SECTION 2

The Skeletal System

When you hear the word skeleton, *you may think of the remains of something that has died. But your skeleton is not dead. It is very much alive.*

You may think your bones are dry and brittle. But they are alive and active. Bones, cartilage, and the connective tissue that holds bones together make up your **skeletal system.**

READING WARM-UP

Objectives

- Identify the major organs of the skeletal system.
- Describe four functions of bones.
- Describe three joints.
- List three injuries and two diseases that affect bones and joints.

Terms to Learn

skeletal system
joint

READING STRATEGY

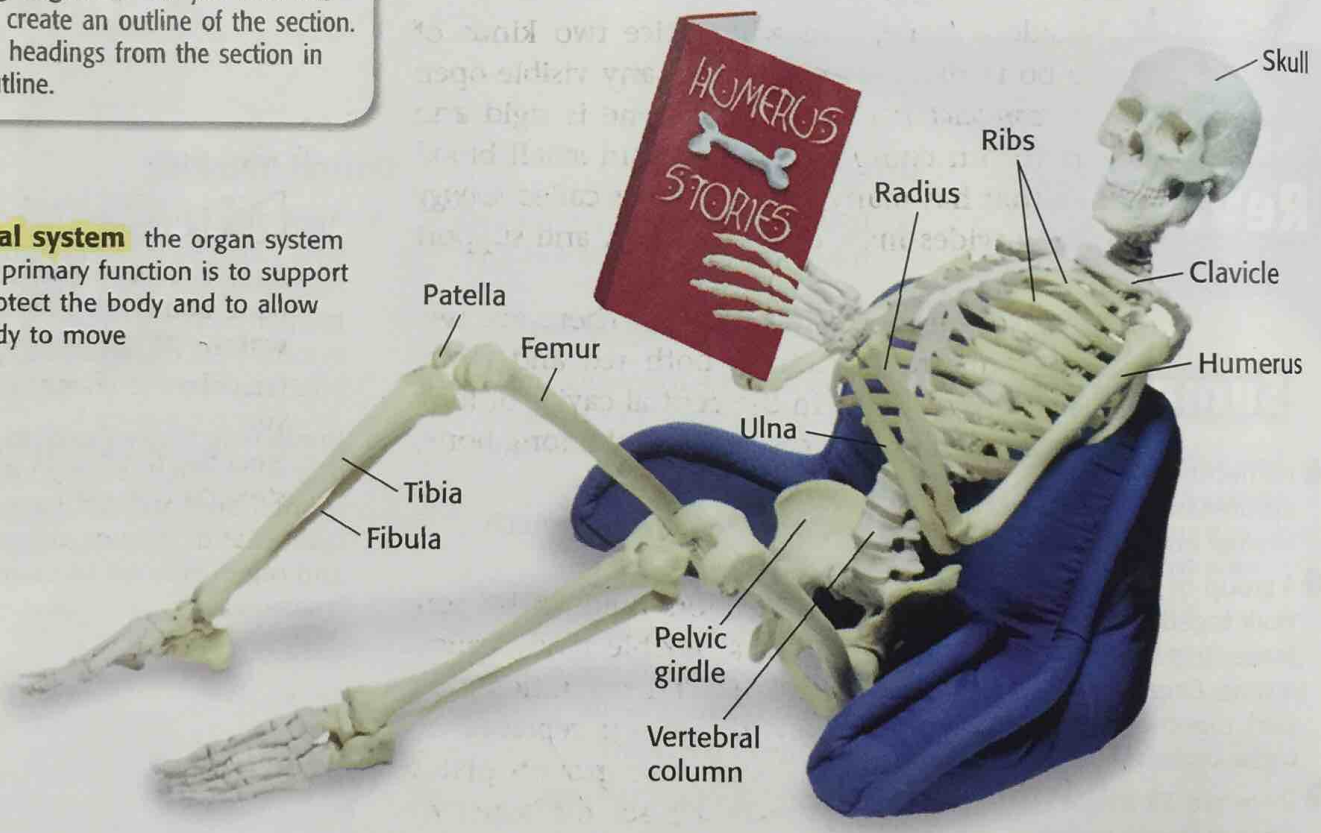
Reading Organizer As you read this section, create an outline of the section. Use the headings from the section in your outline.

skeletal system the organ system whose primary function is to support and protect the body and to allow the body to move

Bones

The average adult human skeleton has 206 bones. Bones help support and protect parts of your body. They work with your muscles so you can move. Bones also help your body maintain homeostasis by storing minerals and making blood cells. **Figure 1** shows the functions of your skeleton.

Figure 1 The Skeleton



Protection Your heart and lungs are protected by ribs, your spinal cord is protected by vertebrae, and your brain is protected by the skull.

Storage Bones store minerals that help your nerves and muscles function properly. Long bones store fat that can be used for energy.

Movement Skeletal muscles pull on bones to produce movement. Without bones, you would not be able to sit, stand, walk, or run.

Blood Cell Formation Some of your bones are filled with a special material that makes blood cells. This material is called *marrow*.

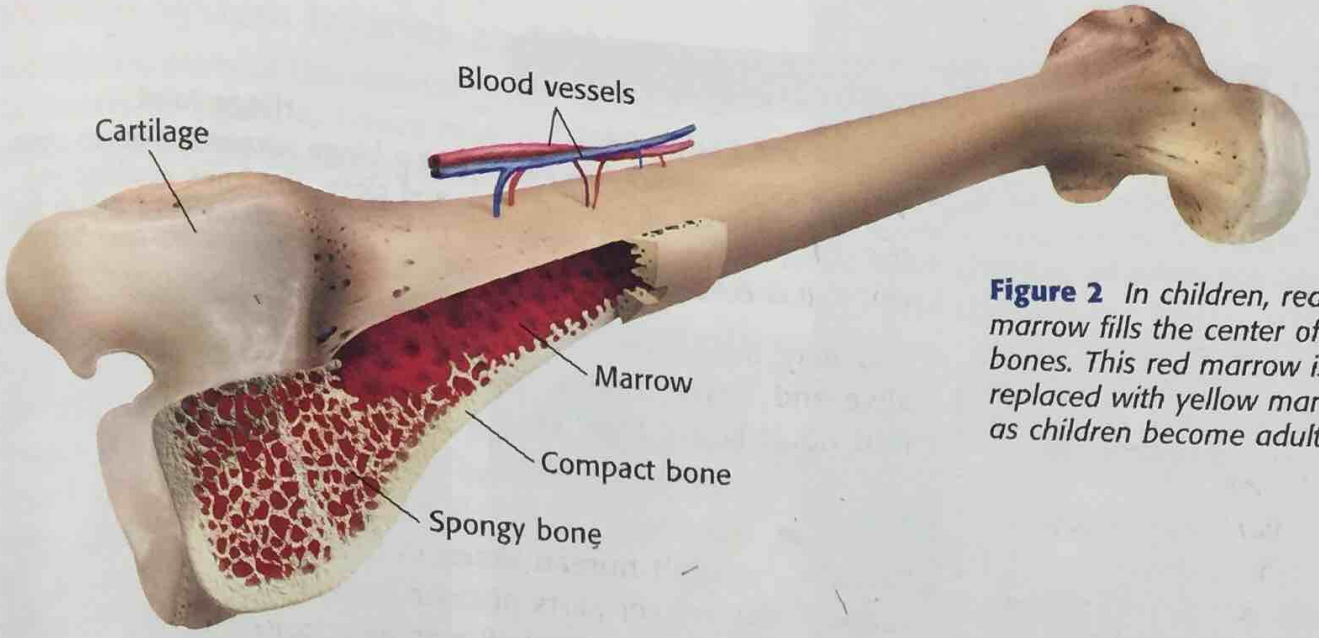


Figure 2 *In children, red marrow fills the center of long bones. This red marrow is replaced with yellow marrow as children become adults.*

Bone Structure

A bone may seem lifeless. But a bone is a living organ made of several different tissues. Bone is made of connective tissue and minerals. These minerals are deposited by living cells called *osteoblasts* (AHS tee oh BLASTS).

If you look inside a bone, you will notice two kinds of bone tissue. If the bone tissue does not have any visible open spaces, it is called *compact bone*. Compact bone is rigid and dense. Tiny canals within compact bone contain small blood vessels. Bone tissue that has many open spaces is called *spongy bone*. Spongy bone provides most of the strength and support for a bone.

Bones contain a soft tissue called *marrow*. There are two types of marrow. Red marrow produces both red and white blood cells. Yellow marrow, found in the central cavity of long bones, stores fat. **Figure 2** shows a cross section of a long bone, the femur.

Bone Growth

Did you know that most of your skeleton used to be soft and rubbery? Most bones start out as a flexible tissue called *cartilage*. When you were born, you didn't have much true bone. But as you grew, most of the cartilage was replaced by bone. During childhood, most bones still have growth plates of cartilage. These growth plates provide a place for bones to continue to grow.

Feel the end of your nose. Or bend the top of your ear. These areas are two places where cartilage is never replaced by bone. These areas stay flexible.

Reading Check **How do bones grow?** (*See the Appendix for answers to Reading Checks.*)

QUICK LAB

Pickled Bones

1. Place a **clean chicken bone** in a **jar of vinegar.**
2. After 1 week, remove the bone and rinse it with **water.**
3. Describe the changes that you can see or feel.
4. How has the bone's strength changed?
5. What did the vinegar remove?

Figure 3 Three Joints

Gliding Joint
Gliding joints allow bones in the hand and wrist to glide over one another and give some flexibility to the area.

Ball-and-Socket Joint
As a video-game joystick lets you move your character all around, the shoulder lets your arm move freely in all directions.

Hinge Joint
As a hinge allows a door to open and close, the knee enables you to flex and extend your lower leg.

joint a place where two or more bones meet

Joints

A place where two or more bones meet is called a **joint.** Your joints allow your body to move when your muscles contract. Some joints, such as fixed joints, allow little or no movement. Many of the joints in the skull are fixed joints. Other joints, such as your shoulder, allow a lot of movement. Joints can be classified based on how the bones in a joint move. For example, your shoulder is a ball-and-socket joint. Three joints are shown in **Figure 3.**

Joints are held together by *ligaments* (LIG uh muhnts). Ligaments are strong elastic bands of connective tissue. They connect the bones in a joint. Also, cartilage covers the ends of many bones. Cartilage helps cushion the area in a joint where bones meet.

Reading Check **Describe the basic structure of joints.**

CONNECTION TO Environmental Science

WRITING SKILL **Bones from the Ocean** Sometimes, a bone or joint may become so damaged that it needs to be repaired or replaced with surgery. Often, replacement parts are made from a metal, such as titanium. However, some scientists have discovered that coral skeletons from coral reefs in the ocean can be used to replace human bone. Research bone surgery. Identify why doctors use metals such as titanium. Then, identify the advantages that coral may offer. Write a report discussing your findings.

Skeletal System Injuries and Diseases

Sometimes, parts of the skeletal system are injured. As shown in **Figure 4,** bones may be fractured, or broken. Joints can also be injured. A dislocated joint is a joint in which one or more bones have been moved out of place. Another joint injury, called a *sprain,* happens if a ligament is stretched too far or torn.

There are also diseases of the skeletal system. *Osteoporosis* (AHS tee OH puh ROH sis) is a disease that causes bones to become less dense. Bones become weak and break more easily. Age and poor eating habits can make it more likely for people to develop osteoporosis. Other bone diseases affect the marrow or make bones soft. A disease that affects the joints is called *arthritis* (ahr THRIET is). Arthritis is painful. Joints may swell or stiffen. As they get older, some people are more likely to have some types of arthritis.

Figure 4 *This X ray shows that the two bones of the forearm have been fractured, or broken.*

SECTION Review

Summary

- The skeletal system includes bones, cartilage, and the connective tissue that connects bones.
- Bones protect the body, store minerals, allow movement, and make blood cells.
- Joints are places where two or more bones meet.
- Skeletal system injuries include fractures, dislocations, and sprains. Skeletal system diseases include osteoporosis and arthritis.

Using Key Terms

1. In your own words, write a definition for the term *skeletal system.*

Understanding Key Ideas

2. Which of the following is NOT an organ of the skeletal system?
   - **a.** bone
   - **b.** cartilage
   - **c.** muscle
   - **d.** None of the above
3. Describe four functions of bones.
4. What are three joints?
5. Describe two diseases that affect the skeletal system.

Math Skills

6. A broken bone usually heals in about six weeks. A mild sprain takes one-third as long to heal. In days, about how long does it take a mild sprain to heal?

Critical Thinking

7. **Identifying Relationships** Red bone marrow produces blood cells. Children have red bone marrow in their long bones, while adults have yellow bone marrow, which stores fat. Why might adults and children have different kinds of marrow?
8. **Predicting Consequences** What might happen if children's bones didn't have growth plates of cartilage?

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