Chapter 36 **Skeletal, Muscular, and Integumentary Systems** **Name _____**

Lab The Skeletal System

Introduction

The skeleton is not just a framework of bones. It serves as an attachment for muscles, as support for the body, and as protection for vital organs. Bones also store certain minerals and contain special cells that form red and white blood cells. The human body contains 206 bones. The bones of the human skeleton are grouped into two divisions: the **axial skeleton** and the **appendicular skeleton**. The axial skeleton includes the skull, vertebrae, and rib cage. The appendicular skeleton includes the rest of the skeleton: the arms, legs, shoulder and pelvic girdles. In addition to bone, human skeletons also contain cartilage. In fact, the human skeleton is initially formed from cartilage, which is gradually replaced by bone. Cartilage is found in adult humans between the vertebrae of the spinal column, at the tips of ribs and other bones, and in the nose, ears, and larynx.

Some lower vertebrates, such as the shark and the lamprey, have skeletons composed entirely of cartilage. Of the three types of cartilage found in the human body - hyaline, fibrous, and elastic - hyaline cartilage is the most common. It is pearly white and glassy or translucent in appearance. Hyaline cartilage is found at the ends of bones in movable joints.

Problem:

How is the human skeleton organized?

Materials (per group)

Prepared slide of a cross section of hyaline cartilage
Prepared slide of a cross section of bone cells
Microscope
2 colored pencils

Procedure

Part A. Observing Bone Cells

1. Observe a prepared slide of compact bone under the low power objective of a microscope. Notice the circular patterned units in the cross section of the bone. Each of these circular units is a Haversian system.

2. Switch to high power to observe the structures that make up each Haversian system.

3. Focus on a group of concentric circles. The central, hollow core of these circles is called the Haversian canal. The Haversian canal contains nerves and blood vessels. The rings around the Haversian canal are called lamellae (singular, lamella). The small dark cavities between adjacent lamellae are called lacunae (singular, lacuna). Lacunae appear as long, dark areas between lamellae.

4. Within each Haversian system, the lacunae are interconnected by small, branching canals called canaliculi (singular, canaliculus). Canaliculi appear as thin, dark lines that resemble the spokes of a wheel. Fluids pass from one part of the bone to another through the canaliculi.

5. Look for darkly stained bodies within the lacunae. These are the osteocytes, or living bone cells. See Figure 1. Notice that osteocytes have fine branches that extend into the canaliculi. The osteocytes are responsible for controlling the life functions of the bone.

6. In the appropriate place in Observations, label the diagram of bone tissue as seen through the high power objective of the microscope. Label the following parts of the Haversian system: Haversian canal, lamella, canaliculus, osteocyte, and blood vessel.

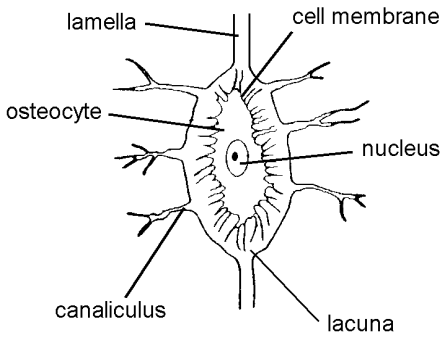
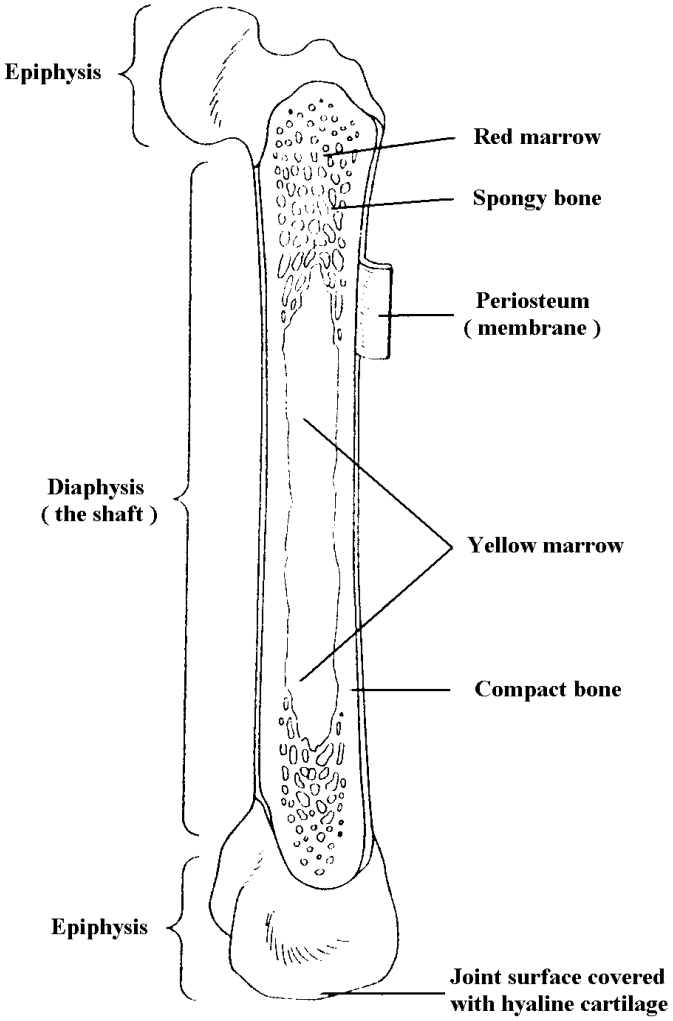


Figure 1

7. Examine the make-up of a typical long bone in Figure 2. If there is a sample specimen available for you to examine, then compare it to the drawing in Figure 2. Complete Table 1 in Observations with regard to the diagram below.

Figure 2



Part B. Examining Cartilage

1. Cartilage is more flexible than bone; thus it can take a great deal of stress. Live cartilage cells, called **chondrocytes**, are found in cavities called lacunae. Unlike bone, cartilage contains no blood vessels. Materials enter and leave chondrocytes by diffusion to and from the blood vessels in adjacent layers of tissue.

2. Observe a prepared slide of the cross section of hyaline cartilage under the low-power objective of a microscope. Locate some chondrocytes.

3. Switch to high power. **CAUTION**: When switching to the high-power objective, always look at the objective from the side of the microscope so that the objective does not hit or damage the slide. Observe the chondrocytes under high power. Notice that the chondrocytes usually occur in groups of two or four cells. In the appropriate place in Observations, sketch and label some chondrocytes as seen under high power. Record the magnification of the microscope.

Part C. Examining the Human Skeleton

1. With a colored pencil, color the axial skeleton in Figure 2.

2. With a different colored pencil, color the appendicular skeleton.

3. In the appropriate place, match the names of the bones of the skeleton with their corresponding numbers as shown in Figure 3.

4. Write the numbers of the bones in Figure 3 that correspond to the names of the bones given below.

Figure 3

carpals _____

scapula _____

fibula _____

clavicle _____

radius _____

tibia _____

ribs _____

metacarpals _____

cranium _____

tarsals _____

phalanges _____

ulna _____

humerus _____

sternum _____

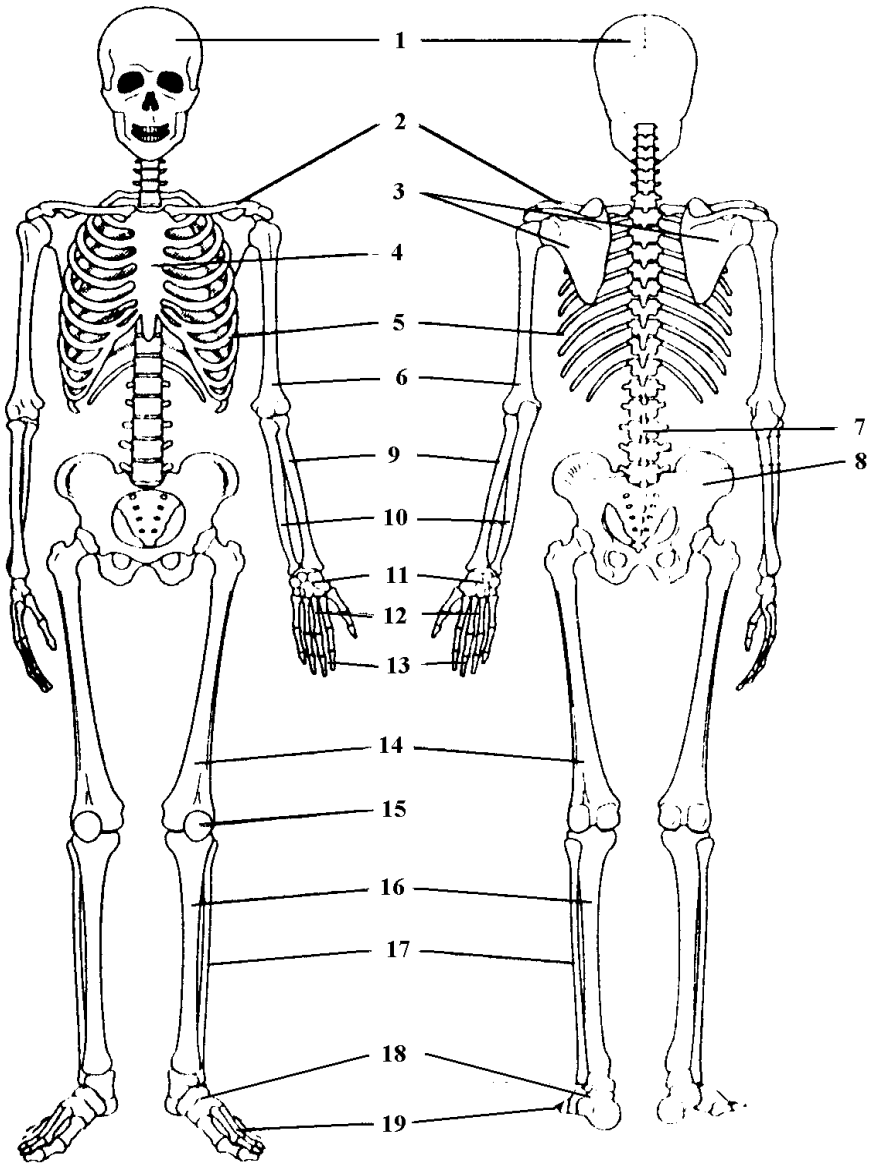
femur _____

pelvis _____

metatarsals _____

vertebrae _____

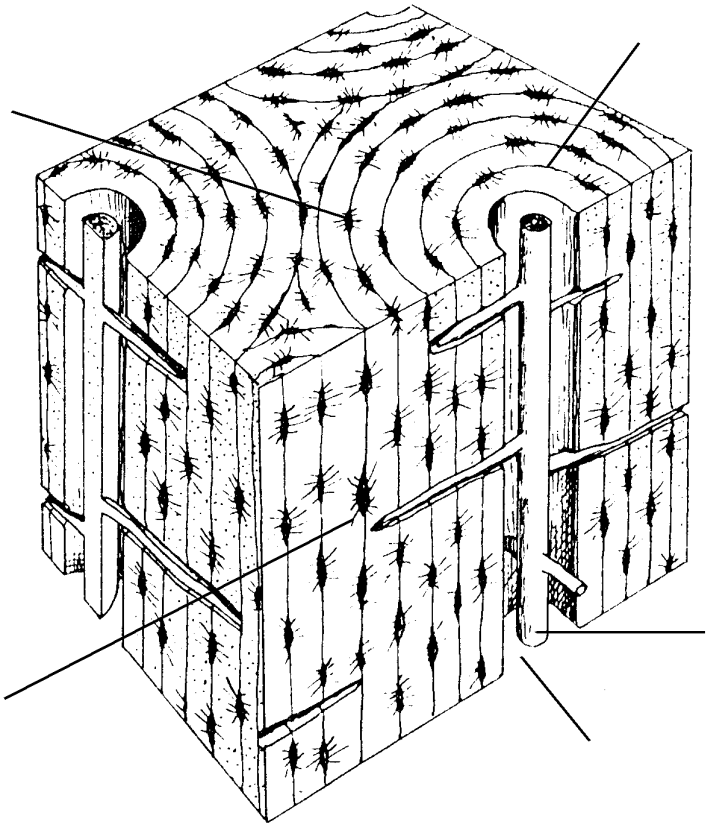
patella _____



5. What color did you make the axial skeleton? _____ . What color did you make the appendicular skeleton? _____ .

Observations

1. Label the diagram of a microscopic section of bone as seen in this picture.

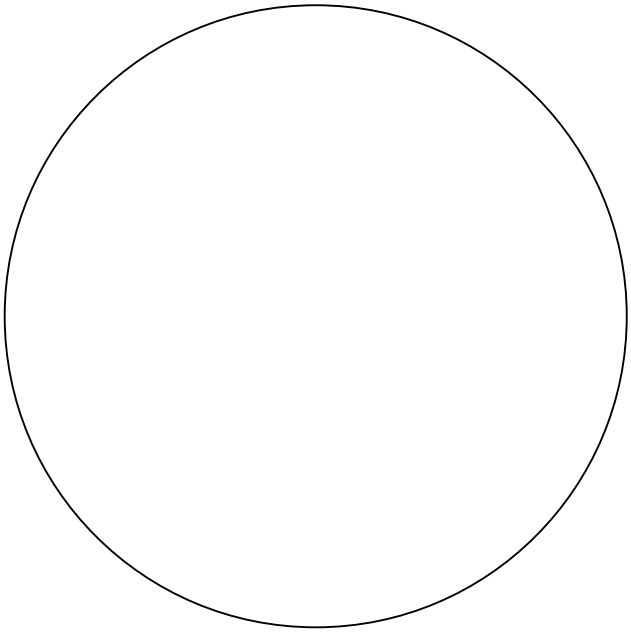


2. The data table below has terms that relate to the structure of a typical long bone. Use your textbook to complete the information in this table.

Table 1 Components of a Long Bone

Structure	Description or Function
a. periosteum	
b. compact bone	
c. spongy bone	
d. red marrow	
e. yellow marrow	
f. hyaline cartilage	
g. epiphysis	
h. diaphysis	
I. epiphyseal plate	

3. Drawing of some Cartilage Cells at High Power



Magnification _____

Analysis and Conclusion

1. Why is it necessary that the ends of bones be covered with cartilage?

2. In which type of joints would you expect to find a lubricating fluid called synovial fluid?

3. How many bone are there in the human skeleton? In the axial skeleton? In the appendicular skeleton?

4. How is cartilage similar to bone?

5. How do cartilage and bone differ?

6. Which part of the skeleton provides protection? (axial or appendicular) Movement? (axial or appendicular)

Critical Thinking and Application

1. The skeleton of an unborn baby consists of a large amount of cartilage, which will later change to bone. Of what advantage to the unborn child is a skeleton made of cartilage?

2. Leukemia is a disease in which white blood cells grow in an uncontrolled manner. Explain why a bone marrow transplant is sometimes used as a treatment for this disease.

3. Of what advantage is the layer of spongy bone found on the inside of a long bone?

4. How is the large number of bones found in the feet and hands of human beings both an advantage and a disadvantage?

5. What is the difference between an osteocyte and a chrondrocyte?

6. Bone ash is a white powdery material made from charred bones. Why do you think bone ash is used in fertilizers?

7. Suppose a person's diet lacks the mineral calcium. How would this deficiency affect the muscular system?