Ohio Science - Extended Learning Standards

Grade 7

Earth and Space Science

1 **The hydrologic cycle illustrates the changing states of water as it moves through the lithosphere, biosphere, hydrosphere, and atmosphere. Thermal energy is transferred as water changes state throughout the cycle. The cycling of water in the atmosphere is an important part of weather patterns on Earth. The rate at which water flows through soil and rock is dependent upon the porosity and permeability of the soil or rock.** 7.ESS.1

Complexity a

a Build a hydrologic cycle showing evaporation, condensation, precipitation, and surface run-off. 7.ESS.1A

Complexity b

b Identify evaporation, condensation, and precipitation. 7.ESS.1B

Complexity c

c Identify types of precipitation. 7.ESS.1C

Learning Progression

- Recognize that condensation in the sky forms clouds and different types of clouds can determine weather (e.g., dark clouds mean rain, light puffy white clouds mean nice weather). 7.ESS.1.LP.A
- Recognize that condensation is caused by a decrease in energy of molecules that changes water vapor (gas) to liquid water. 7.ESS.1.LP.B
- Recognize that evaporation is caused by an increase in energy of molecules (can be modeled by applying heat) that changes liquid water to gas. 7.ESS.1.LP.C
- Identify the changing states of water as it moves through the water cycle. 7.ESS.1.LP.D
- Trace a water molecule through the water cycle starting with a raindrop (be sure to include surface runoff). 7.ESS.1.LP.E
- Match pictures to types of precipitation (rain, snow, sleet, hail). 7.ESS.1.LP.F
- Recognize that water that falls from the sky is “precipitation”. 7.ESS.1.LP.G
- Actively participate in discussion about what happens to water, or where water comes from in the water cycle (e.g., a dish of water left out for several days seems to have disappeared, water falls from the sky). 7.ESS.1.LP.H
- Engage with a sealed terrarium or other model to observe the behavior of water (water cycle) 7.ESS.1.LP.I

2 **Thermal-energy transfers in the ocean and the atmosphere contribute to the formation of currents, which influence global climate patterns. The sun is the major source of energy for wind, air, and ocean currents and the hydrologic cycle. As thermal energy transfers occur in the atmosphere and ocean, currents form. Large bodies of water can influence weather and climate. The jet stream is an example of an atmospheric current and the Gulf Stream is an example of an oceanic current. Ocean currents are influenced by factors other than thermal energy, such as water density, mineral content (such as salinity), ocean floor topography, and Earth's rotation. All of these factors delineate global climate patterns on Earth.** 7.ESS.2

Complexity a

a Describe how thermal energy affects ocean and atmospheric currents. 7.ESS.2A

Complexity b

b Identify that air and water move due to currents. 7.ESS.2B

Complexity c

c Identify how temperature causes air and water to move. 7.ESS.2C

Learning Progression

- Predict the type of weather and climate an area may have based on atmospheric and/or oceanic currents (e.g., show the jet stream bringing rainy weather from the western U.S. on a map and predict what weather Ohio will receive, show warm or cold ocean currents on a map and predict what kind of climate an area has--Why does eastern United States usually have warmer climate?). 7.ESS.2.LP.A
- Recognize that adding or taking away heat can cause particles of matter to speed up or slow down. 7.ESS.2.LP.B
- Identify the movement of air and water as convection currents. 7.ESS.2.LP.C
- Recognize the sun as a source of energy or heat that can move air and water on Earth. 7.ESS.2.LP.D
- Recognize wind patterns across the United States. 7.ESS.2.LP.E
- Observe and record the direction the wind blows each day to determine patterns (e.g., notice that it should blows in the same direction (from the west in Ohio) most days (can watch a flag outside the window)). 7.ESS.2.LP.F
- Engage with maps illustrating global wind or ocean currents. 7.ESS.2.LP.G
- Engage with models that show how air or water can move (e.g., can heat one side of a pan of water and place a drop food coloring into the pan and watch how it moves). 7.ESS.2.LP.H

3 **The atmosphere has different properties at different elevations and contains a mixture of gases that cycle through the lithosphere, biosphere, hydrosphere, and atmosphere. The atmosphere is held to Earth by the force of gravity. There are defined layers of the atmosphere that have specific properties, such as temperature, chemical composition, and physical characteristics. Gases in the atmosphere include nitrogen, oxygen, water vapor, carbon dioxide, and other trace gases. Biogeochemical cycles illustrate the movement of specific elements or molecules (such as carbon or nitrogen) through the lithosphere, biosphere, hydrosphere, and atmosphere. Note: The emphasis is on why the atmosphere has defined layers, not on naming the layers.** 7.ESS.3

Complexity a

a Recognize that natural events and human activities can cause changes in the Earth's atmosphere (e.g., by adding pollution to the atmosphere or depleting valuable gases). 7.ESS.3A

Complexity b

b Identify a gas that is naturally present in our atmosphere (e.g., oxygen, nitrogen). 7.ESS.3B

Complexity c

c Identify the atmosphere as the air around us. 7.ESS.3C

Learning Progression

- Recognize that humans impact the composition of the atmosphere (e.g., pollution can add too much carbon). 7.ESS.3.LP.A
- Identify pictures from a set that represent pollution to the atmosphere (e.g., human activities--factories, plowing, cars; natural events--volcanoes, dust storms, wildfires). 7.ESS.3.LP.B
- Identify how the gases in the atmosphere are important for living things (e.g., oxygen for respiration, nitrogen for plants, carbon dioxide for photosynthesis). 7.ESS.3.LP.C
- Given a visual representation or diagram, identify a gas found in the atmosphere. 7.ESS.3.LP.D
- Recognize that temperature changes in each layer of the atmosphere. 7.ESS.3.LP.E
- Engage with models depicting the different layers of atmosphere. 7.ESS.3.LP.F
- Recognize that the atmosphere is made of gases. 7.ESS.3.LP.G
- Recognize the atmosphere as the invisible gas that surrounds us.. 7.ESS.3.LP.H
- Engage with models depicting the different layers of atmosphere. 7.ESS.3.LP.I

4 **The relative patterns of motion and positions of Earth, moon, and sun cause solar and lunar eclipses, tides, and phases of the moon. The moon's orbit and its change of position relative to Earth and sun result in different parts of the moon being visible from Earth (phases of the moon). A solar eclipse is when Earth moves into the shadow of the moon (during a new moon). A lunar eclipse is when the moon moves into the shadow of Earth (during a full moon). Gravitational force between Earth and the moon causes daily oceanic tides. When the gravitational forces from the sun and moon align (at new and full moons), spring tides occur. When the gravitational forces of the sun and moon are perpendicular (at first and last quarter moons), neap tides occur.** 7.ESS.4

Complexity a

a Show how the positions of the Earth, the moon, and the sun cause tides and phases of the moon. 7.ESS.4A

Complexity b

b Recognize different stages in the lunar cycle (e.g., full moon, new moon). 7.ESS.4B

Complexity c

c Recognize that the moon orbits around the Earth. 7.ESS.4C

Learning Progression

- Using a model, recognize the position of the moon relative to Earth during a high or low tide. 7.ESS.4.LP.A
- Given a tide table, identify the pattern (amount of time) that occurs between high and low tide and high tide to next high tide. 7.ESS.4.LP.B
- Engage with visuals of ocean tides on a time lapse video over a certain period of time (day, month, or season). 7.ESS.4.LP.C
- Observe pictures of solar and lunar eclipses and line up models of Earth, moon and sun in the alignment that would cause the eclipse (can match pictures of the alignments). 7.ESS.4.LP.D
- Engage with models of the Earth, moon, and Sun (a light), to create shadows on both the Earth and moon. 7.ESS.4.LP.E
- Match phases of the moon (as seen from Earth) with a visual representation of the positions of the Earth, moon, and sun. 7.ESS.4.LP.F
- Trace the changes in the lit portion of the moon as it goes through one cycle (i.e. lit portion increases then decreases). 7.ESS.4.LP.G
- Trace the motion of the moon around Earth on a drawing or diagram. 7.ESS.4.LP.H
- Engage in various visual representations of moon phases (e.g., time lapse video, a moon lamp). 7.ESS.4.LP.I

5 **The relative positions of Earth and the sun cause patterns we call seasons. Earth's axis is tilted at an angle of 23.5°. This tilt, along with Earth's revolution around the sun, affects the amount of direct sunlight that the Earth receives in a single day and throughout the year. The average daily temperature is related to the amount of direct sunlight received.** 7.ESS.5

Complexity a

a Compare the amount of direct sunlight on Earth as it tilts toward or away from the sun, and show how that relates to summer and winter season. 7.ESS.5A

Complexity b

b Model the tilt of the Earth towards or away from the sun. 7.ESS.5B

Complexity c

c Recognize that the Earth is tilted. 7.ESS.5C

Learning Progression

- Compare the temperature of a thermometer when a light is shining straight down on a thermometer, to the temperature when you shine the same light from the side, and relate this to the temperature ranges at different locations on Earth. 7.ESS.5.LP.A
- Recognize the connection between temperature data for a season andto the amount of sunlight received in that season (e.g., longer daylight hours in the summer versus the winter). 7.ESS.5.LP.B
- Track and record sunrise and sunset times to observe how daylight hours change by season. 7.ESS.5.LP.C
- Use data of temperatures to show how the temperature changes season-to-season. 7.ESS.5.LP.D
- Track and record temperature data for a year to recognize temperature ranges for each season. 7.ESS.5.LP.E
- Model the sun shining on the Earth. Show the tilt of the Earth causes seasons (tilt toward the sun is summer, tilt away from the sun is winter). 7.ESS.5.LP.F
- Engage with a model of Earth and light (sun). 7.ESS.5.LP.G

Life Science

1 **Energy flows and matter is transferred continuously from one organism to another and between organisms and their physical environments. Plants use the energy in light to make sugars out of carbon dioxide and water (photosynthesis). These materials can be used or stored for later use. Organisms that eat plants break down plant structures to release the energy and produce the materials needed to survive. The organism may then be consumed by other organisms for materials and energy. Energy can transform from one form to another in living things. Animals get energy from oxidizing food, releasing some of its energy as heat. The total amount of matter and energy remains constant, even though its form and location change. Note: Chemical reactions in terms of subatomic structures of atoms are not appropriate at this grade level. Chemical reactions are presented as the rearrangement of atoms in molecules.** 7.LS.1

Complexity a

a Demonstrate the flow of energy from plants to consumers (e.g., energy pyramid). 7.LS.1A

Complexity b

b Trace the path of oxygen between plants and animals (e.g., plants create oxygen during photosynthesis and animals breathe in oxygen to produce carbon dioxide). 7.LS.1B

Complexity c

c Identify that plants use light energy to make their own food (photosynthesis) and humans and animals consume other organisms to get energy 7.LS.1C

Learning Progression

- Recognize that the energy from the sun flows through each trophic level (energy pyramid). 7.LS.1.LP.A
- Recognize that the sun provides energy for living things on Earth. 7.LS.1.LP.B
- Recognize that plants depend on carbon dioxide for photosynthesis. 7.LS.1.LP.C
- Recognize that animals depend on plants for oxygen. 7.LS.1.LP.D
- Trace how energy is transferred from one organism to another (start with the sun). 7.LS.1.LP.E
- Given a food web, identify producers and consumers and show how they depend upon one another. 7.LS.1.LP.F
- Identify how humans and other animals obtain energy (eating). 7.LS.1.LP.G
- Identify that light is needed for plants to perform photosynthesis to make food. 7.LS.1.LP.H
- Identify the energy source for plants. 7.LS.1.LP.I
- Engage in following a path of energy on a food web (e.g., trace arrows on a food chain). 7.LS.1.LP.J
- Engage with pictures of various organisms (plants and animals). 7.LS.1.LP.K

2 **In any particular biome, the number, growth, and survival of organisms and populations depend on biotic and abiotic factors. The variety of physical (abiotic) conditions that exists on Earth gives rise to diverse environments (biomes) and allows for the existence of a wide variety of organisms (biodiversity). Biomes are regional ecosystems characterized by distinct types of organisms that have developed under specific soil and climatic conditions. Ecosystems are dynamic in nature; the number and types of species fluctuate over time. Disruptions, deliberate or inadvertent, to the physical (abiotic) or biological (biotic) components of an ecosystem impact the composition of an ecosystem.** 7.LS.2

Complexity a

a Provide examples of how a plant/ animal population changes in relation to the availability of certain resources and characteristics of a given biome. 7.LS.2A

Complexity b

b Match a given ecosystem/ biome with its characteristics. 7.LS.2B

Complexity c

c Identify an ecosystem or a biome. 7.LS.2C

Learning Progression

- Given a specific environment, alter one component and predict the how that environment will be impacted (e.g., a disease wipes out a species of tree, drought, invasive species). 7.LS.2.LP.A
- Given a specific organism, build a model of an ecosystem to represent their biome. 7.LS.2.LP.B
- Match pictures of plants and animals to biomes that are suitable habitats. 7.LS.2.LP.C
- Given a specific biome and organism, identify biotic or abiotic factors that the organism relies on for survival. 7.LS.2.LP.D
- Using pictures of various biomes, identify abiotic and biotic factors in the biome. 7.LS.2.LP.E
- Identify pictures as biotic (plant and animals) or abiotic factors (soil, air, water). 7.LS.2.LP.F
- Based on picture cues, identify general temperature conditions in a biome. 7.LS.2.LP.G
- Identify common plants and animals found in a picture of a given biome. 7.LS.2.LP.H
- Engage with pictures of various organisms (plants and animals) in their environment. 7.LS.2.LP.I

Physical Science

1 **Elements can be organized by properties. Elements can be classified as metals, non-metals, and metalloids, and can be organized by similar properties such as color, solubility, hardness, density, conductivity, melting point and boiling point, viscosity, and malleability. Note 1: This is the conceptual introduction of the Periodic Table of Elements and should be limited to classifications based on observable properties; it should not include the names of the families.** 7.PS.1

Complexity a

a Sort common elements found on the periodic table by properties (e.g., metals, nonmetals, gases). 7.PS.1A

Complexity b

b Identify an element on the Periodic Table of Elements based on its properties (e.g., metal, non-metal, and gases). 7.PS.1B

Complexity c

c Identify common elements (e.g., oxygen, hydrogen, iron, helium, calcium, carbon) found on the Periodic Table of Elements. 7.PS.1C

Learning Progression

- Given a group of elements, identify them as metals or nonmetals. 7.PS.1.LP.A
- Identify common properties of metals (e.g., luster, color, conductivity). 7.PS.1.LP.B
- Recognize that elements can be sorted by their properties. 7.PS.1.LP.C
- Choose a method to sort a set of objects (candy, toys, shoes) and describe how they were sorted (by color, size, type of sole). 7.PS.1.LP.D
- Recognize the Periodic Table of Elements. 7.PS.1.LP.E
- Engage with a picture based Periodic Table of Elements. 7.PS.1.LP.F
- Engage with materials that would be found on the Periodic Table of Elements (e.g., silver or gold jewelry, iron, helium in balloons, carbon-graphite, etc.) 7.PS.1.LP.G

2 **Matter can be separated or changed, but in a closed system, the number and types of atoms remains constant. When substances interact and form new substances, the properties of the new substances may be very different from those of the original substances, but the amount of mass does not change. Physically combining two or more substances forms a mixture, which can be separated through physical processes. Note: Under these standards, classifying specific changes as chemical or physical is not appropriate.** 7.PS.2

Complexity a

a Explain that the mass and number of atoms remains the same after being combined in a mixture or a compound. 7.PS.2A

Complexity b

b Identify at least one difference between a mixture and a compound (e.g., mixtures can be separated by physical processes). 7.PS.2B

Complexity c

c Identify the components of a given mixture. 7.PS.2C

Learning Progression

- Predict the mass of a substance after a chemical reaction (e.g., baking soda and vinegar in a sealed baggie) or after a mixture is produced. (Note: This is great illustration that gas has mass because the mass should stay the same but baggie will expand. For demonstration purposes, this is a closed system). 7.PS.2.LP.A
- Recognize that the same atoms are present before and after a change, they are just rearranged. 7.PS.2.LP.B
- Identify the mass of components before and after a change (mixing two substances together (rocks and sand)). 7.PS.2.LP.C
- Separate a mixture. 7.PS.2.LP.D
- Create a mixture (e.g., water and salt, water and sugar, salt and pepper). 7.PS.2.LP.E
- Engage with different mixtures (e.g., rocks and sand, different candies in a bowl). 7.PS.2.LP.F

3 **Energy can be transformed or transferred but is never lost. When energy is transferred from one system to another, the quantity of energy before transfer equals the quantity of energy after transfer. When energy is transformed from one form to another, the total amount of energy remains the same.** 7.PS.3

Complexity a

a Describe what happens to an object as it transfers energy elsewhere (e.g., toy car slows down going uphill as energy changes from kinetic to potential). 7.PS.3A

Complexity b

b Demonstrate energy transfer by completing a circuit (e.g., switch to activate a mechanical item). 7.PS.3B

Complexity c

c Identify an energy transfer (e.g., electricity to light after a lamp is plugged in). 7.PS.3C

Learning Progression

- Recognize that the total amount of energy before and after a change remains the same. 7.PS.3.LP.A
- Given an electric circuit (or diagram of one), identify places where energy is transformed from one form to another (e.g., electricity to light and heat, chemical energy to electricity). 7.PS.3.LP.B
- Given an example, (such as Rube Goldberg device videos (many are available online)) identify locations where energy is transferred or transformed. 7.PS.3.LP.C
- Recognize the difference between energy transfer (moving from one location to another as in heat energy from hot tea moving to an ice cube and melting it) and energy transformation (changing from one form of energy to another as in electrical energy from a wall changing to sound, radiant, and thermal energy in a tv). 7.PS.3.LP.D
- Actively participate in a demonstration that causes energy to transform from one form to another. 7.PS.3.LP.E
- Engage with objects that involve energy transformations (e.g., a flashlight, radio, tv, etc.). 7.PS.3.LP.F

4 **Energy can be transferred through a variety of ways. Mechanical energy can be transferred when objects push or pull on each other over a distance. Mechanical and electromagnetic waves transfer energy when they interact with matter. Thermal energy can be transferred through radiation, convection and conduction. An electrical circuit transfers energy from a source to a device. Note 1: Energy transfers should be experiential and observable at this grade level.** 7.PS.4

Complexity a

a Describe how some energy is transferred in waves (e.g., water, heat, light). 7.PS.4A

Complexity b

b Identify ways energy can be transferred (e.g., push and pull, heat from hot to cold objects, light from the sun, electricity through wires, etc.). 7.PS.4B

Complexity c

c Transfer energy in an object by a force (e.g., push or pull). 7.PS.4C

Learning Progression

- Model how energy can be transferred in a system (e.g., boat on water wave, light from cell phone to eye, turning on an electrical circuit). 7.PS.4.LP.A
- Recognize a heat transfer as moving from a warmer object or region to a cooler one (e.g., touch an ice cube, feel heat from a heater). 7.PS.4.LP.B
- Recognize movement of a substance as a transfer of energy (e.g., movement of water in a wave, movement of a slinky). 7.PS.4.LP.C
- Engage in watching a video that shows how energy is transferred in ocean waves. 7.PS.4.LP.D
- Engage with items that demonstrate a transfer of energy (e.g., stretch and release a rubber band, push a toy car, push on a slinky)to illustrate the change from potential to kinetic energy. 7.PS.4.LP.E