

Section 1

Your Skeletal System

Objectives

Before class begins, write the objectives on the board. Have students copy the objectives into their notebooks at the start of class.

1. Focus

Warm-Up Quick Quiz

Use the **Instruction** clickers to survey student responses.

Presentation EXPRESS

Have students answer the questions to the Quick Quiz on their own. When students have completed the quiz, invite them to infer how these healthy behaviors help the body. Challenge students to choose one of the behaviors from the quiz that they sometimes or never do and incorporate it into their lifestyle.

Teaching Transparency W36

Section 1

Objectives

- **Identify** the five main roles of the skeletal system.
- **Describe** the functions of bones and joints.
- **Explain** how you can keep your skeletal system healthy.

Vocabulary

- joint
- cartilage
- ossification
- marrow
- ligament
- osteoporosis
- fracture
- sprain
- dislocation
- scoliosis

Your Skeletal System

Warm-Up

Quick Quiz Complete each of these statements with *always*, *sometimes*, or *never*.

- 1 I ? warm up before exercising.
- 2 When I ride a bicycle or play contact sports, I ? wear a helmet and other protective gear.
- 3 When I ride in a vehicle, I ? fasten my seat belt.
- 4 My backpack for school is ? less than 15% of my body weight.
- 5 I ? make an effort to eat balanced meals and exercise regularly.

WRITING Why do you think that teens might not always practice these healthful behaviors?



Functions of the Skeletal System

Have you ever seen a new building under construction? Before the roof or walls can take shape, the building's frame must be built. Like a building, your body needs a frame to give it shape and support. Your body's framework is your skeletal system. **Your skeletal system has five main roles. It provides support, protects internal organs, allows your body to move, and stores and produces materials that your body needs.**

Support and Protection As you can see in Figure 1, your skeleton is made up of all the bones in your body. Your skeleton gives your body its basic shape and provides the support that you need as you move through your day. The center of your skeleton is your backbone, or vertebral column. The backbone consists of 33 bones called vertebrae (VUR tuh bray). The vertebrae support your head and give flexibility to your neck and back.

Many bones of the skeletal system protect internal organs. Your ribs and breastbone, for example, form a protective cage around your heart and lungs. Your backbone protects the spinal cord, which runs through holes in the vertebrae. The hard, thick skull protects your brain.

WRITING and Health

L3 Web Site

Have student groups plan a Web page that describes the functions and structures of the skeletal system. They can describe their plan for the Web site by using posters as

storyboards. Students should provide details about how users will navigate through the site.

2. Teach

L3 EL Reading/Note Taking 11-1

L2 Adapted Reading/Note Taking 11-1

Functions of the Skeletal System

L2 Class Discussion

Invite volunteers to describe how a house is built. Guide them in their descriptions so that they focus on the frame, regardless of whether it is made of wood, steel, or brick. Then challenge the class to describe how the frame protects and supports the house. Relate how the frame of a house is similar to the skeletal system. Have students make comparisons between the five main roles of the skeletal system and the role of a house frame. Ask: **What does the skeletal system do that a house frame does not?** (*A house frame does not allow the house to move and it does not produce materials.*)

L3 Active Learning

Challenge student groups to use common classroom materials to demonstrate how specific parts of the skeletal system protect and support the body.

L3 Visual Learning: Figure 1 Teaching Transparency 24

Refer students to Figure 1 and ask: **How would you describe the structure of the ribs?** (*Students might describe the ribs as a cage.*) **Based on their structure, what function do you think ribs have?** (*Ribs protect the heart and lungs and support the body so those organs have space to work.*) **What other bones protect internal organs?** (*Sample answer: skull, backbone, breastbone, pelvic girdle*) Then have students compare the number of bones in a finger to the number of bones in an arm. Ask: **How might the number of bones in a structure affect movement?** (*Students might infer that more bones allow for finer movements.*)

Connect to YOUR LIFE the vertebrae that make up the backbone

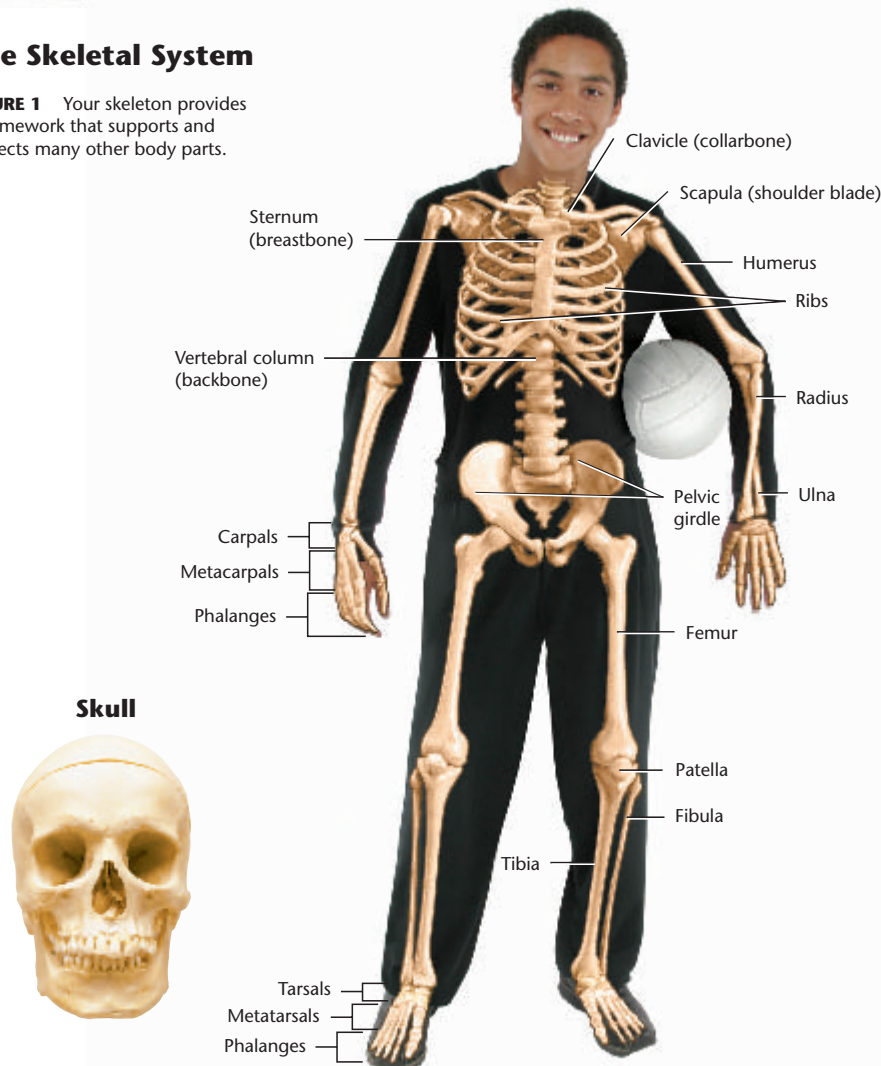
Movement In coordination with your muscular and nervous systems, your skeletal system allows you to move. The range of movements can be as simple as striking a key on a keyboard, or as spectacular as pushing your body off the ground to spike a volleyball.

Storage and Production of Materials Your bones store essential substances, such as phosphorus and calcium, which are released when other parts of the body need them. Some bones, such as the breastbone and part of the thighbone, also produce blood cells.

Connect to YOUR LIFE If you run your fingers down the center of your back, which bones can you feel?

The Skeletal System

FIGURE 1 Your skeleton provides a framework that supports and protects many other body parts.



Movement and Coordination 267

Differentiated Instruction

EL English Language Learners

Provide small groups of students with poster board, markers, index cards, and a pair of dice. Have students design a board game that teaches the names and location of the

bones in the skeleton. They should write the rules and pretest the game. Then ask groups to trade games.

Bones and Joints

L3 Online Activity



Use the Web Code to access an online activity about movable joints. Have students complete the Web activity.

L3 Teacher Demo

About a week before you discuss the skeletal system, obtain two similar bones from a cooked chicken or turkey. Clean the bones. Then boil them and allow them to dry. Place one bone in a jar with white vinegar. Cover the jar and leave it undisturbed. Demonstrate how the bones differ. (*The bone soaked in vinegar is rubbery.*) Explain that the acid in the vinegar dissolved the bone's calcium. Ask: **What can you infer about the function of calcium in bones?** (*It makes bones hard and rigid.*)

L2 Visual Learning: Figure 2

Tell students to read about the parts of a bone in Figure 2. Ask: **How does compact bone differ from spongy bone?** (*Compact bone is more solid and denser than spongy bone. Spongy bone has spaces created by flat, needlelike structures. Spongy bone may contain red bone marrow.*) Point out that only long bones have space in the central cavity to store fat. Then have students describe how bone structure contributes to the five functions of the skeletal system.

Caption Answer in the central cavity

L3 Building Vocabulary

Show students the derivation of the word *ossification* by writing the following on the board: The word *ossify* comes from the Latin word *os*, which means "bone" and the suffix *-fy*, meaning "to make" or "cause to become." Ask: **What does ossify mean?** (*to make into bone*) Then write that the suffix *-ation* means "an action or process." Ask: **What does ossification mean?** (*the process of becoming bone*)



Bones and Joints

Did you know that your skeletal system is made up of just over 200 bones? A place in your body where two or more of your bones come together is called a **joint**. Your bones and joints work together every time you move.

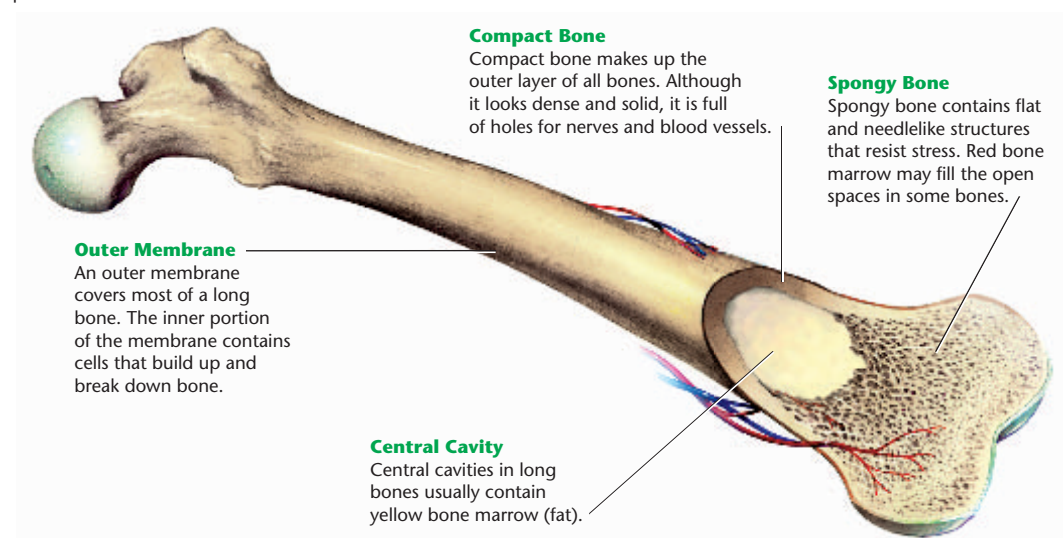
Development of Bones Your bones are living structures that undergo change throughout your life. A newborn's skeleton is made mostly of **cartilage**, a tough supportive tissue that is softer and more flexible than bone. By young adulthood, most of this cartilage is replaced by bone in a process called **ossification** (ahs uh fih KAY shun). During this process, minerals, such as calcium and phosphorus, are deposited within the cartilage, making it hard. By young adulthood, the only cartilage left in your body will be in the outer part of your ears and nose, covering the ends of some bones, and cushioning some joints.

After ossification is complete, cells in the bones continue to maintain and repair the tissue. If you were to break a bone, the cells would form new tissue to fill the gap between the broken ends. Eventually, the healed region containing new bone might be stronger than the original bone.

Structure of Bones Bones are remarkably strong, although they are light in weight. This is because bone consists of two different types of tissue—compact bone and spongy bone. Figure 2 shows the location of these tissues and other structures in the thighbone, or femur. Another type of tissue called **marrow** fills the spaces in bones. There are two types of marrow—red and yellow. Red marrow, found in the spaces of some spongy bone, produces many types of blood cells. On average, red marrow produces 100 billion blood cells every day. Yellow marrow, which can be found in the hollow centers of long bones, stores fat.

FIGURE 2 Bones are intricate living structures that contain several types of tissue.

Interpreting Diagrams In which part of a bone is fat stored?



268 Chapter 11



Bone Cells

Bone tissue is made up of three kinds of cells: osteocytes, osteoblasts, and osteoclasts. Osteocytes are mature bone cells. Osteoblasts make new bone by producing collagen and filling it with mineral deposits (calcium, phosphorus, and sodium). Osteoblasts are active during growth, the repair of fractures,

and bone remodeling that occurs with changes in exercise and nutrition. Osteoclasts break down old bone. Osteoclasts are active during fracture repair, remodeling, and when the body needs stored calcium. The osteoclasts produce an enzyme that removes calcium from the collagen and releases it into the blood.

FIGURE 3 The different kinds of joints allow you to move and position your body in a variety of ways.



Pivot Joint

A pivot joint connects your head to the first vertebra in your backbone. It allows you to turn your head from side to side.

Ball-and-Socket Joint

A ball-and-socket joint allows movement in all directions. Your shoulders and hips are ball-and-socket joints.

Gliding Joint

Gliding joints allow movement in many directions as the bones slide along each other. Your wrists and ankles contain gliding joints.

Hinge Joint

Hinge joints allow bending and straightening movements. Your knees and elbows are hinge joints.

Joints Without joints, your body would be like a chair with arms and legs that cannot move. **Joints allow for movement and protect bones from friction and force.** Some joints, such as those in your skull are immovable—they allow no motion. Other joints, such as those in your elbows, knees, and shoulders are movable. Four different types of movable joints are shown in Figure 3.

Bones are held together at joints by strong, fibrous bands called **ligaments**. A smooth layer of tough cartilage cushions and protects the ends of bones where they meet. Membranes around some joints secrete a fluid that lubricates the joint and reduces friction between the bones.

Connect to YOUR LIFE

What joint allows you to wave hello to a friend? What type of joint is it?

L3 Visual Learning: Figure 3 Teaching Transparency 25

Refer students to the different kinds of joints in Figure 3. Encourage students to move their own joints and visualize how the joint works by looking at the corresponding image in the figure. Then ask: **What would happen if the knee were a ball-and-socket joint?** (*The lower leg would be able to rotate like the upper arm.*) **How would the upper arm move if it were a hinge joint?** (*The arm would not be able to move in all directions.*)

L2 Class Discussion

Ask students to picture what their lives would be like if their fingers had no joints. Ask: **What types of activities would be impossible to perform?** (*typing, buttoning shirts, opening jars, putting on makeup*) **What is the difference between the joints in your fingers and the joints in your skull?** (*The joints in fingers are movable, but the joints in the skull are not.*) Point out that though the skull seems to be one piece, it is actually made of several bones fused together at immovable joints.

L3 Addressing Misconceptions

Double-Jointed Ask students to define “double-jointed” and explain how a double-jointed person can move. Then explain that people who are able to move fingers or limbs farther than average do not have an extra joint. Rather, they have greater muscle flexibility or looser ligaments that allow for a significant range of motion.

Connect to YOUR LIFE

Sample answer: the wrist; a gliding joint

Differentiated Instruction

L2 Less Proficient Readers

Have students carefully read about bone development and create a flowchart that describes the way in which bones change throughout life. Students should include

details about each stage and definitions for *ossification* and *cartilage* in their own words. Encourage students to use their flowcharts to study for the chapter test.

Keeping Healthy

L3 Cultural Connection

Some people have a low calcium intake due to the foods they commonly eat. Have students list foods that are associated with specific cultures. Ask volunteers to find nutrition information for these foods. Are there certain cultures that may consume more calcium than others? Which of the foods are highest in calcium?

L1 Building Health Skills

Analyzing Influences On the board, write a list of sports and activities for which helmets are worn to prevent head injuries. (*football, baseball, hockey, biking, and horseback riding*) Invite students to add to the list. Then, ask students to make their own list of activities they participate in and indicate whether or not they wear a helmet. For each activity, have students write why they do or do not wear a helmet. For activities during which they do not wear helmets, have students consider what is influencing their behavior and what it would take to change their opinion about helmets.

L3 Teacher Demo

Put on a backpack and exaggerate how your body compensates to carry an overloaded pack. Explain how this poor posture strains the back, causing back and neck pain. Tell students that a backpack should weigh no more than 15 percent of their body weight. Then, demonstrate how to wear a backpack properly: each shoulder strap on one shoulder, straps tightened so the pack lies close to the back, waist straps buckled to pull in the bottom of the pack, which should be above the waist.

Connect to YOUR LIFE Sample answers: dancing, running, racquet sports, soccer, basketball, lacrosse



FIGURE 4 Weight-bearing activities, such as running, make your bones stronger by stimulating bone cells to make more bone. Building up bone mass in your teen years may decrease your chance of developing osteoporosis.

Keeping Healthy

Because your skeletal system performs so many functions, it is important to keep it healthy. A combination of eating well, exercising, and avoiding injuries contributes to lifelong bone and joint health. In addition, regular medical checkups can help detect skeletal system problems.

Eating Well Adequate intake of calcium and phosphorus will help your bones grow to their maximum size and strength. Your body stores these minerals during childhood and adolescence. As you age, your bones will begin to lose some of these stored minerals. Significant mineral loss can lead to **osteoporosis**, a condition in which the bones become weak and break easily. If you enter your adult years with a good supply of these minerals, you may decrease your risk for osteoporosis.

Other nutrients that are important for bone health include potassium, magnesium, and vitamins A, C, and D. See Chapter 8 for examples of foods that are rich in these nutrients.

Exercising Another way to build strong bones and prevent osteoporosis is to get plenty of weight-bearing exercise. Activities in which the bones support the entire weight of your body help your bones grow strong and dense. Some examples of weight-bearing activities are dancing, running, racquet sports, soccer, basketball, and lacrosse.

Avoiding Bone Injuries One common injury of the skeletal system is a **fracture**, or a break in a bone. In a simple fracture, the bone may be cracked or completely broken in two or more pieces. In a compound fracture, the broken ends of the bone pierce the skin. Fractures are treated by putting the broken ends of the bone back together. Splints or casts are used to prevent movement of the bone until the bone tissue can repair itself. In some cases, surgery is required.

You can protect your bones from fractures. When participating in a physical activity, wear appropriate safety equipment, such as helmets and pads. Always wear a seat belt when traveling in a vehicle.

Connect to YOUR LIFE

What are three weight-bearing activities that you enjoy?

TEENS Are Asking ...

Q: Is it safe for teens to lift weights?

A: Yes, even though your bones and joints are still developing, it is safe to strength train as long as you do it properly. Strength training will improve your strength and endurance and will help reduce the risk of injuries to bones and joints. Strength training can also prevent or delay osteoporosis

later in life because it makes bones denser. Before starting a strength-training program, work with a coach, athletic trainer, or physical education teacher to learn proper techniques. To prevent injury, start slowly, avoid heavy weights, use proper form, and gradually increase workouts.

3. Assess


Evaluate

These assignments can help you assess students' mastery of the section content.

Section 1 Review

Answers appear below.

Teaching Resources

- Practice 11-1
- Section 11-1 Quiz 

L2 Reteach

Work with students to create a concept map that shows the five main functions of the skeletal system. Students should copy the concept map into their notebooks. Ask students to describe the role of bones and joints and how these components enable the skeletal system to carry out its functions. Invite students to suggest ways to add this information to the concept map.

L4 Enrich

Teaching Resources

- Enrich 11-1

Health and Community

Safety Poster Divide the class into groups, and give each group poster paper and markers. Suggest that students choose one type of joint injury to prevent, such as a sprain, or one way of protecting against injury, such as wearing a helmet. Suggest that students draw illustrations, design graphics on the computer, cut pictures from magazines, or take digital pictures and print them on paper. Have groups present their posters to the class.

Avoiding Joint Injuries As you participate in physical activities, keep in mind that your bones and joints are still developing. Some injuries can lead to permanent damage. Proper warm-up and stretching exercises are important to help prevent joint injuries.

- ▶ **Sprains** Most likely you or someone you know has experienced a **sprain**, an overstretched or torn ligament. Treatment for mild sprains can include ice to reduce swelling and pain relievers. Severe sprains may require a brace or surgery.
- ▶ **Dislocations** In a **dislocation**, the ends of the bones in a joint are forced out of their normal positions. To treat a dislocation, the bones are typically put back into their proper positions and held in place by a cast or bandage until the joint heals.
- ▶ **Torn Cartilage** Serious damage to the cartilage between the bones in a joint is known as torn cartilage. The knees are particularly susceptible to this injury. Surgery, such as arthroscopic surgery, is often necessary to repair or remove torn cartilage.
- ▶ **Overuse Injuries** When an activity is performed too often or too strenuously, joints may become irritated and inflamed. In teens, overuse injuries most commonly occur to the shoulders or knees. Teens who play the same sport year-round are susceptible to overuse injuries. Also, carrying a heavy backpack improperly may cause overuse injuries to the back and shoulders.

Medical Checkups If you experience bone or joint pain it is a good idea to see a doctor. He or she can advise you on how to prevent serious injury or recommend other professionals who can help you.

During yearly physical examinations, a nurse or doctor may check your spine for **scoliosis** (skoh lee OH sis), an abnormal curvature of the spine. Scoliosis usually develops during childhood, but it may not be detected until the teen years. Your doctor will also monitor your height and weight to make sure you are growing properly.



FIGURE 5 During arthroscopic surgery, doctors insert an instrument called an arthroscope into the joint. A camera attached to the arthroscope projects an image onto a monitor. Tiny instruments are then used to make repairs.

Section 1 Review

Key Ideas and Vocabulary

1. List the five main roles of the skeletal system.
2. Explain the function of bones.
3. Describe the two types of bone **marrow**.
4. What is a **joint**? Describe the function of movable joints in the body.
5. Identify four ways you can help your skeletal system stay healthy.

Health and Community

Safety Poster Create a poster aimed at young children that explains how to prevent bone, joint, and muscle injuries. With permission, display the poster in an elementary school, library, or other public place.

Critical Thinking

6. **Comparing and Contrasting** How is a newborn's skeleton different from your own?
7. **Classifying** Which type of joint allows you to kneel down? To move your arm in a circle?

Movement and Coordination 271

Section 1 Review

1. The skeleton provides support, protects organs, allows for movement, and stores and produces materials the body needs.
2. Bones store fat, calcium, and other minerals; produce blood cells; support the body; and protect organs.
3. Red marrow, found in the spaces of some spongy bone, produces many types of blood cells. Yellow marrow, found in the center of long bones, stores fat.
4. A joint is where two or more bones come together. Movable joints allow the body to move in various ways.
5. eat well, exercise, avoid injuries, and get regular medical checkups
6. A newborn's skeleton is made mostly of cartilage. At my age, most of the cartilage has been replaced by bone.
7. hinge; ball-and-socket

Section 11-1

Note Taking Guide

Your Skeletal System (pp. 266–271)

Functions of the Skeletal System

1. List the five main roles of the skeletal system.

- a. *provides support* _____
- b. _____
- c. _____
- d. _____
- e. _____

Bones and Joints

2. Complete the outline by adding details about bones and joints.

I. Bones and Joints

A. Development of bones

1. A newborn's skeleton is made mostly of cartilage.
2. During ossification, cartilage is replaced by bone.
3. After ossification, _____.

B. Structure of bones

1. The two types of bone tissues are _____.
2. Red marrow produces _____.
3. Yellow marrow stores _____.

C. Joints

1. Joints allow for _____.
2. Joints protect bones from _____.
3. Four types of movable joints are _____
_____.
4. Ligaments are _____.

Section 11-1: Note Taking Guide *(continued)*

Keeping Healthy

3. Complete the graphic organizer about keeping your skeletal system healthy. Use the sentences from the box below.

Bones grow strong and dense.
 Get advice on preventing serious injuries.
 Avoid joint injuries.
 Maximize size and strength of bones.
 Avoid bone injuries.

Behavior

Effect

Eat foods that contain calcium, phosphorus, and other nutrients that are important for bone health.	→	a. _____ _____
Get plenty of weight-bearing exercise.	→	b. _____ _____
Wear appropriate safety equipment and seat belts.	→	c. _____ _____
Warm up and stretch before physical activity.	→	d. _____ _____
See a doctor if you experience bone or joint pain.	→	e. _____ _____

Section 11-1**Quiz**

Write the letter of the correct answer in the space provided.

- | | |
|--|-----------------------|
| _____ 1. a tissue found in the spaces of bones | a. cartilage |
| _____ 2. the ends of bones in a joint are forced out of place | b. marrow |
| _____ 3. a break in a bone | c. ligament |
| _____ 4. a soft, flexible supportive tissue that is replaced by bone during ossification | d. fracture |
| _____ 5. a strong, fibrous band that connects bones at joints | e. dislocation |
| | f. scoliosis |

Decide whether each statement is true or false. Write true or false in the space provided.

- _____ 6. The skeleton gives the body its basic shape.
- _____ 7. One role of the skeletal system is to produce blood cells.
- _____ 8. Bones are nonliving structures that do not change once you are finished growing.
- _____ 9. Joints enable the skeletal system to move.
- _____ 10. If you consume enough calcium, you don't need to exercise for bone health.

Section 2

Your Muscular System

Objectives

Before class begins, write the objectives on the board. Have students copy the objectives into their notebooks at the start of class.

1. Focus

Warm-Up Myth/Fact

Presentation
EXPRESS

After students complete the writing assignment, invite volunteers to share their responses. Then, challenge students to identify the underlying motivation for groups or individuals who advocate the “no pain, no gain” myth.

Teaching Transparency W37

Section 2

Objectives

- **Describe** the functions of the three types of muscles.
- **Explain** how you can keep your muscular system healthy.

Vocabulary

- smooth muscle
- cardiac muscle
- skeletal muscle
- tendon
- muscle tone
- atrophy
- anabolic steroid
- strain
- tendonitis

Your Muscular System

Warm-Up

Myth No pain, no gain.

Fact Pain is not a sign of a good workout. Rather, pain is a signal from your body that you are working too hard or you have an injury. Continuing to exercise through the pain could lead to a more serious injury.

WRITING Where do you think most teens get their information about muscles? How factual do you think their information is?



The Muscles in Your Body

To open this book and turn its pages, you use muscles in your arms and hands. Muscles move your eyes as you read the printed words. Muscles in your chest allow you to breathe, and muscles in your heart pump your blood. Every time your body moves, muscles are at work.

Types of Muscle Your body has three types of muscle tissue that perform different functions—smooth muscle, cardiac muscle, and skeletal muscle. Some of these muscle tissues are involuntary muscle, which means they are not consciously controlled. Other muscles are voluntary muscle, which means they can be consciously controlled.

- **Smooth muscle** is involuntary muscle that causes movements within your body. Smooth muscles in the walls of your esophagus and intestines push food through your digestive system. Other smooth muscles in your blood vessels help circulate your blood.
- **Cardiac muscle** is involuntary muscle that is found only in the heart. Throughout your life, cardiac muscle allows your heart to beat and pump blood throughout your body.
- **Skeletal muscles** are the muscles that you control to do activities, such as walk or play a musical instrument. As the name indicates, skeletal muscles are attached to the bones of your skeleton. A thick strand of tissue called a **tendon** attaches a muscle to a bone.

Connect to YOUR LIFE skeletal muscles

Connect to YOUR LIFE Which type of muscle helps you move your jaw to chew your food?

WRITING and Health

L3 News Report

Instruct students to write a news story in which they report the functions of the three types of muscles. Students can choose to treat the story as breaking news

or a health update. In their stories, students should describe the three types of muscle tissue, the functions of each muscle tissue, and how muscles work.

2. Teach

L3 EL Reading/Note Taking 11-2

L2 Adapted Reading/Note Taking 11-2

The Muscles in Your Body

L3 Cooperative Learning

Give student pairs two strips of stiff paper or poster board, two lengths of string, paper fasteners, and a hole punch. Challenge students to use the materials to make a model of how skeletal muscles contract to move bones. Suggest they use the diagram of muscle pairs in Figure 6 as a guide. Then have students write a short description of how the model shows how skeletal muscles work.

L2 Visual Learning: Figure 6

Teaching Transparency 26

Refer students to the muscle pair shown in Figure 6. Encourage students to bend and straighten their arm at the elbow, feeling for the biceps and triceps contracting and relaxing. Ask: **Why are the biceps and triceps called a muscle pair?** (They are both needed to bend and straighten the arm at the elbow. As one contracts, the other relaxes.) Challenge students to identify what body part moves when the quadriceps contracts. (The lower leg bends at the knee.)

Caption Answer the frontalis

L4 Building Media Literacy

Challenge students to analyze a television commercial that advertises fitness equipment. Students should describe what the television commercial is advertising and how the product is supposed to improve muscle tone or strength. Then using reliable sources, students should evaluate the claims made by the television commercial. Have students give reasons for or against purchasing the fitness equipment.

How Muscles Work All muscles do work by contracting, or becoming shorter and thicker. Muscle cells, which are often called fibers, contract when they receive a nerve message to do so. As you can see in Figure 6, many skeletal muscles work in pairs. One muscle in the pair contracts to move the bone in one direction. Then, the other muscle in the pair contracts to move the bone back.

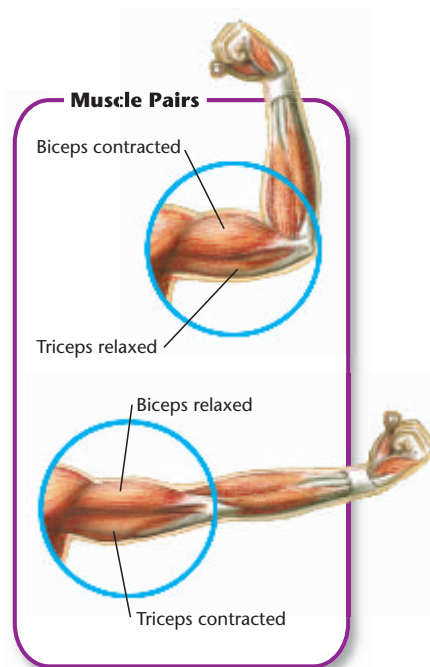
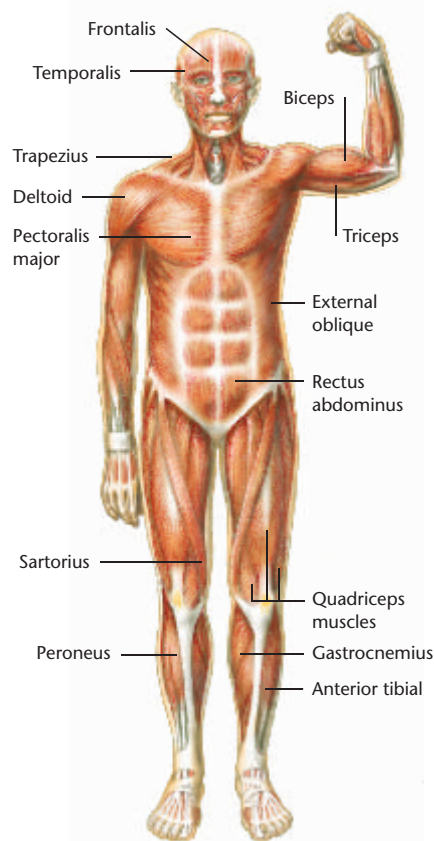
Muscle Tone Even when a skeletal muscle is not contracting to cause movement, a few of its individual muscle fibers are still contracting. These contractions are not strong enough to cause movement, but they do tense and firm the muscle. This slight tension is called **muscle tone**. For example, at any given moment the muscles in your neck contract just enough to keep your head upright, even when you are not moving your head. Muscle tone also keeps your muscles healthy and ready for action. Muscles that cannot contract due to injury, or are not used often, will weaken and shrink, a condition known as **atrophy**.

FIGURE 6 Skeletal muscles are attached to bones and participate in movement. Your biceps and triceps are an example of a muscle pair. When a biceps contracts and a triceps relaxes, your arm bends. Your arm straightens when a biceps relaxes and a triceps contracts.

Relating Cause and Effect

Which muscle contracts when you wrinkle your forehead?

The Muscular System



Movement and Coordination 273

Differentiated Instruction

L1 Special Needs

Smooth muscle movements are the most difficult for students to understand because they usually cannot feel these muscles move. Give students a cracker to eat. After they swallow the cracker, ask them to describe how it gets from their mouth to their stomach. Identify the location of the

stomach if necessary. Explain that the throat and esophagus have muscles all around them that squeeze the food down and into the stomach. Students can squeeze a tube of toothpaste to model this movement.

Keeping Healthy

L3 Content Update

Use the Web Code to access up-to-date information about stretching. Have students complete the Web activity.

L3 Building Health Skills

Setting Goals Have students assess their own exercise routine. They should list the activities they participate in and indicate whether these activities increase muscle strength or endurance. Also have students assess the amount of time they spend warming up and cooling down for these activities. Have students list in their journal the weaknesses in their exercise program. Then ask students to create an exercise plan that addresses these weaknesses and try it for two weeks. After two weeks, students should evaluate how well they implemented their plan and how their fitness improved.

L3 Cultural Connection

Discuss the perception of girls and exercise that may differ from culture to culture. Are girls expected to work out as hard as boys? Are they encouraged to strengthen their muscles in the same way as boys? Have students interview their parents and grandparents about how this trend has changed since they were your age.

Connect to YOUR LIFE Allow students to answer this question in their private journals.

Go Online
HEALTH LINKS™
For: More on stretching
Visit: www.SciLinks.org/health
Web Code: ctn-4112

Keeping Healthy

Like your bones, your muscles get stronger when you use them often. But you must take care to avoid overuse and injury. **You can maintain a healthy muscular system by regularly participating in different types of exercise. To help prevent injuries, exercise sessions should include a warm-up and cool-down period.**

Working Your Muscles Some types of exercise, such as running, increase a muscle's endurance—how long it can contract without tiring. Other exercises, such as lifting weights, make individual fibers grow, which causes the muscles to thicken and increase in strength.

To increase muscle size and strength, some athletes are tempted to use **anabolic steroids**, artificial forms of the male hormone testosterone. Doctors prescribe these drugs to treat people with certain muscle disorders. When used illegally, anabolic steroids are dangerous and can cause serious damage to many body systems. You will read more about the dangers of steroid use in Chapter 13.

Connect to YOUR LIFE

How many different types of exercise do you participate in?

FIGURE 7 Muscular strength and endurance are important in sports and in everyday activities.



274

Differentiated Instruction

L4 Gifted and Talented

Have students compare different local fitness centers, including some less-expensive ones such as Boys and Girls Clubs. Students should find out if the focus of each center is on muscle strength training or cardiovascular fitness; whether instructors have

training in physical education or physical therapy; and whether programs can be individually tailored to meet a person's needs and limitations. Students can make a chart to summarize their findings and present those findings to the class.

3. Assess


Evaluate

These assignments can help you assess students' mastery of the section content.

Section 3 Review

Answers appear below.

Teaching Resources

- Practice 11-2
- Section 11-2 Quiz 

L2 Reteach

Have students make a table that lists the three types of muscle tissue in the muscular system, the functions of each muscle tissue, and where the muscle tissue is found in the body.

L4 Enrich

Teaching Resources

- Enrich 11-2

Health at School

Martial Arts Class Advise students that they should speak with an instructor first to get permission for observing a class. Suggest that students tell the instructor they wish to observe how martial arts helps build muscular strength and endurance.

Avoiding Muscle Injuries You likely have felt muscle soreness immediately after exercise or in the days that followed. Some muscle soreness is normal, but pain can be a sign of a more serious injury.

- ▶ **Strains** A muscle **strain**, or a pulled muscle, is a painful injury that may happen when muscles are overworked or stretched too much or too quickly. Sometimes muscle fibers rip, resulting in a torn muscle.
- ▶ **Tendonitis** Overuse of tendons may lead to painful swelling and irritation called **tendonitis** (ten duh NY tis). Tennis elbow, which consists of pain in the forearm, is one example of tendonitis. Excessive use of a hand-held control while playing video games can also lead to tendonitis. You should not play video games for more than one hour without taking a break.

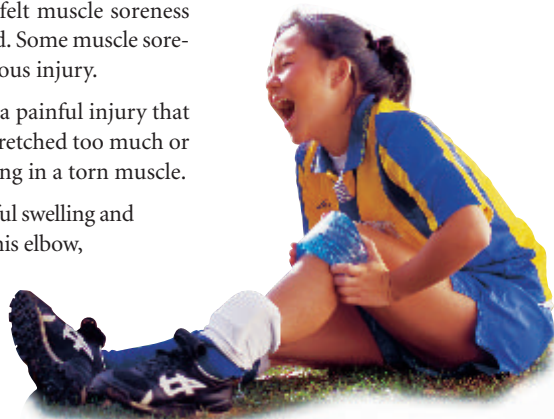


FIGURE 8 To help prevent muscle and tendon injuries, you should warm up properly and rest from exercise if you feel pain.

Treatment for muscle injuries usually includes rest, over-the-counter pain medication, and ice packs. If the injury is severe, surgery may be required.

Regular strengthening and stretching exercises can help you prevent injuries. Vary your exercise routine so that you are not always using the same muscles. Warm up before vigorous exercise, and include a cool-down period of mild exercise. Also, stop exercising if you feel sharp or sudden pain.

Preventing Muscle Cramps Have you ever felt a sudden, sharp pain in your leg or arm? If so, you may have experienced a muscle cramp, which is a strong, uncontrolled muscle contraction. To relieve a cramp, try massaging the affected area and exercising the limb gently. Stretching and drinking plenty of water before and during exercise can help you avoid muscle cramps.

Section 2 Review

Key Ideas and Vocabulary

1. Identify the three types of muscles and describe the location and function of each.
2. What is a **tendon**?
3. Explain what causes **muscle tone**. What causes the condition known as **atrophy**?
4. What can you do to prevent muscle injuries?
5. What is the cause of a muscle **strain**?

Critical Thinking

6. **Evaluating** Why is it an advantage that you do not have control over all of your muscles?

Health at School

Martial Arts Class Find out whether classes in martial arts such as judo, kendo, or tae kwon do are offered in your community. If so, observe a class. Then in a paragraph, describe to your classmates how the activity can help build muscular strength and endurance. **WRITING**

7. **Applying Concepts** Describe how a muscle pair in your thigh would work to bend and straighten your knee.

Movement and Coordination 275

Section 2 Review

1. Smooth muscle is found in many organs. It causes involuntary movements, such as pushing food through the digestive system. Cardiac muscle is found only in the heart and pumps blood through the body. Skeletal muscle is attached to bones and causes all skeletal movements.
2. A tendon attaches muscle to bone.
3. Muscle tone is caused by the slight tension of individual muscle fibers. Atrophy is caused when muscles weaken and shrink due to injury or disuse.
4. regular strengthening and stretching exercises, warming up and cooling down, and stopping exercise when feeling a sharp or sudden pain

5. muscles are overworked or stretched too quickly
6. Muscles that cause important body functions, such as digestion or circulation, continue to act without your control.
7. When the quadriceps at the top of the thigh contract and the muscles at the back of the thigh relax, the knee straightens. When the muscles at the back of the thigh contract and the quadriceps muscles relax, the knee bends.

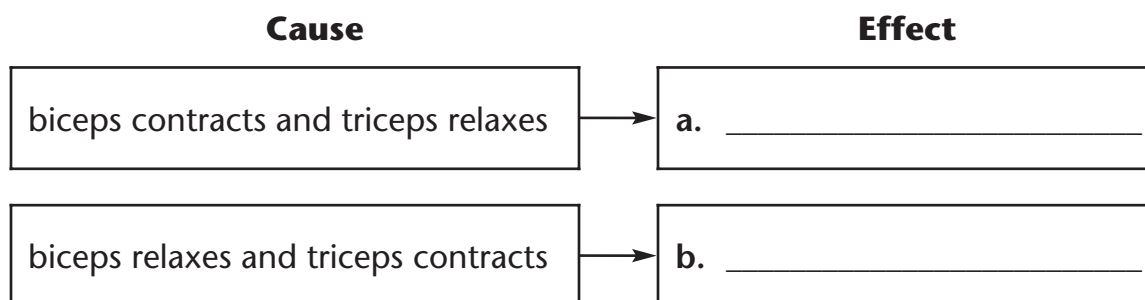
Section 11-2

Note Taking Guide**Your Muscular System** (pp. 272–275)**The Muscles in Your Body**

1. Complete the table about muscle types.

Muscle Type	Description	Example
a. _____	involuntary muscle that causes movements within the body	smooth muscle in blood vessels
b. _____	involuntary muscle found in the heart	allows heart to beat and pump blood throughout the body
c. _____	voluntary muscle that is attached to bones by ligaments	makes movement of limbs possible

2. Complete the graphic organizer about how a pair of muscles in your arm works.



3. What is *muscle tone*?

_____ a slight muscle contraction that tenses and firms the muscle

_____ a voluntary contraction that flexes and stretches the muscle

Section 11-2: Note Taking Guide *(continued)*

Keeping Healthy

4. Complete the sentences. Use the words and phrases from the box below.

strength	it increases how long the muscle can contract
endurance	it increases the muscle's size

- a. Running is a type of exercise that increases a muscle's _____,
because _____.
- b. Lifting weights is a type of exercise that increases a muscle's
_____, because _____.

5. Complete the table by identifying the kinds of muscle injury described.

Injury	Description	Prevention
a. _____	overworked or overstretched muscle	regular strengthening and stretching
b. _____	painful swelling and irritation of tendons	proper warm-up, rest if you feel pain
c. _____	strong, uncontrolled muscle contraction	stretching, drinking plenty of water

Section 11-2**Quiz**

Decide whether each statement is true or false. Write true or false in the space provided.

- _____ 1. You consciously control involuntary muscles.
- _____ 2. All muscles work by contracting.
- _____ 3. To keep up your muscle strength you should always practice the same exercise routine.
- _____ 4. Treatment for muscle injuries includes strenuous exercise.
- _____ 5. Some muscle soreness after exercise is normal.

Write the letter of the correct answer in the space provided.

- _____ 6. Involuntary muscle found only in the heart is called
 - a. smooth muscle.
 - b. cardiac muscle.
 - c. skeletal muscle.
 - d. voluntary muscle.
- _____ 7. Smooth muscles are involved in which one of the following activities?
 - a. pumping blood
 - b. walking
 - c. digesting food
 - d. playing a piano
- _____ 8. A tendon is a thick strand of tissue that attaches
 - a. muscles to nerves.
 - b. muscles to muscles.
 - c. bones to bones.
 - d. muscles to bones.
- _____ 9. Which is a condition that occurs when muscles weaken or shrink due to little use?
 - a. atrophy
 - b. muscle tone
 - c. strain
 - d. tendonitis
- _____ 10. A muscle strain is a(an)
 - a. overused tendon.
 - b. strong, uncontrolled muscle contraction.
 - c. pulled muscle.
 - d. strengthening exercise.

Section 3

Your Nervous System

Objectives

Before class begins, write the objectives on the board. Have students copy the objectives into their notebooks at the start of class.

1. Focus

Warm-Up Health Stats

Presentation
EXPRESS

After students finish completing the writing assignment, ask volunteers to share their responses. Ask the class if they have ever known anyone who suffered a head injury because they were not wearing a helmet. Did this experience affect their attitudes about helmets?

Teaching Transparency W38

Section 3

Objectives

- **Explain** the functions of the nervous system and the role of neurons.
- **Describe** the roles of the central nervous system and the peripheral nervous system.
- **Identify** the most important thing you can do to keep your nervous system healthy.

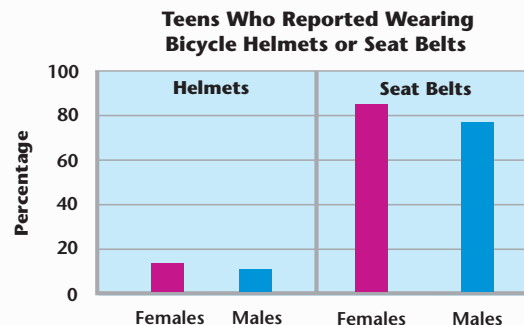
Vocabulary

- neuron
- cerebrum
- cerebellum
- brain stem
- spinal cord
- reflex
- concussion
- coma
- paralysis
- meningitis
- seizure
- epilepsy

Your Nervous System

Warm-Up

Health Stats This graph compares bicycle-helmet use and seat-belt use among teens.



WRITING Why do you think many more teens wear seat belts than bicycle helmets?

What Is the Nervous System?

Many of the actions you perform each day seem simple, but in reality, they are quite complex. For example, as you walk to class, the movement of your legs must be coordinated and your balance maintained. Also, your speed must be continually adjusted. Amazingly, your nervous system allows you to perform all of these actions while you think about your upcoming math test. **Your nervous system receives information about what is going on inside and outside of your body. Then it processes the information and forms a response to it.** These functions are accomplished with the help of the basic unit of the nervous system—a type of cell called a **neuron** (NOOR ahn).

Neuron Structure You can examine the structure of a neuron in Figure 9. **Neurons carry messages, or impulses, from one part of your body to another.** Notice that a neuron has three basic parts: dendrites, a cell body, and an axon. The junction where one neuron sends impulses to another neuron or another type of cell is called a synapse.

MATH and Health

L3 Ratios

The axon of a motor neuron that carries impulses to a foot is about 1 meter (1,000 mm) long. The diameter of its cell body is about 100 μm (0.1 mm). If students were to create a model of a nerve using a ping-pong ball as the cell body, how long

would its axon be? They should assume the diameter of a ping-pong ball is 3.8 cm. *(The length of the model's axon can be calculated using the ratio: $0.1 \text{ mm}/1,000 \text{ mm} = 38 \text{ mm}/x$. When solving for x , $x = (38 \times 1,000) \div 0.1 = 380,000 \text{ mm}$. The axon would be 380 m long.)*

Types of Neurons Three types of neurons are found in your nervous system. Each type of neuron has a specific role.

- **Sensory Neurons** Information about your external and internal environment is gathered by sensory neurons through your sense organs or other parts of your body. For example, when your phone rings, sensory neurons carry information about the noise from your ears to your brain.
- **Interneurons** Located only in the brain and spinal cord, interneurons pass impulses from one neuron to another. When your phone rings, interneurons receive the messages from your sensory neurons about the ringing noise. Your brain determines that the noise is coming from your phone and you make the decision to answer it.
- **Motor Neurons** By command of other neurons, motor neurons send nerve impulses to muscles and glands. In the example of your ringing phone, interneurons signaled thousands of motor neurons. The motor neurons then signaled your muscles to pick up the phone.

**Connect to
YOUR LIFE**

Which type of neuron signals your eyes to move across this page?

Neuron Structure

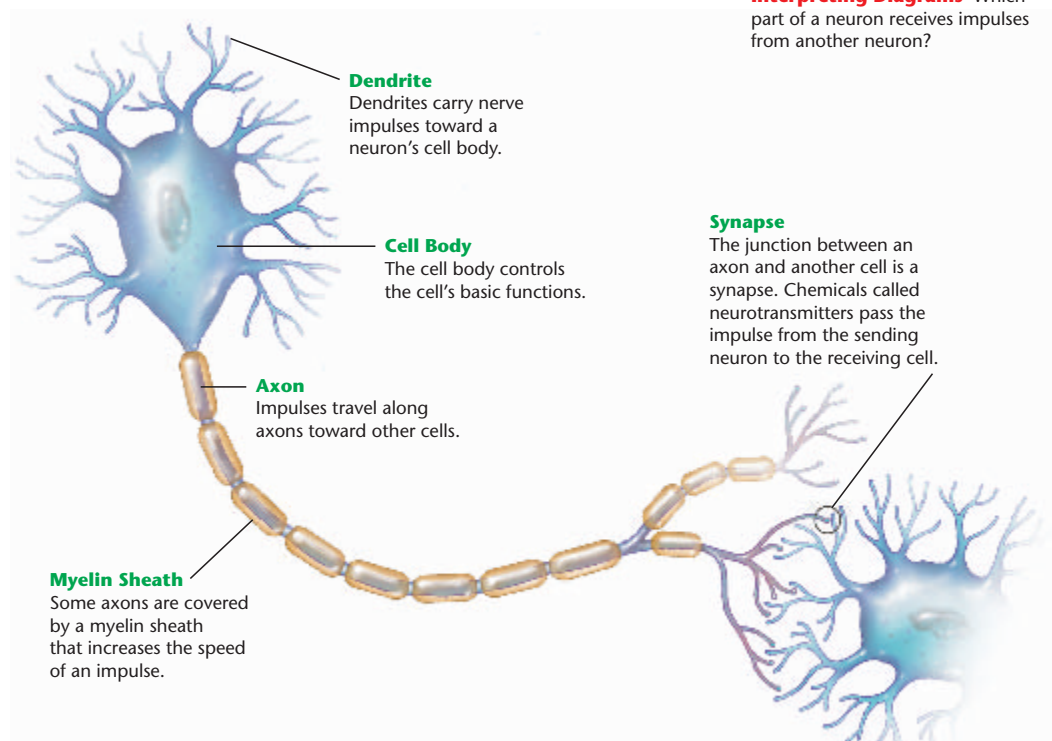


FIGURE 9 Neurons relay impulses to other neurons, or they may send commands, in the form of chemical signals, to muscles or glands.

Interpreting Diagrams Which part of a neuron receives impulses from another neuron?

Movement and Coordination 279

2. Teach

L3 EL Reading/Note Taking 11-3

L2 Adapted Reading/Note Taking 11-3

What Is the Nervous System?

L1 Active Learning

Divide the class into small groups. Have each group stand with their backs to you. Tell students that you will ring a bell and they should raise a hand when they hear the bell. Explain that the speed of their response has to do with how fast messages travel through the different types of neurons. Ask students to explain which neurons were involved in each step of the exercise. (*sensory neurons: carried information about the sound; interneurons: interpreted the sound and the instruction to raise a hand; motor neurons: carried signals to the muscles in their arms*)

L3 Visual Learning: Figure 9
Teaching Transparency 27

Refer students to Figure 9 and have them read about the parts of a neuron. Draw arrows on the Teaching Transparency to show the direction that nerve impulses travel through a neuron. Explain that most neurons do not touch each other. Ask: **What is the name of the area where two neurons meet?** (*synapse*) **How does an impulse move across the synapse?** (*chemicals called neurotransmitters pass the impulse across the synapse*) Explain that the effects of many drugs are caused by disrupting the messages transmitted by neurotransmitters.

Caption Answer dendrite

EL Building Vocabulary

Explain that the prefix *inter-* means "between." Ask: **How is the function of interneurons expressed by the word's prefix?** (*Interneurons pass impulses between two types of neurons.*)

**Connect to
YOUR LIFE**

motor neurons

Differentiated Instruction

L1 Special Needs

Have students model the movement of impulses from one neuron to another. Use yarn, string, or tape to make an outline on the floor of two neurons that share a synapse. On the dendrite side of the first neuron, place a stimulus like a bell. At the end of the axon of the second neuron, place a sign with *brain* written on it. Have students take turns ringing the bell and

handing off a card with *impulse* written on it. One student receives the "impulse" and carries it to the synapse at the end of the axon. The student stops and hands the "impulse" to a student who is acting as a neurotransmitter. The "neurotransmitter" hands the "impulse" to another student standing at the dendrite of the second neuron. This student carries the "impulse" to the brain.

Central Nervous System

L3 Addressing Misconceptions

Static Brain Students may think that their brains are already fully developed. Explain that the brain continues to develop into a person's twenties. During the teen years, further connections are made between neurons that affect emotions and between those that affect physical and mental skills. This allows for more efficient thinking as an adult. It also means that neuron connections that are not used during the teen years will be pruned away. Invite students to list in their journals the activities they are often engaged in, such as music, art, academics, sports, video games, television. Challenge students to assess whether they are training their brains to be the kind of adult they wish to be.

L2 Visual Learning: Figure 10

Teaching Transparency 28

Use Figure 10 to discuss the parts of the brain and their functions. Have students locate the three major parts of the brain in the figure. Ask such questions as: **What does the cerebrum control?** (*movement, memory, communication, and reasoning, and receives information from the senses*) **How do the left and right hemispheres of the cerebrum differ?** (*The right hemisphere controls muscles on the left side of the body and is associated with creativity and artistic ability. The left hemisphere controls muscles on the right side of the body and is associated with mathematical and logical thinking.*)

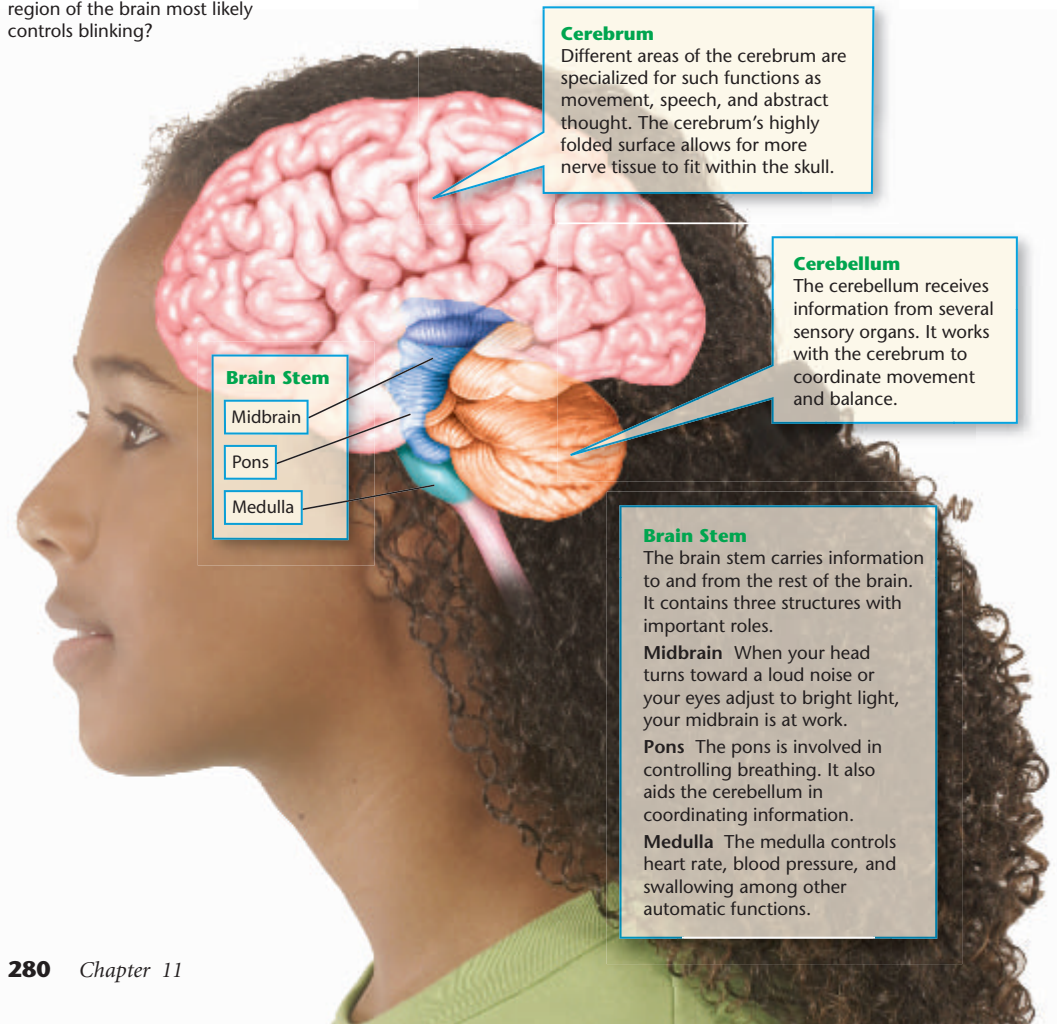
Caption Answer the brain stem

Central Nervous System

The nervous system consists of two major divisions—the central nervous system and the peripheral nervous system. **The central nervous system is the control center of the body. It includes the brain and spinal cord.** The peripheral nervous system (puh RIF ur ul) includes all the other parts of the nervous system, except for the brain and spinal cord.

The Brain The brain is a moist, spongy organ that weighs about 3 pounds. It is made up of about 100 billion neurons that control almost everything you do, feel, and remember. Within the skull, your brain is protected and cushioned by layers of membranes and fluid. The three major regions of the brain—the cerebrum, the cerebellum, and the brain stem—are shown in Figure 10.

FIGURE 10 Each of the three main regions of the brain—the cerebrum, the cerebellum, and the brain stem—carries out specific functions. **Predicting** Which region of the brain most likely controls blinking?



280 Chapter 11



Nerves vs. Neurons

A nerve is a bundle of thousands of fibers, or axons, from different neurons. Nerves are part of the peripheral nervous system. Not all neurons form nerves; the brain contains billions of neurons, but no nerves. When a neuron is stimulated, it responds by initiating and conducting an impulse along the

length of the cell. The nerves that conduct impulses to the central nervous system are called afferent, or sensory, nerves. Nerves that conduct impulses away from the central nervous system are called efferent, or motor, nerves. Efferent nerves stimulate muscles and glands.

Hands-On Activity

Mixed Messages

Test how well your brain can handle conflicting messages.

Material

watch or clock with second hand



green	blue	yellow
red	green	blue
blue	yellow	green
yellow	red	red
red	green	blue

Try This

- 1 Read the list of words while your partner times how long it takes you.
- 2 Notice that the words in the list are written in different colors. This time you should say the color of each word as your partner times you. Do not read the words, rather, identify their colors.

Think and Discuss

- 1 Did it take you more time to read the words or say the colors? Describe the experience of saying the colors.
- 2 Which part of your brain most likely works hardest during this activity? Which task is your brain better at—reading the words or identifying their colors?
- 3 Once people master basic skills such as tying shoes or reading, they perform them with little thought. How do you think this fact affected your results in this activity?
- 4 What do you think would happen if you asked a young child who has just learned to read to do this activity? Explain.

► The **cerebrum** makes up 85 percent of the brain's weight. It consists of several specialized regions that receive messages from sense organs, and control movement, memory, communication, and reasoning. A deep groove divides the cerebrum into left and right hemispheres. The right hemisphere controls the muscles on the left side of your body and the left hemisphere controls the muscles on the right side of your body. The right hemisphere is associated with creativity and artistic ability. The left hemisphere is associated with mathematical and logical thinking.

► The **cerebellum** (sehr uh BEL um) coordinates your body's movements and helps you keep your balance. Without the cerebellum, simple movements, such as picking up a glass of water without spilling it, would be impossible.

► The **brain stem** lies between the cerebrum and the spinal cord. The brain stem consists of three structures—the midbrain, pons, and medulla. These structures control many of your body's involuntary actions, such as your eyes' reaction to light, breathing, and sneezing.

Connect to YOUR LIFE

Which of the three main parts of your brain is most likely involved in yawning?

Movement and Coordination 281

Hands-On Activity

Mixed Messages

Invite student pairs to work on the activity together. Students can use the classroom clock or share watches to time each other. Encourage students to test family members at home.

Think and Discuss Answers

1. It usually takes longer to say the colors. Students might describe how they had to concentrate on thinking what the color was and ignoring that the letters spelled a word.
2. The cerebrum is most likely working hardest during the activity. The brain is better at reading the words.
3. *Sample answer:* Reading has become an activity that can be performed with little thought. My brain's first response was to read the word.
4. *Sample answer:* The child may have more difficulty reading the correct words, but say the correct colors easily. The words have less meaning to a child learning to read, especially because their reading requires a lot of thought. Naming colors is more automatic for young children than reading.

L2 Building Vocabulary

Guide students in creating a concept map for the nervous system. Students should show the parts of the central nervous system and their functions. Direct students to show the role of the peripheral nervous system and how it is related to the central nervous system. Suggest they also include neurons and their role in the nervous system.

Connect to YOUR LIFE

the brain stem

Differentiated Instruction

EL English Language Learners

When introducing the three major parts of the brain, use a symbol that alludes to each part's function. For example, when you talk about the cerebrum, write *cerebrum* on the board and draw a light bulb to represent ideas. Briefly mime a "light bulb" moment to make sure students understand the

meaning of the symbol. (For the cerebellum, draw a dancer standing on one leg to represent balance. For the brain stem, draw a heart to represent involuntary activities.) Give students phonetic spellings of the words accompanied with their symbols and a copy of Figure 10 to write notes on.

L3 Class Discussion

Emphasize that the spinal cord, while part of the central nervous system, links the brain to much of the peripheral nervous system. Briefly explain that the peripheral nervous system includes all the nervous tissue in the body except the brain and spinal cord. Ask: **How do most nerve impulses get to the brain?** (by traveling through the spinal cord) **When does the body react to the environment without nerve impulses reaching the brain?** (during a reflex action)

L3 Teacher Demo

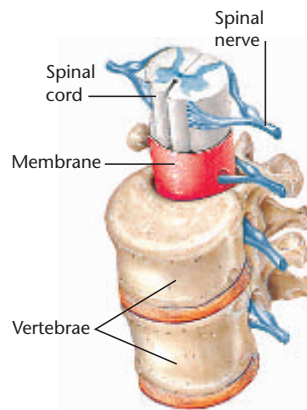
While students are distracted, drop a large book so that it slams loudly onto your desk. Invite students to describe their response or the response they observed in others. Guide students in realizing that they reacted to the sudden noise before they recognized what had really happened. Explain that the startle response is a reflex action, which is an automatic response to the environment. Ask: **How could your response to the sudden noise help protect you?** (prepares the body to avoid danger)

L1 Visual Learning: Figure 12

Teaching Transparency 29

Have student pairs get together. On separate pieces of paper, one student should write down the four steps of a reflex action in his or her own words. The steps should not be numbered. Then the second student should place the separate pieces of paper in the proper order.

FIGURE 11 The spinal cord links the brain to the peripheral nervous system. Information and commands travel to and from the central nervous system via spinal nerves.



The Spinal Cord The **spinal cord** is a thick column of nerve tissue that links the brain to most of the nerves in the peripheral nervous system. The spinal cord extends from the brain down the back. As you can see in Figure 11, the vertebrae of the backbone surround and protect the spinal cord. In addition, like the brain, the spinal cord is covered with protective membranes and bathed in fluid.

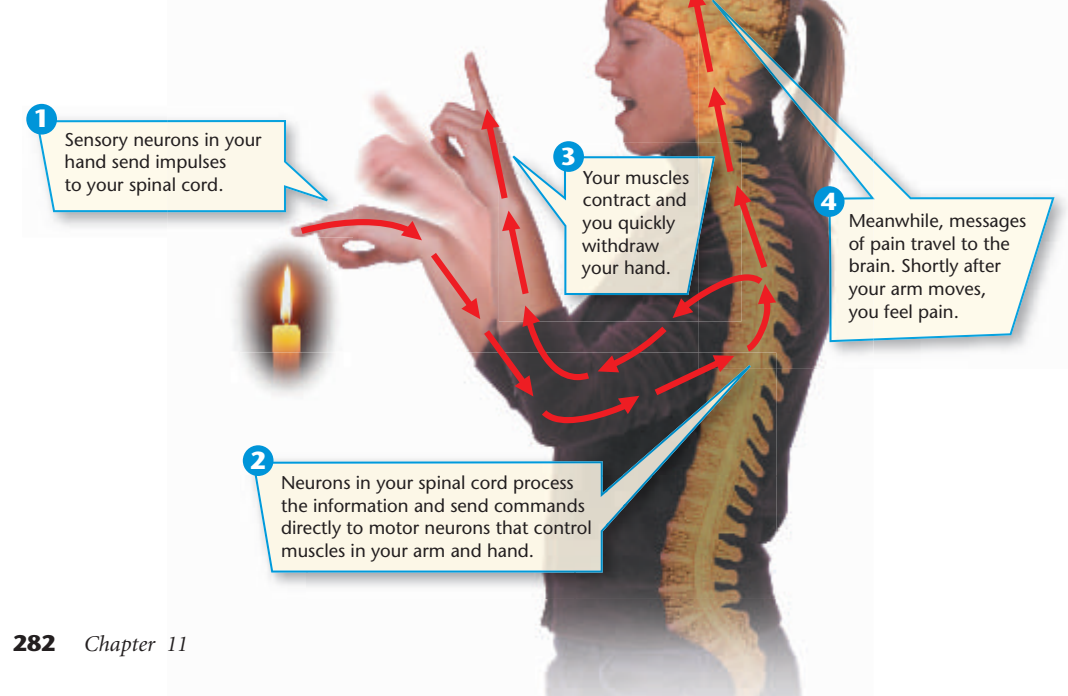
Nerve impulses travel from the brain, through the spinal cord, and then out to the rest of the body via spinal nerves. In the opposite direction, impulses travel from parts of your body via spinal nerves to the spinal cord, and then to the brain. Spinal nerves are part of the peripheral nervous system.

Reflexes What happens when you accidentally touch something hot, such as a flame? Most likely you have noticed that your hand automatically jerks away. This type of automatic response to your environment is called a **reflex**. A reflex action is shown in Figure 12.

In some reflex actions, the actions of the skeletal muscles are controlled by the spinal cord only—not the brain. These reflexes help protect your body from harm because they enable you to react very quickly. The brain receives separate signals but they take longer to arrive there. By the time the brain interprets the signals and you feel pain, the reflex action has already occurred.

A Reflex Action

FIGURE 12 Reflex actions allow you to react quickly in potentially harmful situations.



WRITING and Health

L3 Firsthand Account

Invite students to write a detailed description of a reflex response they have experienced. In their firsthand account, they should describe what the reflex response was and what caused it to occur. They

should also describe any feelings they might have had immediately after the response. Common reflex actions include the startle response, goose bumps, shivering, blinking or ducking, coughing, and sneezing.

Peripheral Nervous System

The **peripheral nervous system** includes the network of nerves that links the rest of your body to your brain and spinal cord. A nerve is a bundle or bundles of axons packaged with connective tissue. Notice in Figure 13 that the nerves of the peripheral nervous system branch from the central nervous system. The peripheral nervous system carries information to the central nervous system, and then carries responses from the central nervous system to the rest of the body. Based on these two functions, the peripheral nervous system is divided into a sensory division and a motor division.

Sensory Division Some nerves in the sensory division carry information about your outside environment from your ears, eyes, and other sense organs. Other sensory nerves carry information about internal body conditions such as blood pressure and heart rate. Both sets of sensory nerves deliver this information to the central nervous system.

Motor Division Once the central nervous system has processed the information from the sensory nerves, the motor division carries the responses back to your muscles and glands. The nerves of the motor division are divided into two groups based on the functions they control.

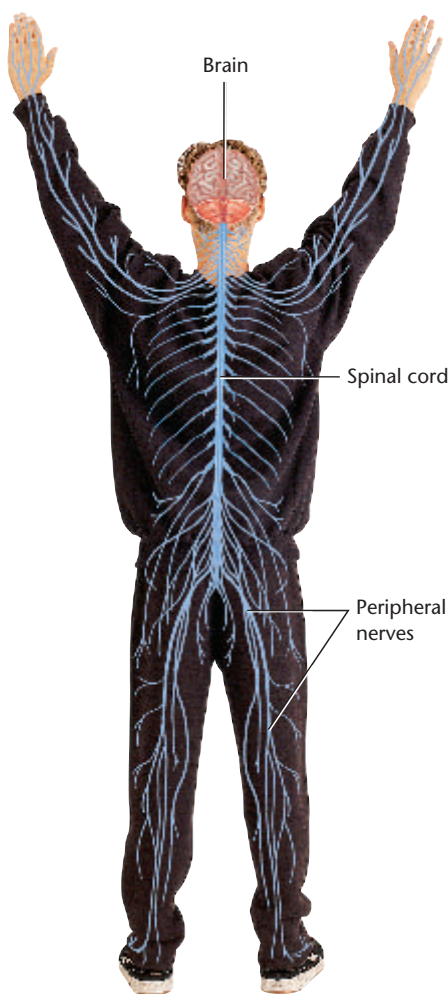
- ▶ **Somatic Nervous System** Motor nerves in the somatic nervous system carry signals that control voluntary actions such as chewing food or putting on a sock. For example, these motor neurons might signal skeletal muscles in your arm to raise your hand in class.

- ▶ **Autonomic Nervous System** Motor nerves in the autonomic nervous system regulate actions that happen automatically. These actions include such things as your breathing rate and digestion. For example, these motor neurons might carry signals to your heart to speed it up or glands in your eyes to release tears.

Connect to YOUR LIFE

How does your brain receive information about the smell of cookies baking?

FIGURE 13 The peripheral nervous system includes all the nerves that branch out from the brain and spinal cord.



Movement and Coordination 283

Peripheral Nervous System

L2 Building Vocabulary

Help students develop ways to remember the names of the different divisions of the peripheral nervous system. For example, linking the words *autonomic* and *automatic* will help them remember that the autonomic nervous system controls actions that happen without conscious thought.

L2 Cooperative Learning

Give student pairs a list of actions and have them identify whether sensory nerves or motor nerves are involved. If motor nerves are involved, students should identify whether the somatic or autonomic nervous system is involved. (Some examples of actions are scratching your arm, sneezing, watching television, walking, tasting a lemon, digesting food.) Then challenge students to name at least one example that involves each type of nerve.

L3 Building Health Skills

Communicating Point out that nonverbal communication is the result of the motor nerves in the somatic nervous system. These nonverbal signals are caused by environmental information picked up by sensory nerves or by thoughts and ideas originating in the brain in response to a conversation. Examples of nonverbal signals, or body language, include facial expressions, hand gestures, body movements, eye movements, and touch or amount of personal space. Explain that sometimes body language does not match what is being said, while other times it helps to clarify. As an example, ask students to share a time when they misunderstood the content of an e-mail. Then discuss how body language might have prevented this misunderstanding.

Connect to YOUR LIFE

Sensory nerves deliver the information about the smell to the brain.

Differentiated Instruction

L2 Less Proficient Readers

Guide students in making a flowchart that describes the path of a nerve impulse from the peripheral nervous system to the central nervous system and back again. Use a specific example that will trigger the senses, such as the sound of the doorbell ringing, to begin the flowchart. End the flowchart with a specific motor response,

such as answering the door. In the flowchart, students should identify which part of the peripheral nervous system is acting: the sensory division or the motor division. They should also identify which part of the motor division is acting: the somatic or autonomic system.

Keeping Healthy

L2 Class Discussion

Discuss the differences between a concussion and a coma. (A coma is period of deep unconsciousness caused by disease, injury, or drugs. A concussion is a bruise-like injury to the brain.) Ask students to describe the symptoms of a concussion. (vomiting, drowsiness, loss of consciousness, confusion, or nose bleeds) Ask: **Why should you stop what you are doing when you get a concussion?** (You could risk further injury to the brain.) **Why should head injuries be avoided?** (Head injuries can impact all aspects of your health because the brain interacts with all body systems.)

L3 Building Health Skills

Making Decisions Have students decide whether or not they should wear a helmet while biking. Instruct students to write the problem and list the possible alternatives. Then have them list the consequences of each alternative, both positive and negative. Finally, have students consider their values and make a decision. Students should write a paragraph that identifies the decision they made and explains why they made it.

L3 Cooperative Learning

Invite an athletic trainer, physical education teacher, or coach to class to talk about injuries they commonly see and how these injuries can be prevented. Before the class visit, have students break into small groups. Each group should brainstorm at least two or three questions to ask the speaker.

Connect to YOUR LIFE Allow students to answer this question in their private journals.



284 Chapter 11

Keeping Healthy

Rest, good nutrition, and daily exercise can help keep your nervous system functioning properly. **The most important step you can take to care for your nervous system is to protect it from injury.** Because your nervous system interacts with all your body systems, damage due to trauma, disease, or drugs can have a significant impact on your health.

Avoiding Head Injuries A severe bump to the head could cause brain tissue to hit the skull. This bruise-like injury to the brain is known as a **concussion**. Seek medical attention if, following a blow to the head, you lose consciousness, vomit, feel drowsy or confused, or your nose bleeds. These symptoms can indicate a concussion or an even more serious head injury, such as a cracked skull or bleeding within the brain.

Certain diseases or drugs that damage or kill nerve cells can also lead to impaired brain function. A severe brain injury from trauma, disease, or drugs could possibly result in a **coma**, which is a prolonged period of deep unconsciousness.

Head injuries can be avoided. Wear a helmet when you play contact sports, ski or snowboard, or ride a bicycle or skateboard. Always fasten your seat belt when traveling in a vehicle. Also, before diving into water be sure that it is deep enough and that there are no underwater hazards. Avoid drugs and alcohol. Many head injuries occur when people are under the influence of drugs and alcohol.

Avoiding Spinal Cord Injuries Spinal cord injuries can result in **paralysis**, or the loss of the ability to move and feel some part of the body. Paralysis to the legs or to the arms and legs occurs when some nerves are so damaged that they can no longer signal the muscles they control. The extent of the paralysis is often related to the location of the spinal cord injury. Spinal cord injuries can be avoided in much the same way as head injuries—fasten your seat belt in a moving vehicle, take care when diving, and avoid drugs and alcohol.

Connect to YOUR LIFE

What activities do you participate in that carry a risk of head or spinal cord injury?

FIGURE 14 In some sports, such as soccer, the risk of concussions is high. Teens who have had several concussions may have impaired memory and learning abilities.

TEENS Are Asking . . .

Q: I recently got a concussion. My doctor said I shouldn't participate in sports for several weeks. If I feel fine, why do I have to wait so long?

A: A concussion is a brain injury. Although you may not have symptoms, brain injuries need time to heal properly. The amount of

time you need to rest depends on the severity of the concussion and if you have had other head injuries recently. Someone with a head injury is more susceptible to repeated injury. Therefore, it is important that you follow your doctor's instructions.



Avoiding Nerve Injuries Individual peripheral nerves also can be injured. For example, people with jobs that include hours of cash register or keyboard use, or who play some musical instruments are prone to a nerve injury called carpal tunnel syndrome. The “carpal tunnel” is a passageway through which a nerve and many tendons travel from the forearm to the hand. Repeated movements of the wrist and fingers can cause the tendons to swell and squeeze the nerve. Other risk factors for this injury include obesity and diabetes.

Symptoms include weakness and numbness in the fingers and pain that travels from the wrist to the upper arm. Treatments include wrist splints, medications to control the swelling, or surgery. To help prevent carpal tunnel syndrome and similar nerve injuries, it is important to take breaks from repetitive motions and to maintain good posture.

Preventing Infections Nervous system infections are rare because its tissues are well protected. When infections do occur, however, they are often serious. For example, **meningitis** (men in jŷ tis) causes inflammation of the membranes surrounding the brain and spinal cord.

Meningitis symptoms are very similar to flu symptoms, but also include a stiff neck and severe headache. If you have not been vaccinated and have been exposed to a person with meningitis, talk to your doctor about preventive treatments. The most serious form of meningitis can be prevented with a vaccine. The vaccine is recommended for high school students and for college students living in dormitories.

A bite from an infected animal can transmit rabies, an infection of the central nervous system. Rabies is almost always fatal if not treated. Avoid contact with animals that act sick or behave strangely. If an animal bites you, seek medical attention.

FIGURE 15 Repetitive movements of the fingers and wrists can lead to a painful condition called carpal tunnel syndrome.



For: Updates on overuse injuries
Visit: www.SciLinks.org/health
Web Code: ctn-4113

Movement and Coordination 285

L2 Class Discussion

Invite volunteers to demonstrate how they typically sit at a computer. Point out both positive and negative aspects of their posture. Then ask: **Why is it important to have proper posture while keyboarding?** (*to prevent nerve injury*) Besides the examples listed in the text, what are some other jobs that involve repetitive movements? (*assembly line, operating machinery, filing*)

L3 Building Health Skills

Advocacy Meningitis can easily spread on college campuses—and even in high schools—because of the close proximity of students. Because the symptoms of meningitis are very similar to those of the flu, people can become very sick before realizing that they need medical attention. Have students prepare a public service announcement that advocates the prevention of bacterial meningitis through vaccination. Students should also describe what meningitis is, who gets it, how it is spread, symptoms, when to go to the doctor, and how to prevent it. Suggest that students prepare a video of their public service announcement and show it to the class.

L3 Addressing Misconceptions

Seizures A common myth about seizures is that a person can die from swallowing his or her tongue. Emphasize that this is physically impossible. Trying to hold down someone’s tongue could lead to jaw injury. Explain that most injuries sustained during a seizure are caused by falling. Advise students that if they witness someone having a seizure, they should make sure that the person is lying down comfortably and away from objects that could cause injury. They might also loosen a tight collar so it is easier for the person to breathe. They should tell someone to call 911 and wait with the person until emergency help arrives.

L3 Content Update



Use the Web Code to access up-to-date information about overuse injuries. Have students complete the Web activity.

Differentiated Instruction

EL English Language Learners

Write these terms on the board: *concussion, coma, paralysis, meningitis, epilepsy, migraine headache*. Give student pairs six index cards. Pairs should work together to describe each term in their own words.

They should write this description on a card without identifying the term. Then have pairs trade sets of cards and identify the term described on each card.

3. Assess

Evaluate

These assignments can help you assess students' mastery of the section content.

Section 3 Review

Answers appear below.

Teaching Resources

- Practice 11-3
- Section 11-3 Quiz



L2 Reteach

Have student pairs use the figures in the lesson to describe the roles of neurons, the central nervous system, and the peripheral nervous system. Pairs should write at least one sentence for each. Then invite pairs to share their sentences with the class.

L4 Enrich

Teaching Resources

- Enrich 11-3

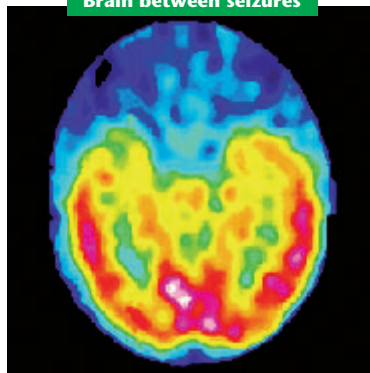
Health at Home

Memories Introduce the activity by explaining that memories are stored in the cerebrum. What is remembered and what is not may depend on how frequently the memory is accessed. Also, the feelings associated with a memory may influence how it is stored. After students have written their paragraph, invite them to make inferences about why the memories of the same event are different.

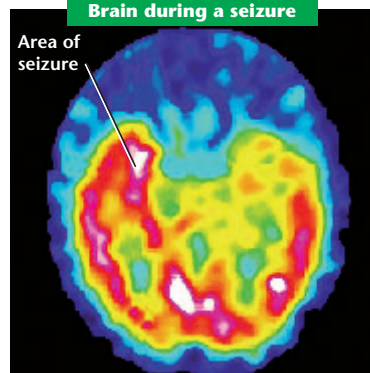
Section 3 Review

1. receives information, processes information, and forms a response
2. A neuron is a type of cell that carries messages. Sensory neurons gather information from inside and outside the body. Interneurons pass impulses from one neuron to another. Motor neurons signal muscles and glands.
3. The central nervous system is the control center of the body. The cerebrum, cerebellum, and brain stem
4. A reflex is an automatic response to the environment. It protects the body by allowing it to react very quickly.
5. A network of nerves throughout the body links the body to the spinal cord and brain.

Brain between seizures



Brain during a seizure



Living With Epilepsy Under certain conditions, a person's brain may experience sudden, uncontrolled nerve impulses. This flood of brain activity can lead to a **seizure**. Anyone can experience a seizure due to an injury or a bad reaction to a medication. However, people with a disorder called **epilepsy** are prone to seizures. Epileptic seizures vary widely in type and intensity, but include facial twitching, loss of awareness, and muscle spasms. Epilepsy has many causes including genetics, problems during prenatal development, diseases, and head injuries. Medication can reduce seizures in most people with epilepsy.

Preventing Headaches The most common problem of the nervous system that people experience are headaches. Tension headaches may be brought on by physical or emotional stress. Migraine (MY grayn) headaches are especially severe, long-lasting headaches. A person with a migraine is usually sensitive to light and noise and may experience nausea and blurred vision. The cause of migraines is not clear. Some scientists think that the brains of migraine sufferers may overreact to environmental signals.

In general, proper diet, exercise, and sleep can help prevent headaches. If you can identify certain foods or odors that trigger headaches, you may be able to avoid those triggers.

FIGURE 16 During a seizure, nerve cells in the brain fire erratically. Notice the area of increased brain activity in the image of the brain experiencing a seizure.

Section 3 Review

Key Ideas and Vocabulary

1. What functions does the nervous system perform?
2. What is a **neuron**? Name the three types of neurons and describe the function of each.
3. What is the role of the central nervous system? List the three main areas of the brain.
4. What is a **reflex**? How do reflexes protect the body?
5. How does the peripheral nervous system connect the central nervous system to the rest of the body?
6. Why is it so important to protect your nervous system from injury?

Health at Home

Memories Consider some of your early memories such as learning to ride a bike or a particular family vacation. Ask family members to describe their memories of the same event. In a paragraph, discuss how the memories of the same event differ from person to person. **WRITING**

Critical Thinking

7. **Evaluating** Suppose that after an accident, a person cannot feel or move his or her legs. What type of injury would you suspect? Explain.
8. **Classifying** After falling and hitting the back of her head, Lynn notices that she is having trouble catching her breath. Which part of her brain may have suffered damage in the fall?

Section 11-3

Note Taking Guide

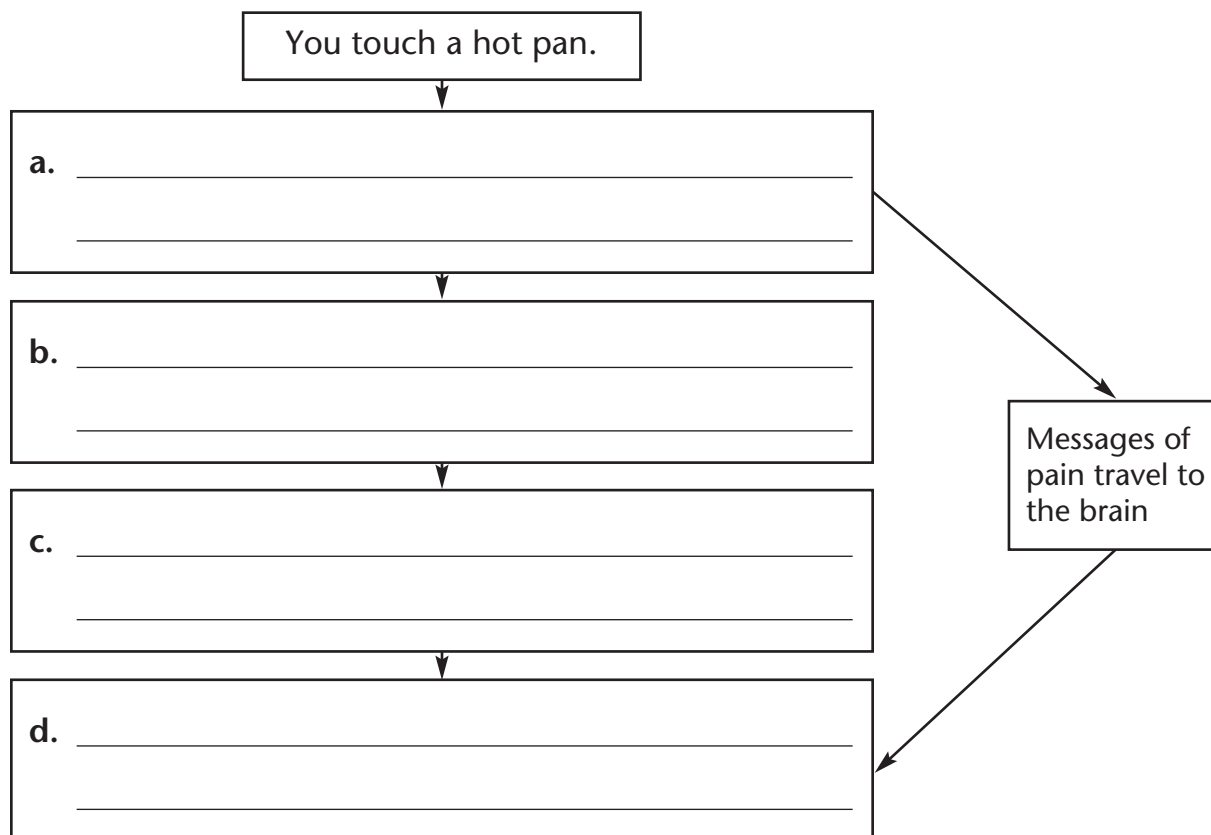
Your Nervous System (pp. 278–286)

What Is the Nervous System?

1. Describe the function of each type of neuron.
 - a. Sensory neurons gather information about your environment.
 - b. Interneurons _____.
 - c. Motor neurons _____.

Central Nervous System

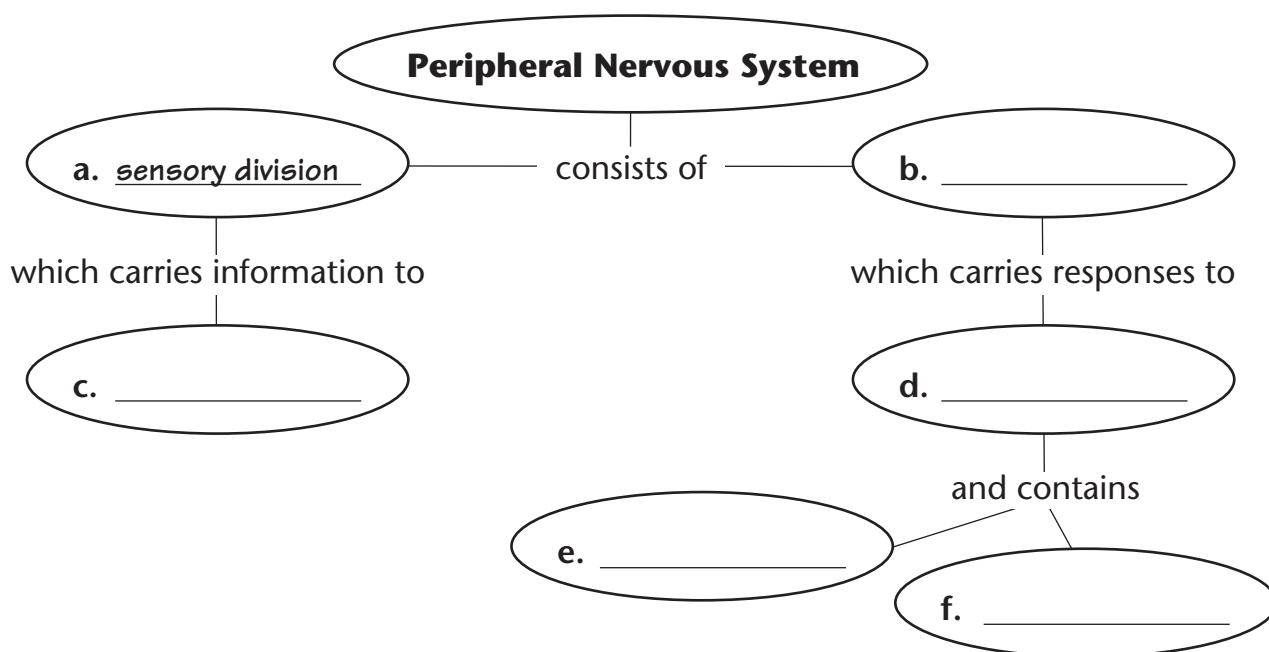
2. Describe the function of each major region of the brain.
 - a. Cerebrum controls movement, memory, communication, and reasoning.
 - b. Cerebellum _____.
 - c. Brain Stem _____.
3. Identify the main steps of a reflex action.



Section 11-3: Note Taking Guide *(continued)*

Peripheral Nervous System

4. Complete the concept map with details about the peripheral nervous system.



Keeping Healthy

5. Complete the table about ways to prevent nervous system injuries and diseases.

Injury or Disease	Prevention
Concussion or coma	a. <u>wear helmet and seat belt; avoid alcohol and drugs</u>
Paralysis	b. _____
Carpel tunnel syndrome	c. _____
Meningitis	d. _____
Headaches	e. _____

Section 11-3
Quiz

Write the letter of the correct answer in the space provided.

- | | |
|--|---------------|
| _____ 1. loss of ability to move and feel some part of the body | a. concussion |
| _____ 2. sudden, uncontrolled nerve impulses in the brain | b. coma |
| _____ 3. inflammation of the membranes surrounding the brain and spinal cord | c. paralysis |
| _____ 4. prolonged period of deep unconsciousness | d. meningitis |
| _____ 5. bruiselike injury to the brain | e. epilepsy |
| | f. seizure |

Write the letter of the correct answer in the space provided.

- _____ 6. The nervous system can directly perform all of the following actions *except*
- a. processing information.
 - b. moving the skeleton in response to information.
 - c. receiving information from inside and outside the body.
 - d. forming a response to information.
- _____ 7. The basic unit of the nervous system is the
- a. neuron.
 - b. cerebrum.
 - c. spinal cord.
 - d. synapse.
- _____ 8. Which function below is *not* performed by the central nervous system?
- a. thinking and reasoning
 - b. coordinating balance
 - c. sensing the environment
 - d. coordinating reflex actions
- _____ 9. Which *best* describes the peripheral nervous system?
- a. the basic unit of the nervous system
 - b. the center of memory, speech, and abstract thought
 - c. the link between the body and the brain and spinal cord
 - d. the control center of the body
- _____ 10. Which is the most important step you can take to care for your nervous system?
- a. eat well-balanced meals
 - b. consume plenty of calcium
 - c. exercise regularly
 - d. protect it from injury

Section 1

Your Cardiovascular System

Objectives

Before class begins, write the objectives on the board. Have students copy the objectives into their notebooks at the start of class.

1. Focus

Warm-Up Myth/Fact

Presentation
EXPRESS

After students complete the writing assignment, call on a few volunteers to read their ideas to the class. Typical responses might include hoping to understand how a heart beats, what the difference is between veins and arteries, or what blood consists of. After students have studied the cardiovascular system, ask them whether they learned what they had hoped to learn. If there are topics that have not been addressed, discuss where students could find the information.

Teaching Transparency W39

Connect to YOUR LIFE *Sample answer:* When you exercise, your cells need more oxygen to function. The cells also release more carbon dioxide as a waste product. You breathe harder to take in more oxygen and to release more carbon dioxide.

Section 1

Objectives

- **Describe** the main functions of the cardiovascular system.
- **Trace** the pathway of blood through the heart.
- **Identify** three types of blood vessels and the four components of blood.

Vocabulary

- atrium
- ventricle
- pacemaker
- artery
- capillary
- vein
- blood pressure
- hypertension
- plasma
- red blood cell
- white blood cell
- platelet

Your Cardiovascular System

Warm-Up

Myth Blood is blue in color when it is not carrying oxygen.

Fact Blood is bright red when it is carrying oxygen and dark red when it is not. Veins appear blue in some people because of the way light reflects from their skin.

WRITING What other knowledge about the cardiovascular system do you hope to gain from this chapter?



Functions of the Cardiovascular System

Whenever you feel the thumping of your heart or the steady pulse in your wrist, you are experiencing your cardiovascular system in action. Your cardiovascular system, or the circulatory system, consists of your heart, blood vessels, and blood. **The main functions of the cardiovascular system include delivering materials to cells and carrying wastes away. In addition, blood contains cells that fight disease.**

Delivering Materials Your heart continually pumps the blood in your blood vessels throughout your body. Many substances that your body needs dissolve in the blood. For example, blood picks up glucose from your digestive system and brings it to cells where it is used for energy.

Removing Wastes Your cardiovascular system also transports wastes from your cells. For example, when your cells break down glucose for energy, carbon dioxide is released as a waste product. Your blood picks up carbon dioxide and transports it to the lungs, where it is exhaled.

Fighting Disease Your blood contains cells that attack microorganisms that cause disease. It also contains substances that seal cuts, preventing blood loss and the entry of microorganisms.

Connect to YOUR LIFE Why do you think you breathe harder when you exercise?

MATH and Health

L1 Averages

Maria checked her pulse three times in one day. Her first pulse rate was 75 bpm (beats per minute). The second rate was 68 bpm. The third rate was 80 bpm. What is Maria's average heart rate? ($72 + 68 + 79 = 219$;

$219 \div 3 = 73$. Her average heart rate is 73 bpm.) Have students estimate how many times Maria's heart beats in one hour. ($73 \text{ bpm} \times 60 \text{ min/hr} = 4,380 \text{ beats per hour}$.)

The Heart

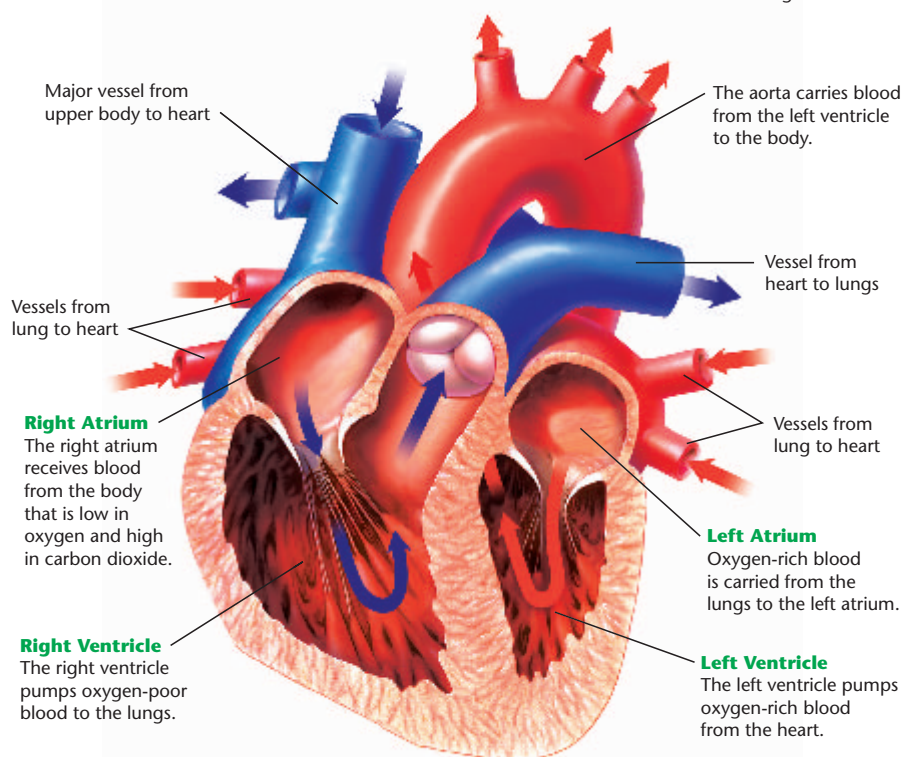
You can think of your cardiovascular system as a network of blood vessels with two major loops. The first loop leads from your heart to your lungs, where the blood releases carbon dioxide, picks up oxygen, and then returns to your heart. The second loop circles through to the rest of your body, where the blood delivers oxygen and nutrients and picks up wastes. The two loops cross paths at your heart. Each time the heart beats, strong cardiac muscles push blood through the blood vessels.

Structure of the Heart Figure 1 shows the structure of the heart. Notice that the heart has a right side and a left side, separated by a thick wall. Each side has two chambers: an upper chamber called an **atrium** (plural, *atria*) and a lower chamber, or **ventricle**. **The atria receive blood entering the heart. Blood flows from the atria to the ventricles, which pump blood out of the heart.** Between each atrium and ventricle, and between each ventricle and large blood vessel, is a flap of tissue called a valve. The valves allow blood to flow in only one direction.

FIGURE 1 Your heart is about the size of your fist. Blood travels from the right side of your heart to your lungs. The blood then returns to your heart's left side and is pumped throughout the body.

Interpreting Diagrams Which heart chamber receives blood from the lungs?

The Heart



Cardiovascular and Respiratory Health 293

2. Teach

L3 EL Reading/Note Taking 12-1

L2 Adapted Reading/Note Taking 12-1

Functions of the Cardiovascular System

L2 Building Vocabulary

Reinforce students' understanding of the cardiovascular system by examining the derivation of *cardiovascular*. Explain that *cardio-* comes from a Greek word for "heart," and *-vascular* comes from a Latin word for "vessel." Ask: **What does the cardiovascular system consist of?** (*heart, blood vessels, and blood*) Point out that although the system is often called the circulatory system, the term *cardiovascular system*—or "heart-vessel system"—is more descriptive of the system's structure.

The Heart

L3 Visual Learning: Figure 1

Teaching Transparency 30

Have students examine the diagram of the heart. Point out that the arrows in the diagram indicate the direction that blood flows. Ask: **What chamber of the heart pumps blood to the lungs?** (*the right ventricle*) **What happens to the blood that circulates through the lungs?** (*The blood releases carbon dioxide and picks up oxygen.*) **What chamber completes the first major loop of the cardiovascular system?** (*the left atrium*) **What two chambers are involved in the second major loop of the cardiovascular system?** (*The left ventricle pumps blood to the body, and the blood from the body returns to the right atrium.*)

Caption Answer the left atrium

Differentiated Instruction

L1 Special Needs

Pass out an unlabeled diagram of the heart that shows the four chambers and the valves between. Help students label each of the chambers. Then have students draw one box labeled "lungs" and a second box labeled "body" next to the heart. Have each student use a red crayon and a blue crayon to draw the pathway of blood through the cardiovascular system. Red should indicate

oxygen-rich blood. A red line should be drawn from the box labeled "lungs" to the left atrium, through the valve to the left ventricle, and to the box labeled "body." Blue should indicate oxygen-poor blood. A blue line should be drawn from the box labeled "body" to the right atrium, through the valve to the right ventricle, and to the box labeled "lungs."

L3 Online Activity

Use the Web Code to access an online activity about the heart. Have students complete the Web activity.

L3 Cooperative Learning

Help students locate the pulse near the wrist of the left hand. Direct them to the photo on page 305. Explain that the pulse they feel is the artery expanding and contracting as the heart pumps blood through the body. After all students have found their pulse, have students work in pairs to answer the Connect to Your Life question on page 295. Make sure all students have a watch or are in sight of a clock with a second hand. One partner can watch the clock while the other partner counts his or her pulse beats.

Blood Vessels**L2 Active Learning**

Use this activity to help students understand gas exchange between cells and capillaries. Pass out blue and red markers. Half the class should draw a large red dot on a piece of paper to represent oxygen. The rest of the class should draw a large blue dot to represent carbon dioxide. Have the “blue dots” stand clustered together as though they are in a cell. Have the “red dots” walk single file toward the “blue dots.” Remind students that during diffusion, substances move from an area of higher concentration to an area of lower concentration. Ask: **What will happen when the oxygen in the capillary meets the carbon dioxide in the cell?** (*The red dots will diffuse into the cell and the blue dots will diffuse into the capillary.*)

For: More on the heart
Visit: PHSchool.com
Web Code: ctd-4121

Your Heartbeat The action of the heart has two main phases. In the first phase, the heart relaxes and the atria fill with blood. In the second phase, the heart contracts and pumps blood. First the atria contract, pumping blood into the ventricles. Then the ventricles contract, pumping blood into the large blood vessels going toward the lungs or toward the rest of the body. The familiar *lub-dub* sound of a heartbeat occurs during the pumping phase. As the valves between the atria and ventricles close, the *lub* sound is made. The *dub* sound is heard when the valves between the ventricles and large blood vessels close.

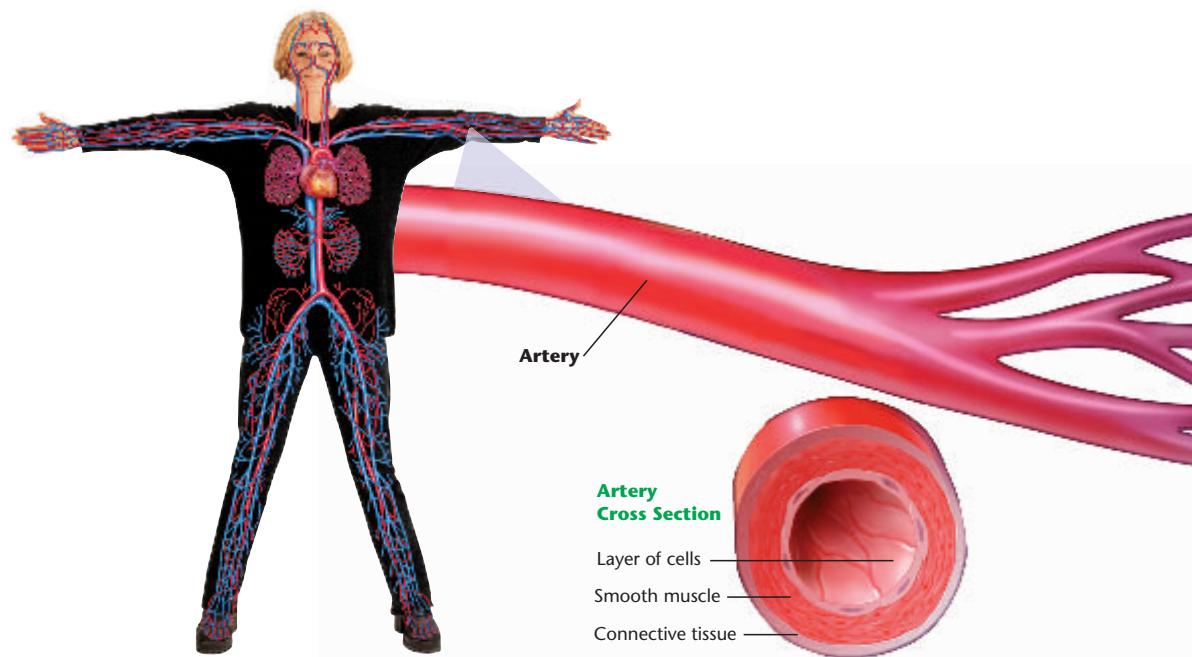
The rate at which your heart muscles contract is regulated by the **pacemaker**, a small group of cells in the wall of the right atrium. The pacemaker receives messages from your brain to increase or decrease your heart rate.

Average heart rate varies from one person to the next and from one situation to the next. Your heart most likely beats about 70 to 80 times per minute when you are inactive. When you exercise, your heart speeds up in response to the body’s need for more oxygen and nutrients and to remove excess carbon dioxide.

Blood Vessels

Your heart pumps blood through an extensive network of blood vessels. If all the blood vessels in your body were placed end to end, they could wrap around Earth more than two times. **The three main types of blood vessels in your body are arteries, capillaries, and veins.**

FIGURE 2 Blood flows from the heart through arteries, capillaries, and then veins.

**WRITING and Health****L3 Descriptive Writing**

Have students describe the beating of the heart and what happens inside the heart as if they were writing to inform a middle school student—that is, someone who has little detailed knowledge about the heart. Ask students to use terms from the chapter. Their descriptions should be clear and

detailed. This activity requires students to describe the heart so thoroughly that any gaps or misconceptions in their knowledge will be revealed to them as they write. Let students use their textbooks as needed to fill any gaps and correct any errors.

Arteries Blood vessels that carry blood away from the heart are called **arteries**. Most arteries carry oxygen-rich blood. The exceptions are the arteries that carry oxygen-poor blood from the heart to the lungs.

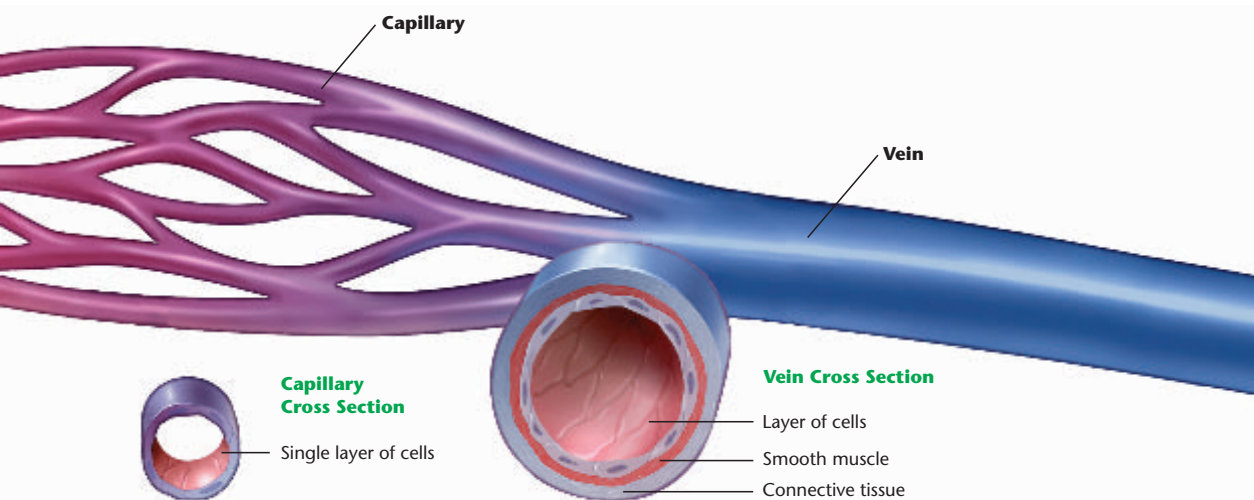
The largest artery in the body is the aorta (ay AWR tuh). Blood leaves the left ventricle through the aorta, which branches into many smaller arteries that carry blood to your organs, muscles, and bones.

As you can see in Figure 2, arteries have thick walls that are both strong and flexible. When your ventricles contract, blood surges through your arteries, causing their elastic walls to expand and then relax. The pulse you feel in your wrist occurs when an artery expands.

Capillaries Branching from the smallest arteries are **capillaries**, the smallest blood vessels in your body. As blood flows through the capillaries, oxygen and dissolved nutrients diffuse through the capillary walls and into your body's cells. At the same time, wastes from body cells, such as carbon dioxide, diffuse into the blood. Capillaries also are involved in temperature regulation. When you are cold, the capillaries near the surface of your skin narrow and keep heat in your body. When you are warm, they expand and allow excess heat to escape your body.

Veins From the capillaries, blood flows into small blood vessels that join together to form veins. **Veins** are large, thin-walled blood vessels that carry blood to the heart. By the time blood reaches veins, the pumping force of the heart has little effect. Skeletal muscle contractions help to squeeze blood back toward the heart. Valves inside the veins prevent blood from flowing backward.

Connect to YOUR LIFE Locate the pulse in your wrist. How many times does your pulse beat in one minute?



Cardiovascular and Respiratory Health 295

L2 Building Vocabulary

Help students remember the difference between arteries and veins by having them associate the phrase “away from” with arteries. Ask: **Which type of blood vessel carries blood away from the heart?** (*arteries*) Point out that both *away from* and *arteries* start with the letter *a*.

L3 Teacher Demo

You can show students which way blood flows through veins with a visual demonstration on your arm or on an arm of a student volunteer. The arm you use must prominently show a blue vein on the forearm running from the wrist to the elbow. As students observe, press down on the vein near the wrist. While pressing down with one hand, trace the vein's path with a finger of your other hand along the forearm to the elbow, gently applying pressure as you move up the vein. The vein should disappear until you release the pressure on the vein near the wrist. Ask: **From what you've observed, what can you tell about the direction the blood flows in this vessel?** (*The blood flows from the wrist toward the elbow, because pressing down on the vessel near the wrist stopped the flow of blood.*) **What stops the blood from flowing back toward the wrist from above the elbow?** (*valves inside the vein*)

Connect to YOUR LIFE Answers will vary. A healthy heart often beats 70 to 80 times a minute, though there is wide variation among individuals.

Differentiated Instruction

L2 Less Proficient Readers

Use a cycle diagram to show students how to organize the information about the flow of blood through the heart and the blood vessels. Begin the diagram with the flow of blood from the body into the right atrium. Blood then flows into the right ventricle, which pumps blood to the lungs. Blood flows from the lungs into the left atrium,

then into the left ventricle, which pumps blood through the aorta to the body. The aorta branches into many smaller arteries that carry blood to all parts of the body. Blood flows from the arteries into the capillaries, then into small blood vessels that join to form veins. Veins carry blood back to the right atrium.

L2 Cooperative Learning

Ask a school nurse to demonstrate to the class how a blood pressure reading is taken. The nurse's presentation should include an explanation of how a sphygmomanometer works and a differentiation between systolic and diastolic readings. Before the class visit, have students break into small groups. Each group should brainstorm at least two questions about blood pressure to ask the nurse.

L3 Building Health Skills

Advocacy Have groups make posters to inform the public about what blood pressure is, what blood pressure readings mean, what different ranges of blood pressures indicate, and why people should have their blood pressure checked. The poster may include drawings, cartoons, or other images that would catch a person's eye. Encourage students to find places in the community to display their posters with permission.

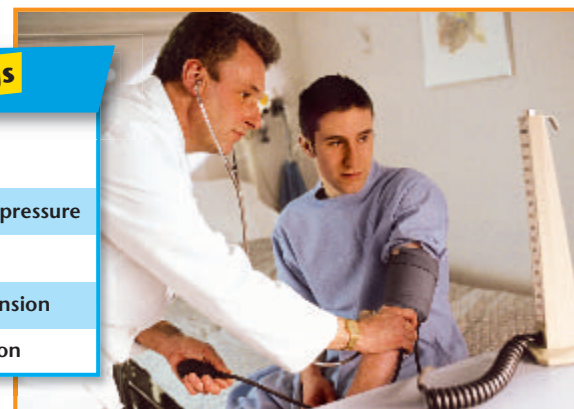
L3 Addressing Misconceptions

Age and Blood Pressure Many people think of high blood pressure as a normal part of the aging process. Explain that blood pressure does not naturally rise as one gets older. Factors that contribute to high blood pressure include a poor diet, lack of exercise, and an increase in body weight. Explain that there appears to be a connection between hypertension and age because years of poor health habits tend to catch up on people as they age.

Connect to YOUR LIFE Allow students to answer this question in their private journals.

Blood Pressure Readings	
Reading (in millimeters of mercury)	Condition
Less than 90/60	Low blood pressure
90/60 to 119/79	Normal
120/80 to 139/89	Prehypertension
140/90 or greater	Hypertension

FIGURE 3 Blood pressure varies from person to person. Factors such as age, weight, fitness, and mood affect blood pressure.



Measuring Blood Pressure Visits to a doctor usually include having your blood pressure measured. **Blood pressure** is the force with which blood pushes against the walls of your blood vessels.

Figure 3 shows a sphygmomanometer (sfig moh muh NAHM uh tur), an instrument used to measure blood pressure. The healthcare provider pumps air into the cuff around the patient's upper arm until a large artery presses closed. As air is released from the cuff, the provider listens for the sound of flowing blood and records the reading from the sphygmomanometer. This first reading represents the *systolic pressure*—the pressure caused when the heart's ventricles contract. When the sound stops, the provider records the second reading. This second reading is the *diastolic pressure*—the pressure when the ventricles are relaxed.

Blood pressure readings are recorded as the systolic pressure over the diastolic pressure. For example, a person with a reading of 120/80 has a systolic pressure of 120 and a diastolic pressure of 80.

- ▶ **Normal Blood Pressure** Blood pressure readings vary from person to person. A blood pressure reading is considered normal if it falls within the range of 90/60 to 119/80.
- ▶ **Low Blood Pressure** Blood pressure lower than 90/60 is considered to be low blood pressure. Doctors are not usually concerned if blood pressure is slightly low, unless symptoms indicate that organs are not receiving enough oxygen. Causes of low blood pressure include medications, dehydration, and allergic reactions.
- ▶ **High Blood Pressure** A person whose blood pressure is consistently 140/90 or greater has high blood pressure, or **hypertension**. People with a blood pressure between 120/80 and 139/89 have "prehypertension," and are likely to develop hypertension in the future. You will read about the dangers of hypertension in Section 2.

Connect to YOUR LIFE When was the last time your blood pressure was measured? What was the measurement?

**Blood Pressure Near the Heart**

The traditional method of measuring blood pressure involves using the inflated arm cuff. Until 2005, medical professionals assumed that measuring arm blood pressure indicated the body's blood pressure. A 2005 study of the effectiveness of blood-pressure medicines showed that blood pressure measured in the arm is not always the same as blood

pressure near the heart. The study also showed that blood pressure near the heart might be a better predictor of heart attack or stroke. These results have significance for which medicines doctors should prescribe, because some medicines lower blood pressure near the heart better than others.

Blood

The average adult has about 4 to 6 quarts of blood circulating through his or her blood vessels. Blood is a complex tissue that consists of cells and cell pieces in a watery solution. **The four components of blood are plasma, red blood cells, white blood cells, and platelets.**

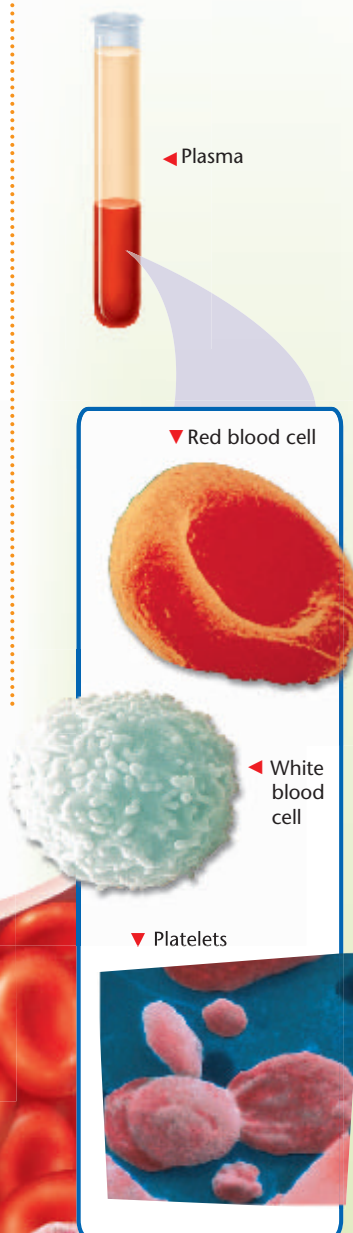
Plasma The liquid component of the blood is called **plasma**. This straw-colored liquid makes up about 55 percent of the blood. Plasma is mostly water, with substances such as nutrients, hormones, and salts dissolved in it. These substances are necessary for many processes that occur in cells. Plasma also carries waste products such as urea to the kidneys for removal from the body.

Red Blood Cells The cells that carry oxygen from the lungs to all the parts of your body are **red blood cells**. Red blood cells contain hemoglobin, which is an iron-containing substance to which oxygen binds. The reaction between oxygen and the iron in hemoglobin gives blood its bright red color. Once oxygen has diffused to tissues, blood becomes a dull red.

White Blood Cells Your body's **white blood cells** help protect you against diseases and foreign substances. They are larger than red blood cells, but far less numerous. There are several kinds of white blood cells. Some white blood cells make chemicals that help your body resist diseases such as cancer. Others destroy invading microorganisms by surrounding and consuming them.

Platelets **Platelets** (PLAYT lits) are cell fragments that play an important role in the blood clotting process. When you get a cut, platelets stick to the edges of the cut and release proteins called clotting factors. Clotting factors and other plasma proteins form a net of fibers across the cut. The fibers trap more platelets and blood cells until a plug forms to seal the cut. When the plug dries, it forms a scab.

FIGURE 4 Blood consists of liquid plasma, red blood cells, white blood cells, and platelets.



Blood

L1 Active Learning

Have students use colored modeling clay to make models of the three different types of blood cells. After they have completed their models, have students draw and label a picture of each type of blood cell.

L3 Cultural Connection

Point out that in different regions of the world some blood types are more common than others. The distribution of blood types in the United States is 45 percent type O, 40 percent type A, 11 percent type B, and 4 percent type AB. Meanwhile, in most parts of Central and South America type A blood is very rare. Many Americans do not know their blood type. However, in Japan many people think that a person's blood type influences his or her personality.

L2 Visual Learning: Figure 5

Have students examine the table about safe blood transfusions. Ask: **Why might a person need a blood transfusion during surgery?** (to replace blood lost as a result of cutting through blood vessels) If a surgical patient has blood type B, what blood types can that patient safely be given in a transfusion? (type B or type O) What would happen if that patient were given blood type A? (The blood would clump together in the patient's blood vessels.)

Caption Answer blood types A and O

Differentiated Instruction

EL English Language Learners

Have students pronounce the word *hypertension*, and then discuss common usage of the word *tension*. The word can be used to describe an emotional state or, as in this case, a physical property of a material. To illustrate the concept of tension, stretch a

rubber band and point out that you are increasing the tension on the rubber band. Explain that the prefix *hyper-* means "above and beyond" or "excessive." Hypertension is tension of the blood vessels over and beyond what is healthy.

3. Assess

Evaluate

These assignments can help you assess students' mastery of the section content.

Section 1 Review

Answers appear below.

Teaching Resources

- Practice 12-1
- Section 12-1 Quiz



L2 Reteach

List the section's vocabulary terms on the board. Point to each word in turn and have students brainstorm facts about that term. Record the key facts. For terms that students know little about, have them reread relevant passages in the section. Suggest that students record the facts for each term in their notebooks.

L4 Enrich

Teaching Resources

- Enrich 12-1

Health and Community

Blood Drive You may want to divide the class into small groups for this activity and have each group produce its own fact sheet and list of local blood drives. Encourage students to find suitable places in the community to display their fact sheets and lists.



FIGURE 5 If you ever need a transfusion, your blood type will be checked to make sure you receive the correct blood.

Reading Tables If you have blood type A, what blood type(s) could you safely receive?

Safe Blood Transfusions

If You Have Blood Type	A	B	AB	O
You Can Receive Blood Type(s)	A and O	B and O	A, B, AB, and O	O

Blood Types A person's blood type is determined by the proteins present on the surface of the red blood cells. Depending on which proteins are present, a person's blood type can be type A, B, AB, or O.

A second blood type is determined by the presence or absence of the Rh factor protein. If your red blood cells have the Rh factor, your blood is said to be Rh positive. If your red blood cells lack the Rh factor, your blood is Rh negative. About 85 percent of people are Rh positive.

Transfusions After an injury, surgery, or some illnesses, a person may require a blood transfusion. During a transfusion, blood from a donor is transferred to the patient's bloodstream. Donated blood is tested to identify the blood type. It is also screened for the presence of some microorganisms such as those that cause hepatitis or AIDS.

Why is blood type important? If a patient is given the wrong blood type during a transfusion, the blood will clump together in the patient's blood vessels. This is a life-threatening reaction. Figure 5 shows which blood types can be given safely during a transfusion.

Section 1 Review

Key Ideas and Vocabulary

1. List the three main functions of the cardiovascular system.
2. Describe the pathway of blood through your heart starting at the right atrium.
3. List the three types of blood vessels in the order in which they receive blood from the heart.
4. Name the four components of blood and their role in the body.

Critical Thinking

5. **Applying Concepts** What is the function of a closed heart valve?

Health and Community

Blood Drive Contact your local chapter of the American Red Cross to find out about upcoming blood drives in your community. With their guidance, prepare a fact sheet describing the requirements for and the importance of donating blood. Get permission to display the fact sheet and a list of local blood drives in a community building or your school.

6. **Predicting** How might low levels of iron affect the blood's ability to transport oxygen?
7. **Evaluating** Why are people with blood type O called "universal donors"? Why are people with blood type AB called "universal recipients"?

Section 1 Review

1. delivering materials, removing wastes, and fighting disease
2. Blood flows from the right atrium into the right ventricle, through the lungs, into the left atrium, and into the left ventricle.
3. arteries, capillaries, veins
4. Plasma: transports many necessary substances and wastes. Red blood cells: carry oxygen. White blood cells: protect the body from disease and foreign substances. Platelets: help in the clotting process.
5. A closed heart valve prevents blood from flowing in the wrong direction.
6. Iron is needed to make hemoglobin—the substance that transports oxygen.
7. Anyone can receive blood type O. People with blood type AB can receive any type of blood.

Section 12-1

Note Taking Guide

Your Cardiovascular System (pp. 292–298)

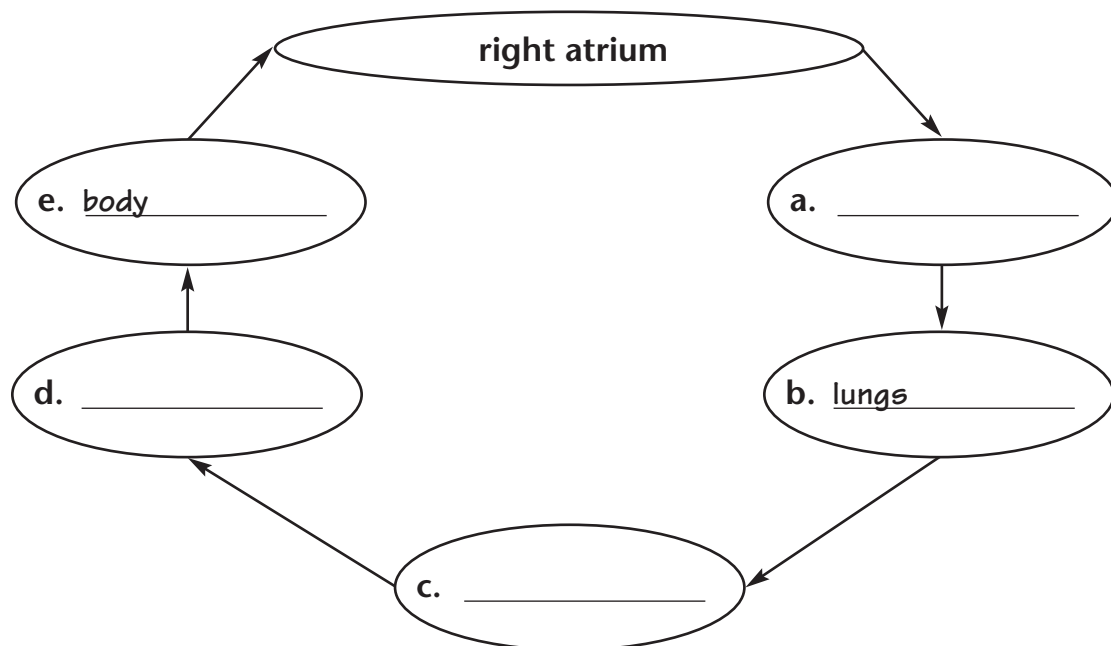
Functions of the Cardiovascular System

1. What are the three main functions of the cardiovascular system?

- delivering materials to cells
- _____
- _____

The Heart

2. Complete the graphic organizer to trace the path of a blood cell, starting in the right atrium.



3. Fill in the blanks to complete the sentence that describes how the heart beats.

First the **a.** _____ contract, pumping blood to the **b.** _____. Then the **c.** _____ contract, pumping blood to the **d.** _____ and the rest of the body.

Section 12-1: Note Taking Guide *(continued)*

Blood Vessels

4. Complete the graphic organizer about blood vessels. Use the phrases from the box below.

smallest blood vessels have thick, strong walls carry blood to the heart
 contain valves deliver oxygen to cells

Main Idea: The three main types of blood vessels in your body are arteries, capillaries, and veins.		
Arteries	Capillaries	Veins
<p>a. Function <u>carry</u> <u>blood away from</u> <u>the heart</u></p> <p>b. Structure _____ _____ _____</p>	<p>c. Function _____ _____ _____</p> <p>d. Structure _____ _____ _____</p>	<p>e. Function _____ _____ _____</p> <p>f. Structure _____ _____ _____</p>

5. Name the two readings in a blood pressure measurement and explain what each reading measures.
- a. The first reading is the _____.
 It is a measurement of blood pressure when the heart's ventricles _____.
- b. The second reading is the _____.
 It is a measurement of blood pressure when the heart's ventricles _____.

Section 12-1: Note Taking Guide *(continued)*

Blood

6. Complete the table about the blood components. Use the terms from the box below.

Platelets Red blood cells Plasma White blood cells

Blood Component	Description	Function
a. _____	straw-colored liquid made mostly of water	carries waste products to kidneys
b. _____	contain hemoglobin	carry oxygen from the lungs to all parts of the body
c. _____	larger but less numerous	help the body resist diseases
d. _____	cell fragments	release proteins to help blood to clot

7. Complete the table with the type of blood each patient could receive in a blood transfusion.

Patient	Can Receive Blood Type(s)
Patient 1: Type A	a. <u>A and O</u>
Patient 2: Type B	b. _____
Patient 3: Type AB	c. _____
Patient 4: Type O	d. _____

Section 12-1**Quiz**

Write the letter of the correct answer in the space provided.

- | | |
|--|-----------------------------|
| _____ 1. blood vessels that carry blood to the heart | a. atrium |
| _____ 2. a lower chamber of the heart that pumps blood from the heart | b. ventricle |
| _____ 3. cells that carry oxygen from the lungs to all parts of the body | c. arteries |
| _____ 4. an upper chamber of the heart that receives blood | d. veins |
| _____ 5. blood vessels that carry blood away from the heart | e. red blood cells |
| | f. white blood cells |

Decide whether each statement is true or false. Write true or false in the space provided.

- _____ 6. One main function of the cardiovascular system is delivering materials to cells.
- _____ 7. Blood flows from the atria to the ventricles.
- _____ 8. The smallest blood vessels are capillaries.
- _____ 9. The main role of white blood cells is to aid with the clotting process.
- _____ 10. A person with type O blood can accept blood from any donor.

Cardiovascular Health

Warm-Up

Quick Quiz Only one of the following statements is true. Which statement do you think it is?

- 1 Heart attacks and strokes can't be prevented.
- 2 Teens do not need to be concerned about cardiovascular disease.
- 3 Smokers are more likely to have a heart attack than are nonsmokers.
- 4 To be healthy, you need to exercise intensely every day.
- 5 You do not need to be concerned about what you eat if you exercise regularly.

WRITING Explain why you gave the answer that you did.



Cardiovascular Diseases

Cardiovascular diseases are the leading causes of death in the United States. These diseases develop over many decades, often without symptoms. Hypertension and high blood cholesterol are two factors that increase your risk of heart attack and stroke. Both factors may begin in your teens.

Hypertension As you read in Section 1, a person whose blood pressure is consistently 140/90 or greater has hypertension. Hypertension damages blood vessel walls due to the increased force of the blood. Also, the heart must work extra hard to pump blood through the body. The heart muscle may weaken and eventually fail to pump blood adequately.

Hypertension is known as the “silent killer” because most people have no symptoms. The only way to know if your blood pressure is high is to have it measured. Hypertension can sometimes be controlled with weight loss, exercise, and a low-sodium diet. In many cases, medication is necessary.

Connect to YOUR LIFE Do any members of your family have high blood pressure? How do they control it?

Cardiovascular and Respiratory Health 299

Differentiated Instruction

EL English Language Learners

Help students with both the pronunciation and meaning of *atherosclerosis*. Pronounce the word clearly, and have students repeat it back to you. Explain that the word part *athero-* comes from a Greek word meaning

a pasty food like cooked oatmeal. The word part *-sclerosis* means “hardening.” The term *atherosclerosis*, then, means the hardening of arteries due to the buildup of a pasty substance.

Section 2

Objectives

- **Identify** two factors that contribute to cardiovascular disease.
- **Describe** behaviors that can reduce your risk of cardiovascular disease.

Vocabulary

- low-density lipoprotein
- plaque
- atherosclerosis
- high-density lipoprotein
- arrhythmia

Section 2

Cardiovascular Health

Objectives

Before class begins, write the objectives on the board. Have students copy the objectives into their notebooks at the start of class.

1. Focus

Warm-Up Quick Quiz

Use the **Instruction** clickers to survey student responses.

Presentation EXPRESS

Call on volunteers to explain which statement they think is true. Hold off telling students which statement is true (statement 3). Rather, have students retake the quiz after reading about cardiovascular health. Then ask students to explain why the other four statements are false.

Teaching Transparency W40

2. Teach

L3 EL Reading/Note Taking 12-2

L2 Adapted Reading/Note Taking 12-2

Cardiovascular Diseases

L3 Class Discussion

Tell students that about 20,000 Americans die each year from the effects of hypertension. Ask: **What is one reason that so many people die from hypertension?** (Sample answer: Most people have no symptoms.) **What is one way that you can help prevent damage to your heart and blood vessels from hypertension?** (Sample answer: Have my blood pressure checked regularly.)

Connect to YOUR LIFE Allow students to answer this question in their private journals.

L2 Teacher Demo

Use a bicycle pump and rubber tubing to demonstrate atherosclerosis. At a hardware store, find tubing that fits snugly over the air nozzle of a bicycle pump. In class, fit the tubing over the air nozzle. Tell students that the pump represents the heart and the tubing represents an artery. Invite volunteers to pump air through the tubing. Then, ask a student to pinch the tubing almost closed. Have the same students pump air through the tubing again. Ask them to describe the difference to the class. *(They must work harder to pump air through the pinched tubing than through the open tubing.)* Ask: **In this demonstration, we narrowed the tubing by pinching it. What can narrow the inside of an artery? (the buildup of plaque) When the tubing is narrowed, airflow is constricted. What is constricted when an artery narrows? (blood flow)**

L3 Building Health Skills

Practicing Healthful Behaviors Use Figure 6 to help students think about a diet that may prevent the development of atherosclerosis. Point out that habits of the childhood and teenage years contribute to the development of the condition later in life. Ask students to plan two meals, one that would contribute to the development of atherosclerosis and another that might help prevent that condition. Ask volunteers to share menus with the class.

FIGURE 6 Your diet affects your blood cholesterol levels. Foods that are rich in fiber, certain vitamins, and monounsaturated fats may help prevent atherosclerosis.

To Prevent Atherosclerosis

- **Choose** fruits, vegetables, nuts, fish, and grains.
- **Limit** red meats, fried foods, and whole milk products.



300 Chapter 12

Blood Cholesterol Your body produces cholesterol to be used as a component of cells, hormones, and nerve tissue. You take in additional cholesterol when you eat animal products. Cholesterol is transported in your blood by carriers known as lipoproteins.

- ▶ **Low-density lipoproteins** (LDL) carry cholesterol to body tissues for use or storage. LDL is called “bad cholesterol” because it may become a component of **plaque**, a substance that builds up in artery walls. If the level of LDL cholesterol in your blood is continually high, you could develop atherosclerosis (ath uh roh skluh ROH sis). **Atherosclerosis** is a condition in which an artery wall hardens and thickens due to plaque buildup. Figure 6 gives you tips on how you can reduce your risk of atherosclerosis.
- ▶ **High-density lipoproteins** (HDL) pick up excess cholesterol from body tissues and artery walls and carry it to the liver. HDL is called “good cholesterol” because it cleans your arteries of excess cholesterol. The liver excretes the excess cholesterol in bile, which is eventually eliminated from the body. If your HDL levels are low, you could be at increased risk for atherosclerosis.

Your LDL level should be lower than 129 mg/dL (milligrams per deciliter of blood). Your HDL cholesterol level should be 40 mg/dL or higher.

Heart Attack and Stroke Why is it so important to reduce your risk of atherosclerosis? As artery walls thicken, blood flow is constricted. Eventually, some cells may not receive adequate oxygen or a blood clot could block the narrowed artery. If the artery carries blood to your heart muscles, a heart attack may result. If the artery carries blood to your brain, a stroke may result. In Chapter 23 you will learn more about heart attacks and strokes.

TEENS Are Asking ...

Q: Why should I worry about cardiovascular disease now?

A: Teens should worry. According to the American Heart Association, about 1 million American teens are at high risk for developing heart disease because of high blood pressure, high blood-sugar levels, or other conditions. Studies show that atherosclerosis can begin in a person's late teens without

symptoms showing. Teens with diabetes are especially at risk for the development of cardiovascular disease. Research shows that teens with type 1 diabetes—especially boys—tend to have a buildup of cholesterol in their arteries. In addition, type 2 diabetes is becoming increasingly common among American teens, and this disease can lead to heart disease and stroke.

MEDIA Wise

Fast Foods and In-Store Ads

Have you ever entered a fast food restaurant intending to order something healthy or to eat light? Once inside, though, did you change your mind? These questions can help you understand how restaurants influence your food choices.



Do photos of tempting foods entice you to order them?

Yes

No

Is it difficult to find nutrition information about the foods?

Yes

No

Does the restaurant offer large servings at “bargain” prices?

Yes

No

Are there more high-fat foods and high-sugar options than healthy foods?

Yes

No

Does the person taking your order suggest additional foods for you to try?

Yes

No

“Yes” answers reveal some of the techniques restaurants use to get you to order different foods or more food than you originally planned.

Activity On the Internet, look for nutrition information for the fast food restaurants you visit. Record the information about foods you commonly order. Keep the information in your backpack or another place where you can easily access it.

MEDIA Wise

Fast Foods and In-Store Ads

Call on volunteers to share their answers. Try to get responses about several different restaurants in your area. Discuss why “Yes” answers to the questions may indicate that a restaurant has influenced food choices.

Activity After discussion, have students carry out the Internet assignment. After students have looked for nutrition information on fast food restaurants, ask volunteers to share their findings.

Other Cardiovascular Disorders Structural problems in the heart may also prevent it from functioning properly. Some of these problems are present at birth, whereas others develop over time.

- **Heart Murmur** Almost half of all children are diagnosed with a heart murmur. The “murmur” is an extra sound, in addition to the lub-dub, a doctor hears when listening to a heartbeat. Often murmurs disappear over time without treatment. Occasionally, a murmur is a sign of a problem in the heart, such as a valve not closing properly.
- **Opening in Heart Wall** Before birth, all babies have a hole in the wall separating the two atria. If the hole does not seal after birth, oxygen-rich and oxygen-poor blood will mix in the heart, reducing its efficiency. Some people may live their entire lives with such a hole and never know it. Others may have complications and require surgery to close it.
- **Arrhythmia** Have you ever felt a strange fluttering in your chest? If so, you may have experienced an **arrhythmia**, or irregular heartbeat. It is normal to experience this from time to time. However, some arrhythmias are signs of serious heart conditions, such as the inability of the pacemaker to regulate the heartbeat.

Cardiovascular and Respiratory Health 301

L3 Cultural Connection

About 72,000 people in the United States have a blood disorder called sickle cell disease. The red blood cells of people with the disease are rigid, sticky, and sickle-shaped. The misshapen cells cannot transport as much oxygen as healthy cells and tend to clog small blood vessels, which leads to many health problems. Sickle cell disease most often affects people of African heritage. About 1 out of 600 African Americans has the disease.

Differentiated Instruction

L1 Special Needs

For students having difficulty grasping the difference in function between low-density lipoprotein and high-density lipoprotein, try this analogy. You can compare these cholesterol carriers to two kinds of trucks. LDL is like a freight truck that carries cholesterol to storage facilities. HDL is like

a garbage truck that transports cholesterol to a place where it can be disposed. A high level of LDL leads to cholesterol being stored as part of plaque within the artery walls. Meanwhile, a high level of HDL leads to more “garbage” cholesterol being collected and removed from the body.

Keeping Healthy

L3 Content Update

Use the Web Code to access up-to-date information on preventing heart disease. Have students complete the Web activity.



For: Updates on preventing heart disease
Visit: www.SciLinks.org/health
Web Code: ctn-4122

L2 Visual Learning: Figure 7

Have students examine the photo and answer the caption question. Ask: **How does exercise help you improve cardiovascular health?** (*Exercise can strengthen heart muscles, decrease blood pressure, increase HDL levels, and lower stress levels.*) Call on volunteers to suggest a way to be active, and write their suggestions on the board. Have students copy the list into their journals. **Caption Answer** *Sample answer:* play soccer after school, participate in a dance program, swim laps at the pool

L3 Building Health Skills

Communicating Ask groups to each create a pamphlet that explains habits that would help teenagers maintain cardiovascular health. Explain that the pamphlet should include basic information about the cardiovascular system and how to reduce the risk of cardiovascular disease. **WRITING**

Connect to YOUR LIFE Allow students to answer this question in their private journals.

Keeping Healthy

Although few young people have heart attacks or strokes, signs of atherosclerosis can be seen in people in their late teens. And cases of teens with hypertension and high cholesterol are on the rise.

What is your risk for cardiovascular disease? One risk factor that you cannot control is heredity. Heredity plays a significant factor in the amount of LDL and HDL cholesterol your body produces. Having a family history of heart disease also puts you at higher risk for cardiovascular disease. But, many risk factors are within your control. Establishing healthy habits now will decrease your risk of serious health problems in the future. **To help maintain cardiovascular health, you should exercise regularly; eat a nutrient-rich, balanced diet; and avoid smoking.**

Exercise Teens should spend 60 minutes performing physical activity every day, or at least most days. Regular exercise has many benefits for your cardiovascular system.

- ▶ Heart muscles strengthen, allowing more blood to be pumped with each beat.
- ▶ Blood pressure may decrease.
- ▶ HDL levels may increase.
- ▶ Stress levels may lower.

Everyday activities can also help keep your cardiovascular system healthy. Anytime you walk to a friend's house instead of getting a ride, take the stairs instead of the escalator, or turn off a video game and take out the trash, you are contributing to your 60 minutes of physical activity.



How many minutes of physical activity have you performed today?

FIGURE 7 With a little planning, you can achieve 60 minutes of physical activity a day.
Evaluating What three activities would you add to this list?

Ways to Be Active

- ▶ Walk the dog.
- ▶ Ride your bike to school.
- ▶ Rake the lawn.
- ▶ Sweep the sidewalk.
- ▶ Jump rope during TV commercials.
- ▶ Walk briskly around the mall.



WRITING and Health

L3 Advertisement

Ask students to create a magazine advertisement that illustrates the heart benefits of exercising regularly, eating a healthy diet, and avoiding smoking. Point out that the text under the heading Keeping Healthy provides information students can use in their ads. In creating this ad, students

should choose information that they think would be most persuasive to a reader. Explain that a good advertisement should be designed so it catches a reader's attention with a bold title, a catchy phrase, or attractive illustrations.

Healthy Food Swaps

Instead of...	Try...
Mayonnaise	Mustard or low-fat mayonnaise
Whole milk	Low-fat or skim milk
Ice cream	Frozen yogurt
Cookies	Fruit
Hamburgers	Turkey burgers

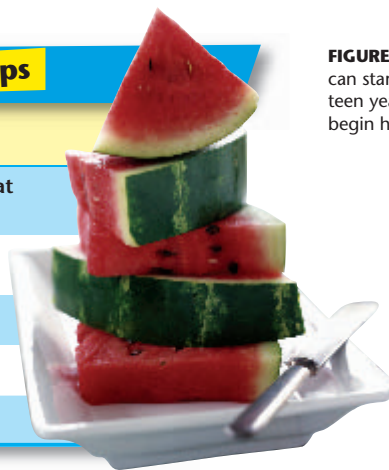


FIGURE 8 Cardiovascular disease can start to develop during your teen years. Now is the time to begin heart-healthy eating habits.

Diet No matter how much you exercise, you still need to pay attention to what and how much you eat. To reduce your risk of cardiovascular disease, limit your intake of fried or processed foods and of foods made from animal products. The cholesterol, saturated fat, and *trans* fat in these foods increase the levels of LDL in your blood. Eating high-fiber foods such as oatmeal, beans, fresh fruits, and fresh vegetables may help keep your blood cholesterol levels low. Also, limiting your salt intake may help to keep your blood pressure in a normal range.

Avoid Smoking Tobacco products damage blood vessels and contribute to the development of atherosclerosis and hypertension. Some of the cardiovascular damage heals in the years after a smoker quits. However, your chances of living a long and healthy life are better if you never start smoking. In fact, smokers are two to three times more likely to have a heart attack than nonsmokers.

Section 2 Review

Key Ideas and Vocabulary

1. What are two factors that contribute to cardiovascular disease that may begin in your teens?
2. What is **low-density lipoprotein**? What is **high-density lipoprotein**?
3. What is one form of treatment for an **arrhythmia**?
4. Describe three ways you can help keep your cardiovascular system healthy.

Critical Thinking

5. **Relating Cause and Effect** How can atherosclerosis and hypertension affect the heart and brain?

Health at Home

Monitoring Saturated Fat Intake For one week, read food labels to track how much saturated fat you consume each day. Remember to keep track of snacks as well as meals. Less than 10 percent of your total calories should come from saturated fats. In a paragraph, discuss ways you can reduce your saturated fat intake. **WRITING**

6. **Predicting** Why do you think cardiovascular diseases are more common in the United States than in some other countries?

Cardiovascular and Respiratory Health 303

3. Assess


Evaluate

These assignments can help you assess students' mastery of the section content.

Section 2 Review

Answers appear below.

Teaching Resources

- Practice 12-2
- Section 12-2 Quiz 

L2 Reteach

Have students work in pairs, with one student naming a cardiovascular disorder described in the lesson and the other student stating two facts about that disorder. Pairs should alternate roles and continue the process until each disorder discussed in the section has been reviewed. If a partner disagrees about a fact, the pair should work together to find the sentence in the text that addresses that fact.

L4 Enrich

Teaching Resources

- Enrich 12-2

Health at Home

Monitoring Saturated Fat Intake

Remind students that saturated fats are found most commonly in animal products, but not exclusively. Show students a Nutrition Facts label on a box of crackers, and point out where they can find the amount of saturated fat in a serving of the crackers. Assure students that they can keep the information about their saturated fat intake private. Ask volunteers to share ideas about how to reduce saturated fat intake.

Section 2 Review

1. hypertension and high blood cholesterol
2. Low-density lipoprotein is a blood carrier that transports cholesterol to body tissues for use or storage. High-density lipoprotein is a blood carrier that picks up excess cholesterol from body tissues and artery walls and transports it to the liver.
3. fluttering in the chest
4. You can exercise regularly; eat a nutrient-rich, balanced diet; and avoid smoking.
5. Both atherosclerosis and hypertension damage blood vessels which can lead to a heart attack or stroke.
6. *Sample answer:* Many Americans eat poorly and do not get enough exercise.

Section 12-2

Note Taking Guide

Cardiovascular Health (pp. 299–303)

Cardiovascular Diseases

1. Complete the outline by adding important details about cardiovascular diseases.

I. Cardiovascular Diseases

A. Hypertension

1. Description blood pressure consistently 140/90 or greater
2. Effect damages blood vessel walls; causes heart to pump harder

B. Blood cholesterol

1. Low-density lipoprotein

- a. Description _____
- b. Effect _____

2. High-density lipoprotein

- a. Description _____
- b. Effect _____

C. Heart attack and stroke

1. Heart attack

Description _____

2. Stroke

Description _____

D. Other cardiovascular diseases

1. Heart murmur

Description _____

2. Opening in heart wall

Description _____

3. Arrhythmia

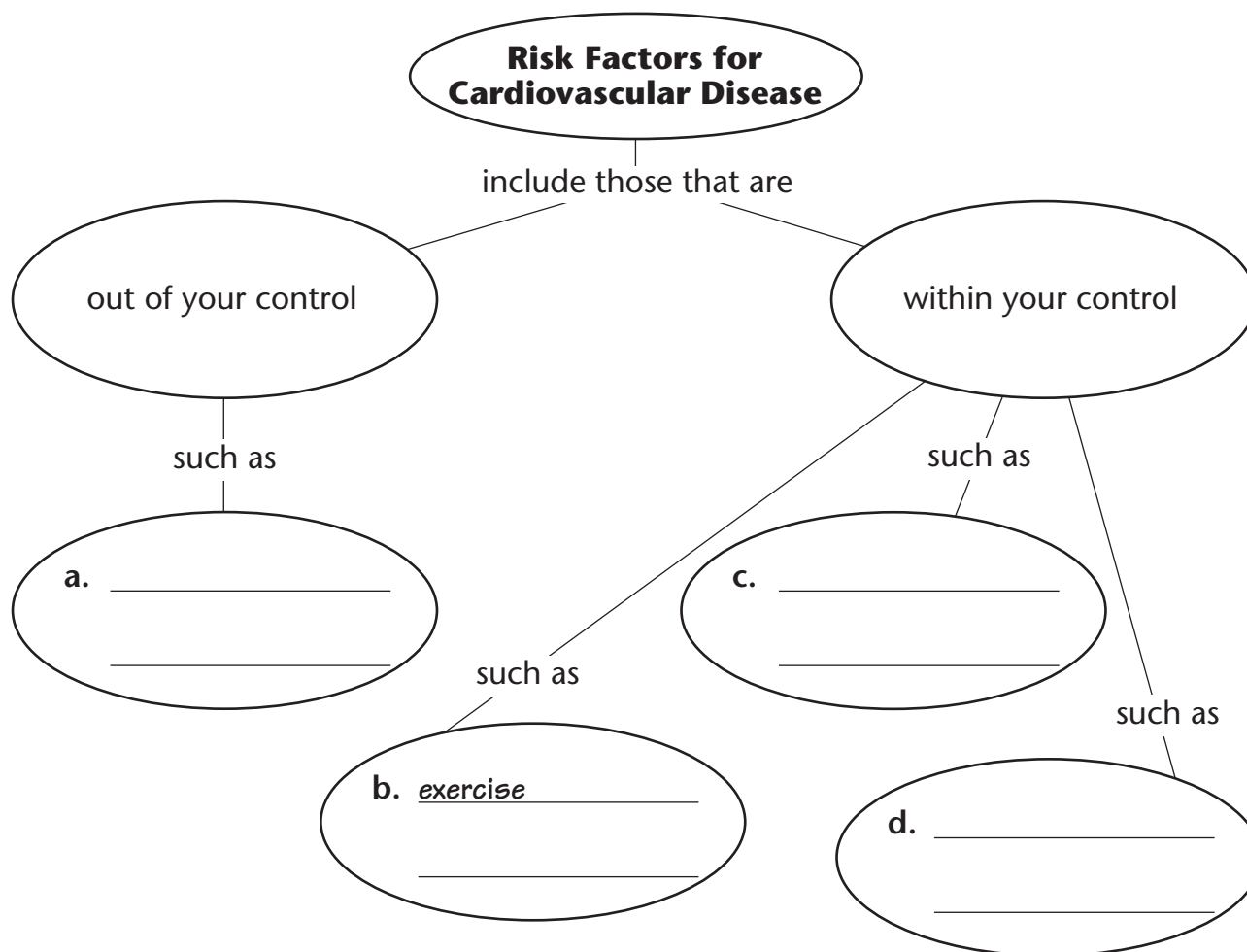
Description _____

Section 12-2: Note Taking Guide *(continued)*

Keeping Healthy

2. Complete the concept map about risk factors for cardiovascular disease. Use the words and phrases from the box below.

family history	diet	avoid smoking
----------------	------	---------------



Section 12-2**Quiz**

Decide whether each statement is true or false. Write true or false in the space provided.

- _____ 1. High levels of LDL and low levels of HDL increase a person's risk of heart attack and stroke.
- _____ 2. Low-density lipoproteins carry cholesterol to body tissues for use or storage.
- _____ 3. The only treatment for hypertension is medication.
- _____ 4. Atherosclerosis is a condition in which an artery wall hardens and thickens due to plaque buildup.
- _____ 5. A heart murmur may be caused by a valve in the heart not closing properly.

Write the letter of the correct answer in the space provided.

- _____ 6. The substance that builds up in artery walls is called
 - a. HDL.
 - b. atherosclerosis.
 - c. plaque.
 - d. LDL.
- _____ 7. Almost half of all children are diagnosed with a(an)
 - a. heart murmur.
 - b. arrhythmia.
 - c. opening in the heart wall.
 - d. stroke.
- _____ 8. Which substance carries excess cholesterol to the liver to be broken down?
 - a. cholesterol
 - b. low-density lipoprotein
 - c. high-density lipoprotein
 - d. plaque
- _____ 9. Which condition is known as a "silent killer"?
 - a. hypertension
 - b. atherosclerosis
 - c. heart attack
 - d. stroke
- _____ 10. Which of the following is *not* a benefit of exercise?
 - a. an overall decrease in blood pressure
 - b. an increase in LDL levels
 - c. lowered stress levels
 - d. strengthened heart muscles

Section 3

Respiratory Health

Objectives

Before class begins, write the objectives on the board. Have students copy the objectives into their notebooks at the start of class.

1. Focus

Warm-Up Myth/Fact

Presentation
EXPRESS

After students have completed the writing assignment, have volunteers share their ideas with the class. Students should point out that the trend of the graph line shows a rise in ER visits for asthma from 1992 until 1998, after which there is a fall. Students might suggest that air pollution contributed to rising asthma rates. Perhaps emergency room visits dropped because at-home treatments became more effective.

Teaching Transparency W41

Section 3

Objectives

- **List** the functions of the respiratory system.
- **Describe** how air travels through your respiratory system, and how you breathe.
- **Identify** ways to keep the respiratory system healthy.

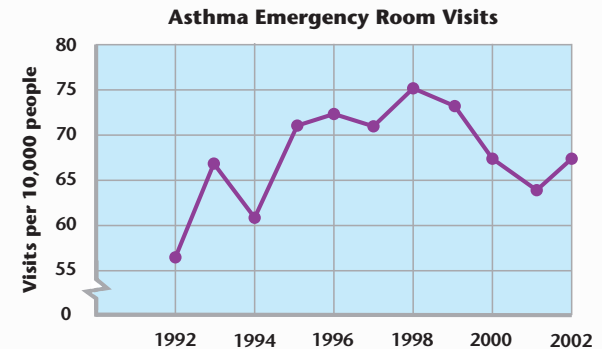
Vocabulary

- alveoli
- diaphragm
- asthma
- bronchitis

Respiratory Health

Warm-Up

Health Stats What does the graph suggest about asthma rates?



WRITING Describe some factors that could contribute to the rise and fall of asthma rates.

The Respiratory System

A person can survive weeks without food and days without water, but only minutes without oxygen. Your respiratory system brings a continuous supply of oxygen from the air into your body. As you have read, your cardiovascular system transports this oxygen to all of your body cells. After the cells use the oxygen to break down glucose for energy, they are left with carbon dioxide that must be expelled from the body. **The respiratory system is responsible for bringing oxygen from the outside environment into the body. It also removes carbon dioxide from the body.**

The Pathway of Air When you breathe in, or inhale, much more than just air enters your body. With every breath, you also take in such things as dust, pollen, and microorganisms that can cause disease. Most of these substances never reach your lungs. Cells lining your nasal cavities release mucus, which traps particles. Mucus also warms and moistens the air as it passes through your nasal cavities. **On its way to the lungs, air passes through the nose, pharynx, larynx, trachea, and bronchi.** Follow the pathway of air from the environment to your lungs in Figure 9.

Sensitive Issues

Be aware that some students with asthma may be sensitive about sharing their experiences with the class. If you know students with asthma in your class, ask them ahead of time if they mind talking about their experiences.



Asthma and Physical Activity

Physical activity is important for the health of the body and the mind. There are ways to help teens with asthma stay active and reap the benefits of physical activity. *Asthma and Physical Activity in the School,*

available through the National Heart, Lung, and Blood Institute, offers advice to teachers and coaches who want to help students with asthma participate in physical activities.

The Respiratory System

Cilia

Cilia line most of the respiratory tract. Cilia capture mucus that contains dust and microorganisms and sweep it toward your throat to be swallowed.



1 Nose and Nasal Cavities

Air enters the body through two nostrils and then moves into the nasal cavities.

2 Pharynx

Next air enters the pharynx, or throat. The mouth also connects to the pharynx.

3 Epiglottis and Larynx

Air travels from the pharynx to the larynx. The larynx contains the vocal cords. When you swallow, the epiglottis seals the larynx to prevent food or liquid from entering the trachea.

4 Trachea

The trachea, or windpipe, leads from the larynx to the lungs.

5 Bronchus

The trachea divides into two bronchi (singular, *bronchus*), which are cartilage-ringed tubes that enter each lung.

6 Lung

In the lungs, bronchi divide like branches of a tree into smaller tubes. At the end of the smallest tubes are the alveoli. Oxygen and carbon dioxide are exchanged in alveoli.

Alveoli

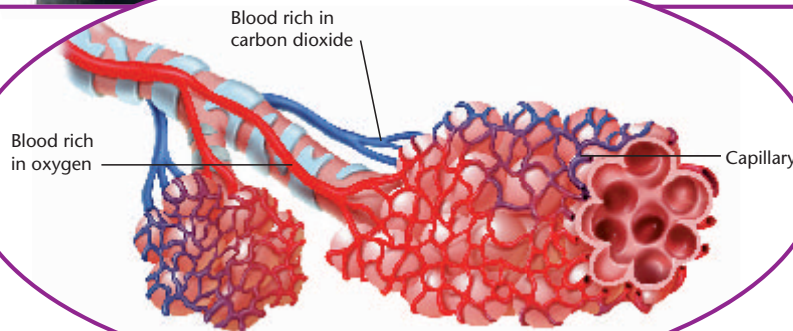


FIGURE 9 On its path to the lungs, air passes through several structures where it is filtered, warmed, and moistened.

Predicting What path does carbon dioxide take on its way out of the body?

2. Teach

L3 EL Reading/Note Taking 3-1

L2 Adapted Reading/Note Taking 3-1

The Respiratory System

EL Visual Learning: Figure 9

Teaching Transparency 31

Have students write the name of each label in Figure 9 on an index card. Have them organize the labels by the order in which air passes through the respiratory system. Suggest they write a question they have about each structure on the card. Have them fill in the answers as they read the section.

Caption Answer Carbon dioxide moves from the lungs through the bronchi, through the trachea, through the larynx, through the pharynx, and out through the nose or mouth.

L2 Active Learning

Ask students to tilt their heads backward and place the fingers of one hand on the front of the neck. Then ask students to move the fingers up and down the neck. Ask: **What are the ridges you feel up and down your neck?** (*the rings of the trachea*) Ask students to keep their fingers in place as they swallow. Explain that the movement they feel is the epiglottis sealing the larynx. Ask: **What does the sealing of the larynx by the epiglottis prevent?** (*It prevents food or liquid from entering the trachea.*)

Differentiated Instruction

L1 Special Needs

Students who need extra help, as well as visual and tactile learners, may learn more about the respiratory system by drawing it. Give each student a sheet of tracing paper or thin unlined paper. Ask students to trace

the outline of the person in Figure 9. Then students should draw the structures, label them, and describe them in their own words. Check students' completed drawings for errors and omissions.

L3 Class Discussion

After students have read about gas exchange, reinforce the connection between the cardiovascular system and the respiratory system. Ask: **Where does the carbon dioxide come from that passes from blood into the alveoli?** (*It is a waste product that passes from body cells into the blood.*) **When the oxygen in the alveoli passes into the blood, to what chamber of the heart does that blood first go?** (*to the left atrium*) **Why is the oxygen that is part of the exchange in the alveoli needed by the body?** (*Body cells use oxygen in the process of gaining energy from nutrients.*)

L2 Teacher Demo

To demonstrate how the diaphragm works, borrow a model of the lungs and diaphragm from a biology teacher. A common apparatus consists of one or two small balloons to represent the lungs. These balloons are attached to a tube within a glass bell jar. The bottom of the jar is sealed with latex, which represents the diaphragm. When you pull down on the “diaphragm,” the “lungs” inside the bell jar inflate. Ask: **What will happen to the “lungs” when the “diaphragm” moves upward?** (*The “lungs” will deflate as air moves out of them.*) Tell students that this model illustrates how changes in air pressure cause the lungs to expand and contract.

L3 Visual Learning: Figure 10**Teaching Transparency 32**

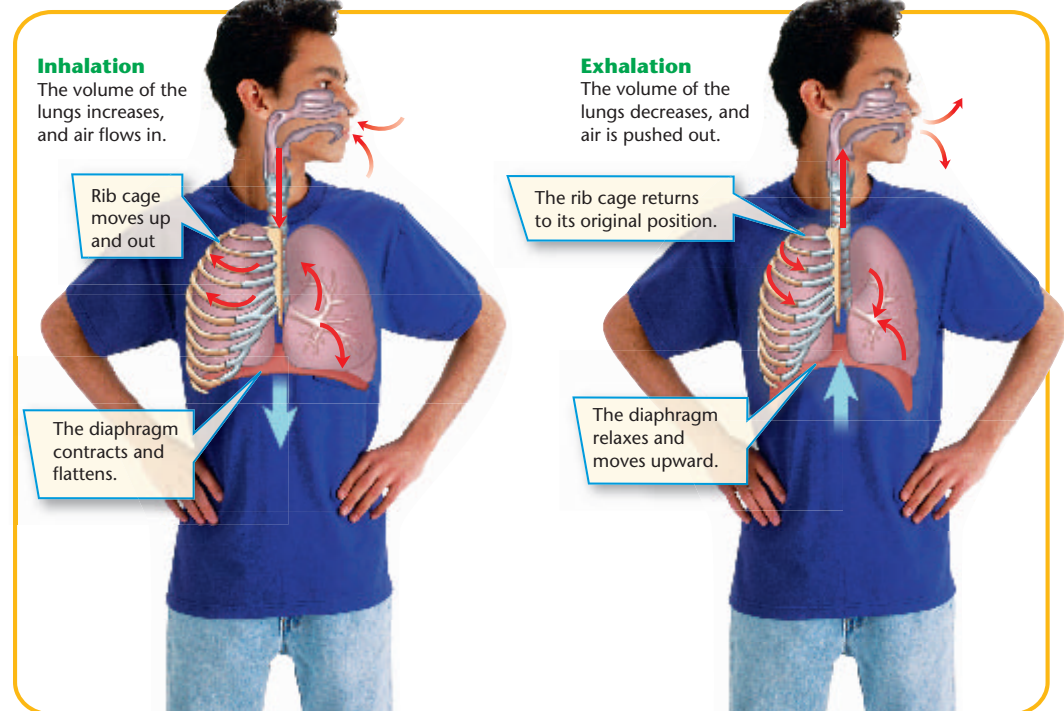
Have students examine the process of inhalation and exhalation shown in the figure. Then ask them to place one hand on their abdomen as they breathe normally. Ask: **Why does your abdomen move in and out as you breathe?** (*When the diaphragm contracts and flattens, it pushes the abdomen out. The reverse occurs when the diaphragm relaxes and moves upward.*)

Gas Exchange At the end of the smallest tubes in the lungs are millions of tiny sacs that look like bunches of grapes. These sacs, called **alveoli** (al VEE uh ly) (singular, *alveolus*), are where gases are exchanged between the air and the blood. You can see an illustration of alveoli in Figure 9 on the previous page. Oxygen passes through the thin walls of an alveolus and through a thin capillary wall into the blood. At the same time, carbon dioxide passes from the blood into the alveoli.

The Breathing Process How does air get into and out of your body? **The breathing process is controlled by the actions of muscles in your ribs and chest.** As you can see in Figure 10, breathing takes place in two stages.

- ▶ **Inhalation** When you inhale, or breathe in, rib muscles pull the ribs up and out. At the same time the **diaphragm** (DY uh fram), a dome-shaped muscle that lies below the lungs, flattens. The chest cavity enlarges, the volume of the lungs increases, and air flows in.
- ▶ **Exhalation** When you exhale, or breathe out, the diaphragm moves upward. The rib muscles relax and the ribs drop. These movements make the chest cavity smaller and squeeze air from the lungs.

FIGURE 10 When you inhale, the diaphragm flattens. Pressure in the expanded lungs decreases, causing air to flow in. When you exhale, the diaphragm curves upward. Pressure in the lungs increases, pushing air out of your lungs.

**MATH and Health****L3 Percentages**

On page 309, students will learn that approximately 15 million people in the United States have asthma. Based on this data, have students estimate the percentage of people in the United States

with asthma. For this exercise, assume that the United States population is 300 million. ($15 \div 300 = 0.05$; $0.05 \times 100 = 5$ percent)



Common Asthma Triggers

- ▶ Pollen
- ▶ Exercise
- ▶ Tobacco smoke
- ▶ Pet dander
- ▶ Dust mites
- ▶ Mold
- ▶ Cold air
- ▶ Perfumes



FIGURE 11 People with asthma can lead active lives if they follow their treatment program. They should also avoid or limit exposure to their particular triggers. People with exercise-induced asthma should work with a doctor to find ways to exercise safely.

Keeping Healthy

What can you do to keep your respiratory system healthy? **You can keep your respiratory system healthy by avoiding tobacco smoke and air pollution and treating asthma if you have it. In addition, avoid respiratory infections, get regular exercise, and maintain a healthy weight.**

Avoiding Smoking and Air Pollution The most important thing you can do to protect your respiratory system is not to smoke. Over time, exposure to tobacco smoke and other air pollutants can seriously harm your respiratory health. In Chapter 16 you will learn how smoking can lead to serious respiratory system disorders such as chronic bronchitis and emphysema.

It is also important to avoid exposure to air pollutants whenever possible. If you do work that generates fumes or dust, such as sweeping a garage, wear a mask. Work in a well-ventilated area when you paint or use other chemicals that produce fumes. Before exercising outdoors on a hot, sunny day, check local news reports for warnings about air quality.

Living With Asthma About 15 million people in the United States, including 5 million children, have asthma. **Asthma** (AZ muh) is a disorder in which respiratory passageways become inflamed. During an asthma attack, the passageways narrow until air can barely pass through. As a result, the person wheezes, coughs, and has difficulty breathing. Attacks can range from irritating to life threatening. Substances or behaviors that cause asthma attacks are called triggers. Common asthma triggers are exercise, allergic reactions, and stress.

Asthma is usually first diagnosed in childhood. Sometimes children outgrow the condition. Many people with asthma take medications daily to control their symptoms and avoid attacks. If an attack does occur, other medications are taken for immediate relief.



What things do you do to keep your respiratory system healthy?

Go Online

HEALTH LINKS™

For: Updates on asthma
Visit: www.SciLinks.org/health
Web Code: ctn-4123

Cardiovascular and Respiratory Health 309

Keeping Healthy

L2 Class Discussion

Write the following question on the chalkboard: How often are you exposed to automobile exhaust, smoke, or dust each day? Where do these exposures occur? Have students call out responses and make a running list on the board. Students will likely be surprised at the long list of respiratory system irritants they are exposed to every day.

L3 Cooperative Learning

Have small groups work together to make a list of “Do’s” and “Don’ts” regarding respiratory health. (*For example, students might list: “Do get regular exercise” and “Don’t exercise outdoors on days when the air is very polluted.”*) Give groups a chance to share their lists. Call on students to explain how following these “Do’s” and “Don’ts” contributes to a healthy respiratory system.

L3 Journal Writing

Ask students to write a journal entry in which they explain why it is important for a person to keep his or her respiratory system healthy. Ask students to think of times when they’ve been tempted to smoke tobacco and describe why refusing tobacco is important to maintain good respiratory health. **WRITING**



Allow students to answer this question in their private journals.

L3 Content Update



Use the Web Code to access up-to-date information about asthma. Have students complete the Web activity.

Differentiated Instruction

L4 Gifted and Talented

Have interested students further investigate asthma. Ask them to find out about the causes of asthma, the triggers that produce an asthma attack, the symptoms of the disorder, and the treatment of asthma. Point out to students that asthma is a growing problem in the United States and

other industrialized countries. Ask students to try to find explanations for the increase of asthma. Have them focus some of their attention on how air pollution affects a person with asthma. Ask students to share what they learn with the class.

3. Assess

Evaluate

These assignments can help you assess students' mastery of the section content.

Section 3 Review

Answers appear below.

Teaching Resources

- Practice 12-3
- Section 12-3 Quiz



L2 Reteach

Play a quiz game in which you describe the function of a part of the respiratory system and students try to name that part. Go around the room, calling on one student after another, until most students show mastery of the information.

L4 Enrich

Teaching Resources

- Enrich 12-3

Health at School

Asthma Attacks Encourage students to ask what the procedures are when a student experiences an asthma attack. To manage this activity, you might assign pairs of students or small groups to interview the nurse or a specific physical education teacher. Each student can then write a paragraph summarizing the findings.



FIGURE 12 Protect your respiratory system by wearing a mask when you do work that generates dust or fumes.

Other Healthful Behaviors You can practice other important behaviors to protect the health of your respiratory system.

- ▶ **Avoid Respiratory Infections** From time to time, microorganisms will escape the mucus and sweeping cilia and infect your respiratory system. For example, **bronchitis** is an infection that causes the mucous membranes lining the bronchi to become inflamed. The inflamed membranes secrete a large amount of thick mucus that must be removed by coughing. In Chapter 21 you will learn about other common respiratory infections such as colds, influenza, and pneumonia. You will also learn ways to prevent and treat these infections.
- ▶ **Get Regular Exercise** A regular exercise program that involves several minutes of repetitive, non-stop physical activity is extremely important for maintaining respiratory health. Exercise helps your lungs become more efficient at taking in oxygen and eliminating carbon dioxide.
- ▶ **Maintain a Healthy Weight** Regular exercise will also help you maintain an ideal weight. The respiratory system of an overweight person must work harder to deliver adequate oxygen than the system of a normal weight person. Maintaining a reasonable weight will help you avoid straining your respiratory system.

Section 3 Review

Key Ideas and Vocabulary

1. What two functions does your respiratory system perform?
2. List the structures that air flows through on its way to the lungs.
3. Explain the action of the **diaphragm** when you inhale and exhale.
4. Identify five ways you can help your respiratory system stay healthy.

Critical Thinking

5. **Relating Cause and Effect** In a healthy person, how might coughing and sneezing protect the respiratory system?

Health at School

Asthma Attacks Talk to your school nurse, physical education teacher, or other students about asthma. What are the most common triggers for asthma attacks at school? Are attacks more common at certain times of day or times of year? How are asthma attacks treated? Summarize your findings in a paragraph. **WRITING**

6. **Comparing and Contrasting** Explain the difference between the movement of oxygen and carbon dioxide in the alveoli.
7. **Evaluating** Why is it important for someone with exercise-induced asthma to find ways to participate in physical activity?

Section 3 Review

1. It brings oxygen into the body and removes carbon dioxide from the body.
2. nose, pharynx, larynx, trachea, and bronchi
3. When the diaphragm flattens, you inhale. When the diaphragm moves upward, you exhale.
4. avoid smoking and air pollution, treat asthma if you have it, avoid respiratory infections, get regular exercise, and maintain a healthy weight
5. **Sample answer:** Coughing and sneezing can remove microorganisms and foreign particles from the respiratory tract.
6. Oxygen moves from the air in the alveoli into the blood in the capillaries. Carbon dioxide moves from the blood in the capillaries into the air in the alveoli.
7. **Sample answer:** Exercise helps your lungs become more efficient at taking in oxygen and eliminating carbon dioxide. Exercise also benefits the cardiovascular system and other systems of the body.

Section 12-3

Note Taking Guide

Respiratory Health (pp. 306–310)

The Respiratory System

1. Complete the flowchart about the pathway that air takes into your body. Use the words from the box below.

trachea	larynx
lungs	bronchi
pharynx	

a. nose

↓

b. _____

↓

c. _____

↓

d. _____

↓

e. _____

↓

f. _____

Section 12-3: Note Taking Guide *(continued)*

2. Complete the table about the breathing process. Use the words and phrases from the box below.

pull ribs up and out	relax and ribs drop	enlarges
gets smaller	flattens	moves upward

Stage	Action
Inhalation	a. rib muscles _____; b. the diaphragm _____; c. the chest cavity _____
Exhalation	d. rib muscles _____; e. the diaphragm _____; f. the chest cavity _____

Keeping Healthy

3. Explain why each of the following behaviors can help keep your respiratory system healthy.

a. Avoid smoking Exposure to smoke damages the respiratory system.

b. Avoid air pollution _____

c. Treat asthma if you have it _____

d. Avoid respiratory infections _____

e. Get regular exercise _____

f. Maintain a healthy weight _____

Section 12-3**Quiz**

Decide whether each statement is true or false. Write true or false in the space provided.

- _____ 1. The respiratory system brings carbon dioxide from the outside environment into the body.
- _____ 2. On the way to the lungs, air passes through the bronchi before passing through the larynx.
- _____ 3. Oxygen and carbon dioxide are exchanged in the alveoli.
- _____ 4. The breathing process is controlled by the actions of muscles in your ribs and chest.
- _____ 5. Excess weight strains the cardiovascular system, but not the respiratory system.

Write the letter of the correct answer in the space provided.

- | | |
|--|----------------------|
| _____ 6. a dome-shaped muscle that lies below the lungs | a. alveoli |
| _____ 7. an infection that involves inflammation of the mucous membranes lining in the bronchi | b. diaphragm |
| _____ 8. tiny sacs in the lungs where gases are exchanged | c. epiglottis |
| _____ 9. the passageway that leads from the larynx to the lungs | d. trachea |
| _____ 10. a piece of tissue that prevents food from entering the trachea | e. asthma |
| | f. bronchitis |

Activity #1 Multimedia-Writing a Slogan

A **Slogan** is a catchy phrase used by a company to help customers remember their business. The shorter the slogan is the better, because it will be easier to remember. Look at the examples below and think about other popular business slogans used by companies today. Then follow the instructions for writing a slogan for your business project.

Popular Slogans

I'm Lovin' It	McDonald's
Like a good neighbor, State Farm is there.	State Farm
Think Outside the Bun	Taco Bell
Taste the rainbow	Skittles
Live in your world. Play in ours.	PlayStation
The Happiest Place on Earth	Disneyland
Eat Fresh	Subway

Instructions: Write three short slogans that will be used to represent and advertise the business you created in class. They should not be more than 6 or 7 words.

Slogan 1:

Slogan 2:

Slogan 3:

Which Slogan will you use for your company? Tell me why this is the best choice?

Activity #2 Multimedia-Writing Job Descriptions

A **Job Description** tells employees important details about their job. It typically includes:

- Job name/title
- Summary of what the job is (Minimum of 1 sentence)
- Job pay (Can be salary/yearly or hourly)
- List of specific required skills or qualifications
- Education needed (HS diploma, college, etc.)

Example Job Description:

Job Title: Business Teacher

Job Summary: This position is responsible for developing and teaching lessons to high school students in various business subjects such as accounting, personal finance, multimedia, and web design.

Salary: \$40,000 per year

Skills Required: Organization, Communication, Ability to develop lessons

Education Required: Bachelor's Degree in Education

Instructions: Think about the employees you will need for the business you created. Write **two** job descriptions using the template below. Don't forget to look at the example!

Job Title:

Job Summary:

Salary:

Skills Required:

Education Required:

Job Title:

Job Summary:

Salary:

Skills Required:

Education Required:

Activity #3 Multimedia-Creating Business Cards

Business Cards are a way to quickly give people your contact information and information about your business. They should be simple and include the following:

- Your Name
- Your Job Title (Owner)
- Your business name
- Your business slogan
- Your business logo or another image
- Your business address
- Your contact info (phone and email)

Example Business Card:



Instructions: Using the Business Card template on Canva.com or a piece of paper, draw/design a business card for your business. Be sure to include all of the required information and be creative!

Activity #4 Multimedia-Radio Ad Script

The final step in your business project is to Advertise! You will create an Ad for the radio. First, you will write a script before recording your ad and adding sound effects.

Instructions: Type your script in Google Docs or write it out on a piece of paper. Your script must be word for word what your ad is going to say. You will read it when you record your ad. Your ad may use pathos(emotion), ethos(credibility), or logos(facts), but be sure to tell us about your company. Your goal is 30 seconds!

Be sure to include:

- Your business name
- What your business is/does
- Your business slogan
- Your business address
- Your contact info (phone or email)

Radio Ad Script Example

Background Sound: Restaurant Noises (Plates, silverware, background conversations)

Man: I'm heading over to the doctor's office to look into that clinical trial I mentioned..

Woman: Oh, right. It's on diabetes prevention?

Man: Yeah. After my Dad's scare, I wanted to see what I can do to help. And from what I read, this trial is a great way.

Woman: I have some time this afternoon, could I come with you?

Man: Definitely! They're looking for all kinds of people.

Narrator: If you are interested in learning more about diabetes contact our Clinic at 417-777-7777.

Why wait? You can Make a Difference.

Help Prevent Diabetes Now.

Activity #5 Multimedia-Radio Ad Recording

Instructions: You are ready to record your Radio Ad! Open up the *Voice Memos* App on your iPad. The red button at the bottom will start/stop recording. Record your ad as many times as it takes. If you need another person, consider asking a family member to read one part of the script. Remember, your goal is 30 seconds!

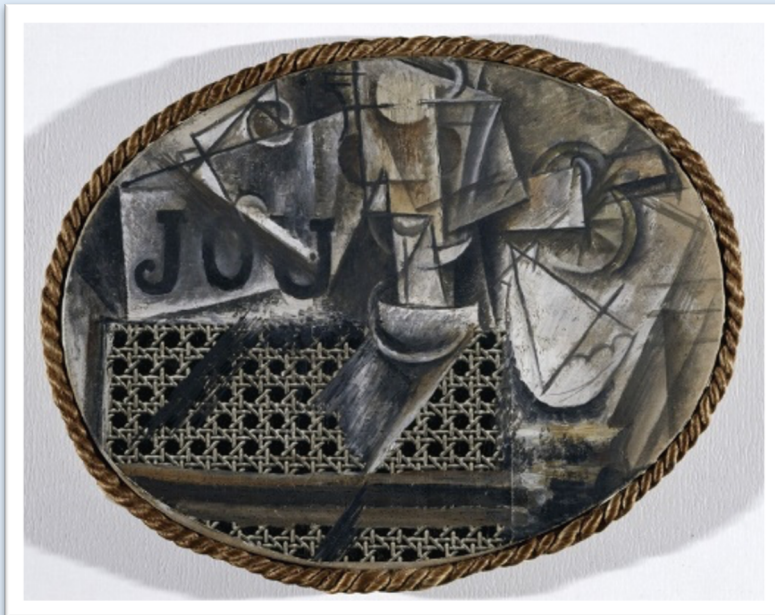
If you want to add sound effects or background music to your Radio Ad,
here's what you do!

1. Open iMovie
2. Choose a photo to be the background image for your iMovie
3. Add the following Audio Clips:
 - a. Background Music
 - b. Your Radio Ad (located under imported from Voice Memos)
 - c. Sound Effects
4. Be sure to adjust the layering and volume so that you can hear all of the audio in your video
5. Make sure you trim the Background music so that it is not longer than your voice recording
6. Save your video by clicking "Done"
7. Export your video to Google Drive (Click the box with the up arrow)
8. Go to your Google Drive
9. Share your Radio Ad with me so I can hear it!!
ebrewer@aurorar8.org

Art on a Chart: Part 2 *Something New*

State Standard: Strand III *Responding*- 7A Explain how a person's aesthetic choices are influenced by culture and environment and impact the visual image that one conveys to others.

The Purpose of this lesson is for you to learn the fundamentals of collage and introduce the concept of Cubist art. Cubism is an important subject to cover because it shows us that there is more than one way to look at art. It is a great opportunity to push out of our comfort zones in art. We will look at works from Pablo Picasso and Georges Braque and attempt to explain why these artists chose to break away from more representational art.



Pablo Picasso, Still Life with Chair Canning, May 1912, oil, oilcloth and pasted paper on canvas with rope surround, 27 x 35 cm.

Picasso's *Still Life with Chair Canning*, fuses Analytic Cubism with collage. *With Analytic Cubism it is up to the viewer to deconstruct the fragmented pieces themselves.* It's like a puzzle, for example let's look analyze this piece. **What do you see?**

Possible answers:

- JOU typography
- Chair design
- Orange
- Glass/ old lamp
- Cigarette (they're bad for you, but they didn't realize that at the time. We know better now).
- Papers
- Table

What did you see?

1. _____
2. _____
3. _____
4. _____
5. _____

There are two more examples below. Look at them and see if you can recognize any familiar object/ letters. Why do you think the artists chose to make everyday objects unrecognizable?

Cubist Analysis Worksheet

Name: _____

Date: _____

Grade: _____



List what you see:

[illegible]

Citation:

Pablo Picasso, Guitar, after 31 March 1913, pasted paper, charcoal, ink and chalk on blue paper, mounted on rag board, 66 x 50 cm.

State Standard: Strand I Create-2C Apply visual organizational strategies to design and produce a work of art, design, or media that clearly communicates information or ideas.

Part One: Making a Translation Tessellation

Suppose you wanted to cover a floor with tiles. You could cover it with square tiles, since squares fit together without leaving any gaps. In this activity, you're going to transform a rectangle into a more interesting shape, then make a tessellation by repeating that shape over and over again.

Try This:

Step 1 Cut an index card in half, creating a 2.5" x 3" rectangle.

You can use a scrap sheet of paper too as long as you have the measurements the same.

Step 2 Find the area of the rectangle (length x width).

Step 3 Draw a line between two adjacent corners on one of the long sides of the rectangle. Your line can be squiggly or made up of straight segments. Whatever its shape, your line must connect two corners that share one side of the rectangle.



Step 4 Cut along the line you drew. Take the piece you cut off and slide it straight across to the opposite long side of the rectangle. Line up the long, straight edges of the two pieces and tape them together.

Step 5 Can you tessellate with this shape? Try tracing this shape several times, creating a row going across a piece of paper. Line up the cut edges of the shape as you trace it.

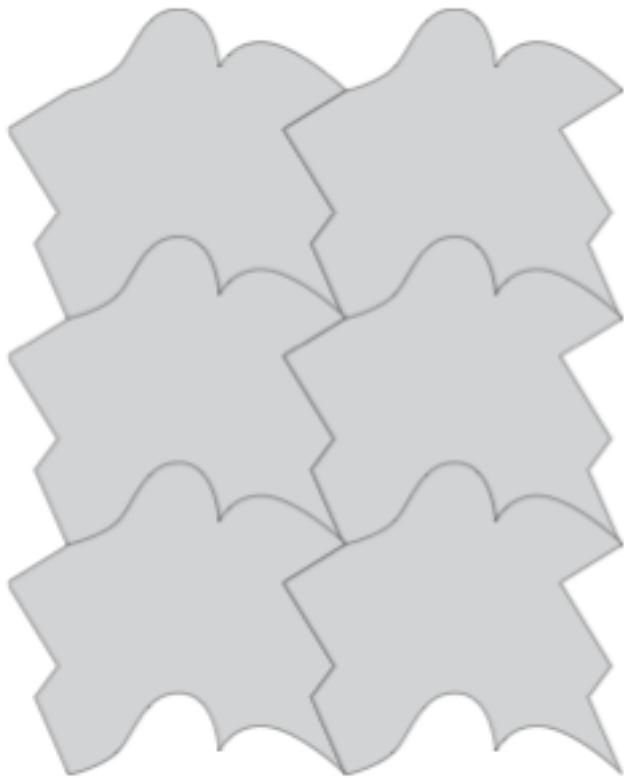
Step 6 Now draw another line that connects two adjacent corners on one of the short sides of the shape.

Step 7 Cut along this new line. Take the piece you cut off and slide it straight across to the opposite side of the shape. Line up the straight edges and tape them together.



Step 8 You have now created a shape that you can use as a pattern to make a tessellation. What's the area of this shape? Write the letter A on one side of the shape and turn it over and write the letter B on the other side.

Step 9 On your grid paper, carefully trace around your pattern shape. Can you figure out where to place the pattern so that your paper will be covered with repetitions of this shape with no overlaps and no gaps? Try to cover your whole sheet of paper by tracing the pattern, moving it, then tracing it again.



Make this shape into at least three different animals.

If you start with side A facing up do you ever have to turn it over to side B to make your tessellation? If you only have to slide the piece without flipping it over or rotating it, then you are making a translation tessellation.

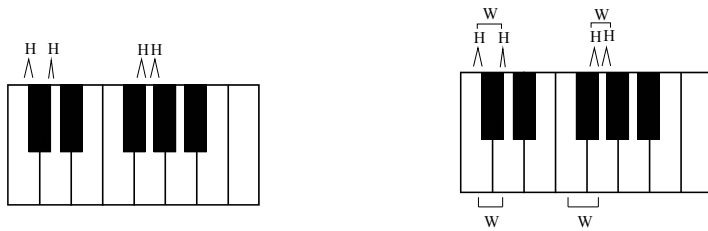
In math, translation means shifting the position of a shape without moving it in any other way.

Look for a clever way to draw/paint in the resulting design on your sheet of paper. Does your shape look like a fish? A bird? An elephant?

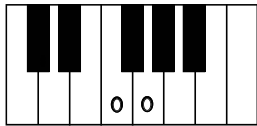
Lesson 18: Half Steps and Whole Steps

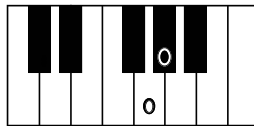
The **half step** (H) is the smallest interval used in traditional Western music. On a piano keyboard, a half step is represented by two adjacent keys.

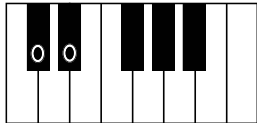
The **whole step** (W) is an interval made by combining two half steps.

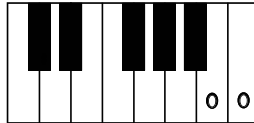


1. On the line beneath each piano keyboard, write whether the interval indicated by the Os are a half step (H) or whole step (W).









2. On the line, write whether the pair of notes represents a half step (H) or whole step (W)

TREBLE CLEF

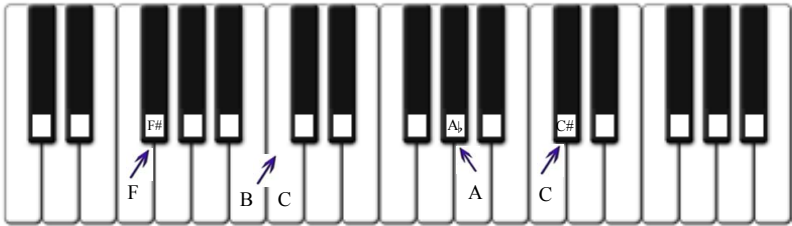
BASS CLEF

Half Step Highlights

Name _____

A half step is the distance from one note to the next key beside it....(or, the smallest interval used which is equal to the distance between two adjacent notes.)

F F Sharp B C A A Flat C C Sharp



Write the note in the blank that is one half step higher. Draw the note on the staff.

D _____ F# _____ E _____ G _____

Write the note in the blank that is one half step lower. Draw the note on the staff.

G _____ B Flat _____ E Flat _____ C _____

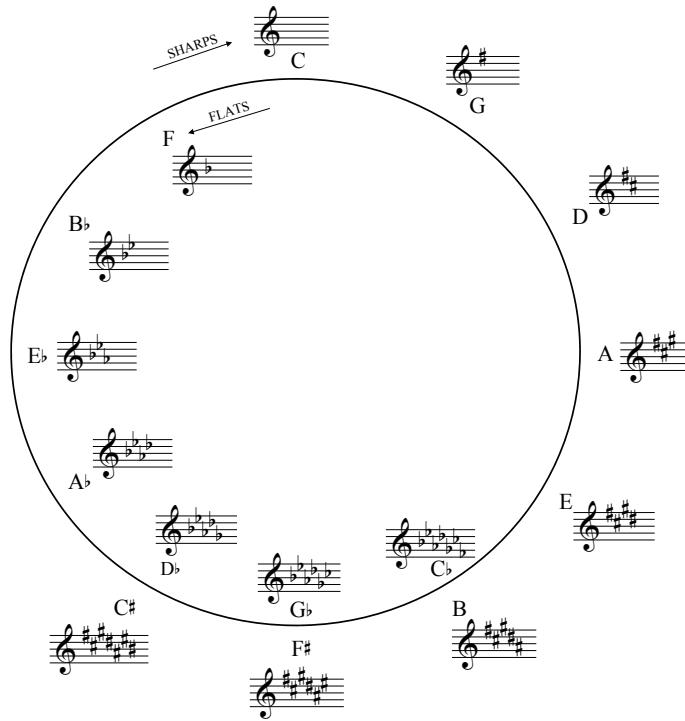
Write the note in the blank that is TWO half steps lower. Draw the note on the staff.

A _____ C _____ E _____ G _____

Write the note in the blank that is TWO half steps higher. Draw the note on the staff.

B _____ A _____ E Flat _____ A Flat _____

The Circle of Fifths



The **Circle of Fifths** diagram is a graphical representation of relationships among the 12 major and minor keys and their corresponding key signatures. The Circle of Fifths shown above shows the major keys.

Key signatures containing sharps are presented clockwise on the outside of the circle in order of ascending fifths. With each added sharp, the key advances five letter names and the tonic moves up a perfect fifth.

Key signatures containing flats are presented counter-clockwise on the inside of the circle in order of descending fifths. With each added flat, the key moves back five letter names and the tonic moves down a perfect fifth.

Determining a Key from a Key Signature

There are two simple rules to help you determine a key from the key signature written on a piece of music.

For Keys with Sharps: The key is one half step UP from the last sharp in the key signature.
For example, if the key signature is F#, C#, G#, then the last sharp is G#. One half step up from G# is A. The key is A.

For Keys with Flats: The key is the next to last flat in the key signature.
For example, if the key signature is Bb, Eb, Ab, then the next to last flat is Eb. So, the key is Eb. Remember, if the key signature has only one flat then the key is F.

✓ Check your answers with the Answer Key on page 168.

Key Signature

What's the Key?

- 1) _____
- 2) _____
- 3) _____
- 4) _____
- 5) _____
- 6) _____
- 7) _____
- 8) _____
- 9) _____
- 10) _____
- 11) _____
- 12) _____
- 13) _____

Major Scales

MAJOR SCALES are the building blocks for all of music. Major scales are built on a specific pattern of half-step and whole-step intervals. The pattern for a major scale is **Whole-step, Whole-step, Half-step, Whole-step, Whole-step, Whole-step, Half-step**. Starting on any note, if you follow this pattern you will build a major scale in the note's key.

Directions: Fill in major scale notes following the interval pattern. Determine the number of sharps or flats. List sharps or flats in order. I have filled in some of the spaces for you.

✓ Check your answers at www.LearnandMasterGuitar.com/answerkey

	Whole	Whole	Half	Whole	Whole	Whole	Half	How many #s or b's?	What are they?
C	<u>D</u>	<u>E</u>	___	___	___	___	___	none	_____

The following scales all contain SHARPS.

G	___	___	___	___	___	<u>F#</u>	___	___	<u>F#</u>
D	___	<u>F#</u>	___	___	___	<u>C#</u>	___	___	<u>F#</u> , <u>C#</u>
A	___	___	___	___	___	___	___	<u>3 #s</u>	_____
E	___	___	___	___	___	___	___	___	_____
B	___	___	___	___	___	___	___	___	_____
F#	___	___	___	___	___	<u>E#</u>	___	___	_____

The following scales all contain FLATS.

F	___	___	<u>Bb</u>	___	___	___	___	___	_____
Bb	___	___	___	___	___	___	___	___	_____
Eb	___	___	<u>Ab</u>	___	___	___	___	<u>3 b's</u>	_____
Ab	___	___	___	___	___	___	___	___	<u>Bb</u> , <u>Eb</u> , <u>Ab</u> , <u>Db</u>
Db	___	___	___	___	___	___	___	___	_____
Gb	___	___	<u>Cb</u>	___	___	___	___	___	_____

Keys & Key Signatures Worksheet

KEY SIGNATURES are derived from the flats or sharps found in a major scale. Each major scale produces a unique combination of sharps or flats as its key signature. A key signature will never have both sharps and flats in it simultaneously. The order of the sharps and flats in a key signature comes in a predictable sequence. The key signature order of sharps is F#, C#, G#, D#, A#, E#. The order of flats is Bb, Eb, Ab, Db, Gb, Cb. Using your major scales, determine the proper key and list the key signature. Put sharps or flats in the proper order.

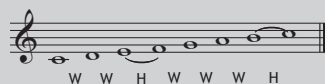
✓ Check your answers with the Answer Key on page 167.

- What key has 4 sharps in its key signature? _____ What are they? _____
- What key has 3 flats in its key signature? _____ What are they? _____
- What key has 2 sharps in its key signature? _____ What are they? _____
- What key has 4 flats in its key signature? _____ What are they? _____
- In the key of Bb, what note(s) are sharped/flatted? _____
- In the key of G, what note(s) are sharped/flatted? _____
- In the key of C, what note(s) are sharped/flatted? _____
- In the key of E, what note(s) are sharped/flatted? _____
- In the key of Eb, what note(s) are sharped/flatted? _____
- What key has 2 flats in its key signature? _____ What are they? _____
- What key has 5 flats in its key signature? _____ What are they? _____
- What key has 1 sharp in its key signature? _____ What is it? _____
- What key has 3 sharps in its key signature? _____ What are they? _____
- If the key signature has an F# and a C# in it, what's the key? _____
- If the key signature has a Bb, Eb, Ab, and a Db, what's the key? _____
- If the key signature is Bb and Eb, what's the key? _____
- If the key signature is F#, C#, G#, and D#, what's the key? _____
- If the key signature is Bb, Eb, Ab, Db, Gb, and Cb, what's the key? _____

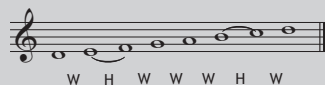
Modal Scales

Commonly used in jazz harmony, the **modal scales** are a series of seven different scales each with their own pattern of whole and half steps. To make them easier to understand we can relate these patterns to the white notes of the piano and the C major scale.

When you play all the white notes on a piano, starting on C and ending on C you have a C major scale. This pattern of whole and half steps is also called the **Ionian mode**.

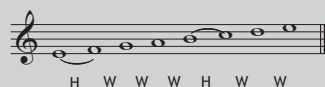


When you play all the white notes on a piano, this time starting on D and ending on D, you have a different order of whole and half steps. Therefore we have a different scale. This is called the **Dorian mode**.

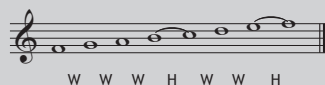


There is a different **modal scale** starting on each of the seven differently named white notes of the piano, each with a distinctive sound. Over the next few pages we will explore the different modes.

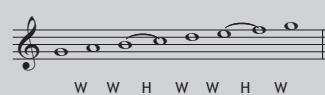
All the white notes starting on E is the **Phrygian mode**



And all the white notes starting on F is the **Lydian mode**



Starting on G is the **Mixolydian mode**



Starting on A is the **Aeolian mode**, which is the same as the natural minor scale.



The final mode starting on B is the **Locrian mode**.

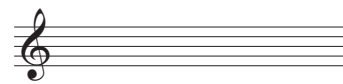


Complete this table:

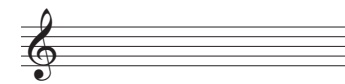
Scale commences on:	Name of mode:	Half steps occur between degrees:
C		
D		
E		
F		
G		
A		
B		

Write out the seven modal scales starting on each of the white notes of the piano beginning on C. Label them with their modal name, and mark the half steps with slurs.

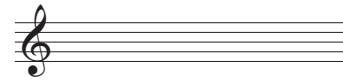
C _____



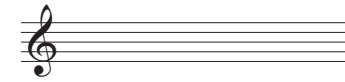
G _____



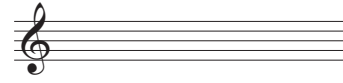
D _____



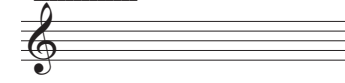
A _____



E _____



B _____

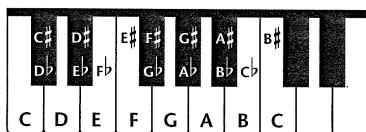


F _____

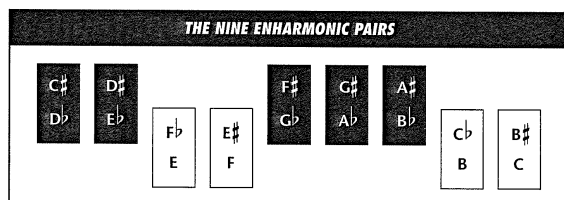


LESSON 22: ENHARMONICS

- By now many students have noticed that each of the black keys has two names: one set with sharps that is used when raising notes, and one set with flats that is used when lowering notes.
- We have also learned that four of the white keys have two names:
F can be called E-sharp, C can be called B-sharp,
E can be called F-flat, B can be called C-flat.
- When two notes have the same sound (because they are played by the same key on the piano) but have two different names, they are called **enharmonic notes**. C \sharp and D \flat are enharmonic notes.
- On a band instrument, enharmonic notes will have the same fingering!
- Here is a piano keyboard with all of the enharmonic notes listed.



- There are nine pairs of enharmonic notes. Memorize these pairs shown in the chart below. Remember, enharmonic notes have the same fingering. If you don't know the fingering to a note, you probably will know the fingering for its enharmonic spelling!



Exercise 6.18 - Writing Enharmonics

Directions: Give the enharmonic spelling for each note below.

- | | | | |
|---------------------------------------|-----------------|------------|------------------|
| 1. <u>D\flat</u> C-sharp | 6. ____ D-flat | 11. ____ F | 15. ____ E-sharp |
| 2. ____ D-sharp | 7. ____ E-flat | 12. ____ C | 16. ____ B-sharp |
| 3. ____ F-sharp | 8. ____ G-flat | 13. ____ E | 17. ____ F-flat |
| 4. ____ G-sharp | 9. ____ A-flat | 14. ____ B | 18. ____ C-flat |
| 5. ____ A-sharp | 10. ____ B-flat | | |

Notating Scales

- For all exercises, draw YOUR instrument's clef sign at the beginning of the staff.
- Based on the given concert pitch, figure out the starting note for YOUR instrument. You will write out the notes and key signatures based on what you would play on YOUR instrument.
- You only need to write out only one octave for each scale. Write the notes as whole notes.

- Concert F Chromatic Scale** - starting on Concert F, write out your chromatic scale (all half steps) ascending and descending. Use sharp enharmonics going up and flat enharmonics going down.

Ascending

Descending

- Concert A \flat Major Scale** - starting on Concert A \flat , write out a scale using the major scale pattern: WWH(W)WWH

- Concert D \flat Major Scale** - starting on Concert D \flat , write out a scale using the major scale pattern: WWH(W)WWH

- Concert D Dorian Scale** - starting on Concert D, write out a scale using the the dorian scale pattern: WHW(W)WHW

(Reminder: dorian scales start on the second scale degree of a major scale, so if you know the key signature for Concert C Major, you know the key signature for Concert D Dorian.)

Coding Activities

Activity #1- What is HTML?

Instructions: Read the following article and answer the questions.

What is HTML?

HTML is a computer language devised to allow website creation. These websites can then be viewed by anyone else connected to the Internet. It is relatively easy to learn, with the basics being accessible to most people. The definition of HTML is **HyperText Markup Language**.

- *HyperText* is the method by which you move around on the web — by clicking on special text called **hyperlinks** which bring you to the next page.
- *Markup* is what **HTML tags** do to the text inside them. They mark it as a certain type of text (*italicised* text, for example).
- HTML is a *Language*, as it has code-words and syntax like any other language.

How does it work?

HTML consists of a series of short **codes** typed into a text-file by the site author — these are the tags. The text is then saved as a html file, and viewed through a browser, like *Internet Explorer* or *Google Chrome*. This browser reads the file and translates the text into a visible form, hopefully rendering the page as the author had intended. Writing your own HTML entails using tags correctly to create your vision.

What are the tags up to?

The tags are what separate normal text from HTML code. You might know them as the words between the <angle-brackets>. They allow all the cool stuff like images and tables and stuff, just by telling your browser what to put on the page. Different tags will perform different functions. The tags themselves don't appear when you view your page through a browser, but their effects do. The simplest tags do nothing more than apply formatting to some text, like this:

****These words will be bold****, and these will not.

Questions:

1. What does HTML stand for?
2. When we separate normal text from HTML code, we use _____.
3. True or False: The tags appear when you view your webpage in a browser.
4. Special lines of text that bring you to another webpage are called _____.
5. HTML is used to create _____.
6. The **** tag makes text bold. Predict at least 3 other tags you might need to create a website and what they do. _____

Coding Activities

Activity #2

Instructions: Study these common HTML tags and what they do. Then, use the information to help you complete the questions at the bottom.

HTML Cheatsheet		page 1 of 2
Basic Tags <html> </html> Creates an HTML document	Formatting <p> </p> Creates a new paragraph	
<head> </head> Sets off the title & other info that isn't displayed	 Inserts a line break (carriage return)	
<body> </body> Sets off the visible portion of the document	<blockquote> </blockquote> Puts content in a quote - indents text from both sides	
Lists Creates an unordered list	Text Tags <pre> </pre> Creates preformatted text	
<ol start=?> Creates an ordered list (start=xx, where xx is a counting number)	<h1> </h1> --> <h6> </h6> Creates headlines -- H1=largest, H6=smallest	
 Encompasses each list item	 Creates bold text (should use instead)	
 Adds image; it is a separate file located at the URL	<i> </i> Creates italicized text (should use instead)	
	Links clickable text Creates a hyperlink to a Uniform Resource Locator	

Fill in the Blank:

1. The _____ tag creates an unordered list.
2. The _____ tag creates the largest type of headline.
3. The _____ tag creates bold text.
4. The _____ tag creates a hyperlink to another website.
5. The _____ tag adds an image to a website.
6. The _____ tag creates italicized texts.
7. The _____ tag creates an ordered list.
8. The _____ tag creates a paragraph.
9. The _____ tag inserts a line break.
10. The _____ tag creates the smallest size of headline.

Coding Activities

Activity #3- HTML Matching Game

Materials: Paper, Pencil, Scissors

Instructions:

1. Cut your paper into 22 small squares, approximately all the same size. If you have sticky notes, they would work great!
2. Write each HTML Tag and HTML Style on one square (only 1 per square)
3. Turn all of the cards over and lay them out in a grid shape, face down
4. Play the matching game. Your goal is to match the correct HTML tag with the correct HTML Style. Good luck!

*Hint: Use the HTML cheat sheet from Activity 2 to help you!

HTML Tags

<H1>
<H6>
<p>

<i>

<a href>
<body bgcolor=?>

HTML Styles

Largest Heading
Smallest Heading
Paragraph text
Bold text
Italicized text
Image
Unordered/Bulleted list
Ordered/Numbered list
URL Link
Background color
Line Break

Coding Activities

Activity #4- HTML Practice 1

Instructions: Study the following HTML paragraph. Then, using the HTML tags you have learned, answer the questions below.

```
<HTML>
<HEAD>
<TITLE> Company Profile, Camembert International </TITLE>
</HEAD>
<BODY>
<H1> CAMEMBERT INTERNATIONAL</H1>
<p>"Many's the night I dreamed of cheese – toasted, mostly." Robert Louis Stevenson</p>
<H2> What We Do </H2>
<HR>
<p>We make cheese. Lots of cheese; more than eight tons of cheese a year. Your Brie, your Gouda, your Havarti, we make it all.</p>
<H2>Why We Do It</H2>
<p> We are paid an awful lot of money by people who like cheese. So we make more. Cheese is not just for mice anymore, you know. These days <i>everybody </i> is getting into cheese. On sandwiches, salads, with meat, or alone. It's the perfect complement to an appetite. So remember: <b>Say cheese!</b> </p>
</BODY>
</HTML>
```

1. Where will the phrase "Company Profile, Camembert International" appear?
2. What text will appear in the H1 heading?
3. What text (if any) will be italicized?
4. What text (if any) will appear in bold type?
5. How many different heading sizes are used in this HTML document?

Coding Activities

Activity #5- HTML Practice 2

Instructions: Look at the example paragraph. Add the needed HTML tags to the text below it so that they would match if we turned it into a website. Just write the needed tags/codes around each line.

Web Page Class The Best of Centerville High School

Purpose

The purpose of this class is to learn to design and produce pages for the *World Wide Web*.

Objectives

The objectives for this class include:

- Discussing issues related to technology
- Designing the Centerville High School website
- Publishing the Centerville High School website

Add the HTML tags around this paragraph. I have done the first one for you.

<H1>Web Page Class</H1>

The Best of Centerville High School

Purpose

The purpose of this class is to learn to design and produce pages for the World Wide Web.

Objectives

The objectives for this class include

Discussing issues related to technology

Designing the Centerville High School website

Publishing the Centerville High School website

Coding Activity #1- What is HTML

Instructions: Read the following article and answer the questions.

What is HTML?

HTML is a computer language devised to allow website creation. These websites can then be viewed by anyone else connected to the Internet. It is relatively easy to learn, with the basics being accessible to most people. The definition of HTML is **HyperText Markup Language**.

- *HyperText* is the method by which you move around on the web — by clicking on special text called **hyperlinks** which bring you to the next page.
- *Markup* is what **HTML tags** do to the text inside them. They mark it as a certain type of text (*italicised* text, for example).
- HTML is a *Language*, as it has code-words and syntax like any other language.

How does it work?

HTML consists of a series of short **codes** typed into a text-file by the site author — these are the tags. The text is then saved as a html file, and viewed through a browser, like *Internet Explorer* or *Google Chrome*. This browser reads the file and translates the text into a visible form, hopefully rendering the page as the author had intended. Writing your own HTML entails using tags correctly to create your vision.

What are the tags up to?

The tags are what separate normal text from HTML code. You might know them as the words between the <angle-brackets>. They allow all the cool stuff like images and tables and stuff, just by telling your browser what to put on the page. Different tags will perform different functions. The tags themselves don't appear when you view your page through a browser, but their effects do. The simplest tags do nothing more than apply formatting to some text, like this:

****These words will be bold****, and these will not.

Questions:

1. What does HTML stand for?
2. When we separate normal text from HTML code, we use _____.
3. True or False: The tags appear when you view your webpage in a browser.
4. Special lines of text that bring you to another webpage are called _____.
5. HTML is used to create _____.
6. The **** tag makes text bold. Predict at least 3 other tags you might need to create a website and what they do. _____

Coding Activity #2-HTML Tags

Instructions: Study these common HTML tags and what they do. Then, use the information to help you complete the questions at the bottom.

HTML Cheatsheet		page 1 of 2
Basic Tags <html> </html> Creates an HTML document <head> </head> Sets off the title & other info that isn't displayed <body> </body> Sets off the visible portion of the document	Formatting <p> </p> Creates a new paragraph Inserts a line break (carriage return) <blockquote> </blockquote> Puts content in a quote - indents text from both sides	
Lists Creates an unordered list <ol start=?> Creates an ordered list (start=xx, where xx is a counting number) Encompasses each list item Adds image; it is a separate file located at the URL	Text Tags <pre> </pre> Creates preformatted text <h1> </h1> --> <h6> </h6> Creates headlines -- H1=largest, H6=smallest Creates bold text (should use instead) <i> </i> Creates italicized text (should use instead)	
	Links clickable text Creates a hyperlink to a Uniform Resource Locator	

Fill in the Blank:

1. The _____ tag creates an unordered list.
2. The _____ tag creates the largest type of headline.
3. The _____ tag creates bold text.
4. The _____ tag creates a hyperlink to another website.
5. The _____ tag adds an image to a website.
6. The _____ tag creates italicized texts.
7. The _____ tag creates an ordered list.
8. The _____ tag creates a paragraph.
9. The _____ tag inserts a line break.
10. The _____ tag creates the smallest size of headline.

Coding Activity #3-Matching Game

Materials: Paper, Pencil, Scissors

Instructions:

1. Cut your paper into 22 small squares, approximately all the same size. If you have sticky notes, they would work great!
2. Write each HTML Tag and HTML Style on one square (only 1 per square)
3. Turn all of the cards over and lay them out in a grid shape, face down
4. Play the matching game. Your goal is to match the correct HTML tag with the correct HTML Style. Good luck!

*Hint: Use the HTML cheat sheet from Activity 2 to help you!

HTML Tags

<H1>
<H6>
<p>

<i>

<a href>
<body bgcolor=?>

HTML Styles

Largest Heading
Smallest Heading
Paragraph text
Bold text
Italicized text
Image
Unordered/Bulleted list
Ordered/Numbered list
URL Link
Background color
Line Break

Coding Activity #4- HTML Practice 1

Instructions: Study the following HTML paragraph. Then, using the HTML tags you have learned, answer the questions below.

```
<HTML>
<HEAD>
<TITLE> Company Profile, Camembert International </TITLE>
</HEAD>
<BODY>
<H1> CAMEMBERT INTERNATIONAL</H1>
<p>"Many's the night I dreamed of cheese – toasted, mostly." Robert Louis Stevenson</p>
<H2> What We Do </H2>
<HR>
<p>We make cheese. Lots of cheese; more than eight tons of cheese a year. Your Brie, your Gouda, your Havarti, we make it all.</p>
<H2>Why We Do It</H2>
<p> We are paid an awful lot of money by people who like cheese. So we make more. Cheese is not just for mice anymore, you know. These days <i>everybody </i>is getting into cheese. On sandwiches, salads, with meat, or alone. It's the perfect complement to an appetite. So remember: <b>Say cheese!</b> </p>
</BODY>
</HTML>
```

1. Where will the phrase "Company Profile, Camembert International" appear?
2. What text will appear in the H1 heading?
3. What text (if any) will be italicized?
4. What text (if any) will appear in bold type?
5. How many different heading sizes are used in this HTML document?

Coding Activity #5- HTML Practice 2

Instructions: Look at the example paragraph. Add the needed HTML tags to the text below it so that they would match if we turned it into a website. Just write the needed tags/codes around each line.

Web Page Class **The Best of Centerville High School**

Purpose

The purpose of this class is to learn to design and produce pages for the *World Wide Web*.

Objectives

The objectives for this class include:

- Discussing issues related to technology
- Designing the Centerville High School website
- Publishing the Centerville High School website

Add the HTML tags around this paragraph. I have done the first one for you.

<H1>Web Page Class</H1>

The Best of Centerville High School

Purpose

The purpose of this class is to learn to design and produce pages for the World Wide Web.

Objectives

The objectives for this class include

Discussing issues related to technology

Designing the Centerville High School website

Publishing the Centerville High School website



CLEAN COINS

MATERIALS:

- 1/2 cup lemon juice
- 1/2 cup dish soap
- 1/2 cup baking soda paste (water and baking soda)
- 1/2 cup water
- 1/2 cup cola
- 5 nickels
- 5 pennies

ACTIVITY:

Explore various cleaning solutions and their effects on tarnished and oxidized coins.

STEPS:

1. Fill two cups each half way full with each of the cleaning solutions (i.e. two cups with 1/4 cup of soap each).
2. Record the condition of each coin.
3. Place one of each coin into each solution, soak overnight (i.e. a penny in soap, a nickel in soap).
4. Scoop the coins out of the solutions, label and record the condition of each.
5. Use the toothbrushes to clean the coins, rinse and then re-examine.

ENDING QUESTION:

Did the coins become clean or remain tarnished? Is there a solution that worked best?

EXTEND YOUR LEARNING!

Try this experiment using pennies, nickels, dimes, and quarters. Or use different "cleaning solutions".



EGG DROP!

POTENTIAL MATERIALS:

- egg
- sponges
- straws
- other household materials
- cardboard
- cotton balls
- tape

DESIGN CHALLENGE:

Have each family member create a container that will keep a raw egg safe when it is dropped from a height.

DESIGN ELEMENTS:

Keeping the egg safe means finding a way to pad its fall or slow it down enough so it won't crack. Many designs find ways to cover the egg so it doesn't make direct contact with the ground.

GUIDING QUESTIONS:

1. What items could be used as padding?
2. How will you secure the egg while it falls?
3. How could you slow down the egg when it is falling?
4. How might height affect this experiment?

CHALLENGE YOURSELF!

Do this activity again but with extra rules. Examples: Use the least amount of materials, design in 5 minutes, etc..



A

MAGICAL MILK

MATERIALS:

- 1 cup of milk
- 4 tbsp vinegar
- food coloring (optional)
- microwave
- strainer (or paper towels)

STEPS:

1. Warm milk in microwave for one and a half minutes.
2. Add vinegar slowly and stir for about a minute, the milk should start to clump.
3. Strain the milk using the strainer or paper towel, push out all the liquid.
4. Take the solid "plastic" out of strainer and add food coloring if you wish.
5. Use the "plastic" to create different shapes.
6. Set aside to dry - about 2 nights.

ENDING QUESTION:

Why do you think the milk reacted the way it did to the vinegar?

FUN FACT!

The process you just went through is very similar to how you make a popular Indian Cheese, paneer!



J

DIY TRAMPOLINE

POTENTIAL MATERIALS:

- colander
- rubber bands
- tape
- plastic bag
- tooth picks
- binder clips
- ball
- fabric

DESIGN CHALLENGE:

Create a trampoline together that will be able to bounce a ball at least 8 inches.

DESIGN ELEMENTS:

Trampolines have a thicker, stretchy material, springs that attach it to a frame.

GUIDING QUESTIONS:

1. How do trampolines work? What is important to make sure your design has?
2. How will you connect your fabric to the frame?
3. What will you build your frame out of?

CONCEPT EXPLORATION!

Trampolines apply Hooke's Law of Physics. The law states the amount of force you exert on a spring, the equal amount will be returned. Learn more about it!



Name: _____ period: _____

Word Problems on Surface Area

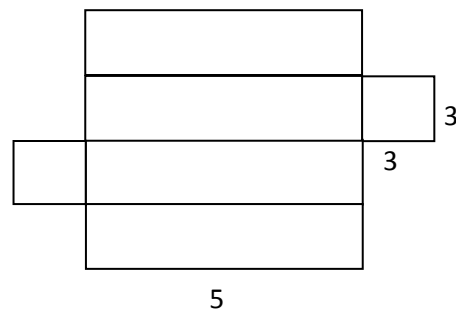
Directions: show all formulas and substitutions.

1. A painter uses a roller to paint a wall. The roller has a radius of 5 inches and a height of 13 inches. In one roll, what is the area of the wall that he will paint? What is the area that he will paint in 3 rolls? Use 3 for π .

2. Maddi bought a gift for her friend. She wants to place the gift in a package with the length of 9 inches, width of 12 inches, and height of 4 inches. Then she wants to wrap the gift.
 - a. What is the surface area of the package?

 - b. If Maddi bought a roll of wrapping paper that is 3 feet long and 2 feet wide, will it be enough to wrap the package? (hint: convert feet into inches)

3. Thomas received a gift in a box that was in the shape of a rectangular prism. The net for the prism is shown.



- a. What is the surface area of the net?

- b. If the dimensions of the box triple, what would be the area of the net?

- c. What is the ratio of the area of the enlarged box to the area of the original box?

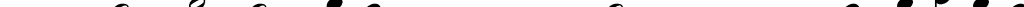
Middle School Melodic Exercises

1. 

[illegible]

3. 

4.

5. 

[illegible]

7.

So

8.

D

[illegible]

Activity #1 Multimedia-Writing a Slogan

A **Slogan** is a catchy phrase used by a company to help customers remember their business. The shorter the slogan is the better, because it will be easier to remember. Look at the examples below and think about other popular business slogans used by companies today. Then follow the instructions for writing a slogan for your business project.

Popular Slogans

I'm Lovin' It	McDonald's
Like a good neighbor, State Farm is there.	State Farm
Think Outside the Bun	Taco Bell
Taste the rainbow	Skittles
Live in your world. Play in ours.	PlayStation
The Happiest Place on Earth	Disneyland
Eat Fresh	Subway

Instructions: Write three short slogans that will be used to represent and advertise the business you created in class. They should not be more than 6 or 7 words.

Slogan 1:

Slogan 2:

Slogan 3:

Which Slogan will you use for your company? Tell me why this is the best choice?

Activity #2 Multimedia-Writing a Job Description

A **Job Description** tells employees important details about their job. It includes:

- Job name/title
- Summary of what the job is (Minimum of 1 sentence)
- Job pay (Can be salary/yearly or hourly)
- List of specific required skills or qualifications
- Education needed (HS diploma, college, etc.)

Example Job Description:

Job Title: Business Teacher

Job Summary: This position is responsible for developing and teaching lessons to high school students in various business subjects such as accounting, personal finance, multimedia, and web design.

Salary: \$40,000 per year

Skills Required: Organization, Communication, Ability to develop lessons

Education Required: Bachelor's Degree in Education

Instructions: Think about the employees you will need for the business you created.

Write **two** job descriptions using the template below. Don't forget to look at the example!

Job Title:

Job Summary:

Salary:

Skills Required:

Education Required:

Job Title:

Job Summary:

Salary:

Skills Required:

Education Required:

Activity #3 Multimedia-Creating Business Cards

Business Cards are a way to quickly give people your contact information and information about your business. They should be simple and include the following:

- Your Name
- Your Job Title (Owner)
- Your business name
- Your business slogan
- Your business logo or another image
- Your business address
- Your contact info (phone and email)

Example Business Card:



Instructions: Using the Business Card template on Canva.com or a piece of paper, draw/design a business card for your business. Be sure to include all of the required information and be creative!

Activity #4 Multimedia-Radio Ad Script

The final step in your business project is to Advertise! You will create an Ad for the radio. First, you will write a script before recording your ad and adding sound effects.

Instructions: Type your script in Google Docs or write it out on a piece of paper. Your script must be word for word what your ad is going to say. You will read it when you record your ad. Your ad may use pathos(emotion), ethos(credibility), or logos(facts), but be sure to tell us about your company. Your goal is 30 seconds!

Be sure to include:

- Your business name
- What your business is/does
- Your business slogan
- Your business address
- Your contact info (phone or email)

Radio Ad Script Example

Background Sound: Restaurant Noises (Plates, silverware, background conversations)

Man: I'm heading over to the doctor's office to look into that clinical trial I mentioned..

Woman: Oh, right. It's on diabetes prevention?

Man: Yeah. After my Dad's scare, I wanted to see what I could do to help. And from what I read, this trial is a great way.

Woman: I have some time this afternoon, could I come with you?

Man: Definitely! They're looking for all kinds of people.

Narrator: If you are interested in learning more about diabetes contact our Clinic at 417-777-7777.

Why wait? You can Make a Difference.

Help Prevent Diabetes Now.

Activity #5 Multimedia-Radio Ad Recording

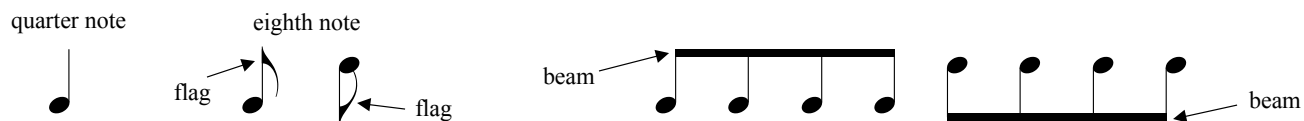
Instructions: You are ready to record your Radio Ad! Open up the *Voice Memos* App on your iPad. The red button at the bottom will start/stop recording. Record your ad as many times as it takes. If you need another person, consider asking a family member to read one part of the script. Remember, your goal is 30 seconds!

If you want to add sound effects or background music to your Radio Ad,
here's what you do!

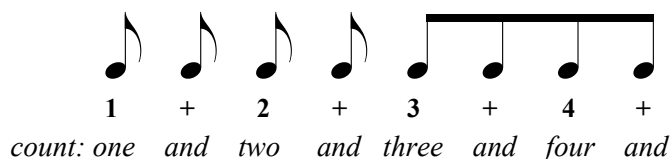
1. Open iMovie
2. Choose a photo to be the background image for your iMovie
3. Add the following Audio Clips:
 - a. Background Music
 - b. Your Radio Ad (located under imported from Voice Memos)
 - c. Sound Effects
4. Be sure to adjust the layering and volume so that you can hear all of the audio in your video
5. Make sure you trim the Background music so that it is not longer than your voice recording
6. Save your video by clicking "Done"
7. Export your video to Google Drive (Click the box with the up arrow)
8. Go to your Google Drive
9. Share your Radio Ad with me so I can hear it!!
ebrewer@aurorar8.org

Lesson 12: Eighth Notes

An eighth note looks like a quarter note with a flag. If two or more eighth notes appear in a row, the eighth notes are connected with a beam.



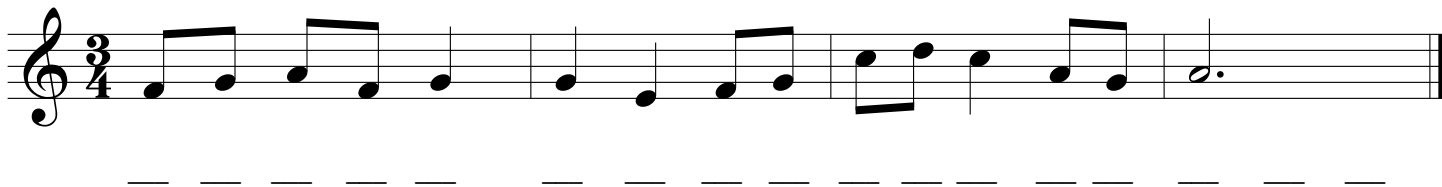
An eighth note has a value of half of a beat. When writing the counts, use a plus sign (+) for eighth notes.



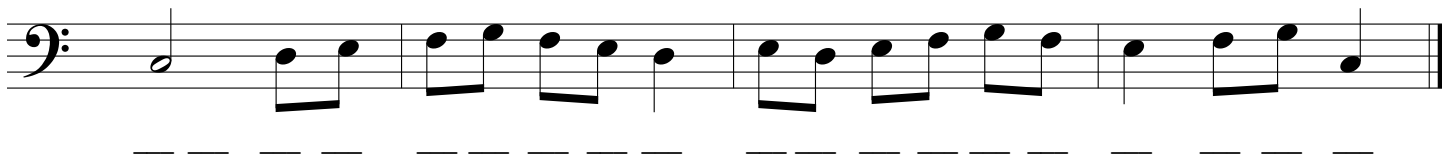
1. Clap the rhythm of the notes while counting the beats out loud.



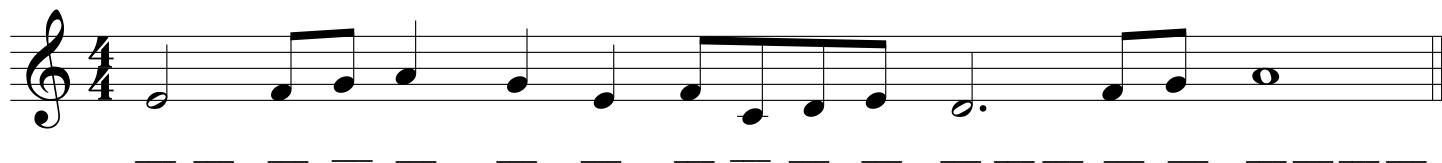
2. Write in the beats below the notes indicated. Then clap the rhythm while counting the beats out loud.



3. Write a $\frac{3}{4}$ time signature after the clef sign. Write in the beats below the notes indicated. Then clap the rhythm while counting the beats out loud.

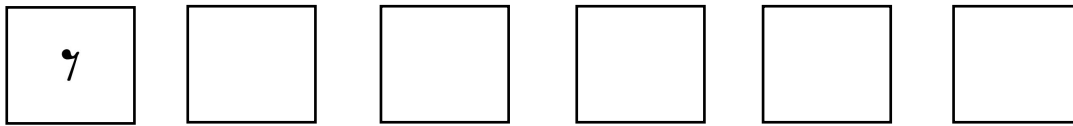


4. Write in the count below the notes and then add the missing barlines.

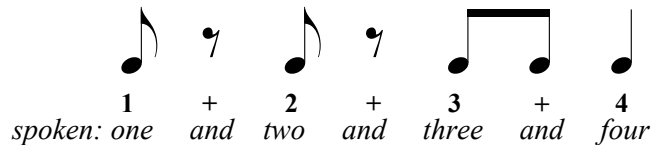


Lesson 13: Eighth Rests

An eighth rest is shown as follows. After the first eighth rest, practice drawing 5 more eighth rests.



An eighth rest has a value of half of a beat. When writing the counts, use a plus sign (+) for eighth notes and eighth rests.



1. Clap the rhythm of the notes while counting the beats out loud.



2. Write in the counts below the notes indicated. Then clap the rhythm while counting the beats out loud.



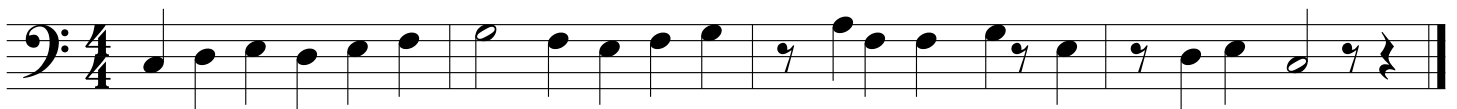
3. Write the count below the notes. Then clap the rhythm while counting the beats out loud.



4. Write in the count below the notes. Then add the missing barlines.



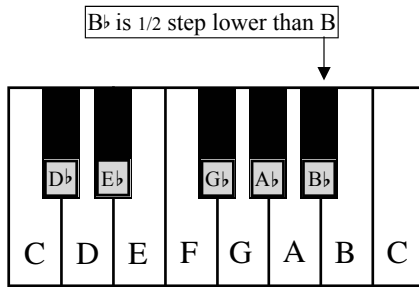
5. Draw the missing flags and beams on the eighth notes that are missing flags or beams.



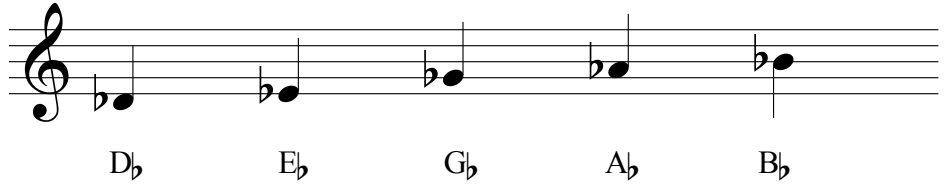
Lesson 16: Flats

A **flat** sign (\flat) lowers the pitch of a note by a half step.

On the keyboard of a piano, the black key to the left of a white key is a half step lower and called a flat.



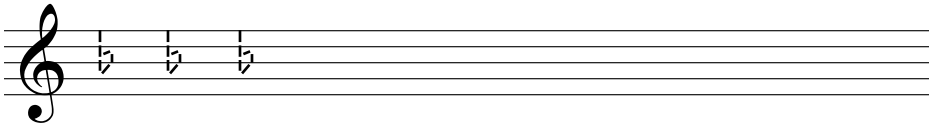
Examples:



To say the name of a flatted note, say the letter name first and the flat next. For example, "B flat".

To write a flatted note on a staff, place the flat sign to the left of the note.

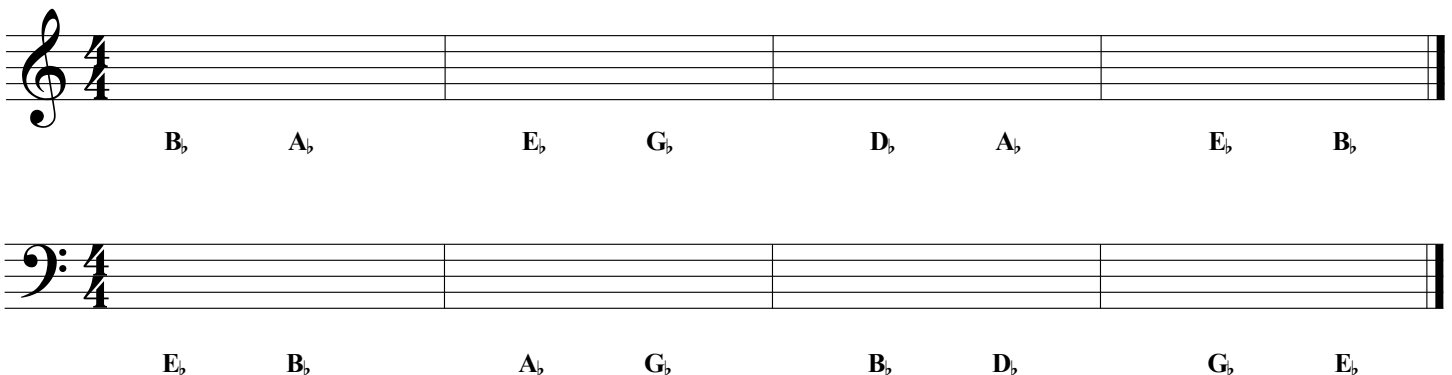
1. Try drawing flats by tracing over the dotted lines. Then draw five more flats on the staff.



2. Draw a flat sign in front of each note. Then write the names of the notes indicated.



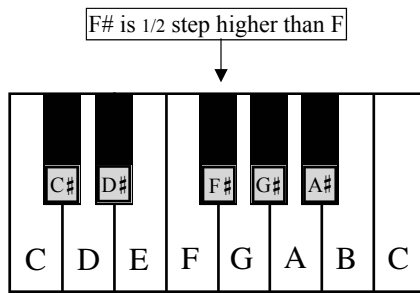
3. Draw the notes indicated.



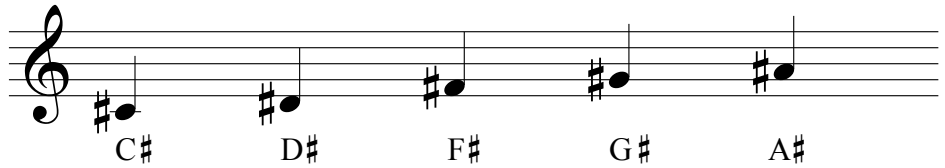
Lesson 17: Sharps

A **sharp** sign (#) raises the pitch of a note by a half step.

On the keyboard of a piano, the black key to the right of a white key is a half step higher and called a sharp.



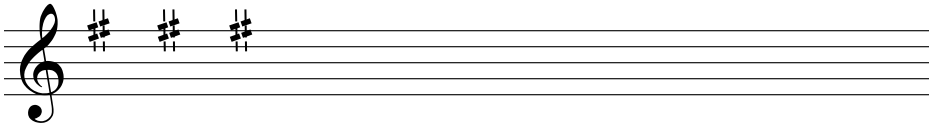
Examples:



To say the name of a sharp note, say the letter name first and the sharp next. For example, "F sharp".

To write a sharp note on a staff, place the sharp sign to the left of the note.

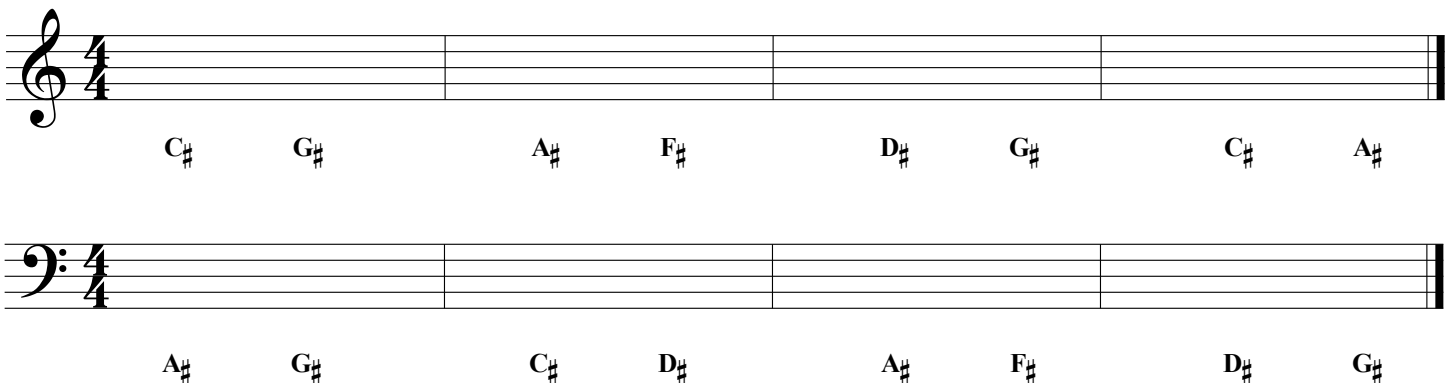
1. Try drawing sharps by tracing over the dotted lines. Then draw five more sharps on the staff.



2. Draw a sharp sign in front of each note. Then write the names of the notes indicated.



3. Draw the notes indicated.



CREATURE POEM AND CREATURE

**This is due:
Share it with me
on email.**

Creature Poem and 3D Model

Expected Grade Level
Work

Poetic Use Figurative Language is
powerfully used
Uses 6 poetic devices

Story Creature is fully-developed

Story is interesting

There is a purpose for the story

100% complete

20 lines long

3D Art 100%Complete

Appropriately made for your creature

Has to match your character

Story of Potential Myths

So much of mythology is stories of how something in the natural world came into existence.

Sorrow and pain=Pandora and Zues' box

Humans beings=Promothesius and his kindness

Different skin tones=Pheaton and his chariot ride

This was the assignment from last session: Take photos and send them to me of different things from nature that would make an interesting story of how in the world it came into existence.

Now include a picture of your favorite idea and a rough summary of the story on the left.

PICTURE	Summary of how it came to be

ATHENA AND POSEIDON'S CONTEST FOR ATHENS



"La Dispute de Minerve et de Neptune pour donner un nom à la ville d'Athènes" by Halle Noël is in the public domain.

[1]

The stories of our Greek and Roman heroes all share similar traits. Heroes or heroines tend to be born in an extraordinary way, (think of the DC Comics Superman, the sole survivor from the planet Krypton who was saved by his father and sent in a rocket to planet Earth), are often brought up by those who are not their birth parents, and go on to face a series of challenges or quests before they can claim what is rightly theirs. During their heroic careers they are called up to intervene in all kinds of human endeavors; such as battles between peoples, or wars between nations. They are also often conscripted^[1] into worthy causes, such as the creation of a new town; laying the metaphoric foundations for what was to prosper into our contemporary major cities that we still walk in today. These stories are called founding myths, and often denote moments in a shared history when new communities arise to later become powerful and prosperous.

One such story comes from Virgil's *The Aeneid* where the popular cult of Romulus and Remus becomes the founding myth of the city of Rome; telling of the twin's unusual infancy, when they were breastfed and reared by a she-wolf after their parents had deserted them.

Our heroine, Athena² was the protagonist of one such founding myth, and she too has a city named after her. And, if you are wondering which city this could possibly be, the clue lies in her name, but it was her name that was given to the city, and not the other way round.

To recall this story we have to start with 'Once, a long, long time ago' because the actual date is not important; only the idea that this all took place in our distant past. Once, a long, long time ago the first king of Athens, King Cecrops (quite an extraordinary king himself, as he was part human and part snake), set out to find a patron deity³ for his city state; already a prosperous⁴ and vibrant⁵ city. He called on Athena and Poseidon⁶ because both in fact desired to be the patron of this beautiful city. Their rivalry was so intense that they almost went to war and just as they were about to attack each other, Athena, with her typical, wise approach suggested that they

should hold a contest for the city. With King Cecrops the judge, they set up the contest and decided that whoever presented the city with the best gift would be rewarded with the city itself as the grand prize.

[5]

In the midst of a huge crowd, with King Cecrops presiding over the contest, they went up to the Acropolis⁷ to present their gifts to the city. Poseidon was to go first, and he lifted his massive trident (three pointed spear) and struck the earth with it. At the point where the spear struck, a frothy spring burst out producing a sea which is now called Erekhtheis. The people loved it but as they went closer to taste the water, to their dismay the water was salty. Don't forget that Poseidon was ruler of the sea, and the water sources he controlled were inevitably salty, just like the seas he ruled.

When it was Athena's turn her act was far less dramatic. She quietly knelt and buried something in the ground which in time grew into an olive tree. This turned out to be a much more useful gift, granting the Athenians not only the olives themselves as sustenance, but also a source of oil for their lamps and for cooking their food as well as the wood from the olive tree to build their boats and houses. Clearly Athena's gift was deemed by far the better by Cecrops, and he declared her the winner and the patron deity of Athens. Athena became the protector of the city (polis) and many people throughout the Greek world worshiped her as Athena Polias (Ἀθηνᾶ Πολιάς "Athena of the city"). As patron of Athens, she fought in the Trojan War³ on the side of the Achaeans.

And if you are worried about what happened to the King, you don't have to be concerned, as the fabulous citadel⁹ at the Acropolis was named Cecropia after him. The Sea God Poseidon however was not at all pleased by all of this, and in a wild fury he flooded the Thriasian plain,¹⁰ drowning Attika¹¹ under his salty sea.

The contest for the city of Athens was later carved into the stone relief¹² on the rear pediment¹³ in the Temple of Athena on the Acropolis, with both of our heroes appearing in the center of the composition — the goddess holding her olive tree and Poseidon his trident.

This story deserves an additional telling — this time in the Roman tradition¹⁴.... Here it was the god Neptune¹⁵ who was to challenge the goddess Minerva¹⁶ to the contest over Athens. In this rendering it was Jove (Zeus)¹⁷ who was to judge them. The outcome however was identical, with Minerva winning the contest with her olive tree, establishing what was said to be the first town in the world and naming it in her own name, Athens. In this version

not only did Neptune flood the land with a sea of salt but went on to curse the city with a water shortage which still continues today in modern day Greece.

Text-Dependent Questions

Directions: For the following questions, choose the best answer or respond in complete sentences.

1. PART A: Which of the following statements best identifies the theme of the myth of Athena and Poseidon's contest for Athens?
 - Democratic contests are more just and preferable than war.
 - Athens was a vibrant city thanks to Athena.
 - A useful gift is better than a dramatic one.
 - Women make better protectors than men.
2. PART B: Which of the following quotes from the text best supports the answer to Part A?
 - "Their rivalry was so intense that they almost went to war and just as they were about to attack each other, Athena, with her typical, wise approach suggested that they should hold a contest for the city." (Paragraph 4)
 - "This turned out to be a much more useful gift, granting the Athenians not only the olives themselves as sustenance, but also a source of oil for their lamps and for cooking their food as well as the wood from the olive tree to build their boats and houses." (Paragraph 6)
 - "Athena became the protector of the city (polis)... As patron of Athens, she fought in the Trojan War on the side of the Achaeans." (Paragraph 6)
 - "The Sea God Poseidon however was not at all pleased by all of this, and in a wild fury he flooded the Thriasian plain, drowning Attika under his salty sea." (Paragraph 7)
3. PART A: What does the phrase "metaphoric foundations" most closely mean as it is used in paragraph 1?
 - the mythic ideas of what the city was built on
 - poetic descriptions of the original buildings in the city
 - early codes of law, originally written as myths
 - a comparison of two different cities
4. PART B: Which phrase from the text best supports the answer to Part A?
 - "what was to prosper into our contemporary major cities that we still walk in today" (Paragraph 1)
 - "These stories are called founding myths" (Paragraph 1)
 - "often denote moments in a shared history" (Paragraph 1)
 - "when new communities arise to later became powerful and prosperous." (Paragraph 1)

5. How are the details about Poseidon's and Athena's characters important to the development of the myth's theme? Cite evidence from the text in your answer. _____
