

# The Skeletal System

**Key Concept** The skeletal system is an organ system. The functions of the skeletal system include support, protection, movement, and the production of blood cells.

## What You Will Learn

- The skeletal system includes bones, cartilage, and connective tissue.
- Bones have four important functions in the body. Bones are structured to perform these functions.
- Three human body joints are gliding, ball and socket, and hinge.

## Why It Matters

The functions of the skeletal system play a role in maintaining the body's homeostasis.

## Vocabulary

- skeletal system
- joint

## READING STRATEGY

**Graphic Organizer** In your **Science Journal**, make a Comparison Table that compares various types of joints.

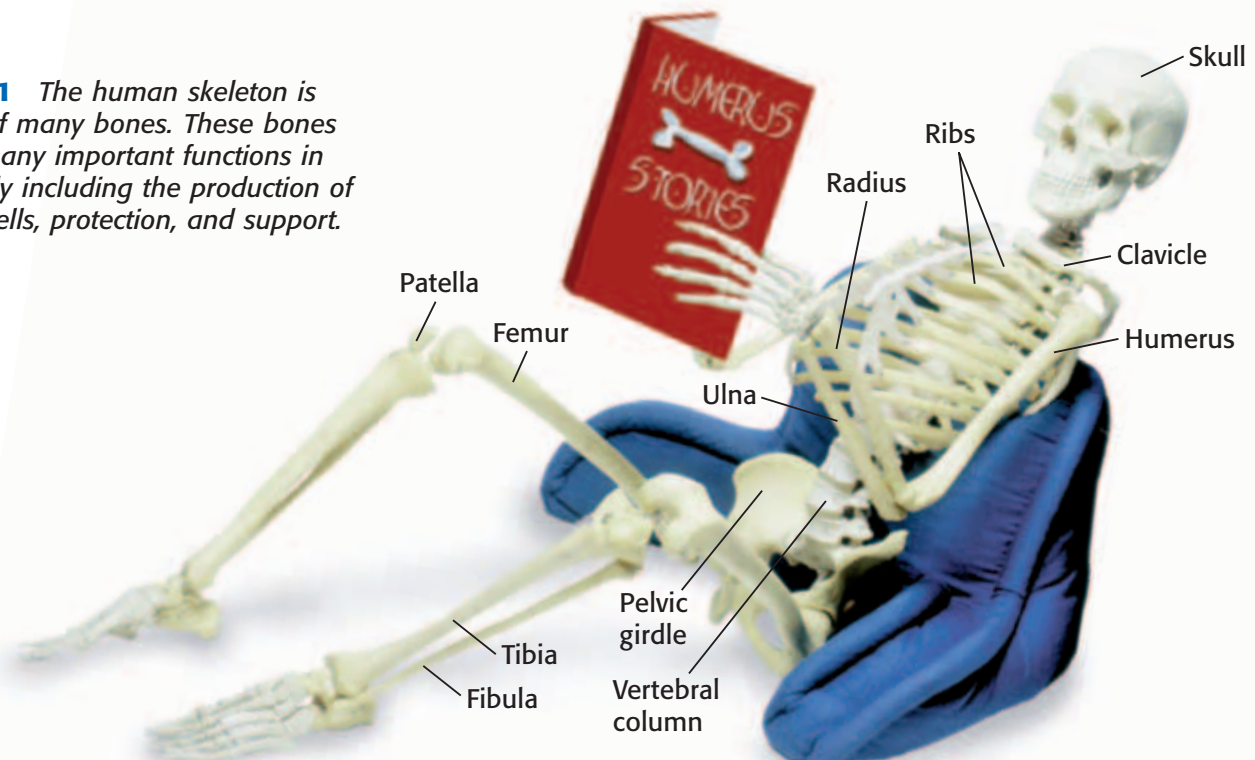
▶ You may think that your bones are dry and brittle. But they are alive and active. Bones, cartilage, and the connective tissue that holds bones together make up your **skeletal system**.

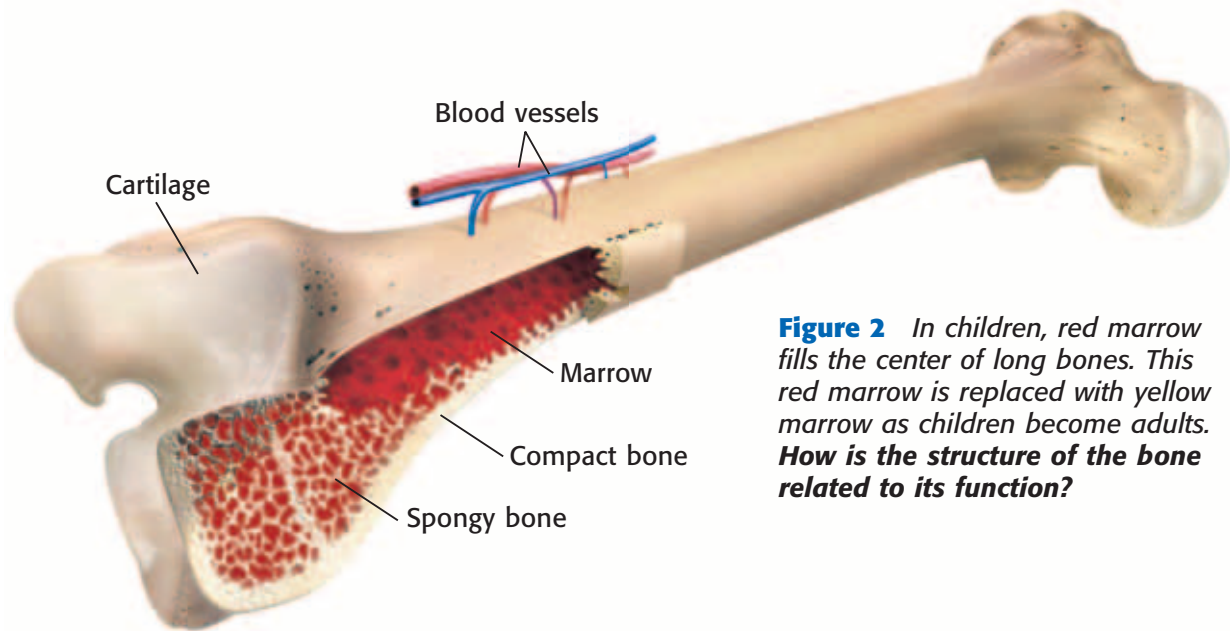
## Bones

The adult human skeleton, shown in **Figure 1**, has 206 bones. Bones help support and protect parts of your body. They work with your muscles so that you can move. Bones also help your body maintain homeostasis by storing minerals and making blood cells. The skeletal system has the following functions:

- Some bones protect organs. For example, your heart and lungs are protected by the ribs.
- Bones store minerals that help your nerves and muscles function properly. Long bones store fat that can be used as energy.
- Skeletal muscles pull on bones to produce movement. Without bones, you would not be able to sit, stand, or run.
- Some of your bones make blood cells. *Marrow* is a special material found in these bones. Marrow makes blood cells.

**Figure 1** The human skeleton is made of many bones. These bones serve many important functions in the body including the production of blood cells, protection, and support.





**Figure 2** In children, red marrow fills the center of long bones. This red marrow is replaced with yellow marrow as children become adults. **How is the structure of the bone related to its function?**

## Bone Structure

A bone may seem lifeless. But a bone is a living organ that is 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 because it is able to absorb shock easily.

As you read earlier, some bones contain a tissue called marrow. There are two types of marrow. Red marrow produces both red and white blood cells. Yellow marrow, which is found in the central cavity of long bones, stores fat. **Figure 2** shows a cross section of a long bone.

**Standards Check** How does the structure of bones provide support?



## Bone Growth

Do 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 did not 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.

**skeletal system** (SKEL i tuhl SIS tuhm) the organ system whose primary function is to support and protect the body and to allow the body to move



**7.5.a** Students know plants and animals have levels of organization for structure and function, including cells, tissues, organs, organ systems, and the whole organism.

**7.5.c** Students know how bones and muscles work together to provide a structural framework for movement.

**7.6.h** Students know how to compare joints in the body (wrist, shoulder, thigh) with structures used in machines and simple devices (hinge, ball-and-socket, and sliding joints).

### Figure 3 Three Joints in the Human Body

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



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



**Hinge Joint** In the same way that a hinge allows a door to open and close, the knee enables you to flex and extend your lower leg.




**joint** (JOYNT) 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. Three joints are shown in **Figure 3**.

Your shoulder is a ball-and-socket joint. Ball-and-socket joints are similar to video-game joysticks. A ball-and-socket joint allows a bone to move up, down, forward, backward, and in a complete circle. A hinge joint allows less movement. The hinge joint that joins your thigh and lower leg allows the knee to bend in one direction. This joint is similar to some door hinges. Gliding joints, also called sliding joints, allow the bones in the wrist and the bones in the foot to glide over one another.

**Standards Check** How is a door hinge similar to the joint in your knee?  **7.6.h**

### The Structure of Joints

Joints are often placed under a great deal of stress. But joints can withstand a lot of wear and tear because of their structure. 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.

## 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?
6. How would this change in the bone's structure change the bone's function in the chicken's body?



7.5.a  
7.7.c



15 min

## Skeletal System Injuries and Diseases

Sometimes, parts of the skeletal system are injured. As **Figure 4** shows, 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 in which the bones 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



7.5.a, 7.5.c,  
7.6.h

### 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.
- A joint is a place where two or more bones meet.
- Skeletal system injuries include fractures, dislocations, and sprains. Skeletal system diseases include osteoporosis and arthritis.

### Understanding Concepts

- 1 **Listing** What parts make up the skeletal system?
- 2 **Describing** What are four functions of bones?
- 3 **Summarizing** Name three joints, and describe the range of motion they allow.

### Critical Thinking

**INTERPRETING GRAPHICS** Use the image below to answer the next question.



- 4 **Identifying Relationships** How is the object related to your skeletal system?

### 5 Identifying Relationships

How do bones provide a structure for muscles to move?

### 6 Predicting Consequences

What might happen if children's bones didn't have growth plates made of cartilage?

### Math Skills

- 7 **Using Equations** A broken bone usually heals in about six weeks. A mild sprain takes one-third as long to heal. How many days does a mild sprain take to heal?

### Internet Resources

For a variety of links related to this chapter, go to [www.scilinks.org](http://www.scilinks.org)  
Topic: **Skeletal System**  
SciLinks code: **HY71399**