

Unit 4

Earth and Space Sciences

Humans use Earth's resources every day. Everything we do depends on the environment around us. In this unit, you will learn some ways people interact with our environment. You'll also learn how the things we do can affect our environment. Then, you'll learn about some of the natural things that can affect Earth.

There are six lessons in this unit:

- 1 Earth Features and Processes** If you drove across Pennsylvania, you would see many different features. You would see mountains, rivers, and even caves. In this lesson, you will learn about the different Earth features in Pennsylvania. You will also learn how these features formed.
- 2 Natural Resources** Materials that we get from the environment are called *natural resources*. Pennsylvania has many natural resources. In this lesson, you will learn about different kinds of resources and the ways we use them. You will also learn how human actions can affect our environment.
- 3 Water on Earth** Water covers almost three-fourths of Earth's surface. In this lesson, you will learn where water is present on Earth. You will learn about different types of water bodies. You will also learn how water cycles between these water bodies, the air, and the land.
- 4 Watersheds and Wetlands** Watersheds are important areas of land. They drain rainwater into particular bodies of water. Wetlands are bodies of water that help the environment. In this lesson, you will learn about the importance of watersheds and wetlands to water on Earth.
- 5 Weather** The weather changes from day to day. Some days are sunny. Some days are cloudy. In this lesson, you will learn about the tools scientists use to observe and predict the weather. You will also learn how scientists use graphs and charts to observe weather patterns.
- 6 The Sun-Earth-Moon System** The sun and moon are easy to see in Earth's sky. However, it is not easy to see how they really move. In this lesson, you will learn how the motions of Earth, the sun, and the moon relate to one another. You will also learn how these motions affect things that happen on Earth.

Earth's surface does not look the same everywhere. Some areas are flat. Some areas have many hills and mountains. Water covers the surface in other areas.

Landforms

Mountains, valleys, and caves are Earth features. So are watersheds and wetlands. Scientists sometimes call Earth features **landforms**. Landforms can be large or small. Pennsylvania has many different landforms.

The Appalachian Mountains cross the eastern part of Pennsylvania. They also pass through many other states on the east coast of the United States. Like other mountains, the Appalachians are large areas of land that are taller than the land around them. Most mountains have sharp, rough tops. They are made mostly of rock.

Some areas are lower than the land around them. These areas are called **valleys**. Many rivers and streams flow through valleys. For example, the Allegheny River in western Pennsylvania flows through the Allegheny River valley.

In some places, areas of land stick out into bodies of water. A large area of land that reaches out into a body of water is called a **peninsula**. Delaware and parts of Maryland are on a large peninsula that sticks out into the Atlantic Ocean.



A **landform** is a feature at or below Earth's surface. Mountains, valleys, rivers, lakes, and caves are examples of landforms.

You can learn more about watersheds and wetlands in Unit 4, Lesson 4.

A **valley** is an area of Earth's surface that is lower than the land around it.

You can learn more about rivers, streams, and other water bodies in Unit 4, Lessons 3 and 4.

A **peninsula** is an area of land that sticks out into a large body of water.

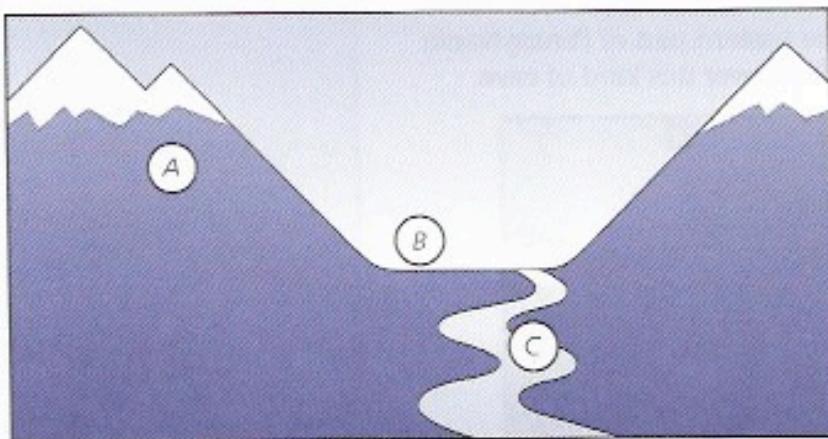
Some landforms are found below Earth's surface. For example, **caves** are holes in the rock below Earth's surface. Some caves are so small that people cannot fit in them. Some caves are so large that they could hold hundreds of people.

Sometimes, the roof of a cave is not strong enough to hold up all the ground above it. Then, the roof of the cave falls in. The ground above the cave falls down into the cave. This forms a **sinkhole**. Sinkholes can be dangerous if they form near roads or people's homes.



Sinkholes form when the ground falls into a cave below.

The picture below is a model of three Earth features. Which of these describes the three Earth features correctly?



- A A is a mountain, B is a valley, and C is a river.
- B A is a mountain, B is a sinkhole, and C is a valley.
- C A is a valley, B is a mountain, and C is a peninsula.
- D A is a valley, B is a peninsula, and C is a mountain.

The Earth feature labeled A is taller than the surrounding land and has a rough peak, so it must be a mountain. Choice C and choice D are incorrect. The Earth feature labeled B is lower than the land around it, so it must be a valley. Choice B is incorrect. The Earth feature labeled C is a river. The correct choice is A.

A cave is a natural space in the rock below Earth's surface.

A sinkhole is a place in which the roof of a cave has collapsed and the ground above it has fallen into the cave.

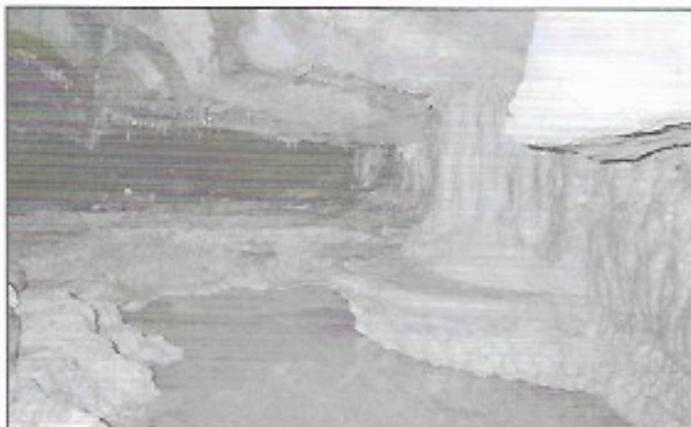
How Earth Features Form

Many different processes form the features of Earth's surface. Two important processes are weathering and erosion. **Weathering** is the process of breaking big rocks into smaller pieces. The smaller pieces are called **sediment**. Sand, mud, clay, and gravel are examples of sediment.

Water causes most of the weathering on Earth. Moving water in rivers and streams can carry tiny pieces of rocks in it. As the water flows over bigger rocks, the small rock pieces in the water grind against the bigger rocks. This wears the bigger rocks down. Over time, pieces of the bigger rocks can break off. In this way, a river or stream can form a valley by cutting through the rock below it.

Water can also cause weathering by dissolving rock. Some kinds of rock can dissolve in water the same way sugar and salt can dissolve in water. As the water flows around these rocks, they slowly dissolve. After a while, they disappear.

Many caves form when water dissolves rock. Water can flow through tiny holes in underground rock. It can dissolve the rock as it flows. In time, the water can dissolve so much of the rock that it forms caves. Many of the caves in the eastern part of Pennsylvania formed in this way. Most sinkholes form over this kind of cave.



Water runs through this cave in Franklin County. The water is slowly dissolving the rock and making the cave larger.

In cold areas, ice can weather rock. During warm weather, water seeps into the cracks in a rock. When the weather gets cold, the water freezes. Water expands, or gets larger, when it freezes. As it expands, it makes the cracks in the rock larger. The cracks can get so big that parts of the rock break off. Many rocks in Pennsylvania have large cracks from this kind of weathering.

When a rock breaks down into sediment, the sediment does not generally stay in the same place. Instead, water, wind, and ice may move the sediment. For example, at the ocean, waves pick up sand and drag some of it out to sea. This is an example of erosion. **Erosion** is the movement of sediment.

Weathering is the process in which rocks are broken down into smaller pieces.

Sediment is pieces of broken rock.

Erosion is the process in which sediment is moved over Earth's surface.

Moving water is the main cause of erosion. For example, the water in many large rivers looks brown and cloudy. The water looks this way because it is carrying millions of tiny pieces of sediment.

Erosion shapes many of the features on Earth's surface. Many of the river valleys in Pennsylvania formed when rivers weathered and eroded the rock below them. Peninsulas form when water erodes some but not all areas of land.

Erosion also causes mountains to become smaller over time. For example, the Appalachian Mountains were once very tall, steep, and jagged. Today, they are shorter, rounder, and smoother. They have become smoother over time because of erosion. The rock in the mountains has been broken down and carried away.



The Appalachian Mountains were once much taller.
Erosion has made them shorter and less steep.

Glaciers are huge rivers of ice. They can also cause erosion. As a glacier moves over the land, it picks up and carries sediment. Glaciers can erode a great deal of land as they move. They form huge valleys.

When the glaciers melt, the valleys can fill with water. This process forms large lakes. The bottom of Lake Erie formed when a glacier carved a huge valley in North America more than 12,000 years ago. When the glacier melted, the valley filled with water and became Lake Erie.

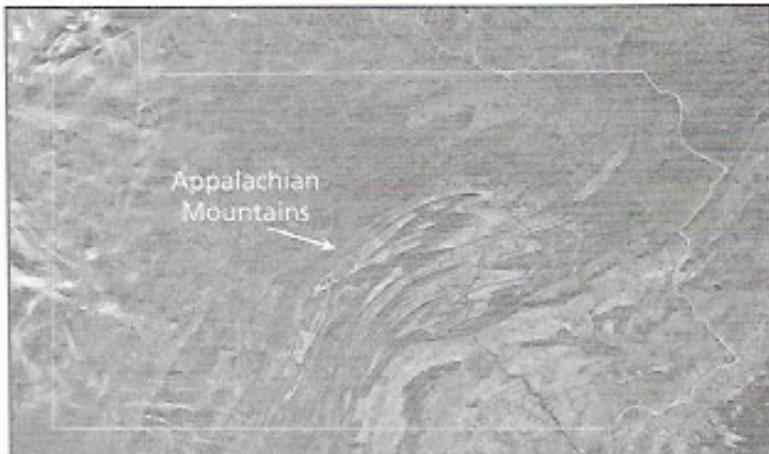
Weathering and erosion do not form all Earth features. For example, although erosion can shape mountains, it does not form them. Most mountains form where huge pieces of Earth's crust collide, or push together.

The huge pieces of Earth's crust are always moving. In places where they are moving together, the crust can bend and buckle. Over millions of years, the crust folds and crumples just as a soda can does when you crush it. The folded crust forms mountains.

Hundreds of millions of years ago, the piece of crust with North America on it crashed into the piece of crust with Europe on it. The crust crumpled up and folded. The folded crust formed the Appalachian Mountains.

A glacier is a huge body of ice that flows slowly over Earth's surface.

Ice, wind, and water cannot carry sediment forever. When water or wind slow down or glaciers melt, the sediment they are carrying falls to the ground. This is called deposition. Deposition helps to form many kinds of landforms.



This image shows how the crust is folded and crumpled in the Appalachian Mountains.

The pieces of crust that formed the Appalachian Mountains are no longer pushing together. Over time, erosion has made the Appalachian Mountains shorter. When the mountains first formed, they were as tall and steep as the Himalaya Mountains.

A landform formed when running water weathered and eroded the land below it. The water cut down into the land. Which Pennsylvania landform does the landform probably look like?

- A Lake Erie
- B Crystal Cave
- C the Pocono Mountains
- D the Susquehanna River valley

Lake Erie formed because of erosion by a glacier, so choice A is incorrect. Most caves form when water dissolves rock under the ground, not when water erodes the land below it. Choice B is incorrect. Most mountains form when pieces of Earth's crust crash into each other. Choice C is incorrect. Most valleys form when running water weathers and erodes the land below it. The landform is probably a valley. The correct choice is D.

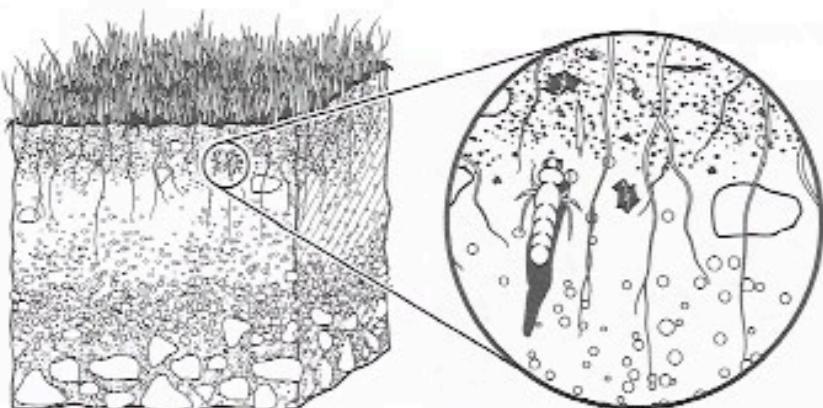
You may not know very much about all the landforms in this question. Even if you do not recognize some of the answer choices, you can use inference to figure out whether they are correct. For example, even if you do not know how Crystal Cave formed, you can think about how *most* caves form. That can help you figure out how Crystal Cave probably formed.

Soil

Weathering breaks rock down into smaller pieces. Many of these rock pieces become part of soil. **Soil** is the loose material that covers the ground in many places. Below the soil is solid rock called bedrock.

Soil is loose material made of sediment, the remains of organisms, water, air, and living things.

Soil is made of sediment and the remains of dead plants and animals. These remains look black and spongy. Most soil also contains water, air, and many living things. If you use a hand lens to look closely at a sample, you can see the different parts that make up soil.



Soil contains pieces of rocks and minerals, water, air, and pieces of dead plants and animals.

A student is studying some soil from his schoolyard and some soil from a park. He looks at each soil with a hand lens. The soil from the schoolyard is light brown and sandy. The soil from the park is very dark brown and soft.

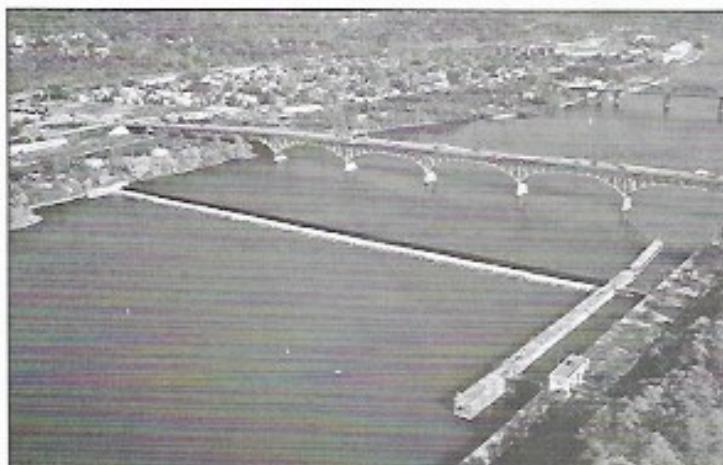
- A Name two things that are probably in both the soil from the park and the soil from the schoolyard.
- B Name one thing that is probably in the soil from the park that is probably not in the soil from the schoolyard. Explain your answer.

Like most soils, the soil in the park and the soil in the schoolyard probably both contain sediment, air, and water. The remains of dead plants and animals can make soil look dark and spongy. The soil from the park is very dark and soft-looking. It probably contains the remains of dead plants and animals. The soil from the schoolyard is light-colored and sandy. It probably does not contain the remains of plants and animals.

It's Your Turn

Please read each question carefully. To answer each multiple-choice question, circle the correct response.

Use the picture below to answer question 1.



- 1 Which of these Pennsylvania landforms does the picture most likely show?**
 - A Crystal Cave
 - B the Monongahela River
 - C the Allegheny Mountains
 - D the Presque Isle Peninsula

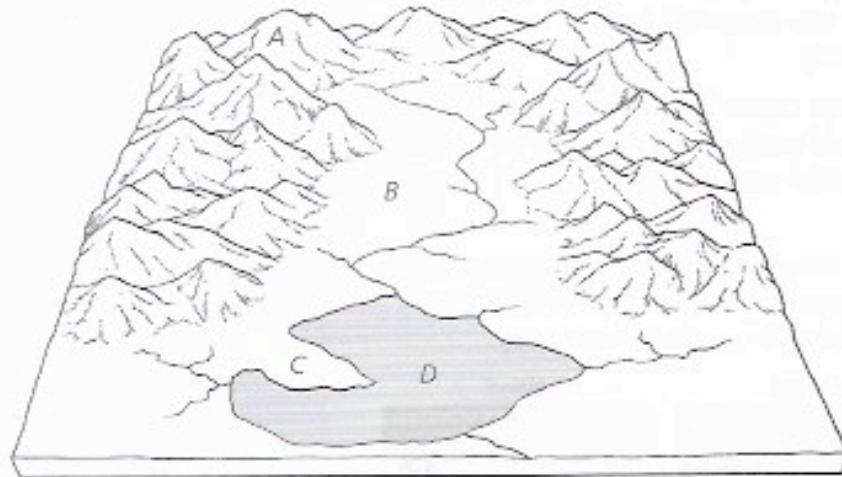
- 2 A sinkhole forms beneath a road. What was most likely beneath the road before the sinkhole formed?**
 - A a cave
 - B solid rock
 - C moving pieces of crust
 - D an underground peninsula

- 3 A scientist looks at some soil with a magnifying glass. Which of these are most likely what the scientist sees?**
 - A rock pieces only
 - B remains of dead organisms only
 - C rock pieces and water drops only
 - D rock pieces, water drops, and remains of dead organisms

4 A scientist is studying a landform in Pennsylvania. She learns that it formed when two huge pieces of Earth's crust collided. Which of these landforms is she most likely studying?

- A Lake Erie
- B Penn's Cave
- C the Susquehanna River
- D the Pocono Mountains

Use the picture below to answer question 5.



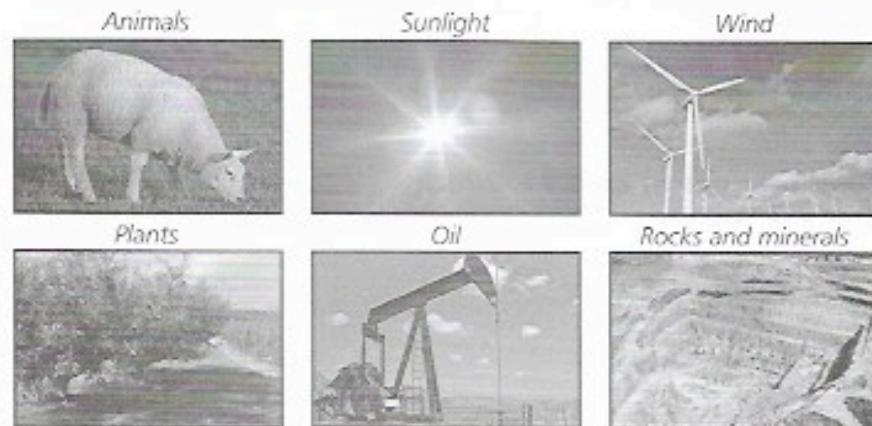
5 The model shows some natural features of an area. Which feature in the model shows a peninsula?

- A feature A
- B feature B
- C feature C
- D feature D

Natural resources are materials from the environment that people use. Plants and animals are examples of natural resources. People use parts of trees and other plants for food. They also use trees to make furniture, buildings, and paper. People use many animals for food, too. They also use materials from animals, such as wool and leather, to make clothing.

Many natural resources do not come from living things. Oil is an example of this kind of natural resource. People use oil to heat buildings. They also use oil to make gasoline, plastics, and fabrics for clothing.

Even sunlight and wind are natural resources. Sunlight gives people light and warmth. Wind pushes sailboats and windmills. Some people use sunlight and wind to produce electricity.



Natural resources include living and nonliving things.

Rocks and minerals are natural resources, too. People use rocks and minerals in many different ways. They use some rocks to make buildings or concrete. Road salt is a mineral that people put on icy roads. The salt helps melt the ice. Many metals are also minerals. People use metals to make bridges, jewelry, and cars. They also use metals to make wires that carry electricity.

Renewable Resources

Some natural resources people use do not run out. A resource people will not run out of is called a **renewable resource**. Sunlight, wind, and clean water are examples of renewable resources. Earth will not run out of sunlight or wind. Clean water will not run out if people use it wisely.

A **natural resource** is anything people take from the environment to meet their needs.

A **renewable resource** will either not run out, or it can be replaced if it does run out.

People need clean water for drinking, cooking, and bathing. Farmers need clean water to grow crops. Most dirty or used water ends up in oceans and lakes. This water evaporates and forms clouds. When water evaporates, it becomes clean. Rain and snow that fall from clouds help renew our supply of clean water.

You can learn more about how water cycles through the environment in Unit 4, Lesson 3.

Energy from moving water is also a renewable resource. People can use this energy to produce electricity. To do this, people build dams across rivers. As water falls over a dam, it turns a generator. As the generator turns, it produces electricity.

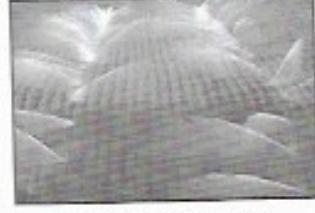
Recreation



Drinking



Growing crops



Producing electricity



People use water resources in many ways.

Plants and animals are also renewable resources. Trees are renewed when new trees grow. Animal resources are renewed when more animals hatch or are born.

People need to use renewable resources wisely so that they do not run out. If people waste water or pollute rivers and lakes, they will run out of clean water before rain and snow bring more. If they cut down trees faster than new ones grow, there may not be enough trees left for all their needs. If people take too many fish from oceans, bays, and rivers, they might run out of fish before new fish can replace them.

What can people do to make sure that clean water is always a renewable resource?

- A water crops on farms every day
- B use water to make electricity
- C remove pollution from water
- D keep sink faucets turned on

Watering crops every day can waste the supply of clean water. Keeping sink faucets turned on can also make the supply of clean water run out. Therefore, choices A and D are incorrect. Using water to make electricity does not affect whether it is renewable. So, choice B is incorrect. Keeping water clean by removing pollution can help make sure that water is renewable. Therefore, the correct choice is C.

Nonrenewable Resources

A resource that people can run out of is called a **nonrenewable resource**. Nonrenewable resources form very slowly over millions of years. Fossil fuels, metals, and other minerals are examples of nonrenewable resources.

Fossil fuels include coal, oil, and natural gas. People pump or dig them out from under the ground. Fossil fuels release energy when they burn. Most people use energy from fossil fuels to heat their homes and run their cars. They burn fossil fuels to make electricity. People also use fossil fuels to make materials such as plastic and polyester. Many of the products people use every day are made from these materials.

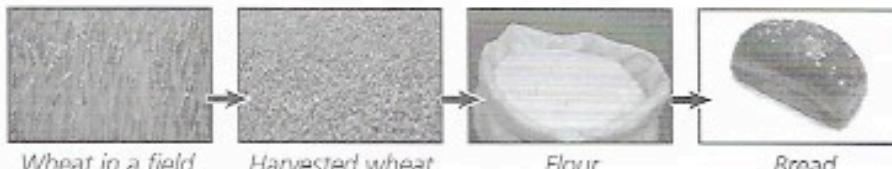
Some nonrenewable resources are running out. Earth has a limited supply of oil. If people continue to use oil, the supply will run out. Some people are now using energy from renewable resources, such as moving water, wind, sunlight, and plants, instead of fossil fuels.

Using Resources

Most resources are not used just as they come from nature. They are used to make products. The products may look very different from the natural resources used to make them.

Imagine a piece of bread with butter. It does not look like a plant or an animal. You do not see any fruits, vegetables, or meat. But without plants and animals, there would be no bread or butter.

Many breads are made from wheat. People grind wheat to make flour. Then they use the flour to make bread. They also use flour to make products such as cereal, noodles, and cookies.



The butter on the piece of bread came from an animal. People use the milk from animals such as cows to make butter. They also use milk to make ice cream, yogurt, and cheese.

People cannot keep making products if natural resources run out. To keep from wasting natural resources, people should use resources and products wisely. Using products wisely means not buying and using more than is needed. It also means finding ways to reuse products such as bottles and bags.

A nonrenewable resource will run out one day.

Fossil fuels form over millions of years from the remains of plants and animals.

Many renewable resources such as clean water, plants, and animals, can become nonrenewable if people waste them or use them too quickly.

Polyester is a fiber that people can use to make fabric. Polyester is a human-made fiber. In contrast, cotton and wool are natural fibers. Cotton comes from a plant, and wool comes from animals.

Wheat is a grain. Rye, oats, barley, corn, and rice are other grains people use to make food products.

Another way to use resources wisely is to recycle them. People can recycle many products. When a product is **recycled**, the materials used to make it are reused to make other products. Paper, glass, and most kinds of plastic can be recycled. Even some kinds of fabrics can be recycled.

For example, when people recycle glass bottles, the bottles are taken to a factory. At the factory, machines break the bottles into small pieces. Then, other machines melt the glass pieces. The melted glass is used to make new bottles.

Forests provide many of our renewable resources in Pennsylvania.

- A Give four examples of products that people can make with resources from a forest.
- B Explain how renewable forest resources could become nonrenewable.

People can use the wood from trees in a forest to make paper and to build homes. They can use parts of some trees and other plants for food. For example, many people eat maple syrup. Maple syrup comes from maple trees. People can eat the berries from some kinds of forest bushes. People can also eat some of the animals that live in forests. Some renewable forest resources will run out if we use too many of them or use them too quickly. If people cut down trees in a forest faster than new trees can grow, the trees will become a nonrenewable resource.

When people recycle, they use the materials in old products to make new products. You can help recycle by taking products with the recycle symbol to a recycling center.



Some benches are made with plastic that was once part of milk jugs. A single bench can use the plastic from 1,000 or more milk jugs!

Most fibers for paper come from trees. Scientists are looking for ways to make paper from plants that grow faster than trees. Plants that grow fast can be renewed more quickly.

It's Your Turn

Please read each question carefully. To answer each multiple-choice question, circle the correct response.

- 1 Which of the following most likely describes the use of a renewable resource?

- A drinking a glass of water
- B making a bridge out of metal
- C using natural gas to heat a house
- D burning coal to produce electricity

- 2 Which person shown below is using a nonrenewable resource?



- 3 What natural resources do people use to make these containers?



- A oil
- B animals
- C minerals
- D renewables

4 Which of these is an example of a product that people make from plants?

- A pasta
- B cheese
- C wool sweater
- D leather jacket

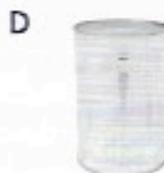
Use the picture below to answer question 5.



5 Which of these is least likely true about the resource shown in the picture?

- A It is not helpful to people.
- B It is a renewable resource.
- C People can use it to make electricity.
- D People can use it for sports and games.

6 Which of these products comes from animals?



You can find water in many different places on Earth. Water can be in oceans, lakes, rivers, and other water bodies. It can also be in clouds, rain, snow, and ice. There is even water in the air that you can't see. Water can be a solid, liquid, or gas. All water on Earth can change between these states of matter.

Types of Water Bodies

Water covers almost three-fourths of Earth's surface. This water is in many different types of water bodies. Oceans are the largest water bodies on Earth. They hold most of Earth's liquid water. The shallow place where oceans meet land is called the coast. When the coast bends inland, it can create a body of water called a bay. A **bay** is surrounded by land on three sides. Oceans and bays have salty water so they are called **saltwater bodies**.

Some types of wetlands also have salty water. A **wetland** is an area of land that is under water all or part of the time. When water that covers land comes from an ocean or a bay, it can form a saltwater wetland. Wetlands such as salt marshes and mangrove swamps have salty water.

Ocean



Salt marsh



Oceans and some wetlands have salty water.

Some wetlands are **freshwater bodies**. The water in a freshwater body has very little salt or no salt. Many freshwater wetlands form along rivers, streams, and creeks.

Rivers, streams, and creeks are also freshwater bodies. They move water over land from one place to another. Streams and creeks are generally smaller than rivers. Streams and creeks can flow into large streams or into rivers. Small rivers generally flow into big rivers that lead to the ocean.

The three common states of matter are solid, liquid, and gas. Water is matter because it has mass and volume. You can learn more about properties of matter in Unit 3, Lesson 1.

A **bay** is a body of saltwater that is surrounded by land on three sides.

Saltwater bodies contain salt.

A **wetland** is an area of land that is covered by water all or part of the time.

Freshwater bodies contain little or no salt.

A stream that flows into a larger stream, a river, or another body of water is called a **tributary**.

Ponds and lakes are other types of freshwater bodies. They are pools of water that do not flow over land. Ponds are shallow and are smaller than lakes. Lakes are generally large and deep.



Streams, ponds, lakes, rivers, creeks, and some wetlands have fresh water.

Which of these best describes most of the water on Earth?

- A frozen
- B salty
- C in large rivers
- D in freshwater bodies

Some water on Earth is frozen, but most water is not. So choice A is incorrect. Most of the water on Earth is in the oceans. So choices C and D are incorrect. Oceans are salty, so the correct choice is B.

Water Systems

The water in some freshwater bodies moves quickly. The water in others moves slowly or not at all. Scientists put freshwater bodies into two groups based on how quickly the water flows.

In **lotic systems**, water flows over land from one point to another. The water flows very quickly. It generally moves downhill. Rivers, streams, and creeks are examples of lotic systems. Because water in rivers moves quickly, people use some rivers for transportation.

Like all systems, a lotic system is made up of many parts. The living parts of a lotic system must be able to survive in fast-moving water. For example, fish that live in lotic systems have strong fins to help them swim in the fast-moving water.

The water in a **lotic system** is fast moving. It flows quickly over land.

You can learn more about how people use water resources in Unit 4, Lesson 2.

In **lentic systems**, water is mostly still or standing. It does not flow or it moves very slowly. Lakes and ponds are examples of lentic systems. Look at the pictures on page 149 to see the difference between moving water in a stream and standing water in a pond. Some freshwater wetlands also have standing water. However, other wetlands, such as swamps, have water that flows. The living things in lentic systems have features that let them survive in slow-moving water. For example, water lilies have long stems that let them float on the tops of lakes and marshes.

Pennsylvania has many important lotic and lentic systems. The Allegheny River, Susquehanna River, and Delaware River are three lotic systems that flow through the state. Lake Erie is a lentic system that borders part of western Pennsylvania. Raystown Lake is also a lentic system. It is the largest lake within Pennsylvania.



Pennsylvania has many lotic and lentic systems.

The Allegheny Reservoir is a lentic system.

- Would you expect to find plants that grow in still water in the Allegheny Reservoir? Explain your answer.
- How is the movement of water in the Ohio River different from the movement of water in the Allegheny Reservoir?

A lentic system has still or slow-moving water. Because the Allegheny Reservoir is a lentic system, plants that grow in still water could be found there. Rivers are lotic systems. Water in the Ohio River flows quickly. However, water in the Allegheny Reservoir moves slowly or not at all.

The water in a lentic system is slow moving or still.

A reservoir is a place where fresh water collects. People use this water for drinking, cooking, bathing, and watering crops.

The Water Cycle

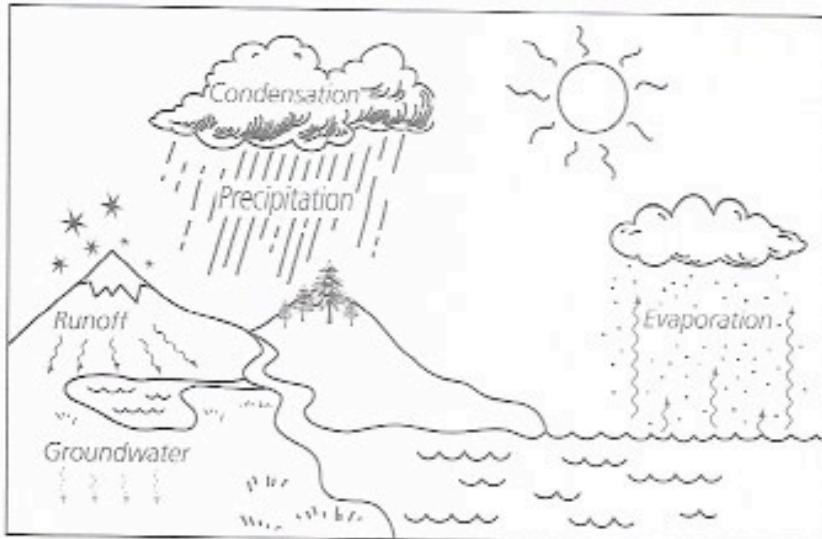
The water you see on Earth today is the same water that was on Earth millions of years ago. The water on Earth is constantly moving, from water bodies to clouds, rain, and snow. Earth's water moves in a cycle called the **water cycle**. You can find water in all steps of the cycle at any time on Earth.

Remember that water can be a solid, liquid, or gas. When water is a gas, it is called **water vapor**. Water vapor is in the air all around you. When water vapor cools, it changes from a gas to a liquid. This process is called **condensation**. Condensation causes water droplets to form on the outside of a cold drinking glass. The cold glass causes water vapor in the air to change from a gas to a liquid. Water vapor high in the air acts the same way when it cools. It condenses into liquid droplets. If enough droplets collect in one area, they form a cloud.

When a lot of water condenses into clouds, the clouds become heavy. When the clouds can no longer hold the water droplets, the drops fall to Earth's surface. Water falling to Earth's surface is called **precipitation**. Precipitation can be rain, snow, sleet, ice, or hail.

When water falls as precipitation, some of it seeps into the ground and some of it flows over land. **Groundwater** is water that is below the ground. Most groundwater is found in rocks and soil. Groundwater can stay underground or it can move through the ground to water bodies such as lakes and oceans. **Runoff** is water that does not soak into the ground. Runoff flows over Earth's surface into bodies of water.

Energy from the sun heats bodies of water. This heat causes water to change from a liquid to a gas. This process is called **evaporation**. The water vapor rises into the air. Eventually, some of the water vapor in the air condenses and forms clouds. In this way, the water cycle repeats.



The **water cycle** is the path water takes as it moves between the oceans, the land, and the air. Water is constantly moving through the water cycle.

When water is a gas, it is called **water vapor**.

During **condensation**, a gas changes into a liquid.

Precipitation is liquid or solid water falling to Earth's surface.

Groundwater is water within rocks and soil underground.

Runoff is water that flows over land instead of soaking into the ground.

During **evaporation**, a liquid changes into a gas.

Remember that water vapor is an invisible gas. It is in the air all around us, but we cannot see it. When you see water in the air, such as steam rising from a teapot, you are seeing tiny drops of liquid water, not water vapor.

The water cycle is a system because it is made up of many parts. It is also a pattern because it repeats in a cycle.

A boy sees a puddle in the parking lot after a rainstorm. The next day, the puddle has gotten smaller. What most likely happened to the water in the puddle?

- A It condensed.
- B It evaporated.
- C It became colder.
- D It became dirtier.

Read each answer choice carefully. Decide if each choice describes something that could make the puddle get smaller. Condensation happens when water turns from a gas into a liquid. Adding liquid to the puddle would make it bigger, not smaller. So choice A is incorrect. If the water became colder or dirtier, it would not make the puddle smaller. So, choices C and D are incorrect. Evaporation happens when a liquid turns into a gas. If some of the liquid in the puddle evaporated, the puddle would become smaller. The correct choice is B.

It's Your Turn

Please read each question carefully. To answer each multiple-choice question, circle the correct response.

- 1 Which statement best describes what happens when water in the air condenses?

- A It changes from a gas to a solid.
- B It changes from a liquid to a gas.
- C It changes from a gas to a liquid.
- D It changes from a liquid to a solid.

- 2 Which group of words most likely describes the water in Lake Waullenpaupack?

- | | |
|-------------------------------|-------------------------------|
| A deep, fast-moving, fresh | C shallow, fast-moving, salty |
| B shallow, slow-moving, salty | D deep, slow-moving, fresh |

Use the picture below to answer question 3.



- 3 Which statement best explains why the Susquehanna River is considered a **lotic** system?

- A There are wetlands near the Susquehanna River.
- B The Susquehanna River flows through Pennsylvania.
- C The Susquehanna River is north of the Chesapeake Bay.
- D The water in the Susquehanna River flows into the Chesapeake Bay.

Watersheds and Wetlands

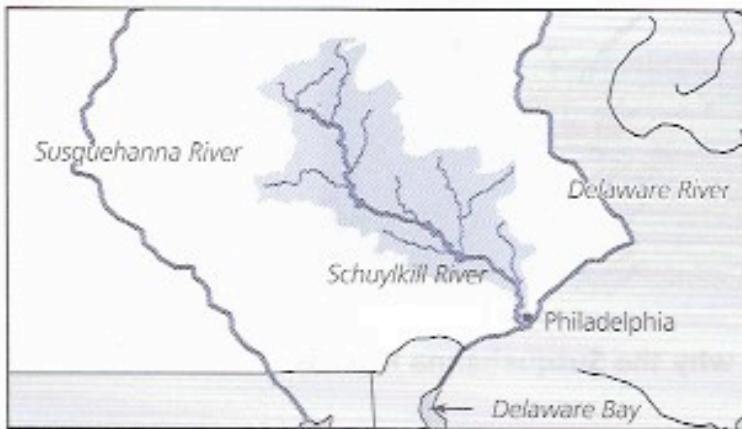
Anchor and Eligible Content S4.D.1.3.4

Water constantly moves in a cycle between the air, the land, and bodies of water. During part of the water cycle, water falls to Earth from clouds. This water can end up in many different places. Sometimes the water can become dirty or polluted. The water can then carry pollution to a different area.

Watersheds

When water falls to the ground, some of it becomes runoff. Runoff flows over land into creeks, streams, and rivers. The creeks flow into streams. Rivers form when these streams combine. The area of land that water flows over to reach a river is called the river's **watershed**. A watershed can be a large area of land.

The shaded area in this map shows the watershed for the Schuylkill River in Pennsylvania. Runoff anywhere in this watershed will eventually drain into the Schuylkill River. It will flow into creeks that lead to the Schuylkill River. It will not flow into the Susquehanna River. The Schuylkill River eventually meets up with the Delaware River and empties into Delaware Bay.



Pollution anywhere in a river's watershed can lead to pollution in the river. When runoff moves over land, it can wash litter and harmful chemicals into creeks. The creeks carry the pollution to the river. The river carries the pollution to other bodies of water.

Not all of the water that falls in a watershed becomes runoff. Some of the water evaporates and returns to the air as water vapor. Plants and animals use some of the water. Some of the water soaks into the ground. It collects in rocks and soil underground as groundwater.

Water flows over land to a particular body of water.

A **watershed** is an area of land that water flows over to reach a particular body of water.

The Delaware Bay also has a watershed. Runoff in this watershed will eventually flow into the Delaware Bay. Because the Schuylkill River eventually empties into the Delaware Bay, the Schuylkill River watershed is part of the Delaware Bay watershed.

You can learn more about pollution and changes to the environment in Unit 2, Lesson 6.

Groundwater is a source of fresh water for people. People pump groundwater up through wells. They use it for drinking, cooking, bathing, and watering crops. Water that soaks into the ground can help recharge, or refill, the supply of groundwater.

Lancaster is a city in Pennsylvania. It is part of the Susquehanna River watershed.

- A Describe three things that can happen to rain that falls in Lancaster.
- B Explain how litter in Lancaster could end up in the Chesapeake Bay.

Rain that falls in a watershed can become runoff and flow over land to streams, creeks, and rivers. It can soak into the ground and become groundwater. It can evaporate and become water vapor. Plants and animals can also use the water. Runoff can wash litter from Lancaster into streams. The streams flow to the Susquehanna River. The Susquehanna River flows into the Chesapeake Bay. So rain can carry litter from Lancaster to the Chesapeake Bay.

Like many open-ended questions, Part A of this question has more than one correct answer. Any three of the possible responses shown for Part A would be correct.

Wetlands

Some water in a watershed can end up in wetlands. **Wetlands** are areas of land that are under water for at least part of the year. They can have fresh or salty water. Wetlands have salty water when water washes over them from oceans and bays. They have fresh water when water washes over them from streams, creeks, rivers, and lakes. Water in wetlands can be still or flowing.

Three main types of wetlands are marshes, swamps, and bogs. Grasses such as reeds and cattails grow in marshes. Woody trees and shrubs grow in swamps. In a bog, the water is shallow. The ground underneath it is soft. It is made of a certain kind of moss that grows only in bogs. Cranberries and some other plants also grow in bogs.

A wetland is an area of land that is covered by water all or part of the time.

Marsh



Swamp



Cranberry bog



Wetlands are important to the environment in many ways.

Wetlands are important because they filter water. This means that they remove pollutants, extra nutrients, and **sediments** from water. Water from many wetlands flows into lakes, rivers, and oceans downstream. By filtering water, wetlands improve the quality of water that flows into these bodies of water.

Wetlands also help prevent floods. Rain that overflows from bodies of water such as rivers soaks into wetlands. This keeps much of the water from flowing over roads and into homes. The water that soaks into wetlands can become groundwater.

Wetlands can also help prevent water from eroding land. Remember that runoff can carry sediments as it moves over the land. Runoff can erode land. Water that collects in wetlands does not become runoff.

Wetlands are also important for living things. Many kinds of living things can live only in wetlands. In addition, many animals raise their young in wetlands. Wetlands help to protect the young from predators. They also give the young food.

A marsh forms along the edge of a river. What will most likely happen to the marsh if the river overflows?

- A It will erode.
- B It will wash away.
- C It will become a swamp.
- D It will soak up the extra water.

A marsh is a type of wetland. Wetlands can help prevent erosion of land along the edges of water bodies. Choice A is incorrect. Marshes and swamps are different types of wetlands. A marsh does not become a swamp when a river floods. Choice C is incorrect. Like all wetlands, marshes can soak up a lot of water. They will not wash away. Therefore, choice B is incorrect. The correct choice is D.

Sediments are small pieces of rock and other materials. As runoff moves over land, it can carry sediments to bodies of water.

People did not always realize the importance of wetlands. They used to fill wetlands in with land and build houses and farms on them. Today, many wetlands are protected areas.

Many birds, fish, crabs, and other animals are born or hatch in swamps and marshes. These wetlands are important nurseries. Some animals leave the wetland once they have grown.

It's Your Turn

Please read each question carefully. To answer each multiple-choice question, circle the correct response.

- 1 A person pours gasoline on the ground outside his house. The gasoline ends up in a river 50 miles away. What is the most likely reason for this?

- A The person's house is in the river's watershed.
- B The gasoline moved through the air to the river.
- C The person's house is close to many large wetlands.
- D The river flooded before the person poured the gasoline.

Use the picture below to answer question 2.



- 2 This is a picture of a wetland. What most likely happens to water as it flows through the wetland?

- A It erodes the land.
- B It becomes cleaner.
- C It picks up sediments.
- D It carries more chemicals.

- 3 Which of these would most likely happen if people changed a large marsh in a river's watershed to dry land?

- A The river would become cleaner.
- B The river would flood more often.
- C The river would filter more water.
- D The river would cause less erosion.

- 4 Which process is more likely to happen in an area with wetlands than in an area without wetlands?

- A rivers flooding
- B groundwater recharging
- C riverbanks eroding
- D runoff increasing

The weather changes from day to day. Some days it is cloudy and rainy. Other days it is sunny and warm. People use tools to observe and predict weather. They can also predict weather by looking at the clouds in the sky.

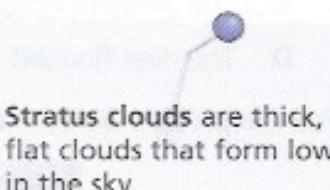
Clouds and Weather

One way people can observe and predict weather is by looking at the clouds. Remember that clouds form when water vapor in the air forms tiny droplets of water. Clouds come in many different shapes. Scientists classify clouds by their shapes and the types of weather they bring. When you know what weather different clouds bring, you can predict the weather too.

Stratus clouds are thick, flat clouds. They form low in the sky and block out the sun. Stratus clouds bring cooler, overcast days.

Cirrus clouds are wispy and look like feathers. Cirrus clouds form high in the sky. They are very thin. Sunlight can pass through them. You may see cirrus clouds on sunny days. **Cumulus clouds** look like puffy cotton balls. They float low in the sky on warm, sunny days.

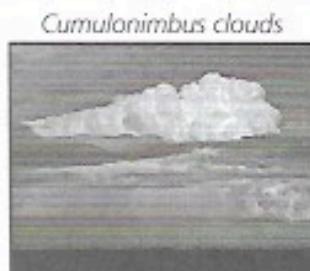
If it is a windy and damp day, a cumulus cloud can turn into a **cumulonimbus cloud**. When *nimbus* is attached to a cloud name, it means that the cloud brings rain or snow. In Latin, *nimbus* means “rain.” Cumulonimbus clouds bring thunderstorms and rain showers. They can also cause tropical hail storms and tornadoes.



Cirrus clouds are wispy clouds that form high in the sky.

Cumulus clouds are low, puffy clouds that form on sunny days.

Cumulonimbus clouds are cumulus clouds that bring thunderstorms and rain.



A scientist is observing the weather. He sees dark clouds low in the sky. They block the sunlight. It starts to rain. What type of clouds did the scientist observe?

- A cirrus
- B cumulus
- C cirrocumulus
- D nimbostratus

Cirrus clouds are high in the sky, so choice A is incorrect. You would normally see cumulus clouds on a sunny day, so choice B is incorrect. Choice C is a combination between cirrus clouds and cumulus clouds. Both appear on sunny days, so a cirrocumulus cloud appears on sunny days, too. Choice C is incorrect. Stratus clouds appear low in the sky, and a nimbus cloud brings rain. The correct choice is D.

Using Tools to Study Weather

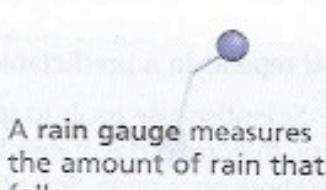
Scientists use tools to describe and predict weather. Scientists use thermometers to observe changes in temperature. These tools measure the temperature of the air. When air heats the liquid inside the thermometer, the liquid expands and moves up the tube.

Scientists use a **rain gauge** to measure the amount of rain that has fallen. A rain gauge is a clear tube with a scale on the side. The scale helps scientists measure the amount of rain easily. The scale shows the amount of rain in millimeters.

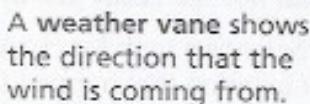
Scientists look at a **weather vane** to see which direction the wind is blowing from. Weather vanes have north, south, east, and west arms. As the wind blows, an arrow above the arms points in the direction the wind is blowing from.

An **anemometer** measures wind speed. Cups attached to arms on the top catch the wind. As the arms turn, a dial on the anemometer shows the wind speed.

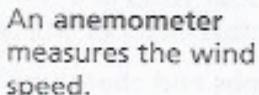
Scientists use a **barometer** to measure changes in air pressure. Air pressure is how much the air in the atmosphere pushes on a certain place. Barometers show whether air pressure is increasing or decreasing. Increasing air pressure brings warm and dry weather. Decreasing air pressure brings rainy and stormy weather.



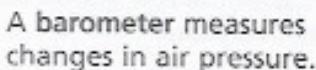
A rain gauge measures the amount of rain that falls.



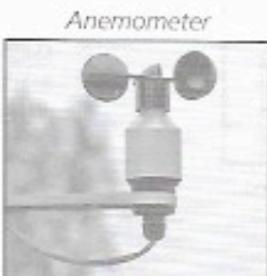
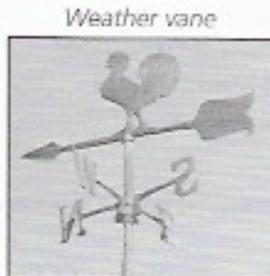
A weather vane shows the direction that the wind is coming from.



An anemometer measures the wind speed.



A barometer measures changes in air pressure.



These are some tools that scientists use to study weather.

A scientist measured the wind speed and direction every day for a week. What two instruments did she use?

- A anemometer and barometer
- B thermometer and weather vane
- C weather vane and barometer
- D anemometer and weather vane

Barometers measure air pressure. Thermometers measure temperature. Therefore, choices A, B, and C are incorrect. A weather vane shows the direction of the wind, and an anemometer measures the speed of the wind. So the correct choice is D.

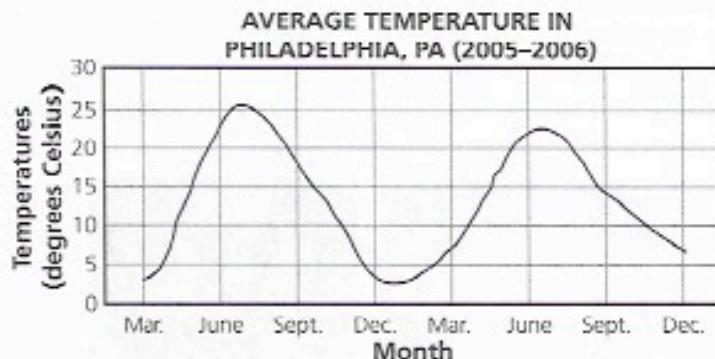
Recording and Predicting Weather

Graphs and charts help scientists study how weather changes over time. They also help scientists predict weather. Most of the time, weather happens in patterns. A **weather pattern** is weather that repeats in a predictable way.

Scientists use tools to gather weather data. Once they gather the data, they record it. It can be hard to see patterns by just looking at numbers on a page. Scientists use weather data to make graphs and charts. Graphs and charts help scientists find patterns that they could not see easily just by looking at data.

Scientists look for changes in temperature, wind direction, and precipitation that happen the same way over time. For example, the amount of rain that falls may be higher in October than any other month four years in a row. Using that information, scientists can predict that October will be the雨iest month of the next year.

Graphs and charts can show how weather changes over time. The graph below shows how temperatures in Philadelphia changed over two years.



When weather repeats in a predictable way, it is a **weather pattern**.

Rain, snow, sleet, and hail are all forms of precipitation.

Australia has a very different weather pattern than the United States. Australia experiences its hottest days during December and its coldest days during June and July.

Which of these statements best describes the weather pattern the graph on page 160 shows?

- A It is warmer in June than in December.
- B September is the warmest month of the year.
- C December is the windiest month of the year.
- D There is more rain in March than in September.

The graph shows only temperatures, so you cannot know which month is the wettest or the windiest. Choice C and choice D are incorrect. The average temperature in September is lower than the temperature in June. Choice B is incorrect. The average temperature in June is higher than in December. Choice A is correct.

Scientists also observe how weather is related to certain clouds or winds. For example, overcast days often go together with stratus clouds. This is also a pattern. Once scientists identify these patterns, it makes it easier to predict what will happen in the future.

The chart below shows how different cloud types and weather are related. Cumulus clouds appear on warm days, and stratus clouds appear on dark, cold days. You could predict that it will be a dark, cold day if you see stratus clouds in the sky.

CLOUD OBSERVATIONS

	Day 1	Day 2	Day 3	Day 4
Cloud Type	cumulus	stratus	stratus	cumulus
Weather	sunny, warm	dark, cold	dark, cold	sunny, warm

The names for clouds come from Latin roots. *Cumulus* means “heap” in Latin. *Stratus* means “layers.” *Cirrus* means “curls of hair.”

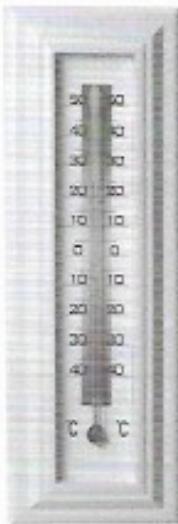
It's Your Turn

Please read each question carefully. To answer each multiple-choice question, circle the correct response.

- 1 A scientist notices that the sky is covered by a thick layer of clouds. What kind of cloud is he most likely seeing?

- A cirrus
- B stratus
- C cumulus
- D cumulonimbus

Use the picture below to answer question 2.



- 2 A student is recording weather conditions every day for a report. She is using the tool above. What is she measuring?

- A the temperature
- B the speed of the wind
- C changes in air pressure
- D the amount of rain that falls

Use the table below to answer question 3.

MONTHLY AVERAGE RAINFALL

Month	Average Rainfall (mm)
January	80
February	74
March	83
April	89

3 Which month will most likely have the most rainfall next year?

- A January
- B February
- C March
- D April

Use the picture below to answer question 4.



4 A student sees this kind of cloud in the sky. What kind of weather should the student expect?

- A warm weather
- B rainy weather
- C cold, dry weather
- D hot, sunny weather

The Sun-Earth-Moon System

Anchor and Eligible Content S4.D.3.1.1–3

Every day, the sun rises and sets. The moon and stars shine in the sky at night. It is warm in the summer, and it gets colder in the winter. These natural patterns are a part of life. The movements of Earth and the moon around the sun cause these patterns. Because Earth and the moon move around the sun, we have seasons, moon phases, and day and night.

Motions of Earth and the Moon

Earth and the moon are always moving. They both **rotate**, or spin on an axis. An **axis** is an imaginary line down the center of an object. The moon's axis is straight up and down. Earth's axis is not straight up and down. It is tilted to the side.



You have probably noticed that the sun moves across the sky during the day. It looks like the sun moves around Earth. However, the sun does not actually move around Earth. The sun appears to move across our sky because Earth rotates.

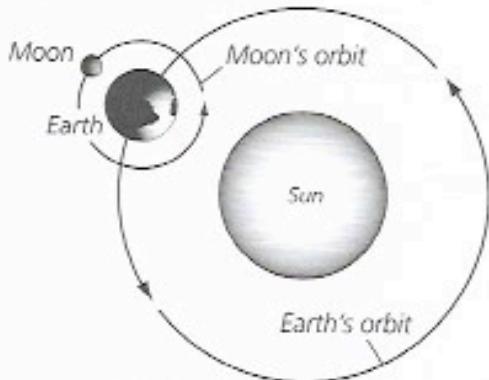
To understand how this works, think about sitting on a merry-go-round. As you look to the side, houses, trees, and other things seem to fly by. However, the houses and trees are not moving. Only the merry-go-round is moving. The merry-go-round is like Earth. The houses and trees are like the sun.

As Earth and the moon rotate, they also **revolve**. That means that they move in a path around other objects. The moon revolves around Earth, and Earth revolves around the sun.

To **rotate** is to spin on an imaginary line.

An **axis** is an imaginary line through the center of an object.

To **revolve** is to move in a path around another object.



As Earth revolves around the sun,
the moon revolves around Earth.

Which statement about the moon is true?

- A It revolves on its axis.
- B It rotates around Earth.
- C It revolves around Earth.
- D It rotates around the sun.

Rotate means "to spin." *Revolve* means "to move in a path around another object." The moon spins, or rotates, on its axis. Choice A is incorrect. The moon revolves around Earth as Earth revolves around the sun. Choices B and D are incorrect. The moon revolves around Earth. Therefore, choice C is correct.

Years, Days, and Seasons

You have probably noticed that every year has four seasons. You have probably also noticed that the length of the day changes during a year. Earth's rotation and revolution cause both of these patterns. People use these patterns to make calendars.

The length of a year is based on Earth's orbit. An **orbit** is a circular path that one object takes around another. Earth follows an orbit as it revolves around the sun. It takes Earth 365 days to make one orbit around the sun. One orbit around the sun equals one Earth year.

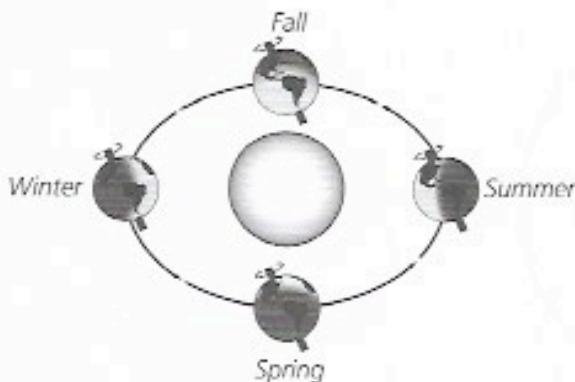
One year has four seasons: winter, spring, summer, and fall. We have seasons because Earth's axis is tilted. When the top half of Earth is tilted toward the sun, the areas on the top half have summer. This is because the top half receives more direct sunlight. This heats it up.

The opposite is true when the top half is tilted away from the sun. During this time, the areas on the top half have winter. If Earth did not have a tilted axis, we would not have seasons.



The word **orbit** can be a noun or a verb. **Orbit** can mean "to move in a path around another object." It can also mean "the path an object takes around another object."

An **orbit** is a circular path one object follows when it revolves around another object.



Earth's motions also affect the length of a day. As Earth spins, some areas of the planet face the sun, and other areas face away from the sun. It is daytime in the areas facing the sun. It is night in the areas facing away from the sun. One day equals the time it takes for Earth to rotate once on its axis. It takes 24 hours for Earth to rotate once on its axis. So, one day equals 24 hours.

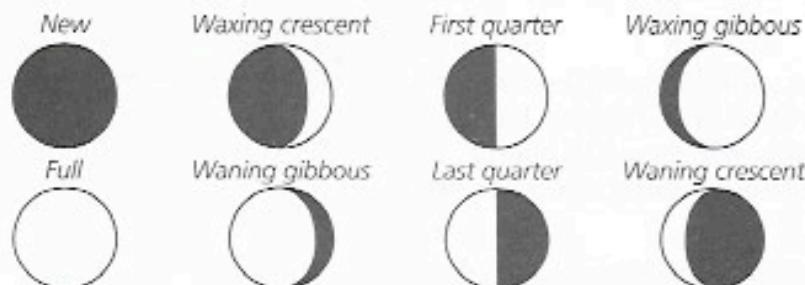
Seasons are caused by Earth's orbit around the sun.
Pennsylvania is on the top half of Earth. Australia is on the bottom half of Earth.

- A Describe the position of Earth during summer in Pennsylvania.
- B What season does Australia have when Pennsylvania has summer? Explain your answer.

During summer in Pennsylvania, Earth's top half is tilted toward the sun. It gets a lot of direct sunlight. That makes it warm. At the same time, the bottom half of Earth is tilted away from the sun. It does not get very much direct sunlight. It is colder. So, Australia has winter when Pennsylvania has summer.

Moon Phases

The moon appears to change shape from night to night. Sometimes it is a full, round ball. Other times it is just a sliver. These different shapes are called moon phases.



The moon seems to change shape in the sky.
 The moon phases change during a month.



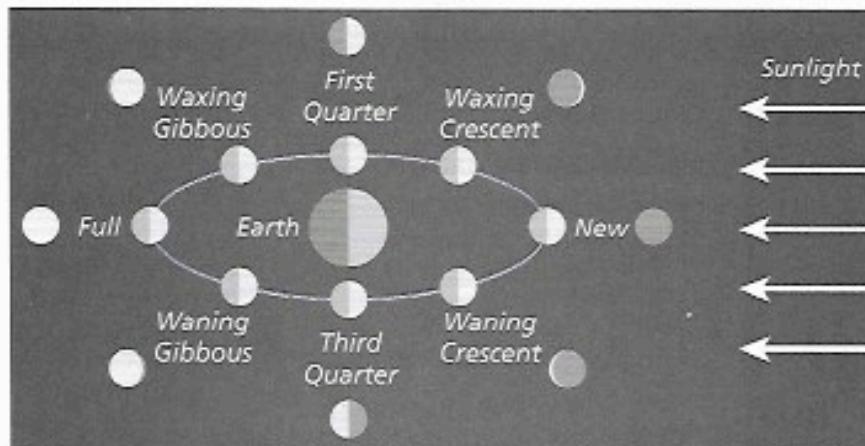
We always see the same side of the moon from Earth. That is because the time it takes the moon to rotate is about the same amount of time it takes the moon to revolve.

The phases of the moon are a pattern. They repeat every 29.5 days. That is about how long a month is. In fact, the length of months is based on the moon phases. Early calendars defined months as the amount of time it took the moon to go through all of its phases.

The moon does not actually change shape every day. The motions of Earth and the moon around the sun are what make the moon seem to change shape. Unlike the sun, the moon does not make its own light. It reflects light from the sun onto Earth. Half of the moon is always facing the sun. That half of the moon is bright. The other half is dark.

As the moon revolves around Earth, we see different parts of the lit half of the moon. When the moon and the sun are on opposite sides of Earth, we can see the entire lit half of the moon. The moon looks full. When the moon is between Earth and the sun, we can see only the dark half of the moon. The moon looks new, or dark.

There is only one full moon in most months. When there are two full moons in one month, the second moon is called a *blue moon*. Blue moons happen very rarely. That's why the phrase "once in a blue moon" is used to refer to things that rarely happen.



We see different parts of the moon's lit half from Earth as the moon revolves. The inner ring shows what the moon looks like from space. The outer ring shows what we see from Earth.

How much of the moon is lit during a full moon?

- A one-quarter
- B one-half
- C three-quarters
- D all of it

Half of the moon is always lit, because half of the moon is always facing the sun. Even though it looks like the whole moon is lit during a full moon, only the half facing Earth is lit. Choice A, choice C, and choice D are incorrect. Choice B is the correct answer.

Eclipses

Sometimes Earth, the moon, and the sun line up perfectly. This can happen during a new moon or a full moon. When the conditions are just right, the moon or the sun may seem to disappear from the sky. When this happens, it is called an eclipse.

There are two kinds of eclipses: solar eclipses and lunar eclipses. A solar eclipse happens when the moon is exactly between Earth and light from the sun. When this happens, the moon's shadow falls on part of Earth. From Earth, it looks like the moon is covering up the sun. A solar eclipse can happen only during a new moon.

You should **never** look directly at the sun during a solar eclipse. You could hurt your eyes.



During a solar eclipse, Earth is in the moon's shadow.

During a lunar eclipse, Earth is exactly between the moon and light from the sun. When this happens, Earth's shadow falls on the moon. From Earth, the full moon seems to go dark. A lunar eclipse can happen only during a full moon.

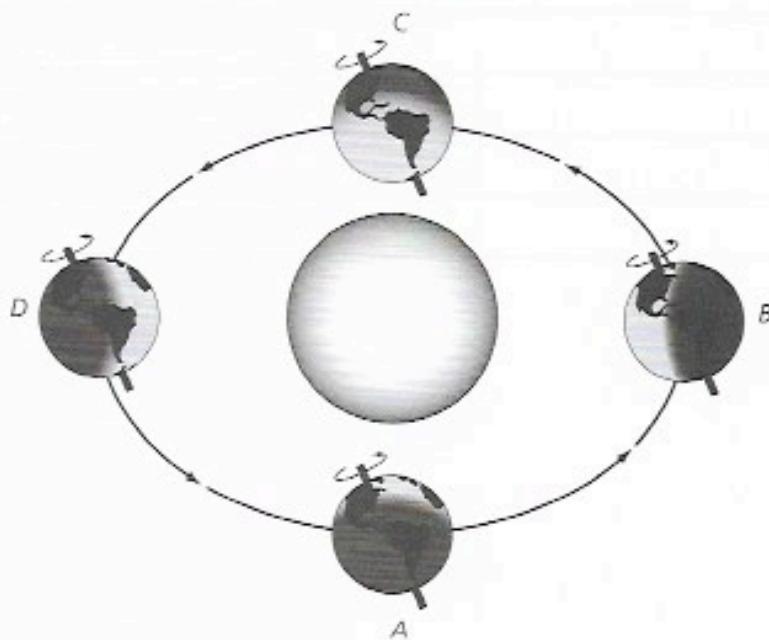
It's Your Turn

Please read each question carefully. To answer each multiple-choice question, circle the correct response.

- 1 Suppose Earth took 200 days to revolve once around the sun. How long would a year be on Earth?

- A 100 days
- B 182 days
- C 200 days
- D 365 days

Use the picture below to answer question 2.



- 2 When it is winter in Pennsylvania, Earth is closest to

- A position A.
- B position B.
- C position C.
- D position D.

This is a short open-ended question. Write your answers on the lines.

- 3** A student wants to make a model to show why the moon has phases.

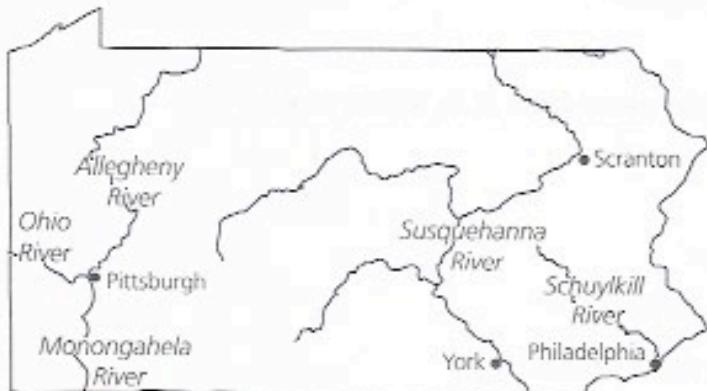
- A What three things must the student include in her model?

- B The student moves the parts of her model around to show why the moon has phases. Describe how she should move the three parts of the model.

Earth and Space Sciences Review

Please read each question carefully. To answer each multiple-choice question, circle the correct response.

Use the map below to answer question 1.



1 Which city is most likely in the Schuylkill River watershed?

- A Philadelphia
- B Pittsburgh
- C Scranton
- D York

2 A scientist studies some soil. Which of these is she least likely to see?

- A drops of water
- B tiny pieces of rock
- C large pieces of ice
- D remains of dead plants

Use the picture below to answer question 3.



3 Suppose Earth's axis were tilted more than it is. What would be the most likely result?

- A The days would be shorter.
- B The months would be longer.
- C The seasons would be more different.
- D The moon phases would be more similar.

4 A pond near a person's home becomes polluted. How will this most likely affect the person?

- A He will use less electricity.
- B He will have more water to drink.
- C It will be easier for him to go swimming.
- D It will be harder for him to grow a healthy garden.

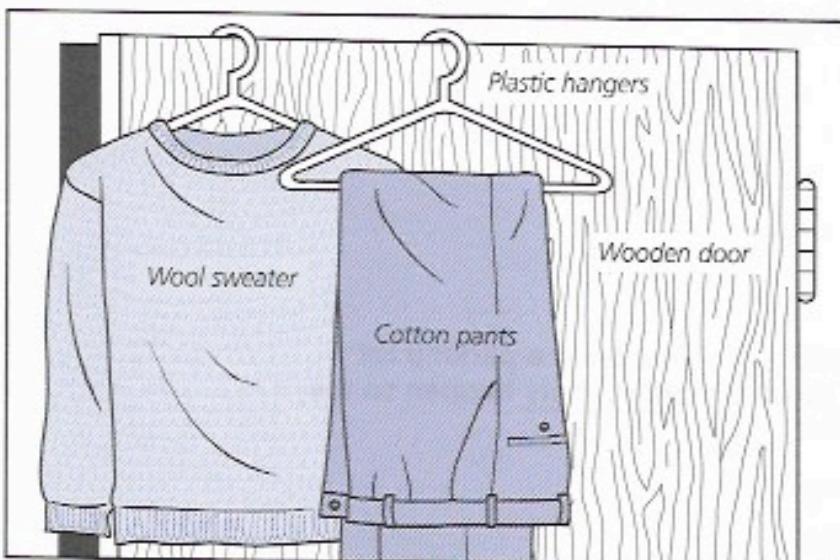
5 A student describes a body of water. She writes that the water in it is fresh. She also writes that there is water in it for only part of the year, but the soil is wet most of the year. What type of water body is the student most likely describing?

- | | |
|---------|-----------|
| A lake | C river |
| B ocean | D wetland |

6 A person hangs a wet towel on a peg. The next day, the towel is dry. This is an example of

- A condensation.
- B evaporation.
- C freezing.
- D melting.

Use the picture below to answer questions 7 and 8.



7 Which item in the picture is made from part of an animal?

- A wooden door
- B cotton pants
- C plastic hanger
- D wool sweater

8 Which item in the picture is most likely made from a nonrenewable resource?

- A wooden door
- B cotton pants
- C plastic hangers
- D wool sweater

- 9 A student is writing a report about lentic water systems in Pennsylvania. Which of these bodies of water should she include in her report?
- A Allegheny River
 - B Codorus Creek
 - C Delaware River
 - D Prompton Lake
- 10 People fill in a wetland with soil. They build a parking lot where the wetland was. What will most likely happen to the area around the parking lot?
- A It will have more flooding.
 - B It will have cleaner water.
 - C More rain and snow will fall on it.
 - D More plants and animals will live there.
- 11 A student looks at the clouds in the sky during a thunderstorm. Which kind of clouds does she most likely see?
- A cirrus
 - B cumulonimbus
 - C cumulus
 - D stratus

Use the table below to answer question 12.

WEATHER IN ANYTOWN, PA

Time	Weather
8:00 A.M.	cool; no clouds; moist air
10:00 A.M.	warm; a little cloudy; moist air
12:00 noon	hot; very cloudy; very moist air
2:00 P.M.	very warm; raining; thunder and lightning; dark clouds
4:00 P.M.	warm; no clouds; dry air

- 12 A student records the weather in Anytown every two hours for several days. He notices a pattern in the weather. The table shows his observations. What can the student conclude about the weather in the place where he made his observations?

- A It is warmer in the mornings than it is in the afternoons.
- B The air is drier in the mornings than in the afternoons.
- C Thunderstorms happen when the weather is very cool and dry.
- D It is cooler and drier after a thunderstorm than before a thunderstorm.

- 13 A scientist wants to measure the wind direction and the temperature in Harrisburg. Which two tools will the scientist need?

- A weather vane and barometer
- B weather vane and thermometer
- C anemometer and weather vane
- D anemometer and thermometer

14 A student looks at the moon one night. A few hours later, the moon is in a different place in the sky. Which of these best explains why the moon has moved in the sky?

- A The sun orbits Earth.
- B Earth orbits the moon.
- C The moon orbits Earth.
- D The sun orbits the moon.

15 Which of the following is equal to one Earth year?

- A one rotation of the sun
- B one rotation of Earth on its axis
- C one revolution of Earth around the sun
- D one revolution of the moon around Earth

This is a short open-ended item. Write your answers on the lines.

16 A scientist finds some caves in central Pennsylvania.

- A Describe how the caves probably formed.

- B The scientist warns the people living on the land above the caves not to build too many houses there. What is the most likely reason that the scientist gave the people this warning?
