

2015-2016

# 4th Grade Milestones Study Guide



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# Georgia Milestones Study Guide

## 4<sup>th</sup> GRADE

The Grade 4 Science EOG assessment has a total of 75 selected-response (multiple-choice) items only.

Model Questions for the Teacher

(DOK 1) (DOMAIN: Earth Science)

**Standard:** S4E3. Students will differentiate between the states of water and how they relate to the water cycle and weather. b. Identify the temperatures at which water becomes a solid and at which water becomes a gas.

**Standard:** S4CS4. Students will use ideas of system, model, change, and scale in exploring scientific and technological matters. a. Observe and describe how parts influence one another in things with many parts.

**Q1. At which temperature does pure water boil?**

- A. 0°C
- B. 50°C
- C. 100°C
- D. 150°C

**Explanation of Correct Answer:** The correct answer is choice **(C)** 100°C. Water begins to boil at 100°C. As water boils, steam escapes as a gas. Choice (A) is incorrect because water freezes, or turns into a solid, at 0°C. Choices (B) and (D) are incorrect because water does not boil at these temperatures.

**(DOK 1: Earth Science)**

**Standard:** S4E1 students will compare and contrast the physical attributes of stars, star patterns, and planets a. Recognize the physical attributes of stars in the night sky such as number, size, color, and patterns.

**Standard:** S4CS4. Students will use ideas of system, model, change, and scale in exploring scientific and technological matters. a. Observe and describe how parts influence one another in things with many parts.

**Q2. How is the temperature of a star determined?**

- A. by its color
- B. by its mass
- C. by its volume.
- D. by its distance

**Explanation of Correct Answer:** the correct answer is choice **(A)** by its color. Cooler stars appear red and orange, hotter stars appear blue and white, choices (B), (C), and (D) are incorrect because stars may be hot or cool regardless of their mass, volume, or distance from earth.

**(DOK 2: Physical Science)**

**Standard:** S4E3 Students will differentiate between the states of water and how they relate to the water cycle and weather. a. demonstrate how water changes states from solid (ice) to liquid (water) to gas (water vapor/steam) and changes from gas to liquid to solid.

**Q3. A student places a large chunk of ice in a pan and heats it on a stove.**

**Which of these shows the correct order of changes that take place when ice is heated?**

- A. solid to gas to liquid because heat is added
- B. solid to liquid to gas because heat is added
- C. liquid to solid to gas because heat is removed
- D. gas to liquid to solid because heat is removed

**Explanation of Correct Answer:** The correct answer is choice **(B)** solid to liquid to gas because heat is added. Adding heat causes solid ice to melt into liquid water; adding further heat causes liquid water to evaporate into water vapor, a gas. Choice (A) is incorrect because solid ice becomes liquid water before it becomes gaseous water vapor. Choices (C) and (D) are incorrect because heat is added to ice, not removed from it.

**(DOK 2: Earth Science)**

**Standard:** S4E2 students will model the position and motion of the earth in the solar system and will explain the role of relative position and motion in determining sequence of the phases of the moon. c. Demonstrate the revolution of the earth around the sun and the earth's tilt to explain the seasonal changes.

**Q4. The Northern Hemisphere experiences winter in January. Which season is the Southern Hemisphere experiencing in January?**

- A. fall
- B. spring
- C. summer
- D. winter

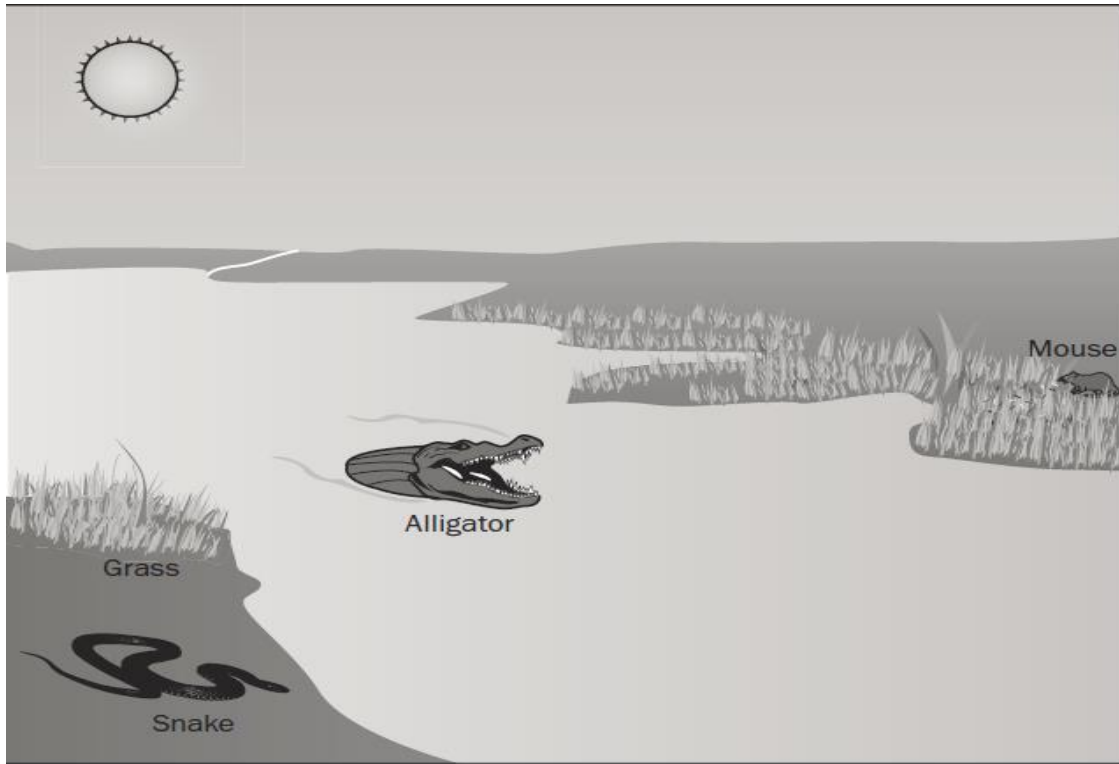
**Explanation of Correct Answer:** the correct answer is choice **(C)** summer. When the northern hemisphere experiences winter, it is facing away from the sun. At that time, the southern hemisphere is facing toward the sun, so it experiences summer. Choices (A), (B), and (D) are incorrect because the northern and southern hemispheres experience opposite seasons, and summer—not fall, spring, or winter—is the opposite of winter.

**(DOK 2: Life Science)**

**Standard:** S4L1. Students will describe the roles of organisms and the flow of energy within an ecosystem. b. Demonstrate the flow of energy through a food web/chain beginning with sunlight and including producers, consumers, and decomposers.

**Standard:** S4CS4. Students will use ideas of system, model, change, and scale in exploring scientific and technological matters. a. Observe and describe how parts influence one another in things with many parts.

**This is a food web that can be found in a wetland habitat.**



**Q5. Which of these shows the correct flow of energy through the food chain?**

- A. Sun → mouse → grass → alligator → snake
- B. Sun → grass → mouse → snake → alligator
- C. Sun → alligator → snake → mouse → grass
- D. Sun → grass → snake → mouse → alligator

**Explanation of Correct Answer:** The correct answer is choice **(B)** Sun → grass → mouse → snake → alligator. The Sun sends energy to Earth. The producers, such as grass, use the energy from sunlight to make food. The producers are eaten by consumers, such as mice. Mice are eaten by consumers, such as snakes. Snakes are eaten by consumers, such as alligators. Choice (A) is incorrect because grass, and not the mouse, should come after the Sun. Choice (C) is incorrect because grass then mouse should come after the Sun, and the alligator should come at the end. Choice (D) is incorrect because the snake should consume the mouse.

**(DOK 3: Earth Science)**

**Standard:** S4E3. Students will differentiate between the states of water and how they relate to the water cycle and weather. b. identify the temperatures at which water becomes a solid and at which water becomes a gas.

**Q6.** The table shows the changes in the state of water.

Day	Change of State
1	Liquid to solid
2	Gas to liquid

**Which of these correctly describes the change in the temperature of the water on one of the days?**

- A. from 0°C to 50°C on day 1
- B. from 50°C to 0°C on day 1
- C. from 30°C to 50°C on day 2
- D. from 90°C to 0°C on day 2

**Explanation of Correct Answer:** the correct answer is choice **(B)** from 50°C to 0°C on day 1 at 50°C, water is liquid; at 0°C, water freezes into solid ice. According to the table, on day 1 the liquid water becomes solid choice (A) is incorrect because it describes the opposite process: solid ice melting into liquid water. Choice (C) is incorrect because water is liquid at both 30°C and 50°C; it does not become gas until it begins to boil at 100°C. Choice (D) is incorrect because it describes liquid water freezing into solid ice; according to the table, however, on day 2 gaseous water vapor condenses.

**(DOK 3 Physical Science)**

**Standard:** S4P2 Students will demonstrate how sound is produced by vibrating objects and how sound can be varied by changing the rate of vibration. b. Recognize the conditions that cause pitch to vary.

**Q7. Which length of string would produce the sound with the highest pitch?**

- A. a string that is ¼ meter long
- B. a string that is ½ meter long
- C. a string that is ¾ meter long
- D. a string that is 1 meter long

**Explanation of Correct Answer:** the correct answer is choice **(A)** a string that is ¼ meter long. Of the four options, this is the shortest string, and shorter strings produce sounds with higher pitches. choices (B), (C), and (D) are incorrect because these strings are longer than ¼ meter, and longer strings produce sounds with lower pitches.

**(DOK 3: Physical Science)**

**Standard:** S3P1. Students will investigate the nature of light using tools such as mirrors, lenses, and prisms. a. Identify materials that are transparent, opaque, and translucent.

**Standard:** S4CS1. Students will be aware of the importance of curiosity, honesty, openness, and skepticism in science and will exhibit these traits in their own efforts to understand how the world works. c. Offer reasons for findings and consider reasons suggested by others.

**Q8. One student holds up a piece of paper with an apple behind it. Another student shines a flashlight on the apple so that the flashlight, apple, and paper are in a straight line. A third student observes the paper. She is able to see the outline of the apple behind the piece of paper. Next, the students try the same experiment using a book, instead of paper.**

**What will MOST LIKELY happen when the light hits the book?**

- A.** The student will not see the apple because the book is opaque.
- B.** The student will not see the apple because the apple is opaque.
- C.** The student will see the apple because the apple is translucent.
- D.** The student will clearly see the apple because the book is transparent.

**Explanation of Correct Answer:** The correct answer is choice **(A)**. The student will not see the apple because the book is opaque. When something is opaque, it does not allow light to pass through it. Choices **(B)** and **(C)** are incorrect because what is being tested is how well light passes through the book, not the apple. Choice **(D)** is incorrect because the book is not transparent. It does not let light pass through.

Standards/Units	Dates	Number of Items	Question #'s
Ecology (LS)	8/17 – 10/15	7 Items	1-4, #1,7,9 Sample
Forces & Motion (PS)	11/30 – 1/14	5 Items	9-12, #10 Sample
Sound & Light (PS)	10/19 – 11/19	6 Items	17 – 20, #2, 5 Sample
Weather (ES)	2/29 – 3/31	6 Items	5-8, # 4, 8 Sample
Stars & Solar System (ES)	1/19 – 2/25	6 Items	13-16, #3, 6 Sample
Total	N/A	30 Items	

### Sample Questions

1. A stick insect looks just like a twig. How does this help the stick insect to survive?

- A. It helps the insect find food.
- B. It helps the insect reproduce.
- C. It helps the insect avoid being seen by predators.
- D. It helps the insect dig into its home inside the tree trunk.

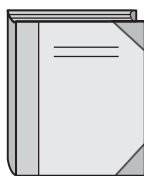
A student labeled each of the items shown as transparent, translucent, or opaque. One of the items is incorrectly labeled.



Water—  
transparent



Limestone—  
opaque



Book  
—  
opaque



Butter—  
translucent

2. Which of the items is incorrectly labeled, and what is its correct label?

- A. Water—opaque
- B. Limestone—transparent
- C. Book—translucent
- D. Butter—opaque

3. A student states that the moon is always visible to Earth. Which of these explains why the student is incorrect?

- A. The Moon is usually invisible to earth during its full moon phase.
- B. The Moon is usually invisible to earth during its new moon phase.
- C. The Moon is usually invisible to earth during its first quarter phase.
- D. The Moon is usually invisible to earth during its third quarter phase.



- 4. Stan left a container of warm water on the table. The container held exactly 160 milliliters of water. The next day, he noticed that the container held 150 milliliters. What is the BEST explanation for what happened?**
- A. Some of the liquid water turned into gas.
  - B. A decrease in temperature caused the volume to change.
  - C. Some of the water formed condensation on the sides of the container.
  - D. An ice cube was added to the container increasing the amount of water.
- 5. A student holds a soft drink bottle that is half-full of water. She blows across the top of the bottle, producing a sound. If the student wants to produce a sound with a higher pitch, what can she do?**
- A. Blow softer.
  - B. Blow longer.
  - C. Add water to the bottle.
  - D. Use a bottle with a longer opening.
- 6. A student is charting the position of a constellation and the planet Venus for a month. Each week Venus moves its location, but the stars in the constellation stay the same. Why does Venus move differently?**
- A. Earth orbits Venus.
  - B. Venus orbits the sun.
  - C. Earth orbits the constellation.
  - D. Venus orbits the constellation.
- 7. A scientist studies tiny organisms in a lake to find out if the habitat is healthy. These tiny organisms, called plankton and algae, are eaten by small fish in the lake, and the small fish are eaten by big fish.**
- Which of these would MOST LIKELY happen in the lake if a rainstorm washes pollution into the water?**
- A. The number of plankton and algae would increase, and the number of fish would also increase.
  - B. The number of plankton and algae would stay the same, and the number of fish would decrease
  - C. The number of plankton and algae would decrease, and the number of fish would also decrease
  - D. The number of plankton and algae would stay the same, and the number of fish would stay the same.

8. In an investigation for his science class, Sam used a drinking cup to collect precipitation. He attached a ruler to the cup. Which weather instrument has Sam made?
- A. wind vane
  - B. rain gauge
  - C. barometer
  - D. thermometer
9. Four students looked at this list of organisms. Each student plans to draw a food chain that includes the Sun.

- |   |
|---|
| <ul style="list-style-type: none"><li>• water insect</li><li>• algae</li><li>• fish</li><li>• shark</li></ul> |
|---|

In which order should the students draw the organisms to show the correct flow of energy through the food chain?

- A. shark → water insect → fish → sun → algae
- B. algae → sun → fish → water insect → shark
- C. shark → fish → water insect → algae → sun
- D. sun → algae → water insect → fish → shark

10. Maria needs to move a large, heavy box from the ground to her tree house. She will use a simple machine that was invented long ago to help her move the box.

Which simple machine would be the MOST helpful to move the box?

- A. lever
- B. pulley
- C. screw
- D. wedge

Item	Standard Element	Characteristics of Science	DOK Level	Correct Answer	Explanation
1	s4I2a	s4cs4a	2	c	<p>The correct answer is choice (c) it helps the insect avoid being seen by predators. The stick insect can camouflage itself by remaining still in its forest habitat; predators looking for food are likely to mistake the insect for a twig. Choice (a) is incorrect because the stick insect's appearance may hide it from prey that wanders nearby, but its appearance doesn't directly help the insect to find prey. Choices (b) and (d) are incorrect because the stick insect's appearance is unrelated to its ability to reproduce or to access its home.</p>
2	s4p1a	s4cs8b	3	d	<p>The correct answer is choice (d) butter—opaque. An object is translucent if some light can pass through it. However, butter blocks light; therefore, it is opaque. Choice (a) is incorrect because water is transparent; light completely passes through it. Choices (b) and (c) are incorrect because limestone and books block light; therefore, they are opaque.</p>
3	s4e2b	s4cs1c	2	b	<p>The correct answer is choice (b) the Moon is invisible to earth during its new moon phase. During its new moon phase, the Moon is not visible from earth. The sunlit part of the Moon is facing away from earth leaving the unlit portion that cannot be seen facing earth. Choices (a), (c), and (d) all describe phases of the Moon where the Moon is visible from earth. During the full moon, the sunlit part of the Moon is facing earth during the first and third quarter, we see half of the Moon illuminated and the other half in shadow.</p>

Item	Standard/ Element	Characteristics of Science	DOK Level	Correct Answer	Explanation
4	s4e3a	s4cs1c	2	a	The correct answer is choice (a) some of the liquid water turned into gas. over time, liquid water evaporates, or changes into water vapor, a gas. When this happens, the vapor molecules escape into the atmosphere, leaving behind less liquid water in the container. Choice (b) is incorrect because the warm water would cool to room temperature. A decrease in temperature would not cause the water to boil (which would be required to decrease the volume in this way). Choice (c) is incorrect because condensation forms when water vapor in the air changes to liquid water on the outside of a container; it does not affect the volume of water inside the container. Choice (d) is incorrect because the water's volume decreased, not increased.
5	s4p2b	s4cs8a	3	c	The correct answer is choice (c) add water to the bottle. Adding water decreases then distance that the air travels inside the bottle. This produces sound waves with shorter wavelengths, and shorter wavelengths produce sounds with higher pitches. Choices (a) and (b) are incorrect because a sound's pitch is related to the wavelength of the wave that produces the sound; blowing more softly or for a longer period of time does not affect wavelength. Choice (d) is incorrect because a larger opening creates more space for the sound waves to move through. This produces sound waves with
6	s4e1c	s4cs1c	2	b	The correct answer is choice (b) Venus orbits the sun. Venus is a planet, which is much closer to earth than the stars in the constellation. So the movement of Venus in the night sky is more visible than the movement of the stars in the constellation. Choice (a) is incorrect because earth and Venus are planets. Planets orbit stars not each other. Choice (c) and (d) would indicate that the constellation is at the center of the solar system, rather than the

Item	Standard/ Element	Characteristics of Science	DOK Level	Correct Answer	Explanation
7	s411c	s4cs8a	3	c	The correct answer is choice (c) the number of plankton and algae would decrease, and the number of fish would also decrease. The pollution would likely harm the plankton and algae. As these tiny organisms die, the small fish that eat plankton and algae would die, followed by the big fish that eat the small fish. Choice (a) is incorrect because pollution would more likely harm than benefit the organisms in the lake. Choice (b) is incorrect because pollution would probably not harm only the fish. Choice (d) is incorrect because pollution would more likely have a negative effect than no effect on the organisms in the lake.
8	s4e4a	s4cs3a	2	b	the correct answer is choice (b) a rain gauge. rain is a type of precipitation. a rain gauge is an instrument for measuring the amount of rainfall. Choice (a) is incorrect because wind is not a type of precipitation. Choice (c) is incorrect because a barometer is an instrument for measuring air pressure, not rainfall. Choice (d) is incorrect because a thermometer is an instrument for measuring temperature, not rainfall.
9	s411b	s4cs5b	2	d	The correct answer is choice (d) sun → algae → water insect → fish → shark. Sunlight carries energy to earth. Algae are producers that use the sun's energy to make food. The algae are then eaten by primary consumers such as water insects, which are eaten by secondary consumers such as fish, which are eaten by tertiary consumers such as sharks. Choices (a) and (c) are incorrect because the shark belongs at the end of the food chain, not the beginning. Choice (b) is incorrect because the sun, not the algae, belongs at the beginning of the food chain.
10	s4p3a	s4cs7b	2	b	The correct answer is choice (b) pulley. A pulley is a simple machine for lifting an object high above the ground. Choice (a) is incorrect because a lever is a simple machine that can lift an object, but probably not high enough to reach a tree house. Choice (c) is incorrect because a screw is a simple machine for fastening objects together. Choice (d) is incorrect because a wedge is a simple machine for redirecting a downward force into two sideways forces.

## Unit 1: Ecology (8/17 – 10/15)

In this unit, you will learn about the organisms and communities living in ecosystems. You will study the relationship between producers, consumers, and decomposers, as well as the relationships between predators and prey. You will learn about how energy flows in an ecosystem by examining food webs and food chains.

### KEY TERMS

An **organism** is a living being. You are a living being. A tree is a living being. Most organisms move, eat, breathe, grow, reproduce, and respond to their environment. Not all organisms do all these things. For example, you move but trees cannot move. (S4L1)

A **community** is made by all the different kinds of organisms that live in an area. A community with many different kinds of living organisms is thought to be able to handle changes to the area better. (S4L1a)

When people refer to an **ecosystem**, they talk about the community of living and nonliving things that make up a system in an environment. A pond with plants, fishes, and decomposers in it located on a mountain is an example of an ecosystem. (S4L1)

A **habitat** is the type of area an organism lives in. A habitat has four parts that an organism needs: shelter, water, food, and space. (S4L1c)

**Producers** are organisms that make their own food using sunlight or other chemical processes and that use some of the food they make for their own energy. Plants are producers. (S4L1a)

**Consumers** are organisms that cannot make their own food. They eat producers and other consumers to get energy. Lions, fish, and birds are examples of consumers. (S4L1a)

**Decomposers** are organisms that break down dead and dying organisms. Decomposers get their energy from dead and dying consumers and producers. Examples of decomposers are worms, bacteria, and mushrooms. (S4L1a)

**Food chains** show how different organisms obtain the matter and energy they need. A food chain contains producers, consumers, and decomposers. Grass → rabbit → bear is an example of a food chain. The arrows show the way energy moves. Some of the energy in the grass moves to the rabbit when it eats the grass. Some of the energy in the rabbit moves to the bear when it eats the rabbit. (S4L1b)

A **food web** is all the food chains in an ecosystem. It looks like a web because it shows how all the different organisms in all the combined food chains interact. The only thing in a food web that is not an organism is the Sun. (S4L1b)

A **predator** is an animal that hunts other animals to get its energy. Some predators eat only animals that are alive. Other predators will eat animals that are alive or dead. Predators can be as small as insects. Predators can be as big as whales. (S4L1b)

A **prey** is an animal that is hunted by a predator. Prey can be the smallest insects that are eaten by birds. Prey can also be large animals like elephants. (S4L1b)

An **herbivore** is an animal that eats only plants to get energy. Geese, rabbits, and horses are examples of herbivores. (S4L1b)

A **carnivore** is an animal that eats only other animals to get energy. Spiders, foxes, and mountain lions are examples of carnivores. (S4L1b)

An **omnivore** is an animal that eats plants and animals to get energy. Ants, turtles, and bears are examples of omnivores. (S4L1b)

A **population** is all the organisms of the same species that live in the same area. All the

black bears that live in a mountain range are a population. All the raccoons that live in a swamp are a population. (S4L1)

**Scarcity** means that there is less of something. When there isn't rain for a long time, there is a scarcity of water. (S4L1d)

When the population of an area is scarce, it is said to be **under-populated**. This means that there is less of an organism in an area. An ecosystem that is under-populated with rabbits means the bears will need to find other animals to eat.

When an area has too many of one kind of an animal, it is said to be **over-populated**. The area they live in will not have enough resources for the animals. The animals may need to move to new areas to find food, water, and shelter. (S4L1d)

All ecosystems have a **balance**. This means there are enough resources for the populations of plants and animals that live in the ecosystem. If there is too little of a resource, the plants and animals that need that resource will have problems. The plants in an area that does not get enough water will stop growing. The animals that eat those plants will not have enough food. If there is too much of a resource, there are also problems. If there is too much water, the plants might die. The animals that eat those plants will need to find something else to eat. (S4L1d)

An **adaptation** is a **feature** of a plant or an animal. Adaptations help animal and plant populations survive in an environment. An adaptation can be a body feature or a way of doing something. Camels are adapted to survive in a desert. They have humps that store water and fat for energy. (S4L2a)

**Camouflage** is an adaptation of plants and animals that increases their chances of survival. Camouflage is the way an animal's or a plant's colors can blend in with the environment. Because they can remain undetected, they can survive. A lion is the same color as the grass it hunts in. This makes it easier for the lion to catch prey to eat. A green insect can hide on a green plant. (S4L2a)

**White-tailed deer are found throughout Georgia. Deer eat different plants, nuts, and fruits, such as grasses, acorns, and apples.**

**1. What role do deer play in their environment?**

- A. consumer
- B. decomposer
- C. predator
- D. producer

**Swamp rabbits feed on grasses and other plants in swamps. Bobcats feed on swamp rabbits. Land development removes many of the grasses and plants eaten by the swamp rabbits.**

**2. How would this change MOST LIKELY affect the animals in this community?**

- A. The rabbits would compete with the bobcats for food.
- B. The bobcats would not be affected because they do not eat plants.
- C. The rabbits would have less food because the bobcats would leave.
- D. The bobcats would have less food because there would be fewer rabbits.

**The Eastern box turtle is found throughout Georgia. Some of its predators include raccoons, skunks, coyotes, and foxes.**

**3. Which adaptation BEST protects the turtle against predators?**

- A. tough skin
- B. webbed toes
- C. hard outer shell
- D. slow movement

**The Tasmanian tiger lived in wetlands, grasslands, and forests in Australia. It was about five feet long with light brown fur and stripes on its back. It was a type of mammal with a pouch for carrying its young. Farmers hunted the Tasmanian tiger to protect their livestock.**

**4. Which statement helps explain why the Tasmanian tiger became extinct?**

- A. It was a type of mammal with a pouch for carrying its young.
- B. Farmers hunted the Tasmanian tiger to protect their livestock.
- C. It was about five feet long with light brown fur and stripes on its back.
- D. The Tasmanian tiger lived in wetlands, grasslands, and forests in Australia.



## UNIT 2: Weather (2/29 – 3/31)

In this unit, you will learn about weather. Some of the topics covered will be the different states of water, how clouds form, and the process known as the water cycle. You will learn about weather maps and the tools that are used to observe and record the weather.

### KEY TERMS

Water is a **liquid**. Liquids take up a definite volume but do not have a fixed shape. You can pour water into glasses of different shapes and it will take the shape of each glass. (S4E3a)

When water is ice, it is a **solid**. Solids have a definite volume and shape. Their volume and shape cannot be easily changed. Water that is colder than 32°F (32 degrees Fahrenheit) or 0°C (0 degrees Celsius) turns into solid ice. (S4E3a, b)

When water is a **gas** it is called a vapor. Gases have no definite volume and take the shape of their container. Liquid water turns into steam at 212°F or 100°C. (S4E3a, b)

The **water cycle** is the process that moves water above, below, and around Earth in a cycle. The water cycle has four main stages: evaporation, condensation, precipitation, and collection. **Evaporation** happens when the Sun heats up liquid water and causes it to evaporate. The water vapor, which is a gas, then rises up into the atmosphere. Water vapor forms clouds as it cools. This cooling is known as **condensation**. The clouds then release the water as **precipitation**, in the form of rain, snow, sleet and freezing rain, and hail. As the water runs off, it is collected into the ground and bodies of water. The Sun then heats the liquid water up, causing it to evaporate, and the water cycle starts all over again. (S4E3d)

**Clouds** form when moist, warm air cools and expands. The water vapor in the air condenses to form small water droplets. Once the air reaches a point of saturation (a point at which there is too much water vapor in the air), clouds begin to form. Small particles of dust in the atmosphere help this process of condensation as water droplets congregate around them. (S4E3c)

**Rain** is liquid water that falls from the sky as drops. The water vapor in a cloud condenses and turns into liquid water in the form of rain. (S4E3e)

**Snow** is solid water that falls from the sky. It can take many forms depending on the temperature and humidity in the atmosphere. Snow is formed when a little drop of water freezes in a cloud. More water slowly freezes around the ice drop. This is why snowflakes have their shapes. (S4E3e)

**Sleet** is solid water that falls from the sky. Sleet is pellets of ice. Sleet is formed when a little drop of water freezes in a cloud. More water slowly freezes around the ice drop. The snowflake then gets lifted up into a warmer part of the cloud. The arms of the snowflake then melt. As this melting ice drop falls through the cold part of the cloud, the water from the arms then refreezes in a new ice layer around the original center, it turns into a larger drop of ice. (S4E3e)

**Hail** is solid water that falls from the sky as ice. Hail is made up of groups of little balls of ice. Hail forms during thunderstorms. Hail starts out as a small ball of ice. As it falls through the tall clouds, more water freezes to it. When it reaches the ground, hail can be as small as a pea or as large as a softball. (S4E3e)

**Dew** is liquid water that forms on objects outside in the morning or evening. Water vapor in the air condenses on the objects, like car windows and grass. Dew is a form of condensation. (S4E3e)

**Fog** is water vapor that hangs in the air near the surface of Earth. When the air gets cool enough, the water vapor in the air forms bigger droplets. These are the same kind of droplets that clouds have. This is why fog is considered a cloud that has settled on the ground. (S4E3e)

**Meteorologists** are scientists who study weather. Meteorologists use many different kinds of tools to help them observe the weather. (S4E4a)

A **thermometer** is a tool used to measure temperature. **Temperature** is a measure of the heat energy contained in an object. In other words, temperature is a measure of how hot or cold something is. A thermometer is used to tell the temperature inside or outside. (S4E4a)

A **rain gauge** is used to collect and measure the amount of rain that falls. Rain gauges are put outside. They are put in areas away from buildings and trees. (S4E4a)

A **wind vane** is also known as a **weather vane**. Wind vanes show the direction the wind is blowing. They are often put on the tops of barns and houses. (S4E4a)

An **anemometer** is a tool that measure how fast the wind is blowing. Some anemometers look like a wind vane. An anemometer has three or four cups connected to a shaft. The cups catch the wind and turn the shaft. You can count the number of times the shaft turns to find out the wind speed. (S4E4a)

When people talk about **weather**, they are talking about the conditions in the atmosphere at a specific time. Conditions that describe the weather include the temperature, humidity, and amount of wind. For example, the temperature in Georgia on January 5 was 41°F. This is an example of the weather of Georgia. (S4E4d)

When people talk about **climate**, they talk about the average of weather conditions in an area over a long time. To compare the two, think about the temperature. The average temperature in Georgia is about 39°F in January. This is an example of the climate of Georgia. (S4E4d)

A weather map shows the weather conditions in an area. There are **weather symbols** on the map. Snow is shown as a snowflake. Rain is shown as drops of water. Sunny weather is shown as a Sun. A weather map can show just one state, such as Georgia, or a larger area, such as the United States. (S4E4b).

Areas where two different air masses meet are called **weather fronts**. On a black-and-white weather map, warm fronts have filled-in half circle symbols placed at intervals on the side of the arc facing the direction the front is moving. Cold fronts have filled-in triangular "sawtooth" symbols at intervals on the side of the arc facing the direction the front is moving. Color weather maps may also show warm fronts as red and cold fronts as blue. Cold fronts often move into an area where a warm front was present. (S4E4b)

**Humidity** is the amount of water vapor that is in the air. When it is humid, rain, dew, or fog is more likely to occur. (S4E4b)

Meteorologists often talk about **high and low pressure** systems when they talk about weather. A low pressure system forms when warm and moist air rises, due to Earth's rotation and friction. This air is pushed toward the center of the system, leading to condensation and precipitation. In a high pressure system, air moves away from the center and the warm air is pushed down. This causes clouds to break up and makes for sunnier weather. (S4E4b)

A **barometer** is a tool that is used to show and measure the change in air pressure. If the air pressure stays the same, the weather will usually stay the same. When the air pressure goes up a lot or goes down a lot, the weather will change. (S4E4a, c)

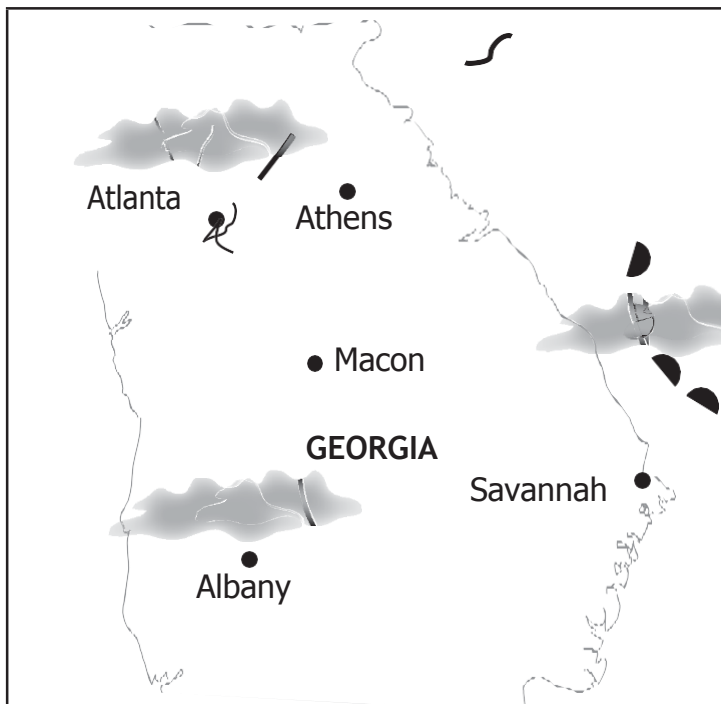
### Important Tip

✍ Clouds do not move on their own. Winds blow clouds around. Electrostatic charge builds up inside a cloud in the same way that it does when you rub a balloon on your head. Dust grains, water droplets, and ice particles rub against each other, creating an electrostatic charge inside the cloud. Because clouds are so big, they build up a lot of static electricity. Sometimes electric charges "jump" from cloud to cloud. These charges can also jump from the cloud to Earth. This is known as lightning. Lightning also creates a lot of heat. This heat causes the air around lightning to move very fast. This creates the sound we call thunder. When you hear thunder but don't see any lightning, it is because the lightning is high up in the clouds. (S4E4b, c)

5. In the water cycle, clouds form when forces raise water vapor particles high into the air. How do clouds form from rising water vapor?

- A. The water vapor particles speed up and evaporate into the air.
- B. The water vapor particles slow down and evaporate into the air.
- C. The water vapor particles lose heat and condense around particles of dust.
- D. The water vapor particles gain heat and condense around particles of dust.

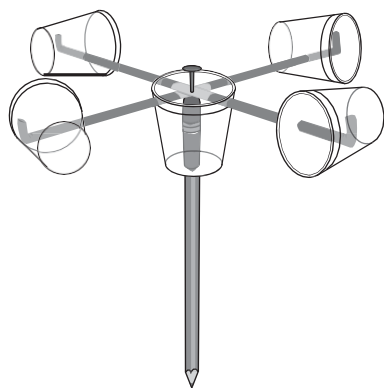
6. A class studied this weather map of Georgia.



Based on the weather map, which of these BEST describes Atlanta's current weather?

- A. cold and rainy
- B. warm and rainy
- C. cold and cloudy
- D. warm and cloudy

7. A student uses items found in the classroom to create the instrument shown, which measures a certain weather characteristic.



**Which weather characteristic does this instrument measure?**

- A. wind speed
- B. wind direction
- C. amount of rain
- D. atmospheric pressure

8. A student measured the temperature and rainfall for one week in September. She recorded her data in a table.

Day of the Week	Highest Daily Temperature (°F/°C)	Amount of Rainfall (cm)
Sunday	88/31	0
Monday	86/30	0
Tuesday	86/30	0.889
Wednesday	85/29	1.27
Thursday	85/29	2.16
Friday	84/28	2.54
Saturday	??	?

**If no new fronts are expected, what will Saturday's weather MOST LIKELY be like?**

- A. warm and rainy
- B. cool and rainy
- C. warm and dry
- D. cool and dry

## UNIT 3: Forces and Motion (11/30 – 1/14)

In this unit, you will study forces that push and pull objects and the resulting effect on their motion. You will learn what happens to the speed or direction of objects when forces are applied on them. You will study the effects of the force of gravity on different objects and how simple machines work.

### KEY TERMS

A **force** is an action that either **pushes** or **pulls** on an object. Force can be the result of contact. You apply force to a book when you push it across a desk. Forces can also result when objects are not in contact with each other. Objects with more mass need more force to move them. Objects with less mass need less force to move them. (S4P3b)

**Position** is the place where an object is in relation to other things. The position where you are reading this might be a desk in the classroom. If you move to the library, your position may change to a chair in the library. (S4P3b)

An object that changes position over time has **motion**. An object that does not change position over time is at rest. People can describe the motion of an object. They can describe how the position changes. They can describe how fast the position changes. They can describe the **direction** the object moves when its position changes. (S4P3b)

**Speed** is a rate that describes the distance an object can or will move over a set amount of time. A car can move on a road at 50 miles per hour. At that speed the car will move 50 miles in one hour and 100 miles in two hours. Speed does not describe the direction an object moves. (S4P3b)

**Gravity** is a force that causes all objects around Earth to fall toward the ground. (S4P3d)

**Simple machines** are devices that change the direction or amount of force to do work. Simple machines do not do the work. They make the work easier to do. There are six simple machines. (S4P3a)

The **lever** is a simple machine made up of a straight beam and a fulcrum, a point that the rod pivots on. Levers change the amount of force required to move an object. A seesaw is an example of a lever. (S4P3a)

An **inclined plane** is a simple machine that uses a flat surface to help raise or lower a load. Inclined planes spread the amount of force required to lift a load over a distance. A wheelchair ramp is an example of an inclined plane. (S4P3a)



A **wedge** is a simple machine made up of one or two inclined planes. Wedges change the direction of force and are usually used to push two objects apart. A wedge can be driven into a log. When the downward force of a sledgehammer is applied, the wedge will change the direction of the force outward, causing the log to split. The cutting edges of knives, axes, and chisels are wedges, as are ice picks, pins, and needles. (S4P3a)

A **screw** is a simple machine that can be thought of as an inclined plane wrapped around an axle. Because of this, the force required to do something is spread out over a longer distance. (S4P3a)

The **wheel and axle** is a simple machine made up of a wheel and an attached axle. The wheel and axle transfers the force from the wheel to the axle. (S4P3a)

A **pulley** is a simple machine made up of a rope or a chain guided around a wheel or an axle. Pulleys change the direction of a force. In some situations when more than one pulley is used, it is also possible to change the amount of force required to move an object. (S4P3a)

### *Important Tips*

-  The more mass an object has, the more force will be needed to move it.
-  The more speed an object has, the more force will be required to slow it, stop it, or change its direction.

9. A woman needs to load a piece of furniture onto the back of her truck. She can choose one of the following to help her with the task: a lever, an inclined plane, a wedge, or a pulley.

**Which of these is the BEST choice for decreasing the force needed to load the furniture?**

- A. lever
- B. pulley
- C. wedge
- D. inclined plane

10. A student stretches a rubber band between two push pins. He starts a toy car by pulling it back against the rubber band and letting it go. He records the distance the car travels. He does the same thing for cars in three other sizes. The rubber band pushes each car with the same force.

Toy Car	Distance Traveled (in meters)
Car 1	2
Car 2	2.5
Car 3	3
Car 4	1

**Which toy car has the GREATEST mass?**

- A. Car 1
- B. Car 2
- C. Car 3
- D. Car 4

11. Three students are investigating force using a wagon. One student sits in the wagon, and another student moves the wagon by pulling it by the handle or pushing it from behind.

**Which of these would cause the wagon to move faster?**

- A. The wagon is pulled with less force.
- B. The third student sits in the wagon.
- C. The wagon is pushed with less force.
- D. The third student helps push the wagon.

12. A student tosses a ball to another student. That student uses a bat to hit the ball high into the air. The ball drops back down, and the student catches it. The student rolls the ball across the sidewalk to the other student.

**Which event is caused by gravitational force?**

- A. A student tosses a ball to another student.
- B. The ball drops back down, and the student catches it.
- C. That student uses a bat to hit the ball high into the air.
- D. The student rolls the ball across the sidewalk to the other student.

## UNIT 4: Stars and Solar System (1/19 – 2/25)

In this unit, you will study some of the characteristics of stars and planets. You will learn about star patterns in the night sky and our Solar System. Throughout the unit, you will explore how the relative positions of Earth, the Sun, and the Moon determine the phases of the Moon and explain the seasonal changes.

### KEY TERMS

The **universe** is composed of all the galaxies: the solar systems, planets, and all the other objects that make them up. Everything from the smallest to the largest object is part of the universe. (S4E1)

**Galaxies** are groups of billions of billions of stars and solar systems. Our Solar System is located in the galaxy called the Milky Way. (S4E1)

An **orbit** is a path that one object takes around another object. Earth orbits the Sun. The Moon orbits Earth. (S4E1)

The **Solar System** is made up of the Sun and all the objects that orbit the Sun. The largest objects that orbit the Sun are planets. **Inner planets** are all composed of rock. They have a few to no moons. They do not have ring systems that orbit the planet. The inner planets of the Solar System are Mercury, Venus, Earth, and Mars. (S4E2d)

The **outer planets** are farther from the Sun. The outer planets are known as the gas giants. They are planets mostly made up of gases and liquids. The outer planets all have ring systems that orbit each planet. The outer planets of the Solar System are Jupiter, Saturn, Uranus, and Neptune. (S4E2d)

A **star** is a very large sphere of gases. Stars are so large that they are held together by their own gravity. Stars are the largest objects in any solar system. This is why stars are at the center of every solar system. Stars can be many different sizes. Earth orbits a star named the Sun. The Sun is small compared to many other stars. Our Sun is also described as yellow. Different stars are also described by the color they give off. The color of a star provides information about its temperature. Blue stars are the hottest stars. Red stars are the coolest stars. Yellow stars, such as the Sun, are in between hot and cool. (S4E1a)

A **constellation** is the pattern a group of stars makes as seen from Earth. The stars that form constellations are not connected by gravity. Constellations are often named after objects they look like. The Big Dipper is a constellation that looks like a ladle used to dip into liquids. (S4E1a, c)

Compared to stars, the **planets** are very small. If the Sun were the size of a basketball, the largest planet in our Solar System, Jupiter, would be the size of a table tennis ball. Earth would be the size of a small pea. (S4E1b)

The planets you can see without a telescope are Mercury, Venus, Mars, Jupiter, and Saturn. Those planets can be seen only during certain times. Mercury, Venus, and Mars are the planets closest to Earth. Jupiter and Saturn are the two largest planets in the Solar System. You need a telescope to see Uranus and Neptune because they are so far away. A **telescope** is a tool that magnifies an object so it looks closer. (S4E1d)

A **satellite** is an object that orbits a planet. Satellites can be objects made by humans, like the Hubble telescope. You can see some satellites at night as they orbit Earth. Satellites are also naturally made objects that orbit a planet, such as a moon. (S4E1d)

A **revolution** is the movement of a body around another in a closed path. Planets revolve around the Sun.

A **rotation** is the movement of a body around a central **axis**. A spinning top rotates around its axis. (S4E1, S4E2)



As Earth revolves around the Sun, it rotates on its axis. This rotation creates the **day and night cycle**. Earth rotates from west to east. This is why the Sun appears to rise in the east and set in the west. (S4E2a)

The Moon appears to change shape because of the **phases of the Moon**. The term “phases of the Moon” refers to how much of the Moon is lit and visible from Earth. During the new Moon phase, the Moon is between Earth and the Sun. This means that sunlight is lighting up the side of the Moon facing away from Earth. From our position on Earth, the Moon is not lit at all. This is known as a new Moon. Fourteen days later, the Moon has revolved around Earth. Earth is now between the Sun and the Moon. When light from the Sun lights up the side of the Moon facing Earth, we see a full Moon. Each day throughout the twenty-eight cycle, a little more or a little less of the Moon is lit. (S4E2b)

Earth rotates on its axis as it orbits the Sun. The **tilt of Earth’s axis** is toward or away from the Sun. Light from the Sun warms Earth. When the northern half of Earth receives more direct light from the Sun, it is tilted toward the Sun. At the same time, the southern half receives less direct light from the Sun. Because of this effect, when the northern half is experiencing summer, the southern half is experiencing winter. (S4E2c)

### *Important Tips*

- ✍ The relative order of each planet in the Solar System is easy to remember. People often remember the phrase “**My Very Eager Mother Just Served Us Nachos.**” The first letter of each word stands for the first letter of each planet. The words are also in order from the Sun and moving outward. **M** stands for **M**ercury, **V** stands for **V**enus, **E** stands for **E**arth, **M** stands for **M**ars, **J** stands for **J**upiter, **S** stands for **S**aturn, **U** stands for **U**ranus, and **N** stands for **N**eptune. (S4E2d)
- ✍ The relative size of the planets in the Solar System is pretty easy to remember. There are four inner planets. Mercury is the planet closest to the Sun. Mars is the next biggest planet. Venus is the next biggest planet. Earth is a little larger than Venus. The relative size of the final four planets is easy to remember as well. The order of their sizes is the reverse of their relative order. The relative order of the outer planets is Jupiter, Saturn, Uranus, and Neptune. In order of size from smallest to largest, the outer planets are Neptune, Uranus, Saturn, and Jupiter. (S4E2d)

13. A student observes stars in the night sky and sketches the portion of sky he can see between two trees in his backyard. Two hours later, he again sketches the portion of the sky he can see between the two trees. The sketches are different.

**Which statement is the BEST possible explanation for this difference?**

- A. Throughout the night, stars move in relation to one another.
- B. Stars and their arrangements move across the sky during the night.
- C. Stars are too far away to recognize any sort of pattern among them.
- D. Due to Earth's rotation, the pattern of stars between the trees changes

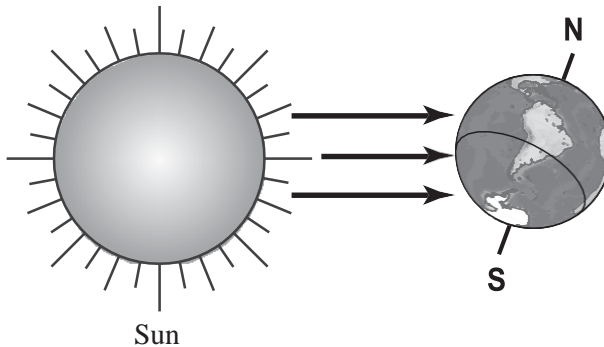
14. Which statement describing the relationship between planets and stars is true?

- A. Stars orbit some planets.
- B. Planets orbit the Sun and stars do not.
- C. Planets create light, and stars reflect light energy.
- D. The sizes of planets are directly related to the sizes of nearby stars.

15. Which of these causes the phases of the Moon?

- A. Earth's orbit around the Sun.
- B. The Moon's orbit around Earth.
- C. The orbit of the Sun as it orbits Earth.
- D. The orbit of the Moon as it orbits the Sun.

16. The model shows Earth during part of its orbit around the Sun.



**What is happening in the Southern Hemisphere?**

- A. It is experiencing fall.
- B. It is experiencing spring.
- C. It is experiencing winter.
- D. It is experiencing summer

## UNIT 5: Sound and Light (10/19 -11/19)

In this unit you will learn about light and sound. You will investigate how light propagates across different materials and how different types of lenses affect what you see and how you see different objects. You will also learn how sound is produced and what makes the pitch of a sound vary.

### KEY TERMS

**Light** refers to the visible light we see. Light can be broken down into different colors. A **rainbow** shows the colors in white light. (S4P1)

When the human eye sees **colors**, it is seeing the parts of light that are reflected from an object. A blue object reflects the parts of light that we see as blue. The other colors are not reflected. (S4P1)

An acronym is a way to remember something. ROY G BIV is an acronym people use to remember colors in a rainbow. ROY G BIV stands for **R**ed **O**range **Y**ellow **G**reen **B**lue **I**ndigo **V**iolet. This is the spectrum of colors. A **spectrum** of light is the range of colors in the light. (S4P1)

If you look through a piece of glass and can see an object on the other side clearly, the glass is said to be **transparent**. Objects that are transparent let light move through them without scattering the light. Water is transparent. Hold a light up to a glass of water, and you will see most of the light move through. (S4P1a)

If you look through a piece of glass and the shape of the object on the other side is not easy to see, the glass is said to be **translucent**. Objects that are translucent let the light move through them, but they scatter the light out. Ice is translucent. Hold a light up to a piece of ice and the ice will glow with light, but not much of the light will move through the ice. (S4P1a)

If you look through something and you cannot see through it, the object is said to be **opaque**. Light cannot move through opaque objects. Hold a light up to a red brick and none of the light will move through it. The brick is opaque. (S4P1a)

Light can do different things as it encounters matter. **Reflection** occurs when light bounces off a medium. When light is reflected, not all the light is reflected.(S4P1b)

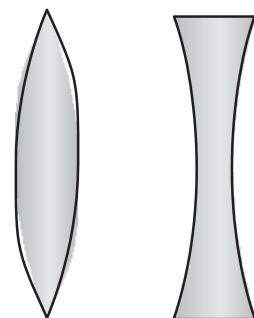
**Refraction** occurs when light moves through something. The light slows down and bends as it moves. Look at your hand through a glass of water. The shape of your hand will appear to change. The light that is reflected off your hand bends as it hits the water and causes your hand to look different. (S4P1c)

A **prism** is a clear object that refracts light as the light moves through it. As light moves through a prism, the different colors slow down at different speeds. This makes the colors separate from the light. The light comes out of the prism broken down into bands of color. This is the same phenomenon that causes rainbows. The drops of water act as little prisms that split the sunlight into the different colors. (S4P1c)

A **lens** is a piece of glass or other clear material with curved sides that concentrate or disperse light waves. A convex lens curves out from the middle.

A **convex** lens is thicker in the middle than at the top and bottom. Light that moves through a convex lens is directed toward the center of the lens. A convex lens focuses light. (S4P1c)

Concave means to curve inward. A **concave lens** is thinner in the middle than at the top and bottom. Light that moves through a concave lens is directed away from the center of the lens. A concave lens spreads light out. (S4P1c)



*Convex*


*Concave*

**Sound waves** are the waves that carry vibrations through gases, liquids, and solids. Someone shouting is an example of sound moving through a gas. When you knock on a door, the vibration your hand creates is heard on the other side of the door. Submarines use sound waves in the water to find things. (S4P2a)

Vibrations that we hear are called **sounds**. Stretch a rubber band with your fingers while someone plucks it. You can feel the vibration in your fingers. You can also hear the vibrations as sound. If you pull the rubber band tighter, the rubber band will vibrate faster. This will also make the pitch of the sound go higher. (S4P2a, b)

**Pitch** describes how high or low a sound is. The rumble of a train is a low pitch. Your shoes squeaking on the floor is a high pitch. (S4P2b)

### *Important Tip*

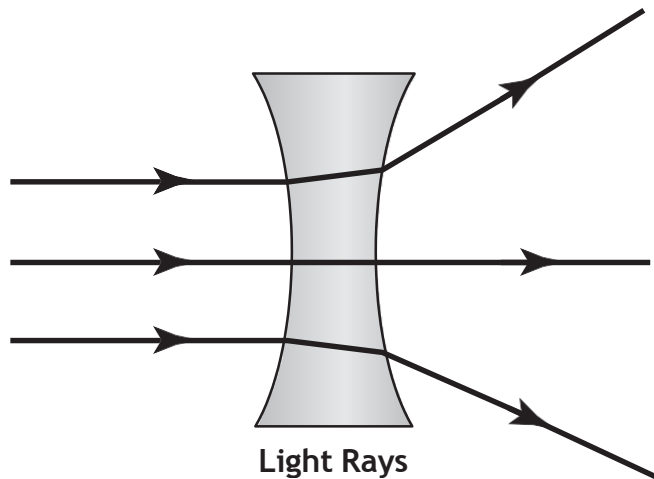
 When sound is made, the type of matter it is made in affects the quality of the sound. Imagine dropping a basketball on a gym floor. The ball will bounce up, and the sound it makes is easy to hear. Now imagine dropping the ball on a carpeted floor. The ball will not bounce up as far, and the sound it makes will be harder to hear. Now imagine dropping the ball on sand. The ball will not bounce up at all, and it will make sound, but it will be so quiet that the sound will be very hard to hear. (S4P2a, b)

17. A student shines a flashlight at a mirror in front of her. She notices that a circle of light appears on the wall behind her.

**Which statement BEST explains this observation?**

- A. The mirror reflects the light.
- B. The mirror scatters the light.
- C. Light bounces over the mirror.
- D. Light passes through the mirror.

18. The model shows how light travels through a piece of glass that has a certain shape.



**Which of these BEST explains this type of lens and how it could be used in a flashlight?**

- A. This is a prism that could be used to make a flashlight look dimmer.
- B. This is a convex lens that could be used to make a flashlight look brighter.
- C. This is a prism that could be used to make a flashlight show different colors.
- D. This is a concave lens that could be used to make a flashlight shine over a bigger space.

19. A student stretches a rubber band across the top of an empty box. What will happen if she plucks the rubber band?

- A. It will vibrate and make a sound.
- B. It will not move or make a sound.
- C. It will vibrate without making a sound.
- D. It will not move, but it will make a sound.

20. A student observes that different lengths of pipe produce different pitches when he taps them. He notices that one pipe produces a lower pitch than the others.

**Which statement BEST explains this observation?**

- A. The low-pitch pipe is longer than the other pipes.
- B. The student tapped softest on the low-pitch pipe.
- C. The student tapped hardest on the low-pitch pipe.
- D. The low-pitch pipe is shorter than the other pipes

Item	Standard Element	Characteristics of Science	DOK Level	Correct Answer	Explanation
1	S4L1a	S4CS4a	2	A	The correct answer choice is (A) consumer. Consumers eat producers or other consumers. Choice (B) is incorrect because decomposers break down, or cause to decay, dead or decaying organisms. Choice (C) is incorrect because a predator is an animal that eats other animals. Deer eat plants. Choice (D) is incorrect because producers are organisms, like plants, that make their own
2	S4L1d	S4CS4a	3	D	The correct answer choice is (D) The bobcats would have less food because there would be fewer rabbits. When one organism in a food chain is removed, it affects all of the organisms in the food chain. There would be fewer rabbits because rabbits would have to find food someplace else or die. The bobcats would have less food because there would be fewer rabbits. Choice (A) is incorrect because rabbits are herbivores. They eat only plants. Bobcats eat only other animals. Choice (B) is incorrect because changes to the rabbit population will affect the bobcat population. Choice (C) is incorrect because bobcats are not a source of food for rabbits.
3	S4L2a	S4CS4a	2	C	The correct answer choice is (C) hard outer shell. The Eastern box turtle is able to hide from danger by retreating inside its hard shell. This protects it from predators. Choice (A) is incorrect because while the turtle does have tough, leathery skin, the outer shell is a better source of protection for the skin. Choice (B) is incorrect because having webbed toes would help the turtle swim better, but it would not be a defense against predators. Choice (D) is incorrect because the turtle's slow movement does not defend it against

Item	Standard Element	Characteristics of Science	DOK Level	Correct Answer	Explanation
4	S4L2b	S4CS4a	2	B	The correct answer choice is (B) Farmers hunted the Tasmanian tiger to protect their livestock. Overhunting led to the extinction of these animals. Choice (A) is incorrect because the fact that the Tasmanian tiger was a marsupial does not explain why it might have become extinct. Choice (C) is incorrect because this sentence only describes the animal. It does not explain what led to its extinction. Choice (D) is incorrect because this sentence explains where the tiger lived. It does not tell why the tiger became extinct.
5	S4E3c	S4CS4c	2	C	The correct answer choice is (C) The water vapor particles lose heat and condense around particles of dust. As water vapor particles rise, they lose heat energy and cool. This causes them to move slower and condense around particles of dust in the air. Choice (A) is incorrect because water vapor particles slow down. They do not speed up or evaporate. Choice (B) is incorrect because the particles condense, not evaporate. Choice (D) is incorrect because the water vapor particles lose heat and get cooler. They do not gain heat.
6	S4E4b	S4CS4b	2	D	The correct answer choice is (D) warm and cloudy. The weather map shows clouds over Atlanta, and the cold front has not yet arrived. Choice (A) is incorrect because the map shows clouds over Atlanta, not rain. Choice (B) is incorrect because it is warm and rainy over Savannah, not Atlanta. Choice (C) is incorrect because the cold front has not yet reached Atlanta.



Item	Standard Element	Characteristics of Science	DOK Level	Correct Answer	Explanation
7	S4E4a	S4CS8c	2	A	The correct answer is choice (A) wind speed. The instrument shown is an anemometer. An anemometer is a tool that has “cups” that spin as the wind blows. The speed is found by counting the number of times the cups spin during a certain amount of time. Choice (B) is incorrect because a wind vane, not an anemometer, measures wind direction. Choice (C) is incorrect because a rain gauge, not an anemometer, measures rainfall. Choice (D) is incorrect because a barometer, not an anemometer, measures atmospheric pressure.
8	S4E4c	S4CS4c	3	A	The correct answer is choice (A) warm and rainy. The table shows that during the week the temperature has remained in the 80s/30s, which is warm. For most of the week, it has been rainy. It will most likely continue in this pattern because no new fronts are expected. Choices (B) and (D) are incorrect because it will most likely be warm. There is no evidence to suggest that the temperature will drop. Choice (C) is incorrect because it will most likely be rainy, not dry.
9	S4P3a	S4CS4a	2	D	The correct answer choice is (D) inclined plane. An inclined plane makes it easier to move heavy objects to higher levels. Less effort is needed to lift a load up a ramp. Choice (A) is incorrect because a lever increases force. Choice (B) is incorrect because a pulley changes the direction of the force used to lift something. Choice (C) is incorrect because a wedge is used to split things apart, not lift them. A wedge changes the direction of the force to a direction perpendicular to the original force.
10	S4P3b	S4CS4a	3	D	The correct answer is choice (D) Car 4. The force used to push the cars was the same, so the differences in the masses affected the distances they traveled. Car 4 traveled the shortest distance, so it had the most mass. Choices (A), (B), and (C) are incorrect because Car 1, Car 2, and Car 3 traveled farther than Car 4, so they had less mass.

Item	Standard Element	Characteristics of Science	DOK Level	Correct Answer	Explanation
11	S4P3c	S4CS8a	3	D	The correct answer is choice (D) The third student helps push the wagon. If more people push the wagon, they add a greater force than the initial force. This would cause the wagon to move faster. Choice (A) is incorrect because pulling the wagon less forcefully would not increase the wagon's speed. Choice (B) is incorrect because adding a passenger to the wagon would add mass to the wagon and slow it down. Choice (C) is incorrect because pushing the wagon less forcefully would not increase the wagon's speed.
12	S4P3d	S4CS4a	2	B	The correct answer is choice (B) The ball drops back down, and the student catches it. The ball falls after being hit high in the air because the gravitational force of Earth pulls the ball downward. Choices (A), (C), and (D) are incorrect because in each case the force applied by a student causes the ball to move.
13	S4E1a	S4CS8a	2	D	The correct answer is choice (D) Due to Earth's rotation, the pattern of stars between the trees changes. The student will see a different part of the night sky in his second observation because Earth's rotation will place him under a different part of the sky. Choice (A) is incorrect because the stars' locations in regard to one another are fixed. Choice (B) is incorrect because stars do not move across the sky; they only appear to because of Earth's rotation. Choice (C) is incorrect because it is possible to recognize patterns among the stars from where we are on Earth.
14	S4E1b	S4CS4a	2	B	The correct answer is choice (B) Planets orbit the Sun and stars do not. This statement is true. Choice (A) is incorrect because planets orbit stars, and stars do not orbit planets. Choice (C) is incorrect because stars create light, which planets reflect. Choice (D) is incorrect because the size of a planet is not related to the size of its star.

Item	Standard Element	Characteristics of Science	DOK Level	Correct Answer	Explanation
15	S4E2b	S4CS4a	2	B	The correct answer is choice (B) the Moon's orbit around Earth. As the Moon revolves around Earth, it reflects different amounts of light. This causes the Moon to look like it is changing shape. Choice (A) is incorrect because Earth's revolution around the Sun causes the change of seasons. Choice (C) is incorrect because the Sun does not orbit Earth. Choice (D) is incorrect because it is the Moon's orbit around Earth, not around the Sun, that causes phases.
16	S4E2c	S4CS4b	3	D	The correct answer is choice (D) It is experiencing summer. When the Northern Hemisphere tilts away from the Sun, it experiences winter. The Southern Hemisphere experiences the opposite because it is tilted toward the Sun. The heat energy from sunlight hits it more directly. Choices (A) and (B) are incorrect because the Southern Hemisphere is not in the correct position in relation to the Sun to be experiencing either of these seasons. Choice (C) is incorrect because the Northern Hemisphere, not the Southern Hemisphere, is experiencing winter.
17	S4P1b	S4CS8a	2	A	The correct answer is choice (A) The mirror reflects the light. When light hits a smooth surface, like a mirror, it bounces back to create a mirror image. Choice (B) is incorrect because light scatters when it hits a rough surface. Choice (C) is incorrect because light would reflect back from the mirror, not over it. Choice (D) is incorrect because light passes through transparent materials, not mirrors.
18	S4P1c	S4CS4a	2	D	The correct answer is choice (D) This is a concave lens that could be used to make a flashlight shine over a bigger space. Concave lenses are curved and cause light to diverge or bend out. They spread light, which lets you see a wider area of light. Choices (A) and (B) are incorrect because concave lenses don't affect the brightness of light. Choice (C) is incorrect because this statement describes a prism.

Item	Standard Element	Characteristics of Science	DOK Level	Correct Answer	Explanation
19	S4P2a	S4CS4a	2	A	The correct answer is choice (A) It will vibrate and make a sound. Sounds are created by vibrations. Choice (B) is incorrect because the force of plucking the rubber band will cause it to move or vibrate. Choice (C) is incorrect because if the rubber band vibrates, it will make a sound. Choice(D) is incorrect because a sound cannot be made without vibrations.
20	S4P2b	S4CS8a	3	A	The correct answer is choice (A) The low-pitch pipe is longer than the other pipes. Short pipes produce high pitches and long pipes produce low pitches. Choices (B) and (C) are incorrect because the force used to hit the pipe would change the volume of the sound created but not the pitch. Choice (D) is incorrect because a low-pitch pipe would not be shorter than the other pipes.

## ACTIVITY

The following activity develops skills in **Unit 1: Ecology**.

**Standards:** S4L1a, S4L1b, S4L1c, S4L1d, S4CS1a, S4CS4a, S4CS4b, S4CS4c

### *Food Chains*

#### **Step 1: Create note cards and gather materials**

Work individually or with family and friends.

- Create note cards with the names of five producers, ten consumers, and five decomposers found in a specific habitat in Georgia, such as a wetland or forest.
- Take the time to research five specific habitats and organisms found in Georgia, such as a wetland or forest.
- Draw a picture of the Sun on five other note cards.

Before beginning, make sure that the following materials are available:

- Note cards with the names of five producers
- Note cards with the names of ten consumers (five herbivores, five carnivores or omnivores)
- Note cards with the names of five decomposers
- Five note cards with the picture of the Sun
- Glue sticks
- Markers

#### *Step 2: Create food chain diagrams*

- Choose note cards with the names of one producer, two consumers, and one decomposer found in each of the five specific habitats in Georgia.
- Arrange the cards into five food chains, with one food chain for each habitat.
- Include the Sun as a part of each food chain.
- Use glue sticks, markers, and construction paper to create five food chain diagrams.

Questions to consider:

- *What pattern do all of your food chains follow?*
- *How can an organism be part of several food chains?*

#### *Step 3: Create food webs*

Next, explore how changes in the environment could affect an ecosystem of organisms. Study the food chains you created to make a food web.

- Find pictures or write on note cards to show the names of organisms found in Georgia. Put one organism on each note card.

For the second half of the activity, make sure that the following materials are available:

- Note cards with the names of organisms
- Cork board

- Push pins
- Safety scissors
- Yarn

Create a food web by pinning the organism cards onto the cork board. The yarn will be used instead of arrows to show the transfer of energy in the food web.

- Any organism that is consumed by another organism should be connected by a piece of yarn.
- Use the push pins to keep the yarn and organism cards in place.
- Once you completed the food webs, predict how a change to the plants would affect the other organisms. For example, you might say that removing the plants would not affect a top carnivore.
- Think of an event that kills off the plants in the ecosystem. Remove the push pins holding the plant note cards and yarn in place.

Questions to consider:

- *What might happen to an ecosystem if the plants of the food web were removed?*
- *What happened when you removed a plant from the food web?*
- *Was your prediction correct? Why or why not?*

## ACTIVITY

*The following activity develops skills in Earth Science, **Unit 5: Stars and Solar System.***

**Standards:** S4E2a, S4E2c, S4E2d, S4CS1a, S4CS4b, S4CS5a, S4CS5d

Use models to explain the causes of the seasons and day/night and explore Earth's place in the Solar System. Use a model of Earth to understand the causes of change of seasons.

Before beginning, make sure that the following materials are available:

- modeling clay
- toothpicks
- flashlight

*Part One:*

Take modeling clay, a toothpick, and a flashlight.

- Use a piece of clay to make a sphere. This model will represent Earth.
- Use another piece of clay to create a round, flat base for the sphere to sit on. Use the toothpick to draw a line all the way around the center of the sphere. This will represent Earth's equator.
- Push the toothpick through the top of the sphere to act as Earth's axis. Tilt the toothpick at about a 23° angle, with the tip pointing away from you. The tip pointing away represents the North Pole.

- Next, shine the flashlight at the model. The beam of the flashlight represents the rays of the Sun.

Draw a diagram showing how the light spreads over the sphere. Explain what seasons the Northern and Southern Hemispheres would be experiencing.

Repeat this activity with the toothpick, or the axis, pointing toward you. Explain how the beam of light spreads and tell which seasons would be experienced in the Northern and Southern Hemispheres.

Questions to consider:

- *What would happen if Earth's axis were not tilted?*
- *How would this change the seasons?*
- *What would an activity that could test this idea look like? Include instructions that others could follow to carry it out.*

#### *Part Two:*

Use your model of Earth to explore the causes of day and night.

- Shine the flashlight at the model of Earth while holding it by the top of the toothpick.
- Slowly spin the model in a counterclockwise direction. This spinning represents Earth's rotation from west to east.

Questions to consider:

- *What happens to the half of Earth that is facing away from the light?*
- *How is your model alike and different from the way the Sun lights Earth?*

#### *Part Three:*

Use objects to represent the Sun and planets in our Solar System.

- Research the relative size and order of the eight planets. Think about the positions of the planets in relation to the Sun.
- Gather clay, marbles, small round beads, and balls of different sizes (such as tennis balls, basketballs, golf balls, etc.).
- Create a model of our Solar System using these materials to represent the Sun and the planets.

Questions to consider:

- *How is your model like the Solar System?*
- *How is your model different from the Solar System?*