

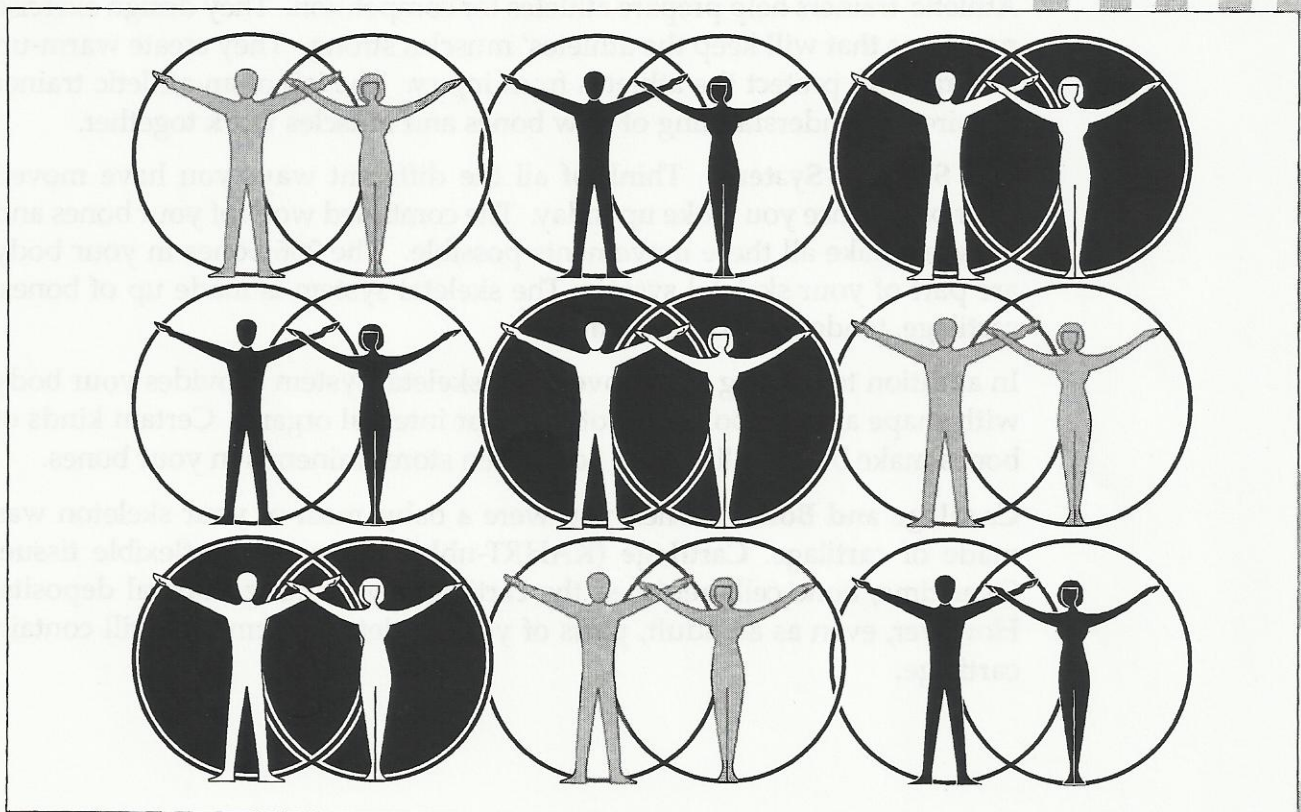
# Human Biology

## UNIT

# 9

Have you ever played softball or baseball? Think about the motions your body makes when you play. Before your turn at bat, you loosen up with a few practice swings. Then, you walk up to the plate. As you take your batting stance, you bend your knees, raise your arms, and flex your muscles. As the pitcher throws the ball, your eyes track its movement toward you. At just the right moment, you swing. The ball sails toward the outfield. You drop the bat and run full speed toward first base.

Some movements, such as hitting a baseball, require hundreds of parts of the body to work together. The human body can perform these and many other actions with very little thought. The human body consists of a number of different systems. All these systems work together to make the body perform simple and complex tasks.





# Bone, Muscle, and Skin

## Key Words

<b>cartilage:</b>	tough, flexible tissue from which many bones form
<b>joint:</b>	place where two or more bones meet
<b>ligaments:</b>	strips of connective tissue that join bones together
<b>tendons:</b>	bands of tissue that connects skeletal muscles to bones
<b>epidermis:</b>	outer layer of skin
<b>dermis:</b>	inner layer of skin

## KEY IDEAS

Bones protect and support the body. They also provide a system of levers on which muscles work to move the body. Together, the skeletal and muscular systems control the body's movements.

An important part of any professional sports team is an athletic trainer. Athletic trainers help prepare athletes for competition. They design exercise programs that will keep the athletes' muscles strong. They create warm-up programs to protect the athletes from injury. The job of an athletic trainer requires an understanding of how bones and muscles work together.

**The Skeletal System.** Think of all the different ways you have moved your body since you woke up today. The combined work of your bones and muscles make all these movements possible. The 206 bones in your body are part of your skeletal system. The skeletal system is made up of bones, cartilage, tendons, and ligaments.

In addition to helping you move, your skeletal system provides your body with shape and support. It protects your internal organs. Certain kinds of bones make blood cells. Your body even stores minerals in your bones.

**Cartilage and Bone.** When you were a baby, most of your skeleton was made of cartilage. **Cartilage** (KAHRT-uhl-ihj) is a tough, flexible tissue. Over time, bone cells replaced the cartilage by forming mineral deposits. However, even as an adult, parts of your skeletal system will still contain cartilage.



**Joints.** All movement occurs at the joints. A **joint** (joint) is the place where two or more bones meet. Strips of tough connective tissue, called **ligaments** (LIHG-uh-muhnt), hold bones together at a joint. As ligaments stretch, the bones move.

Different kinds of joints permit different kinds of movement. Your shoulder contains a ball-and-socket joint. This joint allows your arm to move in all directions. At your elbow, you have a hinge joint. A hinge joint allows bones to only move back and forth.

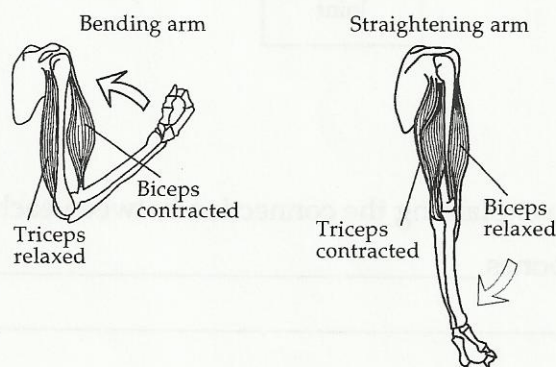


1. What are ligaments? \_\_\_\_\_

**Muscles.** Your muscles work with the skeletal system to move your body. Muscles are specialized tissues that contract, or shorten. Your body contains three types of muscle: cardiac muscle, smooth muscle, and skeletal muscle. Your heart is made up of cardiac muscle. Your stomach and other organs contain some smooth muscle. Since you do not think about controlling the actions of cardiac muscles or smooth muscles, they are called involuntary muscles.

Your skeletal muscles are called voluntary muscles because you do think about controlling their motion. Skeletal muscles are attached to bones by bands of tissue called **tendons** (TEHN-duhnz). Skeletal muscles work in pairs to move bones at a joint. The brain sends a signal for one muscle of the pair to contract. As it contracts, the muscle pulls on tendons. The tendons pull on bones, which move with the muscle. At the same time, the other muscle of the pair relaxes. You can see in Fig. 43-1 that the bicep and tricep work as a pair to move the arm at the elbow joint.

Fig. 43-1



Muscles need energy to contract. Muscle cells get most of this energy through cellular respiration. However, the body sometimes uses up the oxygen needed for cellular respiration. When this occurs, the muscles get their energy from fermentation. Recall that fermentation gives cells energy from glucose when oxygen is not available.

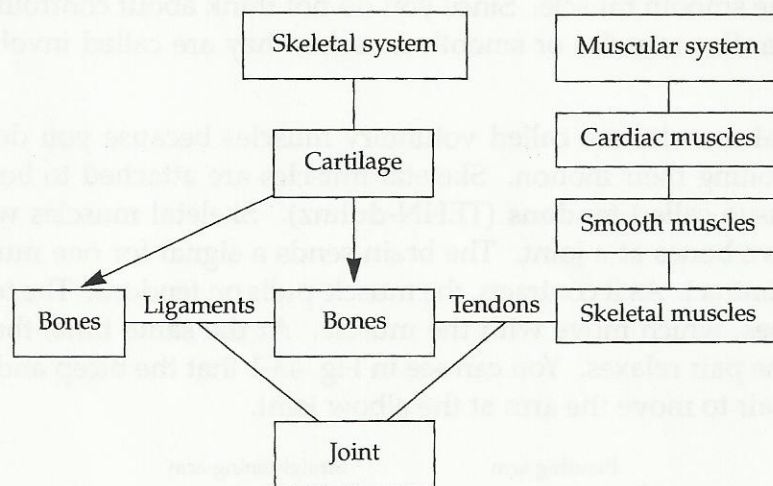
**Skin.** The surface of the body is covered with skin. Skin protects the internal organs from the outside world. It also provides the body with support. Skin is made up of two layers. The outer layer of skin is the **epidermis** (ehp-uh-DER-mihs). The epidermis is a thin barrier that helps prevent water loss. It also protects the body from germs.

The inner layer of skin is the **dermis** (DER-mihs). Nerves, blood vessels, hair follicles, oil glands, and sweat glands are located in the dermis. Waste products and water are eliminated from the body through the sweat glands. The release of water through the skin helps the body maintain a certain temperature.

**TAKE  
ANOTHER  
LOOK**

Fig. 43-2 summarizes the relationship among the parts of the skeletal and muscular systems.

Fig. 43-2



**Check Your  
Understanding**

Write a sentence explaining the connection between each pair of words.

2. cartilage, bones \_\_\_\_\_  
\_\_\_\_\_
3. tendons, muscles \_\_\_\_\_  
\_\_\_\_\_
4. dermis, epidermis \_\_\_\_\_  
\_\_\_\_\_



Complete the following paragraph.

Skeletal (5)\_\_\_\_\_ work in pairs to move the (6)\_\_\_\_\_ that meet at the (7)\_\_\_\_\_. The brain sends a signal for one muscle to (8)\_\_\_\_\_. As it shortens, the muscle pulls on (9)\_\_\_\_\_. The tendons pull on a bone, causing it to (10)\_\_\_\_\_. In order to do this work, muscle cells and bone cells need (11)\_\_\_\_\_. The cells get energy through (12)\_\_\_\_\_ and fermentation.

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13. What are five jobs of the skeletal system?

\_\_\_\_\_

\_\_\_\_\_

14. How do ligaments help you move? \_\_\_\_\_

\_\_\_\_\_

15. What is the difference between a ligament and a tendon?

\_\_\_\_\_

\_\_\_\_\_

16. What is the difference between a hinge joint and a ball-and-socket joint?

\_\_\_\_\_

\_\_\_\_\_

17. What is the difference between voluntary and involuntary muscles?

Give an example of each. \_\_\_\_\_

\_\_\_\_\_

18. How do skeletal muscles move bones? \_\_\_\_\_

\_\_\_\_\_

19. Describe the importance of the epidermis and the dermis.

\_\_\_\_\_

\_\_\_\_\_

