

Integumentary, Skeletal, and Muscular Systems

section 2 The Skeletal System

MAIN Idea

The skeleton provides a structural framework for the body and protects internal organs.

What You'll Learn

- differences in bones of the axial and appendicular skeletons
- how new bone is formed
- the functions of the skeletal system

Study Coach

Make Flash Cards Make a flash card for each underlined term in this section. Write the term on one side of the card. Write the definition on the other side. Use the flash cards to review what you have learned.

Reading Check

1. **Describe** the role of the blood vessels in osteons.

Before You Read

Examine your knee. On the lines below, describe ways your knee can move and ways it cannot move. Read the section to learn how joints allow different kinds of motion.

Read to Learn

Structure of the Skeletal System

You have 206 bones in your body. There are two divisions of the human skeleton. The axial skeleton includes the skull, vertebral column, ribs, and sternum. The appendicular skeleton includes bones of the arms, hands, legs, feet, shoulders, and hips.

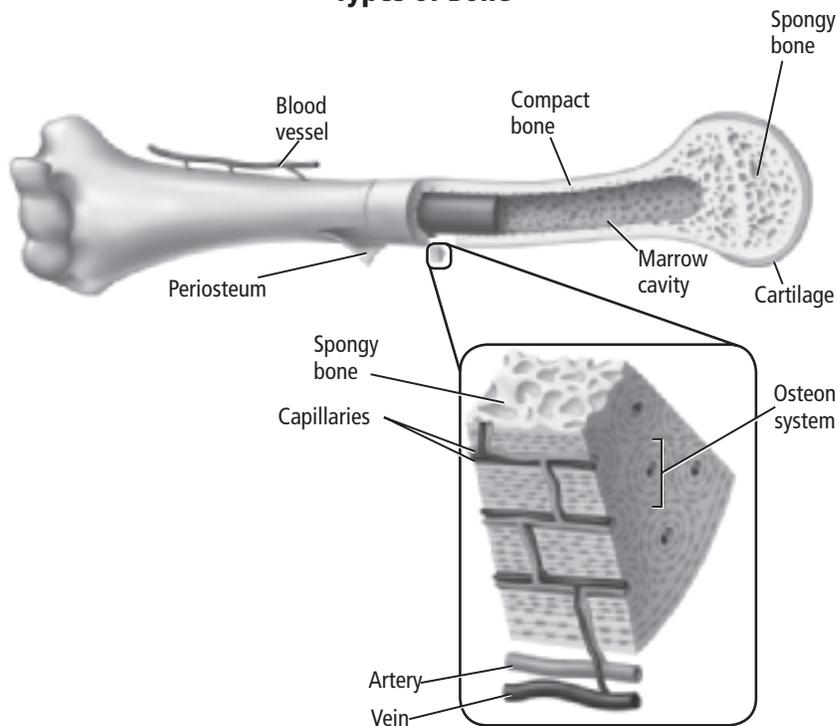
How are bones structured?

Bone is connective tissue. Bones are classified as long, short, flat, or irregular. Arm and leg bones are long bones. Wrist bones are short bones. The skull is made of flat bones. The bones of the face and vertebrae are irregular bones.

All bones have a dense outer layer of compact bone for strength and protection. As shown in the figure on the next page, tubelike osteons run the length of compact bone. Osteons contain nerves and blood vessels. The blood vessels bring oxygen and nutrients to living bone cells called osteocytes.

Less-dense spongy bone is found at the center of short and flat bones and at the ends of long bones. Spongy bone is surrounded by compact bone and does not have osteons. Instead, it has cavities that contain bone marrow.

Types of Bone



What are the two types of bone marrow?

The two types of bone marrow are red and yellow. **Red bone marrow** produces red and white blood cells and platelets. Red bone marrow is found in the humerus, femur, sternum, ribs, vertebrae, and pelvis. Children's bones have more red bone marrow than adult bones. **Yellow bone marrow** in other bones contains stored fat.

How is bone formed?

The skeletons of embryos are made of cartilage. As the fetus develops, the cells in cartilage become bone-forming cells called **osteoblasts**. Bone forms from osteoblasts through **ossification**. Except for places such as the nose, ears, and vertebrae disks, the human skeleton is bone. Osteoblasts are also responsible for bone growth and repair.

How do bones repair themselves?

Bones are constantly being remodeled, which means old bone cells are replaced with new cells. Cells called **osteoclasts** break down bone cells, which are replaced with new cells. Nutrition and exercise are important for bone growth.

When a bone breaks but does not come through the skin, it is a simple fracture. When the bone breaks and does come through the skin, it is a compound fracture. A stress fracture is a thin crack in the bone.

Picture This

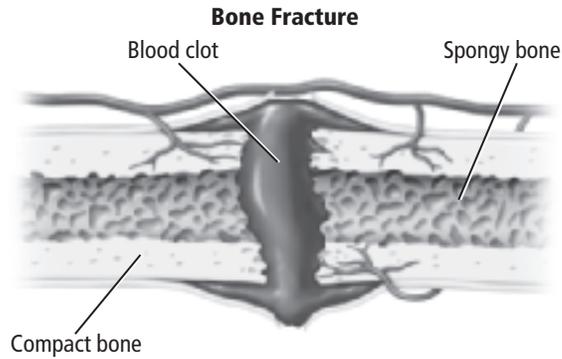
2. Determine What is the importance of the osteon system?

Reading Check

3. Define the role of osteoclasts.

Picture This

4. Comprehend When a bone breaks how long does it take for new bone to form?



What happens immediately after a bone breaks?

When a bone is broken, endorphins flood the area. They reduce the pain for a short time. The injured area swells and a blood clot forms at the break in the bone, as shown in the figure above.

New bone begins to form within eight hours. First, cartilage forms at the location of the fracture. This tissue is weak. In about three weeks, osteoblasts form spongy bone around the fracture. Later, osteoclasts remove the spongy bone while osteoblasts create stronger compact bone to replace it. Splints and casts help keep broken bones in place until new bone forms.

Think it Over

5. Draw Conclusions

Why is it important to keep broken bones in place until compact bone forms?

What is osteoporosis?

Calcium in the diet is important to bone growth and repair. Too little calcium can lead to a condition called osteoporosis, which results in weak bones that break easily.

Joints

Two or more bones meet at a joint. The table on the next page describes the five types of joints: ball and socket, pivot, hinge, gliding, and sutures. Each allows a certain type of movement. The joints between some skull bones are the exception. They do not move.

Ligaments hold the bones of joints together. **Ligaments** are tough bands of connective tissue that attach one bone to another.

What is osteoarthritis?

Cartilage covers the ends of bones in movable joints. The cartilage cushions the bones in the joint and allows smooth movement. Osteoarthritis (ahs tee oh ar THRI tus) is a painful condition that affects joints and results when cartilage in the joints deteriorates. Injury to a joint can result in osteoarthritis later in life.

Joint Movements					
Joint name	Ball-and-Socket	Pivot	Hinge	Gliding	Sutures
Example	hip joint, shoulder joint	elbow joint	knee joint	wrist joint, ankle joint, and vertebra	skull joint
Description	ball-like surface fits into cuplike depression in another bone; allows widest range of motion, such as swinging arms	primary movement is rotation, such as twisting lower arm	outward curve of one bone fits into inward curve of another bone; allows back and forth movement	allows side-to-side and back-and-forth movement	joints in the skull that are not movable

How does rheumatoid arthritis affect joints?

Rheumatoid (roo MAH toyd) arthritis affects the joints but does not result from deteriorating cartilage. Affected joints are swollen and painful. The joints lose both strength and function.

What is bursitis?

Fluid-filled sacs called bursae surround shoulder and knee joints. Bursae reduce friction and act as cushions between bones and tendons. Bursitis is an inflammation of the bursae, causing pain, swelling, and reduction in movement.

What causes a sprain?

A sprain is damage to the ligaments of a joint. Sprains result from overstretching a joint and cause pain and swelling.

Functions of the Skeletal System

Support is a major function of the skeleton. Bones of the legs, pelvis, and vertebral column support the body. The mandible supports teeth. Almost all bones support muscles. The pull of muscles on bones causes movement.

The skeleton has other functions as well. The skull protects the brain. Vertebrae protect the spinal cord. The rib cage protects the heart, lungs, and other organs.

The outer layers of bone protect the bone marrow. Red bone marrow produces red and white blood cells and platelets for blood clotting. Yellow bone marrow stores fat for energy.

Bones store minerals. When blood calcium levels are too low, bones release calcium. When the levels are too high, bones store calcium. This helps maintain homeostasis.

Picture This

6. Highlight the type of movement allowed by each joint described in the table.



Think it Over

7. Summarize Identify three major functions of the skeletal system.
