UNIT 9

The Structure of Living Things

FLORIDA BIG IDEA 14

Organization and Development of Living Organisms

Spectators watch a basketball game in Miama, FL.

I Wonder Why

These basketball players are working hard and sweating. Why do athletes use sports drinks instead of just water?

Turn the page to find out.

Here's Why

When the body gets hot, sweat helps cool it down. Sweat is made up of water and salts. Salts are important to keep the body working. Sports drinks replace water and salts that are lost by sweating.

Essential Questions and Florida Benchmarks

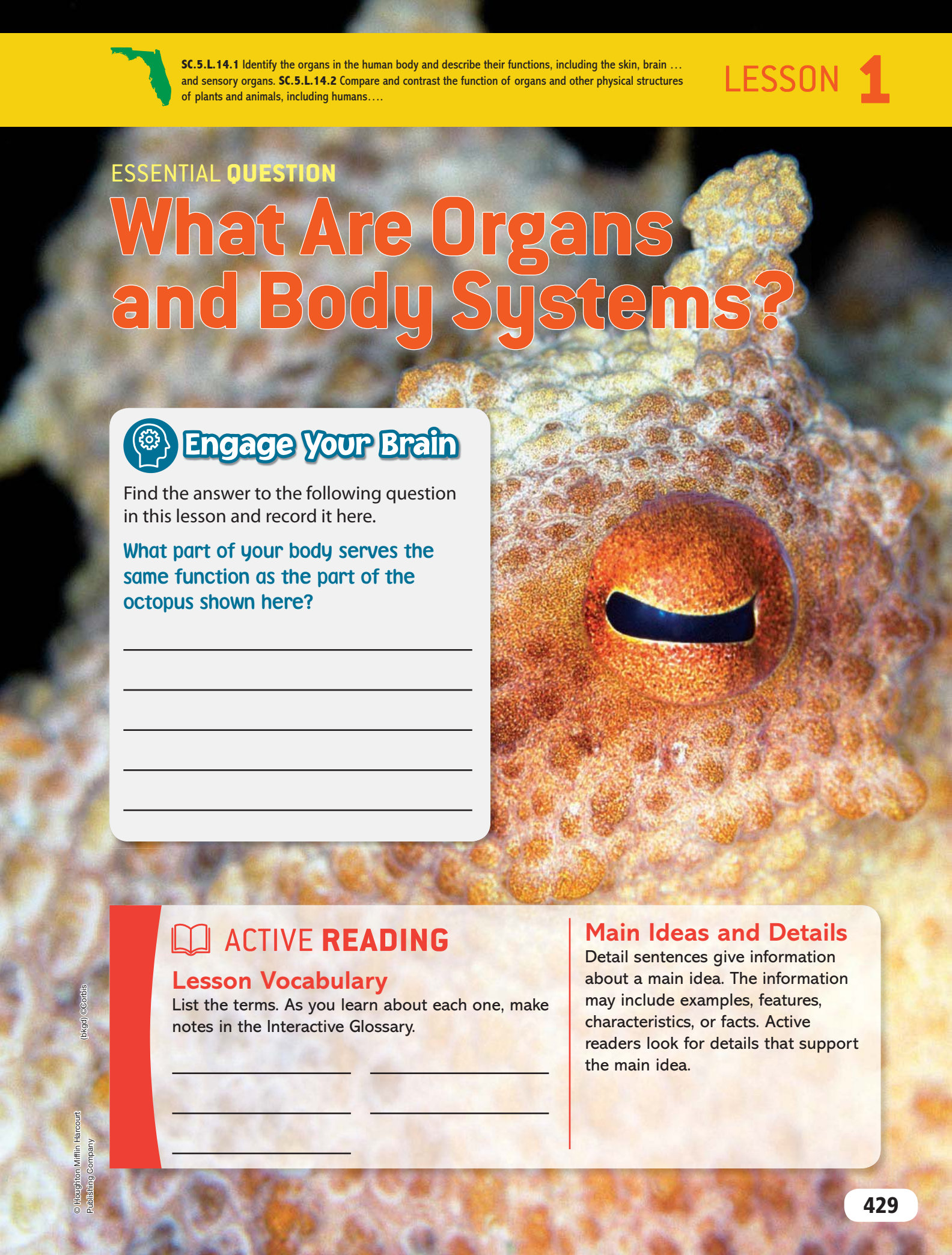
Science Notebook

Before you begin each lesson, write your thoughts about the Essential Question.

SC.5.L.14.1 Identify the organs in the human body and describe their functions, including the skin, brain … and sensory organs. **SC.5.L.14.2** Compare and contrast the function of organs and other physical structures of plants and animals, including humans….

ESSENTIAL **QUESTION**

What Are Organs and Body Systems?



Engage Your Brain

Find the answer to the following question in this lesson and record it here.

What part of your body serves the same function as the part of the octopus shown here?

_____

_____

_____

_____

_____

ACTIVE **READING**

Lesson Vocabulary

List the terms. As you learn about each one, make notes in the Interactive Glossary.

_____ _____

_____ _____

_____

Main Ideas and Details

Detail sentences give information about a main idea. The information may include examples, features, characteristics, or facts. Active readers look for details that support the main idea.

Building a BODY

Your body has hundreds of different parts! These parts work together to keep you healthy.

ACTIVE READING As you read these two pages, circle each lesson vocabulary term and underline its definition.

Every living thing needs certain things to survive. An **organism** is a living thing. It is made of parts that work together to meet its needs. Some parts are extremely small. Others are large.

An **organ** is a body part that is made up of smaller parts that work together to do a certain job. For example, your eye is an organ. It is made of a clear lens, a colored iris, and other parts that work together to enable you to see.

Groups of organs work together. An **organ system** is a group of organs that work together to do one type of job. Your mouth and stomach are part of one organ system. They work together to supply your body with energy from food. You have many organ systems in your body.

Eyes

Eyes are organs that help you _____. They send information about the world around you to another organ, your brain.

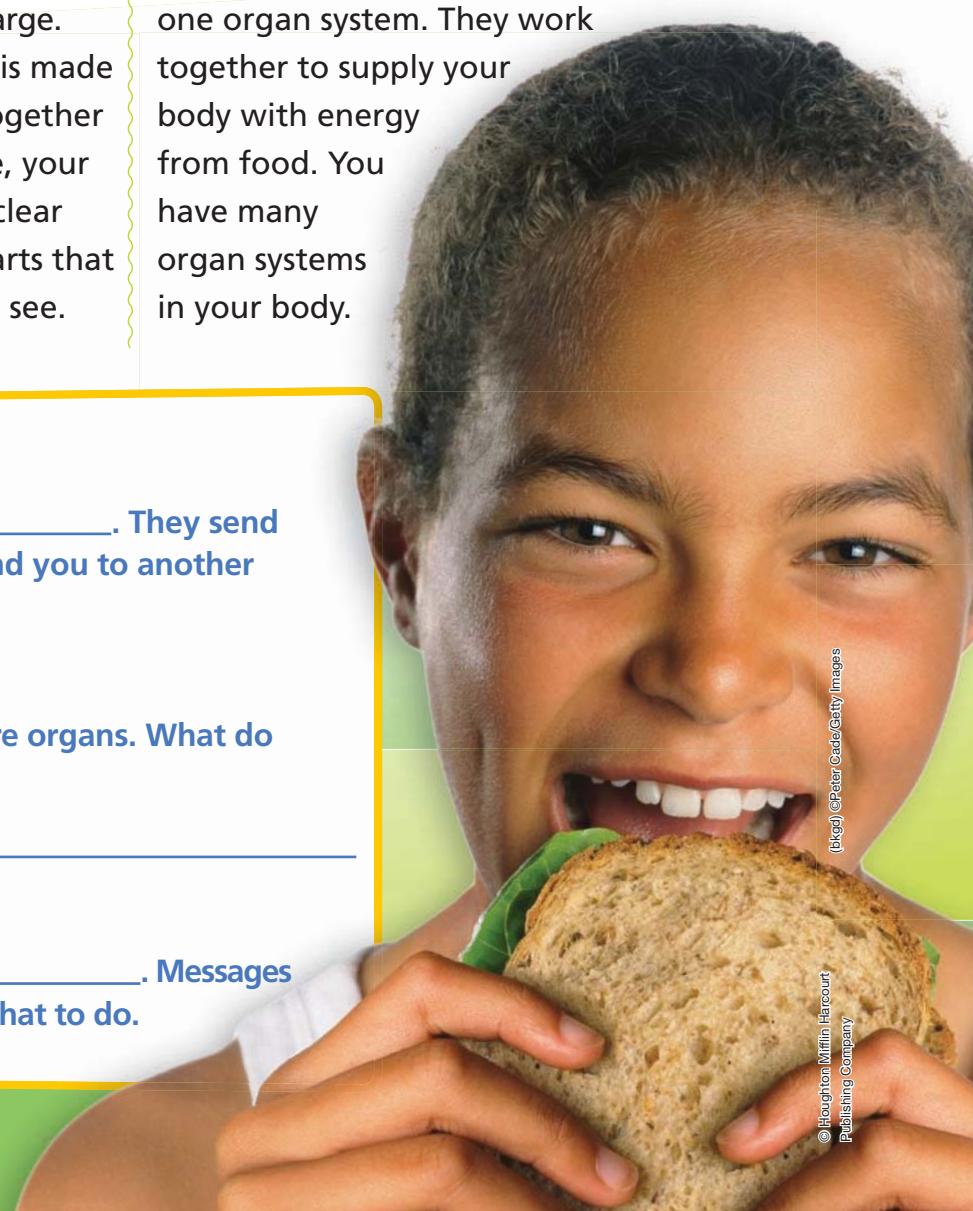
Teeth

Your teeth are bones, and bones are organs. What do teeth do?

_____

Muscles

Muscles are organs that help you _____. Messages from your brain tell your muscles what to do.



(bkgd) ©Peter Cade/Getty Images

Animals are organisms. Plants are organisms, too. Did you know that plants have organs? Roots absorb nutrients and water for the plant. Leaves use sunlight to make food for the plant. Stems support the leaves. Stems also transport water from the roots and food from the leaves. A protective layer covers the plant and keeps the plant from drying out.

Like plants, humans have organs that work together to help us stand. We have an organ that protects us from drying out. We have organs that supply us with food. Plant and animal organs are different, but they are all alike in one way: They all help an organism meet its needs so it can live.

Match It!

▶ **Draw a line to connect the plant part to an animal part that does a similar job.**

Bones

Bones support your body. They enable you to stand. Each bone in your body is an organ.

Mouth

Your mouth brings food into your body. Your lips, teeth, and tongue work together to help you chew and swallow food.

Skin

What's the largest organ in your body? Your skin is. It protects your body from germs and keeps your body from drying out.

Bark

Stems

Leaves

The Information HIGHWAY

Keep your eye on the ball! In just seconds you can see a ball, run toward it, and swing a racket! How does the body relay all of the information needed to do this? Read on to find out.

ACTIVE READING As you read this page, underline the names of parts of the nervous system.

Sensing your surroundings and communicating information within the body are the main jobs of your *nervous system*. Your nervous system is made of tiny structures called *nerve cells*. Chains of long nerve cells make up nerves. Nerves carry information to and from the **brain**. The brain is the organ that processes information. It's like a computer made of millions of nerve cells working together.

A rope-like bundle of nerves, called the *spinal cord,* runs along your backbone. Your spinal cord is the main pathway for information traveling to and from the brain. Nerves connect to your spinal cord from all over your body. Some of these nerves send information to the brain. Others receive signals from the brain.

Imagine that you're playing tennis. Nerves in your eyes sense light. These nerves, like other nerves in your head, send information directly to your brain without routing the signal through your spinal cord. You see the ball coming toward you. Your brain decides on an action. It sends instructions through your spinal cord to nerves in your body. The messages from your brain "tell" your legs to run across the court and your arms to swing the racket and hit the ball. All of this communication takes place in seconds!

Information Relay

Fill in the blanks to describe the path that a nerve signal might take in this tennis player.

1. The boy's _____ sense the ball coming toward him.

2. His _____ processes this information.

3. Messages from the _____ travel down the _____ _____.

4. _____ in his arms deliver the message from his brain to swing the racket.

SENSING Surroundings

A carnival is a feast of sights, sounds, tastes, and smells! How do you sense all of that information?

ACTIVE READING As you read this page, draw a box around phrases that describe sensory structures.

Senses are your body's way of gathering information about the world around you. Special structures in certain parts of your body can detect light, sound, and chemicals in the air and in the food you eat.

A Sight: The part of the eye that gives us our eye color is a muscle called the *iris.* Light enters the eye through a hole in the iris called the *pupil,* passes through the lens, and hits the back of the eye, called the *retina.* Inside the retina are special nerve cells that detect light. They send signals that travel along nerve pathways to the brain. The brain interprets this information and we see.

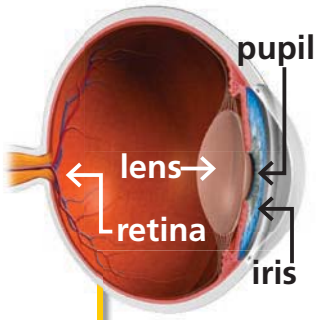
B Hearing: The part of your ear that you see is called your outer ear. The outer ear funnels sound into the middle ear. In the middle ear, sound causes the eardrum to vibrate. The vibrations are passed to tiny bones called the hammer, anvil, and stirrup. These bones pass vibrations to the inner ear. There, a fluid-filled structure called the cochlea [KOH•klee•uh] passes vibrations to tiny hairs attached to nerves. The nerves send messages about the vibrations to the brain, and you sense sound.

C Smell: When you breathe, air travels through your nose. Inside your nose are structures that sense chemicals in the air. They are attached to nerve cells in the olfactory bulb that send messages to the brain about the chemicals they sensed. This makes up your sense of smell.

D Taste: Have you ever noticed small bumps all over your tongue? These bumps are called *taste buds.* They sense the chemicals in food. Taste buds are attached to nerves that send messages to the brain about the chemicals they sense. The brain interprets this information as the sense of taste.

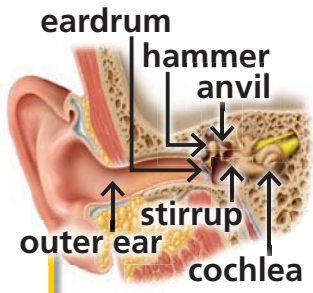
A Eyes

Light enters the eye through the _____, passes through the _____, and hits the _____, where special structures detect _____.



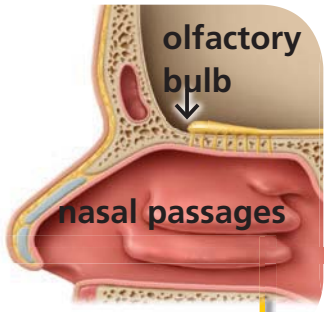
B Ears

Sound enters the ear. Vibrations pass from the _____ to tiny bones, through the _____, to tiny hairs attached to nerves.



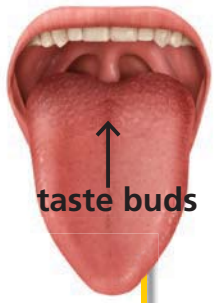
C Nose

When you breathe, structures in the nose detect _____ that are carried in the air.



D Tongue

When food enters the mouth, special structures on the tongue sense _____ in food. These structures are called _____.



Sensory OVERLOAD

All organisms have sensory structures that help them survive. Flies have compound eyes. Instead of 1 lens, they have over 5,000!

ACTIVE **READING** As you read these two pages, find and underline four facts about plant and animal senses.

Animal Senses

Draw an animal that you are familiar with. Label its sensory organs, and describe how it uses them.

Sight

Snails have their eyes on the ends of stalks. The eyespots can sense light and dark. You can see eyespots on the tip of each eyestalk shown here.

Sound

Bats "see" with their ears! They make squeaking noises and listen for the sounds to echo back to them. The way the sound bounces and the amount of time it takes for the sound to return let the bat know what is in its path. Dolphins use a very similar system under water.

Smell

Moths have "noses" on the tops of their heads. The moth's antennae [an•TEN•ee] have structures that sense chemicals in the air.

Touch

The Venus' flytrap has special leaves that are sensitive to touch. When a fly lands on them, the fly touches trigger hairs. The hairs send a message to the leaves of the plant, and the leaves snap shut. The fly is trapped!

The SKIN You're In

Some people don't think of skin as an organ, but it is. Our bodies couldn't survive without it.

ACTIVE READING As you read, circle the different parts of the integumentary system described below.

Covering your body is a protective layer called **skin**. Skin is part of the *integumentary* [in•teg•yoo•MEN•ter•ee] *system.* Fingernails, toenails, and hair are, too. This system helps to protect the inside of your body.

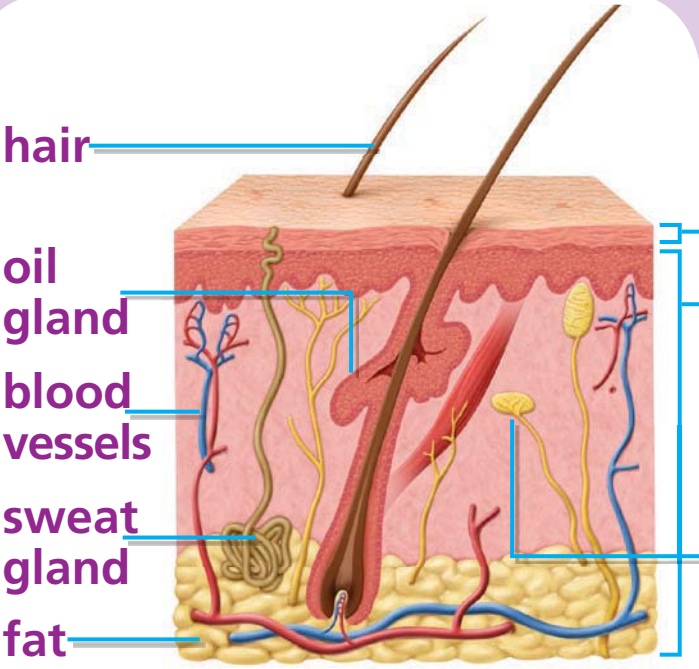
Skin keeps germs out. If you've ever had a cut that got infected, you know how important it is to keep germs from entering your body. At the same time, skin keeps water in. Your waterproof skin keeps you from becoming dehydrated.

What happens when you get too hot? Sweat helps cool your body. Also, tiny blood vessels near the surface of the skin help to cool your blood.

But what if you get cold? Hair helps to keep your head warm in cold weather. Hair also helps to protect your scalp from injury and shades your scalp from the sun's harmful rays.

Fingerprinting

Draw your own friction ridges in the circles at the tips of these fingers.



Epidermis

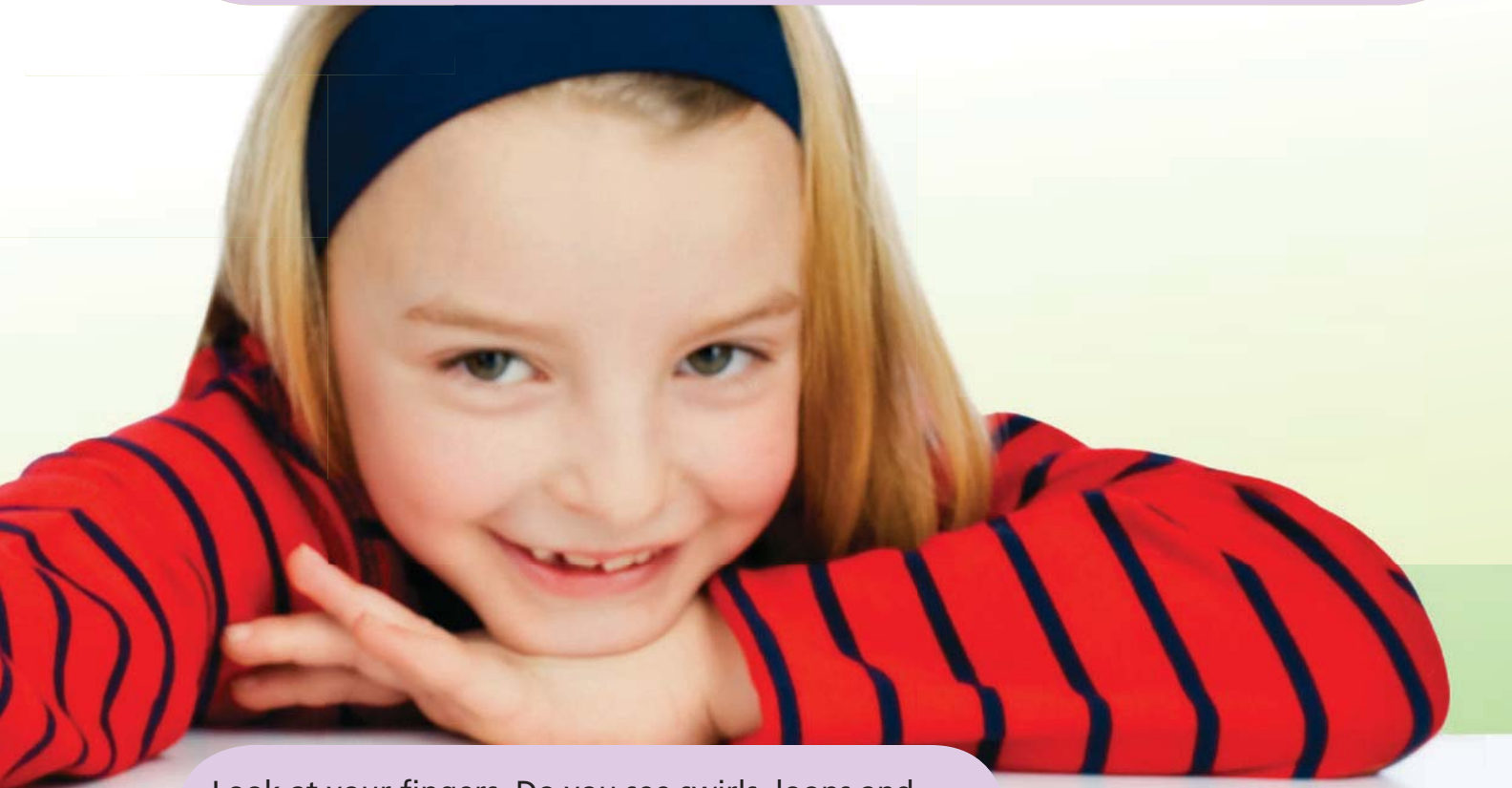
This is the outer layer of the skin. It is thin in some places, like your eyelids, and thick in others.

Dermis

This is the inner layer of the skin. It contains hair follicles, sweat glands, blood vessels, and nerve endings.

Nerve endings

These are special structures that sense touch, heat, cold, pain, pressure, and vibration.



Look at your fingers. Do you see swirls, loops and waves? These are friction ridges, which form your fingerprints. They allow your fingers to be more sensitive to touch.

Plant and Animal COVERINGS

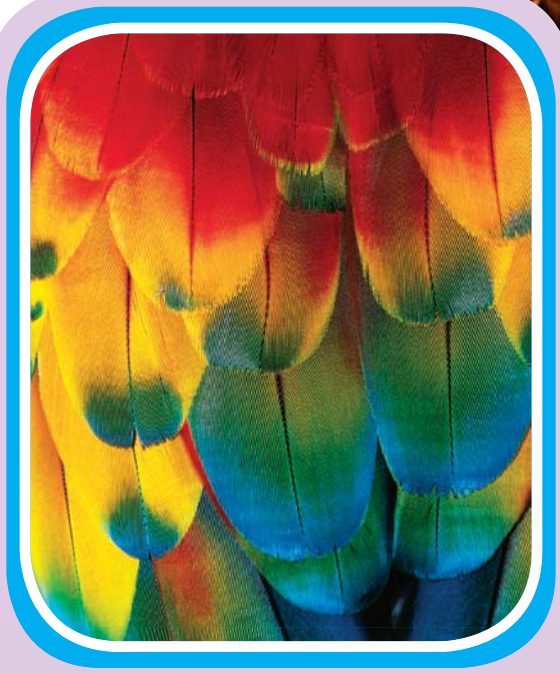
Would you want to pet a cactus? There are many different kinds of plant and animal coverings. They all protect the plant or animal.

ACTIVE READING Circle the different types of plant and animal coverings that are listed below.

Take a look at the examples of animal coverings on these pages. Can you identify them? Animals such as monkeys, horses, and rabbits are covered in soft fur. Birds are covered with feathers. Fish and snakes are covered in scales. Some animals, such as lobsters and turtles, have hard shells.

Plants do not have skin, but they do have special coverings. Many trees are covered with a thick, hard bark to protect the inner plant. Plant leaves have a waxy coating that keeps the plant from drying out.

Even though plant and animal coverings may look different, they still protect the organisms from predators, disease, injury, and drying out.



These colorful feathers cover the bird's skin. They keep the bird warm and keep water out. Feathers on the wing help the bird fly.

tree bark

Plant leaves have a waxy coating that helps keep the plant from drying out when the weather is hot and dry.

Ouch! This cactus has sharp spines that keep predators away.

DO THE MATH

Use a Scale

scale = 1 centimeter

Look at these magnified scales from a banded rainbow fish. The black line on the picture is a scale showing how many scales are in 1 centimeter. If the body of the fish is 12 cm long, how many scales long would the fish's body be?

_____

_____

_____

This monkey has thick fur. Fur helps to keep the monkey warm in cold weather.

Sum It Up »

Fill in the blanks in the following sentences.

1. All living things are called (a)_____ .
   An (b)_____ is a body part that does a certain job in the body.
   Several of these parts work together to make up an (c)_____ _____.

Read the summary statements. Match each statement with the correct image.

2. The brain, spinal cord, and nerves form the nervous system. The nervous system senses the environment, sends information to the brain, processes information, and sends instructions to the body.

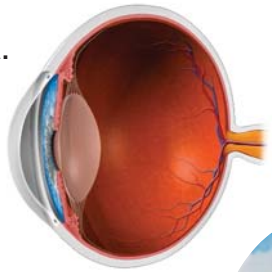
3. The eyes, ears, nose, and tongue are sense organs. They have special parts that sense the environment.

4. Skin, hair, and nails are part of the human integumentary system. It protects internal organs, helps maintain body temperature, and provides waterproofing.

5. Plants and animals have specialized organs for sensing the environment, like compound eyes, antennae, and trigger hairs.

6. Plants and animals have special body coverings such as bark, fur, feathers, quills, scales, and shells.

A.



B.

C.

D.

E.

Brain Check

LESSON 1

Name _____

Vocabulary Review

1 Unscramble the words on the right to fill in the blanks in each sentence.

1. The _ _ _ _ _ _ _ system sends messages throughout your body.	s r n u o e v
2. The _ _ _ _ _ _ _ _ _ _ _ _ _ system protects the body's organs.	n e n i g e m t t a y r u
3. An _ _ _ _ _ _ _ _ is a living thing. It is made up of parts that work together.	s n g m a r o i
4. The _ _ _ _ is the largest organ in the body. It covers and protects the other organs.	i n k s
5. The _ _ _ _ _ receives messages from the body, processes the information, and sends instructions to the body.	r b i n a
6. An _ _ _ _ _ system is a group of organs that work together to do a job.	o g n r a
7. _ _ _ _ _ _ _ _ are used by moths to "smell" the world around them.	e t n n n e a a
8. The _ _ _ _ _ _ include sight, taste, smell, hearing, and touch.	s s s e e n

Bonus: How many body parts can you think of that have only three letters?

_____ _____ _____

_____ _____ _____

_____ _____ _____

_____ _____ _____

Apply Concepts

2 Some areas of the body have more sensory structures than others. Which do you think would have more? For each pair of body parts, circle the one you think would have more sensory structures. Then state your reason.

Why? _____

_____

_____

_____

_____

Why? _____

_____

_____

_____

_____

3 Draw a line to connect the animal to the description of its senses.

Have "noses" on their antennae to "smell" the air

Has compound eyes on moveable eyestalks

Uses an echo system to find objects in water

4 How are the senses of taste and smell alike?

_____

_____

_____

_____

5 Which of the following structures is used to sense touch?

a. eyestalk

b. antenna

c. trigger hair

d. compound eye

Take It Home! See *ScienceSaurus*® for more information about living things.

Name _____

ESSENTIAL **QUESTION**

How Does the Body Stay Cool?

EXPLORE

When you are hot, you sweat. This allows your body to cool off. In this activity, you will explore what happens as three towels cool. Think about how this relates to your body's cooling system.

Materials

- 3 paper towels
- 3 thermometers
- 3 paper plates
- marker
- graduated cylinder
- water
- rubbing alcohol
- fan

Before You Begin—Preview the Steps

CAUTION: Be sure to protect your eyes from splashing liquids. Keep alcohol away from flames.

1. Wrap a paper towel around the bottom of each thermometer. Place each thermometer on a plate.
2. Label the plates *Dry*, *Water*, and *Alcohol*. Record the starting temperature of each thermometer.
3. Make sure the water is at room temperature. Measure 50 mL of water. Pour the water on the paper towel on the plate labeled *Water*.
4. Obtain 50 mL of rubbing alcohol from your teacher. Pour it on the paper towel on the plate labeled *Alcohol*.
5. Place all three plates in front of the fan. Record the temperature on each thermometer every minute for five minutes.

Set a Purpose

What will you learn from this experiment?

State Your Hypothesis

Write your hypothesis, or testable statement.

Think About the Procedure

Which sample is the control? What is its purpose? Why is it important to have a control in an experiment?

Name _____

Record Your Data

Record your observations in a data table.

Draw Conclusions

How did your results compare with your hypothesis?

_____

_____

_____

_____

Claims • Evidence • Reasoning

1. What was the difference between the starting temperature and the ending temperature for each of your experimental groups? Show your work in the space below.

2. Make a bar graph in the space below to display your data.

3. Write a claim for how this activity relates to the role of sweating. Explain your reasoning.

4. A swamp cooler is a type of air conditioner that blows air over a wet surface. Use your data to make a claim about whether you think this would be an effective way to cool a building.

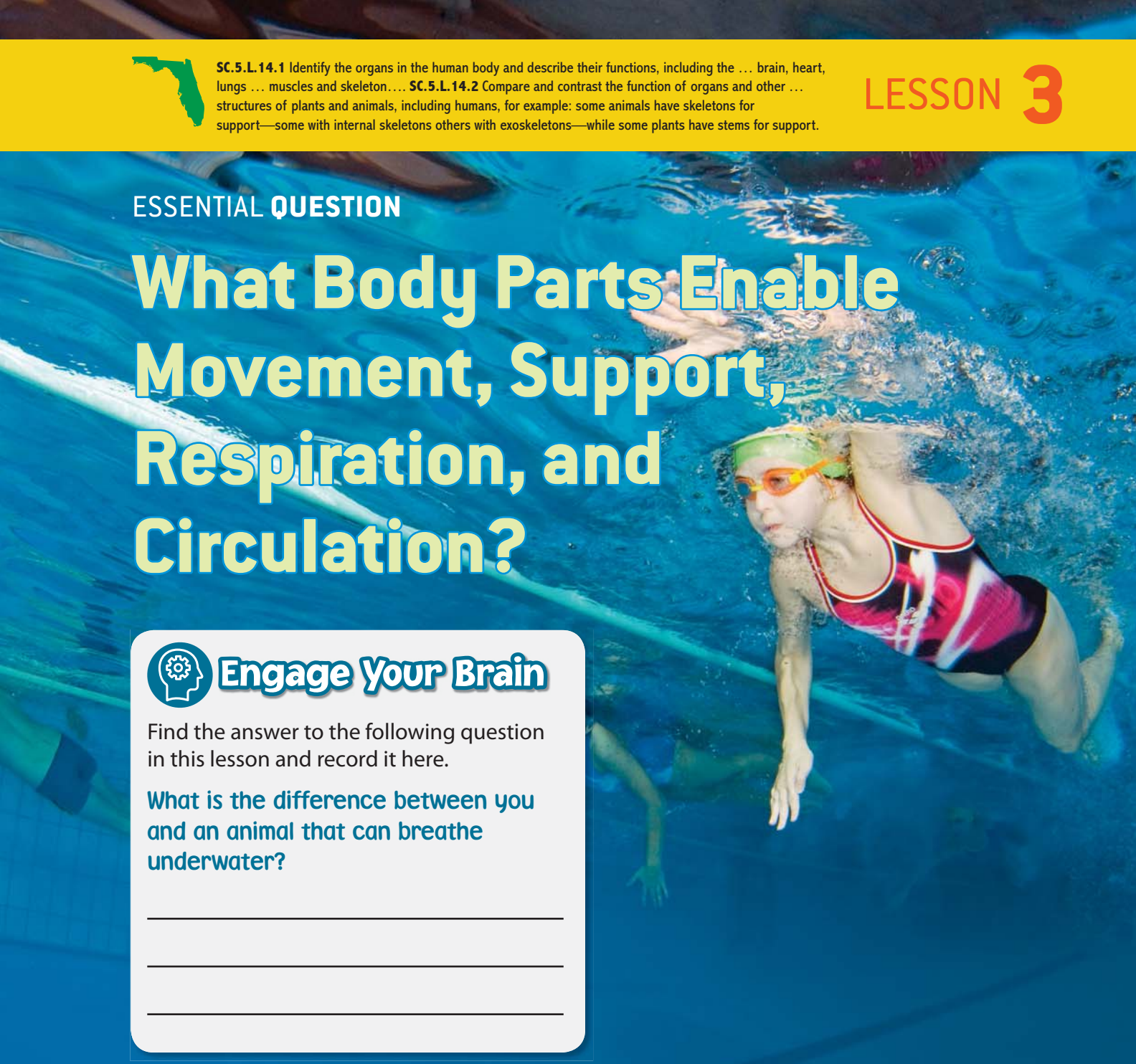
5. Why is it important that your body be able to cool itself?

SC.5.L.14.1 Identify the organs in the human body and describe their functions, including the … brain, heart, lungs … muscles and skeleton…. **SC.5.L.14.2** Compare and contrast the function of organs and other … structures of plants and animals, including humans, for example: some animals have skeletons for support—some with internal skeletons others with exoskeletons—while some plants have stems for support.

LESSON 3

ESSENTIAL **QUESTION**

What Body Parts Enable Movement, Support, Respiration, and Circulation?



Engage Your Brain

Find the answer to the following question in this lesson and record it here.

What is the difference between you and an animal that can breathe underwater?

_____

_____

_____

ACTIVE **READING**

Lesson Vocabulary

List the terms. As you learn about each one, make notes in the Interactive Glossary.

_____ _____

_____ _____

_____

Main Ideas

The main idea of a paragraph is the most important idea. The main idea may be stated in the first sentence, or it may be stated elsewhere. Active readers look for main ideas by asking themselves, What is this section mostly about?

Strong Bones and Mighty Muscles

What would your body be like without bones and muscles? Your body would be a shapeless blob!

ACTIVE READING As you read these two pages, draw two lines under each main idea.

Organs that support and protect the body and store minerals are called **bones**. The ribs and skull are bones that protect internal organs. Bones attached to muscles help move the body. Bones have a hard outer layer that contains calcium. Inside bones is a spongy layer where blood cells are made.

The place where two or more bones meet is called a joint. Some joints, like the joints in your skull, don't allow the bones to move. Others joints, like the joint in your shoulder or knee, allow different types of movement. *Ligaments* [LIG•uh•muhntz] connect the bones of a joint.

Feel the tip of your nose. This is cartilage. Cartilage cushions the ends of bones and forms flexible parts like your ears and nose. Bones, ligaments, and cartilage form the *skeletal system*.

©Photodisc

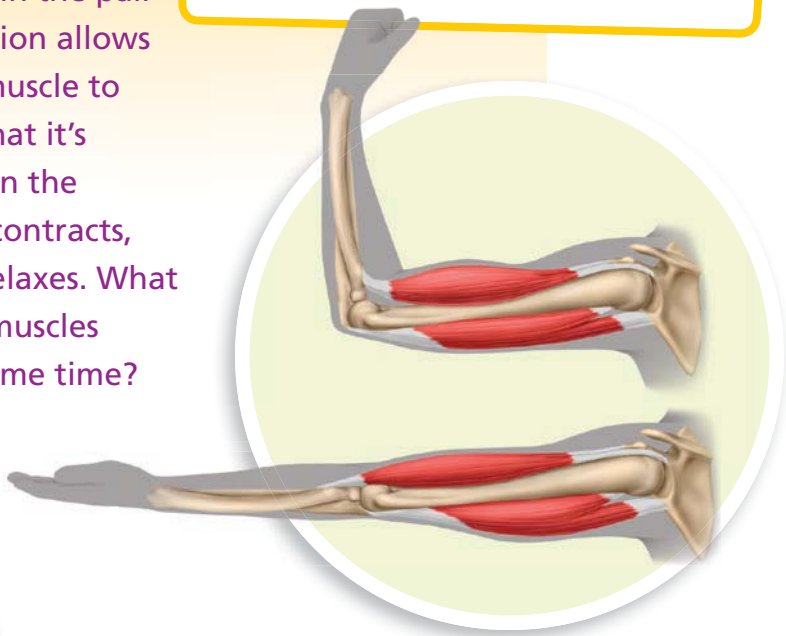
What Do Bones Do?

- support the body
- anchor muscles
- protect internal organs
- store minerals like calcium
- make blood cells

Muscles often work in pairs. When one muscle contracts, the other muscle in the pair relaxes. Cooperation allows the contracting muscle to move the bone that it's attached to. When the opposite muscle contracts, the first muscle relaxes. What happens if both muscles contract at the same time?

Let's Get Moving

Circle the muscle that bends your arm.



Muscles are organs that contract to produce movement in the body. There are three different types of muscles. The heart is made of one type of muscle. Another type makes up the walls of blood vessels and organs. Still another type of muscle pulls our bones to help us move.

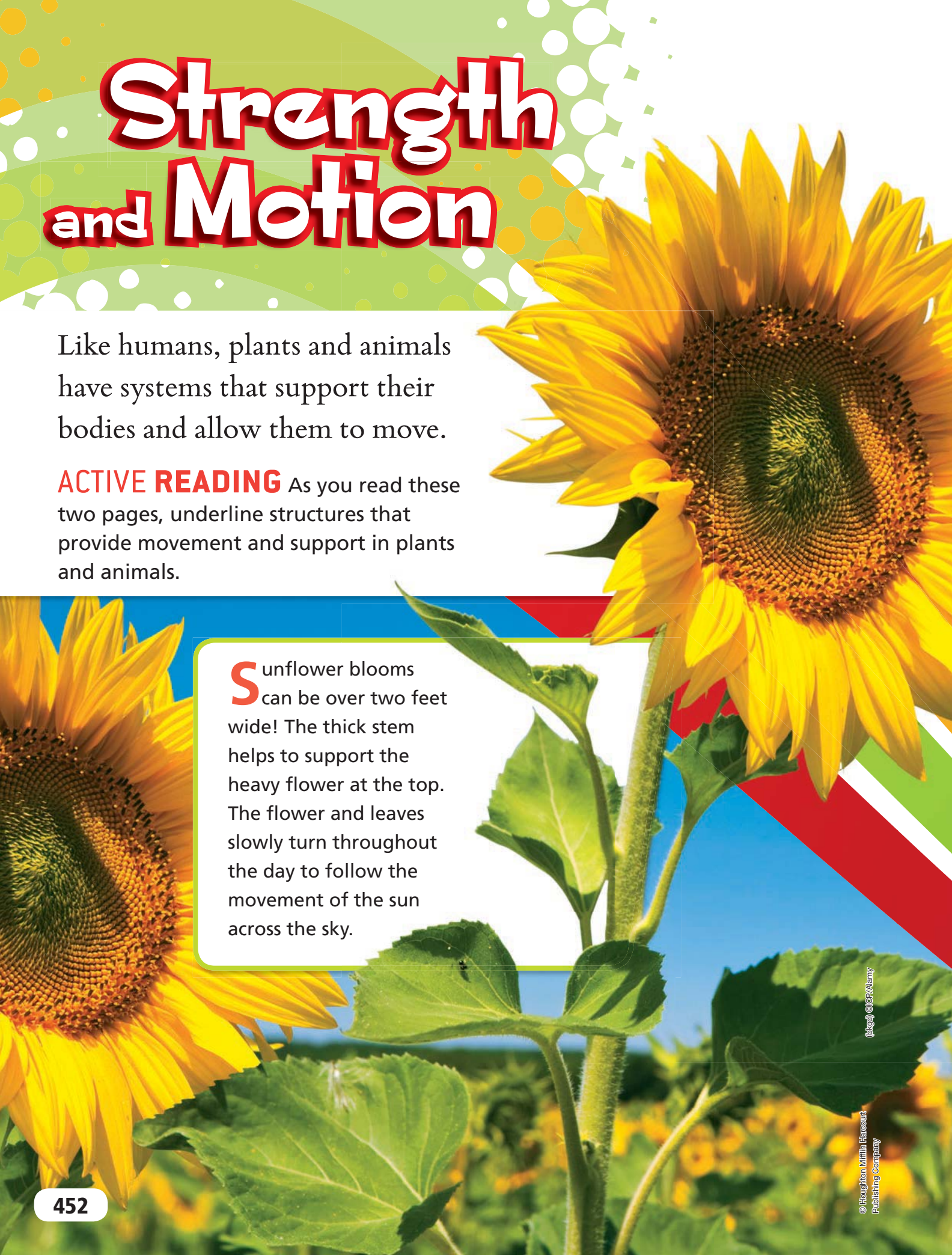
The major function of the *muscular system* is to produce movement in the body. You control some movements, like running. These movements are *voluntary.* Other movements, like the beating of your heart, happen without your having to think about them. These are *involuntary* movements.

Strength and Motion

Like humans, plants and animals have systems that support their bodies and allow them to move.

ACTIVE READING As you read these two pages, underline structures that provide movement and support in plants and animals.

Sunflower blooms can be over two feet wide! The thick stem helps to support the heavy flower at the top. The flower and leaves slowly turn throughout the day to follow the movement of the sun across the sky.



Cicadas [si•KAY•duhz] have a hard outer layer, called an **exoskeleton**. It's like having bones outside their bodies. Exoskeletons help protect them from being eaten. Their muscles are attached to their exoskeletons and move their bodies by pulling from the inside. As cicadas grow, they shed the old exoskeleton. Underneath is a new one.

A Hardened Life

How would your life be different if you had an exoskeleton?

The seal's flexible body lets it glide through water. Its flippers help it swim.

Sea stars use water in tiny tubes, called tube feet, to move. Muscles squeeze water into and out of the tubes, causing the tube feet to move. Suction cups on the ends of the feet help the sea star grip surfaces.

This sensitive plant responds to touch by closing its leaves.

Breathe In, Breathe Out

Take a deep breath. Do you feel "inspired"? You should. *Inspire* is another word for breathing in. Breathing out is called *expiring*.

ACTIVE READING As you read the text below, draw boxes around the five parts of the respiratory system that are described.

Organs in the *respiratory system* bring in oxygen that the body needs and release carbon dioxide, the body's waste gas. The main organs of the respiratory system are the **lungs**. Lungs are spongy organs that expand to fill with air.

Air enters your body through your nose or mouth. It flows through a tube in your throat called the *trachea* [TRAY•kee•uh]. The trachea branches into two smaller tubes called bronchi [BRAHNG•ky]. Where the bronchi enter the lungs, they branch into many bronchioles [BRAHNG•kee•ohlz]. At the end of each bronchiole are tiny sacs called alveoli [al•VEE•uh•ly]. Alveoli make up most of the lungs. When you inhale (breathe in), air flows into the lungs and the alveoli inflate like tiny balloons. When you exhale (breathe out) air flows back out of the alveoli and out of the lungs.

DO THE MATH

Solve Word Problems

On average, a person breathes about 20 times per minute.

There are 60 minutes in an hour. How many times does a person breathe in one hour?

_____

_____

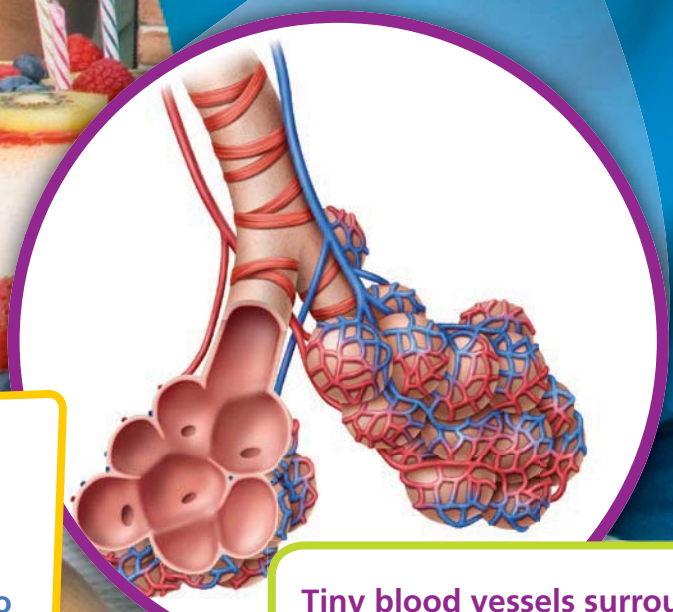
There are 24 hours in a day. How many times does a person breathe every day?

_____

If you take in about 1 liter of air with each breath, how much air passes through your lungs every day?

_____

You have two bronchi, one for each lung. These bronchi branch into smaller tubes called bronchioles.



Airflow

Draw arrows to show the path that air takes into and out of the alveoli.

Tiny blood vessels surround the alveoli. Red blood cells in the vessels absorb oxygen. At the same time, carbon dioxide is released from the blood into the alveoli.

Asthma Attack

Asthma is an illness that makes it hard for a person to breathe. During an attack, some kids say it feels like breathing through a straw.

ACTIVE **READING** As you read these two pages, draw a star next to what you consider to be the most important sentence, and be ready to explain why.

Constricted Airways

When people are having an asthma attack, their bronchi become swollen. The swelling makes their airways smaller. It is much harder to get air in and out of the lungs. People having an asthma attack may cough, wheeze, or feel like a weight is sitting on their chest. They struggle to breathe. Medication can help end an asthma attack. After the attack, a person's airways return to normal.

▶ **Fill in the sequence of events that lead to an asthma attack.**

Asthma trigger enters airway → **Airway becomes irritated** → **Bronchi become** _____

Airways become smaller → **It becomes difficult to** _____

Normal bronchi are open wide. Air can flow easily.

Constricted bronchi are smaller, making it difficult for air to pass through.

Pollen from plants can trigger an asthma attack.

Air pollution can trigger attacks.

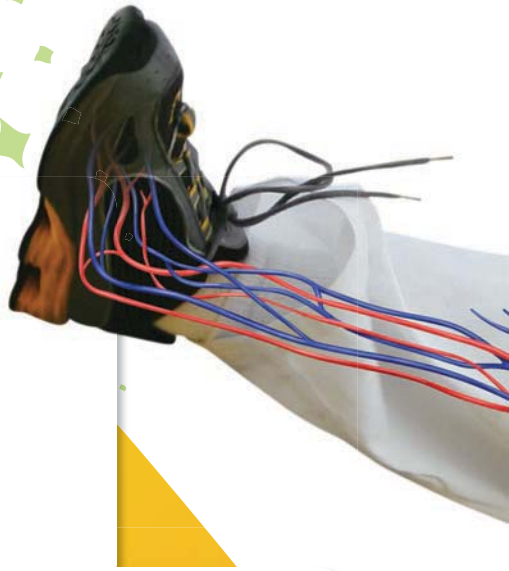
Triggers

The exact causes of asthma aren't known. Many people are born with it, but people sometimes develop asthma as they get older. Doctors do know that there are things that can cause an asthma attack. These things are called asthma triggers. Smoke, air pollution, and allergies are all possible triggers that start the process of an asthma attack.

Management

People who have asthma try to avoid things in the air that trigger attacks. However, a person can't always avoid triggers such as pollen or air pollution. A doctor can give people who suffer from asthma a device called an inhaler. An inhaler releases a mist of medicine that a person breathes in. This medicine can help open up airways during an attack. Other types of medicine help to prevent asthma attacks.

Beat It



Your heart is a powerful muscle. It never rests! The drum-like sound of your heart's contractions is called your heartbeat.

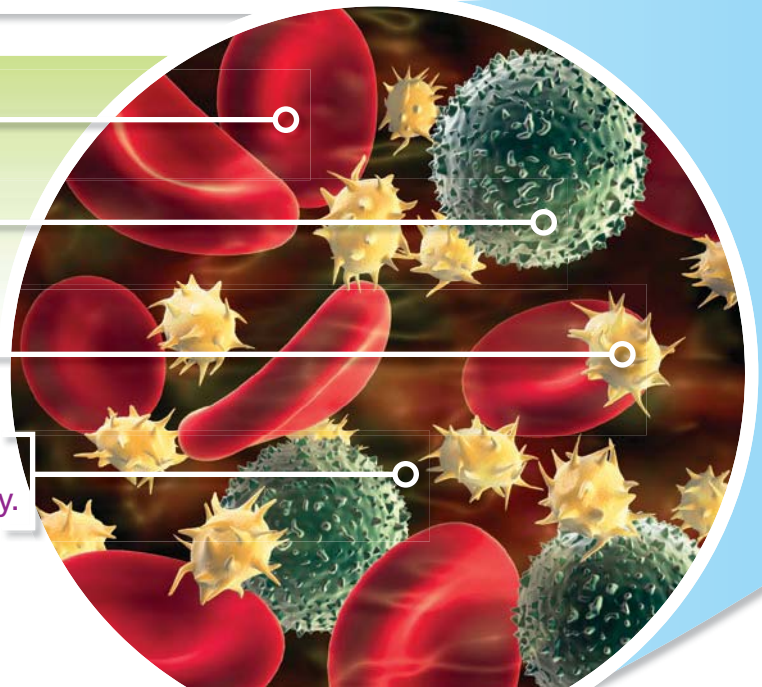
ACTIVE READING As you read this page, underline the four parts of blood and their jobs.

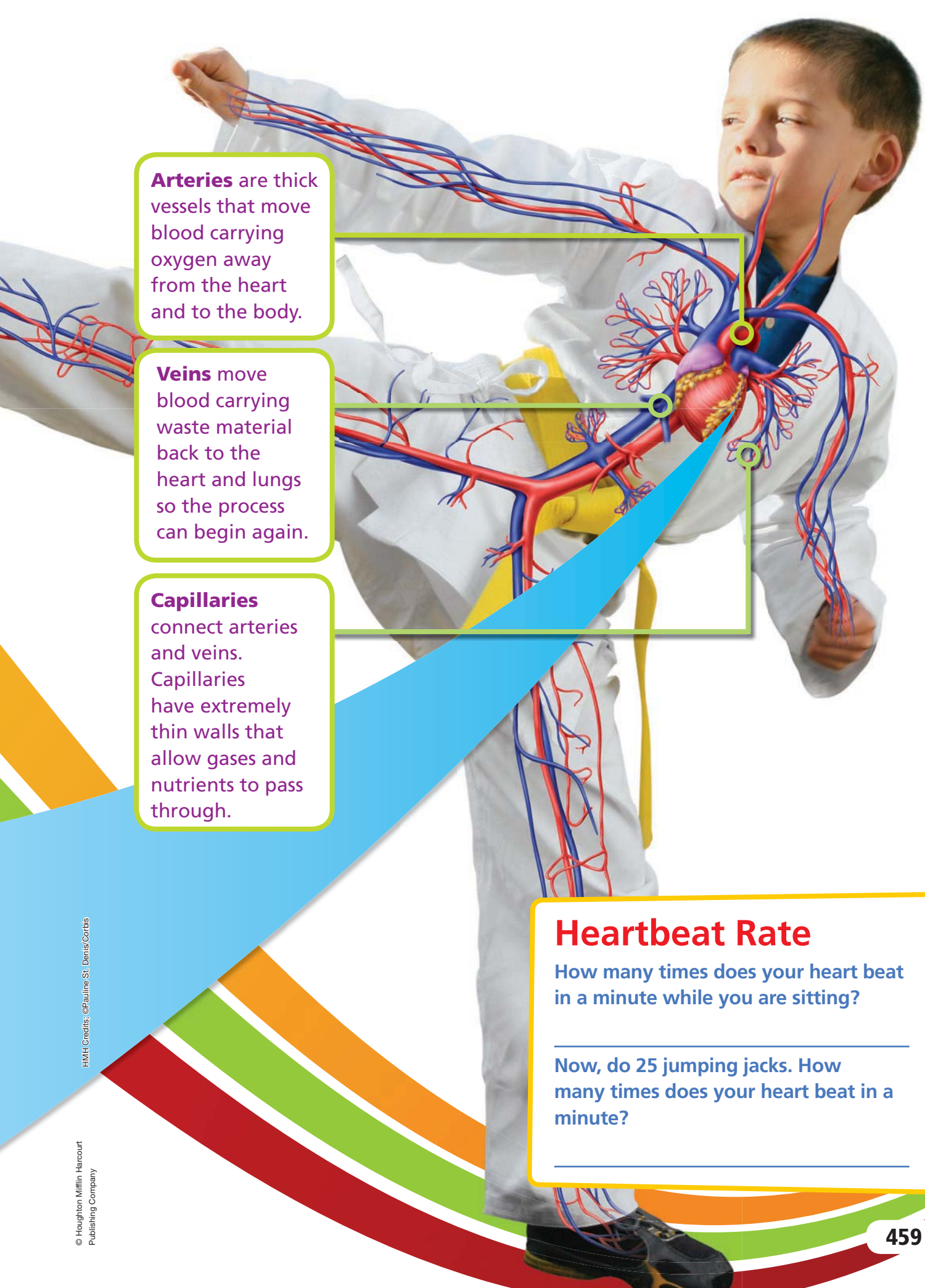
Your **heart** is a muscular organ that pumps blood throughout your body. It contracts in two phases. When the top part is relaxed, it fills with blood. Then the top contracts and the bottom relaxes. Blood is squeezed into the lower part of the heart. The lower part contracts and squeezes blood out of the heart, into vessels, and to all parts of the body.

Blood is made up of a clear liquid called plasma and small structures called blood cells. There are three main types of blood cells—red cells, white cells, and platelets.

Arteries are blood vessels that carry blood away from the heart to different parts of the body. Veins are blood vessels that bring blood back to the heart from the lungs and the body. Capillaries [KAP•uh•lair•eez] are tiny vessels with very thin walls. Oxygen and nutrients can pass through capillary walls to the body. Carbon dioxide passes from the body, through capillary walls, and into the blood to be carried back to the lungs.

The heart, vessels, and blood are all part of the *circulatory system.*





Arteries are thick vessels that move blood carrying oxygen away from the heart and to the body.

Veins move blood carrying waste material back to the heart and lungs so the process can begin again.

Capillaries connect arteries and veins. Capillaries have extremely thin walls that allow gases and nutrients to pass through.

Heartbeat Rate

How many times does your heart beat in a minute while you are sitting?

_____

Now, do 25 jumping jacks. How many times does your heart beat in a minute?

_____

Got Lungs?

Respiration and circulation may look very different in plants and animals, but these systems still have the same purposes.

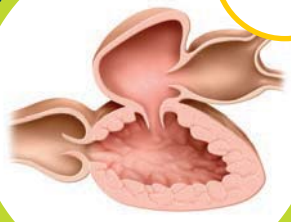
ACTIVE **READING** As you read these two pages, circle lesson vocabulary each time it is used.

Circulation or Respiration?

Write a *C* or an *R* in the circle next to each picture to tell whether circulation or respiration is being described.

Spiders have structures called book lungs that look like tiny books whose pages can fill with air. Book lungs bring oxygen to the spider's blood.

Fish cannot breathe in air. Instead, they have special structures called gills that can take oxygen from water.



Our hearts have four parts, or chambers. Fish hearts have only two chambers. Blood goes from the heart to the gills, then to the body, and then back to the heart.

Birds use huge amounts of energy to fly. They also use a lot of oxygen. To keep air flowing through their lungs constantly, birds have special sacs that store air. With these sacs, even when a bird is breathing out, air is moving into the lungs.

Plants take in air through special openings in leaves called *stomata*. The word *stoma* means "mouth," which is what these tiny structures look like.

Most plants have a transport system that moves fluid throughout a plant's body. This cross-section of a stem shows bundles of plant vessels.

Sum It Up »

Read the summary statements below. Each one is incorrect. Change the part of the summary in blue to make it correct.

1. The circulatory system consists of bone, cartilage, and ligaments. Your lungs work in pairs to move your body.

2. The respiratory system brings in carbon dioxide for the body to use and releases oxygen as a waste product.

3. The muscular system carries blood through your body. It consists of the heart, blood vessels, and blood.

4. Plants bring air into their bodies using structures called mouths.

5. Fish take in air through hearts, and spiders take in air through exoskeletons.

Name _____

Vocabulary Review

1 Draw a line from each term to its definition or description.

1. tube	A. body parts that work in pairs to help your body move
2. bronchi	B. the organ system that moves air into, around, and out of your body
3. circulatory	C. the organ system that supports your body
4. muscles	D. hard body parts that support your body
5. heart	E. hard covering on the outside of some animals' bodies
6. respiratory	F. pumps blood throughout the body
7. lungs	G. the organ system that moves blood around the body
8. exoskeleton	H. organs that expand to fill with air
9. bones	I. type of feet used by sea stars to move
10. skeletal	J. two tubes that connect to the trachea and to bronchioles

Apply Concepts

2 For each action on the left, write the opposite action in the blank to the right.

contract ⟷ _____

inhale ⟷ _____

bleed ⟷ _____

3 What are two structures in animals that serve the same purpose as lungs?

_____ _____

4 Think about how different types of animals move, breathe, and circulate blood. Place the words from the bank below under the picture of the organism that has that structure. You may not use all the words.

tube feet	stem	muscles	gills
book lungs	bones	exoskeleton	lungs

sea star

dog

spider

_____ _____ _____

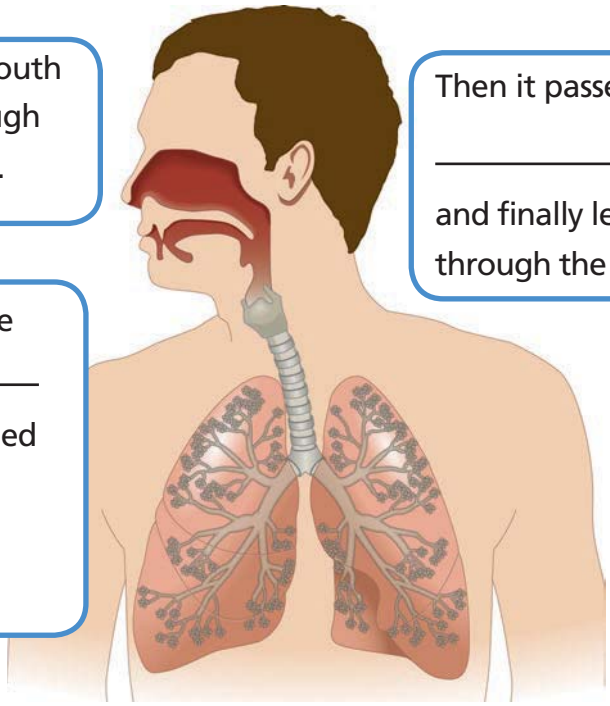
_____ _____ _____

_____ _____ _____

5 Fill in the process chart below to describe the path that air takes through the respiratory system.

Air enters through the mouth or nose, and travels through the _____ .

Then it flows through the large tubes called _____ and the smaller tubes called _____ until it reaches the _____ .



There, oxygen enters the blood and _____ _____ leaves the blood and enters the _____ .

The air flows back out through the _____ and then through the larger _____.

Then it passes through the _____ and finally leaves the body through the mouth or nose.

6 _____is a disease that causes the bronchioles to _____which makes _____difficult.

7 How is the function of muscles and bones related?

_____

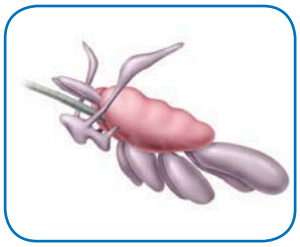
_____

_____

_____

_____

8 Label each of the following as an example of respiration or circulation.



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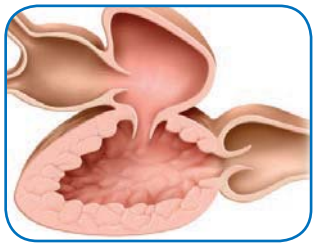

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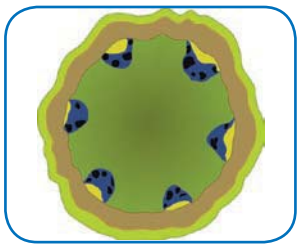

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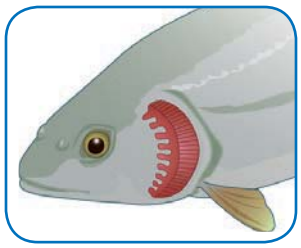

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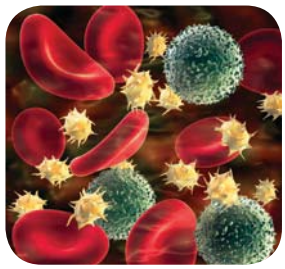


_____

9 Think about what is happening and identify the part of blood that is being used.

1. You get a cut. The _____ help to close the cut.
2. The _____ _____ _____ help to fight infection and get rid of germs.
3. The _____ helps carry all of these blood cells to the wound area.

10 Which part of the body has thin walls that allow oxygen to pass through?

a. arteries

b. veins

c. capillaries

d. bronchioles

Take It Home! Make a model of a skeleton using different types of pasta. You can model a human skeleton or the skeleton of another animal. Talk with your family about the different bones and what purpose they serve.

SC.5.N.2.1 Recognize and explain that science is grounded in empirical observations that are testable; explanation must always be linked with evidence.

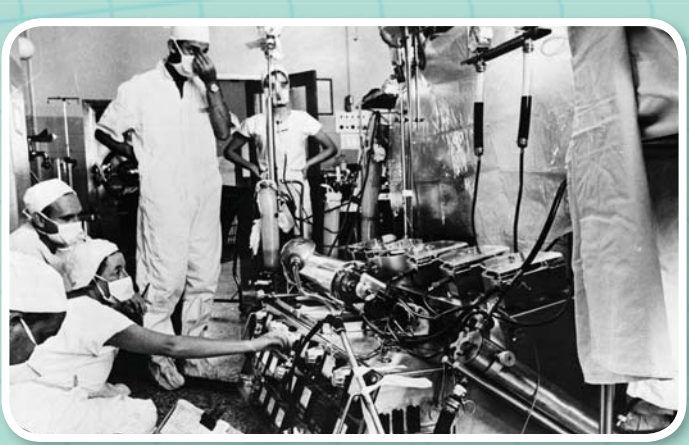
S.T.E.M.

ENGINEERING & TECHNOLOGY

Pumping Blood

1950s Early Machines

The first device to artificially keep blood flowing through the body was the heart-lung machine. It was used to keep a patient alive when the patient's heart was being operated on. These machines are still used in surgeries today. They remove blood from the body, transfer gases, and put the blood back in.



1964 Artificial Heart Program

The National Institutes of Health began a program to develop an artificial heart that could replace a defective human heart.

1982 First Artificial Heart

The first artificial heart was implanted into a person. This heart was designed to be temporary until the patient could receive a donor heart for a transplant.

1990s Heart Assist Devices

An LVAD (left ventricular assist device) is an implanted device that keeps a patient alive while waiting for a donor heart. A natural heart transplant is still the longest-term solution for patients.

2010s Artificial Hearts Today

This is the first self-contained artificial heart. It is designed as an alternative to a heart transplant.

TROUBLESHOOTING

How have mechanical devices that circulate blood improved over time?

Artificial hearts are the last resort for patients who cannot survive without them, even just to wait long enough for a transplant of a donor heart.

Do research on how real human hearts work and on the most modern artificial heart. Draw and label a diagram of the human heart and a replacement heart. Describe how each heart pumps blood.

You Decide

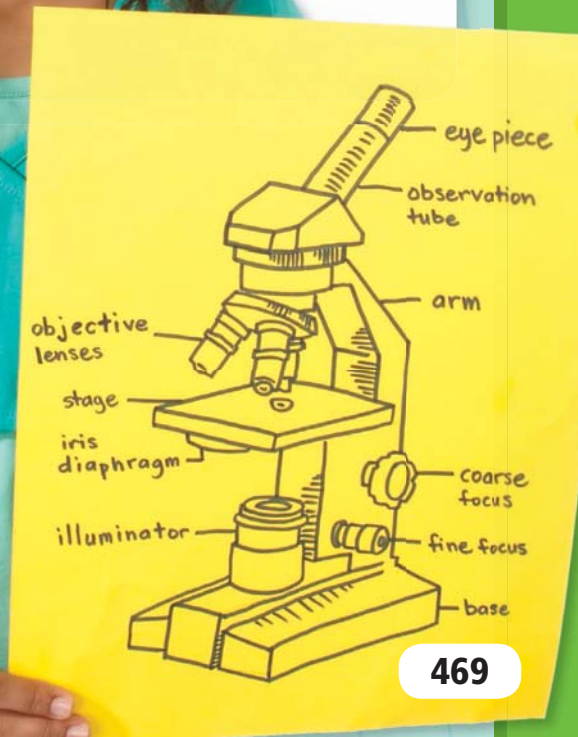
What are the advantages and disadvantages of artificial hearts? What improvements would reduce the disadvantages?

ENGINEERING DESIGN CHALLENGE

Owner's Manual: Using a Microscope

Communication is an important part of the engineering process. Once you have a subject, you need to find out what others already know about it. Then, as you work on your project, you'll share your ideas with team members. Lastly, you'll need to explain your final design. This explanation can include instructions in the form of an owner's manual that tells how to properly use your device.

Have you ever used a microscope before? If so, you know that there are certain steps that you must follow in order to use this tool correctly. Suppose you had to compose a five-page manual that explained how to use a microscope to a fourth grader. Could you do it? Let's find out.



What to Do:

1. Learn more about different types of microscopes and how they help us observe objects close up.
2. Using two hands, carefully transport a classroom microscope to your table.
3. Make a drawing of this observation tool. Label the microscope parts.
4. As a team, discuss the directions for using and caring for this microscope. Write step-by-step instructions that explain how to properly use and care for this tool in the classroom.
5. Keep a record of your work in your Science Notebook.

SC.5.L.14.1 Identify the organs in the human body and describe their functions, including … lungs, stomach, liver, intestines, pancreas … reproductive organs, kidneys, bladder…. **SC.5.L.14.2** Compare and contrast the function of organs and other physical structures of plants and animals, including humans….

LESSON 4

ESSENTIAL **QUESTION**

What Body Parts Enable Digestion, Waste Removal, and Reproduction?

Engage Your Brain

Find the answer to the following question in this lesson and record it here.

If you could see through your body, this might be what you'd see when you look in the mirror. What is the coiled tube inside your belly, and what does it do?

_____

_____

_____

ACTIVE **READING**

Lesson Vocabulary

List the terms. As you learn about each one, make notes in the Interactive Glossary.

_____ _____

_____ _____

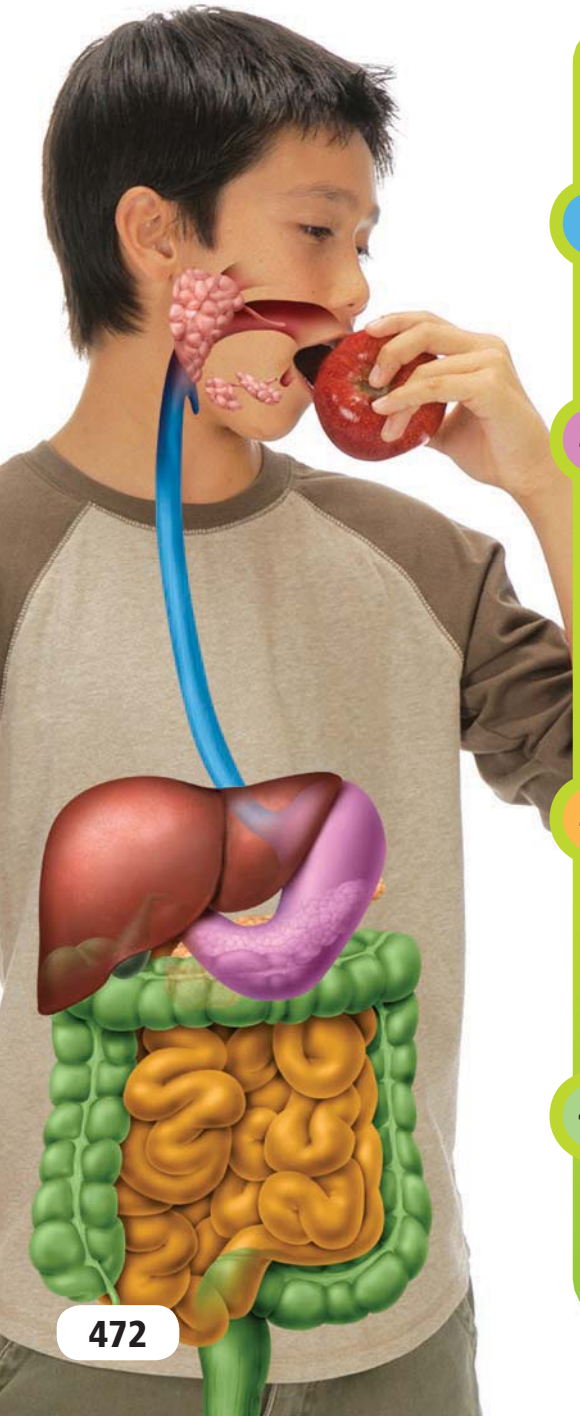
_____

Using Charts

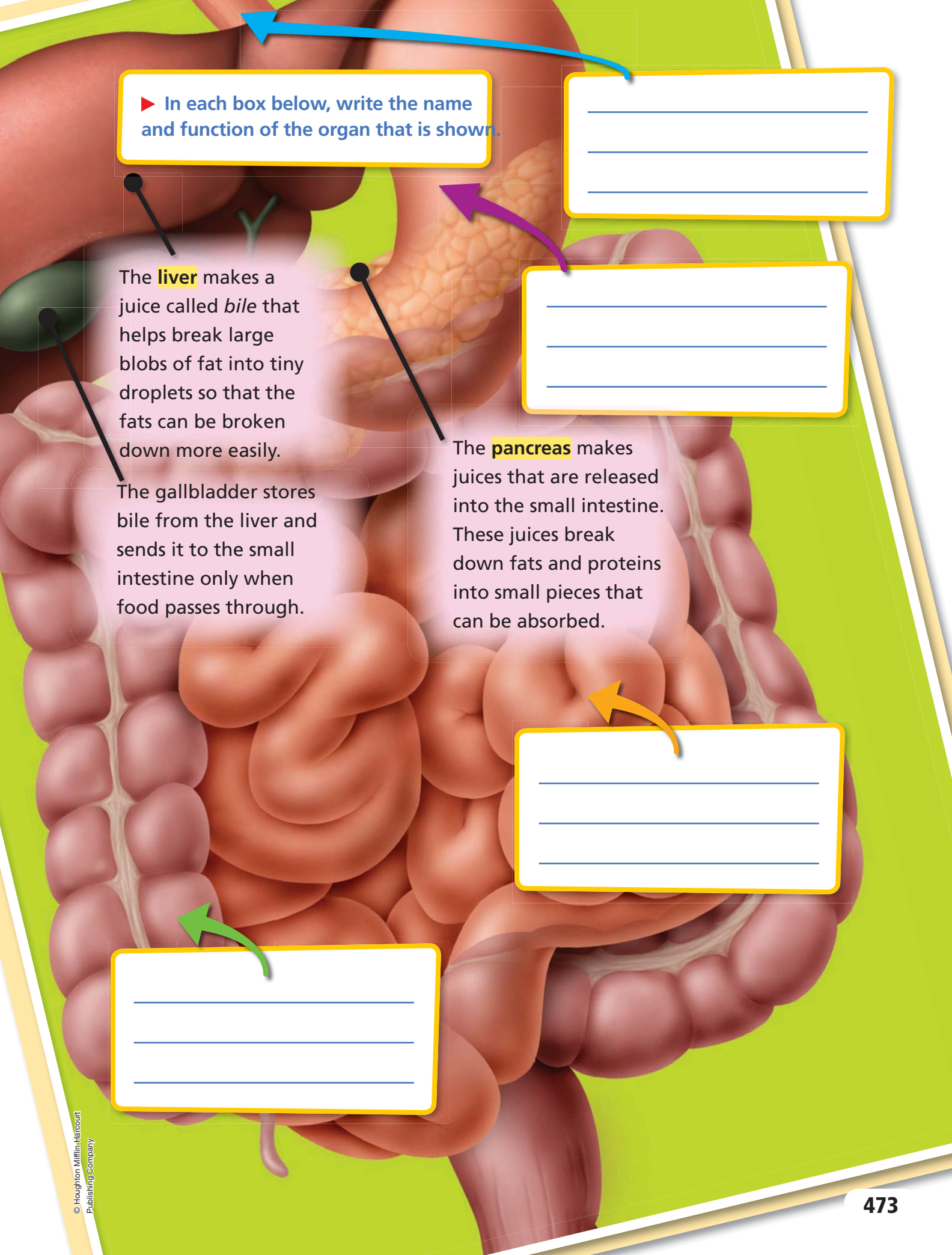
A chart adds information to the text that appears on the page with it. Active readers pause their reading to review the chart and decide how the information in it adds to what they are reading.

Down the Hatch

When you swallow food, it passes through a long tube in your body. As it travels, it is broken down into smaller pieces, and all of the useful parts are absorbed by the body. All that is left over is waste.



Organ	Job
1 esophagus	It's a long tube that begins in your throat. It moves food from the mouth to the stomach.
2 stomach	It's a muscular bag that mashes food into a liquid and mixes the food with digestive juices. These juices break down some nutrients and kill germs. Then the food, which is now liquid, goes through an opening to the small intestine.
3 small intestine	It's a long coiled tube that digests food and absorbs nutrients your body needs from the digested food. Anything not absorbed is sent to the large intestine.
4 large intestine	It's a large tube that soaks up water and minerals and leaves only the waste. Solid waste passes out of your body.



▶ In each box below, write the name and function of the organ that is shown.

The **liver** makes a juice called *bile* that helps break large blobs of fat into tiny droplets so that the fats can be broken down more easily.

The gallbladder stores bile from the liver and sends it to the small intestine only when food passes through.

The **pancreas** makes juices that are released into the small intestine. These juices break down fats and proteins into small pieces that can be absorbed.

Food for Thought

You have two boxes of cereal in your hand. How do you know which is the healthier choice? You can read their food labels to help you decide.

ACTIVE READING As you read these two pages, draw a star next to what you consider to be the most important sentence, and be ready to explain why.

Packaged foods must have a label that gives you information about what is inside the package. This is called nutrition information. Learning how to use nutrition information can help you make healthy food choices.

Each part of a nutrition label has different information. For example, you can learn how many servings are in the box. You can also learn how many Calories [KAL•uh•reez] each serving has. Calories are a way to measure how much energy your body will get from your food. Carbohydrates, proteins and fats are used by the body for energy.

The nutrition label has information about more than just energy. It also lists the amounts of important nutrients that the food contains. Bones need calcium for strength. Sodium is used by the nerves to send signals. Vitamin A helps with your eyesight. Protein is used to build muscle. Fats are used to make important chemical signals and to store energy. As you can see, reading food labels can help you make choices that fulfill all of your body's nutrition needs.

DO THE MATH

Solve Word Problems

One serving of this cereal provides you with 160 mg of sodium. This is 7% of your body's daily needs. How many milligrams of sodium equal 100%?

Nutrition Facts

Serving Size ¾ cup (30g)
Servings Per Container About 14

Amount Per Serving	Corn Crunch	with ½ cup skim milk
Calories	120	160
Calories from Fat	15	20
		% Daily Value**
Total Fat 2g*	3%	3%
Saturated Fat 0g	0%	0%
Cholesterol 0mg	0%	1%
Sodium 160mg	7%	9%
Potassium 65mg	2%	8%
Total Carbohydrate 25g	8%	10%
Dietary Fiber 3g		
Sugars 3g		
Other Carbohydrate 11g		
Protein 2g		

*Amount in Cereal. A serving of cereal plus skim milk provides 2g fat, less 5mg cholesterol, 220mg sodium, 270mg potassium, 31g carbohydrate (19g sugars) and 6g protein.

**Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Potassium		3,500mg	3,500mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

The serving size will help you make smart decisions about how much of a food you should eat to get the right amount of nutrients in your diet.

The "% Daily Value" tells you what percent of this nutrient a serving of this food will provide compared to how much you should get in a full day.

This section shows how many grams (g) or milligrams (mg) of each type of nutrient you should get each day, depending on how many Calories you need.

▶ How many Calories are in 1 serving, with $\frac{1}{2}$ cup skim milk?

_____

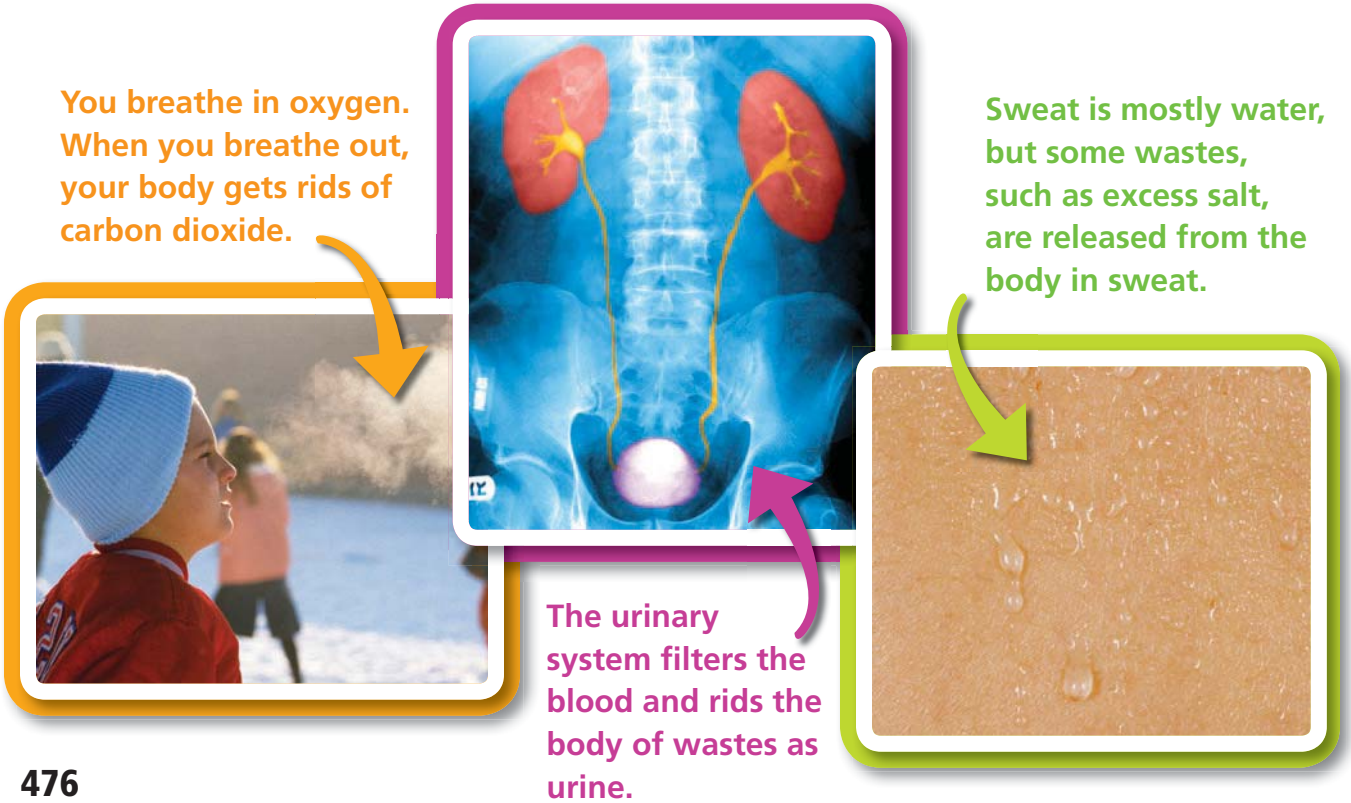
Waste Removal

Digesting food produces one kind of waste. Using the nutrients produces another. The *excretory system* rids the body of this waste and keeps your body's water and salt levels in balance.

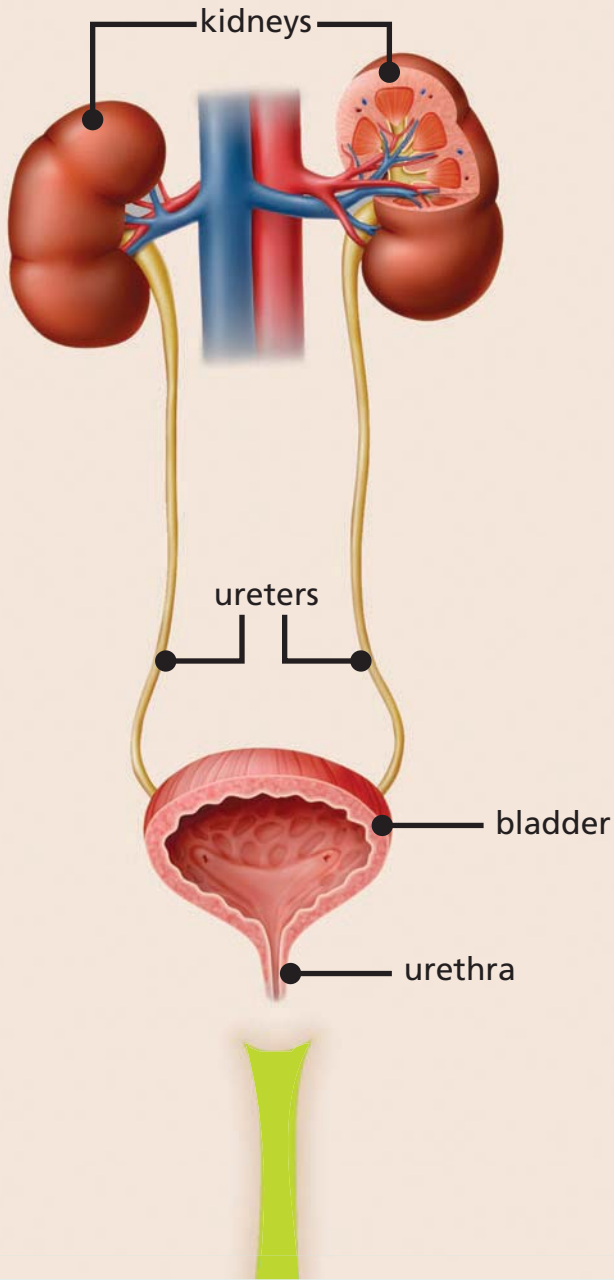
ACTIVE **READING** As you read this page, underline the different types of waste that are described.

Your body "burns" nutrients much like a fire burns wood. Your body doesn't produce ash, but the "burned" nutrients do make waste products. For example, as protein is broken down, ammonia is made. Ammonia is very toxic! The liver converts ammonia to urea [yoo•REE•uh], which is less toxic. But if urea builds up it makes you sick, so your body gets rid of it as urine. A small amount of urea is also released in sweat.

Like a fire, your body uses oxygen and produces a waste gas called carbon dioxide. Carbon dioxide is released by your lungs when you breathe out.



The Urinary System



1 The **kidneys** are organs that remove waste from the blood. They also help to conserve water and to make sure the blood does not have too much or too little salt.

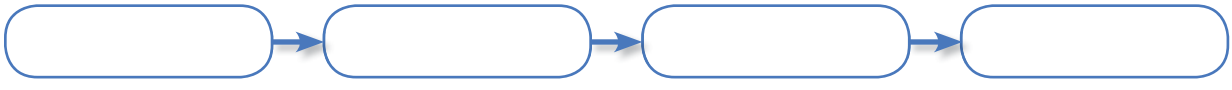
2 After the kidneys filter the blood, the waste, *urine*, collects in tubes called *ureters* [YUR•ih•tuhrz]. These take the urine to the bladder.

3 The **bladder** stores urine and then releases it from the body. The bladder can stretch like a balloon. It can hold up to a pint at a time!

4 The urethra [yu•REE•thruh] is a small tube that takes urine from the bladder to outside of the body.

Organize It—Sequence

Write the organs in order to show the path of urine through the urinary system.



Eating and Excreting

All living things use nutrients and produce waste. Living things have many ways of breaking down nutrients and getting rid of waste.

ACTIVE READING On these two pages, draw circles around descriptions of nutrient use and squares around descriptions of waste removal.

Flies spit out acids onto food. Food is partly digested outside the fly's body! Then the fly sucks up the nutrients through a straw-like mouthpart.

Bird droppings aren't made of urine. Instead, they are made of uric acid and digestive waste. Uric acid is a very powerful acid that damages statues.

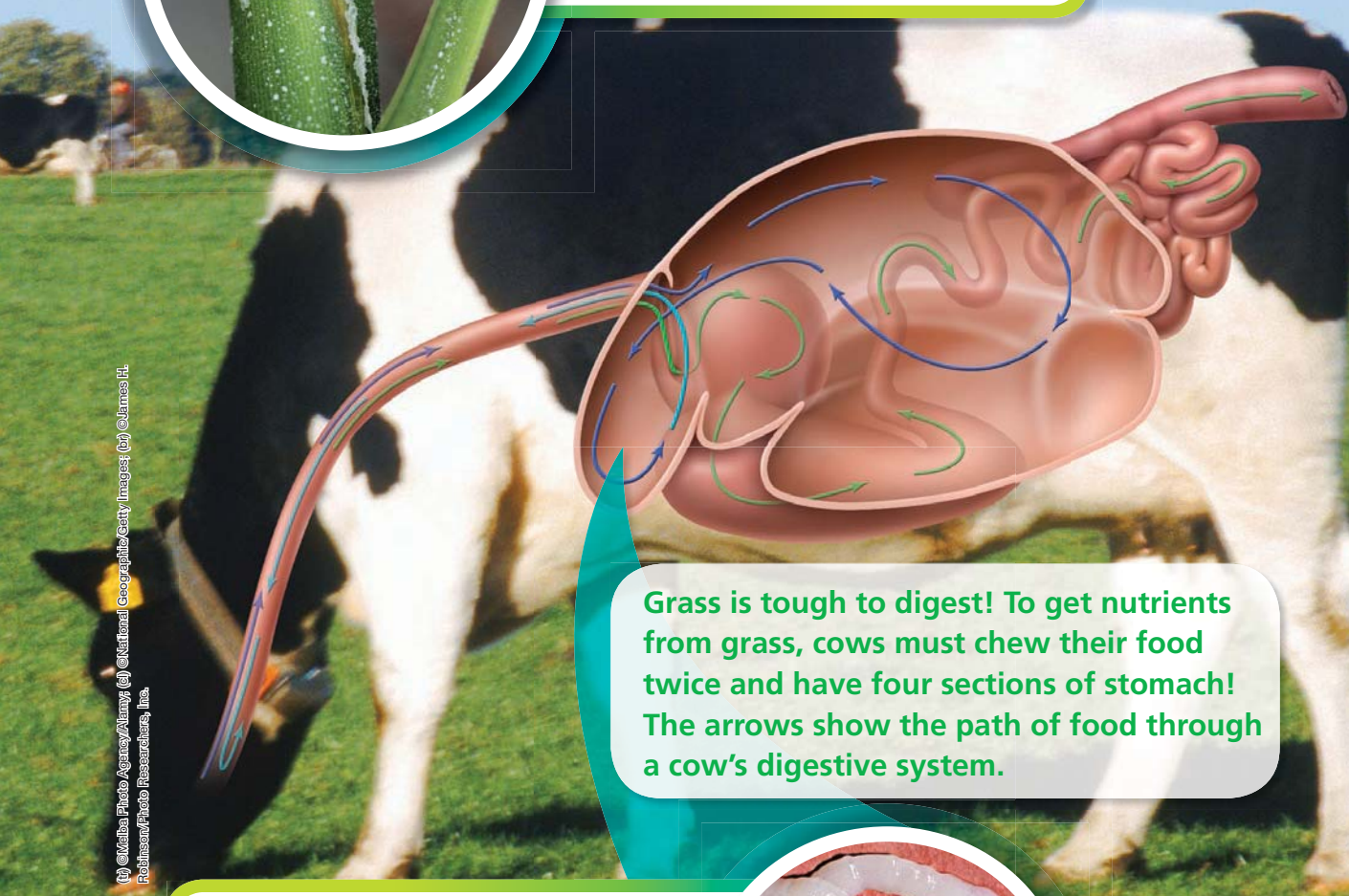
No Stomach? No Problem!

Which two organisms below have no digestive system?

_____

Jellyfish bring food into their mouths to digest it. Then they get rid of the waste by sending it back out of their mouths!

Marsh grasses live in salty areas where most plants could not survive. The leaves of marsh grasses get rid of excess salt.



Grass is tough to digest! To get nutrients from grass, cows must chew their food twice and have four sections of stomach! The arrows show the path of food through a cow's digestive system.

Tapeworms have no digestive system. Instead they live inside other animals' digestive systems. As digested food flows past, a tapeworm soaks up nutrients through its skin.

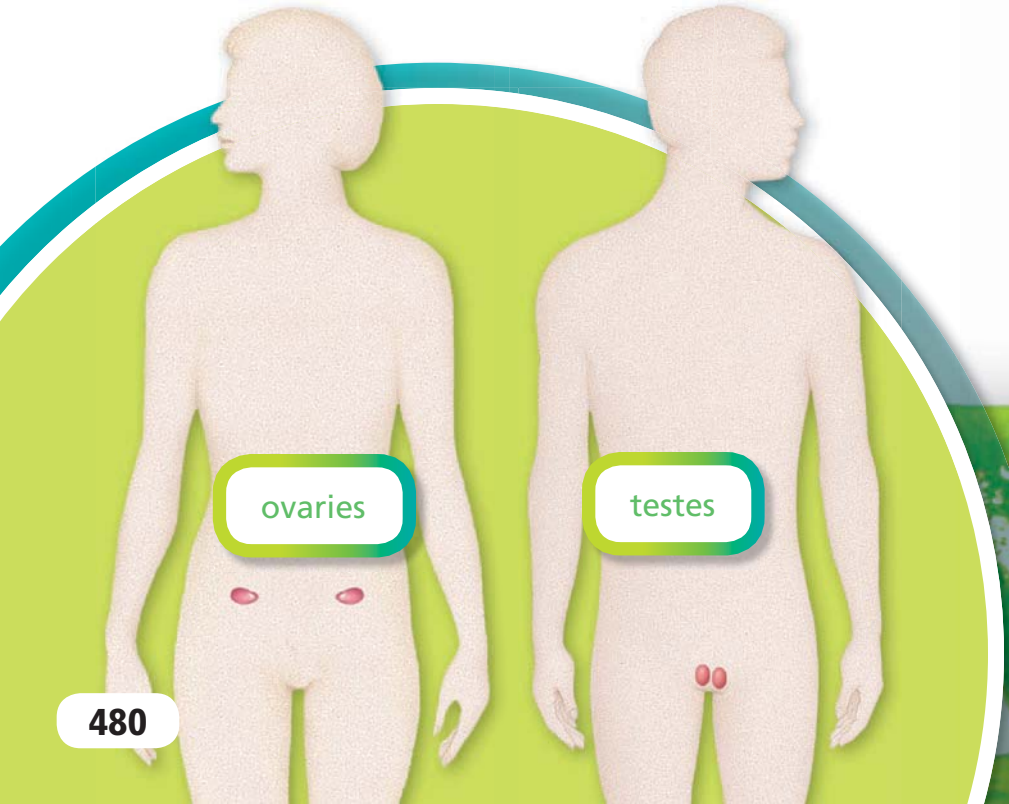
Cycles of Life

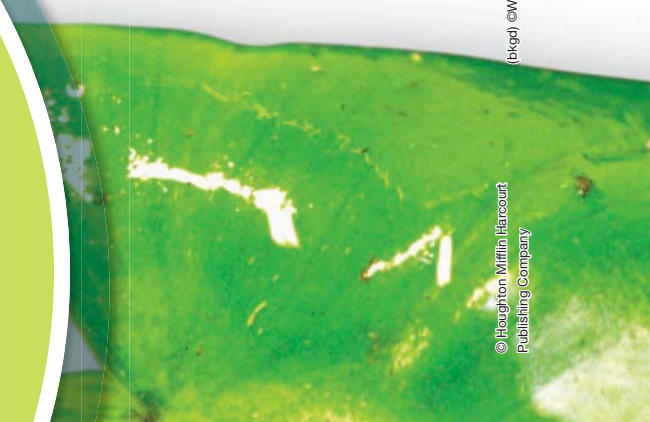
What do babies, plantlets, tadpoles, and larvae have in common? They're all organisms that came from other organisms.

ACTIVE **READING** As you read these two pages, find and underline the different names for young organisms.

Animals and plants all have *reproductive systems*. This system has one very important job: to make new organisms.

Human males and females have reproductive organs that make special cells. The male reproductive cells are made in the testes [TES•teez]. Female reproductive cells are made in the ovaries [OH•vuh•reez]. These reproductive cells join to form an embryo [EM•bree•oh]. The embryo develops in the mother's body for nine months. It grows and changes until it can survive outside the mother's body. At this time, a baby is born.





A spider plants grows little "plantlets" at the end of some stems. These plant buds can be broken off to grow new plants.

Insects lay eggs that hatch into larvae [LAR•vee], like the ones shown here. Insects go through several stages before they reach adult form.

Many plants make seeds. Male plant reproductive cells join with female reproductive cells and develop into a seed. Dandelion seeds are carried by wind. If they land in soil, they begin to grow and develop into a new plant.

Many frogs lay their eggs in a jelly-like pile. The eggs must stay wet, or they will die. Tadpoles hatch from the eggs. Tadpoles start out looking like fish with large heads. Slowly they grow legs and their tails become smaller and smaller. Little by little they turn into adult frogs.

Sum It Up

Complete the summary paragraph by filling in the blanks. Then place the words in the list below the summary paragraph with the correct system at the bottom of the page.

Your body is made up of many 1._____ that work together in systems. The 2._____ system is a long tube that travels through your body. It takes the nutrients out of food for your body to use. The 3._____ system is responsible for removing waste from your body. The 4._____ system makes special cells that produce new organisms. Plants and animals also have ways to get energy, remove waste, and reproduce.

testes	small intestine	esophagus
kidneys	ovaries	ureters
stomach	large intestine	
urethra	bladder	

Digestive System	Urinary System	Reproductive System
5. _____	9. _____	13. _____
6. _____	10. _____	14. _____
7. _____	11. _____	
8. _____	12. _____	

Name _____

Vocabulary Review

1 Use the words in the box to complete each sentence.

1. The _____ are bean-shaped organs filter the blood and remove wastes.

2. The long tube that connects the mouth to the stomach is the _____.

3. The _____ expands and fills up with urine until it is ready to be released.

4. The _____ makes juices that break down protein in the small intestine.

5. The _____ system moves food through your body and absorbs the nutrients.

6. The _____ makes a juice that breaks large blobs of fat into smaller blobs.

7. The _____ system helps an organism make new organisms.

8. The _____ mashes food and mixes food with digestive juices.

bladder	digestive	esophagus	kidneys
liver	pancreas	reproductive	stomach

Apply Concepts

2 Think about how organs depend on other organs to do their work. Complete each sentence.

1. Food couldn't reach the stomach without the _____ and the _____ .
2. Kidneys couldn't work without the _____ because _____ couldn't leave the body.
3. The small intestine couldn't work without the _____ because fats couldn't be broken down.

3 Describe the life cycle of the tadpole shown here.

_____

_____

_____

_____

_____

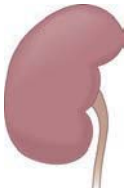
4 Explain how each of the items shown below are alike.


stomach and blender

_____

_____

_____




kidney and coffee filter

_____

_____

_____


bladder and water balloon

_____

_____

_____

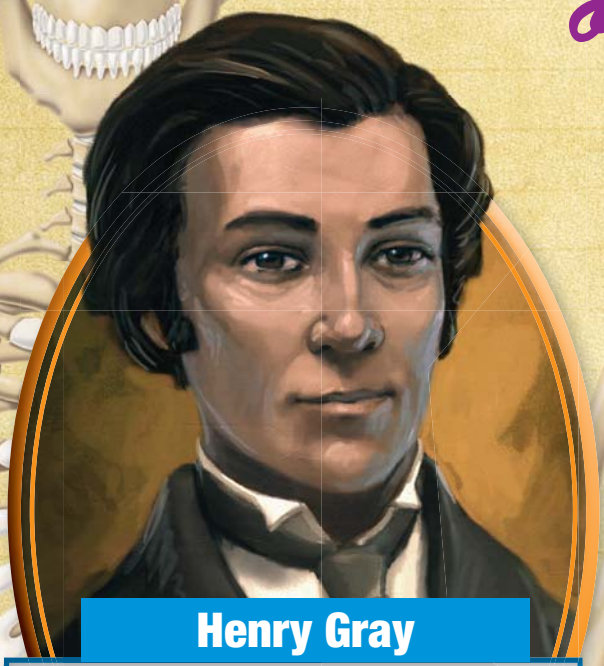
5 Scientists have discovered a new animal. Is it possible for it to have no digestive system? Why or why not? _____

_____

_____

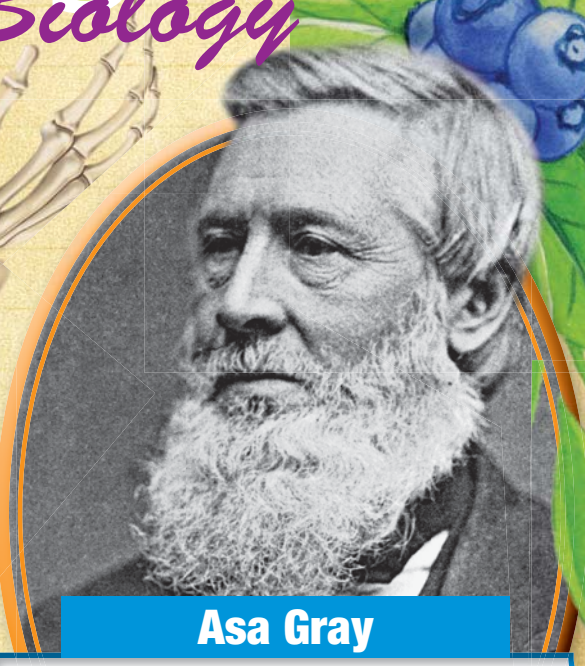
Take It Home! Write the words *small intestine, pancreas, esophagus, liver, large intestine, gall bladder, and stomach* on index cards. Eat a snack. Ask your family to explain how each organ helps to digest your food.

Meet the Grays of Biology



Henry Gray

Henry Gray was a surgeon in London. He was fascinated by the science of anatomy. Anatomy is the study of the parts of the body. In 1858, when he was only 31 years old, Henry Gray published a book on anatomy. It became one of the most famous scientific books of all time: *Gray's Anatomy*. The book included drawings of all of the organs and systems of the human body. Henry Gray died three years later from smallpox, but his work lives on. In 2009, the 40th edition of *Gray's Anatomy* was published. It is still used today by doctors, students, and other scientists.



Asa Gray

Asa Gray was an American botanist. He studied plants. He lived around the same time as Henry Gray, but the two men were not related. They never even met. Still, their work had some things in common. Asa Gray wrote a book known as *Gray's Manual*. Working with a scientific illustrator named Isaac Sprague, Asa Gray published a book that had information about almost every plant in the Northern United States. It was written more than a century ago. But *Gray's Manual* is still used by botanists today. Asa Gray is considered to be one of history's most important botanists.

Be a Scientific Illustrator

Try your hand at scientific illustrations! See how well you can produce an anatomical drawing of the bones of the human hand. Then try making a botanical illustration of the raspberry branch.

Bones of the Human Hand

Raspberry Branch

UNIT 9 Benchmark Review

Name _____

Vocabulary Review

Use the terms in the box to complete the sentences.

brain
skin
lungs

1. The _____ forms a protective covering of the body.
2. Fish gills take in oxygen from water and release carbon dioxide. This is similar to the function of the human _____.
3. The _____ is the organ that processes information in the body.

Science Concepts

Fill in the letter of the choice that best answers the question.

4. During recess, Renee scraped her knee, so the nurse put a bandage on it. Which of the functions below that are normally provided by skin is now being provided by the bandage?

   (A) preventing dehydration
   (B) regulating body temperature
   (C) keeping bacteria out of the body
   (D) sensing when it is being touched

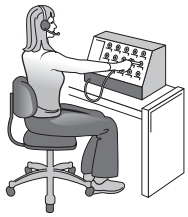
5. Latoya knows that skin produces oil, water, and salt. She wants to find out which of these causes cooling. She creates the following table to record data.

	Towel soaked in oil	Towel covered in salt	Towel soaked in water	Towel that is clean and dry
Starting temperature				
Temperature after 1 min				
Temperature after 10 min				

   Which towel is the control?

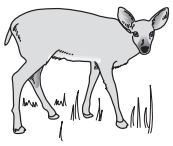
   (F) towel soaked in oil
   (G) towel covered in salt
   (H) towel soaked in water
   (I) towel that is clean and dry

6. In the early days of telephone use, there were no computers. To make a phone call, a person had to call an operator. The operator would connect two callers. The operator performed a function that is most similar to which human body part?



Ⓐ brain
Ⓑ nose
Ⓒ eyes
Ⓓ skin

7. Animals have body coverings, such as skin, that protect them. This protective layer can be used to protect the animal from extreme temperatures and to help it blend in with its environment to avoid predators. Look at the body coverings of these animals. Which animal has a body covering that will best protect it from bites and scratches during an attack by a predator?

Ⓕ 
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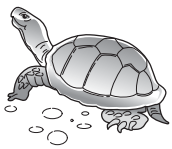
Ⓖ 
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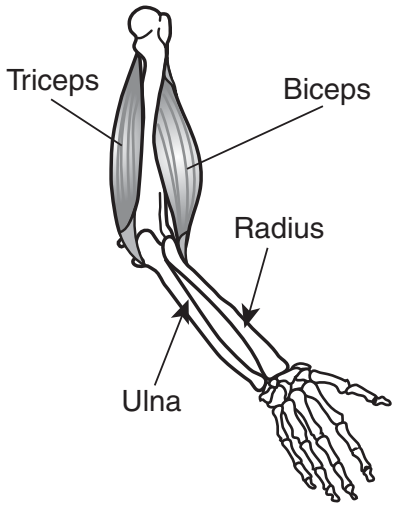
8. The following picture shows some muscles and bones of the arm.



As this arm bends, which word describes what the biceps muscle is doing?

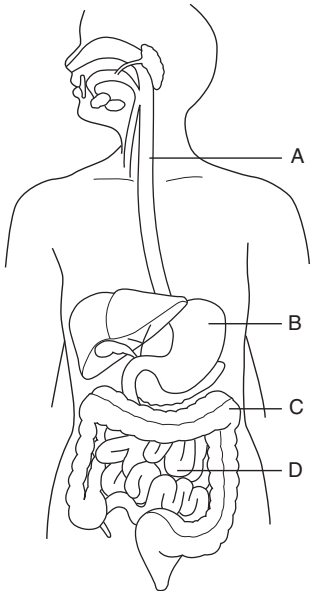
Ⓐ relaxing
Ⓑ retracting
Ⓒ contracting
Ⓓ constricting

9. How do nutrients in digested food reach the bloodstream?

Ⓕ They are absorbed by the large intestine.
Ⓖ They pass from the esophagus into the blood.
Ⓗ They are absorbed into the bloodstream by the small intestine.
Ⓘ They are absorbed into the bloodstream through the pancreas wall.

Name _____

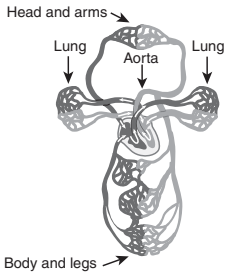
10. Digestion takes place in the digestive tract, shown here.



In what order does food move through the organs of the digestive tract?

Ⓐ A, B, C, D
Ⓑ A, C, B, D
Ⓒ A, B, D, C
Ⓓ A, D, B, C

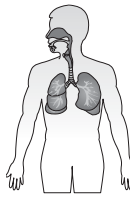
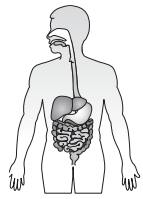
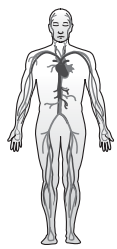
11. The following picture shows the flow of blood through the human circulatory and respiratory systems.



Which statement is true of the large blood vessel called the aorta?

Ⓕ It carries blood to the heart.
Ⓖ It carries blood to the lungs.
Ⓗ It carries blood that is high in oxygen.
Ⓘ It carries blood that is high in carbon dioxide.

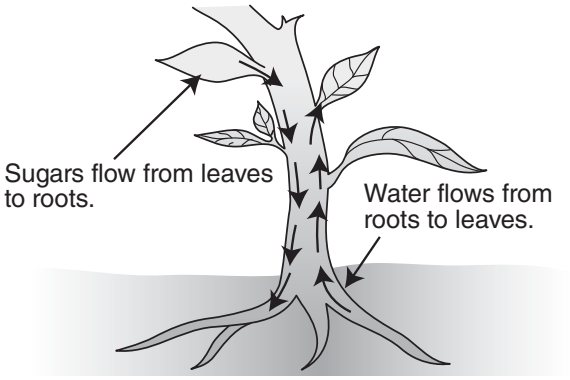
12. Cells in the body use nutrients and oxygen for energy. Which body system transports oxygen and nutrients throughout the body?

Ⓐ 
Ⓒ 
Ⓑ 
Ⓓ 

Apply Inquiry and Review the Big Idea

Write the answers to these questions.

13. The following picture shows how plant tissues carry water and nutrients throughout a plant.



Make a claim about which human body system is similar to this plant's vascular system. Explain your reasoning.

14. Insects have a hard outer covering called an exoskeleton. How do an insect's exoskeleton and a human's skeletal system compare?