



## 22.1 The Skeletal System

### Lesson Objectives

-  List the structures and functions of the skeletal system.
-  List the different kinds of joints and describe the range of motion of each.

### Lesson Summary

**The Skeleton** The human skeleton, like that of other vertebrates, is an endoskeleton.

- ▶ The adult human skeleton consists of 206 bones. Some bones are considered part of the axial skeleton and others of the appendicular skeleton.
  - The skull, vertebral column, and rib cage form the **axial skeleton**, which supports the central axis of the body.
  - The bones of the arms, legs, shoulders, and hips make up the **appendicular skeleton**.
- ▶ The skeleton supports the body, protects internal organs, produces movement by acting as levers, stores minerals, and produces blood cells.

**Bones** A solid network of living cells and protein fibers surrounded by calcium salts forms the bones of the human body.

- ▶ Bones have a complex structure. A layer of tough connective tissue called the periosteum covers a bone. Bones are made up of two types of bone tissue.
  - Spongy bone is a less dense layer found at the ends of long bones and in the center of flat bones, which adds strength without adding excess mass.
  - Soft tissue called **bone marrow** fills cavities in some bones. Yellow marrow stores fat. Red marrow contains stem cells, which make most types of blood cells.
- ▶ In infants, the skeleton is almost all **cartilage**, which is a dense tissue built around protein fibers. Bone replaces cartilage by a process called **ossification**, during which cells called **osteoblasts** secrete minerals. Osteoblasts mature into cells called **osteocytes**, which maintain the minerals in bone and strengthen the bone.
- ▶ Mature bone contains some osteoblasts, which build new bone, and cells called **osteoclasts**, which break down bone minerals. These cells enable the repair of broken or damaged bones and keep bone from becoming brittle and weak.

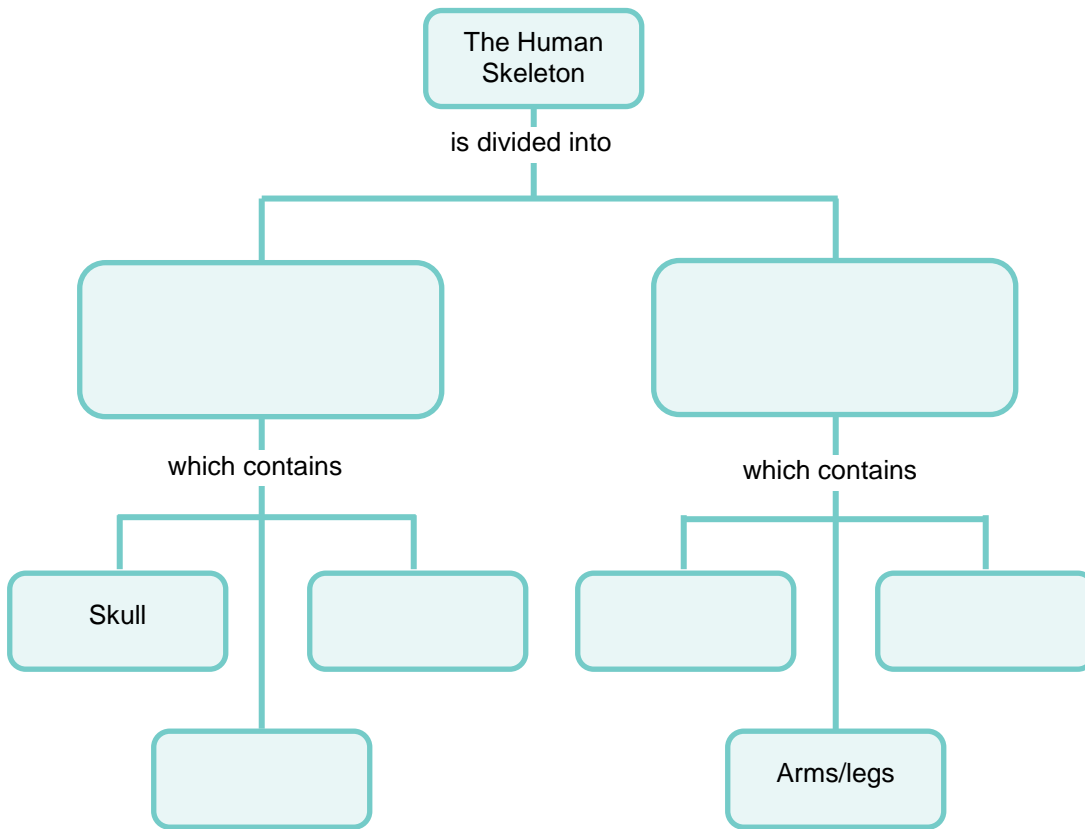
**Joints** Bones meet at **joints**, which contain connective tissues that hold the ends together. Joints permit bones to move without damaging each other.

- ▶ Joints are classified into three types:
  - Immovable, or fixed, joints allow no movement. These joints are found between bones in the skull.
  - Slightly movable joints, such as those found between vertebrae, permit some movement.
  - Freely movable joints, such as those found in the elbows and knees, permit movement in two or more directions.

- ▶ Cartilage covers the ends of the bones in a joint. **Ligaments**, tough strips of connective tissue, hold bones together. Synovial fluid reduces friction between moving bones. Bursae are sacs of synovial fluid that also act as shock absorbers.
- ▶ Joint injuries include ligament damage, inflammation, or loss of cartilage. Bursitis is inflammation of the bursae. Osteoarthritis is a painful stiffening of joints caused by the breakdown of cartilage.

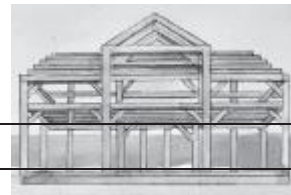
## The Skeleton

1. Complete the concept map that summarizes the parts of the human skeleton.



For Questions 2–3, refer to the Visual Analogy comparing the skeleton to the wooden frame of a house.

2. **VISUAL ANALOGY** What would happen to a house if its upright beams were not strong and sturdy. Compare that to what would happen in the human body if upright bones were not strong and sturdy.



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4. List five functions of the skeletal system.

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For Questions 6–12, complete each statement by writing the correct word or words

8. Bone \_\_\_\_\_ is soft tissue in bone cavities that produces \_\_\_\_\_
9. Bone with a latticework structure is called \_\_\_\_\_ bone.
12. A disorder called \_\_\_\_\_ results when \_\_\_\_\_ break down bone minerals more quickly than they can be deposited.

## Joints

13. What is a joint?

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14. List the three classifications of joints, based on their type of movement.

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For Questions 15–19, match each joint with the category of joints that it represents

### Joint

### Category

- |                                 |                           |
|---------------------------------|---------------------------|
| _____ 15. Ankle                 | A. Ball-and-socket joint  |
| _____ 16. Between two vertebrae | B. Hinge joint            |
| _____ 17. Shoulder              | C. Immovable joint        |
| _____ 18. Elbow                 | D. Pivot joint            |
| _____ 19. Between skull bones   | E. Slightly movable joint |

For Questions 20–22, write True or False on the line provided.

- \_\_\_\_\_ 20. Ligaments protect the ends of bones as they move against each other at joints.
- \_\_\_\_\_ 22. Osteoarthritis is joint pain and stiffness caused by loss of cartilage.

## Apply the Big idea

23. Plumbers use the word *joint* to refer to the place where two pipes are joined together. How are the structure and function of pipe joints similar to and different from the skeletal system's joints?

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