

	Content Statement	I Can...	Key Vocabulary
Cycles and Patterns of Earth and Moon (ESS)	<p>1. The hydrologic cycle illustrates the changing states of water as it moves through the lithosphere, biosphere, hydrosphere and atmosphere.</p> <p>NOTE: Contamination can occur within any step of the hydrologic cycle. Ground water is easily contaminated as pollution present in the soil or spilled on the ground surface moves into the ground water and impacts numerous water sources.</p>	<ul style="list-style-type: none"> -Describe the movement of water through all four spheres of Earth (lithosphere, hydrosphere, atmosphere, biosphere). -Identify the changes in thermal energy as water changes state in the hydrologic cycle. -Recognize that the sun is the source of energy that drives the hydrologic cycle. -Describe how the porosity and permeability of rock/soil can affect the rate at which water flows through the hydrologic cycle. -Describe the relationship between water, energy and weather through the use of the cycling through the hydrologic cycle. -Relate water flow to geographic and topographic landforms and/or features to understand where water flows and how it moves through the different spheres. -Use topographic and aerial maps to identify drainage patterns and watersheds that contribute to the cycling of water. -Use investigations and/or technology to simulate different segments of the hydrologic cycle. -Describe why ground water and surface water quality are important components of the hydrologic cycle. -Research an area in Ohio that exhibits a unique water contamination problem including recent discoveries, case studies, clean-up technologies or field investigations that are occurring. -Evaluate the effectiveness of different tools, models and methods to collect ground water and surface water data (e.g., rate of flow, direction of movement, types of contamination). 	<ul style="list-style-type: none"> • Hydrologic cycle • Lithosphere • Biosphere • Hydrosphere • Atmosphere • Contamination • Pollution • Ground water • Thermal energy • Topographic map • Aerial map • Watershed • Drainage patterns • Permeability • Porosity • Surface water • Topographic landforms and features • Geographic landforms and features

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Cycles and Patterns of Earth and the Moon (ESS)	<p>2. Thermal-energy transfers in the ocean and the atmosphere contribute to the formation of currents, which influence global climate patterns.</p> <p>NOTE: Regional temperature and precipitation contribute to the identification of climatic zones.</p>	<p>-Describe how the sun is a major source of energy for wind, air and ocean currents and the hydrologic cycle.</p> <p>-Use a variety of maps, models and technology (e.g., remote sensing, satellite images, LANDSAT) to study current and climate patterns on a global level.</p> <p>-Connect the causes of moving currents in the atmosphere and ocean to thermal energy, density, pressure, composition and topographic/geographic influences (e.g., continental mountains, ocean ridges).</p> <p>-Map and document specific current patterns in the atmosphere.</p> <p>-Map and document specific current patterns in the ocean.</p>	<ul style="list-style-type: none"> • Hydrologic cycle • Global climate patterns • Thermal energy • Atmosphere • Density • Currents • Climatic zones • Remote sensing • Satellite images • LANDSAT • Pressure • Composition • Topographic influences • Geographic influences • Climate patterns

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Rocks, Minerals and Soil (ESS)	<p>3. The atmosphere has different properties at different elevations and contains a mixture of gases that cycle through the lithosphere, biosphere, hydrosphere and atmosphere.</p> <p>NOTE: The emphasis is on why the atmosphere has defined layers, not on naming the layers.</p>	<ul style="list-style-type: none"> -Identify the general properties of the different layers of the atmosphere. -Recognize the human-made and natural factors (including greenhouse gases and water vapor, ozone) that can change the properties of the atmosphere. -Identify the different gases that are present in Earth’s atmosphere. -Trace the different biogeochemical cycles through each of Earth’s spheres. -Understand the interactions between Earth’s spheres and how specific elements and/or molecules move between them. -Use real-time scientific data pertaining to air quality and properties of air to study atmospheric properties and air quality. -Discuss contemporary issues and technological advances concerning the atmosphere. -Describe how gravity is used to hold the atmosphere to the Earth. 	<ul style="list-style-type: none"> • Atmosphere • Biogeochemical cycles • Greenhouse gas • Ozone • Air quality • Gravity • Elevations • Lithosphere • Biosphere • Hydrosphere • Water vapor • Atmospheric properties
	<p>4. The relative patterns of motion and positions of the Earth, moon and sun cause solar and lunar eclipses, tides, and phases of the moon.</p> <p>NOTE: The emphasis should not be on naming the phases of the moon or tides, but in understanding why the phases of the moon or tides are cyclical and predictable.</p> <p>NOTE: Advances in science knowledge regarding patterns and movement in the solar system are included in this content statement.</p>	<ul style="list-style-type: none"> -Demonstrate the changing positions of the moon and Earth as they orbit the sun using models and/or simulations. -Demonstrate solar and lunar eclipses using models and/or simulations. -Demonstrate the daily tides using models and/or simulations. -Demonstrate neap and spring using models and/or simulations. -Recognize the relationship between gravity and tidal movement. 	<ul style="list-style-type: none"> • Solar eclipse • Lunar eclipse • Tide • Phases of the moon • Spring tide • Neap tide • Gravity

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	Content Statement	I Can...	Key Vocabulary
Cycles of Matter and Flow of Energy (LS)	<p>5. Matter is transferred continuously between one organism to another and between organisms and their physical environments.</p> <p>NOTE: Chemical reactions are presented as the rearrangement of atoms in molecules. Chemical reactions in terms of subatomic structures of atoms are not appropriate.</p> <p>NOTE: New discoveries, technology and research must be used to connect the concept of energy transfer and transformation within the ecosystem and between ecosystems. For example, the use of biomass as an alternative energy source for the local area can focus on different types of biomass, competition between human food crops and biomass crops, and biomass vs. other types of alternatives to fossil-fuels energy.</p>	<ul style="list-style-type: none"> -Identify the cellular structures primarily responsible for photosynthesis and respiration. -Distinguish between photosynthesis and respiration and illustrate how the two processes are connected. -Use the formulas for photosynthesis and respiration appropriately. -Describe how and what plants create through the process of photosynthesis. -Understand the transfer of matter and energy between organisms. -Describe how energy and matter are conserved in an ecosystem. -Create and explain an energy pyramid (including where energy is stored and where energy is lost as heat produced in the chemical processes in cells, role of decomposers) for any given ecosystem. -Realize that the amount of energy remains constant in an ecosystem even though the form and location undergo continual change. 	<ul style="list-style-type: none"> • Photosynthesis • Respiration • Conservation of matter • Conservation of energy • Decomposer • Chemical process • Energy transformation • Chemical reaction • Ecosystem • Energy transfer • Cellular structures • Energy pyramid

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	Content Statement	I Can...	Key Vocabulary
Cycles of Matter and Flow of Energy (LS)	6. In any particular biome, the number, growth and survival of organisms and populations depend on biotic and abiotic factors.	-Define biomes based on abiotic components of the environment – topography, soil types, precipitation, solar radiation and temperature. -Compare biomes found on Earth (aquatic, forest, desert, grassland, taiga, tundra) based on abiotic components of their environment. -Link biomes to climate zones on a global level by using a variety of maps, models and technology (e.g., remote sensing, satellite images, LANDSAT). -Explain how the fluctuating interactions between biotic and abiotic factors affect ecosystems and the organisms that live in them. -Trace and explain how matter and energy are transferred through an ecosystem. -Describe how a natural disaster can change an ecosystem causing it to go through the stages of succession in order to recover.	<ul style="list-style-type: none"> • Biotic factors • Abiotic factors and components • Biome • Topography • Solar radiation • Desert biome • Grassland biome • Taiga • Tundra • Climate zone • Aquatic biome • Forest biome • Remote sensing • Satellite images • LANDSAT • Ecosystems • Energy transfer • Stages of succession

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	Content Statement	I Can...	Key Vocabulary
Conservation of Mass and Energy (PS)	<p>7. The properties of matter are determined by the arrangement of atoms.</p> <p>NOTE: This is the conceptual introduction of the Periodic Table of Elements.</p> <p>NOTE: It is important to emphasize that most changes in the properties of matter have some combination of chemical and physical change (at different levels).</p> <p>NOTE: The discussion of hydroxide and hydrogen ions as they relate to the pH scale is reserved for high school and will not be assessed at 7th grade.</p> <p>NOTE: Appropriate background knowledge such as graphics representing the atomic composition of the substances involved or descriptions of how the matter can be formed, decomposed or separated, should accompany questions asking to classify matter as an element, compound or mixture. The nature of chemical bonding is not appropriate at this grade.</p> <p>NOTE: While mass is always conserved, this is not the case for volume. Mixing alcohol with water results in a volume that is less than the sum of the volumes. Boiling liquid results in a significant increase in volume.</p> <p>NOTE: The idea of reversibility of changes is not a criterion for classifying changes as chemical or physical. Some changes cannot be reversed, like tearing paper. As students progress farther in chemistry, they will learn about equilibrium, which involves many chemical changes that are reversible. Dissolving an ionic substance is an example of a process that is not clearly chemical or physical since bonds are broken.</p>	<p>-Explain how the arrangement of atoms determines properties specific to a certain state of matter.</p> <p>-Describe the characteristics of mixtures.</p> <p>-Group elements based on their properties and position on the periodic table (metals, non-metals, gases).</p> <p>-Describe the characteristics of the groups of elements on the periodic table.</p> <p>-Conduct pH tests on a variety of substances.</p> <p>-Compare and evaluate the properties of the compounds that are acidic, neutral, or basic.</p> <p>-Connect acidity and alkalinity values to the natural world (water, soil, and air quality).</p> <p>-Recognize that mass remains constant because in any closed system, the number and type of atoms stays the same, even if the atoms are rearranged.</p> <p>-Recognize that when objects, substances or materials undergo change, there may be a combination of chemical and physical changes occurring.</p>	<ul style="list-style-type: none"> • Matter • Atom • Mixture • Atomic composition • Elements • Periodic table of elements • Metal • Non-metal • Gases • pH test • Acidity/Acid • Alkalinity • Compound • Neutral • Basic/base • Chemical change • Physical change • Conservation • Mass • Volume

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	Content Statement	I Can...	Key Vocabulary
Conservation of Mass and Energy (PS)	<p>8. Energy can be transformed or transferred but is never lost.</p> <p>NOTE: Further discussion of energy transformation is addressed at the high school level.</p> <p>NOTE: This content statement does not deal with radiation, convection and conduction.</p> <p>NOTE: ESS grade 7 is connected to this content statement regarding thermal energy. Thermal energy is transformed as water changes state throughout the water cycle. Thermal energy transferred in the ocean and atmosphere contributes to the formation of currents, which influence global climate patterns (ESS grade 7). Middle school LS also is connected to this statement as it relates to the transfer and transformation of energy within ecosystems.</p>	<ul style="list-style-type: none"> -Describe how matter behaves in a closed system (ecosystem, atmosphere, hydrosphere, solar system, human body). -Describe how matter behaves in an open system (ecosystem, atmosphere, hydrosphere, solar system, human body). -Observe the quantifiable energy changes in a virtual environment. -Experiment with energy transfers and transformations within systems. -Recognize that energy can change forms but the total amount of energy remains constant. -Describe ways that energy can leave a system so it may appear to disappear (dissipate). 	<ul style="list-style-type: none"> • Energy transformation • Energy transfer • Closed system • Open system • Dissipate • Thermal energy • Atmosphere • Currents • Global climate patterns • Ecosystems • Matter • Hydrosphere • Quantifiable

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	Content Statement	I Can...	Key Vocabulary
Conservation of Mass and Energy (PS)	<p>9. Energy can be transferred through a variety of ways.</p> <p>NOTE: Investigation and experiments (3-D and virtual) must be used to connect energy transfer and waves to the natural world. Real data must be used, such as oceanic or seismic wave data or light and sound wave data.</p> <p>NOTE: The electromagnetic nature of electromagnetic radiation is not appropriate at this grade level nor are mathematical calculations of work or electricity.</p>	<ul style="list-style-type: none"> -Recognize when electrical energy in a circuit reaches a source it can be transferred into kinetic, thermal, light, sound and/or magnetic energy. -Recall different ways that thermal energy can be transferred between two objects (conduction, convection, radiation). -Explain how thermal energy can transfer from one object to another by conduction. -Use a particle model of matter to explain how energy can be transformed through convection. -Describe mechanical energy and what happens during its transfer. -Recognize that mechanical energy needs a medium in which to travel. -Describe waves by their speed, wavelength, amplitude and frequency. -Use the mathematical representation for a particular uniform medium, as the frequency (f) of the wave is increased, the wavelength of the wave is decreased. -Explain how waves affect the pitch and loudness of a sound. ($V_{\text{wave}} = \lambda f$) -Describe how different waves travel through different mediums of lack there of. -Use technology to demonstrate the transfer of thermal energy on the surface or interior of Earth and within the solar system. -Experiment with electrical circuits to evaluate the energy transfers, resistance, current and changes in voltage. -Use density to explain the motion of convection in liquids and gases. -Classify mechanical waves as transverse or longitudinal (compression) depending on the direction of movement of the medium. -Differentiate between heat and thermal energy. -Compare and contrast series and parallel circuits. -Connect energy transfer and waves to the natural world using investigation and experiments (oceanic, seismic, light and sound waves). 	<ul style="list-style-type: none"> • Mechanical energy • Transverse wave • Longitudinal and compression waves • Wavelength • Amplitude • Frequency (f) • Thermal energy • Conduction • Convection • Radiation • Electrical energy • Renewable energy systems • Current • Voltage • Resistance • Seismic waves • Sound waves • Light energy • Energy transfer • Energy transformation • Geothermal energy • Kinetic energy • Magnetic energy • Density • Particle model of matter • Sound energy • Electric circuit • Medium • Pitch • Mechanical wave

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