HOUGHTON MIFFLIN HARCOURT
School Publishers

Bobcat Facts

What's the most common wildcat found in North America? The bobcat, of course! The bobcat lives in the forests and swamps of Mississippi. Even though bobcats are rarely seen in the wild by humans, they are very recognizable. They have stubby tails, fur with black bars and spots, and hair at the tips of their ears. They also have a very good sense of sight, smell, and hearing. Their retractable hooked claws help them hunt.

HOUGHTON MIFFLIN HARCOURT

Mississippi Science

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KWL

WHAT DO YOU KNOW?

List one fact about each of these topics:

a. Physical properties of matter:

_____

_____

_____

b. Physical changes in matter:

_____

_____

_____

Matter Changes

Contents

KWL

WHAT DO YOU WANT TO KNOW?

Skim the pictures and headings in this chapter. List one thing you want to find out about each of these topics:

a. Physical properties of matter:

_____

_____

_____

b. Physical changes in matter:

_____

_____

_____

Lesson Preview

VOCABULARY

gas Matter that has no definite shape and does not take up a definite amount of space. *(noun)*

liquid Matter that takes the shape of its container and takes up a definite amount of space. *(noun)*

mass The amount of matter in an object. *(noun)*

matter Anything that has mass and takes up space. *(noun)*

physical property One of matter's characteristics that can be measured or observed with the senses. *(noun)*

solid Matter that has a definite shape and takes up a definite amount of space. *(noun)*

volume The amount of space that matter takes up. *(noun)*

2.a. Investigate to conclude that the weight of an object is always the sum of its parts, regardless of how it is assembled (e.g., Lego creation/ separate blocks, bucket/cups of sand, roll/stacks of pennies, bag/individual potatoes, etc.). (DOK 2)

1

What Are Physical Properties?

Matter has properties that can be observed and measured.

Three States of Matter

Matter is anything that has mass and takes up space. Everything in this kitchen is matter. Even the air in the kitchen is matter.

Matter is found in different states, or forms. Three states of matter are solid, liquid, and gas. Heating and cooling can cause matter to change from one state to another. Look in this kitchen for matter in different states.

Find five things in this picture that are matter.

A **solid** (SAHL ihd) is matter that has a definite shape and takes up a definite amount of space. Ice is a solid. If you heat ice, it becomes liquid (LIHK wihd) water. A **liquid** takes the shape of its container and takes up a definite amount of space. If you heat water, it becomes water vapor, a gas. A **gas** has no definite shape and does not take up a definite amount of space. A gas will spread out to fill a large space. Or it can be squeezed into a small space.

Ice is a solid.

1. What is matter?

_____

_____

2. Complete the diagram below to tell about how water can change.

Ice is a _____.

↓

If you heat ice, it becomes a _____.

↓

If you heat water that is liquid, it becomes a _____ called _____ _____.

3. If you closed your eyes, which senses could you use to tell a peach from an apple?

_____

_____

4. What are four physical properties?

_____

_____

Express Lab

Use the Activity Card **Show a Change of State.**

1.b., 2.b.

Observing Matter

All matter is made up of many tiny particles. These particles are so small they can only be seen using special tools that scientists have. The particles of matter are always moving.

The state of matter is one physical property (FIHZ ih kuhl PRAHP ur tee) of matter. A **physical property** is a characteristic of matter that can be measured or observed with the senses. Some physical properties that you can observe are texture, temperature, hardness, sound, flavor, and size. You use your senses of sight, touch, taste, smell, and hearing to observe the physical properties of matter.

To find the melon in the basket, you might look for its color and shape. Those are both physical properties.

Measuring Matter

Mass is the amount of matter in an object. A balance measures mass. Mass is given in units called grams (g).

Mass is different from weight (wayt). Weight measures the pull of Earth's gravity (GRAV ih tee) on an object. Mass and weight are both physical properties of matter.

The mass of the parts of an object are added together to figure out the whole object's mass.

5. How are mass and weight different?

_____

_____

6. What device is used to measure mass?

_____

Science Test Practice

Circle the correct answer.

7. Toby got a new piggy bank that had a mass of 400 grams. Then he added two dimes and a quarter to the bank. The mass of one dime is 2 grams, and the mass of one quarter is 6 grams. What is the mass of the piggy bank now?

Ⓐ 400 grams
Ⓑ 408 grams
Ⓒ 410 grams
Ⓓ 426 grams

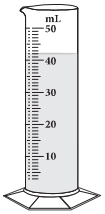
2.a. (DOK 2)

Express Lab

Use the Activity Card **Time a Change of State.**

1.c., 2.g.

8. What is the volume of liquid in the graduated cylinder below?



_____

9. List two objects and give one property of each object that makes it useful.

a. _____

_____

b. _____

_____

Directed Inquiry

Flip Chart p. 1

Change It

Observe several changes to matter. Compare a change of state to other physical changes.

1.b., 2.b., 2.g.

Each container is a different shape and size. But the volume of sand in each container is the same.

Volume (VAHL yoom) is the amount of space that matter takes up. Look at the containers. The same volume of sand has been put into each container. No matter what shape the container is, the sand takes up the same amount of space in each one.

Volume is also a physical property. The volume of a solid is often measured in cubic centimeters (cm^3). Liquid volume is often measured in liters (L).

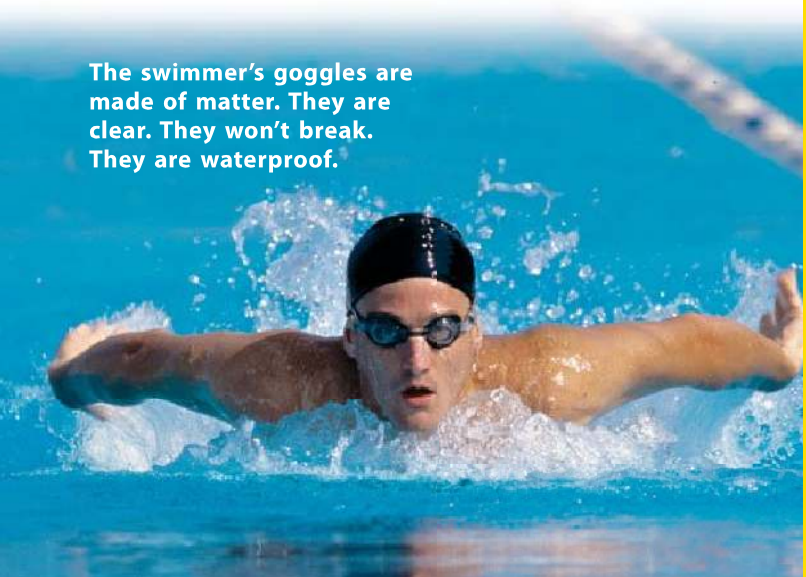
Useful Properties of Matter

The properties of different kinds of matter make them useful for different purposes. You can't cook food on a stove in a plastic pan. The pan would melt. A metal pan heats food without melting.

A useful property for some metals is that they act like a magnet. Some kinds of matter let electricity pass through them easily. Glass is a kind of matter that lets light pass through it.

CLASSIFY

What are three states of matter?



The swimmer's goggles are made of matter. They are clear. They won't break. They are waterproof.

Summary Three states of matter are solid, liquid, and gas. You can describe physical properties of matter by using your five senses and by measuring. The properties of matter make it useful for different purposes.

Describe the physical properties of your favorite food, using as many of your senses as possible.

_____

_____

_____

Classify What are three states of matter?

Three States of Matter		
_____	_____	_____
Example: _____ _____	Example: _____ _____	Example: _____ _____

Lesson Preview

VOCABULARY

condense To change state from gas to liquid. *(verb)*

evaporate To change state slowly from liquid to gas. *(verb)*

freeze To change state from liquid to solid. *(verb)*

melt To change state from solid to liquid. *(verb)*

physical change A change in the size, shape, or state of matter. *(noun)*

VOCABULARY SKILL: Antonyms

Words that mean the opposite of each other are antonyms. Find and write two vocabulary words that have opposite meanings.

2.b. Explore and identify physical changes of matter, including melting, freezing, boiling, evaporation, and condensation. (DOK 2)

2.g. Cite evidence to explain why heating or cooling may change the properties of materials (e.g., boiling an egg, evaporating water, chilling gelatin, making ice cream, etc.). (DOK 2)

2

What Is a Physical Change in Matter?

A physical change is a change in the way matter looks.

Energy and Changing States

A **physical change** is a change in the size, shape, or state of matter. A physical change does not change the makeup of the matter.

Why do you have to eat a frozen juice bar very fast on a hot day? The juice bar melts. This happens because energy, in the form of heat, causes it to change state.

Water changes from a solid to a liquid when ice melts.

Matter heats up when energy is added to it. Adding energy makes the particles of matter move faster. Adding enough heat to a solid causes it to **melt**, or change state from a solid to a liquid. When a liquid is heated enough, it will boil. Boiling makes matter change from a liquid to a gas. When liquids **evaporate** (ih VAP uh rayt), they change state slowly from a liquid to a gas.

Matter cools when energy is taken away. Taking away energy makes the particles of matter move more slowly. When a gas is cooled, it will **condense** (kuhn DEHNS), or change state from a gas to a liquid. When a liquid is cooled enough, it will **freeze**, or change state from a liquid to a solid.

Boiling changes a liquid to a gas.

1. Complete the sentences to describe each change in the state of water.

a. When warm water is placed in a tray in a freezer overnight, the water changes from

_____

b. Spilled water evaporating in sunlight is changing slowly from

_____

c. When water vapor condenses, it changes from

_____

Science Test Practice

Circle the correct answer.

2. Which is an example of matter changing from a solid to a liquid?

Ⓐ A puddle freezes.

Ⓑ An ice cube melts.

Ⓒ A puddle evaporates.

Ⓓ Water vapor condenses.

2.b. (DOK 2)

3. Read the first paragraph. Underline three ways that heating and cooling can change matter.

4. What properties of an egg change when it is cooked?

_____

_____

Science Test Practice

Circle the correct answer.

5. What happens to a puddle of water when it is heated?

   Ⓐ It changes state.

   Ⓑ It changes color.

   Ⓒ It gets larger in size.

   Ⓓ It becomes magnetic.

2.g. (DOK 2)

Directed Inquiry

Flip Chart p. 2

Changing Matter

Observe two kinds of matter, and determine how heating causes them to change.

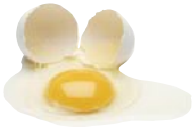
1.d., 2.b.

Heating and Cooling

Heating and cooling can change the properties of matter. Many materials expand, or grow in size, when they are heated. Iron turns bright orange as it is heated. Cooling causes some magnets to become stronger.

Heating and cooling also cause matter to change state. Water freezes when cooled to 0°C. It becomes a gas when heated to 100°C. But, heating doesn't change the kind of matter. Ice, liquid water, and water vapor are all still the same substance—water.

Sometimes, heating causes one substance to turn into one or more different substances. The new substances have different properties than the original substance. Cooking and burning are examples. When a log burns, it is changed into ashes and gases.



Heating causes the properties of an egg to change when it is cooked.

A liquid was chilled in a freezer to make this popsicle.

Useful Physical Changes

Every day you make physical changes to matter so that the matter is useful to you. Mixing chopped celery and tuna fish is a physical change. You can taste both the celery and the tuna. That's because mixing does not change the celery or the tuna into new kinds of matter.

One girl is molding clay. The other girl is folding paper. The girls are making useful physical changes.

CAUSE AND EFFECT

What causes matter to change state?

Summary A physical change is a change in the size, shape, or state of matter. Energy must be added or removed to cause matter to change state. Folding, molding, and mixing are physical changes that make matter useful.

How is making a paper airplane a physical change in matter?

_____

_____

_____

Cause and Effect What causes matter to change state?

Cause	Effect
_____ _____	Matter changes state.

KWL

WHAT DID YOU LEARN?

Science Test Practice

❶ Circle the correct answer.

Comprehension

❷ _____

_____

❸ _____

_____

❹ _____

_____

Critical Thinking

❺ _____

_____

_____

KWL

WHAT DID YOU LEARN?

Science Test Practice

❶ **Which is an example of a liquid becoming a solid?**

Ⓐ water boiling

Ⓑ ice melting into water

Ⓒ water freezing into ice

Ⓓ a puddle of water evaporating

2.b. (DOK 2)

Comprehension

❷ List four physical properties of a chocolate bar.

❸ What must happen for an ice cube to melt?

❹ What properties change when batter is heated to make cake?

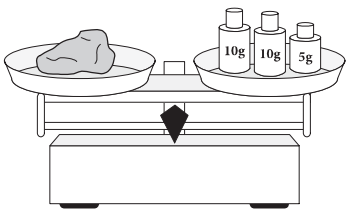
Critical Thinking

❺ An empty paper bag weighs 5 grams. When a marble is added, the bag weighs 10 grams. How much would the bag weigh with four identical marbles inside?

Make a graphic organizer and fill it in to show the physical properties of rice.

Circle the correct answer.

1. The picture shows a rock on a balance.



What is the mass of the rock?

Ⓐ 5 grams
Ⓑ 10 grams
Ⓒ 15 grams
Ⓓ 25 grams

2.a. (DOK 2)

2. Look at the liquid water in the picture.

Which physical property has changed?

Ⓕ color
Ⓖ flavor
Ⓗ texture
Ⓙ volume

2.b. (DOK 2)

3. After a storm, there was a puddle of water on the street. Later, the water seemed to slowly disappear. Which process occurred?

Ⓐ boiling
Ⓑ melting
Ⓒ evaporation
Ⓓ condensation

2.b. (DOK 2)

4. Which of these changes to matter requires heating?

Ⓕ melting a wax candle
Ⓖ slicing a loaf of bread
Ⓗ turning milk into ice cream
Ⓙ mixing ingredients to make dough

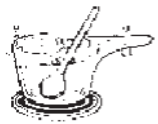
2.g. (DOK 2)

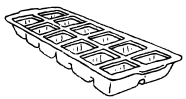
5. A substance melted. Later, it froze. Which states of matter was the substance in?

Ⓐ solid only
Ⓑ liquid and gas
Ⓒ liquid and solid
Ⓓ solid, liquid, and gas

2.b. (DOK 2)

6. In which example are the particles of matter that make up the water moving <u>most quickly</u>?

Ⓕ 

Ⓗ 

Ⓖ 

Ⓙ 

2.g. (DOK 2)

7. Kara and Tyler made a tower of blocks. The tower was too large to fit on a balance.

How can they find the tower's mass?

Ⓐ Add the masses of the largest blocks.
Ⓑ Add the masses of the heaviest blocks.
Ⓒ Find the mass of each block and add the masses.
Ⓓ Find the mass of the blocks on the bottom of the tower.

2.a. (DOK 2)

8. Which tool is used to measure temperature?

Ⓕ 

Ⓗ 

Ⓖ 

Ⓙ 

1.c. (DOK 1)

9. Which happens to a liquid if it is cooled enough?

Ⓐ It begins to boil.
Ⓑ It turns into a gas.
Ⓒ It turns into a solid.
Ⓓ It turns into a new substance.

2.g. (DOK 2)

10. Which would <u>not</u> change the weight of a birthday cake?

Ⓕ adding more icing
Ⓖ adding ten candles
Ⓗ putting sprinkles on top
Ⓙ moving around the candles

2.a. (DOK 2)

KWL

WHAT DO YOU KNOW?

List one fact about each of these topics:

a. How forces affect objects: _____

_____

b. How motion can be described: _____

_____

c. How simple machines work: _____

_____

Force and Motion

Contents

KWL

WHAT DO YOU WANT TO KNOW?

Skim the pictures and headings in this chapter. List one thing you want to find out about each of these topics:

a. How forces affect objects: _____

_____

b. How motion can be described: _____

_____

c. How simple machines work: _____

_____

Lesson Preview

VOCABULARY

force A push or a pull. *(noun)*

gravity A force that pulls objects toward each other. *(noun)*

motion A change in the position of an object. *(noun)*

VOCABULARY SKILL: Use Pictures

Read the definition of *force*. Then look at the pictures on these pages. What do you know about *force* from these pictures?

_____

_____

_____

2.c. Investigate and describe forces affecting motion in simple machines (e.g., lever, wheel and axle, block and tackle, inclined plane, screw). (DOK 2)

1

How Do Forces Affect Objects?

Forces can change the way things move. Gravity, magnetism, and friction are forces.

Motion, Pushes, and Pulls

Suppose your chair is next to the wall. You want it to be near your desk. How would you get it there? Yes, you would move it. Moving it would change its position, or place. The change in position of an object is called **motion** (MOH shuhn). Motion happens any time something moves from one place to another.

The furniture in this room is in motion. The children are also in motion.

How are these children using force?

Think again about moving your chair. To move your chair, you would have to use a force on it. A **force** (fawrs) is a push or a pull. A push moves something away from you. A pull moves something toward you.

Any change in motion uses a force. You use a force to start or stop a motion. You use a force to make a motion go faster or slower. You use a force to change the direction of a motion. Using a strong force causes a big change in a motion.

1. What is motion?

_____

2. What is a force?

_____

3. Circle the letter for each sentence that tells about a change in motion.

a. The tree branches begin moving in the wind.

b. Three books are on a table.

c. A moving car stops suddenly.

d. A ball rolls down a hill.

e. The bus makes a right turn.

f. The chair is too heavy to push.

Express Lab

Use the Activity Card **Measure Forces.**

1.f., 2.c.

4. What two things must you know in order to describe a force?

   a. _____

   b. _____

5. Make a simple drawing to show someone applying an unbalanced force to a baseball.

Balanced and Unbalanced Forces

To describe a force, you must know two things. You must know the size of the force and which way the force is moving. Suppose a soccer player kicks a ball. The player applies an unbalanced force to the ball. The force sends the ball moving quickly in the direction of the kick.

The picture shows two players about to kick the ball in opposite directions. Suppose they kick the ball at the same time with the same force. Then the ball will not move. That's because the forces on the ball are balanced.

Two players kick the ball at the same time with equal force. The ball will not move because the forces are balanced.

Gravity

One force affects all matter on Earth. It keeps the juice in your glass and the glass on the table. The force is gravity. **Gravity** (GRAV ih tee) is a force that pulls objects toward each other. Earth's gravity pulls things toward its center. That is why your glass falls to the floor if it falls off the table. Gravity is found between all things. Gravity is not just between Earth and other things.

Gravity pulls the glass toward Earth. Its force is strong. It is strong enough to break the glass when it hits the floor.

Science Test Practice

Circle the correct answer.

6. Jane raised a flag to the top of a pole. Which force is attempting to pull the flag back to the ground?

(A) a push
(B) gravity
(C) a magnetic force
(D) a balanced force

2.c. (DOK 2)

7. Does gravity act on an airplane that is flying above Earth? Explain your answer.

I Wonder . . . How does Earth's pull of gravity on an elephant compare with its pull on a kitten?

8. Look at the pictures of the ice skate on the next page. Circle the part that allows the skate to glide smoothly. Put an X over the part that makes friction so the skater can stop.

Gravity acts on things without touching them. How strong gravity is depends on the mass of something. Mass is how much matter something has. There is more gravity between things that have more mass. Earth has a large mass, so there is a strong pull between Earth and other things on or near it.

Gravity pulls the children down the slide.

Friction

Friction is a force that slows down and stops motion between two things that touch. Rough things make more friction than smooth things.

Friction can be useful. Friction keeps your feet from slipping on the floor when you walk. Sometimes friction is not useful. Friction can slow down machines. Many machines use oil to make parts slippery and have less friction.

smooth blade

rough tip

The blade on this ice skate is smooth. It makes less friction with the ice. The rough tip makes more friction with the ice. It helps the skater start and stop.

CAUSE AND EFFECT

What is needed to change a motion?

Summary A force is needed to change a motion. Gravity pulls objects toward each other. An unbalanced force will cause an object to move. Balanced forces will not cause movement. Friction is a force that slows down and stops motion between two surfaces that touch.

Suppose each of two people holds a different end of a rope. They pull with equal force in opposite directions. Which way will the rope move? Explain your answer.

_____

_____

Cause and Effect

What is needed to change a motion?

Cause	Effect
An _____ is applied to an object.	The object moves.

Lesson Preview

VOCABULARY

direction Where an object is moving from one moment to the next *(noun)*

distance A measure of length. *(noun)*

speed A measure of how fast or slow something is moving. *(noun)*

VOCABULARY SKILL: Use Syllables

Break *direction* into syllables. Say each syllable aloud. Clap once for each syllable. How many syllables are in *direction*?

2.c. Investigate and describe forces affecting motion in simple machines (e.g., lever, wheel and axle, block and tackle, inclined plane, screw). (DOK 2)

2

How Can Motion Be Described?

You can tell about the motion of something by its distance, direction, and speed.

Position and Motion

Motion is a change in position. You can tell where something is by looking at where other things are around it. The man in the photo starts in one place. As he moves, his position changes.

The position of the man changes in each picture.

First the man runs straight ahead. Then he jumps in the air. Next he comes down. He lands in the sand. Friction with the sand causes him to slow down and stop.

Every change in motion is caused by a force. A force is a push or pull. It passes energy between two objects. Gravity and magnetism can pass energy between objects even when the objects are not touching. Friction passes energy between objects only when they are touching.

1. What is motion?

_____

2. How can you describe the position of an object?

_____

_____

3. Look at the pictures of the man in motion.

a. How does gravity affect his motion?

_____

_____

b. How does friction affect his motion?

_____

_____

4. What is distance?

_____

5. What can distance tell about motion?

_____

6. Look at the picture of the ballplayer. Circle the part of the picture that shows the exact distance from home plate to the fence.

Directed Inquiry

Flip Chart p. 3

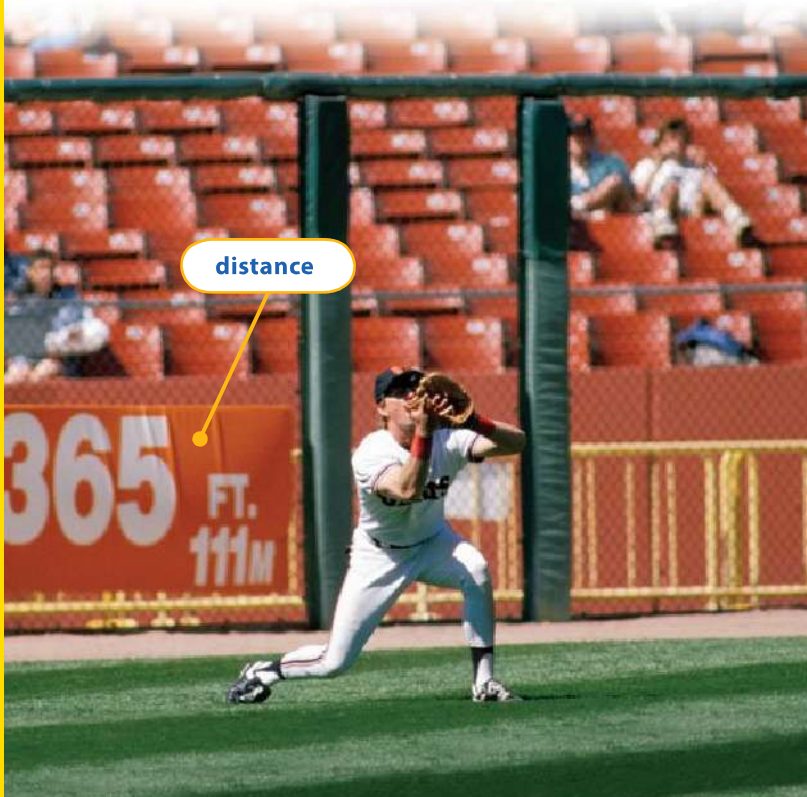
Make Things Move

Investigate motion and distance using a toy car. Record how the weight of the car affects distance traveled.

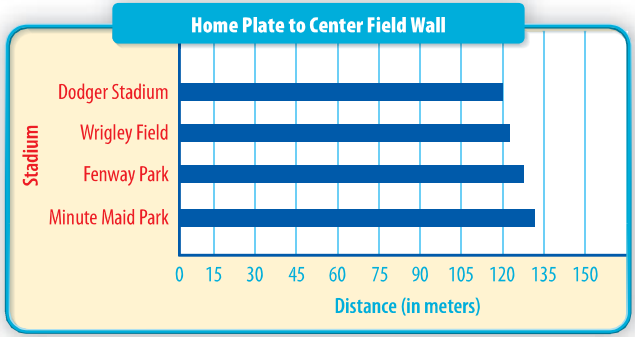
1.f., 2.c.

Distance

Distance (DIHS tuhns) is a measure of length. Distance is one way to tell about motion. You can tell about how far something goes. Let's say a baseball player hits a ball at home plate. The ball hits the center field wall. You can find the distance, or how far, the ball went. You can measure how far it is from home plate to the wall.



It takes a stronger force to move something a longer distance. The harder a player hits the ball, the longer distance it will go. This graph shows the distance from home plate to the center field wall in four ball parks. A player would have to hit the ball harder at Fenway Park than a player would at Dodger Stadium in order to hit the center field wall.



7. How can you make an object travel a longer distance?

8. Look at the graph. Which is farther from home plate, the wall at Fenway Park or the wall at Wrigley Field?

I Wonder . . . A baseball rolling along the ground will slow down. Slowing down is a change in motion. Any change in motion needs a force. What force causes the baseball to slow down?

9. What is the direction of an object?

_____

_____

10. How can you find the direction of a moving object?

_____

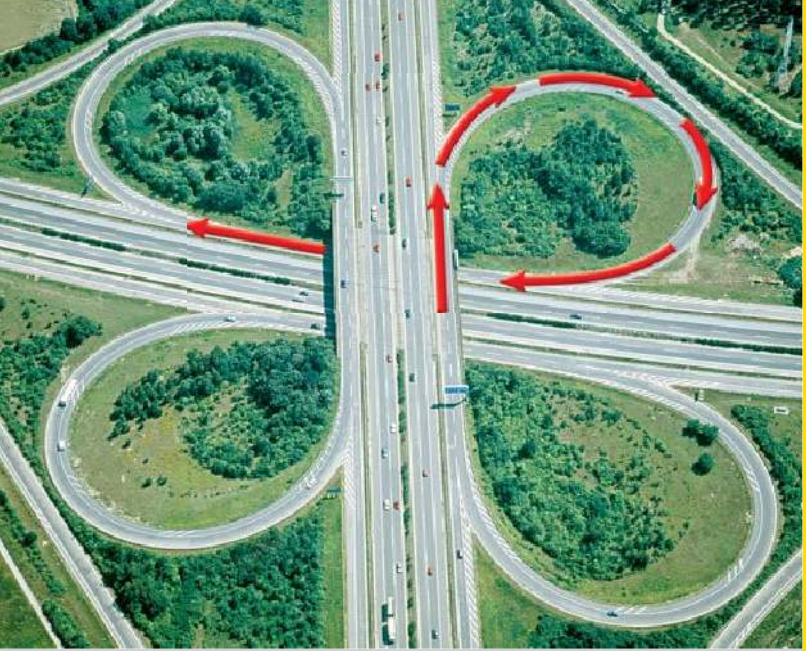
_____

11. Look at the picture of the planes. Choose one plane. Use your pencil to trace the path of that plane in the sky.

Direction

Direction (di REHK shuhn) is the path something follows. Direction is another way to tell about motion. Direction tells where something is going. You can find the direction of something if you look at where it is now and where it was before.

Look at where the smoke starts for each plane. Now look at where each plane is. You can tell about the direction each plane is moving.



The cars are turning. Their direction changes as they turn.

Look at the picture. What can you tell about the direction of these cars? You can say that they are moving east or turning right. Like other changes in motion, a change in direction is caused by a force.

Science Test Practice

Circle the correct answer.

12. An object that was moving east is now moving north. Which of the following changed?

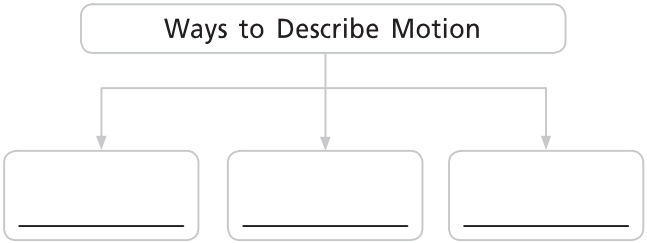
(A) the object's distance
(B) the object's direction
(C) the object's speed
(D) the object's weight

2.c. (DOK 2)

13. What are some words you could use to describe the direction of a moving object?

Summary A motion is a change in position. The motion of an object can be described by the distance the object travels. The direction of an object is the path the object follows. The speed of an object tells how fast or slow the object is moving.

Complete the diagram to tell about motion.



Text Structure

How is speed related to motion?

Cheetah

Sloth

Speed

Speed is a measure of how fast or slow an object is moving. Speed is another way to tell about motion. Look at the animals in the pictures. A cheetah is one of the fastest animals. A sloth is one of the slowest. You can measure speed by finding how far something has moved over time.

TEXT STRUCTURE

How is speed related to motion?

What Are Simple Machines?

3

Simple machines make work easier. They can change how strong a force is. They can also change the direction of a force.

Machines and Work

Did you know that some machines are very small and do not have any moving parts? A machine is any tool that makes work easier. **Work** is the movement of an object by a force. A **simple machine** is something that makes work easier. It changes the force that is needed to move something. It can change how strong a force is. It can also change the direction of a force.

This girl uses a hammer to do work. The force of the hammer moves the nail.

Lesson Preview

VOCABULARY

inclined plane A simple machine that is a slanted surface. *(noun)*

lever A simple machine made up of a bar that can pivot, or turn, around a fixed point. *(noun)*

pulley A simple machine made up of a wheel with a rope around it. *(noun)*

screw A simple machine you turn to lift an object or to hold two or more objects together. *(noun)*

simple machine A tool with few or no moving parts that makes work easier. *(noun)*

wedge A simple machine made up of two inclined planes placed back to back. *(noun)*

wheel and axle A simple machine made up of a small cylinder attached to the center of a larger wheel. *(noun)*

work The use of a force to move an object. *(noun)*

2.c. Investigate and describe forces affecting motion in simple machines (e.g., lever, wheel and axle, block and tackle, inclined plane, screw). (DOK 2)

1. Draw a box around the arrow that shows the force a person places on the lever.

2. Circle the arrow that shows the force the lever places on the nail.

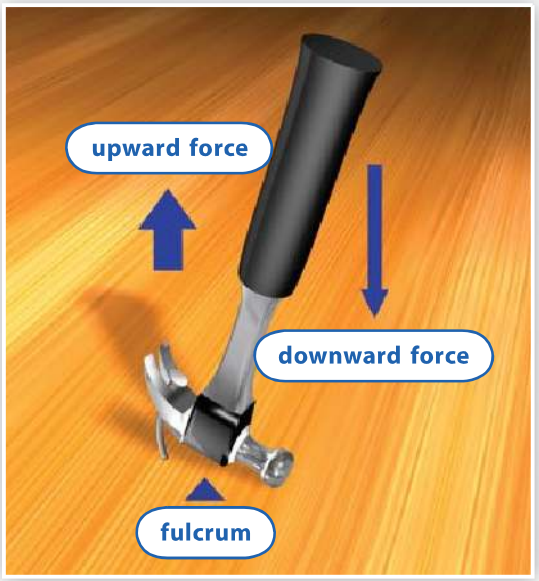
3. Which of the two forces is stronger?

_____

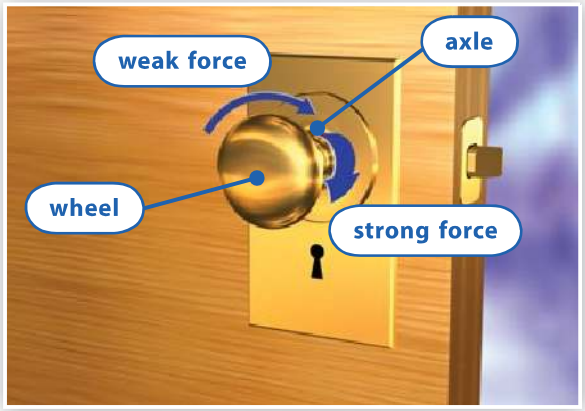
_____

Lever

A hammer can be used as a simple machine called a lever (LEHV ur). A lever can pull out a nail. A **lever** is a simple machine made up of a stiff arm that can move freely around a fixed point. The fixed point is called the fulcrum (FUL kruhm). The lever changes the weak force on the handle of the hammer to a strong force on the nail. It also changes the direction of the force.



A lever changes how strong a force is. It also changes the direction of a force.



A wheel and axle changes how strong a force is. It does not change the direction of a force.

Wheel and Axle

You use a doorknob to open a door. A doorknob is a simple machine called a wheel and axle (AK suhl). A **wheel and axle** is a simple machine made up of a small cylinder, or axle, attached to the center of a larger wheel. The knob is the wheel. The part that goes into the door is the axle. When you apply a weak force to the wheel, it changes to a strong force on the axle.

4. If a wheel is turned to the right, in which direction does the axle turn?

_____

5. Look at the picture below.

Where in the picture is there a wheel and axle, and how does it help you?

_____

_____

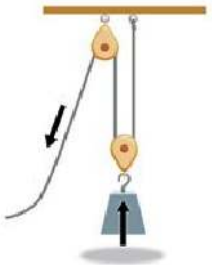
_____

_____

6. How can a single fixed pulley change a force?

_____

A block-and-tackle system combines more than one pulley. When you use a block and tackle, you do not need as much force to lift an object. However, you must pull a greater length of rope.



7. Circle the two pulleys in the block-and-tackle system.

Directed Inquiry

Flip Chart p. 4

Load Them Up

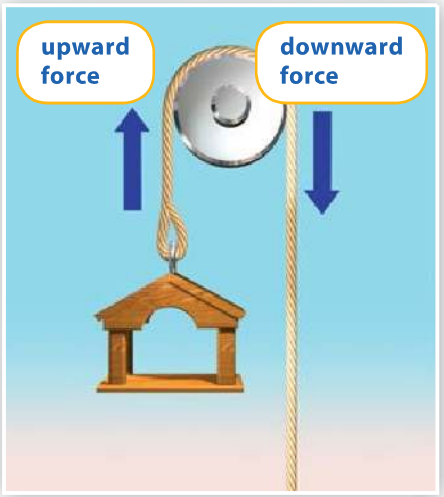
Use a string and a spool to lift a cup of rocks. Observe and record the effort used.

1.a., 2.c.

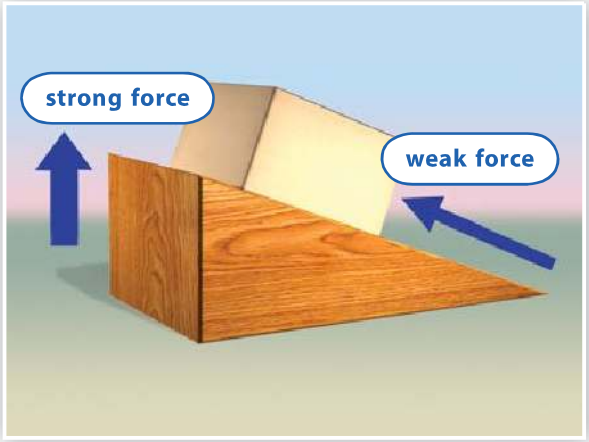
Pulley

A **pulley** (PUL ee) is a simple machine made up of a rope fitted around a fixed wheel. A pulley can change the direction of a force. You pull in one direction. The pulley changes the force to the other direction.

Pulleys and other simple machines can be put together to make complex (kuhm PLEHKS) machines. A bike has pulleys, wheels and axles, and levers.



A pulley like this changes the direction of a force. It does not change how strong the force is.



An inclined plane changes how strong a force is. It also changes the direction of a force.

Inclined Plane

Movers often use a ramp to move something heavy. A ramp is a kind of simple machine called an inclined plane (ihn KLYND). An **inclined plane** is a simple machine made up of a slanted surface. Using an inclined plane makes it easier to move something heavy to a higher place. Movers could lift something heavy straight up. That would take a stronger force. Instead they use a ramp. They use a weaker force over a longer distance.

Science Test Practice

Circle the correct answer.

8. Which of these factors change when an inclined plane is used?

(A) the distance only

(B) the strength of the force only

(C) the distance, as well as the strength of the force

(D) the number of people needed to lift an object

2.c. (DOK 2)

9. Look at the two arrows in the diagram.

a. Circle the arrow that represents the force needed to lift the box without using a ramp.

b. Why are the two arrows different lengths?

10. What is one way that people use a wedge?

_____

_____

11. Where on a wedge do you apply a force?

_____

12. Underline the sentence that tells how a wedge changes the force you apply to it.

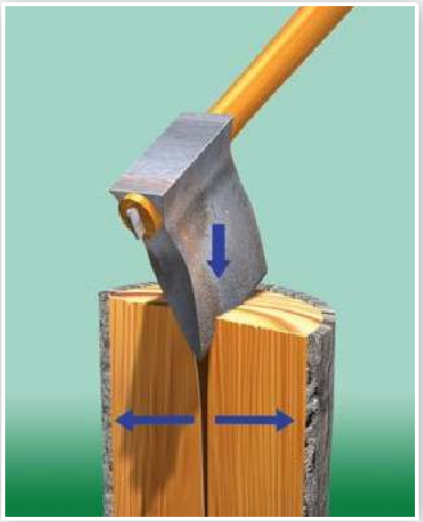
Express Lab

Use the Activity Card **Lift With a Ramp.**

1.e., 2.c.

Wedge

A **wedge** (wehj) is a simple machine made up of two inclined planes. A wedge has a pointed end and a wide end. An ax is a wedge. It is used to cut or split things. When you use a wedge, you use a force, pushing down on the wide end. The slanted sides change the downward force to sideward forces. This splits the thing into two pieces.

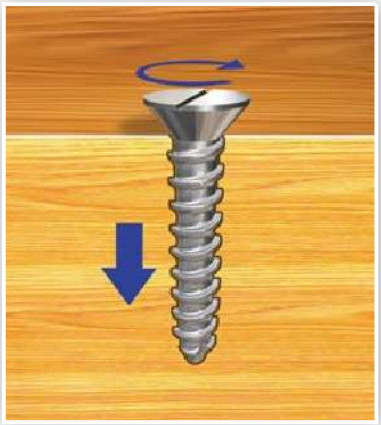


A wedge changes a downward force to an outward force.

Screw

A **screw** (skroo) is a simple machine made up of an inclined plane wrapped around a column. Screws are used to keep two things together, like two boards. When you turn a screw, the inclined plane moves the column up or down. You use a weak turning force on the screw. The screw changes this force to a strong downward or upward force.

A screw changes a weak turning force to a strong downward or upward force.



CLASSIFY

What two simple machines are made up of one or more inclined planes?

Summary There are six types of simple machines—levers, wheel and axles, pulleys, inclined planes, wedges, and screws. Simple machines make work easier.

Complete the diagram to show the effects that using simple machines can have.

A pulley is used to lift a box. →	The _____ of the force is changed.
A box is pushed up an inclined plane. →	A smaller force is applied over a _____ distance.
A lever is used to open a can of paint. →	The lever changes the weak downward force into a strong _____ force.

Classify What two simple machines are made up of one or more inclined planes?

_____

_____

KWL

WHAT DID YOU LEARN?

Science Test Practice

❶ Circle the correct answer.

Comprehension

❷ _____

_____

❸ _____

❹ _____

_____

Critical Thinking

❺ _____

_____

_____

KWL

WHAT DID YOU LEARN?

Science Test Practice

❶ **Which force can act on an object without touching the object?**

Ⓐ gravity

Ⓑ friction

Ⓒ a balanced force

Ⓓ an unbalanced force

2.c. (DOK 2)

Comprehension

❷ What are three ways you can tell about the motion of an object?

❸ How can you cause an object to move or change the object's direction?

❹ How are balanced forces and unbalanced forces different?

Critical Thinking

❺ Give two examples of ways that simple machines have made your life easier.

Make a graphic organizer and fill it in to show how simple machines help you do work.

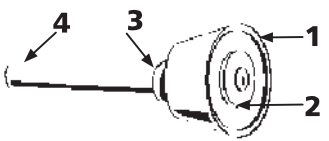
Circle the correct answer.

1. What is a force?

Ⓐ a push or a pull
Ⓑ a change in position
Ⓒ a measure of length
Ⓓ how fast something moves

2.c. (DOK 2)

2. Suppose the doorknob below is turned.



Which location has the greatest force?

Ⓕ Location 1
Ⓖ Location 2
Ⓗ Location 3
Ⓙ Location 4

2.c. (DOK 2)

3. Which simple machine turns a downward force into an outward force?

Ⓐ lever
Ⓑ pulley
Ⓒ wedge
Ⓓ wheel and axle

2.c. (DOK 2)

4. Which would take the most force to get moving quickly?

Ⓕ an empty wagon
Ⓖ a wagon filled with bricks
Ⓗ a wagon filled with feathers
Ⓙ a wagon filled with softballs

2.c. (DOK 2)

5. Marcus used four pulleys of different sizes in an investigation. He raised a brick with each pulley. His results are shown below.

Pulley Experiment

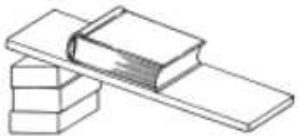
Pulley Diameter (cm)	Force Needed (N)
6	20
8	20
10	20
14	20

What should Marcus conclude?

Ⓐ Smaller pulleys are easier to use.
Ⓑ The weight of the brick changed each time.
Ⓒ Pulley size does not affect the force needed.
Ⓓ The largest pulley is broken.

1.d. (DOK 2)

6. Look at the picture below.



In which direction will the book <u>most likely</u> move?

Ⓕ straight up
Ⓖ up the board
Ⓗ down the board
Ⓙ over the side of the board

2.c. (DOK 2)

7. Which simple machine does <u>not</u> change the direction of a force?

Ⓐ lever
Ⓑ pulley
Ⓒ wedge
Ⓓ wheel and axle

2.c. (DOK 2)

8. Which simple machine turns a small downward force into a larger upward force?

Ⓕ 

Ⓗ 

Ⓖ 

Ⓙ 

2.c. (DOK 2)

9. How does an axle move when a wheel is turned to the right?

Ⓐ upward
Ⓑ downward
Ⓒ to the right
Ⓓ to the left

2.c. (DOK 2)

10. Mr. Simmons is using a wheelbarrow.

Which term identifies the point labeled *A*?

Ⓕ bar
Ⓖ lever
Ⓗ force
Ⓙ fulcrum

2.c. (DOK 2)

KWL

WHAT DO YOU KNOW?

List one fact about each of these topics:

a. Energy: _____

_____

_____

b. How energy changes: _____

_____

_____

c. Waves: _____

_____

_____

Forms of Energy

Contents

KWL

WHAT DO YOU WANT TO KNOW?

Skim the pictures and headings in this chapter. List one thing you want to find out about each of these topics:

a. Energy: _____

_____

b. How energy is converted: _____

_____

c. Waves: _____

_____

Lesson Preview

VOCABULARY

energy The ability to cause matter to change or move. *(noun)*

VOCABULARY SKILL: Word Context

Thermal energy is one type of energy that you will learn about in this lesson. Read the definition of *thermal energy* on the next page. Circle the words *heat* and *warm. Thermal* is a word that means "heat."

2.d. Differentiate between potential and kinetic energy and recognize their conversions. (DOK 2)

- Potential to kinetic (e.g., winding a clock/clock begins ticking)
- Kinetic to potential (e.g., roller coaster moving downward/upward to the top of the hill)

1 What Is Energy?

Energy is the ability to move or change things. There are many kinds of energy.

Forms of Energy

Energy is the ability to make things move or change matter in other ways. You use energy to ride a bike. A stove uses energy to cook food. Your eyes use energy from the Sun to see. How can energy do all of these things?

There are many kinds, or forms, of energy. Each form of energy changes matter, but in different ways. A bike is matter. The energy you use to ride a bike makes it move.

These children use energy to play a game.

Forms of Energy

Chemical Energy is energy stored in the particles that make up things such as food and batteries.

Light Energy is energy you can see. Earth gets it from the Sun.

Electrical (ih LEHK trih kuhl) **energy** is used to run appliances and other machines.

Mechanical (mih KAN ih kuhl) **energy** is the combination of an object's energy of motion and stored energy.

Sound Energy is energy you can hear. It is used to hear music.

Thermal energy is the energy of tiny moving particles of matter. It is used to heat food and warm homes. Heat is thermal energy moving from one thing to another.

1. Energy is the ability to _____ or _____ things.

2. Complete the chart to show the type of energy described by the clue.

Clue	Type of Energy
Energy used to heat food	
Energy of a falling object	
Energy you hear	
Energy stored in food	
Energy used to run machines	
Energy you can see	

Summary Energy is the ability to cause things to move or to cause other changes in matter. There are many forms of energy.

List three things that the chemical energy in food helps you do.

1. _____

2. _____

3. _____

Classify What form of energy does a moving guitar string make?

_____

_____

_____

Useful Chemical Energy

Chemical energy is stored in things such as food, batteries, and gasoline. It can be used in many different ways.

You need the chemical energy in food to live, move, and grow. The food you eat in one day has as much chemical energy as two car batteries!

CLASSIFY

What form of energy does a moving guitar string make?

How Is Energy Converted?

2

Machines and living things change stored energy to motion and heat.

Kinetic and Potential Energy

Some energy is in motion, or moving from one place to another. Someone sledding down a hill has energy of motion. Energy of motion is called **kinetic energy** (kuh NEHT ihk EHN ur jee).

Other kinds of energy, such as chemical energy, do not use motion. Chemical energy is stored energy. It has energy based on where it is, or its position. The energy of position is called **potential energy** (puh TEHN shuhl EHN ur jee). Someone standing at the top of a hill has potential energy.

As the children slide down the hill, they have kinetic energy because of their motion.

Lesson Preview

VOCABULARY

friction A force that occurs when one object rubs against another object. *(noun)*

kinetic energy The energy of motion. *(noun)*

potential energy The energy of position. *(noun)*

VOCABULARY SKILL: Word Origins

Read the definition of *kinetic energy*. *Kinetic* comes from the Greek word *kinetikos*, which means "moving." Moving objects have kinetic energy. Rewrite the definition of *kinetic energy* to include the word *moving*.

_____

_____

2.d. Differentiate between potential and kinetic energy and recognize their conversions. (DOK 2)

- Potential to kinetic (e.g., winding a clock/clock begins ticking)
- Kinetic to potential (e.g., roller coaster moving downward/upward to the top of the hill)

1. Identify each type of energy.

   a. Energy of motion: _____

   b. Energy of position: _____

2. Circle the word that makes each sentence true.

   a. Potential energy can (change, move) to kinetic energy.

   b. When you hold a ball above the ground, the ball has (potential, kinetic) energy because of its position.

   c. A ball that is (rolling, on a high shelf) has kinetic energy.

Express Lab

Use the Activity Card **Store and Release Energy.**

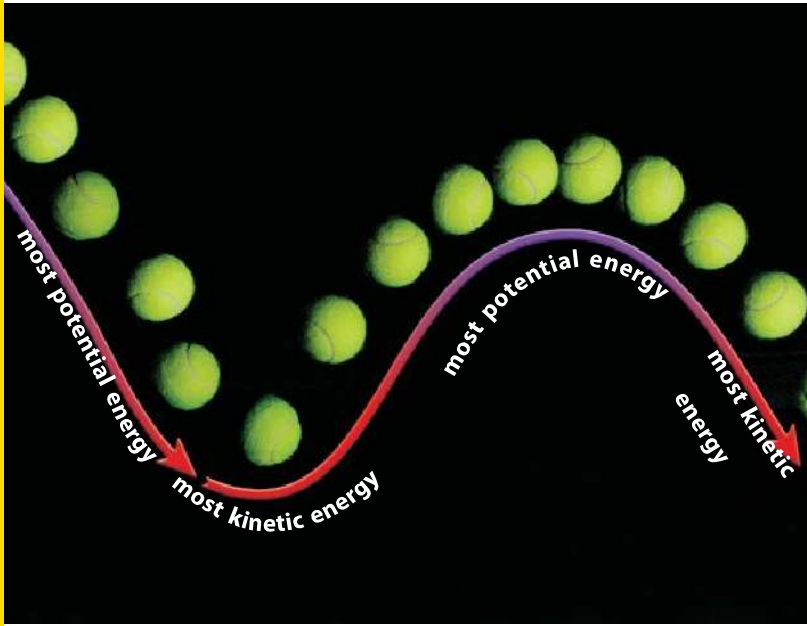
1.d., 2.d.

Storing and Releasing Energy

Energy can change from potential to kinetic. It can also change back from kinetic to potential.

Hold a ball in your hand. The ball has potential energy because of its position. Drop the ball. Now the ball is in motion, so it has kinetic energy.

The ball bounces. As it moves up into the air, it slows down. The ball slows down because its kinetic energy is changing back to potential energy.



Your body changes chemical energy in food to heat energy and motion.

Changing Forms of Energy

Energy can change from one form to another, too. When you use energy, it almost always changes form. When you turn on a light, electrical energy changes to light energy. When you eat, chemical energy in food changes to mechanical and thermal energy.

Most forms of energy can change to thermal energy. You feel warm when you stand in sunlight. That is because the Sun gives off thermal energy.

Think about a toaster and a hair dryer. How do they work? Like many things in your home, they use electrical energy to make thermal energy.

3. Energy can change from one _____ to another.

4. Tell the energy change that occurs with each action.

Action	Energy Change
Turning on an electric light	_____ changes to light energy.
Eating food	_____ changes to thermal and mechanical energy.
Using a hair dryer	Electrical energy changes to _____.

Directed Inquiry

Flip Chart p. 5

Launch It!

Use energy stored in a spring to launch a foam ball. Record the distance the ball travels.

1.c., 2.d.

Summary Kinetic energy is energy of motion. Potential energy is energy of position. Energy can change from one form to another. Machines and living things change stored energy to motion and heat. Friction is a force caused by objects rubbing together.

What force makes a bike slow down?

Cause and Effect What causes your hands to get warm when you rub them together? Fill in the box to explain what happens.

Cause	Effect
	My hands get warm when I rub them together.

Friction

When you rub your hands together, they get warm. The heat comes from thermal energy. But what makes the thermal energy? It comes from friction (FRIHK shuhn) between your hands. **Friction** is a force that happens when one object rubs against another object.

When you ride a bike, how do you slow down? You press on the brakes. The brakes push down on the tire. When the tire and the brakes rub together, they make friction. The friction makes the bike slow down.

CAUSE AND EFFECT

What causes your hands to get warm when you rub them together?

What Are Waves?

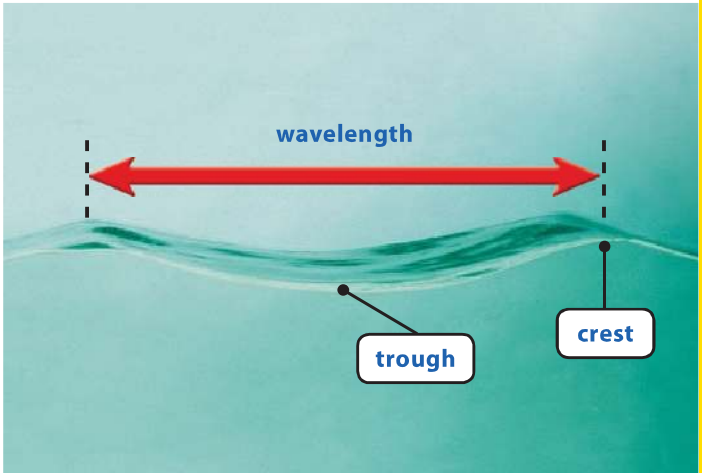
3

Waves carry energy from place to place.

How Energy Travels

Rocks fall down the side of a mountain and into the ocean. It's a landslide! The energy of the moving rocks makes waves in the ocean. The waves reach a far-off shore. Water rushes over the land. How did the energy of the landslide move through the water? It moved as waves. A **wave** is a movement that carries energy from one place to another.

All waves have properties you can see. The **crest** is the highest point of the wave. The **trough** (trawf) is the lowest point of the wave. The distance between two crests is the wavelength.



Lesson Preview

VOCABULARY

crest The highest point of a wave. *(noun)*

trough The lowest point of a wave. *(noun)*

vibrate To move back and forth quickly. *(verb)*

wave A movement that carries energy from one place to another. *(noun)*

VOCABULARY SKILL: Decoding

Write the word *trough*. Circle the blend that begins this word *(tr)*. In this word, the letters *-ough* make the same sound as *o-f-f*. Write the word *trough* the way it sounds. Practice saying the word.

2.f. Differentiate the movement of vibrations in waves (e.g., sound and seismic waves), and cite examples to explain that vibrations move through different materials at different speeds. (DOK 1)

1. Waves carry _____ from place to place.

2. **a.** The highest point of an ocean wave is its _____.

   b. The lowest point of an ocean wave is its _____.

3. How does sound energy move?

_____

4. Tell why pulling on a guitar string and then letting it go produces sound waves.

_____

_____

Express Lab

Use the Activity Card **Model a Sound Wave.**

1.b., 2.f.

Sound Waves

Waves do not move only in water. Waves can move through air and other things, too.

Sound energy moves in waves. Sound is made when things **vibrate** (VY brayt), or move back and forth quickly.

When you play a guitar, you pull a string. The string moves back and forth very fast. This makes sound waves in the air. The sound waves move out in all directions. You hear the waves as sounds.

Sound Moves Through Matter

You often hear sound waves through the air, which is a gas. But sound waves can also move through liquids. Look at these dolphins. They use sound waves to talk to each other under water.

Sound waves can move through solids, too. Sound waves move through solids faster than they move through liquids. They move through liquids faster than through gases. That means sound waves move faster through a wood door than through air!

You can hear sounds under water, just as dolphins do.

5. The measurements below are speeds measured in meters per second (m/s). Place the measurements into the data table where they belong.

340 m/s 5,960 m/s 1,480 m/s

Approximate Speed of Sound	
Type of Matter	**Speed**
solid steel beam	_____
fresh water	_____
air at sea level	_____

Science Test Practice

Circle the correct answer.

6. Which causes sound waves?

(A) vibrations (C) falling objects

(B) ocean waves (D) crests and troughs

2.f. (DOK 1)

Directed Inquiry

Flip Chart p. 6

Seeing Sounds

Observe and record vibrations traveling through solids.

1.d., 1.f., 2.f.

Summary Waves carry energy from place to place. Sound is the energy of vibrating matter. Sound waves can travel through liquids, solids, and gases. Seismic waves move through Earth and cause earthquakes.

Do all sound waves travel at the same speed? Explain.

_____

_____

_____

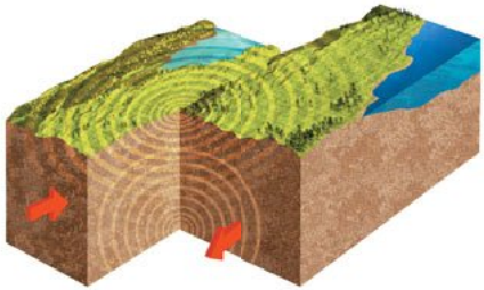
Compare and Contrast How are light and sound waves similar and different?

Light Waves	Both	Sound Waves
do not involve _____	carry _____ from one place to another	movements of _____ through matter

Seismic Waves

Earth's surface is made of sections of rock that push against one another. When two sections slip and move, an earthquake occurs. The moving rocks cause the ground to vibrate and shake. The waves that move through the ground are called *seismic waves*.

Sound waves and seismic waves both cause matter to vibrate. Other kinds of waves do not involve vibrations. Light waves and waves in the ocean are examples.



Some seismic waves travel deep into Earth. Other seismic waves travel on Earth's surface.

COMPARE AND CONTRAST

How are light waves and sound waves similar and different?

KWL

WHAT DID YOU LEARN?

Science Test Practice

❶ What kind of energy is stored in a stretched rubber band?

Ⓐ friction

Ⓑ kinetic energy

Ⓒ potential energy

Ⓓ energy traveling in a wave

2.d. (DOK 2)

Comprehension

❷ Suppose you are at the top of a hill, wearing roller skates. How can you convert your potential energy to kinetic energy?

❸ How can energy travel from place to place?

❹ What is chemical energy?

Critical Thinking

❺ The Sun is the main source of light energy during the day. What are some sources of light energy you can use at night?

KWL

WHAT DID YOU LEARN?

Science Test Practice

❶ Circle the correct answer.

Comprehension

❷ _____

_____

❸ _____

_____

❹ _____

_____

Critical Thinking

❺ _____

_____

_____

Circle the correct answer.

1. Look at where the roller coaster cars are in the picture below.

Which statement is true?

Ⓐ The cars have no kinetic energy.
Ⓑ The cars have no potential energy.
Ⓒ The cars have a lot of potential energy.
Ⓓ The cars have very little potential energy.

2.d. (DOK 2)

2. What happens to tiny particles of matter as a sound wave passes by?

Ⓕ They vibrate.
Ⓖ They change state.
Ⓗ They stop moving.
Ⓙ They spin in a circle.

2.f. (DOK 1)

3. Which is an example of converting potential energy to kinetic energy?

Ⓐ A battery is charged.
Ⓑ A runner stops running.
Ⓒ A thrown ball travels upward.
Ⓓ A wind-up toy moves across the floor.

2.d. (DOK 2)

4. Which of the following produces a sound wave?

Ⓕ a seismic wave
Ⓖ a vibrating drum
Ⓗ a stationary guitar string
Ⓙ a fast-moving light wave

2.f. (DOK 1)

5. Through which material does a sound wave probably move fastest?

Ⓐ air
Ⓑ a gas
Ⓒ a solid
Ⓓ a liquid

2.f. (DOK 2)

6. Which has <u>only</u> potential energy?

Ⓕ 

Ⓗ 

Ⓖ 

Ⓙ 

2.d. (DOK 2)

7. Which observation is evidence that sound waves travel through solids?

Ⓐ Tony yells and hears his echo a few seconds later.

Ⓑ Darius sees a dolphin trainer use a whistle to train a dolphin.

Ⓒ Dana taps on one end of a long pipe, and Jenny feels a vibration at the other end.

Ⓓ Amy watches workers install foam on the walls to improve the sound in a music hall.

1.d. (DOK 2)

8. Which does <u>not</u> produce vibrations?

Ⓕ a sound wave

Ⓖ a seismic wave

Ⓗ plucking a guitar string

Ⓙ shining a light on a table

2.f. (DOK 1)

9. Look at the drawing below.

Shelf 1

Shelf 2

Shelf 3

Shelf 4

On which shelf do the books have the <u>most</u> potential energy?

Ⓐ Shelf 1

Ⓑ Shelf 2

Ⓒ Shelf 3

Ⓓ Shelf 4

2.d. (DOK 2)

10. Which object has the <u>most</u> kinetic energy?

Ⓕ a leaf falling from a tree

Ⓖ a race car speeding around a track

Ⓗ a person standing on a roof

Ⓙ a student walking to school

2.b. (DOK 2)

KWL

WHAT DO YOU KNOW?

List one fact about each of these topics:

a. Light: _____

_____

_____

b. How light is reflected: _____

_____

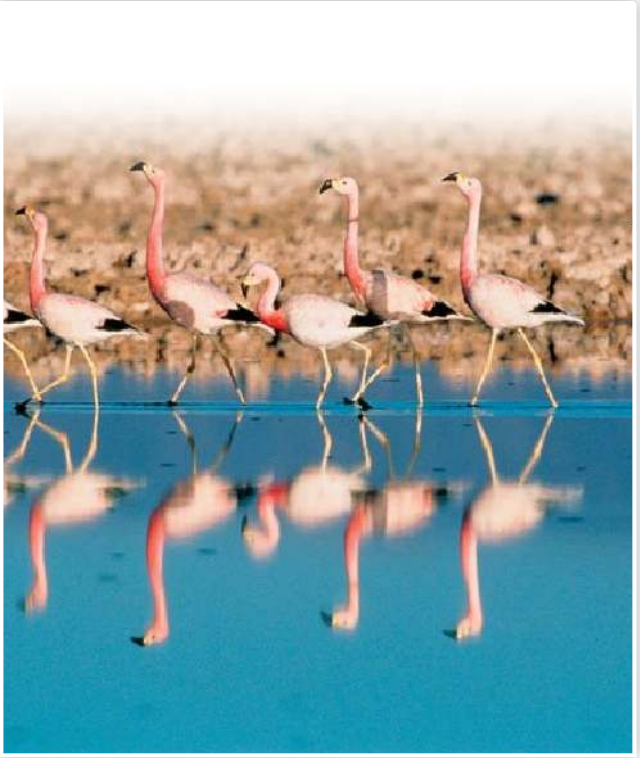
_____

c. Color: _____

_____

_____

Light



Contents

KWL

WHAT DO YOU WANT TO KNOW?

Skim the pictures and headings in this chapter. List one thing you want to find out about each of these topics:

a. Light: _____

_____

_____

b. Reflecting Light: _____

_____

_____

c. Color: _____

_____

_____

Lesson Preview

VOCABULARY

light A form of energy that you can see. *(noun)*

opaque Not allowing light to pass through. *(adjective)*

shadow A darker area caused by blocked light. *(noun)*

translucent Allows only some light to pass through. *(adjective)*

transparent Lets light pass through. *(adjective)*

VOCABULARY SKILL: Prefixes

The prefix *trans-* means "across." Write the two vocabulary terms that begin with the prefix *trans-*. Circle the prefix in each word.

_____

_____

2.e. Explain how light waves travel (e.g., in a straight line until they strike an object, through transparent and translucent objects, from reflecting and refracting surfaces, at the surface of opaque objects). (DOK 1)

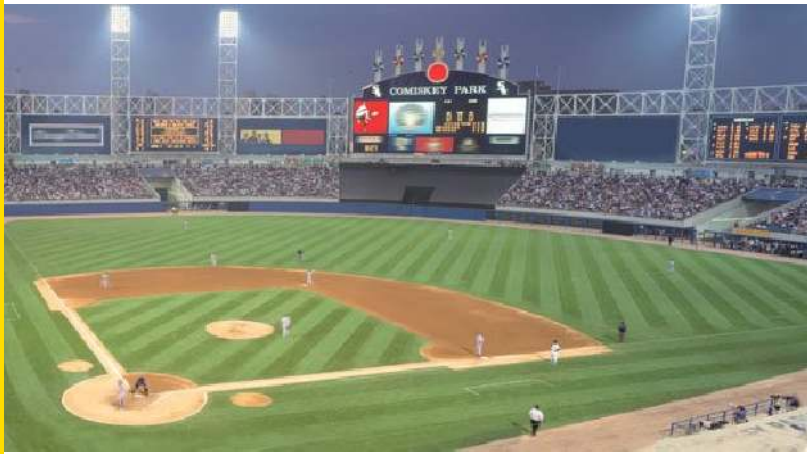
1 What Is Light?

We can see objects because of light. Light moves from the object and into our eyes. Shadows are made when light is blocked.

Energy You Can See

Look around you. What can you see? You can see things because of light. **Light** is a kind of energy. It moves in waves. Light waves move away from their source, or the place where they start.

Most objects do not give off their own light. You can see them because light from another source bounces off of them.



Lights can make night seem like day.

How can you see an object? Light waves hit the object and bounce off it. Then the light waves hit your eyes.

Look at the picture. The boy can see the toys. Light waves from a bulb hit the toys. Some of the light waves bounce from the objects to the boy's eyes. Then he can see them.

The boy sees the objects when light waves bounce from their surfaces to his eyes.

1. Fill in the blanks.

Light is a kind of _____ that moves in _____.

2. Most objects do not give off their own light. Tell how you see them.

_____

_____

3. Draw arrows to show how you see the toy and the book. The arrows should show how light travels.

Toy

Lamp

My Eye

Book

4. An object that lets light pass through it is a/an _____ object.

Science Test Practice

Circle the correct answer.

5. What happens to light when it strikes a transparent glass window?
   - Ⓐ The light becomes blurry.
   - Ⓑ All of the light passes through.
   - Ⓒ Some of the light passes through.
   - Ⓓ None of the light passes through.

2.e. (DOK 1)

Directed Inquiry

Flip Chart p. 7

Shining Light

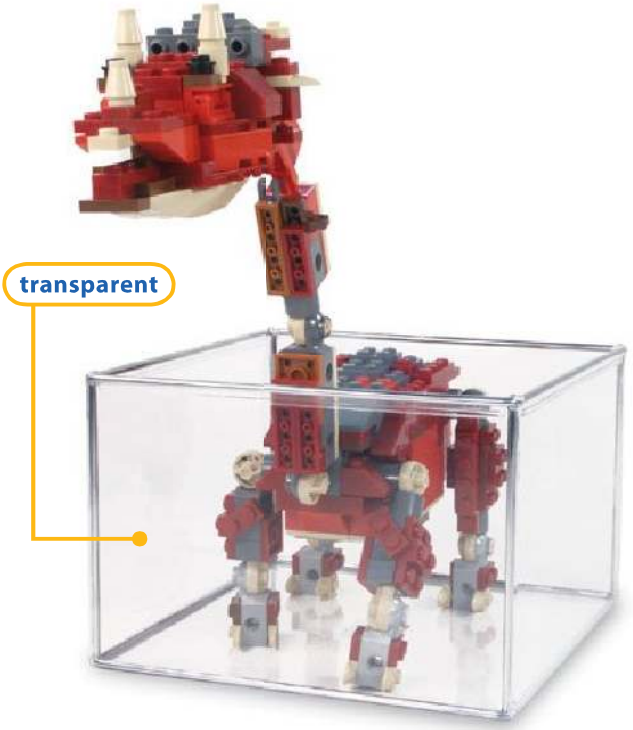
Observe and record what happens to light when it hits different materials.

1.a., 2.e.

Light and Matter

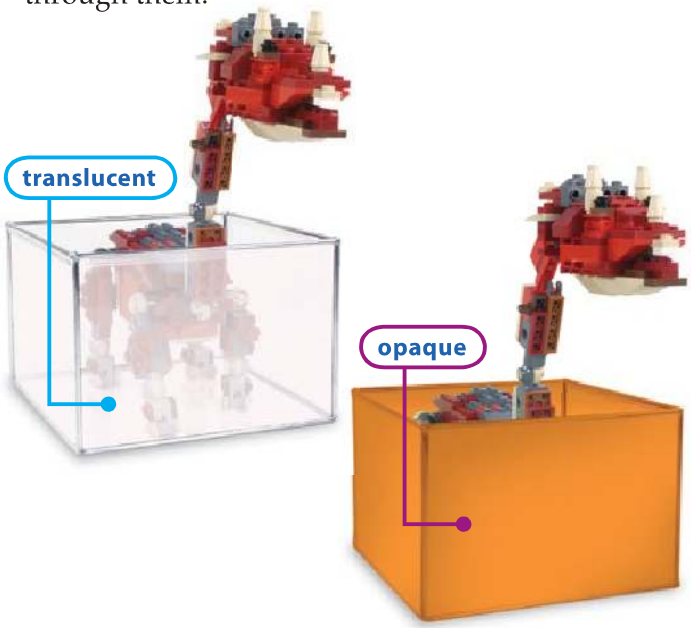
You can see through water, but you cannot see through a rock. Why can you see through some things and not others?

You can see through things that are transparent (trahns PAIR uhnt), such as water and glass. A **transparent** object lets light pass through it. Windows are made of transparent glass so that you can see through them.



You can partly see through things that are translucent (trahns LOO suhnt), such as frosted glass. A **translucent** object lets some light pass through it, but sends the light in many directions. Objects seen through translucent objects look blurry.

You cannot see through things that are opaque (oh PAYK), such as wood and rock. An **opaque** object does not let light pass through it. Walls are opaque. People are opaque, too. You cannot see through them.



6. Draw an arrow to show what happens to light when it hits an opaque object.

light source

wooden door

7. Use *transparent*, *translucent*, or *opaque* to describe each object.

a. clear window _____

b. wall _____

c. clean water _____

d. person _____

e. frosted glass _____

Express Lab

Use the Activity Card **See Light Intensity.**

1.f., 2.e.

8. What is a shadow?

_____

_____

9. Place an X where the shadow will fall.

light source

person

I Wonder . . . Are there shadows at night?

_____

_____

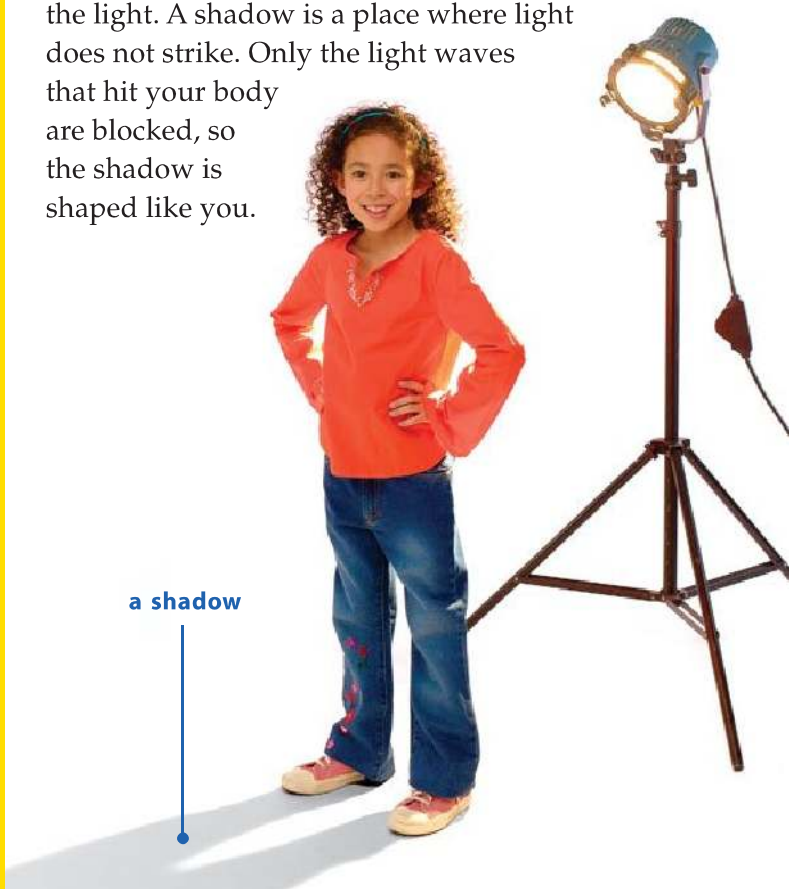
_____

_____

Shadows

What happens when light hits an opaque object, such as your body? Some of the light waves hit your body. Your body blocks those light waves. But some of the light goes past your body and hits the ground or a wall.

A **shadow** is made where your body blocks the light. A shadow is a place where light does not strike. Only the light waves that hit your body are blocked, so the shadow is shaped like you.



Sharp Shadows

Look at the shadows in these pictures. In the first picture, the shadow is about the same size as the puppet. The edges are clean and sharp.

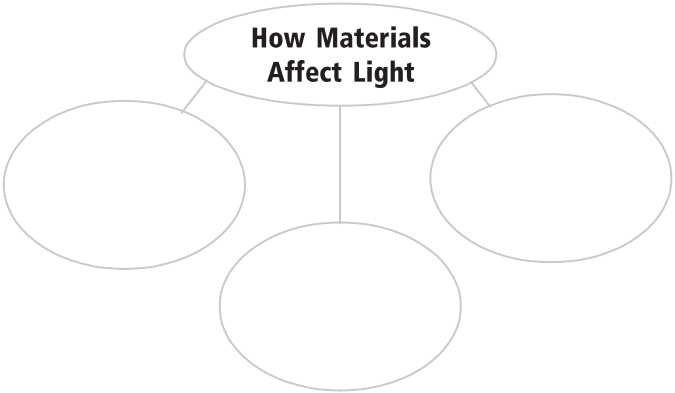
In the second picture, the shadow is a lot bigger than the puppet. The edges of the shadow are blurry. What makes the shadows different?

An object that is close to its shadow makes a small, sharp shadow. An object that is far from its shadow makes a large, blurry shadow.

MAIN IDEA

Where should you hold your hands to make a clear, sharp shadow on the wall?

Summary Objects are seen when light traveling from them enters the eye. A shadow forms when light is blocked. List three words used to describe how light passes through materials and explain each term.



Main Idea Where should you hold your hands to make a clear, sharp shadow on the wall?

Lesson Preview

VOCABULARY

lens An object that refracts light. *(noun)*

reflect To bounce off. *(verb)*

refract To bend. *(verb)*

VOCABULARY SKILL: Multiple-Meaning Words

The word *reflect* can mean "to think about something." Read both sentences below. Circle the sentence in which the word *reflect* means "to bounce off."

After reading this lesson, I will reflect on what I learned.

Still, smooth water will cause light to reflect, just as a mirror does.

2.e. Explain how light waves travel (e.g., in a straight line until they strike an object, through transparent and translucent objects, from reflecting and refracting surfaces, at the surface of opaque objects). (DOK 1)

2

How Is Light Reflected?

Light waves change direction when they hit something. How they change direction affects what you see.

Reflection

Light waves move in straight lines. But they change directions when they hit something. How their direction changes depends on what they hit.

Light waves **reflect** (rih FLEHKT), or bounce, off most objects. When light waves hit a mirror, they reflect right back to your eyes. That is why you see yourself.

Light waves can also hit things that are not smooth and shiny like a mirror. Then they bounce back in many directions.

This water is very smooth. It reflects light like a mirror.

Refraction

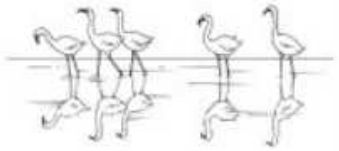
Look at the straw. Is it broken? No, but the way light hits it makes it look broken.

The path of light waves changes when it hits some things, such as air or water. Light waves refract (rih FRAKT) when they move from air to water. To **refract** is to bend. Refracted light makes things look bent or broken. The straw looks as if it is broken because light bends when it moves from water to air.

This straw looks broken because of refraction.

1. Circle the term that correctly completes each sentence about how light waves change direction.
   - **a.** Light waves move in (curved, straight) lines until they hit something.
   - **b.** When light waves move from air to water, they (bounce, bend).
   - **c.** When light waves strike a mirror, they (bounce, bend) back to your eyes.

2. Use the words *reflect* and *refract* to label each picture.



_____ _____

Directed Inquiry

Flip Chart p. 8

Ways of Reflecting

Predict the path of light, and observe how mirrors reflect light.

1.b., 2.e.

Science Test Practice

Circle the correct answer.

3. What happens when a light wave is refracted?

Ⓐ It bends.

Ⓑ It breaks.

Ⓒ It gets larger.

Ⓓ It bounces backward.

2.e. (DOK 1)

4. Fill in the chart to tell what happens in your eye when you look at and see a flower.

Reflected light bounces off the flower and enters my eye.

↓

The lens of my eye _____ the light. The image is _____ in my eye.

↓

My brain _____ the image of the flower so that I can see it correctly.

A **lens** is an object that refracts light. A lens is made of glass. Glass refracts light. The lens in eyeglasses is curved to bend light. This helps people see better.

A hand lens is made of glass. It is curved, too. It refracts light to make objects look bigger.

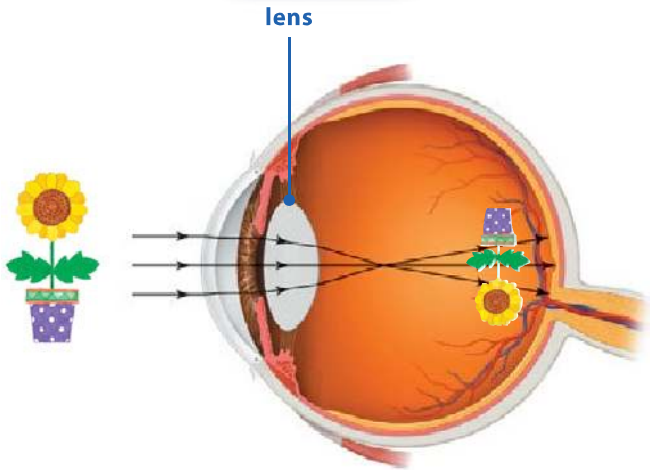
This hand lens refracts light.

The Human Eye

Each of your eyes has a lens, too. The lens is near the front of your eye.

When you look at an object, reflected light goes into your eye. The lens bends the light. Your eye makes an image of the object. The image is upside down! Your brain "flips" the image so that you can see it correctly.

Human Eye



PROBLEM AND SOLUTION

How do you see your image reflected in a mirror?

Summary Light waves change direction, depending on the kind of surface they strike. Smooth, shiny surfaces reflect light. Light can refract, or bend, when it passes through air or water. How the direction changes affects what a person sees. What part of your eyes helps you see an image?

Problem and Solution How do you see your image reflected in a mirror? Complete the chart to explain how.

Problem	Solution
You want to see your image in a mirror.	

Lesson Preview

VOCABULARY

absorb To take in. *(verb)*

prism A transparent object that separates white light into all the colors of the rainbow. *(noun)*

VOCABULARY SKILL: Antonyms

Read the definition of the word *prism.* The word *separates* means "divides or splits." An opposite of *separates* is "unites" or "joins together." Rewrite the definition of *prism* using the word *split* or *divide.*

_____

_____

_____

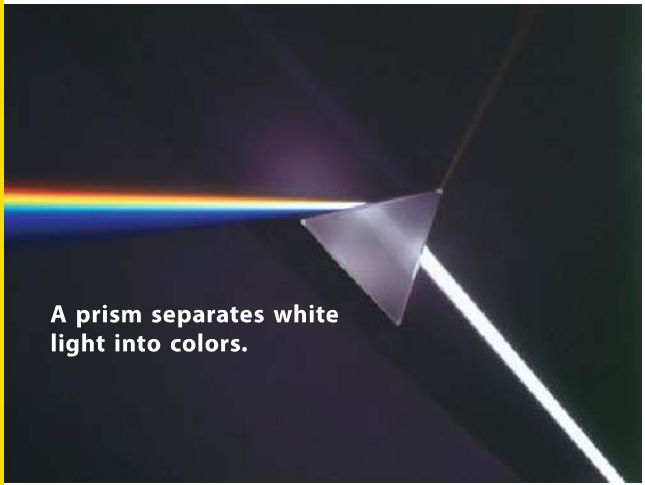
2.e. Explain how light waves travel (e.g., in a straight line until they strike an object, through transparent and translucent objects, from reflecting and refracting surfaces, at the surface of opaque objects). (DOK 1)

3 What Is Color?

Light hits an object. The color of the light affects the way you see the object.

The Colors of Sunlight

White light is made up of all the colors of the rainbow. Look at the picture. You can see many colors when light shines through the prism. A **prism** is a piece of glass or other transparent object. It is shaped like a triangle. It breaks white light into many colors.



A prism separates white light into colors.

Raindrops act like tiny prisms to create a rainbow.

Sunlight has many colors, too. When it is raining, you might see a rainbow if there is also some sunlight. That is because raindrops act like prisms. They break white light into colors. This makes a rainbow.

1. Complete the sentences to describe a prism.

a. It is made of glass or other _____ material.

b. It is shaped like a/an _____.

c. It breaks white light into many _____.

I Wonder . . . One rainy day, the Sun began to shine through a break in the clouds. A rainbow appeared in the sky. Why did that happen? What do you think?

_____

_____

_____

_____

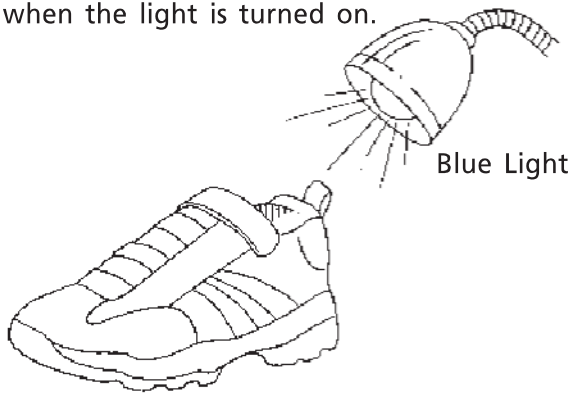
2. Circle the correct answer. When you are looking at a colored object, what do you see?

the light waves that are absorbed

the light waves that are reflected

the light waves that are refracted

3. Label the shoe to tell the color it will look when the light is turned on.



Express Lab

Use the Activity Card **Make Colored Light.**

1.b., 2.e.

Seeing Colors

Light shines on an object. The object will **absorb** (uhb SAWRB), or take in, some of the light waves.

The object absorbs some colors. It reflects other colors. You see the reflected colors. You do not see the absorbed colors.

Bananas look yellow because they reflect yellow light. They absorb other colors.

An orange absorbs all colors other than orange. So orange is the only color we see when we look at it.

Colored Light

The color of an object is based on the light it reflects. It is also based on the color of light shining on it.

White light is made up of all the colors of the rainbow. White objects reflect all of these colors, so they look white.

Shine a white light on a white shoe. It will look white. Shine a red light on the white shoe. It will look red.

Shine a colored light on a white shoe and the shoe seems to change color.

SEQUENCE

How could you cause a white golf ball to appear blue, then red, then yellow?

Summary White light is made up of all the colors of the rainbow. When white light strikes a colored object, the object absorbs some colors. It reflects other colors. You see only the reflected color. The color of the reflected light is the color of the object. The color of the light shining on an object also affects the way the object is seen. Complete the chart to explain why an apple looks red.

Light shines on a red apple.

↓

The apple _____ most colors of light.

↓

The apple _____ red light.

↓

You see a red apple.

Sequence How could you cause a white golf ball to appear blue, then red, and then yellow?

_____

_____

KWL

WHAT DID YOU LEARN?

Science Test Practice

❶ Circle the correct answer.

Comprehension

❷ _____

❸ _____

❹ _____

_____

Critical Thinking

❺ _____

_____

_____

_____

KWL

WHAT DID YOU LEARN?

Science Test Practice

❶ **What is it called when a light wave bounces off an object?**

Ⓐ color

Ⓑ refraction

Ⓒ reflection

Ⓓ magnifying

2.e. (DOK 1)

Comprehension

❷ How do you see objects?

❸ What is the difference between *reflect* and *refract*?

❹ What happens to sunlight after it strikes a banana?

Critical Thinking

❺ A toy bear is on a dresser in front of a mirror. Why does the mirror produce a reflection, but the bear does not?

Make a graphic organizer and fill it in to show how light waves travel.

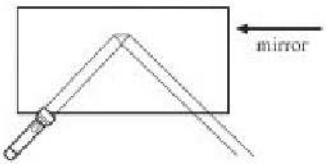
Circle the correct answer.

1. Which does not show refraction?

Ⓐ 

Ⓑ 

Ⓒ 

Ⓓ 

2.e. (DOK 1)

2. Which of the following objects is translucent?

Ⓕ book
Ⓖ tree limb
Ⓗ wax paper
Ⓙ clear glass window

2.e. (DOK 1)

3. Which is true about an object that is transparent?

Ⓐ It blocks all light.
Ⓑ All light passes through it.
Ⓒ Only some light passes through it.
Ⓓ It does not let light pass through it.

2.e. (DOK 1)

4. When you look at grass, which color or colors are being reflected?

Ⓕ black
Ⓖ white
Ⓗ green
Ⓙ all but white

2.e. (DOK 1)

5. Which best describes how light waves travel if they do not hit anything?

Ⓐ The waves bounce off particles of air.
Ⓑ The waves travel in a straight line.
Ⓒ The waves reflect.
Ⓓ The waves bend.

2.e. (DOK 1)

6. Suppose a beam of white light travels through a prism and is refracted. What would you see exiting the prism?

Ⓕ sunlight
Ⓖ only blue light
Ⓗ all the colors of the rainbow
Ⓙ all colors except the color of the prism

1.b. (DOK 1)

7. What causes an object sticking out of water to appear bent?

Ⓐ Light is reflected
Ⓑ Light is refracted.
Ⓒ Light is absorbed.
Ⓓ Light makes a shadow.

2.e. (DOK 1)

8. Which object would make a dark shadow?

Ⓕ a wood door
Ⓖ a glass window
Ⓗ a clear tank of water
Ⓙ a transparent marble

2.e. (DOK 1)

9. An object of which of the following colors would absorb the most light?

Ⓐ black
Ⓑ violet
Ⓒ white
Ⓓ orange

2.e. (DOK 1)

10. Look at the picture of a mirror below.

Which is happening to the light?

Ⓕ Light is reflecting off an opaque surface.
Ⓖ Light is reflecting off a transparent surface.
Ⓗ Light is refracting off a translucent surface.
Ⓙ Light is being absorbed by an opaque surface.

2.e. (DOK 1)

KWL

WHAT DO YOU KNOW?

List one fact about each of these topics:

a. Jobs that plant parts do: _____

_____

b. Parts inside your body: _____

_____

c. Animal life cycles: _____

_____

How Living Things Function

Contents

KWL

WHAT DO YOU WANT TO KNOW?

Skim the pictures and headings in this chapter. List one thing you want to find out about each of these topics:

a. Jobs that plant parts do: _____

_____

_____

b. Parts that make up your body: _____

_____

_____

c. Animal life cycles: _____

_____

_____

Lesson Preview

VOCABULARY

cell The smallest basic unit of a living thing. *(noun)*

leaf The part of a plant that collects sunlight and gases from the air and uses them to make food for the plant. *(noun)*

nutrient Something that living things need to live and grow. *(noun)*

plant A living thing that can make its own food and is made of cells with stiff walls. *(noun)*

root The part of a plant that takes in water and nutrients and holds the plant in the soil. *(noun)*

stem The part of a plant that holds up the leaves and carries water and nutrients through the plant. *(noun)*

3.a. Research and explain diverse life forms (including vertebrates and invertebrates) that live in different environments (e.g., deserts, tundras, forests, grasslands, taigas, wetlands) and the structures that serve different functions in their survival (e.g., methods of movement, defense, camouflage). (DOK 2)

3.c. Investigate the relationships between the basic needs of different organisms and discern how adaptations enable an organism to survive in a particular environment. (DOK 2)

1

How Do Plants Use Their Parts?

Plants use their parts to meet their needs.

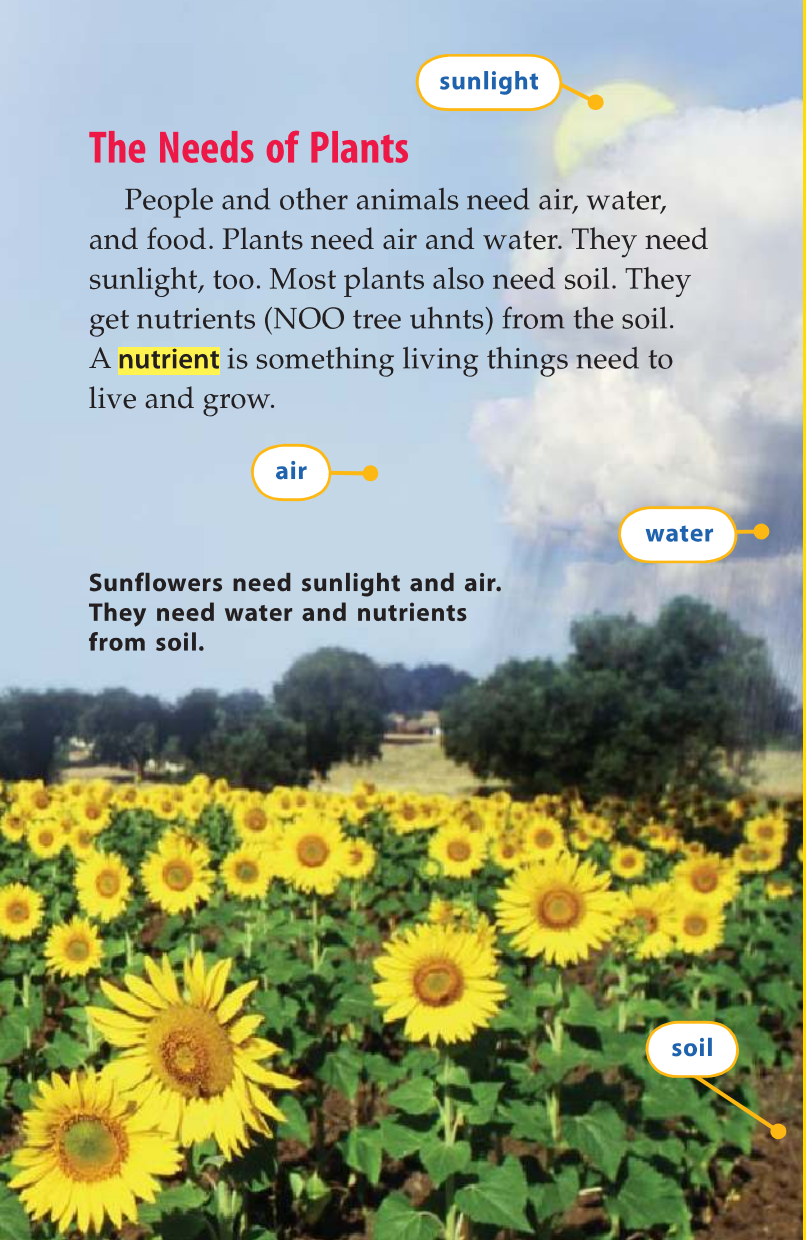
Plants

Living things are things that are alive. They are found all over Earth. Plants and animals are two groups of living things. A **plant** is a living thing that grows on land or in water. Plants cannot move from place to place. Most plants have green leaves.

Sunflowers are plants.

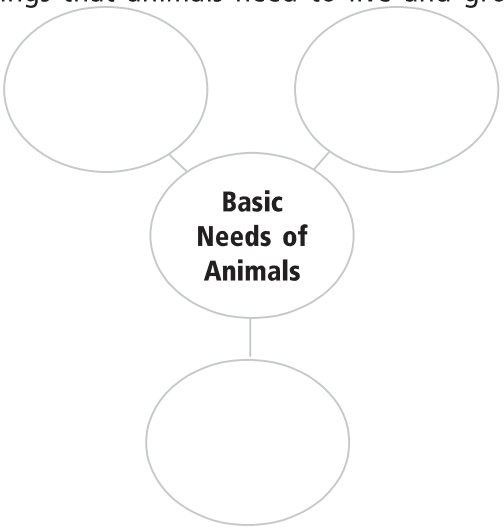
The Needs of Plants

People and other animals need air, water, and food. Plants need air and water. They need sunlight, too. Most plants also need soil. They get nutrients (NOO tree uhnts) from the soil. A **nutrient** is something living things need to live and grow.

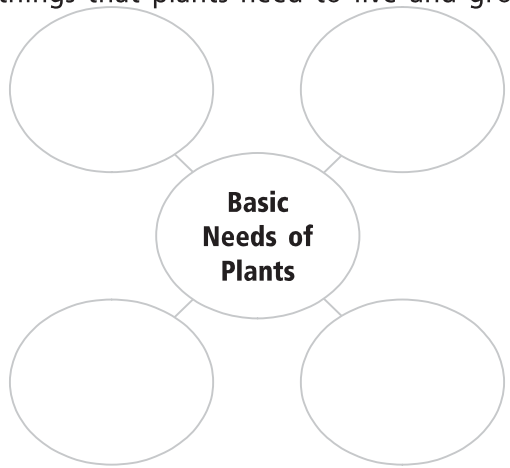


Sunflowers need sunlight and air. They need water and nutrients from soil.

1. Complete the diagram below to show the things that animals need to live and grow.



2. Complete the diagram below to show the things that plants need to live and grow.



3. How do the stiff walls of plant cells help a plant?

_____

_____

4. Look at the photo of the plant on page 85. Draw an X on a leaf. Draw a check mark on the stem. Draw a circle around the roots.

Use the Activity Card **Make a Terrarium.**

1.d., 3.c.

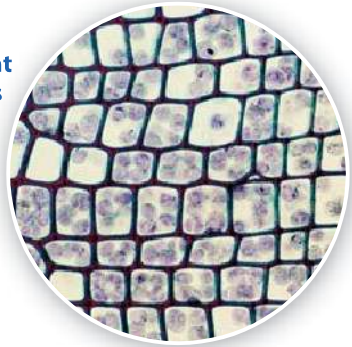
Parts of Plants

Animals are made of cells (sehlz). Plants are made of cells, too. A **cell** is the smallest basic unit of a living thing.

Plant cells have stiff walls. These walls hold the plant up. They give the plant its shape.

Plants cannot move from place to place. So plants cannot get food like animals can. How do plants get what they need? They have parts that help them.

plant cells



Plants are made of cells.

Most plants have three parts. Each part has a job. A **root** takes in water and nutrients. It also holds the plant in the soil. A **stem** holds up the leaves. It carries water and nutrients through the plant. A **leaf** gets sunlight and gases from the air. It uses these things to make food for the plant.

This is a zebra plant. It has stripes like a zebra.

Science Test Practice

Circle the correct answer.

5. Which plant part carries water and nutrients to different parts of the plant?

Ⓐ root
Ⓑ cell
Ⓒ stem
Ⓓ leaf

3.a. (DOK 2)

6. Plants need energy from food to survive. Where does the food in a plant come from?

_____

_____

7. Draw an X on the picture on the part of the plant that stores food.

8. What keeps a huge tree from falling over?

_____

_____

Roots

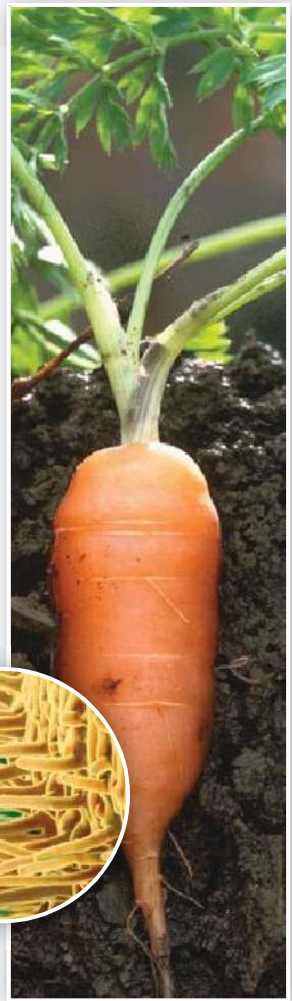
You can't see the roots of most plants. Most plants have roots under the ground.

Roots have an important job. They take in water and nutrients from the soil. Tiny hairs on the roots help them do this.

Roots have another job. They hold the plant in place. They also help the plant stand up. Huge plants like trees have huge roots. That keeps them from falling over.

Some roots store food for the plant. Carrots are really roots. They are full of nutrients that the whole plant needs. People eat carrots and other roots.

carrot plant



root hairs

A carrot is a root.

Stems

Many plants have long, thin stems. The stems have small tubes. Water and nutrients move through these tubes to other parts of the plant. Stems also hold up the leaves. This lets the leaves get sunlight.

Some stems store food or water. A plant called sugar cane stores food in its stems. A cactus stores water in its stems.

People eat some stems. Celery is one kind of stem that people eat.

bamboo plants

Stems help some plants grow tall.

9. Describe four jobs that stems do.

a. _____

_____

b. _____

_____

c. _____

_____

d. _____

_____

10. Complete the diagram to tell about an important job of plant leaves.

Leaves take in _____ and _____.

↓

Leaves use these things to make _____.

↓

The plant uses this material for _____.

Directed Inquiry

Flip Chart p. 9

Cactus Spine

Observe and draw the parts of a cactus. Infer how the parts of a cactus help it survive.

1.e., 3.a.

Leaves

Leaves grow out of the stem of a plant. Most plants have many leaves. The leaves of a plant have a big job. They take in sunlight and gases from the air. They use them to make sugar. The sugar is food for the plant.

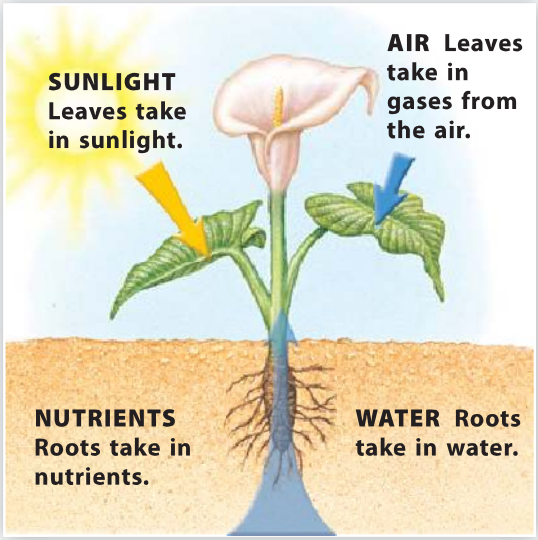
Most leaves grow near the top of a plant. That helps them take in more sunlight.

Leaves do not all look the same. They have different shapes. The spines on a cactus are leaves. So are the needles on a pine tree.

People eat the leaves of some plants.

Japanese maple leaf

People eat lettuce leaves.



How Plants Meet Needs

Roots, stems, and leaves all work together. They help a plant meet its needs. That helps it live and grow.

Roots take in water and nutrients from soil. Stems move water and nutrients to other parts of the plant. Leaves use sunlight, water, and air to make food.

TEXT STRUCTURE

Look at the heads in this section. What are the three parts of a plant?

Summary Plants need air, water, sunlight and nutrients to live. The roots, stems, and leaves of plants work together to help a plant meets its needs.

Look at the diagram that shows how a plant meets its needs.

a. Draw an arrow on the diagram to show where water and nutrients get into the plant.

b. Circle the plant part where food is made.

c. Draw an X on the plant part that takes in gases from the air.

Text Structure Look at the heads in this section. What are the three parts of a plant?

_____

_____

Lesson Preview

VOCABULARY

digestive system The body system that breaks down food into a form your body can use. *(noun)*

muscular system The body system made up of all your muscles. *(noun)*

nervous system The body system that senses things and controls your body. *(noun)*

skeletal system The body system made up of all your bones. *(noun)*

VOCABULARY SKILL: Use Pictures

Read the definitions above. The definition for *muscular system* tells about the parts that make it up. Look at the images in this lesson. Then write a definition for *digestive system* that tells about the parts that make it up.

_____

_____

3.b. Identify and describe the purpose of the digestive, nervous, skeletal, and muscular systems of the body. (DOK 1)

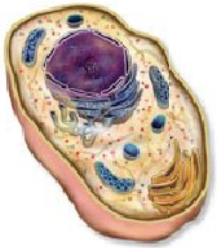
3.f. Recognize that cells vary greatly in size, structure, and function, and that some cells and tiny organisms can be seen only with a microscope. (DOK 1)

2 What Parts Make Up Your Body?

From Small Parts to Large Parts

All living things, including you, are made up of cells. But not all cells look alike. Plant cells and animal cells are very different. Plant cells are surrounded by a thick wall. Animal cells are not.

There are many different kinds of cells in your body. Each kind of cell has a different job to do. The size and shape of a cell help the cell do its job.

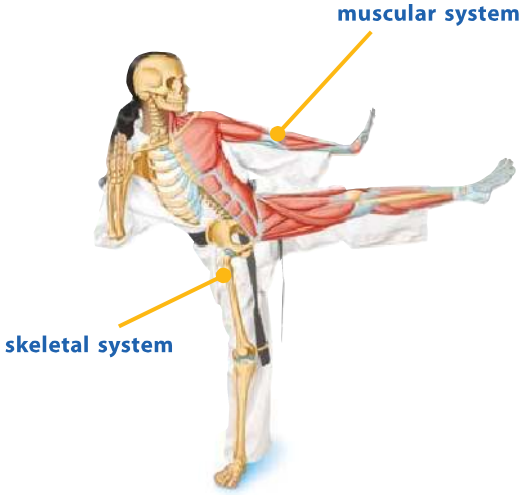


Most cells are so small that you need a microscope to see them. Even though they are small, cells have many smaller parts inside.

These red blood cells carry oxygen from your lungs to other cells. They are small and smooth so they can fit through tiny blood vessels.

The cells in your body work together. For example, millions of muscle cells make up each muscle in your body. Muscle cells are long and skinny. They can contract, or get shorter. That makes your body parts move. All your muscles make up the **muscular system** of your body.

Most of your muscles are attached to bones. Bones and muscles work together to help you move. Bones are strong. Some of them help protect your body. All your bones make up your **skeletal system.**



Your muscular system and your skeletal system work together to help you move.

1. *Structure* is what something is made of and how it is put together. Cross out the box below that has wrong information about a red blood cell.

Smooth and shaped like a doughnut	Surrounded by a thick wall

2. A *function* is what something does or is used for. Underline two functions of the skeletal system.

3. How does a muscle cell's structure help it function?

_____

_____

Science Test Practice

Circle the correct answer.

4. Which statement about cells is true?

   Ⓐ All cells are the same size.

   Ⓑ All cells are the same shape.

   Ⓒ All cells have a certain job to do.

   Ⓓ All cells can contract, or get smaller.

3.f. (DOK 1)

5. Circle the part of a nerve cell that sends information to another nerve cell.

6. How is the food you eat turned into a form your body can use?

_____

_____

_____

Science Test Practice

Circle the correct answer.

7. Which of the following describes what the nervous system does?

   Ⓐ breaks down food in the body

   Ⓑ gathers information and controls the body

   Ⓒ helps protect things inside the body

   Ⓓ moves parts of the body

3.b. (DOK 1)

Express Lab

Use the Activity Card **Model a Cell.**

1.b., 3.f.

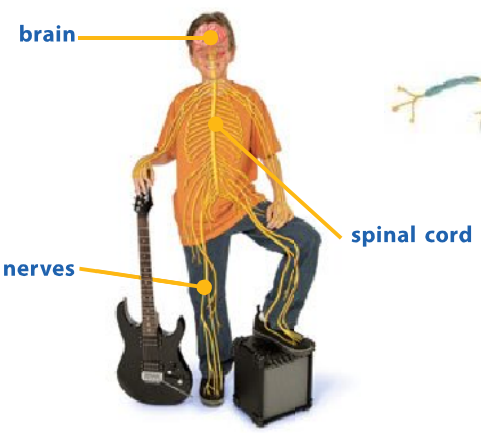
The Nervous System

Your brain is your body's control center. It gets messages from your eyes, ears, and other sense organs. Then your brain decides what to do with the information.

The brain can send messages to other parts of the body. Nerves carry messages to and from the brain. Your brain, nerves, and sense organs make up your **nervous system.**

Nerves are made of nerve cells. A nerve cell has long "arms" that reach out and connect to other nerve cells.

The Nervous System **Nerve Cells**

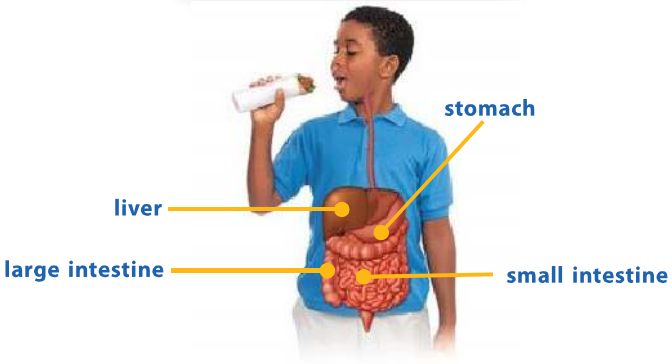


The Digestive System

What do you think is happening to the food you ate for breakfast? It is moving through your digestive system. Your **digestive system** breaks down food into a form that your body can use.

Food moves from your mouth down a tube to your stomach. Then it moves into your small intestine. Liquid made by your liver is added to help break down the food. Food your body can't use travels through the large intestine. Then it exits your body.

The Digestive System



SEQUENCE

What happens to food after you swallow it?

Summary Your body is made of tiny cells. The cells work together to form the parts that make up your body systems. The muscular, skeletal, nervous, and digestive systems are four of your body's systems. How do your nervous and muscular systems work together?

Sequence What happens to food after you swallow it?

It travels down a tube to your _____.

It enters your _____ _____.

Liquid from your _____ is added. Food is broken down and absorbed.

The remaining food moves into your _____ _____, and waste exits your body.

Lesson Preview

VOCABULARY

chrysalis The case a butterfly makes during the pupa stage of its life cycle. *(noun)*

larva The second, wormlike stage in a butterfly's life cycle. *(noun)*

offspring The young living thing made when an adult living thing reproduces. *(noun)*

pupa The third stage of a butterfly's life cycle, during which it changes into an adult. *(noun)*

tadpole The stage in a frog's life cycle when it hatches from an egg and has a long tail, gills, and no legs. *(noun)*

VOCABULARY SKILL: Use Syllables

Break the vocabulary words into syllables. Say each syllable aloud. Which vocabulary word on this page has more than two syllables? Write that word below. Then write the respelling that helps you pronounce the word.

_____

3.d. Illustrate how the adult animal will look, when given pictures of young animals (e.g., birds, fish, cats, frogs, caterpillars, etc.). (DOK 2)

3

What Are Some Animal Life Cycles?

Animals have life cycles. They are born, grow, reproduce, and die. But different kinds of animals have different life cycles.

Life Cycles of Insects

Most insects change more than other animals do. Butterflies go through four different stages. Many other insects go through this same life cycle.

The first stage in the life cycle of a butterfly is the egg. The second stage is the **larva** (LAHR vuh). A larva looks a lot like a worm. The third stage is the **pupa** (PYOO puh). In this stage a butterfly makes a case called a **chrysalis** (KRIHS uh lihs). This is when the butterfly turns into an adult. The fourth stage is the adult. The adult female butterfly lays eggs. Then the life cycle starts again.

Life Cycle of a Butterfly

LARVA A larva hatches from the egg. A butterfly larva is called a caterpillar.

EGG The adult female butterfly lays eggs on a leaf.

PUPA The caterpillar becomes a pupa. It makes a case called a chrysalis.

ADULT An adult butterfly comes out of the chrysalis.

1. Starting with egg, put these stages in the life cycle of a butterfly in the correct order: pupa, egg, larva, adult butterfly.

Stage 1: _____

Stage 2: _____

Stage 3: _____

Stage 4: _____

I Wonder . . . A butterfly goes through many stages. Is its food the same in each stage?

_____

_____

_____

Directed Inquiry

Flip Chart p. 10

Caterpillar Change

Observe a caterpillar for several days.
Compare two stages of the butterfly life cycle.

1.b., 3.d.

2. In the chart below, compare and contrast an adult frog with a tadpole.

Trait	Adult Frog	Tadpole
how it breathes	_____ _____	_____ _____
how it moves	_____ _____	_____ _____
how it looks	_____ _____	_____ _____

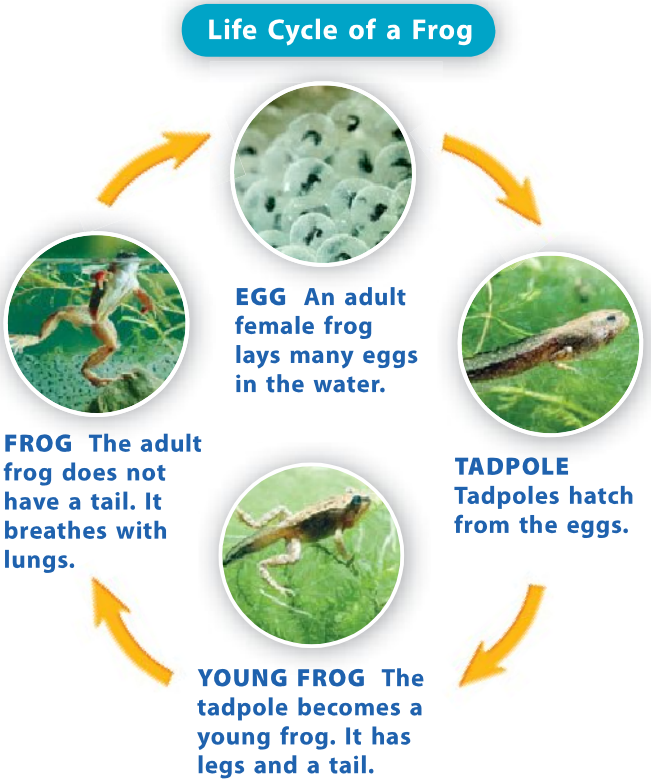
3. Frogs live part of their lives on land and part in water. Would you find a tadpole or an adult frog living on land?

_____

_____

Life Cycles of Amphibians and Reptiles

Amphibians change form during their life cycles. After a frog hatches from its egg, it is called a tadpole (TAD pohl). A **tadpole** lives in water. It has a long tail, gills, and no legs. It does not look like an adult frog.



A young crocodile hatches from an egg. It looks like an adult crocodile, but it is smaller.

Reptiles have a different life cycle from amphibians. The adult female reptile lays eggs. The eggs are usually laid on land. Young reptiles hatch from the eggs. They get bigger and grow into adults. Reptiles do not change form as they grow. A young reptile looks like its parents.

Science Test Practice

Circle the correct answer.

4. Which life cycle stage is common to turtles, butterflies, and crocodiles?

Ⓐ egg
Ⓑ tadpole
Ⓒ larva
Ⓓ pupa

3.d. (DOK 2)

I Wonder . . . Amphibians change form as they grow. Young reptiles look like their parents. Are crocodiles amphibians or reptiles?

5. Draw an X on the picture of the baby chick just after it hatched from its egg. Draw a check mark on the adult bird.

6. Compare the pictures of the young chick and the adult quail. How does the chick change as it grows?

_____

_____

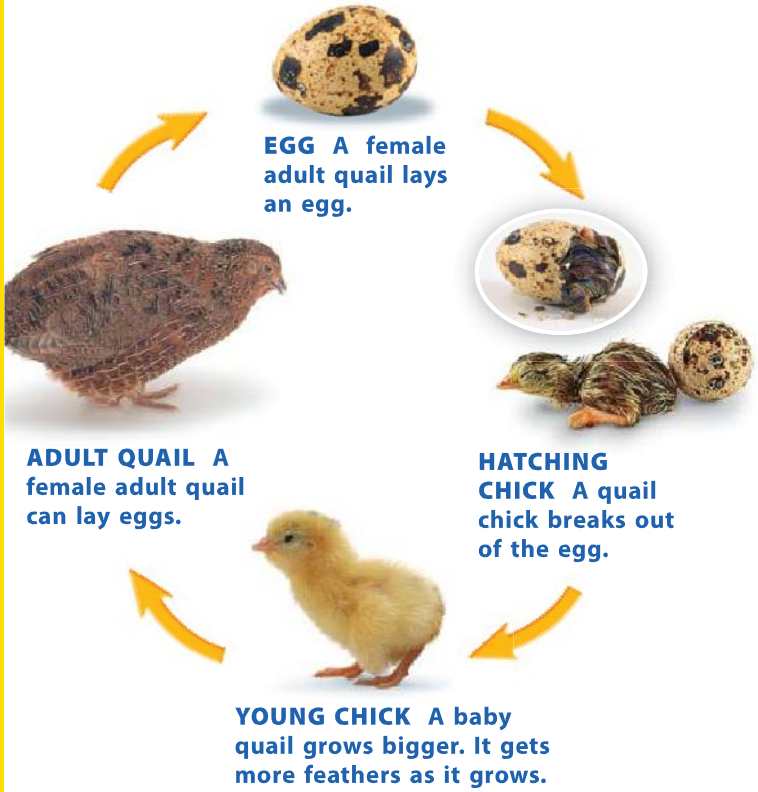
_____

_____

Life Cycles of Birds and Mammals

Insects, amphibians, and reptiles lay eggs. So do birds. Young birds are like their parents in many ways.

Life Cycle of a Bird



Elephants are mammals. Young elephants grow and develop inside the adult female's body.

Offspring (AWF sprihng) are the young living things made when adult living things reproduce. The offspring of mammals grow inside the bodies of adult females. They are born live. They do not hatch from eggs. When they are born, young mammals look much like adult mammals. Dogs, cats, and humans grow and develop in this way.

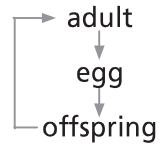
SEQUENCE

Female insects, amphibians, and reptiles lay eggs during which stage of their life cycles?

Summary Some animals are born live. Others hatch from eggs. Animals grow in size or change form as they develop. Adult animals produce offspring.

The diagrams show the life cycles of a dog, a frog, and a bird. Write the correct animal on the line below its life cycle.

A



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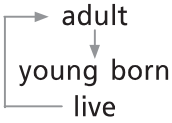
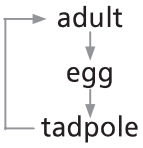


C



_____ _____ _____

Sequence

Female insects, amphibians, and reptiles lay eggs during which stage of their life cycles?

_____

_____

KWL

WHAT DID YOU LEARN?

Science Test Practice

❶ Circle the correct answer.

Comprehension

❷ _____

❸ _____

_____

_____

❹ _____

_____

Critical Thinking

❺ _____

_____

_____

KWL

WHAT DID YOU LEARN?

Science Test Practice

❶ **Which is a basic need of plants but not animals?**

Ⓐ air

Ⓑ food

Ⓒ water

Ⓓ sunlight

3.c. (DOK 2)

Comprehension

❷ When adult living things reproduce, what are the young living things called?

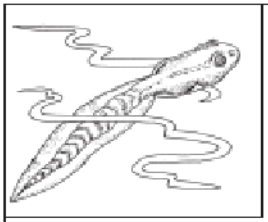
❸ Tell how the roots, stems, and leaves of a plant help the plant live.

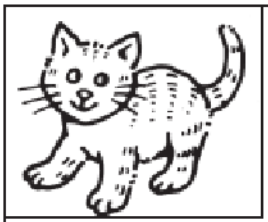
❹ Which two body systems work together to move your arm?

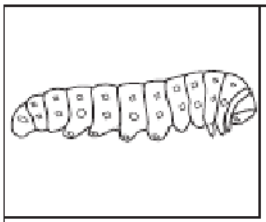
Critical Thinking

❺ How is the life cycle of a frog like the life cycle of a butterfly? How are they different?

Draw what each young animal will look like as an adult.

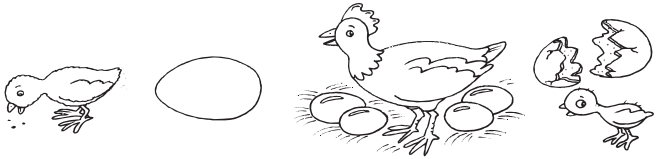






Circle the correct answer.

1. Look at the pictures below.



1 2 3 4

Which is the correct order for the pictures?

Ⓐ 2, 3, 1, 4
Ⓑ 2, 3, 4, 1
Ⓒ 2, 1, 3, 4
Ⓓ 2, 4, 1, 3

3.d. (DOK 2)

2. Which type of cell is long with a lot of branches?

Ⓕ bone cell
Ⓖ nerve cell
Ⓗ muscle cell
Ⓙ red blood cell

3.f. (DOK 1)

3. Which is a basic need of <u>all</u> animals?

Ⓐ water
Ⓑ soil
Ⓒ warmth
Ⓓ sunlight

3.c. (DOK 2)

4. What does your digestive system do?

Ⓕ helps you move
Ⓖ helps you breathe
Ⓗ breaks down food
Ⓙ controls your body

3.b. (DOK 1)

5. Look at the picture below.

What will this animal be as an adult?

Ⓐ cat
Ⓑ frog
Ⓒ chicken
Ⓓ butterfly

3.d. (DOK 2)

6. Chad drew the following pictures of an animal that he observed for three weeks.

How should he label the pictures?

Ⓕ egg, caterpillar, pupa
Ⓖ egg, tadpole, adult
Ⓗ butterfly, larva, adult
Ⓙ butterfly, egg, pupa

1.e. (DOK 2)

7. Which basic needs of a plant are obtained by the plant's roots?

Ⓐ air and water
Ⓑ air and nutrients
Ⓒ sunlight and food
Ⓓ water and nutrients

3.a. (DOK 2)

8. Which part of a cactus <u>most likely</u> swells and becomes larger when it rains?

Ⓕ stem
Ⓖ roots
Ⓗ spines
Ⓙ leaves

3.a. (DOK 2)

9. Which type of cell has a thick wall around it?

Ⓐ plant cell
Ⓑ nerve cell
Ⓒ animal cell
Ⓓ red blood cell

3.f. (DOK 1)

10. Which system is the brain a part of?

Ⓕ digestive system
Ⓖ nervous system
Ⓗ muscular system
Ⓙ skeletal system

3.b. (DOK 1)

KWL

WHAT DO YOU KNOW?

List one fact about each of these topics:

a. Animals that have a backbone: _____

_____

_____

b. Animals that do not have a backbone: _____

_____

_____

Classifying Animals

Contents

KWL

WHAT DO YOU WANT TO KNOW?

Skim the pictures and headings in this chapter. List one thing you want to find out about each of these topics:

a. Vertebrates: _____

_____

_____

b. Invertebrates: _____

_____

_____

Lesson Preview

VOCABULARY

amphibian A vertebrate that starts life in water and has smooth skin. *(noun)*

backbone A line of bones that runs down the back of some animals. *(noun)*

bird A vertebrate that has feathers. *(noun)*

fish A vertebrate that lives in water and is covered with flat scales. *(noun)*

mammal A vertebrate that has hair or fur. *(noun)*

reptile A vertebrate that has dry skin covered with scales. *(noun)*

vertebrate An animal that has a backbone. *(noun)*

Directed Inquiry

Flip Chart p. 11

Model a Backbone

Make a model of a backbone, and infer how backbones help animals move.

1.a., 3.a.

3.a. Research and explain diverse life forms (including vertebrates and invertebrates) that live in different environments (e.g., deserts, tundras, forests, grasslands, taigas, wetlands) and the structures that serve different functions in their survival (e.g., methods of movement, defense, camouflage). (DOK 2)

1

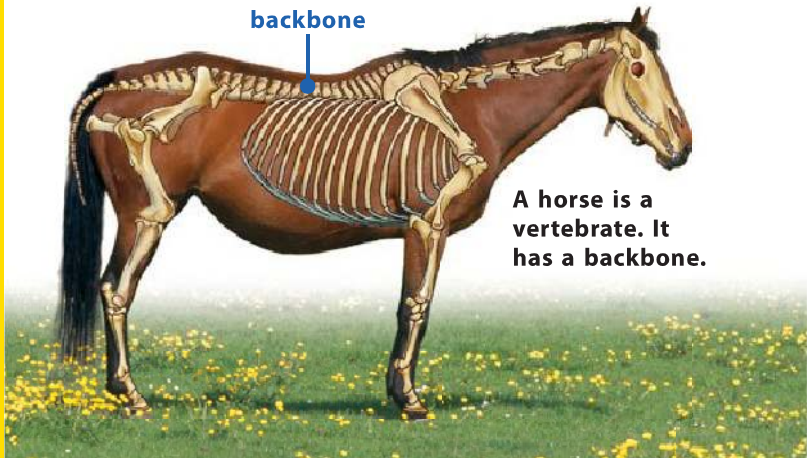
Which Animals Are Vertebrates?

Animals and plants are living things. Both are made of many cells. Both grow and change. But animals are different from plants. Animals eat food, and most can move from place to place.

Animals can be classified into two big groups. One group is animals with backbones. The other group is animals without backbones.

Traits of Vertebrates

Some animals have backbones. A **backbone** is a line of bones that runs down the back of some animals. It helps to hold up the animal's body. An animal that has a backbone is called a **vertebrate** (VUR tuh briht). Vertebrates can be classified into smaller groups.



A horse is a vertebrate. It has a backbone.

Mammals

People are mammals.

One group of vertebrates is mammals. A **mammal** (MAM uhl) is an animal that has hair or fur. Mammals make milk to feed their young.

All animals need oxygen to live. Oxygen is a gas in air. Mammals use lungs to breathe air. Some mammals live in water. They still have lungs and must breathe air. These mammals come to the top of the water to breathe.

Most mammals have thick hair or fur. Hair or fur traps air near the animal's body. That helps the animal stay warm.

Sea lions are mammals. They breathe air.

Science Test Practice

Circle the correct answer.

1. Which helps many mammals stay warm?

Ⓐ breathing air
Ⓑ having thick fur
Ⓒ having a backbone
Ⓓ feeding their young milk

3.a. (DOK 2)

2. Circle the name of the gas that mammals need to live.

3. Why must a dolphin come to the surface of the water?

4. List two features of birds that enable them to fly.

_____

_____

5. Circle the feature of the puffin that it uses to catch fish.

I Wonder . . . Turtles lay dozens of eggs. Frogs lay hundreds. Some fish lay thousands! Many birds lay between 2 and 5 eggs in their nest. Why don't birds lay more than a few eggs?

_____

_____

_____

_____

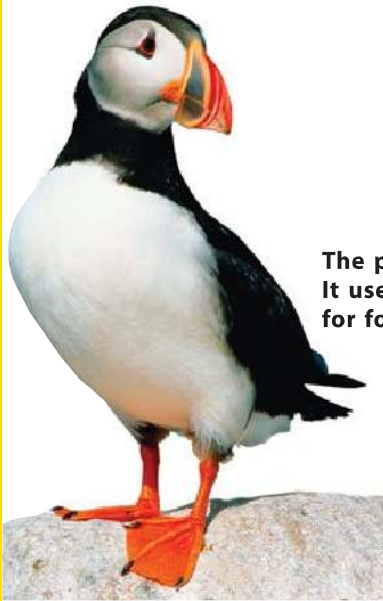
Birds

This owl has strong wings.

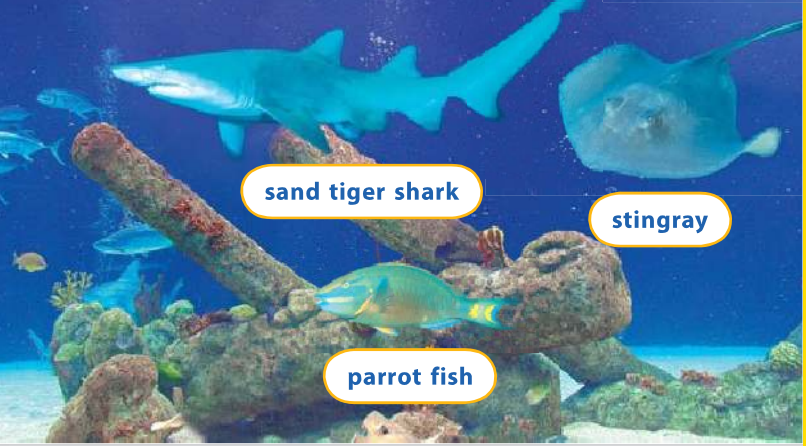
Another group of vertebrates is birds. A **bird** is a vertebrate that has feathers. Birds have wings and two legs. Birds breathe air with lungs.

Birds lay eggs with hard shells. Young birds hatch from the eggs. Most bird parents feed their young. When the young get bigger, they can find their own food.

Most birds can fly. They have strong wings. Feathers keep a bird's body warm. Some of a bird's bones are hollow. That makes the bird light and helps it fly.



The puffin has a strong beak. It uses the beak to catch fish for food.



All fish have backbones. Some fish have backbones made of cartilage (KAHR tih lihj). Cartilage is softer than bone.

Fish

Fish are vertebrates that live in water. Many fish have long, thin bodies. Their shape helps them move through water.

Most fish are covered with hard, thin, flat scales. Scales protect fish and help them swim. Slime on the scales helps keep water out.

Fish also have fins. Fins keep the fish straight up when it swims. They help the fish steer through the water.

Fish breathe with gills instead of lungs. A fish takes water into its mouth. The water goes through the gills. The gills take oxygen gas out of the water.

6. Circle the fins on the sand tiger shark.

7. Underline the things a fish uses its fins for.

8. Fish and dolphins both live under water. How is a fish different than a dolphin?

_____

_____

_____

_____

_____

_____

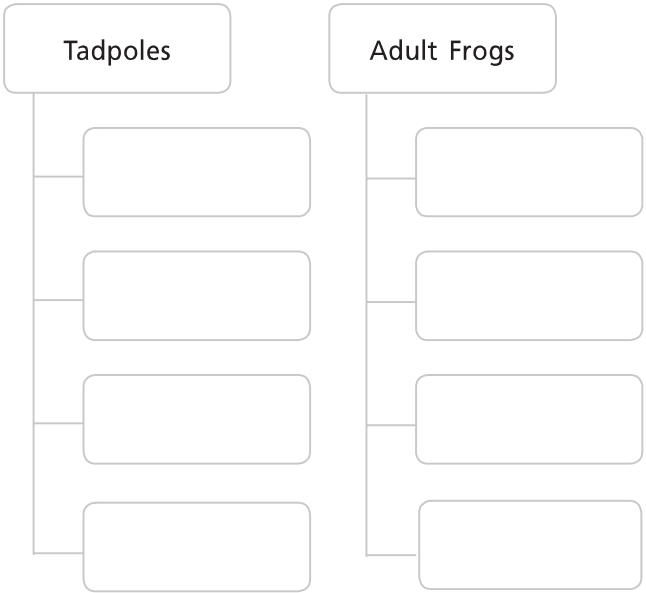
Express Lab

Use the Activity Card **Test Camouflage.**

1.b., 3.a.

9. Use the terms in the box below to fill in the diagram.

• have legs	• no legs	• have tail
• no tail	• gills	• lungs
• live on land	• live in water	



10. Circle the two sentences that tell how frogs and toads are different.

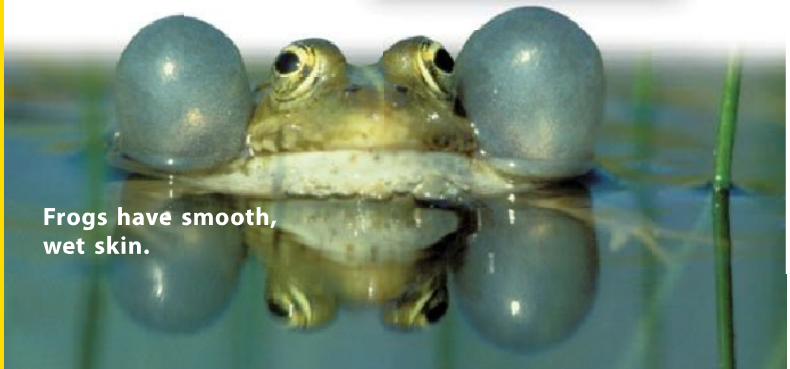
Amphibians

An **amphibian** (am FIHB ee uhn) is a vertebrate that starts life in water. Amphibians move to land when they are adults. Toads and frogs are amphibians.

Amphibians lay eggs in water. Young amphibians hatch from the eggs. The young animals look very different from adult amphibians. They breathe with gills, and they have tails.

Young amphibians change as they grow. They grow legs. Gills disappear. Lungs appear and grow. After young amphibians change, they live on land. They breathe air with lungs.

Toads have rough, dry, bumpy skin.

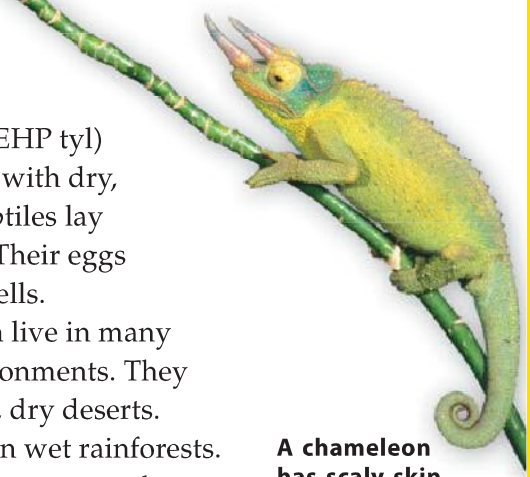


Frogs have smooth, wet skin.

Reptiles

A **reptile** (REHP tyl) is a vertebrate with dry, scaly skin. Reptiles lay eggs on land. Their eggs have tough shells.

Reptiles can live in many different environments. They can live in hot, dry deserts. They can live in wet rainforests. Their scaly skin protects them from the hot Sun. It also protects them from water. Some reptiles use legs to move. Reptiles like snakes slide along the ground.



A chameleon has scaly skin.

All reptiles use lungs to breathe. Reptiles like alligators spend a lot of time in water. They stick their noses out of the water to breathe.

A snake does not have legs.

11. How is the body covering of a reptile like the body covering of a fish? How are the body coverings different?

_____

_____

_____

I Wonder . . . Look at the picture of the snakes. They were able to wrap their bodies around the tree. Do you think snakes have a lot of bones or just a few bones in their backbone? Explain your answer.

_____

_____

_____

_____

_____

Science Test Practice

Circle the correct answer.

12. What do mammals, birds, fish, amphibians, and reptiles have in common?

Ⓐ They all have scales.

Ⓑ They all live on land.

Ⓒ They all have hair or fur.

Ⓓ They all have a backbone.

3.a. (DOK 2)

13. Identify each animal below as an amphibian, a bird, a fish, a mammal, or a reptile.

a. peacock _____

b. chimpanzee _____

c. poison dart frog _____

d. channel catfish _____

e. eastern fence lizard _____

Comparing Vertebrates

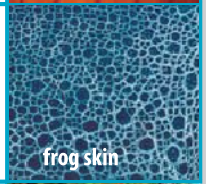
Vertebrates can be classified in different ways. They can be grouped by the kind of body they have. They can be grouped by where they live. They can be grouped by how they make their young.

Vertebrates can also be grouped by their body covering. A body covering protects an animal. It helps the animal live in its environment.

The peacock is covered with feathers.

A chimpanzee is covered with hair.

Body Coverings

Vertebrate Group	Covering and What it Does	Example
Mammals	**hair or fur** protects the animal, keeps the animal warm	 giraffe hair
Birds	**feathers** protects the animal, keeps the animal warm, helps the animal fly	 parrot feathers
Fish	**scales** protects the animal, helps the animal swim	 fish scales
Amphibians	**wet, smooth skin** protects the animal, keeps the animal's skin from drying out, lets some air pass through the animal's skin	 frog skin
Reptiles	**dry, scaly skin** protects the animal, keeps the animal's skin from drying out	 chameleon skin

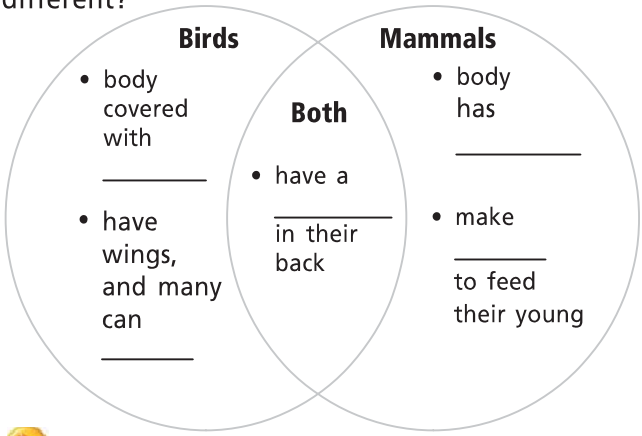
This chart compares the body coverings of vertebrates.

CLASSIFY

What are four ways that vertebrates can be classified?

Summary A vertebrate is an animal that has a backbone. The major groups of vertebrates are mammals, birds, fish, amphibians, and reptiles. Each group has different characteristics and body coverings.

How are birds and mammals similar and different?



Classify What are four ways that vertebrates can be classified?

_____

_____

_____

_____

Lesson Preview

VOCABULARY

arthropod An invertebrate that has a hard outer covering, a segmented body, and legs that bend at joints. *(noun)*

invertebrate An animal that does not have a backbone. *(noun)*

VOCABULARY SKILL: Prefixes

In Lesson 1, you learned about vertebrates. In this lesson, you will learn about invertebrates. Think about the definitions of the words *vertebrates* and *invertebrates.* What do you think the prefix *in-* means? Explain.

_____

_____

_____

3.a. Research and explain diverse life forms (including vertebrates and invertebrates) that live in different environments (e.g., deserts, tundras, forests, grasslands, taigas, wetlands) and the structures that serve different functions in their survival (e.g., methods of movement, defense, camouflage). (DOK 2)

2

Which Animals Are Invertebrates?

Not all animals have backbones. There are many kinds of animals that are not vertebrates. They can be classified into different groups.

Traits of Invertebrates

Most of the animals on Earth are invertebrates (ihn VUR tuh brihts). An **invertebrate** is an animal that does not have a backbone. Some invertebrates live on land. Some invertebrates live in water.

Sponges

Sponges are invertebrates that live in water. They move very little. Their bodies are full of holes. Sponges get tiny bits of food from the water.

sea urchin

Sea Stars and Sea Urchins

Sea stars and sea urchins are covered with spines. These animals do not have heads. But they do have mouths. They also have tube feet that can stick to things. They use their feet to move and to catch food.

Worms

Worms have soft bodies shaped like tubes. They do not have legs, eyes, or shells. Worms live in water or soil. Some worms even live inside other animals.

1. Circle the word that makes each sentence true.

   a. Most animals are (vertebrates, invertebrates).

   b. Unlike vertebrates, invertebrates do not have a (backbone, mouth).

2. Underline the sentence that tells how sea urchins use their tube feet.

3. List three places where different kinds of worms live.

_____

_____

_____

Directed Inquiry

Flip Chart p. 12

Worm Work

Observe earthworms and predict whether they prefer to be in light or in darkness.

1.d., 3.a.

Science Test Practice

Circle the correct answer.

4. What would a jellyfish with long, powerful tentacles be able to do better than a jellyfish with short, weak tentacles?

Ⓐ breathe air

Ⓑ live in the water

Ⓒ grow a backbone

Ⓓ capture and eat food

3.a. (DOK 2)

5. Circle three body parts or features that corals and jellies both have.

6. Underline the sentence that tells how corals and jellies are different.

coral

Corals and Jellies

Corals and jellies live under water. They both have soft bodies. But some corals have a hard covering on the outside.

Corals and jellies have mouths and body parts called tentacles (TEHN tuh kuhlz). They use their tentacles like arms. When food floats by, their tentacles grab it. Then they put it in their mouths.

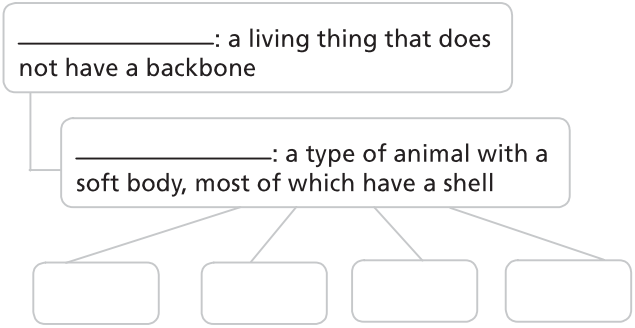
Snails and Squids

Snails and squids belong to a group called mollusks. So do clams, octopuses, oysters, and scallops. Mollusks have soft bodies. Most mollusks have shells. But an octopus does not.

snail

7. Use the terms in the box to fill in the diagram.

• Octopus	• Invertebrate	• Squid
• Mollusk	• Oyster	• Clam



I Wonder . . . Clams have very strong muscles that hold their shells closed. How does having a shell help a clam?

_____

_____

_____

8. Draw an X through the box below that does **not** describe all arthropods.

have legs that bend at joints	have mouths with jaws and fangs	have bodies divided into sections

9. Draw an X through the box below that does **not** belong with the others.

centipedes	crayfish	crabs

10. Arthropods have an exoskeleton. What do you think the prefix *exo-* means?

_____

Express Lab

Use the Activity Card **Act Out an Animal.**

1.b., 3.c.

Arthropods

The largest group of invertebrates is the arthropod (AHR thruh pahd) group. An **arthropod** has legs that bend at joints. Its body has two or more sections, or parts. An arthropod also has a hard outer covering. It is like a skeleton on the outside. This outer skeleton protects the animal.

There are several groups of arthropods.

Butterflies and Ants Butterflies and ants are part of the largest group of arthropods. These insects all have six legs. They have three body sections. Some animals in this group have wings. Some do not.

butterfly

Centipedes and Millipedes Centipedes and millipedes have bodies with many sections. Centipedes have one pair of legs on each section. Millipedes have two pairs of legs on each section.

centipede

Spiders Spiders have eight legs with joints. They have two body sections. Spiders also have mouths with jaws and fangs. Many spiders spin webs.

Crabs, Lobsters, and Crayfish Crabs, lobsters, and crayfish are part of another group of arthropods. Their outer skeletons are very hard, like shells.

spider

lobster

DRAWING CONCLUSIONS

There is an animal with an outer skeleton. It also has one pair of legs on each body section. What kind of animal is it?

Summary An invertebrate is an animal that does not have a backbone. Invertebrates can be found almost everywhere on Earth. There are many more kinds of invertebrates than vertebrates.

For each location, list two types of invertebrates that can be found there.

In Ocean	On Plants	In Soil
• _____	• _____	• _____
• _____	• _____	• _____

Drawing Conclusions There is an animal with an outer skeleton. It also has one pair of legs on each body section. What kind of animal is it?

_____

KWL

WHAT DID YOU LEARN?

Science Test Practice

❶ Circle the correct answer.

Comprehension

❷ _____

_____

❸ _____

_____

❹ _____

_____

Critical Thinking

❺ _____

_____

_____

KWL

WHAT DID YOU LEARN?

Science Test Practice

❶ **Which could not live at the bottom of the ocean?**

Ⓐ clam

Ⓑ coral

Ⓒ spider

Ⓓ sponge

3.a. (DOK 2)

Comprehension

❷ Name one trait shared by people and fish. Name one trait that is not shared by people and fish.

❸ Why are insects, lobsters, and spiders all classified as arthropods?

❹ Which vertebrates have lungs?

Critical Thinking

❺ Butterflies and birds both have wings. Why do scientists **not** classify them together?

Choose an animal and find out more about it by using reference books or the Internet. Take notes in the space below. Make sure to find out where the animal lives and how it is able to survive.

Circle the correct answer.

1. Look at the drawing below.

Which is most closely related to the animal shown?

Ⓐ fish
Ⓑ squid
Ⓒ jellyfish
Ⓓ earthworm

3.a. (DOK 2)

2. Which animal uses tentacles to feed?

Ⓕ sponge
Ⓖ jellyfish
Ⓗ butterfly
Ⓙ earthworm

3.a. (DOK 2)

3. Which adult animal lived in the water when it was young?

Ⓐ toad
Ⓑ eagle
Ⓒ horse
Ⓓ butterfly

3.a. (DOK 2)

4. A scientist counted the number of spiders and ants in one part of a forest. Her data table is shown below.

Sherwood Forest			
	Week 1	Week 2	Week 3
Number of Ants	502	420	361
Number of Spiders	17	25	33
Rainfall (cm)	8	7	9

Which conclusion could she draw?

Ⓕ The number of ants decreases when it rains.
Ⓖ There are no arthropods in Sherwood Forest.
Ⓗ There are more invertebrates than vertebrates in Sherwood Forest.
Ⓙ The number of ants decreases when the number of spiders increases.

1.d. (DOK 2)

5. Which includes both a vertebrate and an invertebrate?

Ⓐ A sea star eats a clam.
Ⓑ Worms live in a dog's stomach.
Ⓒ A person goes horseback riding.
Ⓓ An ant is stuck in a spider's web.

3.a. (DOK 2)

6. Which animal would you expect to have a thick coat of fur?

Ⓕ an owl that lives in a snowy place
Ⓖ an owl that lives in a warm place
Ⓗ a deer that lives in a snowy place
Ⓙ a deer that lives in a warm place

3.a. (DOK 2)

7. How does a snake move?

Ⓐ It walks on two feet.
Ⓑ It crawls on four feet.
Ⓒ It flies through the air.
Ⓓ It slithers on the ground.

3.a. (DOK 2)

8. Which is an arthropod?

Ⓕ 
Ⓗ 
Ⓖ 
Ⓙ 

3.a. (DOK 2)

9. Which are you most likely to find if you dig a hole in a field?

Ⓐ 
Ⓒ 
Ⓑ 
Ⓓ 

3.a. (DOK 2)

10. Which body part helps fish get oxygen from the water?

Ⓕ gills
Ⓖ lungs
Ⓗ scales
Ⓙ fins

3.a. (DOK 2)

KWL

WHAT DO YOU KNOW?

List one fact about each of these topics:

a. Kinds of living things in a forest: _____

_____

b. How living things survive in cold places: _____

_____

_____

c. Body parts that help a dolphin live in the ocean:

_____

_____

_____

Adaptations to Land and Water

Contents

KWL

WHAT DO YOU WANT TO KNOW?

Skim the pictures and headings in this chapter. List one thing you want to find out about each of these topics:

a. Surviving in a forest: _____

_____

b. Surviving in the tundra: _____

_____

_____

c. Surviving in aquatic environments: _____

_____

_____

Lesson Preview

VOCABULARY

adaptation A way of acting or a body part that helps a living thing survive. *(noun)*

behavior The way that an organism usually acts in a certain situation. *(noun)*

biome A large area that has similar living things and about the same temperature and rainfall throughout. *(noun)*

forest A large area in which there are many trees growing close together. *(noun)*

grassland An area made up of large, flat land that is covered with grasses. *(noun)*

habitat The place where a plant or an animal lives. *(noun)*

3.a. Research and explain diverse life forms (including vertebrates and invertebrates) that live in different environments (e.g., deserts, tundras, forests, grasslands, taigas, wetlands) and the structures that serve different functions in their survival (e.g., methods of movement, defense, camouflage). (DOK 2)

3.c. Investigate the relationships between the basic needs of different organisms and discern how adaptations enable an organism to survive in a particular environment. (DOK 2)

1

What Organisms Live in Forests and Grasslands?

Forests and grasslands are different places with different living things.

Living in the Forest

A **forest** (FAWR ihst) is a large piece of land with many trees. Many plants and animals live in a forest biome (BY ohm). A **biome** is a large area that has the same living things and weather across the whole area.

The living things in a forest have adaptations (ad ap TAY shuhnz) that help them live there. An **adaptation** is a way of acting or a body part that helps a living thing to live. For example, some forest trees grow very tall. This is an adaptation that helps their leaves get sunlight.

The forest biome closest to the Arctic Circle is called the *taiga* (TY guh). The trees in the taiga are mostly conifers, or trees with cones. These trees can survive the cold winters. Their needle-like leaves have a waxy coating that helps keep water inside. They also contain a chemical that keeps animals from eating them.

1. Look at the picture. List one adaptation of each living thing that helps it live in the forest.

   a. hawk:

   _____

   _____

   b. skunk:

   _____

   _____

   c. trees:

   _____

   _____

Directed Inquiry

Flip Chart p. 13

Best Bird Beak

Use tools as models of bird beaks. Infer how a bird's beak shape is related to the food the bird eats.

1.d., 3.c.

2. An area of large, flat land that is covered with grasses is called a _____.

3. Tell how each adaptation in the chart helps animals live in the grassland.

Adaptation	How It Helps
A zebra's stomach can break down grasses that the animal eats.	_____ _____
A lion's fur is the color of grasses where it lives.	_____ _____

Science Test Practice

Circle the correct answer.

4. Which is an adaptation that is a behavior?

   Ⓐ A lion has sharp claws.

   Ⓑ A cat has strong back legs.

   Ⓒ A bird flies south in winter.

   Ⓓ A zebra's stomach can break down grasses.

3.c. (DOK 2)

Grassland Survival

A **grassland** is a biome, too. It is an area of large, flat land. It is covered with grasses. The grassland is dry at some times of the year. When it does rain, the grasses there grow fast.

Zebras and lions are animals that live in grasslands. They have adaptations that help them live in their habitat (HAB ih tat). A **habitat** is the place where a plant or animal lives. The grassland is a habitat for zebras and lions.

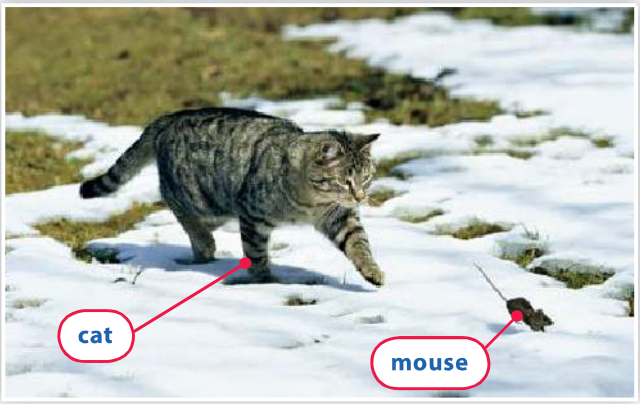
A zebra's stomach helps it break down grasses that it eats. This is an adaptation.

A lion has good eyes and sharp claws. A lion's fur is the color of the grasses. These are adaptations.

Types of Adaptations

Some adaptations are structural adaptations. A structural adaptation is a body part that helps a plant or animal live. A cat has strong back legs. It uses the legs to jump on a mouse. This is a structural adaptation.

Some adaptations are behaviors. A **behavior** is the way a living thing acts. A cat walks up to a mouse very quietly. This adaptation is a behavior.



The cat has both behaviors and structural adaptations that help it catch the mouse.

CLASSIFY

What are two kinds of adaptations?

Summary Organisms have adaptations that help them live in a certain habitat. Some adaptations are structural. Other adaptations are the way a living thing acts. These adaptations are behaviors.

Describe some adaptations of a cat.

a. structural:

_____

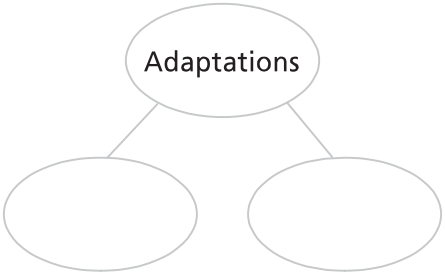
_____

b. behavioral:

_____

_____

Classify What are two kinds of adaptations?



Lesson Preview

VOCABULARY

desert An area that receives less than about 25 cm (10 in.) of precipitation in a year. *(noun)*

environment All the living and nonliving things that surround and affect an organism. *(noun)*

tundra A cold, treeless area that has short, cool summers and long, cold winters. *(noun)*

VOCABULARY SKILL: Related Terms

The environment in the tundra is different than other environments. What word best describes the temperature in the tundra?

_____

What large plants are not found in a tundra environment?

_____

3.a. Research and explain diverse life forms (including vertebrates and invertebrates) that live in different environments (e.g., deserts, tundras, forests, grasslands, taigas, wetlands) and the structures that serve different functions in their survival (e.g., methods of movement, defense, camouflage). (DOK 2)

3.c. Investigate the relationships between the basic needs of different organisms and discern how adaptations enable an organism to survive in a particular environment. (DOK 2)

2

What Organisms Live in Tundra and Deserts?

The tundra and the desert are very different biomes. They both have living things with adaptations that help them live there.

Surviving on the Tundra

The **tundra** (TUHN drah) is a very cold area without trees. The summers are short and cool. The winters are long and cold. Snow covers the ground for most of the year. It is hard for many things to live in the tundra.

The tundra is an **environment** (ehn VY ruhn muhnt). An environment is everything around an organism. It has living things, such as plants and animals. It also has nonliving things, such as air and water.

Tundra in Spring

Tundra plants are short so that they can stay safe from wind.

This bird changes color to match the things around it.

Most plants in the tundra grow close to the ground. This keeps them safe from strong winds that blow there. The plants grow very fast, too. The tundra only has a few warm months each year. The plants do not have much time to grow. These are adaptations that help plants live in the tundra.

Some tundra animals can change color! Their coat turns from brown to white in winter to help them hide in the snow. They have thick fur and a lot of fat to help them stay warm. Some animals rest all winter to stay out of the cold. These are adaptations that help animals live in the tundra.

1. Circle the words that correctly describe plant and animal adaptations to the tundra.

Tundra Plants	Tundra Animals
a. grow close to the (river, ground)	**a.** may change (color, habitat)
b. grow (fast, slow)	**b.** have (thick, thin) fur
c. grow (tall, short)	**c.** have (little, a lot of) fat

2. A desert is an area that does not get much _____.

3. Animals that live in the desert need adaptations that help them _____ water and _____ water.

Science Test Practice

Circle the correct answer.

4. Which adaptation would you expect to find in a desert animal?

   Ⓐ spending all day in the hot Sun

   Ⓑ growing quickly all year round

   Ⓒ living under the ground to stay cool

   Ⓓ being able to swing from vines and trees

3.a. (DOK 2)

Express Lab

Use the Activity Card **Choose a Habitat.**

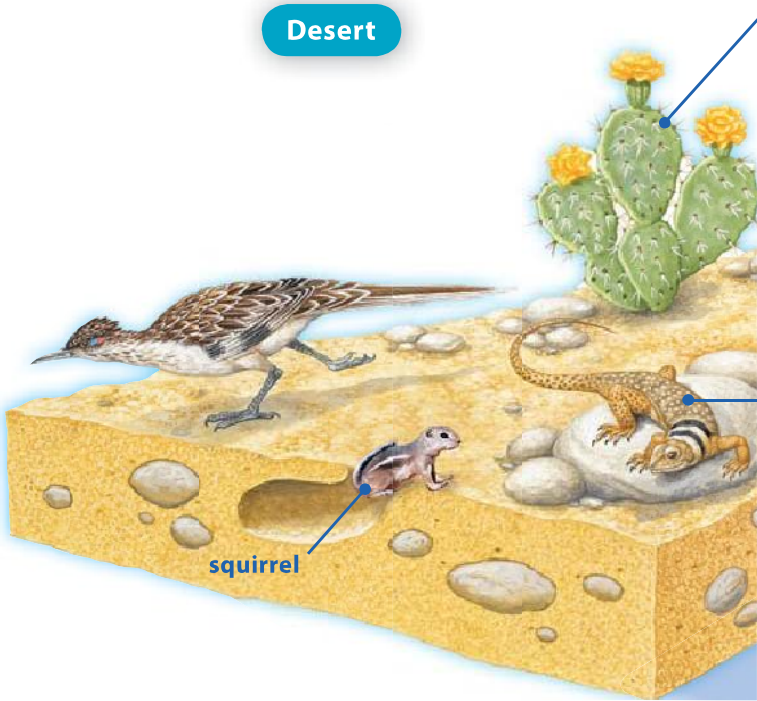
1.b., 3.a.

Surviving in the Desert

A **desert** is an area that gets little rain. Most deserts are very hot. Many organisms in the desert have adaptations that help them find and keep water.

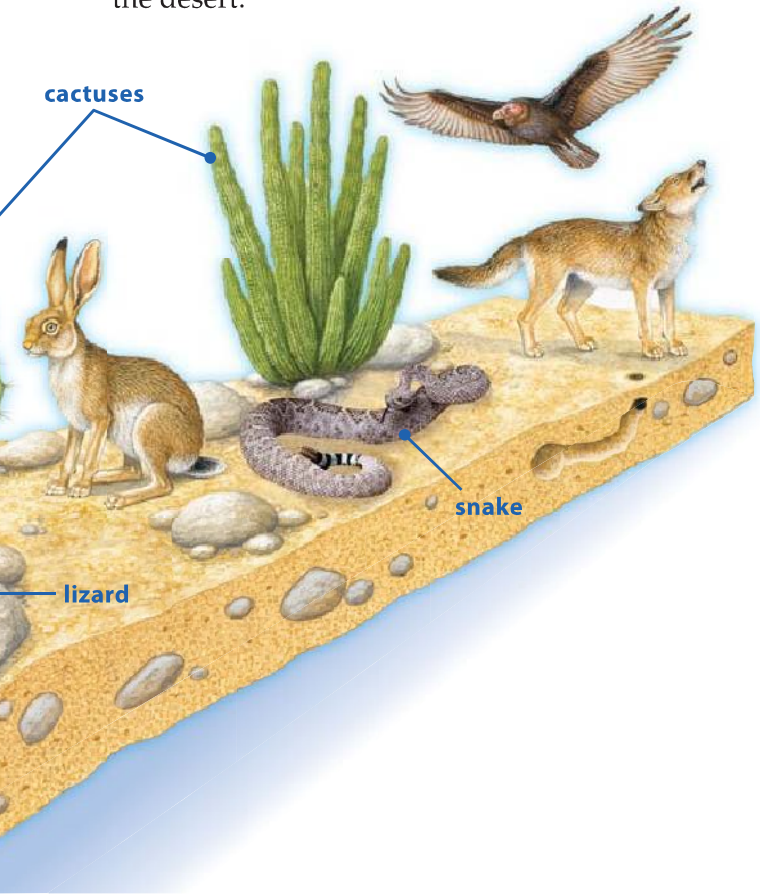
Snakes and lizards have hard skin that holds in water. This is a structural adaptation that helps them live in the desert.

Squirrels live in the ground where it is not as hot. This is a behavior that helps squirrels stay cool.



Most desert plants have roots that can take in a lot of water very fast. Cactuses have thick stems that hold water for the dry months.

Some plants wait for rain and then grow very fast. These are adaptations that help them live in the desert.



5. Circle the animals that are adapted to the desert.

6. Describe the adaptations that help these animals live in the desert.

a. snake:

_____

b. squirrel:

_____

_____

7. Circle the words in the chart that correctly describe plant and animal adaptations to the desert.

Desert Plants	Desert Animals
a. have (thick, thin) stems	**a.** have (hard, soft) skin
b. grow (fast, slow)	**b.** live in (trees, the ground)
c. have roots that take in water (quickly, slowly)	

Summary The tundra and the desert are two extreme environments. Organisms in these biomes have adaptations that help them survive.

What are some self-defense adaptations that keep organisms safe in their habitat?

a. plants:

_____

_____

b. animals:

_____

_____

Problem and Solution How do desert plants get and store water?

Problem	Solution
Desert plants must get and store water.	

Self-Defense

Organisms in every habitat have adaptations that help them stay safe. This is called self-defense.

Desert plants have to stay safe from animals that want to get water from them. Some plants have spines, or points, that keep animals away. Some plants taste bad so that animals will not want to eat them.

Some animals run or hide to get away from danger. Some group together. Some have horns or hard skin that help them fight back.

Oxen stand in a circle to keep the young oxen safe.

PROBLEM AND SOLUTION

How do desert plants get and store water?

What Organisms Live in Water Habitats?

3

Many habitats are under water. The organisms in these habitats adapt to living in water.

Life in a Tide Pool

Tide pools are pools of water left behind when water flows back out to sea. A tide pool is an aquatic (uh KWAT ihk) habitat. An **aquatic habitat** is a place where organisms live in or around water.

Plants and animals in a tide pool have adaptations that help them live in the salty water. Adaptations help them eat, grow, and stay safe.

Adaptations to Tide Pools

This grass lets off salt from its leaves so that it can live in salt water.

This snail goes in its shell to hide.

This crab uses its strong claws to catch and eat snails.

Lesson Preview

VOCABULARY

aquatic habitat A place where organisms live in or around water. *(noun)*

VOCABULARY SKILL: Break It Apart

You will be learning about wetland habitats in this lesson. The word *wetland* is made of two words: *wet* and *land*. From these two words, guess what a wetland is.

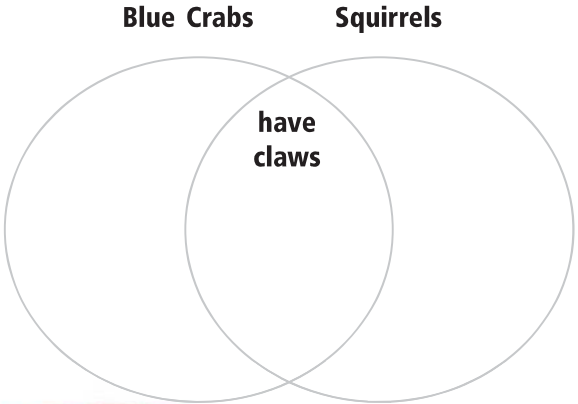
3.a. Research and explain diverse life forms (including vertebrates and invertebrates) that live in different environments (e.g., deserts, tundras, forests, grasslands, taigas, wetlands) and the structures that serve different functions in their survival (e.g., methods of movement, defense, camouflage). (DOK 2)

3.c. Investigate the relationships between the basic needs of different organisms and discern how adaptations enable an organism to survive in a particular environment. (DOK 2)

1. Circle the tide pool organisms.

2. How do long legs keep a sea bird dry?

3. How do blue crabs and squirrels use their claws to live in their habitats? (Look back at the squirrel on page 127 if you need help.)



Directed Inquiry

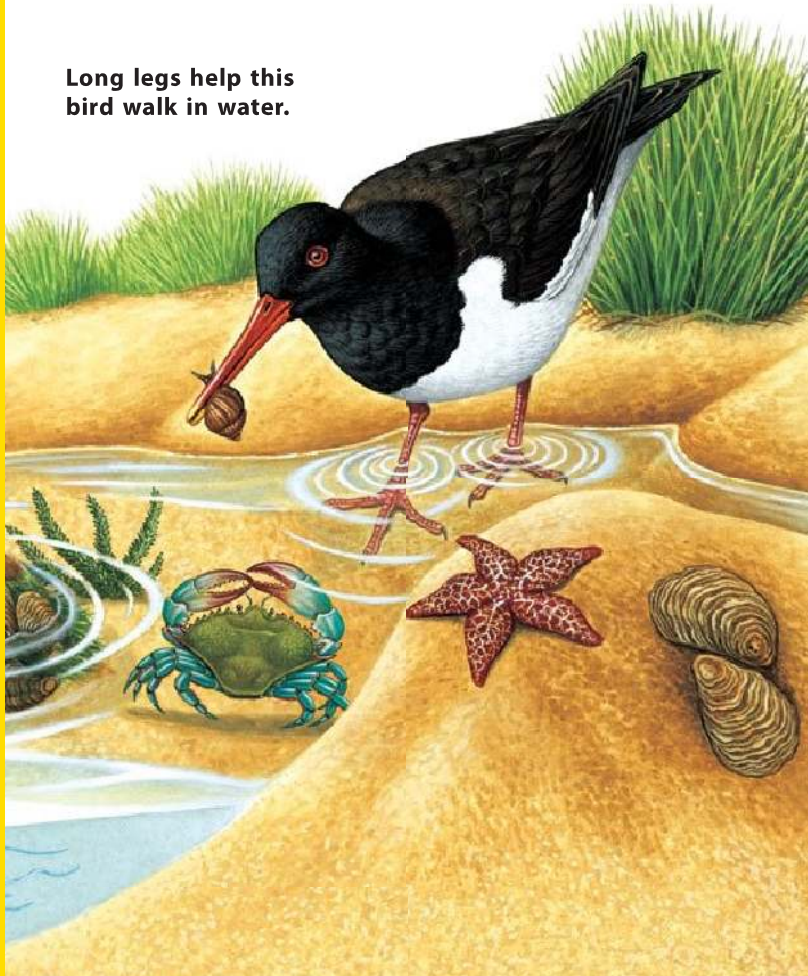
Flip Chart p. 14

Cold-Water Adaptation

Observe how some kinds of ocean animals keep themselves warm in cold water.

1.b., 3.e.

Some animals can close their shell. It keeps water in with them when the tide pool dries up. Sea birds have long legs that help them walk in water. These are structural adaptations.



Long legs help this bird walk in water.

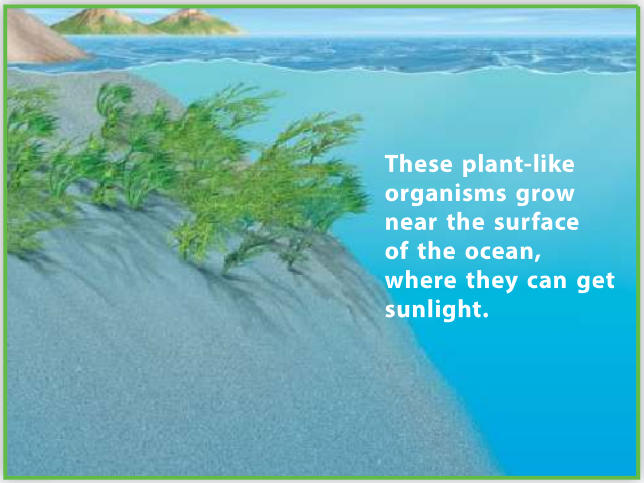
Life in the Ocean

An ocean is another aquatic habitat. From land, the ocean may look like it does not have many living things. But the ocean is filled with living things small and large.

The top of the ocean is called the surface. Near the surface, the water is warm and there is a lot of sunlight. Many organisms live there.

As you go down in the ocean, there is less light. The water is not as warm. There are animals that are good swimmers.

As you get very deep in the ocean, there is no light. Some animals have body parts that light up to help them find food.



These plant-like organisms grow near the surface of the ocean, where they can get sunlight.

I Wonder . . . Plant-like organisms, such as seaweed, live only near the surface of the ocean. Why do you think this is so?

Science Test Practice

Circle the correct answer.

4. A small fish lives in the ocean. It likes to hide in the sand, and it has large eyes to look out for bigger fish. Where does the fish most likely live?

Ⓐ in a tide pool

Ⓑ close to the shore

Ⓒ in the deepest parts of the ocean

Ⓓ near the surface

3.c. (DOK 2)

Express Lab

Use the Activity Card **Model an Adaptation.**

1.a., 3.c.

5. Draw and label an animal that lives at each level of the ocean.

Surface

Middle

Deep

Wetlands

A wetland is another aquatic habitat. The ground in a wetland is covered with a small amount of water. Organisms have adaptations that help them live there.

Wetland birds have long legs so that they can walk in water. Their mouths help them catch fish.

Plants have adaptations that help them live in water, too. Trees have strong roots that hold them up. The roots can be in salt water.

COMPARE AND CONTRAST

How are a tide pool and the deep ocean alike and different?

Summary Many habitats are partly or completely under water. The organisms in these habitats have adapted to living in water. What adaptations do organisms have that help them live in wetlands?

a. birds:

_____

b. plants:

_____

Compare and Contrast How are a tide pool and the deep ocean alike and different?

Tide Pool **Deep Ocean**

KWL

WHAT DID YOU LEARN?

Science Test Practice

❶ Circle the correct answer.

Comprehension

❷ _____

_____

❸ _____

_____

❹ _____

_____

Critical Thinking

❺ _____

_____

_____

_____

KWL

WHAT DID YOU LEARN?

Science Test Practice

❶ **Carlos saw zebras and a lion while on vacation. Which environment did he most likely visit?**

Ⓐ forest

Ⓑ tundra

Ⓒ tide pool

Ⓓ grassland

3.a. (DOK 2)

Comprehension

❷ Describe the taiga.

❸ What are two ways that animals defend themselves?

❹ Compare an adaptation of an animal that lives on land to an adaptation of one that lives in an aquatic habitat.

Critical Thinking

❺ Use what you know about the adaptations of tundra plants to explain why there are no trees in the tundra.

Make a graphic organizer and fill it in to tell about ways that adaptations help living things survive.

Circle the correct answer.

1. Look at the picture below.

Which environment is shown?

Ⓐ desert
Ⓑ forest
Ⓒ wetland
Ⓓ grassland

3.a. (DOK 2)

2. Which bird would you expect to have sharp claws for catching small mammals?

Ⓕ 

Ⓖ 

Ⓗ 

Ⓙ 

3.c. (DOK 2)

3. Which would benefit a bird in the taiga?

Ⓐ a beak that can dig into a cactus
Ⓑ a beak that can crack open pine cones
Ⓒ legs that are long and have webbed feet
Ⓓ feathers that are bright orange and pink

3.a. (DOK 2)

4. Which is not an adaptation?

Ⓕ A kangaroo carries her baby in her pouch.
Ⓖ A crab uses its claw for protection.
Ⓗ A bat hibernates in winter.
Ⓙ A dog catches a stick.

3.c. (DOK 2)

5. The owl butterfly has a wing pattern that looks like an owl's eyes. What is the purpose of this adaptation?

Ⓐ to find food
Ⓑ to find a mate
Ⓒ to scare away predators
Ⓓ to blend with the background

3.c. (DOK 2)

6. Look at the drawing below.

How does having stripes help a tiger?

Ⓕ Stripes help a tiger hear better.
Ⓖ Stripes help keep a tiger warm.
Ⓗ Stripes help a tiger sneak up on its food.
Ⓙ Stripes keep a tiger from becoming thirsty.

3.c. (DOK 2)

7. Look at the picture below. The arrow is pointing to an adaptation.

Which basic need does the adaptation shown help the organism meet?

Ⓐ air
Ⓑ food
Ⓒ water
Ⓓ shelter

3.c. (DOK 2)

8. Which adaptation helps a living thing defend itself?

Ⓕ sharp quills on a porcupine
Ⓖ a plant with flowers that smell good
Ⓗ a bird beak that can crack open seeds
Ⓙ tree roots that grow deep into the ground

3.a. (DOK 2)

9. Which is not an adaptation that helps a cactus survive in a desert?

Ⓐ thick stem
Ⓑ sharp spines
Ⓒ losing leaves in winter
Ⓓ roots that quickly gather water

3.a. (DOK 2)

10. Why is it difficult to live deep in the ocean?

Ⓕ There is no food.
Ⓖ There is no sunlight.
Ⓗ There are no ways to stay warm.
Ⓙ There are no structural adaptations.

3.a. (DOK 2)

KWL

WHAT DO YOU KNOW?

List one fact about each topic:

a. Food chains: _____

_____

b. Food webs: _____

_____

c. Microorganisms: _____

_____

Energy in Ecosystems

Contents

KWL

WHAT DO YOU WANT TO KNOW?

Skim the pictures and headings in this chapter. List one thing you want to find out about each of these topics:

a. Food chains: _____

_____

b. Food webs: _____

_____

c. Microorganisms: _____

_____

Lesson Preview

VOCABULARY

carnivore An animal that eats only other animals. *(noun)*

food chain The path of food energy in an ecosystem from producers to consumers. *(noun)*

herbivore An animal that eats only plants. *(noun)*

omnivore An animal that eats both plants and animals. *(noun)*

photosynthesis The process through which plants make their own food. *(noun)*

VOCABULARY SKILL: Root Words

The Greek root *photo* means "light," and the Greek root *syntithenai* means "to put together." Combine the meanings of these root words to write your own definition of *photosynthesis*.

3.e. Recall that organisms can survive only when in environments (deserts, tundras, forests, grasslands, taigas, wetlands) in which their needs are met and interpret the interdependency of plants and animals within a food chain, including producer, consumer, decomposer, herbivore, carnivore, omnivore, predator, and prey. (DOK 2)

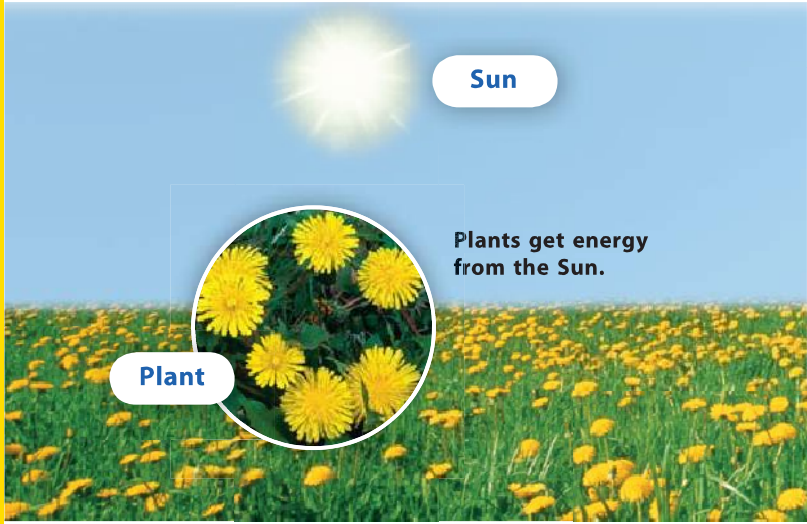
1 What Are Food Chains?

In an ecosystem, energy goes from the Sun to producers. Then energy goes from producers to consumers.

Energy from the Sun

All living things need energy. They get that energy from food. Some animals eat plants. Some animals eat other animals.

Plants do not eat food. They make their own food. They do this by **photosynthesis** (foh toh SIHN-thih sihs). Photosynthesis takes place in a plant's leaves. The leaves trap energy from the Sun. During photosynthesis, plants use water and a gas from the air to make sugar. Sugar is their food.



Predator and Prey

As you have learned, an animal that eats other animals for food is a predator. A fox is a predator. A rabbit is its prey. An animal can be both predator and prey. A fox eats rabbits, but other animals eat foxes.

Plants are producers. Animals are consumers. When a consumer, such as a rabbit, eats a plant, it gets some of the plant's energy. When the rabbit is eaten by the fox, the fox gets some of the plant's energy.

1. Find the fox in the picture. How can the fox be both predator and prey?

I Wonder . . . Plants are producers that get energy from the Sun. A fox is a consumer. As a consumer, how does a fox receive some of the Sun's energy in the food it eats?

2. Trace the path of energy in an ecosystem by completing the diagram below.

In every ecosystem . . .

energy from the Sun goes first to

_____.

Then the energy goes to

_____.

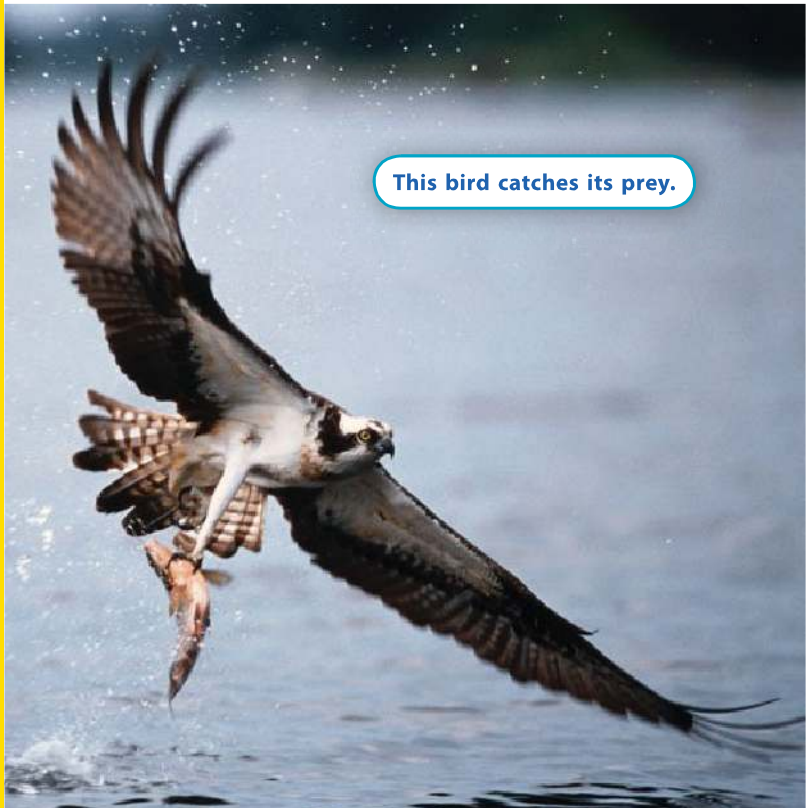
Express Lab

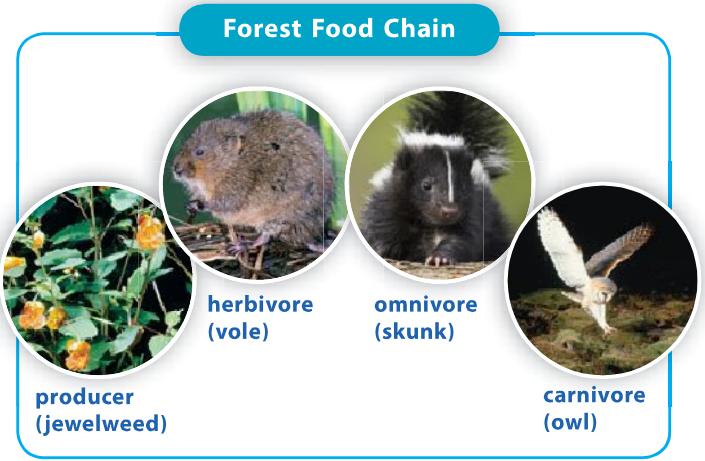
Use the Activity Card **Put Yourself in a Food Chain.**

1.e., 3.e.

In a pond, tiny plants are the producers. They use energy from the Sun to make food. Small animals then eat the small plants. These small animals are in turn eaten by small fish. Then the small fish get eaten by big fish.

In every ecosystem, energy comes from the Sun. First it goes to the producers. Then it goes to the consumers. The energy goes from one stage to the next.





Food Chains

A **food chain** (CHAYN) shows how food energy goes from plants to animals. In the food chain above, a vole gets energy by eating a plant. Then the skunk gets energy by eating the vole. And an owl gets energy from eating the skunk.

Food chains are different in different ecosystems. But the first part is always a producer. Most producers are green plants. Energy enters the food chain through the plant. This happens when the plant uses the sunlight for photosynthesis. Plants make food by photosynthesis.

Then the plants are eaten by animals. Animals that eat only plants are called **herbivores** (HUR buh vawrz). Herbivores get energy from eating the plants.

Science Test Practice

Circle the correct answer.

3. Which living things use photosynthesis to make food in a food chain?

Ⓐ prey
Ⓑ predators
Ⓒ producers
Ⓓ herbivores

3.e. (DOK 2)

4. Draw a star over the photo of the herbivore. Underline the type of food that herbivores eat.

Directed Inquiry

Flip Chart p. 15

Food-Chain Mobile

Classify and sequence living things in a food chain. Make a food-chain model.

1.e., 3.e.

5. Some animals eat both plants and animals.
   a. An animal that eats both plants and animals is called an _____.
   b. Which animal shown eats both plants and animals? _____

6. If an animal eats only other animals, it is called a _____.

7. Label each level of the energy pyramid on the next page. Use the terms *producers*, *herbivores*, and *carnivores*.

I Wonder . . . As a living organism, you must eat food in order to survive. Are you a herbivore, an omnivore, or a carnivore? What do you think?

_____

_____

_____

The third and fourth links in a food chain are either omnivores (AHM nuh vawrz) or carnivores (KAHR nuh vawrz). An **omnivore** is an animal that eats both plants and animals. A skunk is an omnivore. It eats insects and mice, as well as nuts and berries.

A **carnivore** is an animal that eats only other animals. An owl is a carnivore. It will not eat plants.

At the end of every food chain are decomposers. A *decomposer* is a living thing that breaks down the remains of dead things. Decomposers help return nutrients to the soil. Some kinds of bacteria and fungi are decomposers.

Organisms need each other for food. Sometimes there isn't enough food for one kind of animal. Soon, there will be fewer of that kind of animal.

An omnivore eats both plants and animals.

A carnivore eats only other animals.

The Energy Pyramid

At each link in the food chain, some energy is lost. Plants use some energy to make flowers and seeds. So not all of the energy captured from the Sun goes to an animal that eats a plant. The animal that eats the plant uses some energy to look for food and run from predators. When that animal is eaten, even less of the energy is there for the predator that catches it.

In a food chain, the further an organism is from the producer, or plant, the less energy it gets when it eats. That is why the population of predators is smaller than the population of their prey. That is also why there are only three or four links on a food chain.

The energy an animal can get goes down as the pyramid goes up.

SEQUENCE

How are a predator and its prey related?

Summary In an ecosystem, energy flows from the Sun to producers and from producers to consumers.

Complete the diagram to tell how plants and some animals get energy.

A plant's leaves trap the Sun's _____.

↓

Plants make food through _____.

↓

Plants use water and a gas from the air to make _____ during photosynthesis.

↓

To get energy, animals eat _____ or other _____ that eat plants.

↓

A _____ would be at the top of the energy pyramid.

Sequence How are a predator and its prey related?

_____

_____

Lesson Preview

VOCABULARY

food web The overlap of two or more food chains. *(noun)*

VOCABULARY SKILL: Multiple-Meaning Words

The word *web* has many meanings, such as a *spider web* and the *World Wide Web*, or *Internet*. Think about the definition of the word *food chain*. Now use that definition, and your knowledge of the multiple meanings of *web*, to write your own definition for *food web*.

_____

_____

_____

3.e. Recall that organisms can survive only when in environments (deserts, tundras, forests, grasslands, taigas, wetlands) in which their needs are met and interpret the interdependency of plants and animals within a food chain, including producer, consumer, decomposer, herbivore, carnivore, omnivore, predator, and prey. (DOK 2)

2

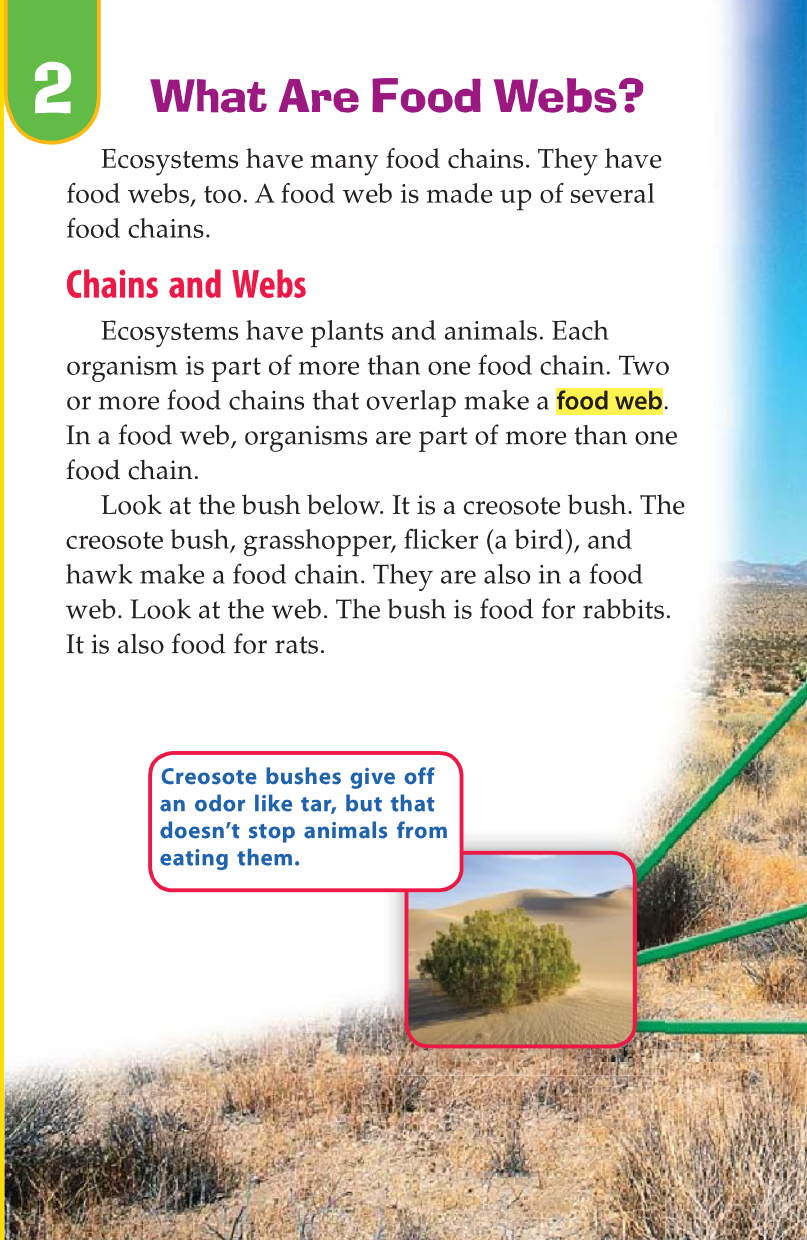
What Are Food Webs?

Ecosystems have many food chains. They have food webs, too. A food web is made up of several food chains.

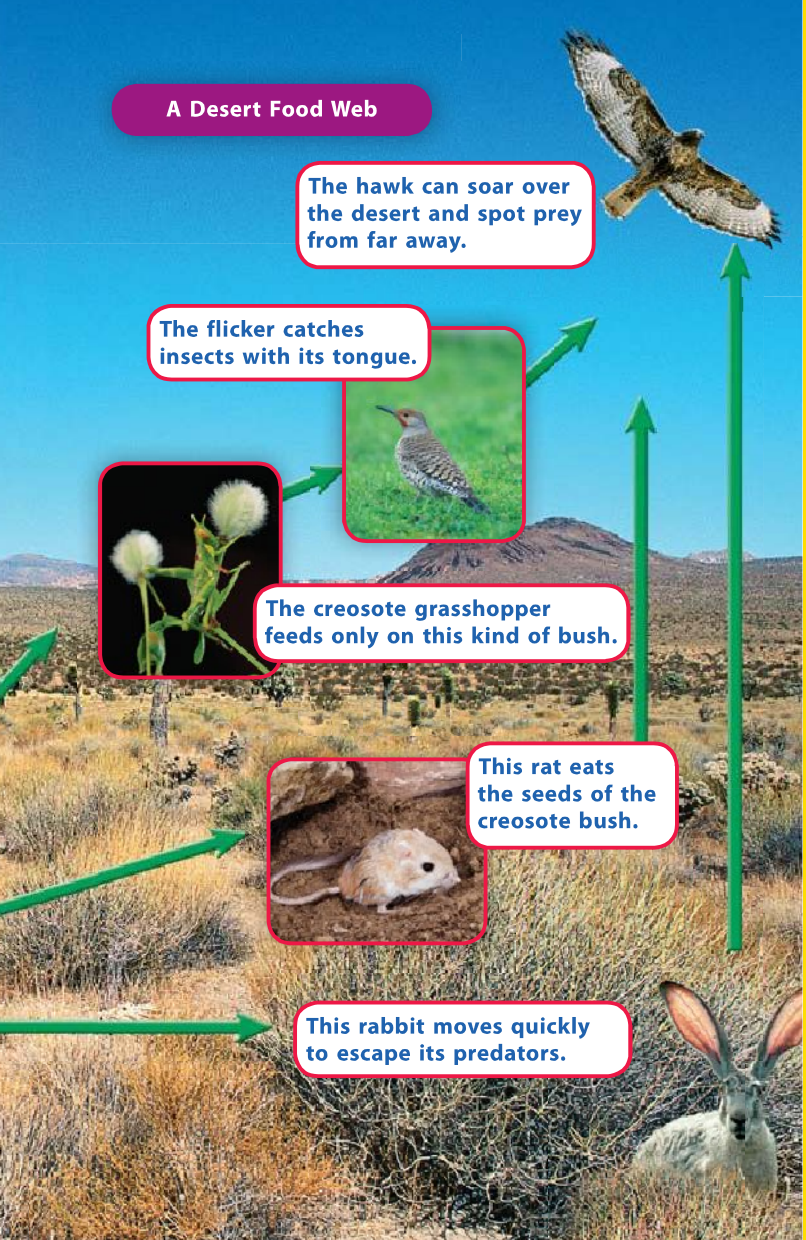
Chains and Webs

Ecosystems have plants and animals. Each organism is part of more than one food chain. Two or more food chains that overlap make a **food web**. In a food web, organisms are part of more than one food chain.

Look at the bush below. It is a creosote bush. The creosote bush, grasshopper, flicker (a bird), and hawk make a food chain. They are also in a food web. Look at the web. The bush is food for rabbits. It is also food for rats.



Creosote bushes give off an odor like tar, but that doesn't stop animals from eating them.



1. Find the creosote bush in the photo. Use your finger to trace the different energy paths that begin with the creosote bush. How many energy paths did you trace?

_____

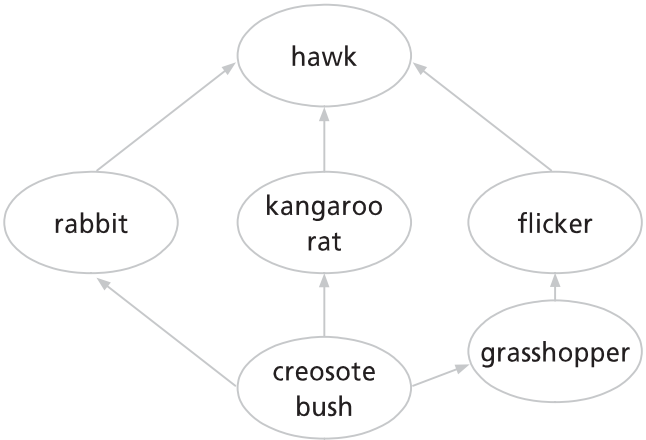
List the organisms that receive energy directly from the creosote bush.

a. _____

b. _____

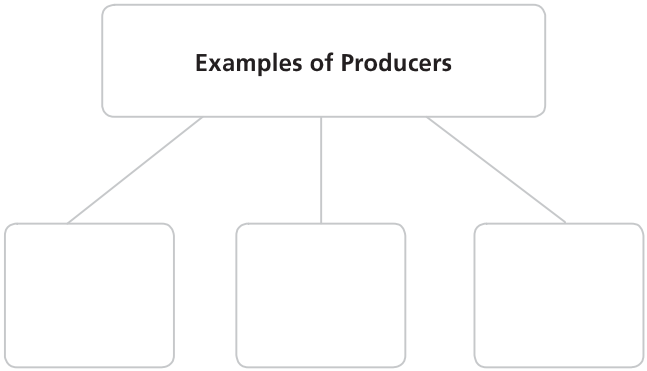
c. _____

2. In the diagram below, use your pencil to circle the organisms that are part of several overlapping food chains.



Summary A food web is made up of several food chains. In every kind of ecosystem, energy enters food webs through producers that are either green plants or plant-like organisms, such as algae.

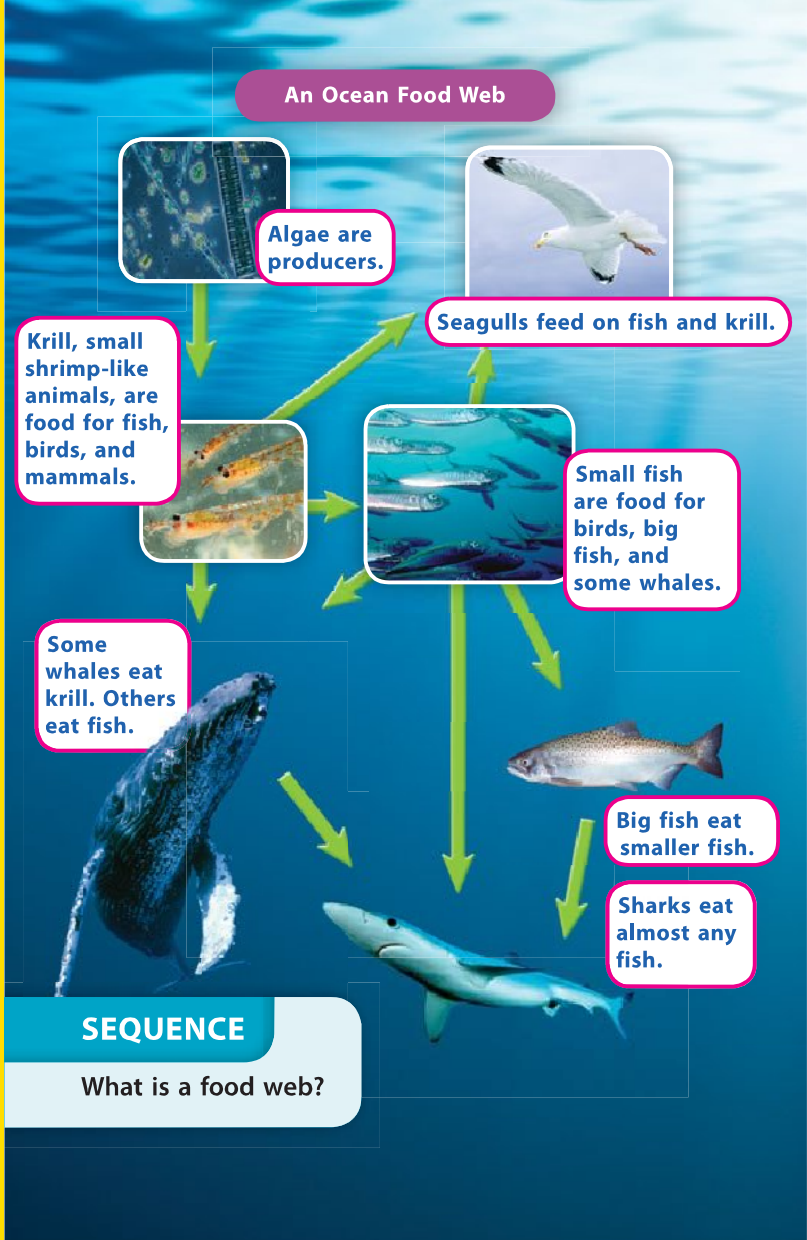
What are some examples of producers? Make sure to include the plant-like producers in the ocean food web shown on this page.



Sequence What is a food web?

_____

_____



What Are Microorganisms?

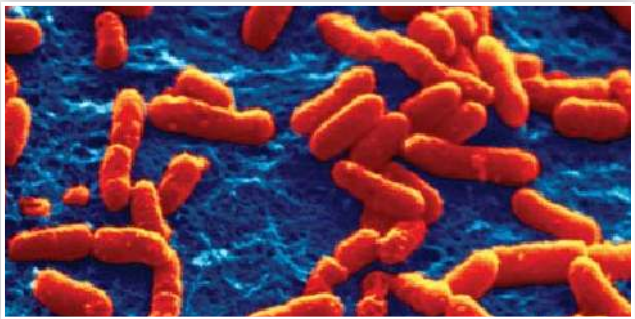
3

Microorganisms are an important part of many ecosystems. Many help make food. Some are at the bottom of food chains.

One-Celled Organisms

A **cell** is the basic unit of life. Some small organisms only have one cell. Others have many cells. Organisms that are too small to be seen without a microscope are called **microorganisms** (my kroh AWR guh nihz uhmz). Organisms with one cell are microorganisms. Bacteria and yeast are microorganisms.

Bacteria (bak TEER ee uh) are microorganisms found all over Earth. There are good and bad bacteria. Some make you sick. Others are important for life.



Some bacteria help your body get nutrients. Others make you sick.

Lesson Preview

VOCABULARY

bacteria Microorganisms found in all living organisms and everywhere on Earth. *(noun)*

cell The basic unit that makes up all living things. *(noun)*

microorganism An organism that cannot be seen without the help of a microscope. *(noun)*

plankton Microorganisms that exist in the water and form the beginning of most aquatic food chains. *(noun)*

VOCABULARY SKILL: Prefixes

The word *microorganism* contains the prefix *micro-*, which means "small." Use this definition and your knowledge of the word *organism* to write your own definition for *microorganism*.

3.f. Recognize that cells vary greatly in size, structure, and function, and that some cells and tiny organisms can be seen only with a microscope. (DOK 2)

1. Bacteria and yeast are microorganisms.

Bacteria help make these foods.

a. _____

b. _____

c. _____

Yeast is used to make this food rise.

_____

Yeast is used to make alcohol that helps make this fuel burn cleaner.

_____

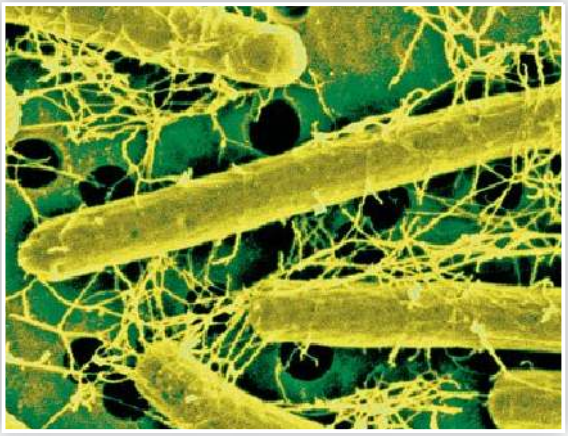
2. Bacteria help you get _____ from the food you eat.

Bacteria turn dead _____ and _____ into _____ that are useful to living things.

Express Lab

Use the Activity Card **Watch Microorganisms Work.**

1.d., 3.f.



This microorganism helps turn milk into yogurt and cheese.

Microorganisms at Work

Microorganisms do all kinds of work. Some foods are made by bacteria. Bacteria help make yogurt, sour cream, and cheese.

Yeast is another microorganism. Yeast is used to make bread. Yeast eats the sugar in bread dough. This is what makes bread rise. Yeast also can be used to make alcohol that helps gasoline burn cleaner. This is good for the environment.

Without bacteria in your body, you would not be able to get all the nutrients in the food you eat. Bacteria also turn dead plants and animals into nutrients.

Microorganisms in Water

Most of Earth is covered by oceans. Plankton are found in the water of the oceans. **Plankton** are microorganisms that live in water. They make the beginning of most ocean food chains.

There are different kinds of plankton. Together, they form a layer over all of Earth's oceans.

Plankton produce the food that is the beginning of many ocean food chains.

3. You learned about food chains in Lesson 1. What role do plankton play in most ocean food chains?

_____

_____

I Wonder . . . What would happen to ocean food chains if all of Earth's plankton died?

_____

_____

_____

Science Test Practice

Circle the correct answer.

4. Scientists first observed microorganisms in 1675. An advance in technology helped them. Which improvement most likely happened around that time?

Ⓐ smaller scuba diving gear

Ⓑ new ways to make cheese

Ⓒ more-powerful microscopes

Ⓓ nets that could catch smaller fish

3.f. (DOK 1)

Summary Microorganisms are an important and necessary part of most ecosystems.

Microorganisms help you get nutrients from your food. Animals need oxygen to breathe. How do microorganisms help provide oxygen?

Main Idea Why are microorganisms important in ocean food chains?

Directed Inquiry

Flip Chart p. 16

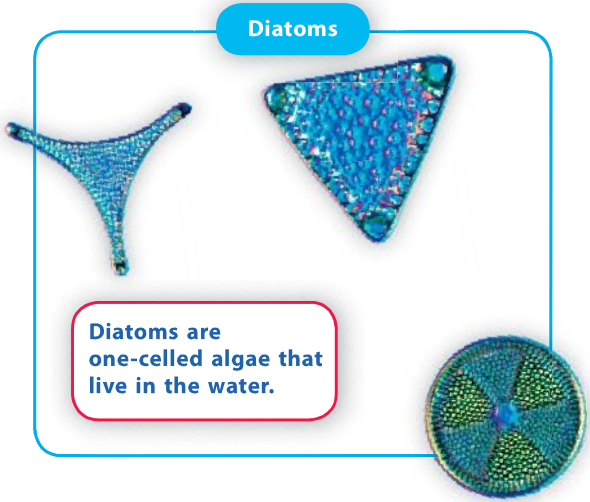
Observing Microorganisms

Find, observe, and draw microorganisms in a drop of pond water.

1.b., 3.f.

Many kinds of plankton are small plants or one-celled algae (AL jee). Algae use the Sun's energy to make food. They do this by using photosynthesis. In photosynthesis, the plants give off oxygen. Because there are so many plankton in the world, they make most of the oxygen on Earth.

Ocean food webs need plankton. Without plankton using photosynthesis to make food, other animals could not live. Larger ocean animals, from fish to whales, eat plankton.



MAIN IDEA

Why are microorganisms important in ocean food chains?

Responding

KWL

WHAT DID YOU LEARN?

Science Test Practice

❶ **Which describes an animal that eats only leaves from oak trees?**

Ⓐ bacteria

Ⓑ carnivore

Ⓒ herbivore

Ⓓ plankton

3.e. (DOK 2)

Comprehension

❷ Plants make food through the process of _____.

❸ Name two ways that an animal might depend on a plant.

❹ Explain what happens to energy as you move up an energy pyramid.

Critical Thinking

❺ How do herbivores benefit from the Sun's energy?

KWL

WHAT DID YOU LEARN?

Science Test Practice

❶ Circle the correct answer on the page.

Comprehension

❷ _____

❸ _____

_____

❹ _____

_____

Critical Thinking

❺ _____

_____

_____

Circle the correct answer.

1. Which tool is most useful to a scientist studying microorganisms?

Ⓐ balance
Ⓑ microscope
Ⓒ thermometer
Ⓓ measuring cup

3.f. (DOK 1)

2. The three drawings below show parts of a food chain.

In which order should the parts be placed?

Ⓕ corn→chicken→person
Ⓖ chicken→corn→person
Ⓗ person→chicken→corn
Ⓙ corn→person→chicken

3.e. (DOK 2)

3. Which of the following might herbivores eat?

Ⓐ mice and insects
Ⓑ berries and birds
Ⓒ berries and leaves
Ⓓ carrots and rabbits

3.e. (DOK 2)

4. Which of these names only producers?

Ⓕ dirt and deer
Ⓖ grass and trees
Ⓗ trees and frogs
Ⓙ insects and grass

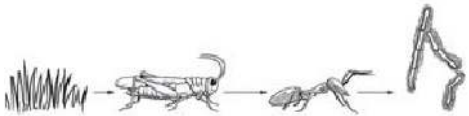
3.e. (DOK 2)

5. Wolves hunt rabbits and mice for food. Which are the predators in this example?

Ⓐ the food
Ⓑ the mice
Ⓒ the rabbits
Ⓓ the wolves

3.e. (DOK 2)

6. Look at the food chain below.

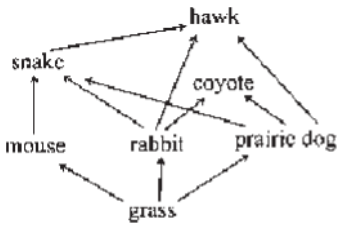


Which organism is a decomposer?

Ⓕ ant
Ⓖ grass
Ⓗ bacteria
Ⓙ grasshopper

3.e. (DOK 2)

7. Look at the food web for a grassy field.



What would happen if the coyotes moved out of the field?

Ⓐ All the rabbits would die.
Ⓑ The grass would grow taller.
Ⓒ The number of hawks would decrease.
Ⓓ The number of rabbits would increase.

3.e. (DOK 2)

8. Which is not a microorganism?

Ⓕ yeast
Ⓖ plankton
Ⓗ bacteria
Ⓙ earthworm

3.f. (DOK 1)

9. Why might two different drops of pond water not contain the same microorganisms?

Ⓐ Microorganisms are all at the end of their food chains.
Ⓑ The drops may have come from different parts of the pond.
Ⓒ Large animals may have eaten most of the microorganisms.
Ⓓ A drop of pond water should only have one or two microorganisms.

1.f. (DOK 2)

10. Which term describes all microorganisms?

Ⓕ tiny
Ⓖ consumers
Ⓗ harmful
Ⓙ decomposers

3.f. (DOK 1)

KWL

WHAT DO YOU KNOW?

List one fact about each of these topics:

a. How Earth's surface changes: _____

_____

_____

b. Things you can find in soil: _____

_____

_____

c. Fossils: _____

_____

_____

Changes to Earth's Land

Contents

KWL

WHAT DO YOU WANT TO KNOW?

Skim the pictures and headings in this chapter. List one thing you want to know about each of these topics:

a. How Earth's surface changes: _____

_____

_____

b. Soil: _____

_____

_____

c. Fossils: _____

_____

_____

Lesson Preview

VOCABULARY

erosion The movement of weathered rock material from one place to another. *(noun)*

weathering The slow breaking apart or wearing away of rock into smaller pieces. *(noun)*

VOCABULARY SKILL: Use Syllables

Break the word into syllables.

Say each syllable aloud.

Clap once for each syllable.

How many syllables does **weathering** have?

4.b. Compare and contrast changes in the Earth's surface that are due to slow processes (erosion, weathering, mountain building) and rapid processes (landslides, volcanic eruptions, earthquakes, floods, asteroid collisions). (DOK 2)

1

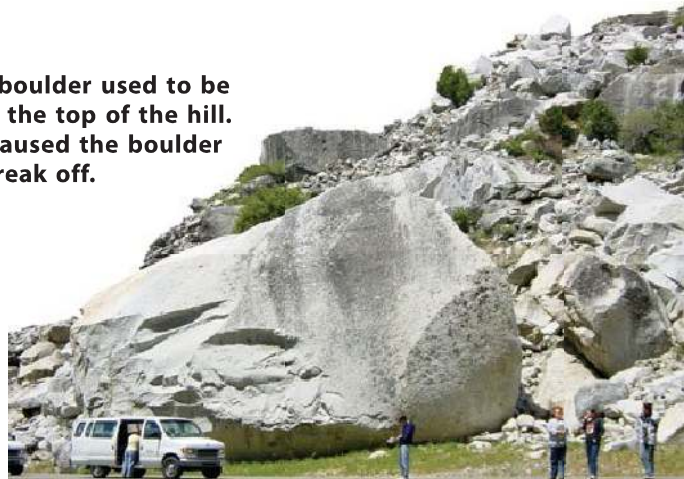
What Causes Changes to Earth's Surface?

Earth's land changes over time. Moving water, wind, and ice change the land. Growing plant roots also change the land.

Weathering

Some rocks are rough. Other rocks are smooth. Smooth rocks have been changed by weathering.

Weathering is the slow breaking apart or wearing away of rock into smaller pieces. Weathering can break large rocks into smaller rocks. Moving water, wind, and ice cause weathering. Growing plant roots also cause weathering.



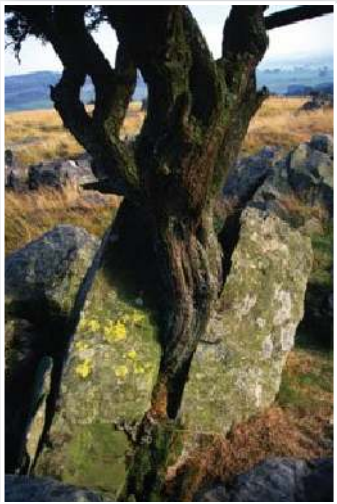
The boulder used to be near the top of the hill. Ice caused the boulder to break off.

One kind of weathering is caused by moving water. Rocks in rivers and streams rub against each other. Over time, rocks get smoother and smaller.

Wind can also cause weathering. Wind can blow small rocks into large rocks. The large rocks slowly get worn down.

Temperature changes can also cause weathering. Water can get into the crack of a rock and freeze. Ice takes up more space than water. Over the years, this can break apart the rock.

Plants also cause weathering. A plant may begin to grow in the crack of a rock. The roots grow larger, and can break apart the rock.



As the plant grew, its roots got larger. This caused the rock to break apart.

1. Four things that cause weathering are

a. _____

b. _____

c. _____

d. _____

2. What happens to rocks in rivers?

_____

_____

I Wonder . . . A sidewalk next to a tree is raised up and broken. What has probably happened to cause the damage to the sidewalk?

_____

_____

_____

3. Erosion is the _____ of weathered _____ from _____.

4. Explain how a river can form a canyon.

_____

_____

_____

_____

Science Test Practice

Circle the correct answer.

5. Which is an example of erosion?

Ⓐ wind moving sand from a dune

Ⓑ plant roots splitting apart a boulder

Ⓒ large rocks wearing down

Ⓓ ice forming in cracks in a rock

4.b. (DOK 2)

Erosion

Erosion (ih ROH zhuhn) is the movement of weathered rock material from one place to another. The sides and bottoms of rivers are made up of soil and small rocks. The moving river water carries away some of these materials. Over time, the water carries away so much soil and rock that a deep canyon may form.

Erosion can also change an ocean's shoreline. Each day, waves wash onto the shoreline. Sand and rock are carried away. Over the years, the shoreline changes.

Wind causes erosion, too. Wind can blow away sand and soil. Sometimes the wind blows sand and soil onto rocks. Over time, small pieces of rock break off and blow away. The size and shape of the rocks change.

Mountains are slowly broken down by weathering and erosion. But some mountain ranges are growing taller. Mountain building is another process that happens very slowly. Mountains are built when two sections of Earth's surface are pushed together. This causes the land to crumple and fold upward.

The ocean waves carry rock away from the shoreline. The rock left behind forms a tiny island called a sea stack.

Read each description of erosion. Write the cause of each in the chart.

6. It blows sand and soil onto rocks, causing bits of rock to break off and blow away.	
7. Sand and rock are carried away from the shore.	

Express Lab

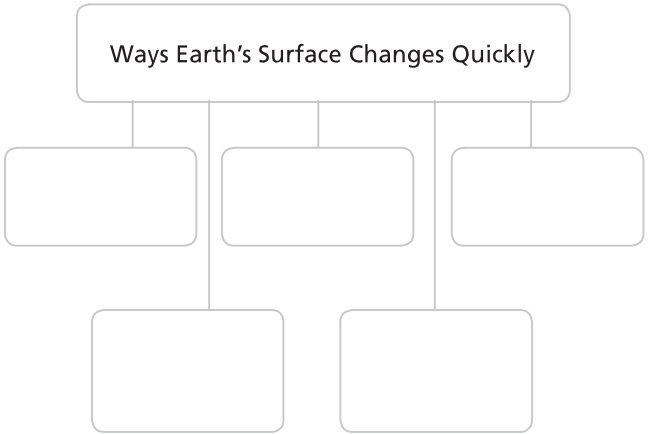
Use the Activity Card **Observe Weathered Rock.**

1.d., 4.b.

8. Circle the lava in the picture.

9. Draw an arrow pointing to the center of the crater that was formed by an asteroid collision.

10. Fill in the diagram.

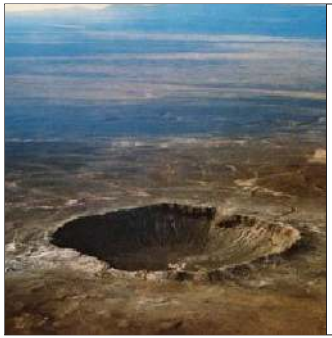


Rapid Changes

Some changes to Earth's surface happen quickly. For example, an earthquake is a shaking of Earth's surface. Most earthquakes only last for a few seconds. Large cracks can form in the ground. Earthquakes can create uneven areas of land. Near the coast, beaches may be destroyed.

Inside Earth there is a lot of melted rock. It can move up through cracks in Earth's surface. Melted rock that flows out is called lava. It forms a volcano. A volcanic eruption covers land with lava, ash, and rock. Clouds of hot gas and ash can burn down trees and buildings.

When a volcano erupts, new rock is formed quickly.



Asteroids and meteoroids are large rocks in space. It doesn't happen often, but sometimes they collide with Earth. This leaves a large hole called a crater. The impact may send a lot of dust into the air, which could block sunlight.

A flood occurs when an area gets a lot of rain. Streams and rivers overflow. The moving water can wash away soil and rocks. The water drops off the soil and rocks somewhere else.

Gravity can quickly pull a lot of soil and rocks down a mountain. This is called a landslide. Landslides usually happen when the ground is wet or when there is an earthquake.

COMPARE AND CONTRAST

How are asteroid collisions and landslides similar? How are they different?

Summary Earth's surface is constantly changing. Some changes, such as weathering and mountain building, occur very slowly. Other changes occur quickly.

What effects does an erupting volcano have on land?

Compare and Contrast How are asteroid collisions and landslides similar? How are they different?

Asteroid Collisions

- occur when an _____ strikes Earth
- form a hole called a _____
- very rare

Both

- cause Earth's surface to _____

Landslides

- occur on sides of hills and _____
- happen after earthquakes or when it _____
- common

Lesson Preview

VOCABULARY

bedrock Unweathered rock that lies below the lowest layer of soil. *(noun)*

humus The decayed remains of plants and animals. *(noun)*

soil The loose material that covers much of Earth's surface. *(noun)*

subsoil The layer of soil just below the topsoil. *(noun)*

topsoil The uppermost layer of soil. *(noun)*

VOCABULARY SKILL: Prefix

The prefix *sub-* means "below" or "under." Write the meaning of *subsoil.*

4.a. Recall that soil is made up of various materials (weathered rock, minerals, plant and animal remains, living organisms). (DOK 1)

2

What Is Soil?

Soil comes from weathered rocks. It takes many years for soil to form. Different kinds of soil are made up of different materials.

What's in Soil?

Much of Earth's surface is covered with soil. **Soil** is made up of bits of rock, minerals, and material that was part of once-living things. Many living things, such as earthworms and bacteria, can be found in soil.

Soil takes a long time to form. First, rocks get broken into very small pieces. Then the weathered rock material mixes with humus (HYOO mus) and forms soil. **Humus** is the decayed remains of plants and animals.

Sandy soil has medium-sized particles. These particles are very hard.

Types of Soil

There are three main kinds of soil: sandy soil, clay soil, and silt soil. Each kind of soil is made up of different rock particles. Sand has the largest particles. Clay has the smallest particles. The bigger the particles, the more easily water moves through the soil.

Water moves easily through sandy soil. That's because sandy soil is made of large particles. Water takes more time to move through silt. That's because silt is made of smaller particles.

clay soil

Clay soil has very small particles. They are packed together tightly.

silt

Silt soil is soft and smooth soil. It is made up of smaller particles than sandy soil.

1. Fill in the missing information on the chart.

Type of Soil	Size of Rock Particles	How Water Moves Through It
sandy soil	_____	easily
silt	small	_____
_____	smallest	very slowly

Science Test Practice

Circle the correct answer.

2. Which kind of soil has the smallest rock particles?

Ⓐ sandy soil

Ⓑ silt

Ⓒ clay

Ⓓ humus

4.a. (DOK 1)

3. What is loam?

_____

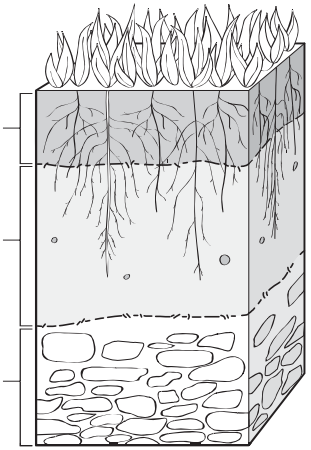
_____

4. Label each layer in the drawing.

a. _____

b. _____

c. _____



Directed Inquiry

Flip Chart p. 17

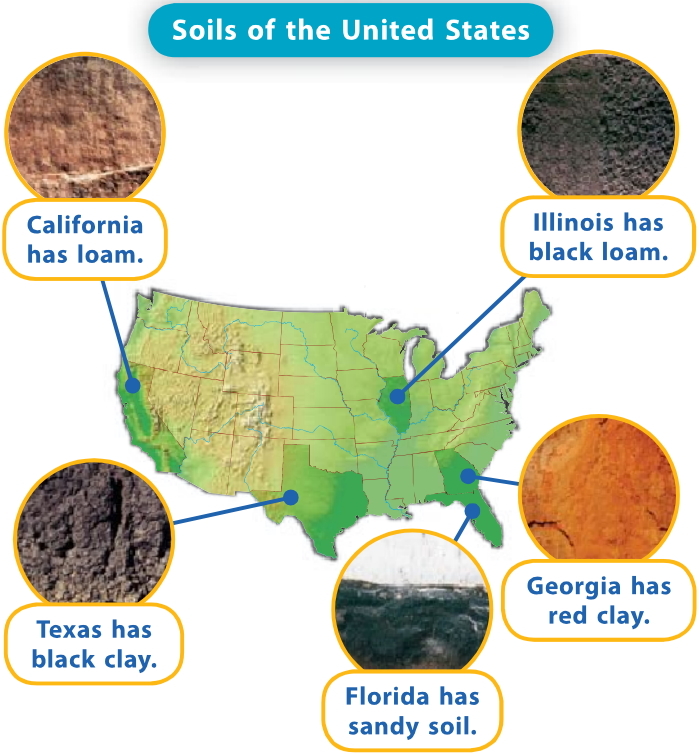
How Soils Differ

Compare two soil samples. Determine what happens to bare soil.

1.c., 4.a.

Clay particles are very small. These particles stick together when they get wet. Because of the small particles, it takes a while for water to move through clay. So when it rains hard, puddles often form on clay soils.

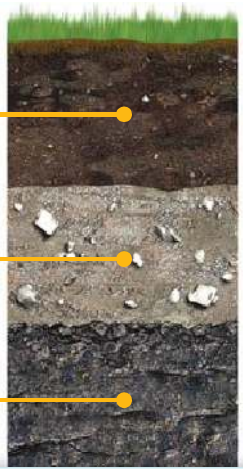
Often different soils are mixed together. Loam is made up of sand, silt, clay, and humus. Many plants grow well in loam.



Soil Layers

You have learned that wind, moving water, and moving ice cause erosion. When these forces slow down, they drop sediments. Over time, these sediments form layers of soil. Most places on Earth have three layers of soil.

Topsoil is the uppermost layer of soil. Topsoil has a lot of humus. Plants grow well in this soil. **Subsoil** is the layer of soil just below the topsoil. There is not much humus in this layer. **Bedrock** is the unweathered rock that lies below the subsoil.



CLASSIFY

Which type of soil can water pass through most easily?

Summary Different soils have different properties, but all are formed from rock that has been weathered over the years.

What kind of soil is around your school?

_____

_____

Classify Which type of soil can water pass through most easily?

Sandy Soil	Silt	Clay Soil
Water passes through _____.	Water passes through _____.	Water passes through slowly.

Lesson Preview

VOCABULARY

fossil The preserved remains of a plant or an animal that lived long ago. *(noun)*

paleontologist A scientist who studies fossils and organisms that lived long ago. *(noun)*

VOCABULARY SKILL: Word Origin

The word *fossil* comes from the Latin word *fodere,* which means "to dig." Read the definition of the word *fossil.* Then think about the meaning of its Latin origin. How do you think scientists find some fossils?

4.g. Explain how fossil records are used to learn about the past, identify characteristics of selected fossils, and describe why they may be found in many places. (DOK 2)

- The Earth Science Museum at the Petrified Forest in Flora, MS
- The Natural Science Museum in Jackson, MS

3 What Are Fossils?

Fossils are the remains of plants and animals that lived long ago. Fossils help us learn about these plants and animals of the past.

Life Long Ago

A **fossil** (FAHS uhl) is the preserved remains of a plant or animal that lived long ago. A scientist who studies fossils and organisms that lived long ago is called a **paleontologist** (pay lee ahn-TAHL uh jihst). Fossils help paleontologists learn what Earth was like long ago. A fossil might be a bone, tooth, or shell.

This is the tooth of a shark that lived millions of years ago. Fossil shark teeth like this one can be found in parts of Mississippi.

The animal below is called a woolly mammoth. Woolly mammoths and mastodons (MAS tuh donz) lived millions of years ago. They looked like large elephants.

Scientists can learn about woolly mammoths and mastodons from fossils. Look at the picture of the mastodon tooth. This fossil helps scientists know how large mastodons were. The shape of the tooth helps scientists know what mastodons ate.

Fossils of mastodon teeth have been found in Mississippi.

Woolly mammoths and mastodons once lived in Mississippi.

Woolly mammoth

1. A _____ is a scientist who studies fossils to learn about plants and animals of long ago.

I Wonder . . . The caption on page 174 says that fossil shark teeth can be found in Mississippi. How can that be true, since sharks live in the ocean?

_____

_____

_____

Express Lab

Use the Activity Card **Find Fossil Clues.**

1.b., 4.g.

2. Fill in the blanks to tell how a fossil forms.

A _____ dies and is covered with _____ and _____.

After many years, the _____ and _____ turn into _____.

Over time, the _____ wears away, and a _____ can be seen.

Science Test Practice

Circle the correct answer.

3. What is the first step in how a fossil is formed?

Ⓐ A plant is covered with sand and soil.

Ⓑ A living thing dies.

Ⓒ Sand and soil turn into rock.

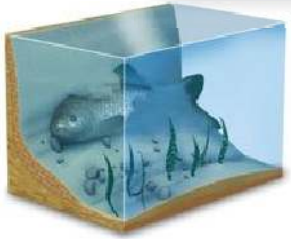
Ⓓ Rock wears away.

4.g. (DOK 2)

Kinds of Fossils

There are different kinds of fossils. The remains of an animal can be a fossil. A part of an animal's body, like a tooth, can also be a fossil. Fossils are sometimes found in mud, rock, and ice. The pictures show how the fossil of a fish formed.

How Fossils Form



1 **A living thing dies. It gets covered with sand and soil.**

2 **After many years, the sand and soil turn into rock.**

3 **The rock slowly wears away. Now the fossil can be seen.**

One type of fossil is called a mold. Suppose a shell gets buried in mud. Over many years, the mud hardens to rock. The shell breaks down and disappears. Now the shape of the shell is left in the rock. This is a mold.

A cast is a fossil that forms when a mold is filled with minerals, sand, or mud. Over time, these materials become rock. A cast fossil has the same shape as the object that made the mold.

At the Mississippi Museum of Natural Science in Jackson, scientists study fossils. The fossils include sharks, dinosaurs, sea stars, and giant ground sloths that used to live where the state of Mississippi is today.

4. Two kinds of fossils are

a. _____ **b.** _____

5. How is a cast fossil formed?

_____

_____

6. Circle the four examples of fossils that scientists study at the Mississippi Museum of Natural History. Then draw what you think one of these fossils might look like. Label your drawing.

Science Test Practice

Circle the correct answer.

7. Why is the only petrified forest in the eastern U.S. located in Mississippi?

Ⓐ Mississippi is the only place where trees grew in water.

Ⓑ Mississippi is the only place where there are minerals in the soil.

Ⓒ Mississippi is the only place where there were no animals that ate trees millions of years ago.

Ⓓ Mississippi is the only place where trees were quickly covered with sand so that they decayed slowly.

4.g. (DOK 2)

There are also "petrified" fossils. These are plants that have "turned into rock." How does this happen? Suppose that long ago a tree died and fell. Mud and sand cover the tree. Over millions of years, minerals go into the tree. The wood slowly rots and the minerals take its place. The tree has become "petrified." The fossil looks like a tree, but it is a rock.

This is a fossil of part of a tree from long ago. The tree has been petrified. It is now hard, like a rock.

Mississippi is home to the only petrified forest in the eastern United States! Scientists at The Earth Science Museum in Flora study the petrified wood fossils.

The insect fossils are preserved in the amber.

Some fossils form in hardened tree sap. Tree sap is very sticky. Small animals, like insects, get trapped in the sap.

Look at the picture above. Long ago these insects got trapped in tree sap. Over time, the sap got very hard. It turned into a material called amber. The amber protected the bodies of the insects.

8. How are petrified wood and amber fossils alike? Name at least two ways.

a. _____

_____

b. _____

_____

9. Fill in the chart to show how petrified wood and amber fossils are different.

Petrified Wood	Amber Fossils
a. _____	**a.** _____
_____	_____
b. _____	**b.** _____
_____	_____
c. _____	**c.** _____
_____	_____

10. What can fossils tell us about Earth's land, water, and climate?

_____

_____

_____

Directed Inquiry

Flip Chart p. 18

Make a Fossil

Make models of fossils. Observe the fossils and infer what objects made the fossils.

1.b., 4.g.

Record in the Rocks

Earth's surface changes over time. Today it is different from the way it was many, many years ago. Fossils can help scientists learn about some of these changes.

Look at the fossil and the mountain below. Many fossils like this have been found near the top of the mountain. This tells scientists that the mountain was once covered by water.

This is a fish fossil. Fossils can show where plants or animals once lived.

This mountain is high. Fish fossils were found at the top. This means that the land where the mountains are was once under water.

Most plants and animals can't live in very cold places. Look at the picture of the cold and snowy place. It would be hard for most plants or animals to live here.

Now look at the picture of the fern fossil. Fossils like this were found in the cold, snowy place. This means that plants used to live there. So the weather in this place used to be warmer than it is today.

This is a fern fossil. A fern is a plant that grows in warm places.

This place is cold and snowy. Fern fossils were found here. That means that the weather in this place changed over the years.

MAIN IDEA

What is one clue a fossil tooth might give about an animal from long ago?

Summary Fossils, the remains of once-living things, give scientists clues about living things of long ago.

What might a scientist learn by studying a fossil of a leaf from a plant that lived long ago?

_____

_____

_____

_____

Main Idea What is one clue that a fossil tooth might give about an animal from long ago?

Main Idea

Fossil tooth could help scientist know

Detail	**Detail**
_____	size of animal
_____	

KWL

WHAT DID YOU LEARN?

Science Test Practice

❶ Circle the correct answer on the page.

Comprehension

❷ _____

_____

❸ _____

_____

❹ _____

_____

Critical Thinking

❺ _____

_____

_____

KWL

WHAT DID YOU LEARN?

Science Test Practice

❶ **Which causes a large, round hole to form on Earth's surface?**

Ⓐ a flood

Ⓑ an earthquake

Ⓒ an asteroid collision

Ⓓ mountain building

4.b. (DOK 2)

Comprehension

❷ What are two causes of erosion?

❸ What are two ways in which soils differ?

❹ What can scientists learn from fossils?

Critical Thinking

❺ Suppose you find an insect inside a yellowish, rock-like material. Have you found a fossil? Explain how you know.

Make a graphic organizer and fill it in to show ways in which Earth's surface changes.

Circle the correct answer.

1. Which causes the slowest change to Earth's surface?

Ⓐ floods
Ⓑ landslides
Ⓒ weathering of rocks
Ⓓ eruption of volcanoes

4.b. (DOK 2)

2. Look at the drawings below.

A B C

Which is the correct order of the images?

Ⓕ A, B, C
Ⓖ A, C, B
Ⓗ B, C, A
Ⓙ B, A, C

4.g. (DOK 2)

3. Look at the drawings below.

Which processes caused the changes?

Ⓐ floods and earthquakes
Ⓑ weathering and erosion
Ⓒ erosion and asteroid collisions
Ⓓ landslides and mountain building

4.b. (DOK 2)

4. Which is not a physical part of soil?

Ⓕ erosion
Ⓖ minerals
Ⓗ living things
Ⓙ remains of plants

4.a. (DOK 1)

5. Which is a characteristic of petrified wood?

Ⓐ hard
Ⓑ soft
Ⓒ clear
Ⓓ square

4.g. (DOK 2)

6. Weathering and earthquakes both cause changes to Earth's surface. What is the biggest difference between these two processes?

Ⓕ Earthquakes are rapid; weathering is slow.
Ⓖ Weathering is rapid; earthquakes are slow.
Ⓗ Earthquakes happen everywhere; weathering does not.
Ⓙ Weathering happens in warm places; earthquakes do not.

4.b. (DOK 2)

7. Javier is planning to measure how deep the soil is at the top, side, and bottom of a mountain. Which part of the mountain should have the deepest soil?

Ⓐ the middle because the streams move faster
Ⓑ the middle because there are not as many trees
Ⓒ the bottom because erosion carries soil down the mountain
Ⓓ the top because there are more bare rocks that will turn into soil

1.a. (DOK 3)

8. Which process explains why fossils of fish are found in places far from water?

Ⓕ floods
Ⓖ erosion
Ⓗ volcanoes
Ⓙ mountain building

4.g. (DOK 2)

9. Which change to Earth's surface should people living on a mountainside be concerned about?

Ⓐ flood
Ⓑ landslide
Ⓒ weathering
Ⓓ wind erosion

4.b. (DOK 2)

10. What is humus?

Ⓕ the size of the rocks in the soil
Ⓖ the amount of water a soil can hold
Ⓗ the remains of living things in soil
Ⓙ the color of the bedrock below the soil

4.a. (DOK 1)

KWL

WHAT DO YOU KNOW?

List one fact about each of these topics:

a. How people affect ecosystems: _____

_____

_____

b. How ecosystems can be conserved: _____

_____

_____

Preserving Ecosystems

Contents

KWL

WHAT DO YOU WANT TO KNOW?

Skim the pictures and the headings in this chapter. List one thing that you want to find out about each of these topics:

a. The effects that people have on ecosystems:

b. The ways ecosystems can be conserved:

Lesson Preview

VOCABULARY

hazardous waste Waste that can pollute the environment even in small amounts. *(noun)*

litter Trash that is not disposed of properly. *(noun)*

pollutant A material that causes pollution. *(noun)*

pollution The addition of harmful materials to the environment. *(noun)*

VOCABULARY SKILL: Multiple-Meaning Words

The noun *litter* has several meanings. Read the definition above, and then give two other meanings of the noun. You may use a dictionary if you need to.

_____

_____

4.d. Identify the causes and effects of various types of air, land, and water pollution and infer ways to protect the environment. (DOK 3)

1

How Do People Affect Ecosystems?

People change their ecosystem. Human changes make it hard for some other organisms to survive.

Effects on Land Ecosystems

Humans change their ecosystem as they meet their needs. People may clear a forest for farmland. Forest plants are replaced with crop plants. Forest animals are replaced by farm animals.

When people build a town or road, it becomes hard for the local organisms to survive. Plants cannot grow in a parking lot. Forests do not grow in houses.

Humans clear land for resources, such as wood.

Cutting down trees can hurt the environment and the people and other animals in it.

People can change a forest into a city. People can make a river into a lake. These changes can be helpful or harmful to the environment.

Dams can be helpful. They can stop flooding. They can bring water to dry places. They can help give water to people in cities.

Dams can also do harm. Flooding causes the soil to become rich. After dams stop flooding in an area, the soil will not have as many nutrients.

1. Fill in the table to tell how dams both help and harm the environment.

How Dams Are Helpful	How Dams Are Harmful
• stop _____ • bring _____ to dry places • give water to people in _____	• prevent nutrients from being added to the _____

Science Test Practice

Circle the correct answer.

2. Which living things would be helped by the building of a dam?

Ⓐ fish that travel up and down a river

Ⓑ turtles that need slow-moving water

Ⓒ plants that need their environment to flood

Ⓓ crayfish that live in shallow, fast-moving water

4.d. (DOK 3)

3. Complete the sentences in the diagram to tell about pollution and its effects.

Pollutants that people add to the environment cause _____.

Two types of pollutants are litter and hazardous waste.

Litter can keep _____ from growing and can make _____ sick if they eat it.

Hazardous waste includes _____, paint, and _____.

Directed Inquiry

Flip Chart p. 19

Feather Failure

Observe how oil affects a feather. Infer how an oil spill affects birds.

1.c., 4.d.

People add things that hurt the environment. Some farmers use weed killers that can get into the soil and cause pollution (puh LOO shuhn). **Pollution** is when harmful materials are added to the environment. **Pollutants** are things that cause pollution. They can harm many organisms.

Smoke from a factory is one pollutant that causes air pollution. When there is a lot of air pollution, smog can form. People may have trouble breathing.

People make a lot of waste. **Litter** is trash that is not disposed of properly. Most litter is trash that people throw on the ground. Litter is one type of land pollution. Plants cannot grow where there is a lot of litter. Animals sometimes eat litter and get sick.

Weed killers can help farm crops grow, but they can also hurt other parts of the environment.

Effects on Water Ecosystems

Pollution happens when people do not throw out their waste correctly. Pollution can affect both land and water ecosystems. Some sea animals get tangled up in garbage. This can injure or kill the animals.

Hazardous (HAZ ur duhs) **waste** is waste that can pollute the environment, even in small amounts. Hazardous waste is dangerous to people and other organisms. Motor oil, paint, and insect sprays are all hazardous wastes.

Because oil is so hazardous, big spills are very dangerous to the environment. Spills normally happen when oil is being moved. Spills can harm vast ocean habitats. They can kill birds, whales, and fish. They are very hard to clean up.

Litter can get caught on animals and harm them.

COMPARE AND CONTRAST

What is the difference between litter and hazardous waste?

Summary People change ecosystems in which they live. Human changes can affect the ability of other organisms to survive. Complete the diagram to tell how humans can affect a water ecosystem.

Cause	Effect
A large oil spill takes place in ocean habitats.	Ocean habitats are _____, and many _____ are killed.

Compare and Contrast What is the difference between litter and hazardous waste?

_____

_____

_____

Express Lab

Use the Activity Card **Model the Effects of Pollution.**

1.a., 4.d.

Lesson Preview

VOCABULARY

biodegradable material Matter that breaks down easily in the environment. *(noun)*

compost Decayed material from once-living things that is used to enrich soil. *(noun)*

decomposer An organism that breaks down the remains of dead organisms or materials that are made from once-living things. *(noun)*

ecotourism Travel to natural habitats that avoids harming them and helps preserve these areas and the living things there. *(noun)*

recycle To collect old materials, process them, and make new items. *(verb)*

VOCABULARY SKILL: Prefixes

The word *biodegradable* contains the prefix *bio-*, which comes from the Greek word meaning "life." What other words have you read that have this prefix? You may use a dictionary if you need to.

4.d. Identify the causes and effects of various types of air, land, and water pollution and infer ways to protect the environment. (DOK 3)

2

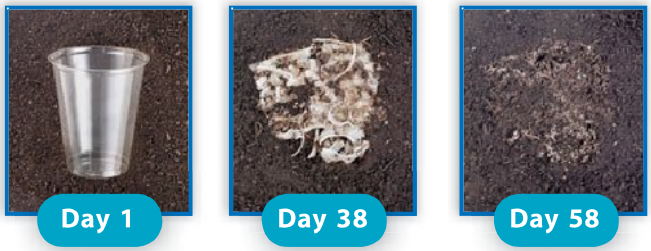
How Can Ecosystems Be Conserved?

We can help ecosystems by using biodegradable materials, recycling, and practicing green agriculture.

Biodegradable Materials

Biodegradable materials are things that break down easily in the environment. Paper and wood are biodegradable materials. Things that are not biodegradable last for a long time. Some last as long as 1,000 years! Metals and most plastics are not biodegradable.

Scientists are finding ways to make more things biodegradable. There is now biodegradable plastic and biodegradable cloth.



This is a new kind of plastic. It is made from plants. When it is thrown away it will break down and not pollute the environment.

Problems with Landfills

Over time a biodegradable newspaper will break down, right? It may not if the newspaper goes to a landfill.

A landfill is a large outdoor place used to bury wastes. Today, landfills are lined with plastic. With plastic liners, no hazardous waste can leak into other ecosystems.

So, why wouldn't a newspaper break down in a landfill? It is because the garbage is packed so closely that there is little air or water. Many tiny organisms that break things down cannot live there.

A landfill is made to stop pollutants from leaking into the environment.

1. List two kinds of material in each category.

Material Is Biodegradable	Material Is Not Biodegradable
a. _____	a. _____
b. _____	b. _____

2. Tell why biodegradable items do not always decay in a landfill.

_____

_____

_____

I Wonder . . . Landfills are lined with plastic to keep hazardous waste from leaking out. What would happen if landfills were lined with a layer of wood instead of with plastic?

_____

_____

3. Circle two problems with landfills listed on this page.

4. What are two benefits of keeping biodegradable trash out of landfills?

a. _____

b. _____

Directed Inquiry

Flip Chart p. 20

Recycling Waste

Model what happens to garbage in a landfill. Compare what happens to different items.

1.d., 4.d.

Most people do not want to have a landfill near their homes.

Another problem with landfills is their size. They are very big. And since no one wants to live near a landfill, it is hard to find a new place to put one.

The best way to make sure biodegradable trash decomposes is to keep it out of a landfill. This would save a lot of space at landfills. It would also stop garbage from becoming pollution.

Composting

Decomposers are important to ecosystems. A **decomposer** is an organism that breaks down the remains of dead organisms. It also breaks down materials made from once-living things. Decomposers get rid of unwanted materials that are biodegradable.

Because decomposers are helpful, it makes sense to help them grow. People can make a perfect place for decomposers. They can do this by making a place where natural material, including garbage, can become compost (KAHM pohst). **Compost** is decayed material that is used to make the soil rich.

These mushrooms are decomposers.

5. Decomposers help the environment in many ways.

a. How can you help decomposers grow?

_____

_____

_____

b. What is compost?

_____

_____

6. What are some of the things that can be put in compost piles?

a. _____

b. _____

c. _____

d. _____

I Wonder . . . Directions for making compost piles usually advise people to use only vegetable kitchen scraps, no bones or meat. What is a possible reason for that?

_____

_____

_____

This compost pile includes yard waste and food scraps.

Materials that could be used in a compost pile are often thrown away. If these materials end up at a landfill, they take up space and decay very slowly.

Grass clippings, leaves, kitchen scraps, and some paper should be put into compost piles. These things are recycled by decomposers. After the decomposers have broken down the compost pile, the decayed leftovers can be mixed with the soil. This soil will be very rich and will help plants grow.

Preserving Rainforests

Rainforests are very important. They are the home of plants and animals. They also have many resources. We get medicines from rainforests. We also get fruits and nuts.

Many rainforests are being cut down. People do this for a few reasons. People use wood to build houses and make paper. Some use the land for farming. Others use it to raise animals.

Plants of the rainforest provide many resources.

7. List three resources that rainforests provide for people.

a. _____

b. _____

c. _____

8. List two reasons that people cut down rainforests.

_____

_____

_____

I Wonder . . . Ecotourism means visiting natural habitats, such as the rainforest, and helping to keep them healthy. What rules would you give to people traveling to a rainforest that would help keep the ecosystem healthy?

_____

_____

_____

_____

_____

ExpressLab

Use the Activity Card **Protect Wildlife.**

1.a., 4.d.

Ecotourists in Okefenokee Swamp enjoy the environment without hurting it.

Rainforests could be saved. The resources from the rainforest could provide money. The fruits, nuts, and medicines would pay the local people more than farming or raising animals.

Ecotourism is another way to help. Ecotourism is visiting natural habitats and helping to keep them as they are. Ecotourists pay to visit rainforests and see the plants and animals. This money also helps save the forests.

Green Agriculture

You have learned some ways that farming can change an ecosystem. Forests, grasslands, and deserts can be turned into farms. Some farmers use weed killers that pollute the environment.

Many farmers use fertilizers on their crops. Fertilizers help plants grow. But these fertilizers can get into the water. Then the water becomes full of plants. This causes fish to die.

There are ways to farm that do not hurt the environment. This is called green agriculture. Green agriculture helps save water, improve soil, and keep the ecosystem safe.

Organic farmers do not use harmful fertilizers.

9. Fill in the diagram about some effects of using fertilizers.

Farmers use fertilizers on their crops to help the plants _____.

↓

Fertilizers can get into the _____.

↓

The water becomes full of _____.

↓

Because of this, fish _____.

Science Test Practice

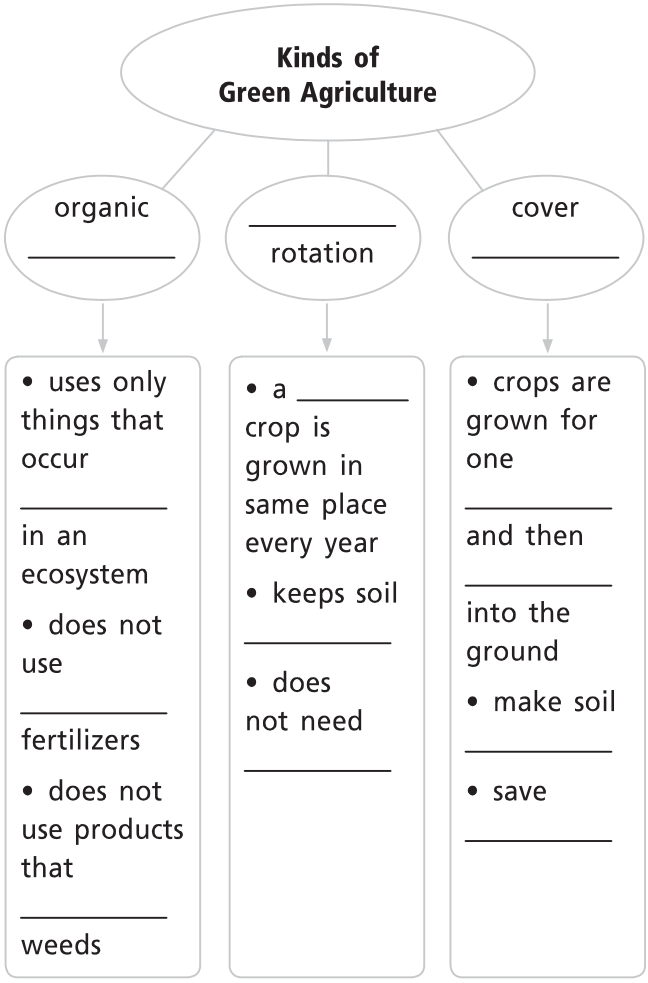
Circle the correct answer.

10. How can you help decrease the amount of fertilizer in rivers?

Ⓐ buy food from organic farms
Ⓑ buy food when it isn't raining
Ⓒ use weed killer in my garden
Ⓓ buy food grown in rainforest farms

4.d. (DOK 3)

11. Fill in the diagram about green agriculture.



Many people prefer to buy food produced by green agriculture, such as these organic vegetables.

One kind of green agriculture is organic farming. Organic farming uses only things that occur naturally in an ecosystem. Harmful fertilizers or products that kill weeds are not used.

Another kind of green agriculture is crop rotation. Crop rotation means that a farmer grows a different crop in the same place every year. When the farmer rotates crops, the soil stays rich and fertilizer is not needed.

Green agriculture also includes growing cover crops. These are crops that are grown for a year and then mixed into the ground. This makes the soil rich. It saves water. It keeps soil from washing away.

Zero Waste

The goal of zero waste is to recycle and reuse items so that very little new waste is made. This keeps waste out of landfills. It keeps waste from causing pollution. Reaching this goal can also save ecosystems. If shoppers carried their groceries home in a cloth bag, fewer paper bags would be needed. Not as many trees would have to be cut down for the paper. Forests would be saved.

Recycling helps save minerals, metals, and oils. Glass, paper, and plastics are some of the things that can be recycled. Many things can be made from recycled goods, including clothing, newspapers, and furniture.

This is a paper recycling center in San José, California.

PROBLEM AND SOLUTION

What is one way that rainforests can be preserved?

Summary Some ways to conserve ecosystems include using biodegradable materials, recycling, and practicing green agriculture.

How does working to meet the goal of zero waste help save ecosystems?

Problem and Solution What is one way that rainforests can be preserved?

Problem	Solution
Rainforests are being cut down.	

KWL

WHAT DID YOU LEARN?

Science Test Practice

❶ Circle the correct answer on the page.

Comprehension

❷ _____

❸ _____

_____

❹ _____

_____

Critical Thinking

❺ _____

_____

_____

KWL

WHAT DID YOU LEARN?

Science Test Practice

❶ **Which is one of the most harmful things that can pollute the environment ?**

Ⓐ compost

Ⓑ a decomposer

Ⓒ a hazardous waste

Ⓓ a biodegradable material

4.d. (DOK 3)

Comprehension

❷ Trash that is thrown on the ground or in water is _____.

❸ What is one way to keep material out of landfills?

❹ How can compost improve soil?

Critical Thinking

❺ How can recycling and using less resources help the environment?

Make a graphic organizer and fill it in to show ways to protect the environment.

Circle the correct answer.

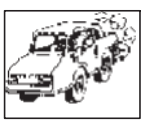
1. Look at the picture below.

Which types of pollution are shown?

Ⓐ air only
Ⓑ land only
Ⓒ air and water only
Ⓓ air, land, and water

4.d. (DOK 3)

2. Which is a way to help the environment?

Ⓕ 
Ⓗ 
Ⓖ 
Ⓙ 

4.d. (DOK 3)

3. How do humans affect the environment?

Ⓐ They help it.
Ⓑ They harm it.
Ⓒ They do not help or harm it.
Ⓓ They help it, and they harm it.

4.d. (DOK 3)

4. Scientists added fertilizer to Pond A and did nothing to Pond B. Which is most likely?

Ⓕ The number of fish in Pond B will increase.
Ⓖ The number of plants in Pond A will increase.
Ⓗ The amount of water in Pond B will decrease.
Ⓙ Water pollution in Pond A will decrease.

1.a. (DOK 3)

5. Which group or groups can change an environment?

Ⓐ people only
Ⓑ animals only
Ⓒ all living things
Ⓓ plants and people only

4.d. (DOK 3)

6. Which change is most likely to increase the number of deer and birds?

Ⓕ Trees and flowers are planted in a forest.
Ⓖ Trash is dumped in the ocean.
Ⓗ A dam is built on a river.
Ⓙ A swamp is drained.

4.d. (DOK 3)

7. Ann is measuring the amount of smoke in the air from a wildfire. She is also counting how often people cough. Which question is she most likely investigating?

Ⓐ Does air pollution cause coughing?
Ⓑ Does coughing cause air pollution?
Ⓒ Do wildfires help a forest?
Ⓓ Do wildfires harm a forest?

1.a. (DOK 3)

8. Predict which change is helpful to trees living in a forest.

Ⓕ making roads
Ⓖ blocking rivers
Ⓗ building houses
Ⓙ reducing air pollution

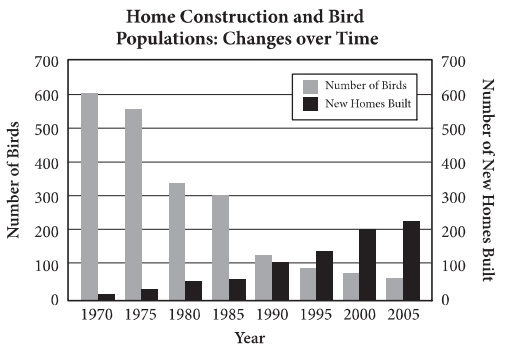
4.d. (DOK 3)

9. Which animals are most likely to be harmed by an oil spill?

Ⓐ deer and people
Ⓑ whales and seals
Ⓒ butterflies and moths
Ⓓ earthworms and beetles

4.d. (DOK 3)

10. Look at the graph below.



Which effect did building new homes have?

Ⓕ The number of trees increased.
Ⓖ The number of trees decreased.
Ⓗ The number of birds decreased.
Ⓙ The number of birds increased.

4.d. (DOK 3)

KWL

WHAT DO YOU KNOW?

List one fact about each of these topics:

a. The water cycle: _____

_____

_____

b. Weather: _____

_____

_____

c. Climate: _____

_____

_____

Patterns in Earth's Atmosphere

Contents

KWL

WHAT DO YOU WANT TO KNOW?

Skim the pictures and headings in this chapter. List one thing you want to find out about each of these topics:

a. The water cycle: _____

_____

_____

b. Weather: _____

_____

_____

c. Climate: _____

_____

_____

Lesson Preview

VOCABULARY

condensation The change of state from gas to liquid. *(noun)*

evaporation The change of state from liquid to gas. *(noun)*

precipitation Any form of water that falls from clouds to Earth's surface. *(noun)*

water cycle The movement of water between the air and Earth as it changes state. *(noun)*

water vapor Water in the form of an invisible gas. *(noun)*

VOCABULARY SKILL: Antonyms

Words that mean the opposite of each other are antonyms. Find and write two vocabulary words with opposite meanings.

4.c. Gather and display local weather information such as temperature, precipitation, clouds, etc., on graphs and use graphs of weather patterns to predict weather conditions. (DOK 3)

- Water cycle (evaporation, precipitation, condensation)

1

What Is the Water Cycle?

In the water cycle, water changes form. It moves between the air and Earth's surface.

Changing Water

How are ice, liquid water, and water as a gas alike? They are all different forms of water. Ice is water in the solid form. Water is the liquid form. **Water vapor** is water in the form of a gas. You cannot see water when it is a gas.

Water is found in three forms, or states. There are few other things on Earth that can be found in all three forms. You have likely seen or felt water as a solid, liquid, and a gas.

The fog in this picture is made of tiny drops of liquid water in the air.

Water Changes State

Ice

Ice is the solid form of water. When enough heat is taken out of water, ice forms.

– heat **+ heat**

Water

Liquid water forms when heat is added to ice. It can also form when heat is taken away from water vapor.

– heat **+ heat**

Water Vapor

You cannot see water vapor. One way it forms is when heat is added to liquid water.

1. Fill in the chart to show the three states of water. Use these terms: liquid, gas, solid.

States of Water	
Example	**Form**
Water in a bathtub	
Frozen water	
Water vapor	

I Wonder . . . When you boil water in a tea kettle, a small cloud forms near the end of the spout. Between the cloud and the spout is a clear space. What is most likely in the clear space? What is the small cloud most likely made up of? (Hint: Read the picture caption on page 208.)

2. To get from A to C in the chart below, _____ must be added at each arrow.

A. ice

↓

B. liquid water

↓

C. water vapor

3. In the above diagram, the change from B to C is _____.

Directed Inquiry

Flip Chart p. 21

Water and Ice

Compare what happens over time to a bowl of warm water and a bowl of cool water with ice cubes.

1.a., 2.b., 4.c.

Have you ever seen puddles of water after it rains? Sometimes, in a few hours, the puddles are gone. The liquid water in the puddles changes form. It becomes a gas called water vapor. The change of state from a liquid to a gas is called **evaporation** (ih vap uh RAY shuhn).

You may see drops of water on leaves on cool mornings. This water is dew. Dew does not fall like rain. It forms on cool surfaces when water vapor changes state from a gas to a liquid. This change is called **condensation** (kahn dehn SAY shuhn).

The drops of water on this flower are dew. In some dry places, animals and plants get water they need from dew.

Sunshine warms the water in the puddle. The water changes form and becomes water vapor. The puddle dries up.

Water can change form when it is heated or cooled. When heat is added to ice, the ice melts. It changes to liquid water. When heat is added to liquid water, the water evaporates. It turns into water vapor that you cannot see. That is what happens when wet clothes dry in the sunlight.

When heat is taken out of water vapor, the water condenses. It becomes liquid water. If enough heat is taken away, the liquid water freezes. It becomes ice.

4. In the diagram on page 210, a change from C to B would be _____.

I Wonder . . . Puddles like the one shown on this page evaporate quickly. Will a lake evaporate? Why or why not?

_____

_____

_____

_____

_____

5. Mark an X on the source of heat for the water cycle.

6. The word *cycle* comes from a Greek word meaning "circle." How is the water cycle like a circle?

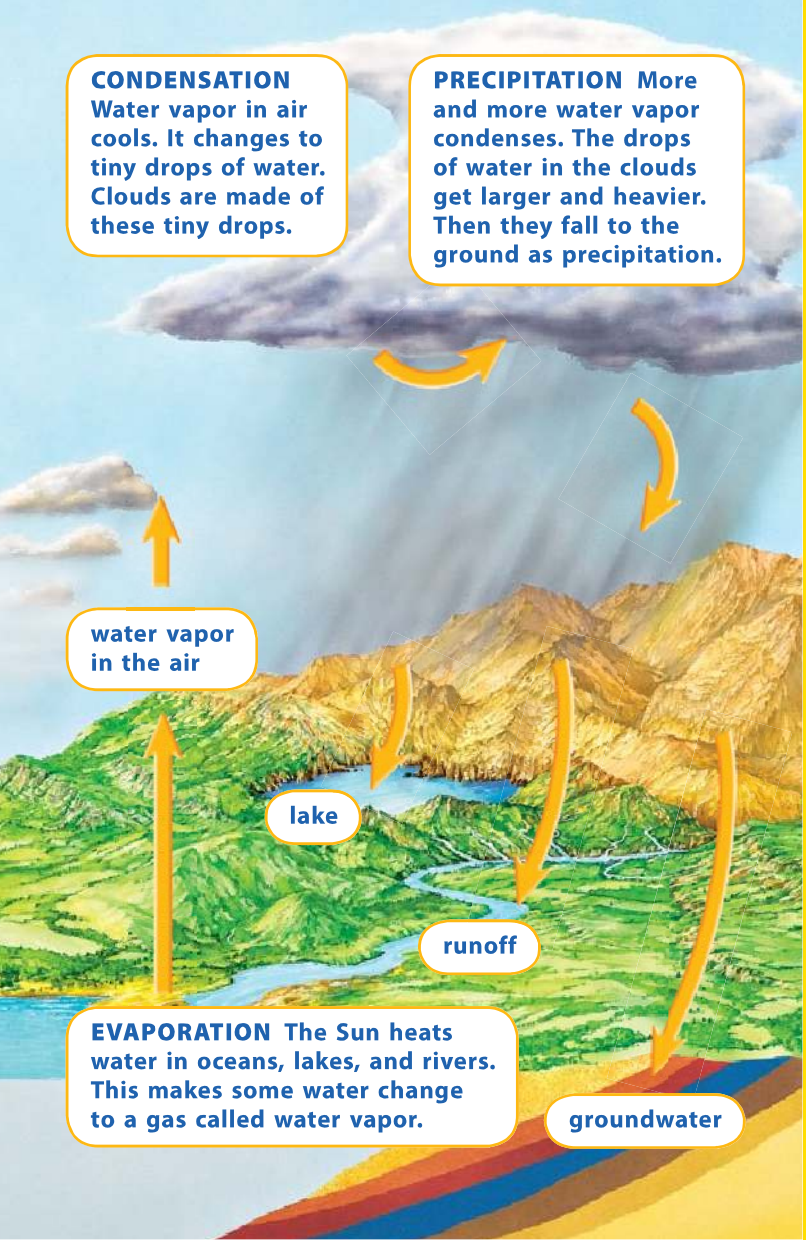
_____

_____

The Water Cycle

Water is always moving between the air and Earth. This movement is called the **water cycle**. Liquid water evaporates and forms water vapor in the air. The water vapor cools and condenses into tiny drops. These tiny drops form clouds.

Larger water drops fall to Earth as precipitation (prih sihp ih TAY shuhn). **Precipitation** is any form of water that falls from clouds. Rain, snow, sleet, and hail are all precipitation. Some precipitation soaks into the ground. It becomes groundwater. Runoff is water that does not soak into the ground. It collects in streams and rivers. Streams and rivers flow into ponds, lakes, and oceans.



Science Test Practice

Circle the correct answer.

7. Which also decreases when the amount of precipitation decreases?

Ⓐ the size of each raindrop
Ⓑ the number of clouds in the sky
Ⓒ the amount of runoff that occurs
Ⓓ the amount of water evaporating

4.c. (DOK 3)

8. How does water vapor in the air form clouds?

9. Plants are part of the water cycle because they _____ water through their roots and give off water through their _____.

10. Humans and animals are part of the water cycle because they take in water by _____ it and they give off water as _____.

11. According to the circle graph on the next page, where do people in the United States use the most water?
Circle your answer.

a. in homes

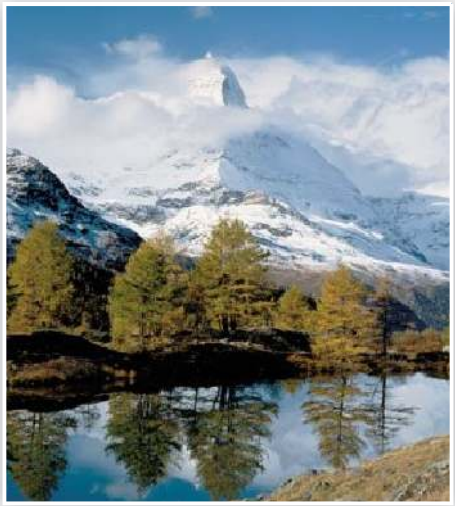
b. on farms

c. in factories and power plants

Living Things and the Water Cycle

Living things are part of the water cycle. All living things need water. Without water, they will die. Plants take in water through their roots. Animals drink water.

Living things also put water back into the water cycle. Plants give off a lot of water through their leaves. Animals and humans give off water as waste. In the water cycle, this water is renewed. It becomes fresh again so plants and animals can use it.

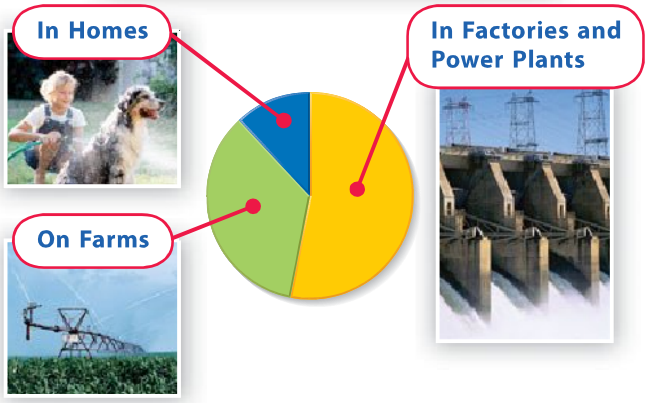


Trees and other plants use water. They also put water back into the water cycle.

People use water in many ways. At home, they drink water and take baths in it. They use water to cook and to clean. Farmers put water on their plant crops to help them grow. This uses a lot of water.

Factories use water, too. Some water is used to cool machines. Some is used to make things that people buy. Power plants use water to make electricity.

Water Use in the United States



SEQUENCE

What happens after water falls to the ground as precipitation?

Summary Water changes state among liquid, solid, and gas forms when heat is added or taken away. The water cycle is the process in which water continuously moves between the air and Earth. Living things take water from the water cycle and return it to the water cycle.

Why is the Sun important to the water cycle?

Sequence

What happens after water falls to the ground as precipitation?

Lesson Preview

VOCABULARY

atmosphere The layers of air that cover Earth's surface. *(noun)*

temperature The measure of how hot or cold something is. *(noun)*

weather The condition of the atmosphere at a certain place and time. *(noun)*

VOCABULARY SKILL: Homophones

Homophones are words that sound the same but have different meanings. A homophone for *weather* is *whether. Whether* is a word used to show a choice between two things. Write the correct words in the sentence below.

Before we listened to the forecast, we didn't know _____ the _____ would be cloudy or sunny.

4.c. Gather and display local weather information such as temperature, precipitation, clouds, etc., on graphs and use graphs of weather patterns to predict weather conditions. (DOK 3)

- Instruments (wind vane, rain gauge, thermometers, anemometers, and barometers)
- Cloud types (cirrus, stratus, cumulus)

2

How Does Weather Change Each Day?

Weather is what the atmosphere is like in one place on Earth. Weather includes temperature, wind, and water in the air.

Earth's Atmosphere

The air you breathe is part of Earth's atmosphere (AT muh sfihr). The **atmosphere** is the layers of air that cover Earth's surface. The air in the atmosphere is a mixture of gases. These gases have no color and no taste.

The atmosphere is like a big blanket around Earth. It helps to keep Earth warm. Like a blanket, the atmosphere has weight. It presses down on Earth's surface.

The force of the atmosphere pressing down on Earth is called air pressure. Earth's air pressure is always changing. When it rises, you can expect fair weather. When it drops, precipitation is probably on the way.

A tool called a barometer measures air pressure.

1. I breathe _____, which is a part of Earth's _____.

2. The _____ is like a blanket around Earth.

3. The force of the atmosphere pressing down on Earth is called _____. It is measured with a tool called a _____.

Fill in the table to show the kind of weather each cloud type usually brings.

Cloud Type	Kind of Weather
4. small cumulus	
5. cirrus	
6. high, thin stratus	
7. low, heavy stratus	
8. cumulonimbus	
9. tall cumulonimbus	

Clouds

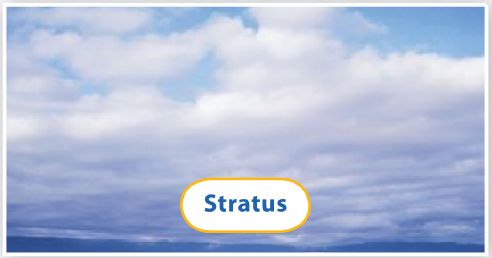
Clouds can be many different shapes and sizes. Different types of clouds are different temperatures. They are also different heights. Many clouds in the sky are two or more cloud types put together.

Cumulus (KYOOM yuh luhs) clouds are thick and white. They have fluffy tops and flat bottoms. Small cumulus clouds usually mean fair weather.

Cirrus (SEER uhs) clouds are thin and wispy. They are high in the sky. These clouds mean fair weather, too.

Another type of cloud is stratus (STRAY tuhs) clouds. These clouds form flat layers in the sky. Sometimes stratus clouds are high and thin. Then they mean cloudy, dry weather. Sometimes stratus clouds are low and heavy. Then they mean light rain.

Cumulonimbus (KYOOM yuh loh NIHM bus) clouds are heavy and gray. They mean stormy weather with precipitation. Sometimes cumulonimbus clouds are very tall. Then they can mean thunderstorms.



Science Test Practice

Circle the correct answer.

10. Hurricanes are powerful storms that form over warm ocean waters. Which type of cloud makes up most of a hurricane?

Ⓐ cirrus
Ⓑ stratus
Ⓒ cumulus
Ⓓ cumulonimbus

4.c. (DOK 3)

Directed Inquiry

Flip Chart p. 22

Weather Report

Observe and record weather conditions. Analyze data to look for changes in weather.

1.c., 1.e., 4.c.

11. Weather is the condition of the atmosphere in a certain _____ and at a certain _____.

Science Test Practice

Circle the correct answer.

12. Which question could you answer if the only tool you have is a rain gauge?

Ⓐ Does air pressure drop when it rains?

Ⓑ Does temperature decrease when it snows?

Ⓒ Does it rain more in June than it does in August?

Ⓓ Is there a relationship between wind direction and the amount of rain we receive?

4.c. (DOK 3)

Express Lab

Use the Activity Card **Use a Rain Gauge.**

1.c., 4.c.

Changing Weather

Weather is what Earth's atmosphere is like in a certain place at a certain time. Weather takes place in the lowest part of the atmosphere. Weather can change very quickly. The air in the lowest part of the atmosphere is always moving. It can bring clouds or colder air to an area. It can also bring changes in humidity (hyoo MIHD ih-tee). Humidity is how much water vapor is in the air.

Moving air is called wind. Wind is an important part of weather. Scientists use tools called weather instruments to measure wind speed. They also measure the wind's direction.

WEATHER VANE
A weather vane shows the direction of the wind.

ANEMOMETER
An anemometer tells how fast the wind is blowing.

Another important part of weather is the air temperature (TEHM pur uh chur). **Temperature** is how hot or cold something is. You use a thermometer (thur MAHM ih tur) to measure temperature. Temperature can be measured two ways. One way is in degrees Celsius (SEHL see-uhs). The other way is in degrees Fahrenheit (FAHR uhn hyt).

Precipitation is also part of weather. Rain, sleet, snow, and hail are all types of precipitation. The temperature of the air is what causes different types of precipitation. You can measure precipitation by how deep it is on the ground.

THERMOMETER
A thermometer measures the temperature of the air.

RAIN GAUGE
A rain gauge measures how much precipitation has fallen.

13. List four parts of weather discussed on these two pages.

a. _____

b. _____

c. _____

d. _____

14. The type of precipitation that falls (rain, sleet, or snow) depends on

a. temperature
b. wind speed
c. wind direction
d. air pressure

15. Match each tool with the part of weather that it measures.

a. barometer	temperature
b. weather vane	wind speed
c. anemometer	precipitation
d. thermometer	air pressure
e. rain gauge	wind direction

16. One of the tools that scientists called _____ use is a weather map.

17. The weather map on this page has symbols for _____, _____, and a _____.

I Wonder . . . The text says that meteorologists help keep people safe by tracking big storms. How does that keep people safe?

_____

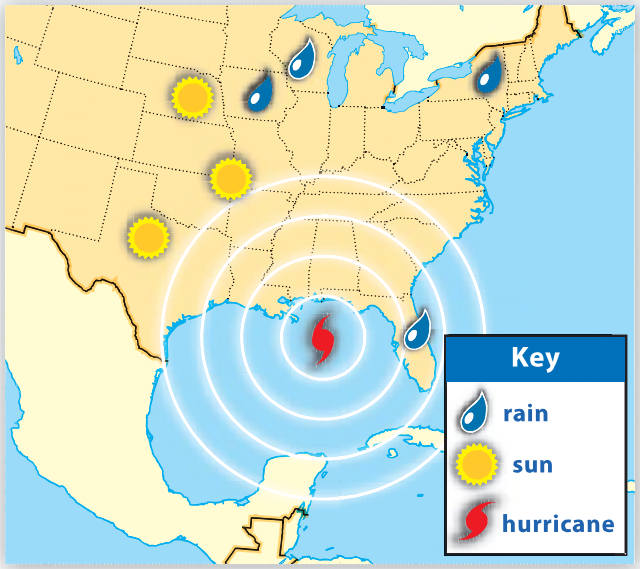
_____

_____

Weather Maps

Scientists who study weather are called meteorologists (mee tee uh RAHL uh jihstz). They use many kinds of tools to study weather. These tools help them understand weather. They help them figure out what kind of weather will come next.

One tool that meteorologists use is a weather map. The map uses symbols to tell about the weather. Weather maps can show temperature. They can show wind and humidity, too.



This map uses symbols to tell about the weather.

This map shows what part of Earth looks like from a satellite. It can be used to make a weather map.

Meteorologists get information from weather instruments. They get information from satellites, too. They put this information together. They use weather maps to make weather forecasts for the day. They also use weather maps and computers to track big storms. This helps keep people safe.

MAIN IDEA

What are two parts of weather?

Summary The atmosphere is the blanket of air that surrounds Earth. Weather is the condition of the atmosphere at a certain place and time. Meteorologists study and predict weather using weather maps and computers.

List five other tools that a meteorologist might use.

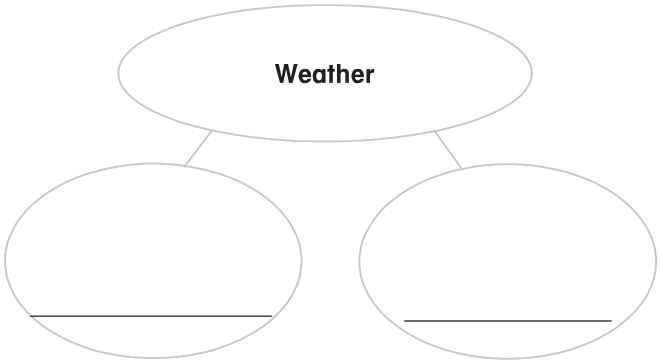
_____ _____

_____ _____

_____

Main Idea

What are two parts of weather?



Lesson Preview

VOCABULARY

climate The average weather conditions in an area over a long period. *(noun)*

equator An imaginary line around Earth, halfway between the North Pole and the South Pole. *(noun)*

latitude The distance north or south of the equator. *(noun)*

polar climate A climate with long, cold winters and short, cool summers. *(noun)*

temperate climate A climate with warm or hot summers and cool or cold winters. *(noun)*

tropical climate A climate that is very warm and wet for all or most of the year. *(noun)*

4.c. Gather and display local weather information such as temperature, precipitation, clouds, etc., on graphs and use graphs of weather patterns to predict weather conditions. (DOK 3)

3 What Is Climate?

Climate is the average weather of an area over a long time. Climate is different in different places on Earth.

Temperature and Precipitation

What if you were going to Alaska in the winter? Would you pack shorts and T-shirts? Would you pack a winter coat to go to Hawaii? Of course not! That's because Alaska has a very cold climate (KLY miht). Hawaii has a warm climate. It helps to know the climate of a place. Then you know what to pack when you visit.

A tundra has a very cold climate. Summer is short.

A rain forest has a warm, wet climate.

A desert has a very dry climate. Many deserts are hot.

Climate is the average weather in a place over many years. Climate is not the same as weather. Every year, Alaska has cold weather for many months. So Alaska has a cold climate. But on a summer day, it might be warm enough to wear shorts.

Climate depends on average temperature and precipitation. In Hawaii, the average temperature is warm. There is a lot of rain. So Hawaii has a warm, wet climate. Alaska is often cold. It gets a lot of rain and snow. So Alaska has a cold, wet climate.

1. How is weather different from climate?

_____

_____

_____

2. When you describe an area's climate, you describe the area's average _____ and _____.

3. Read the caption next to the desert picture. Then complete this sentence:

All deserts are dry, but not all deserts are _____.

4. The _____ is an imaginary line halfway between the North Pole and the _____ Pole.

Science Test Practice

Circle the correct answer.

5. In which location would you expect to find the most moisture in the air?

   Ⓐ the polar tundra
   Ⓑ a tropical forest
   Ⓒ a temperate forest
   Ⓓ a temperate grassland

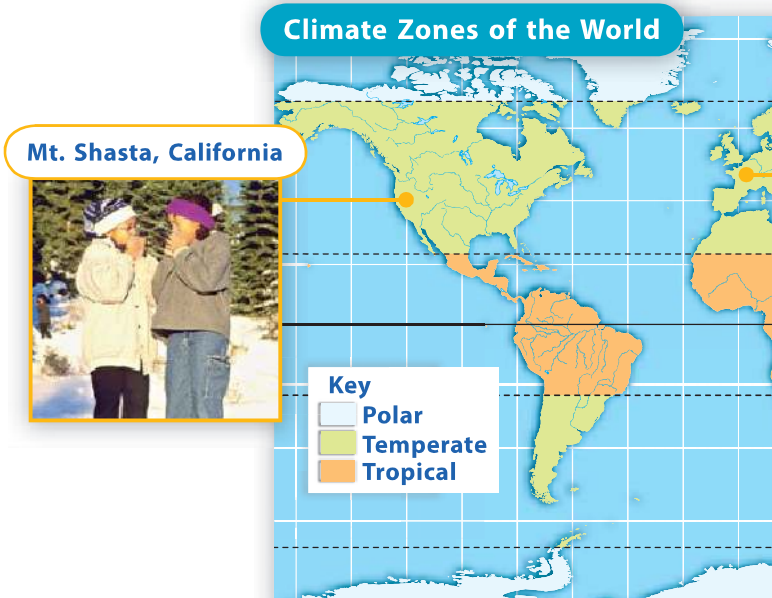
3.c. (DOK 3)

Latitude

Climate depends on latitude (LAT ih tood). **Latitude** is how far north or south a place is from the equator (ih KWAY tur). The **equator** is an imaginary line around Earth. It is halfway between the North Pole and the South Pole. Places close to the equator are warm. Places far from the equator are cold.

Areas close to the equator have a tropical (TRAHP ih kuhl) climate. A **tropical climate** is very warm and wet.

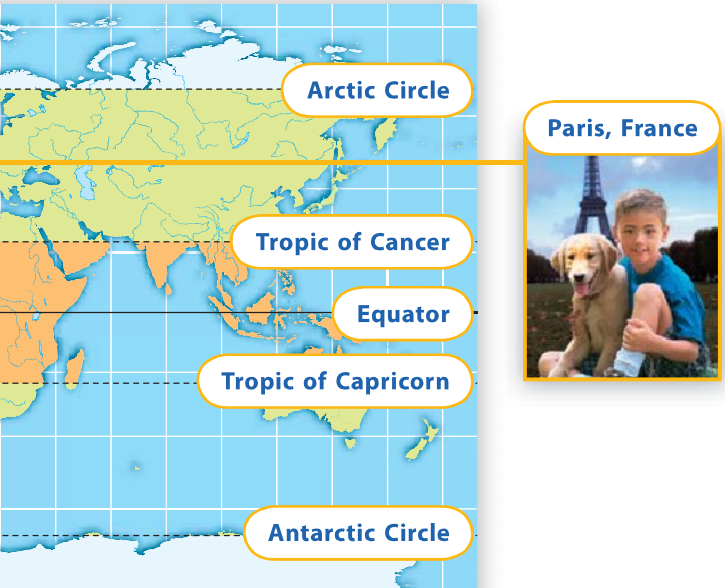
Places that are halfway between the equator and the poles have a **temperate climate**. Summers are warm or hot. Winters are cool or cold.



The climate is very cold near the North and South Poles. It is often very dry. These places have a **polar climate**. Winters are long and cold. Summers are short and cool.

Places in the same climate zone, or area, can have different climates. The temperate zone has dry climates, such as deserts. It also has wet climates, such as wetlands. How high or low the land is also makes a difference in the climate. Mountains have colder climates than low areas do.

Places with the same climate can be very different. Mount Shasta and Paris are both in the temperate zone. But how high Mount Shasta is above the sea makes it colder.



6. Lands north of the Arctic Circle and south of the Antarctic Circle have a _____ climate.

7. Lands between the Tropic of Cancer and the Tropic of Capricorn have a _____ climate.

8. If you were going camping, where would you most likely need the warmest clothing—on a mountain or in a valley?

_____

Express Lab

Use the Activity Card **Find Other Climate Factors.**

1.a., 4.c.

9. The graphs show that Tampa's wettest and warmest month is _____.

Summary Climate is the average weather conditions of a place over many years. Climate zones change with latitude, from tropical to temperate to polar. Temperatures within a climate zone can vary.

Name one place that has a temperate climate.

_____

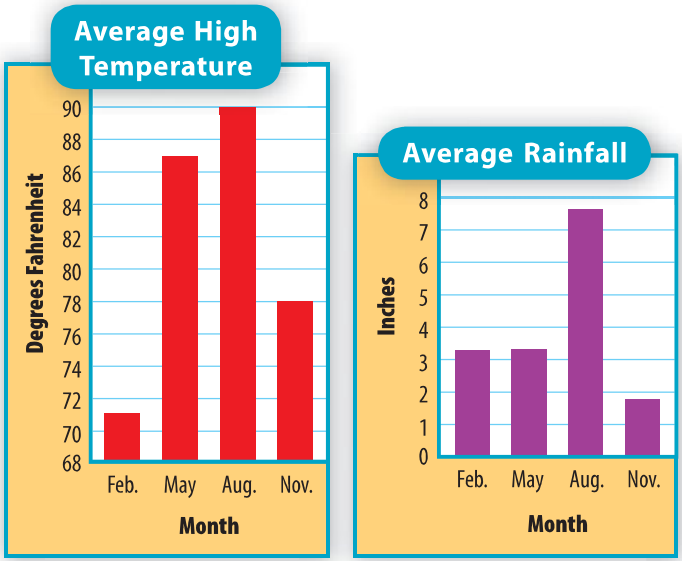
Compare and Contrast

How are summers in a temperate climate and a polar climate different?

Temperate Summer	Polar Summer

Weather Patterns and Climate

You cannot tell the climate of a place by the weather on one day. Scientists look at the weather from many years to learn the climate for a place. Look at the graphs. These graphs give a good idea of the climate of Tampa, Florida. The information was gathered for many years.



COMPARE AND CONTRAST

How are summers in a temperate climate and a polar climate different?

KWL

WHAT DID YOU LEARN?

Science Test Practice

❶ **In which of these climates would you expect to find a rain gauge with the highest yearly readings?**

Ⓐ temperate

Ⓑ desert

Ⓒ tropical

Ⓓ polar

4.c. (DOK 3)

Comprehension

❷ In the water cycle, what takes place between evaporation and precipitation?

❸ What is weather?

❹ How are weather and climate different?

Critical Thinking

❺ A person has never seen snow. What can you conclude about the climate where this person lives?

KWL

WHAT DID YOU LEARN?

Science Test Practice

❶ Circle the correct answer.

Comprehension

❷ _____

❸ _____

_____

❹ _____

_____

_____

Critical Thinking

❺ _____

_____

Circle the correct answer.

1. Look at the data table below.

Weather Data		
Day	**Air Pressure**	**Wind**
Monday	high	strong
Wednesday	low	light

Which day most likely had precipitation?

Ⓐ Monday
Ⓑ Wednesday
Ⓒ both days
Ⓓ neither day

4.c. (DOK 3)

2. Look at the drawing below.

Which type of cloud produces this weather?

Ⓕ cirrus
Ⓖ stratus
Ⓗ cumulus
Ⓙ cumulonimbus

4.c. (DOK 3)

3. Craig hypothesized that it is colder on days when the wind blows from the north. Which instruments will he need to test his hypothesis?

Ⓐ wind vane and rain gauge
Ⓑ barometer and thermometer
Ⓒ thermometer and wind vane
Ⓓ thermometer and anemometer

1.c. (DOK 1)

4. The reading on a barometer is increasing quickly. Which weather conditions are most likely to develop?

Ⓕ cumulus clouds and rain
Ⓖ cirrus clouds and sunshine
Ⓗ stratus clouds and sunshine
Ⓙ cumulonimbus clouds and rain

4.c. (DOK 3)

5. Which data was collected using a rain gauge?

Ⓐ 5 miles per hour
Ⓑ from the north
Ⓒ 12°C
Ⓓ 15 cm

4.c. (DOK 3)

6. The water level in a lake is below normal. Which would help fill the lake?

Ⓕ evaporation
Ⓖ precipitation
Ⓗ condensation
Ⓙ water vapor

4.c. (DOK 3)

7. In which zone would a thermometer most likely have the lowest reading in summer?

Ⓐ polar climate zone
Ⓑ tropical climate zone
Ⓒ temperate climate zone
Ⓓ the zone closest to the equator

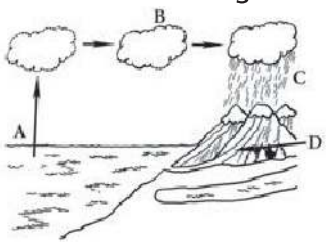
4.c. (DOK 3)

8. A puddle on the ground disappears after it stops raining. Nancy says the water evaporated. Which is a different possible explanation?

Ⓕ The water turned into precipitation.
Ⓖ The water seeped into the ground.
Ⓗ The water became water vapor.
Ⓙ The water condensed.

4.c. (DOK 3)

9. Look at the drawing below.

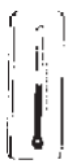


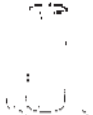
Where in the drawing does runoff occur?

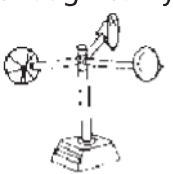
Ⓐ Point A
Ⓑ Point B
Ⓒ Point C
Ⓓ Point D

4.c. (DOK 3)

10. Which instrument would you use to find out if the wind is blowing fast enough to fly a kite?

Ⓕ 

Ⓖ 

Ⓗ 

Ⓙ 

4.c. (DOK 3)

KWL

WHAT DO YOU KNOW?

List one fact about each of these topics:

a. The solar system: _____

_____

_____

b. Changes in how the Moon looks: _____

_____

_____

c. Stars and constellations: _____

_____

_____

Our Solar System

Contents

KWL

WHAT DO YOU WANT TO KNOW?

Skim the pictures and headings in this chapter. List one thing you want to find out about each of these topics:

a. The solar system: _____

_____

_____

b. Phases of the Moon: _____

_____

_____

c. Stars and constellations: _____

_____

_____

Lesson Preview

VOCABULARY

asteroid A large piece of rock that orbits the Sun. *(noun)*

inner planets The four planets closest to the Sun—Mercury, Venus, Earth, and Mars. *(noun)*

moon A small, rounded body that orbits a planet. *(noun)*

orbit To move in a path around an object. *(verb)* Also the path itself. *(noun)*

outer planets The four planets farthest from the Sun—Jupiter, Saturn, Uranus, and Neptune. *(noun)*

planet A large body in space that moves around a star. *(noun)*

solar system The Sun and the planets, moons, and other objects that orbit the Sun. *(noun)*

Sun The nearest star to Earth. *(noun)*

4.f. Describe the different components of the solar system (sun, planets, moon, asteroids, comets). (DOK 1)

- Gravitational attraction of the sun

1

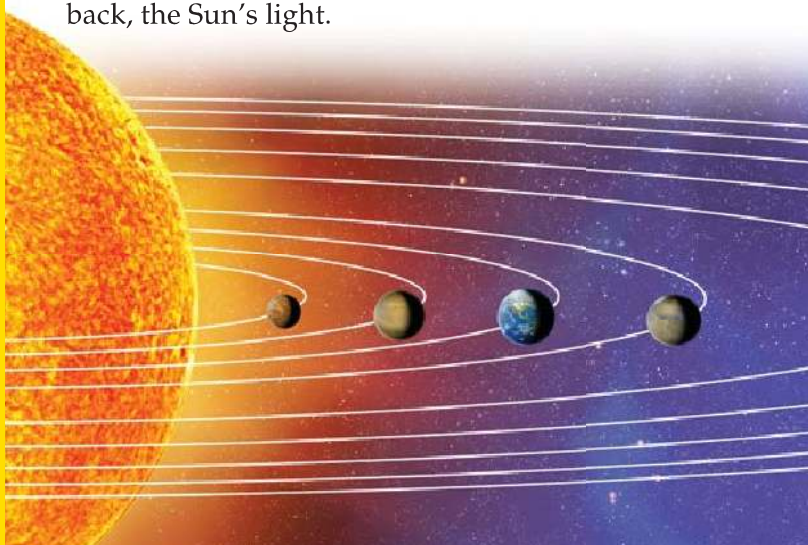
What Is the Solar System?

The solar system is made up of the Sun and the objects around it. Eight planets, their moons, and other things travel around the Sun.

The Sun and Planets

Stars are big balls of hot gas that give off heat and light. The **Sun** is a star. It is close to Earth. Other stars look small because they are so far away.

A **planet** is a large body in space that moves around a star. A planet does not make light. We can see planets shine in the night sky because of light from the Sun. The planets reflect, or send back, the Sun's light.



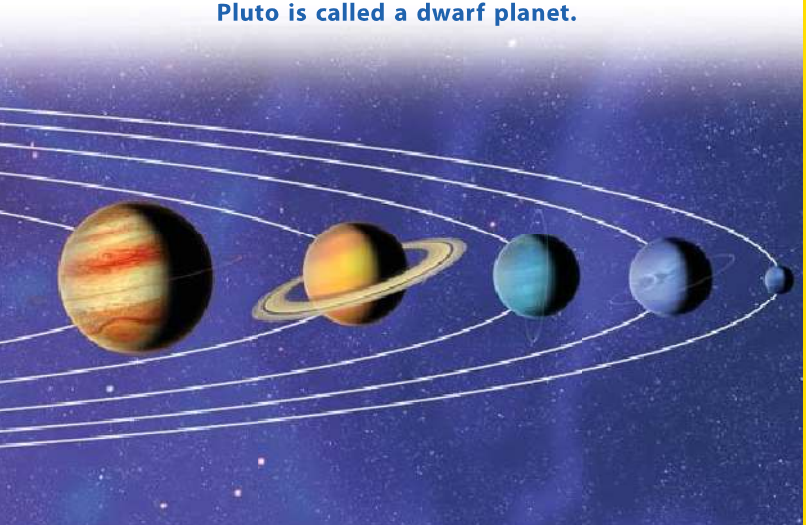
Earth is one of eight planets that orbit the Sun. **Orbit** means to move in a path around something.

The force of gravity causes one object in space to orbit another. Gravity is an attraction between any two objects. Planets orbit the Sun because of the Sun's gravity. Earth's gravity keeps the Moon in its orbit around Earth.

You can see Earth's moon at night, too. A **moon** is a small ball in orbit around a planet. Moons do not make light. Like planets, moons reflect light from the Sun. Most planets have one or more moons.

The Sun, planets, moons, and other things that orbit the Sun make up the **solar system** (SOH lur SIHS tuhm).

Eight planets orbit the Sun. Pluto is called a dwarf planet.



1. Read the clues. Then identify the object or objects in space that are described.

Clue	Space Object(s)
They do not make their own light.	
Earth is one of several that orbit the Sun.	
Some planets have none, some have one, and some have many.	
The star that is closest to Earth.	
The Sun and the planets, moons, and all other things that orbit the Sun.	

Directed Inquiry

Flip Chart p. 23

Orbiting the Sun

Model the movement of planets in the solar system. Record changes in position over time.

1.c., 4.f.

2. List the inner planets in order from the Sun.

a. _____

b. _____

c. _____

d. _____

3. Circle two things the inner planets get from the Sun.

Science Test Practice

Circle the correct answer.

4. Which causes Mercury to orbit the Sun?

Ⓐ its small size
Ⓑ its closeness to the Sun
Ⓒ the pull of the Sun's gravity
Ⓓ heat and light from the Sun

4.f. (DOK 1)

The Inner Planets

Mercury (MUR kyuh ree), Venus (VEE nuhs), Earth, and Mars (mahrz) are the **inner planets**. They are the planets closest to the Sun. They get a lot of heat and light from the Sun.

1 **Mercury is the first planet from the Sun. It is hot in the day and very cold at night.**

2 **Venus is the second planet from the Sun. It is covered by gas and is very hot.**

3 **Earth is the third planet from the Sun. As far as we know, it is the only planet that has living things.**

4 **Mars is the fourth planet from the Sun. It has many craters and mountains.**

The Outer Planets

Jupiter (JOO pih tur), Saturn (SAT urn), Uranus (YUR uh nuhs), and Neptune (NEHP toon) are the **outer planets**. They are cold and dark because they are far from the Sun. These planets are made of gas and have many moons. Pluto (PLOO toh) is called a dwarf planet. It is small and made of rocks.

5 Jupiter is the fifth planet from the Sun. It is the largest planet.

6 Saturn is the sixth planet from the Sun. It has rings made of dust, ice, and rocks.

8 Neptune is the eighth planet from the Sun. It is blue.

7 Uranus is the seventh planet from the Sun. It is the only planet that spins, or turns, on its side.

Pluto is a dwarf planet. It is smaller than the planets and very far from the Sun.

5. List the outer planets in order from the Sun. Include one dwarf planet.

a. _____

b. _____

c. _____

d. _____

e. _____

6. Look at the list you just made.

a. Put a ✔ next to the largest planet.

b. Circle the planet that spins on its side.

c. Identify the object that is farthest from the Sun. Write "dwarf planet" next to this object's name.

Express Lab

Use the Activity Card **Compare the Outer Planets.**

1.e., 4.f.

7. Fill in the blanks.

a. One day = _____ hours

b. One year = about _____ days

8. Draw lines between the two boxes that are equal.

Earth spins one time.	One day
Earth orbits the Sun one time.	One year

I Wonder . . . Earth moves in two ways. It rotates, or spins like a top, as it travels in its orbit around the Sun. How many times does Earth rotate in one year?

_____

_____

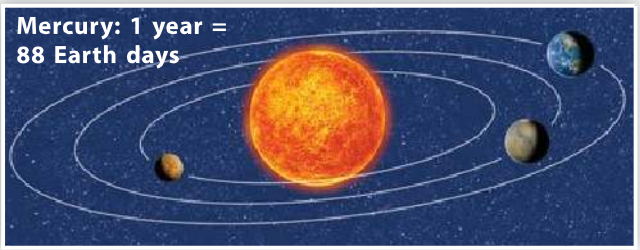
_____

Planets in Motion

Planets spin like tops as they orbit the Sun. Earth's day is one full spin. It is 24 hours long. Some planets spin faster than Earth. Some planets do not spin as fast as Earth.

Planets also take different times to orbit the Sun. Planets that are far from the Sun have a long way to go. They take a long time to orbit. Planets that are close to the Sun do not have as far to go. They take less time to orbit.

The time it takes Earth to orbit the Sun is called a year. Earth's year is about 365 days long. Mercury is close to the Sun, so it orbits in less time than Earth. It takes only 88 Earth days to orbit the Sun.



Comets

A *comet* is a ball of rock, ice, and frozen gases. Comets are part of the solar system, which means they orbit the Sun. However, many of them are beyond the outer planets. Most comets are less than 10 kilometers (6 miles) across.

When a comet nears the Sun, heat from the Sun turns some of the frozen matter into gas. The gas and dust look like a fiery tail that may be visible from Earth. A comet's tail can be as much as 100,000 kilometers (62,000 miles) long!

A comet's tail always points away from the Sun.

9. Circle the comet's tail in the picture.

10. How is a comet different from an asteroid?

_____

_____

_____

I Wonder . . . Some comets have long tails and others do not. Does the position of a comet in its orbit affect the comet's tail? Why or why not?

_____

_____

_____

11. Underline the sentence that tells where most asteroids are found.

12. How small are the smallest asteroids? How large are the largest? Circle the answers on the page.

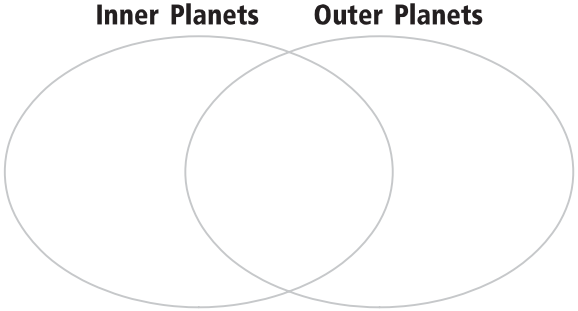
Summary The solar system is made up of the Sun and the planets, their moons, and other objects traveling around the Sun.

List two objects in the solar system other than the Sun, planets, and their moons.

_____

_____

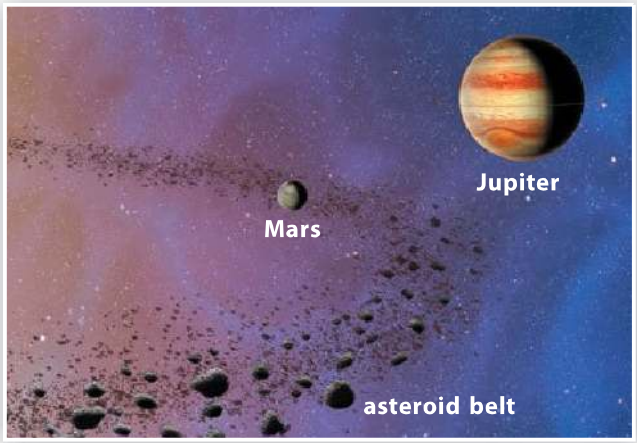
Compare and Contrast How are the inner planets and outer planets alike? How are they different?



The Asteroid Belt

The asteroid (AS tuh royd) belt is between the inner planets and outer planets. An **asteroid** is a piece of rock that orbits the Sun. There are thousands of asteroids in the asteroid belt. Some are as small as a grain of sand. Some are about as big as the state of California.

Sometimes a piece of an asteroid moves close to Earth. It burns up when it moves through Earth's atmosphere.



COMPARE AND CONTRAST

How are the inner planets and outer planets alike? How are they different?

What Are the Phases of the Moon?

2

The Moon seems to change shape. These changes are caused by the way sunlight hits the Moon as it revolves around Earth.

Earth's Moon

The Moon is a ball-shaped object made of rock. It revolves around Earth once every $27\frac{1}{3}$ days. The Moon also rotates on its axis once in the same amount of time. So the same side of the Moon always faces Earth. This is called the near side.

The Moon does not make its own light. It reflects, or bounces back, the Sun's light. The reflected sunlight makes the near side of the Moon look bright. The other side is dark, so you cannot see it.

Lesson Preview

VOCABULARY

crescent moon The phase of the Moon when a thin part of the Moon's near side is sunlit. *(noun)*

full moon The phase of the Moon when all of the Moon's near side is sunlit. *(noun)*

new moon The phase of the Moon when the Moon's near side receives no sunlight. *(noun)*

phases of the Moon The different ways the Moon looks throughout the month. *(noun)*

quarter moon The phase of the Moon when half of the Moon's near side is sunlit. *(noun)*

waning moon The phases of the Moon when a decreasing amount of the Moon's near side is sunlit. *(noun)*

waxing moon The phases of the Moon when an increasing amount of the Moon's near side is sunlit. *(noun)*

4.e. Identify patterns in the phases of the moon, describe their sequence, and predict the next phase viewed in the night sky. (DOK 1)

4.f. Describe the different components of the solar system (sun, planets, moon, asteroids, comets). (DOK 1)

- Phases of the moon

1. Tell why the same side of the Moon always faces Earth.

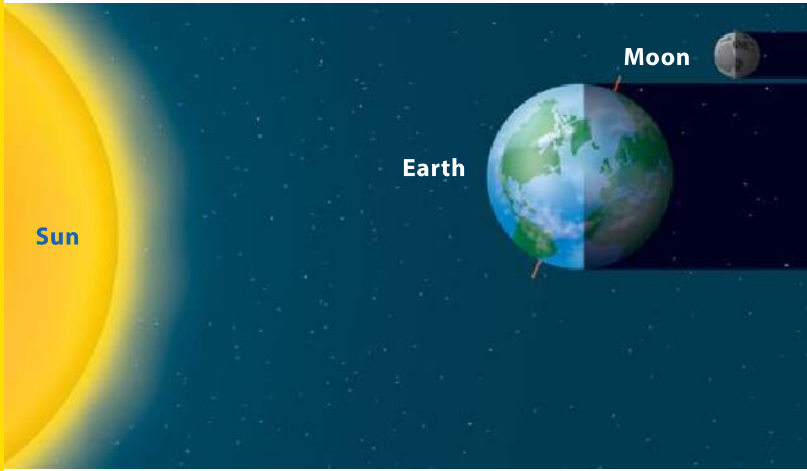
_____

_____

2. Circle the sentence that tells what makes the near side of the Moon look bright.

a. The Moon makes its own light.

b. The Moon reflects light from the Sun.



**The Moon does not make light.
It reflects light from the Sun.**

Even though the same side of the Moon always faces Earth, it seems to change shape. This is because the near side of the Moon gets different amounts of sunlight at different times.

The Moon revolves and rotates the same way every $27\frac{1}{3}$ days. That means that the Moon will look the same tonight as it will in about one month. In that time, the Moon takes on eight different forms. The different ways the Moon looks throughout the month are called the **phases of the Moon**.

These pictures show how the phases of the Moon look from Earth.

3. Complete the diagram to tell what causes the Moon to seem to change shape.

Cause	Effect
	The Moon seems to change shape.

4. What is the changing shape of the Moon called?

_____

Science Test Practice

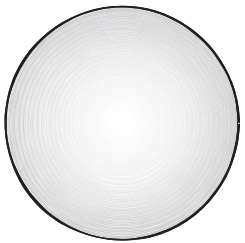
Circle the correct answer.

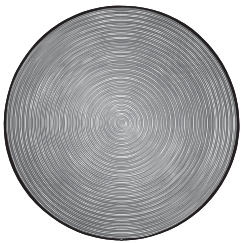
5. Which phase of the Moon occurs when all of the Moon's near side is sunlit?

Ⓐ new moon
Ⓑ full moon
Ⓒ quarter moon
Ⓓ crescent moon

4.e. (DOK 1)

6. Label the drawings below to show a new moon and a full moon.





_____ _____

The first phase is called a **new moon**. The Moon's near side does not get any sunlight. The near side of the Moon is dark, and you cannot see it.

The second phase is called a **waxing moon**. A little bit of the Moon's near side gets sunlight. This waxing moon is in a thin shape called a **crescent** (KREHS uhnt) **moon**.

The third phase is called a **quarter moon**. Half the Moon's near side faces the Sun. You can see one quarter of the whole Moon lit. From Earth, the quarter moon looks like half of a ball.

The fourth phase is another waxing moon. But this time three-quarters of the near side gets sunlight. This waxing moon looks like a circle with a small bite taken out of it.

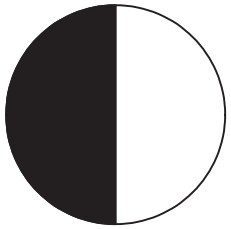
The fifth phase is a **full moon**. The Moon has revolved halfway around Earth. The whole near side gets sunlight. From Earth, the full moon looks like a whole ball.

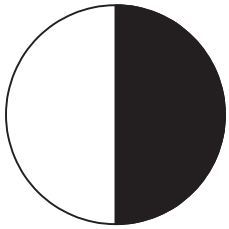
The sixth phase is a **waning moon**. A little bit less of the Moon's near side gets sunlight. This waning moon looks like another circle with a small bite taken out of it.

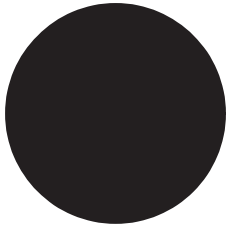
The seventh phase is another quarter moon. Like the third phase, it looks like half of a ball to people on Earth.

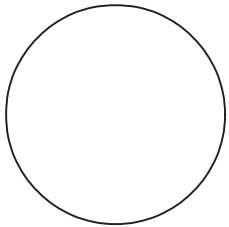
The eighth phase is the last one. It is another waning moon. This moon looks like the second phase. They are both thin crescents. After this phase, a new moon happens again and the phases start all over again.

7. Number the drawings of the phases of the Moon in order. Start with new moon as 1.









8. Describe how the moon appears just after it is a full moon.

I Wonder . . . If the Moon and Earth never moved, would the Moon have phases? Explain your answer.

_____

_____

_____

9. List three facts about the surface of the Moon.

a. _____

b. _____

c. _____

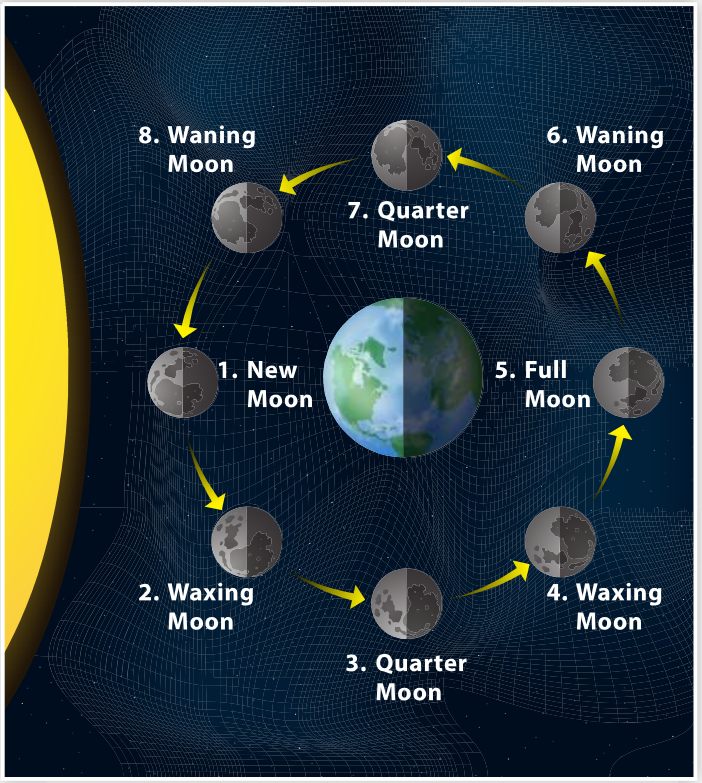
Directed Inquiry

Flip Chart p. 24

Moon Motion

Model the movement of Earth and the Moon. Record the shape the Moon appears to have.

1.e., 4.e., 4.f.



The Moon in Motion

The Moon's phases are based on where the Moon is as it revolves around Earth. These pictures show where the Moon is in each phase.

A Closer Look at the Moon

The Moon is made of dark rock and dust. It is covered with mountains, flat areas, and craters. A crater is a dent that is shaped like a bowl. It is made when an object from space hits the Moon or a planet.

There is no air or water on the Moon. Living things need air and water, so there are no living things on the Moon. The Moon gets very hot in the day and very cold at night.

the Moon

COMPARE AND CONTRAST

What are two different ways that the Moon moves?

Summary The Moon's shape seems to change from a crescent, to a half circle, to a whole circle, and then back again. These changes are caused by the way sunlight strikes the Moon as the Moon revolves around Earth.

Tell why there are no living things on the Moon.

Compare and Contrast What are two different ways that the Moon moves?

Lesson Preview

VOCABULARY

constellation A group of stars that forms a pattern shaped like an animal, person, or object. *(noun)*

star A ball of hot gases that gives off light and other forms of energy. *(noun)*

VOCABULARY SKILL: Word Origins

Read the definition of the word *constellation*. *Stella* is a Latin word, which means "star." *Con* is a prefix meaning "with." Together, *con* and *stella* mean "with stars." Write your own definition of *constellation* to include the words *with stars*.

_____

_____

4.f. Describe the different components of the solar system (sun, planets, moon, asteroids, comets). (DOK 1)

- Constellations

3

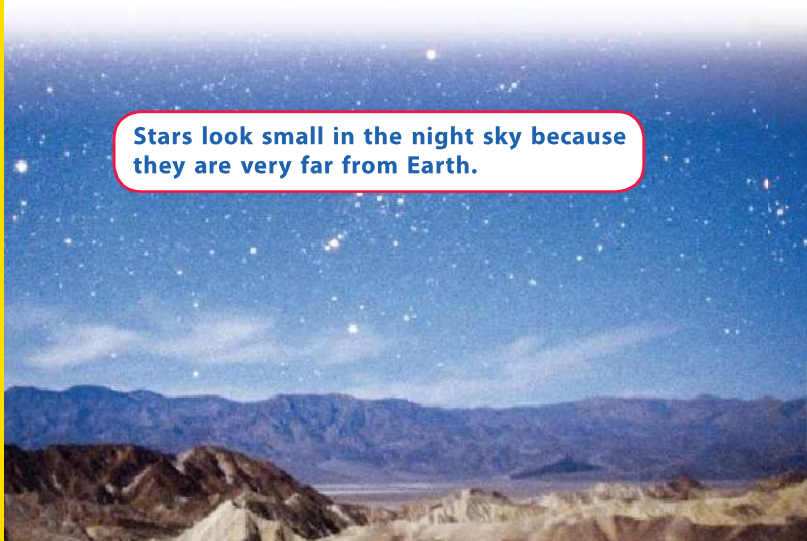
What Is a Star?

Stars are big balls of hot gas. From Earth, stars appear to be small points of light because they are very far away. Stars stay in the same place but seem to change because Earth is always moving.

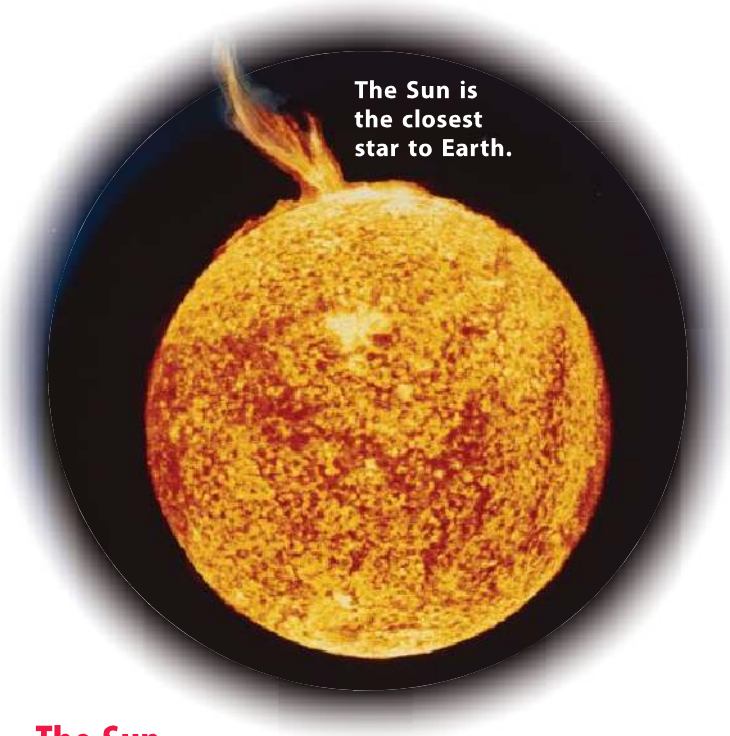
The Night Sky

A **star** is a ball of hot gas that gives off light. Stars look like tiny dots of light. But they are not tiny at all. They only look small because they are very, very far away.

Stars come in different sizes. Some stars are only about 20 km across. But some stars are bigger than 1,000 times the distance from Earth to the Moon!



Stars look small in the night sky because they are very far from Earth.



The Sun

The Sun is a star. It is the largest thing in the solar system. More than 1 million Earths would fit inside the Sun! But, compared to other stars, the Sun is not very big. The Sun looks much larger than other stars because it is so much closer to Earth than any other star.

The Sun gives us light and heat. Living things could not live on Earth without the Sun.

1. A star is a ball of hot gas that gives off light. Compare the size of the Sun to the size of other stars.

_____

2. Tell why the Sun looks larger than the other stars.

_____

3. List two things that the Sun gives Earth.

a. _____

b. _____

Science Test Practice

Circle the correct answer.

4. What is a constellation?

Ⓐ a very bright star
Ⓑ a star that is always visible
Ⓒ several stars that make a pattern
Ⓓ a star that does not seem to move

4.f. (DOK 1)

5. How many constellations are there?

_____

6. Look at the two pictures of the Big Dipper. Circle the picture that shows the Big Dipper low in the sky.

7. What caused the change in where the Big Dipper appears?

_____

Constellations

Look up at the sky. The stars make patterns that look like things you know. Some patterns look like animals. Some look like people or things we see every day.

These patterns in the sky are called constellations (kahn stuh LAY shuhns). A **constellation** is a group of stars that makes a pattern shaped like an animal, person, or object. There are 88 constellations.

The Big Dipper is a pattern of seven stars that look like a big pot.

You know that the Sun appears to move across the sky each day. At night, the stars appear to move across the sky. These are both caused by the rotation of Earth.

As Earth rotates, the part of the sky that you see changes. That makes the constellations seem to move. But it is really Earth that is moving. The shape of the constellations does not change, but their place in the sky does.

The Big Dipper looks like it has moved, but it is Earth that moves.

8. Draw and label the Big Dipper.

Express Lab

Use the Activity Card **Make a Constellation.**

1.e., 4.f.

Summary A star is a huge ball of hot gases. When seen from Earth, most stars look like small points of light because they are very far away. They form patterns that seem to change position in the sky as Earth rotates and revolves.

Tell why you can see different stars at different times of the year.

_____

_____

Draw Conclusions Why do the stars appear to move during the night?

_____

Seasonal Constellations

Earth revolves around the Sun. As it does, the part of the sky that you see changes. You can see different constellations at different times of the year. That means that you may not be able to see the same stars in the summer that you see in the winter.

In the summer, you can see Scorpius (SKAWR pee uhs). It is a group of stars that look like a scorpion. In the winter, you can see the Big Dog. One of the stars in the Big Dog is called Sirius (SIHR ee uhs). It is the brightest star in the night sky.

The Scorpius Constellation

The Big Dog Constellation

DRAW CONCLUSIONS

Why do the stars appear to move during the night?

KWL

WHAT DID YOU LEARN?

Science Test Practice

❶ **Which of these objects in the solar system is largest?**

Ⓐ the Sun

Ⓑ a comet

Ⓒ an asteroid

Ⓓ the planet Jupiter

4.f. (DOK 1)

Comprehension

❷ What causes day and night?

❸ Why does the Moon's shape look different on different nights?

❹ Why does the Sun look larger than the other stars you can see?

Critical Thinking

❺ How is the movement of the Moon similar to that of Earth?

KWL

WHAT DID YOU LEARN?

Science Test Practice

❶ Circle the correct answer.

Comprehension

❷ _____

_____

❸ _____

_____

_____

❹ _____

_____

Critical Thinking

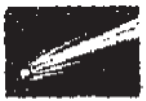
❺ _____

_____

_____

Circle the correct answer.

1. Look at the picture below.



What does the picture show?

Ⓐ a planet
Ⓑ a comet
Ⓒ an asteroid
Ⓓ a constellation

4.f. (DOK 1)

2. Which planet is farthest from the Sun?

Ⓕ Mars
Ⓖ Earth
Ⓗ Neptune
Ⓙ Jupiter

4.f. (DOK 1)

3. Which is not part of our solar system?

Ⓐ the Sun
Ⓑ the asteroid belt
Ⓒ the Big Dog constellation
Ⓓ the largest moon of Jupiter

4.f. (DOK 1)

4. Look at the drawing below.

Which moon phase is shown?

Ⓕ new moon
Ⓖ full moon
Ⓗ crescent moon
Ⓙ first quarter moon

4.e. (DOK 1)

5. Look at the drawings below.

Which should come next in the sequence?

Ⓐ 
Ⓒ 
Ⓑ 
Ⓓ 

4.e. (DOK 1)

6. Which is an inner planet?

Ⓕ Earth
Ⓖ Uranus
Ⓗ Saturn
Ⓙ Neptune

4.f. (DOK 1)

7. Which keeps the planets in their orbits?

Ⓐ friction
Ⓑ heat
Ⓒ light
Ⓓ gravity

4.f. (DOK 1)

8. Look at the data table below.

Objects in the Solar System		
Row	**Object**	**Distance from Sun**
A	Earth	150 million km
B	Mars	228 million km
C	Saturn	1429 million km

Where should the asteroid belt be added?

Ⓕ after Row C
Ⓖ before Row A
Ⓗ between Rows A and B
Ⓙ between Rows B and C

1.e. (DOK 2)

9. Look at the data table below.

Moon Phases—Summer 2005				
Month	**New Moon**	**First Quarter**	**Full Moon**	**Third Quarter**
June	6	15	22	28
July	6	14	21	28
August	5	13	19	26
September	4	11	18	25

When will a crescent moon be visible?

Ⓐ October 6
Ⓑ October 12
Ⓒ October 17
Ⓓ October 25

4.e. (DOK 1)

10. Which is at the center of the solar system?

Ⓕ the Sun
Ⓖ the Earth
Ⓗ the Moon
Ⓙ the asteroid belt

4.f. (DOK 1)

Glossary

A

absorb (uhb SAWRB) To take in. **(p. 74)**

adaptation (ad ap TAY shuhn) A way of acting or a body part that helps a living thing survive. **(p. 126)**

amphibian (am FIHB ee uhn) A vertebrate that starts life in water and has smooth skin. **(p. 110)**

aquatic habitat (uh KWAT ihk HAB ih tat) A place where organisms live in or around water. **(p. 135)**

arthropod (AHR thruh pahd) An invertebrate that has a hard outer covering, a segmented body, and legs that bend at joints. **(p. 118)**

asteroid (AS tuh royd) A large piece of rock that orbits the Sun. **(p. 240)**

atmosphere (AT muh sfihr) The layers of air that cover Earth's surface. **(p. 216)**

B

backbone (BAK bohn) A line of bones that runs down the back of some animals. **(p. 106)**

bacteria (bak TEER ee uh) Microorganisms found in all living organisms and everywhere on Earth. **(p. 155)**

bedrock (BED rahk) Unweathered rock that lies below the lowest layer of soil. **(p. 173)**

behavior (bih HAYV yur) The way that an organism usually acts in a certain situation. **(p. 129)**

biodegradable material (by oh dee GRAY duh buhl muh TEE ree uhl) Matter that breaks down easily in the environment. **(p. 192)**

biome (BY ohm) A large area that has similar living things and about the same temperature and rainfall throughout. **(p. 126)**

bird (burd) A vertebrate that has feathers. **(p. 108)**

C

carnivore (KAHR nuh vawr) An animal that eats only other animals. **(p. 150)**

cell (sehl) The basic unit that makes up all living things. **(pp. 84, 155)**

chrysalis (KRIHS uh lihs) The case a butterfly makes during the pupa stage of its life cycle. **(p. 94)**

climate (KLY miht) The average weather conditions in an area over a long period. **(p. 225)**

compost (KAHM pohst) Decayed material from once-living things that is used to enrich soil. **(p. 195)**

condensation (kahn dehn SAY shuhn) The change of state from gas to liquid. **(p. 210)**

condense (kuhn DEHNS) To change state from gas to liquid. **(p. 11)**

constellation (kahn stuh LAY shuhn) A group of stars that forms a pattern shaped like an animal, person, or object. **(p. 250)**

consumer (kuhn SOO mur) An organism that gets energy by eating other living things. **(p. 147)**

Glossary

crescent moon (KREHS uhnt moon) The phase of the Moon when a thin part of the Moon's near side is sunlit. **(p. 244)**

crest (krehst) The highest point of a wave. **(p. 53)**

D

decomposer (dee kuhm POH zuhr) An organism that breaks down the remains of dead organisms or materials that are made from once-living things. **(p. 195)**

desert (DEHZ urt) An area that receives less than about 25 cm (10 in.) of precipitation in a year. **(p. 132)**

digestive system (dy JEHS tihv SIHS tuhm) The body system that breaks down food into a form your body can use. **(p. 93)**

direction (di REHK shuhn) Where an object is moving from one moment to the next. **(p. 30)**

distance (DIHS tuhns) A measure of length. **(p. 28)**

E

ecotourism (ee koh TAWR iz uhm) Travel to natural habitats that avoids harming them and helps preserve these areas and the living things there. **(p. 198)**

energy (EHN ur jee) The ability to cause matter to change or move. **(p. 46)**

environment (ehn VY ruhn muhnt) All the living and nonliving things that surround and affect an organism. **(p. 130)**

equator (ih KWAY tur) An imaginary line around Earth, halfway between the North Pole and the South Pole. **(p. 226)**

erosion (ih ROH zhuhn) The movement of weathered rock material from one place to another. **(p. 166)**

evaporate (ih VAP uh rayt) To change state slowly from liquid to gas. **(p. 11)**

evaporation (ih vap uh RAY shuhn) The change of state from liquid to gas. **(p. 210)**

F

fish (fihsh) A vertebrate that lives in water and is covered with flat scales. **(p. 109)**

food chain (food chayn) The path of food energy in an ecosystem from producers to consumers. **(p. 149)**

food web (food wehb) The overlap of two or more food chains. **(p. 152)**

force (fawrs) A push or a pull. **(p. 21)**

forest (FAWR ihst) A large area in which there are many trees growing close together. **(p. 126)**

fossil (FAHS uhl) The preserved remains of a plant or an animal that lived long ago. **(p. 174)**

freeze (freez) To change state from liquid to solid. **(p. 11)**

friction (FRIHK shuhn) A force that occurs when one object rubs against another object. **(p. 52)**

full moon (ful moon) The phase of the Moon when all of the Moon's near side is sunlit. **(p. 245)**

Glossary

G

gas (gas) Matter that has no definite shape and does not take up a definite amount of space. **(p. 5)**

grassland (GRAS land) An area made up of large, flat land that is covered with grasses. **(p. 128)**

gravity (GRAV ih tee) A force that pulls objects toward each other. **(p. 23)**

H

habitat (HAB ih tat) The place where a plant or an animal lives. **(p. 128)**

hazardous waste (HAZ ur duhs wayst) Waste that can pollute the environment even in small amounts. **(p. 191)**

herbivore (HUR buh vawr) An animal that eats only plants. **(p. 149)**

humus (HYOO mus) The decayed remains of plants and animals. **(p. 170)**

I

inclined plane (ihn KLYND playn) A simple machine that is a slanted surface. **(p. 37)**

inner planets (IHN ur PLAN ihts) The four planets closest to the Sun—Mercury, Venus, Earth, and Mars. **(p. 236)**

invertebrate (ihn VUR tuh briht) An animal that does not have a backbone. **(p. 114)**

K

kinetic energy (kuh NEHT ihk EHN ur jee) The energy of motion. **(p. 49)**

L

larva (LAHR vuh) The second, wormlike stage in a butterfly's life cycle. **(p. 94)**

latitude (LAT ih tood) The distance north or south of the equator. **(p. 226)**

leaf (leef) The part of a plant that collects sunlight and gases from the air and uses them to make food for the plant. **(p. 85)**

lens (lehnz) An object that refracts light. **(p. 70)**

lever (LEHV ur) A simple machine made up of a bar that can pivot, or turn, around a fixed point. **(p. 34)**

light (lyt) A form of energy that you can see. **(p. 62)**

liquid (LIHK wihd) Matter that takes the shape of its container and takes up a definite amount of space. **(p. 5)**

litter (LIT ur) Trash that is not disposed of properly. **(p. 190)**

M

mammal (MAM uhl) A vertebrate that has hair or fur. **(p. 107)**

mass (mas) The amount of matter in an object. **(p. 7)**

matter (MAT ur) Anything that has mass and takes up space. **(p. 4)**

melt (mehlt) To change state from solid to liquid. **(p. 11)**

Glossary

microorganism (my kroh AWR guh nihz uhm) An organism that cannot be seen without the help of a microscope. **(p. 155)**

moon (moon) A small, rounded body that orbits a planet. **(p. 235)**

motion (MOH shuhn) A change in the position of an object. **(p. 20)**

muscular system (MUHS kyuh luhr SIHS tuhm) The body system made up of all your muscles. **(p. 91)**

N

nervous system (NUR vuhs SIHS tuhm) The body system that senses things and controls your body. **(p. 92)**

new moon (noo moon) The phase of the Moon when the Moon's near side receives no sunlight. **(p. 244)**

nutrient (NOO tree uhnt) Something that living things need to live and grow. **(p. 83)**

O

offspring (AWF sprihng) The young living thing made when an adult living thing reproduces. **(p. 99)**

omnivore (AHM nuh vawr) An animal that eats both plants and animals. **(p. 150)**

opaque (oh PAYK) Not allowing light to pass through. **(p. 65)**

orbit (AWR biht) To move in a path around an object. Also, the path itself. **(p. 235)**

outer planets (OW tur PLAN ihts) The four planets farthest from the Sun—Jupiter, Saturn, Uranus, and Neptune. **(p. 237)**

P

paleontologist (pay lee ahn TAHL uh jihst) A scientist who studies fossils and organisms that lived long ago. **(p. 174)**

phases of the Moon (FAYZ ihz uhv thuh moon) The different ways the Moon looks throughout the month. **(p. 242)**

photosynthesis (foh toh SIHN thih sihs) The process through which plants make their own food. **(p. 146)**

physical change (FIHZ ih kuhl chaynj) A change in the size, shape, or state of matter. **(p. 10)**

physical property (FIHZ ih kuhl PRAHP ur tee) One of matter's characteristics that can be measured or observed with the senses. **(p. 6)**

planet (PLAN iht) A large body in space that moves around a star. **(p. 234)**

plankton (PLAYNK tuhn) Microorganisms that exist in the water and form the beginning of most aquatic food chains. **(p. 157)**

plant (plant) A living thing that can make its own food and is made of cells with stiff walls. **(p. 82)**

polar climate (POH lur KLY miht) A climate with long, cold winters and short, cool summers. **(p. 227)**

pollutant (puh LOO tuhnt) A material that causes pollution. **(p. 190)**

Glossary

pollution (puh LOO shuhn) The addition of harmful materials to the environment. **(p. 190)**

potential energy (puh TEHN shuhl EHN ur jee) The energy of position. **(p. 49)**

precipitation (prih sihp ih TAY shuhn) Any form of water that falls from clouds to Earth's surface. **(p. 212)**

prism (prihzm) A transparent object that separates white light into all the colors of the rainbow. **(p. 72)**

producer (pruh DOO sur) An organism that uses energy from the Sun to make its own food. **(p. 147)**

pulley (PUL ee) A simple machine made up of a wheel with a rope around it. **(p. 36)**

pupa (PYOO puh) The third stage of a butterfly's life cycle, during which it changes into an adult. **(p. 94)**

Q

quarter moon (KWAHR tur moon) The phase of the Moon when half of the Moon's near side is sunlit. **(p. 244)**

R

recycle (ree SY kuhl) To collect old materials, process them, and make new items. **(p. 201)**

reflect (rih FLEHKT) To bounce off. **(p. 68)**

refract (rih FRAKT) To bend. **(p. 69)**

reptile (REHP tyl) A vertebrate that has dry skin covered with scales. **(p. 111)**

root (root) The part of the plant that takes in water and nutrients and holds the plant in the soil. **(p. 85)**

S

screw (skroo) A simple machine you turn to lift an object or to hold two or more objects together. **(p. 39)**

shadow (SHAD oh) A darker area caused by blocked light. **(p. 66)**

simple machine (SIHM puhl muh SHEEN) A tool with few or no moving parts that makes work easier. **(p. 33)**

skeletal system (SKEHL ih tuhl SIHS tuhm) The body system made up of all your bones. **(p. 91)**

soil (soyl) The loose material that covers much of Earth's surface. **(p. 170)**

solar system (SOH lur SIHS tuhm) The Sun and the planets, moons, and other objects that orbit the Sun. **(p. 235)**

solid (SAHL ihd) Matter that has a definite shape and takes up a definite amount of space. **(p. 5)**

speed (speed) A measure of how fast or slow something is moving. **(p. 32)**

star (stahr) A ball of hot gases that gives off light and other forms of energy. **(p. 248)**

stem (stehm) The part of a plant that holds up the leaves and carries water and nutrients through the plant. **(p. 85)**

Glossary

subsoil (SUHB soyl) The layer of soil just below the topsoil. **(p. 173)**

Sun (suhn) The nearest star to Earth. **(p. 234)**

T

tadpole (TAD pohl) The stage in a frog's life cycle when it hatches from an egg and has a long tail, gills, and no legs. **(p. 96)**

temperate climate (TEHM pur iht KLY miht) A climate with warm or hot summers and cool or cold winters. **(p. 226)**

temperature (TEHM pur uh chur) The measure of how hot or cold something is. **(p. 221)**

topsoil (TAHP soyl) The uppermost layer of soil. **(p. 173)**

translucent (trahns LOO suhnt) Allows only some light to pass through. **(p. 65)**

transparent (trahns PAIR uhnt) Lets light pass through. **(p. 64)**

tropical climate (TRAHP ih kuhl KLY miht) A climate that is very warm and wet for all or most of the year. **(p. 226)**

trough (trawf) The lowest point of a wave. **(p. 53)**

tundra (TUHN drah) A cold, treeless area that has short, cool summers and long, cold winters. **(p. 130)**

V

vertebrate (VUR tuh briht) An animal that has a backbone. **(p. 106)**

vibrate (VY brayt) To move back and forth quickly. **(p. 54)**

volume (VAHL yoom) The amount of space that matter takes up. **(p. 8)**

W

waning moon (WAY nihng moon) The phases of the Moon when a decreasing amount of the Moon's near side is sunlit. **(p. 245)**

water cycle (WAH tur SY kuhl) The movement of water between the air and Earth as it changes state. **(p. 212)**

water vapor (WAH tur VAY pur) Water in the form of an invisible gas. **(p. 208)**

wave (wayv) A movement that carries energy from one place to another. **(p. 53)**

waxing moon (WAHK zihng moon) The phases of the Moon when an increasing amount of the Moon's near side is sunlit. **(p. 244)**

weather (WEHTH ur) The condition of the atmosphere at a certain place and time. **(p. 220)**

weathering (WETH ur ihng) The slow breaking apart or wearing away of rock into smaller pieces. **(p. 164)**

wedge (wehj) A simple machine made up of two inclined planes placed back to back. **(p. 38)**

wheel and axle (hweel and AK suhl) A simple machine made up of a small cylinder attached to the center of a larger wheel. **(p. 35)**

work (work) The use of a force to move an object. **(p. 33)**

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PHOTOGRAPHY CREDITS

KEY: (l) left, (r) right, (b) bottom, (t) top, (tl) top left, (tr) top right, (c) center, (cl) center left, (cr) center right, (bg) background, (bl) bottom left, (br) bottom right.

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