added to the system in the form of heat, light, electrical, or mechanical energy. (National Science Education Standards, 1994).	None	Energy released or added in chemical reactions	
Force and Motion 3.21 Force must be used to change speed or direction (or both) of a moving object. In the absence of such a force, the object will continue to move with the same speed and in the same direction. Forces have directions and magnitudes that can be measured. Any change in motion depends upon the amount of force causing the change and the mass of the object.	6.324 conduct investigations to demonstrate that a force causes a resting object to move, brings a moving object to rest or changes the direction of a moving object. 6.326 observe and compare the speed of objects when forces such as friction are varied.	Characteristics of forces	Forces that Cause Motion(6^{th})
3.22 Mechanical energy comes from the motion and/or the position of physical objects. The work done on an object depends on the applied force and on the distance that the object moves.	6.325 calculate an objects average speed (average speed = distance ÷ time) when forces of different magnitudes are applied to initiate the objects motion.	Origin of mechanical energy	Forces that Cause Motion(6^{th})
3.23 The motion of an object can be described as its change in position, direction, and speed relative to another object.	6.325 calculate an objects average speed (average speed = distance ÷ time) when forces of different magnitudes are applied to initiate the objects motion.	Description of the motion of an object	Forces that Cause Motion(6^{th})
3.24 Simple machines (e.g., levers, inclines, pulleys, gears) are used to change the force on an object and its speed or direction in order to make work easier.	6.327 explain and demonstrate how common tools (e.g., pliers, crowbars, hammers, pulleys, can openers) incorporate simple machines in their designs. Discuss the forces and motions involved. 6.328 use simple machine principles to design a device which performs a task (e.g., lift a weight, move a heavy object). Explain the forces and motions involved.	Usefulness of simple machines	Forces that Cause Motion(6^{th})

Transformation and Conservation of Energy 3.31 Almost all events in the Universe involve the transformation of one form of energy into another form with the release of heat. Regardless of the transformation, the total amount of energy remains constant.	8.314 trace the transfer of energy across several events or sequence of actions to demonstrate an understanding that even though energy is transferred from one form to another, the total amount of energy is conserved (e.g., Sun's heat → unequal heating of air → wind → windmills → electricity → light bulb → light and heat → eye OR Sun energy → plant → sugar → food for horse → digested → particles going to cells → cells do work → use horse to plow fields → plant seeds → Sun energy → sugar etc., etc., etc.)	Conservation of Energy	Transformation of Energy(8th) (tentative)
3.32 Heat energy is transported through materials by conduction, by convection in fluids (e.g., air or water), or across space by radiation. The addition or removal of heat from a material changes its temperature or its physical state (e.g., ice melting).	8.321 examine maps of ocean currents and trace the origin and flow of such currents to explain the transfer of heat energy. Identify which currents have dominant influence on the Delaware Coast. 8.306 conduct simple investigations to demonstrate that heat flows from one object to another in predictable ways, from warmer objects to cooler ones, until both reach the same temperature.	Conduction and convection	Weather(8th) Transformation of Energy (8th) (tentative)
Interactions of Energy with Materials 3.41 Energy can travel as waves which are characterized by wavelength, frequency, amplitude, and speed. Waves have common properties of absorption, reflection, and refraction when they interact with matter. They are either mechanical (e.g., sound, earthquake, tidal) or electromagnetic (e.g., sunlight, radio waves); only electromagnetic waves will travel through a vacuum.	8.304 conduct simple investigations with a variety of materials (sand, water, cloth, objects) to describe and measure the effects (including both physical and chemical changes) of light energy on these materials. 8.305 trace what happens when light energy from the Sun encounters various materials or mediums, such as, atmosphere, oceans, Earth's surface, objects, plants, and animals. Recognize that the effect of light energy on these materials or mediums is not uniform. 8.310 describe and demonstrate how light energy interacts with a variety of materials by transmission (including refraction), absorption, and scattering (including reflection). Explain how interactions with materials account for a range of phenomena observed (colors of objects, changes of state, light from the moon).	Energy travels as waves	Transformation of Energy(8th) (tentative)
3.42 The resistance to flow of an electric current through a material depends on the mobility of electrons in the material. In conductors (e.g. metals) the electrons flow easily, while in insulators (e.g., wood, glasses) they flow	None	Electricity's flow through conductors and insulators	Forces that Cause Motion(6th)

hardly at all. The resistance to flow converts electric energy to heat energy.			
Production/Consumption/Application of Energy 3.51 Technological advances throughout history (e.g., electric light, steam engine, internal combustion engine, radio, TV) have led to new applications which use different forms of energy. Such advances have led to increased demand for energy, and in some cases, unanticipated effects on society.	6.334 compile a list of ways electric motors can be used to perform different kinds of hard work and describe how the use of electricity has changed our lives.	Technological advances of the uses of energy	Forces that Cause Motion(6^{th})
3.52 Energy is obtained from a variety of sources, some of which are finite and some of which are renewable. The major source of energy for society is chemical energy stored in fossil fuels created many years ago through the process of photosynthesis. Another source is nuclear energy. Renewable sources (e.g., wind, geothermal, waves, biomass) vary in their availability and ease of use.	8.340 design food webs and trace the flow of matter and energy (beginning with the Sun) through the food web. Recognize that energy entering ecosystems as sunlight is transferred by producers into chemical energy through photosynthesis.	Various energy sources	Ecosystems(8^{th}) Transformation of Energy (8^{th}) (tentative)
3.53 Most energy used by industrial societies is derived from fossil fuel sources. Such sources are inherently limited on the earth and are unevenly distributed geographically. Responsible use of energy requires consideration of energy availability, efficiency, environmental issues, and alternative sources.	None	Fossil Fuels and their issues	Transformation of Energy(8^{th}) (tentative)

Standard 4 - Earth in Space

Science Standard	Performance Indicator	Concept	Unit
Solar System Models 4.11 The Universe is composed of billions of stars. The Sun is a medium size star which many millions of miles closer to Earth than the next nearest star.	None	Stars including the Sun	Planetary Systems(8^{th})
4.12 The Solar System forms part of the Milky Way Galaxy, which is one of many galaxies that comprise the Universe. Some of the galaxies are so far away that their light takes billions of years to reach Earth.	8.336 use scale drawings, models, or triangulation to determine the distance between specific points in the solar system.	Galaxies including the Milky Way	Planetary Systems(8^{th})
4.13 The nine planets, their respective Moon(s), comets and many asteroids, and meteorites orbit the Sun which is the gravitational center of the Solar System.	8.328 use models, charts, illustrations, and other suitable representations to predict regular patterns of motion for most objects in the solar system.	The components our solar system	Planetary Systems(8^{th})
4.14 The apparent shape of the Moon changes dramatically as it moves in its orbit. These shapes, called phases, relate to lunar visibility and the times at which the Moon rises and sets. The Moon produces no light of its own and shines only as a result of sunlight reflected from its surface.	8.329 model and explain how the regular and predictable motion of most objects in the solar system is responsible for observed phenomena such as day/night and the year. Use models to show how the motion of the Moon about the Earth and the location of the Sun relative to the Earth and its Moon explains the regular patterns of phases of the Moon, eclipses, and tides.	Moon Phases	Planetary Systems(8^{th})
4.15 The yearly revolution of Earth in its orbit about the Sun and the tilt of Earth on its axis (23.5 degrees) cause the angle at which sunlight strikes the Earth to vary at different locations. This causes differences in the heating of Earth's surface which produces seasonal variations in weather and a variety of climates.	8.322 8.307 explain how uneven heating of Earth's components – water, land, air – produces global atmospheric and oceanic movement. Describe how these global patterns of movement influence weather and climate. 8.308 use models to explain how variations in the amount of sun's energy hitting the Earth's surface results in seasons.	Revolution and tilt of the Earth	Weather(8^{th}) Transformation of Energy(8^{th}) (tentative)

Interactions in the Solar Systems 4.21 Nuclear processes that take place in the Sun continuously convert matter to energy. A small portion of this energy, which is intercepted by Earth, drives biological, chemical, and physical processes on Earth.	8.321 examine maps of ocean currents and trace the origin and flow of such currents to explain the transfer of heat energy. Identify which currents have dominant influence on the Delaware Coast. 8.323 use diagrams or simulations of the hydrologic cycle to describe the Sun's effect on the water cycle and to describe the circulation of water through the Earth's crust, oceans, and atmosphere. 8.309 use a variety of models, charts, diagrams, or simple investigations to explain how the Sun's energy causes water to cycle through the Earth's crust, oceans, and atmosphere.	The Sun's energy drives Earth's processes	Weather (8^{th}) Transformation of Energy(8^{th}) (tentative)
4.22 The gravitational attraction that exists between all forms of matter holds objects on Earth, causes tides, keeps the Solar System and galaxy together, and controls the movement of the planets in the Solar System.	8.330 explain how the force of gravity keeps planets in orbit around the sun.	Gravity	
Technology and Applications 4.31 Close-up pictures and data received from space probes allow scientists to compare the physical properties of planets (e.g., size, surface features, number of rings) and to speculate about conditions on other planets.	8.331 construct scale models of the solar system in order to describe the relative sizes of planets (as viewed from Earth) and their distances from the Sun. Understand how a telescope magnifies the appearance of certain objects in the sky, including the Moon and the planets. 8.332 use a variety of resources (e.g., NASA photographs, computer simulations, satellite images) to compare and contrast the physical properties (e.g., temperature, size, composition, surface features) of planets. Use this information to explain why Earth is a suitable planet for life. 8.333 study a space probe mission and the evidence it provides scientists that either confirms or refutes theories about conditions on other planets.	Physical properties of planets	Planetary Systems(8^{th})
	Missing 8.335 investigate how some people have used the movement of objects in the sky in order to tell time and location. 8.334 observe and demonstrate that patterns of stars only appear to move across the sky and that different stars can be seen at different times of the year.		

Standard 5 – Earth's Dynamic Systems

Science Standard	Performance Indicator	Concept	Unit
Components of Earth 5.11 Rocks and minerals are classified according to their chemical and physical properties. Rocks also are classified according to how they are formed.	6.313 identify and classify rocks and minerals according to their physical and chemical properties. 6.314 explain the difference between minerals (a relatively pure substance that occurs in the Earth and has a crystalline form) and rocks (a combination of different minerals). 6.316 classify unknown rock samples (e.g., igneous, sedimentary, or metamorphic) based on identifiable characteristics. Explain how this method of classifying is related to the rock's formation. 6.315 create models of rock formation to investigate how igneous, sedimentary, and metamorphic rocks are formed.	Classification of rocks and minerals	Earth's History(6th)
5.12 Sedimentary rocks, which are made of particles from other rocks and organic remains, are laid down in horizontal layers. Fossilized remains and successive layering of sedimentary rocks provide evidence of the Earth's history. Absolute age is determined by radioactive dating.	6.315 create models of rock formation to investigate how igneous, sedimentary, and metamorphic rocks are formed. 6.322 recognize that successive layers of sedimentary rock and the fossilized remains found in those layers confirm Earth's long history. 6.323 compare and contrast fossils and anatomical models to draw reasonable conclusions regarding evolutionary change over time (e.g., trilobites → horseshoe crabs, belemnites → squid).	Formation of sedimentary rocks and the importance of fossils	Earth's History(6th)
5.13 The atmosphere has properties that can be observed, measured, and used to predict changes in weather and to identify climatic patterns.	8.315 verify that the atmosphere has properties that can be observed, measured, and used to predict changes in weather. Recognize that the atmosphere has different properties at different elevations. 8.316 explain the role of the atmosphere's ozone layer in absorbing harmful ultraviolet radiation. 8.322 compare and contrast weather and climate. 8.325 examine satellite imagery pictures and describe the use of these images in photographing weather systems and producing forecasts.	Dynamics of the atmosphere	Weather(8th)
5.14 Water falling to Earth flows over the surface as run-off	7.336 use maps to locate Delaware watersheds and to	The water	Watersheds(7th)

and collects in ocean basins, rivers, lakes, ice caps, and underground. Water stored underground (sub-surface) and water stored above ground (surface) form a continuum, each supplying water to the other. Human activity and natural events can introduce chemicals affecting the quality of the water supply.	identify the bodies of water into which they drain. 7.337 use models or diagrams to explain how water stored underground and water stored above ground form a continuum each supplying water to the other. 7.338 use diagrams of the hydrologic cycle to describe the circulation of water through the Earth's crust, oceans, and atmosphere. 7.339 recognize that water is a solvent and as it passes through the water cycle it dissolves minerals, gases, and pollutants and carries them to surface water and ground water supplies. 7.340 identify the sources of drinking water for the citizens of Delaware. 7.342 conduct investigations to determine the extent to which the permeability and porosity of a soil sample effect water percolation. 7.343 describe the role of wetlands and streamside forest (riparian) in filtering water as it runs off into local streams, rivers, and bays or seeps into ground water.	cycle and the affects upon it	
Interactions Among Earth's Systems 5.21 Volcanoes, earthquakes, and other mountain-building processes are responsible for most major features of the Earth's crust.	8.312 recognize that forces result from the transformation of energy and can be constructive or destructive. Both constructive forces (e.g., volcanic eruptions and deposition of sediment) and destructive forces (e.g., weathering and erosion) shape the Earth's surface.	Volcanoes, earthquakes and mountain building processes	Transformation of Energy (8^{th}) (Tentative)
5.22 Rocks are changed by erosion and deposition and by exposure to heat and pressure. There are a variety of physical and chemical processes that lead to the decomposition and breakdown of rocks and the eventual formation of soils and sediments. These soils and sediments can then be transported to other places by wind, flowing water, waves, and ice.	6.317 investigate factors that cause weathering of rocks. (e.g., exposure to wind, precipitation, temperature changes, plant growth, acid rain, etc.) 6.318 survey the local area (e.g., walk around the school building, visit a cemetery) to observe, describe and explain the visual and structural effects of weathering on both natural and manmade rock structures. 6.319 examine soil samples to identify and discuss factors that determine soil composition and structure (type of underlying rocks, climate, sorts of vegetation present). 6.320 investigate how rocks are cycled through the processes of weathering, erosion, transport, and deposition. 6.321 conduct simulations to demonstrate how erosion	Erosion, weathering and deposition of rocks	Earth's History(6^{th}) Transformation of Energy (8^{th}) (Tentative)

	(e.g., beach erosion) and deposition of rock and soil (e.g., beach formation) lead to the development of land forms. 8.312 recognize that forces result from the transformation of energy and can be constructive or destructive. Both constructive forces (e.g., volcanic eruptions and deposition of sediment) and destructive forces (e.g., weathering and erosion) shape the Earth's surface. 8.313 conduct simple investigations to determine how constructive and destructive forces alter the surface of the earth (e.g., build model glaciers, formation of river beds, stream tables that model weathering and erosion, model wind erosion, etc.)		
5.23 The cycling of water in the atmosphere is driven by energy transfer processes, such as convection and radiation, and is constantly changing the location and phase of water.	7.338 use diagrams of the hydrologic cycle to describe the circulation of water through the Earth's crust, oceans, and atmosphere. 8.309 use a variety of models, charts, diagrams, or simple investigations to explain how the Sun's energy causes water to cycle through the Earth's crust, oceans, and atmosphere. 8.318 classify clouds according to their characteristics and explain how clouds formed by condensation affect weather and climate. 8.323 use diagrams or simulations of the hydrologic cycle to describe the Sun's effect on the water cycle and to describe the circulation of water through the Earth's crust, oceans, and atmosphere.	The sun's energy drives the water cycle	Weather(8^{th}) Watersheds(7^{th}) Transformation of Energy (8^{th}) (Tentative)
5.24 Uneven heating and cooling of Earth's surface produces various air masses which differ in density, humidity, and temperature. The origin, movement, and interaction of these air masses result in significant weather changes.	8.307 explain how uneven heating of earth's components – water, land, air – produce global atmospheric and oceanic movement. Describe how these global patterns of movement influence weather and climate. 8.314 8.317 record and interpret daily weather measurements over an extended period of time using a variety of instruments (e.g., barometer, anemometer, sling psychometer, etc.) in order to identify weather patterns. 8.319 use weather maps to describe the movement of air masses, fronts, and storms and to predict their influence on local weather.	Differing air masses and their affects upon weather	Weather (8^{th}) Transformation of Energy (8^{th}) (Tentative)

	8.320 examine isobars on weather maps to describe how wind (moving air) travels from a region of high pressure to a region of low pressure. 8.324 discuss the origin of the great storms of the east coast (e.g. hurricanes, "nor-Easters", snow, and ice storms). Describe the environmental, economic, and human impact of these storms.		
5.25 Ocean currents affect the weather and long term climatic patterns of a region. Large bodies of water (oceans, the Great Lakes, inland seas) can also affect the weather and climate of an area.	8.321 examine maps of ocean currents and trace the origin and flow of such currents to explain the transfer of heat energy. Identify which currents have dominant influence on the Delaware coast.	Ocean currents and large bodies of water affect weather	Weather(8^{th})
Technology and Applications 5.31 Instrumentation (e.g., pH meters, water analysis kits) and computer models enable the measure and analysis of environmental pollution. Sources of environmental pollution can be tracked using maps and satellite imagery.	7.341 conduct tests (e.g., pH, dissolved oxygen) or surveys (e.g., macroinvertebrate) to determine the ecological health and potability of local water samples. 7.344 distinguish between point source water pollutants and non-point source water pollutants. 8.326 identify factors that increase the acidity of rain water and explain the effects of acid rain on buildings, cars, plants, animals, lakes, etc.	Measurement of pollution	Watersheds(7^{th}) Weather(8^{th})

Standard 6 - Life Processes

Science Standard	Performance Indicator	Concept	Unit
Structure/Function Relationship 6.11 The basic unit of all living organisms is the cell. In multi-cellular organisms, different cells are specialized to perform various tasks, and cells similar in shape and function are organized into groups (e.g., muscle cells, motor nerve cells).	7.312 observe both unicellular and multicellular organisms to identify common life processes. Recognize that the more complex the organism, the greater the extent of cellular specialization. 7.322 research the sequence of events that lead to formulation of the cell theory and explain how the events correlate with technological advancements.	Cell as basic unit of life	Human Body, Cells and Genetics(7^{th})
6.12 Cells contain a set of observable structures called organelles (e.g., cell wall, cell membrane, nucleus, chloroplast, and vacuole) that control the various functions of the cell such as structural support, exchange of materials, photosynthesis, and storage of essential materials.	7.313 identify and describe how specific structures of living organisms are responsible for particular life processes. 7.316 use microscopes and other appropriate tools and technology to observe multicellular organisms (plant and animal cells) and explain how the structures of the major organelles are related to the functions they perform. 7.317 demonstrate an understanding of structure/function relationships at the cellular level using a variety of appropriate representations (e.g., analogy of a city or a factory performing a variety of specialized jobs, analogy of an automobile doing work, space stations at work, etc.).	Structure and Function of cell organelles	Human Body, Cells and Genetics(7^{th})
6.13 Unicellular organisms perform, within a single cell, all of life's specific functions such as water regulation, digestion, locomotion, and circulation using specialized structures for each function.	7.314 compare and contrast the interactive systems of unicellular and multicellular organisms. 7.315 use microscopes and other appropriate tools and technology to observe and compare a variety of unicellular organisms. Explain how specific cellular structures perform such specialized functions as water regulation, digestion, locomotion, and circulation. 7.323 recognize that reproduction is a characteristic of all living systems and is essential to the continuation of the species.	Self -Sufficient unicellular organisms	Human Body, Cells and Genetics(7^{th})

Matter and Energy Transformations 6.21 Plants make their food by the process of photosynthesis. Using light energy, green plants convert water and carbon dioxide into energy-rich simple sugar and oxygen. Sugar is the source of food used by most plants, and ultimately, by all other consumers. Oxygen produced during photosynthesis is required for the survival of most plants and animals.	8.340 design food webs and trace the flow of matter and energy (beginning with the sun) through the food web. Recognize that energy entering ecosystems as sunlight is transferred by producers into chemical energy through photosynthesis. 8.314	Photosynthesis	Ecosystems (8th) Transformation of Energy (8th) (Tentative)
6.22 All living things obtain energy from food. Energy is needed for living cells to carry out all the processes of life such as growing, disposing of wastes, making new cells, and using food.	7.318 recognize that for multicellular organisms, most interactions that sustain life take place at the cellular level. Explain how the energy and materials needed by cells to perform work and to build new materials are derived from the food and oxygen taken in by the organism.	Energy is obtained from food and is essential	Human Body, Cells and Genetics(7th)
Regulation and Behavior 6.31 All organisms obtain and use resources to grow, reproduce, and maintain a relatively stable environment while living in a constantly changing external environment. Regulation of an organism's internal environment involves sensing external changes in the environment and changing physiological activities to keep within the range required to survive. (National Science Education Standards, 1994)	7.320 conduct simple investigations (how the body reacts to exercise, changes in temperature, etc.) to determine how the systems in the human organism respond to various external stimuli to maintain stable internal conditions. 7.323 recognize that reproduction is a characteristic of all living systems and is essential to the continuation of the species.	Regulation of an organism's internal environment	Human Body, Cells and Genetics(7th)
6.32 Behavior is one kind of response an organism makes to environmental stimuli. Behavioral responses require coordination and communication at many levels including cells, organ systems, and whole organisms.	7.320 conduct simple investigations (how the body reacts to exercise, changes in temperature, etc.) to determine how the systems in the human organism respond to various external stimuli to maintain stable internal conditions. 7.319 select several human body systems and explain how they interact to transport the food and oxygen required by all cells to perform work and to build new materials.	Organism's response to stimuli	Human Body, Cells and Genetics(7th)
Health and Technology Applications 6.41 The functioning and health of organisms, including humans, are influenced by heredity, diet, lifestyle, bacteria, viruses, parasites, and the environment. Certain body structures and systems function to protect against disease and injury.	7.321 explain how the systems of the human body interact to protect against disease and injury.	Influences on the health of an organism	Human Body, Cells and Genetics(7th)
6.42 Sanitation measure such as the use of sewers, landfills, quarantines, and safe food handling are important	7.346 research the processes used by municipalities to ensure water taken from local reservoirs is safe to drink.	Human precautions	Watersheds(7th)

in controlling the spread of organisms that cause disease.	7.347 investigate the extent to which legislation such as the Clean Water Act has impacted the quality of Delaware water. 7.348 explain how sanitation measures such as sewers landfills, and water treatment are important in controlling the spread of organisms that contaminate water and cause disease.	against disease	

Standard 7 - Diversity and Continuity of Living Things

Science Standard	Performance Indicator	Concept	Unit
Heredity 7.11 Chromosomes, which are components of cells, occur in pairs and carry hereditary information. The subunits of chromosomes are genes which direct the formation of an organism's traits.	7.327 distinguish between dominant and recessive traits. 7.328 use models to demonstrate that chromosomes and genes come in pairs and that chromosomes are composed of many genes. Use these same models to discuss how genetic material is transmitted from cell to cell or from parent to offspring. 7.329 construct Punnett squares and pedigree charts to demonstrate and predict how single gene traits such as seed shape in peas and tongue rolling in humans are transmitted to offspring.	Chromosomes	Human Body, Cells and Genetics(7^{th})
Reproduction and Development 7.21 In asexual reproduction, a new organism grows from a single cell or a cluster of cells provided by the parent and results in offspring genetically identical to the parent.	7.323 recognize that reproduction is a characteristic of all living systems and is essential to the continuation of the species.	Asexual reproduction	Human Body, Cells and Genetics(7^{th})
7.22 In sexual reproduction, gametes (egg and sperm), which are produced in specialized structures of the parents, fuse during fertilization to form an organism. Since each gamete contributes a set of chromosomes, the offspring have traits of both parents.	7.323 recognize that reproduction is a characteristic of all living systems and is essential to the continuation of the species. 7.325 use models or diagrams to identify the structures of a flowering plant that produce eggs and sperm and explain that plants also reproduce sexually. 7.326 use models or diagrams to identify the structures of a flowering plant that produce eggs and sperm and explain that plants also reproduce	Sexual reproduction	Human Body, Cells and Genetics(7^{th})

	sexually.		
7.23 After the egg is fertilized, it undergoes an orderly series of changes involving cell division and differentiation as a new organism is formed. Each of the new cells in the developing organism receives an exact copy of the genetic information contained in the fertilized egg.	None	Fertilization and differentiation	Human Body, Cells and Genetics(7^{th})
Evolution 7.31 Natural selection is the process by which some individuals with certain traits are more likely to survive and produce greater numbers of offspring than other organisms of the same species. Conditions in the environment can affect which individuals survive in order to reproduce and pass their traits on to future generations. Small differences between parents and offspring accumulate over many generations and ultimately new species may arise.	7.332 recognize that species acquire many of their unique characteristics through biological adaptations, which involve the selection of naturally occurring variations in populations. 7.333 observe a variety of organisms and explain how a specific trait could increase an organism's chances of survival. 7.334 conduct a natural selection simulation to demonstrate that a specific trait has selective advantages for an organism. 7.335 Explain how the extinction of a species occurs when the environment changes and the adaptation of a species is insufficient to allow for its survival. 8.344 conduct a natural selection simulation to demonstrate how a specific trait has selective advantages for an organism.	Natural Selection	Human Body, Cells and Genetics(7^{th})
7.32 Anatomical comparisons and fossils provide evidence for evolution and indicate that the first organisms originated on the Earth between three and four billion years ago. The Earth's present day species evolved from earlier, distinctly different species.	7.335 Explain how the extinction of a species occurs when the environment changes and the adaptation of a species is insufficient to allow for its survival. 6.323 compare and contrast fossils and anatomical models to draw reasonable conclusions regarding evolutionary change over time (e.g., trilobites $\rightarrow$ horseshoe crabs, belemnites $\rightarrow$ squid).	Fossil evidence supporting evolution	Human Body, Cells and Genetics(7^{th}) Classification(6^{th})

Diversity 7.41 Organisms are currently classified into five kingdoms (monera, protista, fungi, plantae, animalia) based on similarities in structure and behavior.	6.336 recognize that there is a standard system of classifying and naming species that is used throughout the world. 6.337 identify "kingdom" as the first main level of the standard classification system. Observe a variety of living organisms and determine into which kingdom they would be classified. 6.338 examine an assortment of plants and animals and use simple classification keys, based on observable features to sort and group the organisms.	Five kingdom organization	Classification(6^{th})
7.42 A species is an important biological grouping of organisms whose members have similar structures, normally interbreed, and produce fertile offspring.	6.336 recognize that there is a standard system of classifying and naming species that is used throughout the world. 6.338 examine an assortment of plants and animals and use simple classification keys, based on observable features to sort and group the organisms. 8.337 survey the diversity of organisms in a local or model ecosystem and recognize that a population consists of all individuals of a species that occur together at a given place and time.	Definition of species	Classification(6^{th}) Ecosystems(8^{th})
7.43 Each structure in an organism is uniquely adapted to perform a particular function for enhancing the ability of the organism to survive. The great variety of body forms found in different species enable organisms to survive in diverse environments.	7.332 recognize that species acquire many of their unique characteristics through biological adaptations, which involve the selection of naturally occurring variations in populations. 7.333 observe a variety of organisms and explain how a specific trait could increase an organism's chances of survival. 7.334 conduct a natural selection simulation to demonstrate that a specific trait has selective advantages for an organism. 8.345 investigate and discuss how short-term physiological adaptations of an organism (e.g., skin tanning, muscle development, formation of	Structure and function in terms of organisms' adaptations	Human Body, Cells and Genetics(7^{th}) Ecosystems(8^{th})

	calluses) differ from long-term evolutionary adaptations (e.g., white coloration of polar bears, seed formation in plants) that occur in a group of organisms over generations.		
Health and Technology Applications 7.51 Selective breeding is used to produce new varieties of cultivated plants and domesticated animals with enhanced traits.	7.330 use a variety of resources to develop a report on selective breeding. Select an organism (e.g., super sweet corn, oven stuffed roaster) and trace its history of development and traits of the plant or animal that were enhanced by selective breeding.	Selective breeding	Human Body, Cells and Genetics(7^{th})
7.52 Knowledge gained from research in genetics is being applied to areas of human health.	7.331 select one area of biotechnology (genetic, reproduction, or embryonic research) and explain the human benefits as well as the economic, social, and ethical issues raised by such research.	Genomics	Human Body, Cells and Genetics(7^{th})

Standard 8 - Ecology

Flow of Matter and Energy in an Ecosystem 8.11 An ecosystem consists of all the organisms that live together and interact with each other and their physical environment.	8.337 survey the diversity of organisms in a local or model ecosystem and recognize that a population consists of all individuals of a species that occur together at a given place and time. 8.338 categorize populations of organisms according to the functions they serve in an ecosystem.	Ecosystem definition	Ecosystems(8^{th})
8.12 Interactions in an ecosystem result from the transfer of matter and energy from producers to consumers and eventually to decomposers. The total amount of matter and energy in the system remains the same even though its form and location changes.	8.339 construct food webs and identify the relationships among producers, consumers, and decomposers. 8.340 design food webs and trace the flow of matter and energy (beginning with the Sun) through the food web. Recognize that energy entering ecosystems as sunlight is transferred by producers into chemical energy through photosynthesis. 8.314	Energy transfers between producers, consumers and decomposers	Ecosystems(8^{th}) Transformation of Energy (Tentative)
8.13 Matter is recycled in an ecosystem, and energy which enters the system as sunlight is either stored in the bodies of organisms, used by consumers to support their activities, or dissipated to the environment as heat energy. Loss of heat from an ecosystem is compensated for by continuous input of solar energy.	8.340 design food webs and trace the flow of matter and energy (beginning with the Sun) through the food web. Recognize that energy entering ecosystems as sunlight is transferred by producers into chemical energy through photosynthesis.	Matter is recycled in an ecosystem	Ecosystems(8^{th})

Change in Ecosystems 8.21 Changes in the physical or biological conditions of an ecosystem can alter the diversity of species in the system. As the ecosystem changes, populations; of organisms must adapt to these changes, move to another ecosystem, or become extinct.	8.344 conduct a natural selection simulation to demonstrate how a specific trait has selective advantages for an organism. 8.346 investigate local areas, disturbed and undisturbed, that are undergoing natural cycles of succession, such as abandoned gardens; uncut areas beneath power lines; areas along ditch banks, fences, and the edge of a forest. Predict how plant communities that grow in the area may change over time and how their presence determines what kinds of animals may move into and out of the areas. 8.349 contact the Department of Natural Resources or a wildlife agency to acquire information on animals or plants that have been introduced to Delaware. Investigate issues that relate to the introduction or reintroduction of a species into a local habitat (e.g., Norway Maple, Delmarva Fox Squirrel, Gypsy Moth, Phragmites)	Changes in an ecosystem can affect organism diversity	Ecosystems(8^{th})
8.22 The size of populations in an ecosystem may increase or decrease as a result of the interrelationships among organisms, availability of resources, natural disasters, habitat changes, and pollution.	8.341 describe factors (e.g., space, food, water, disease) that limit the number of organisms an ecosystem can support. 8.342 construct data tables or line graphs to show population changes of a selected species over time. 8.343 observe graphs or data tables showing both the population growth of a species and the consequences of resource depletion on the population. Analyze the data and explain how exponential growth can have a dramatic effect on resources. 8.347 research and analyze data on human population changes that have occurred in a specific Delaware area or county. Discuss reasons for changes in human population and explain how	Population size is affected by limiting factors	Ecosystems(8^{th})

	these changes have affected biodiversity and availability of natural resources (e.g., habitat loss, water quality, preservation/concentration efforts).		
Technology and Its Influence on the Environment 8.31 Agriculture relies heavily on technology to increase productivity. Advances in irrigation allow crops to grow in areas where there is not enough precipitation. Chemicals are used to fertilize crops and to control damage done by rodents, fungi, insects, and weeds. The need to increase agricultural production results in environmental trade-offs (e.g., saltwater intrusion, water table lowering, agricultural runoff into rivers/streams, elimination of beneficial insects, desertification).	7.344 distinguish between point source water pollutants and non-point source water pollutants. 7.345 explain the impact of human activities (e.g., farming, building roads, fertilizing golf courses, etc.) on the quality of Delaware's waters. 8.348 investigate some of the economic and environmental tradeoffs given Delaware's short-term and long-term resource management plans.	Human needs and environmental tradeoffs	Watersheds(7th) Ecosystems(8th)
Interactions of Humans Within Ecosystems 8.41 The extinction or introduction of species can affect the stability of ecosystems. With careful planning, humans may be able to sustain ecosystems for their use as well as preserve their biodiversity and natural beauty.	8.349 contact the Department of Natural Resources or a wildlife agency to acquire information on animals or plants that have been introduced to Delaware. Investigate issues that relate to the introduction or reintroduction of a species into a local habitat (e.g., Norway Maple, Delmarva Fox Squirrel, Gypsy Moth, Phragmites)	Ecosystem stability with help from humans	Ecosystems(8th)
8.42 Decisions about the use of natural resources are often determined by a society's short-term needs for the resources with little regard for long term consequences. The supply of natural resources such as water and petroleum is finite. Non-material resources (e.g., tranquility, beautiful scenery) can not be easily quantified but must be preserved.	8.348 investigate some of the economic and environmental tradeoffs given Delaware's short-term and long-term resource management plans.	The supply of natural resources are limited and must be preserved	Ecosystems(8th)