**Instructor’s Manual**

Lab 5 Introduction to the Skeleton

**Answers to Lab 5 Concept Review Questions**

1. One of the main functions of the skeleton within the body is among these:

**Structural—support muscles, protect organs**

**Physiological—store calcium and phosphorus, produce blood cells, store fat**

2. **Cortical and trabecular** are the two main types of tissue in lamellar bone (cortical bone forms the exterior and trabecular bone forms the interior).

3. **False;** approximately 2/3 of the skeleton is *not* made of inorganic components but of organic components.

4. **A. Osteoblast** is the type of bone cell responsible for making bone (not osteoclast, osteodon, or osteocyte; “blasts build”).

5. **D. Osteoclast** is the type of bone cell responsible for removing bone (not osteodon, osteocyte, or osteoblast; “clasts clean up”).

6. Bone remodels for one reason, among the following: **allow for growth; extract nutrients; repair microdamage; repair fractures; respond to functional needs and stress**

7. **B. Long bone** is a bone that has a shaft in the middle and distinct ends on each side (not flat bone, irregular bone, or short bone).

8. **C. Foramen** is what a hole in the bone that is associated with a nearby nerve or vessel is usually called (canal or fissure is also correct but not among the other choices of depression, fossa, or projection).

9. Students may provide any one bone in the appendicular skeleton (the arm or leg, including the hip and shoulder girdles), such as the **scapula, clavicle, humerus, radius, pelvis, femur, and tibia.**

10. **B. Inferiorly** describes how the lumbar (lower back) vertebrae are located compared to the cervical (neck) vertebrae (not anteriorly, ventrally, or laterally).

**Answers to Lab 5 Exercises**

Exercise 1: Bone Remodeling (15 minutes)

1. Describe a hypothetical situation of the “use it” portion of the use it or lose it principle. Description of the situation/behavior:

Explanation for why *more* bone is present under these circumstances:

**Answers will vary but should address the following issues: Increased functional need/stress, such as athletes or people in laborious occupations using parts of their body more, leads to greater remodeling and building up of bone over time.**

1. Describe a hypothetical situation of the “lose it” portion of the use it or lose it principle. Description of the situation/behavior:   
   Explanation for why *less* bone is present under these circumstances:

**Answers will vary but should address these issues: Decreased functional need/stress, such as people who have been severely ill and inactive for long periods of time or people who have lost the use of some part or parts of their body through amputation, injury, etc., leads to less remodeling and thinner, lighter bone structure.**

Exercise 2: Bone Shapes (15 to 20 minutes)

*For this exercise, you will need to provide students with colored pencils, markers, or crayons for coloring four types of bones (long, short, flat, and irregular) on a diagram of the human skeleton. Specific answers (color schemes) will vary, but the major bone types should be similarly distinguished across students.*

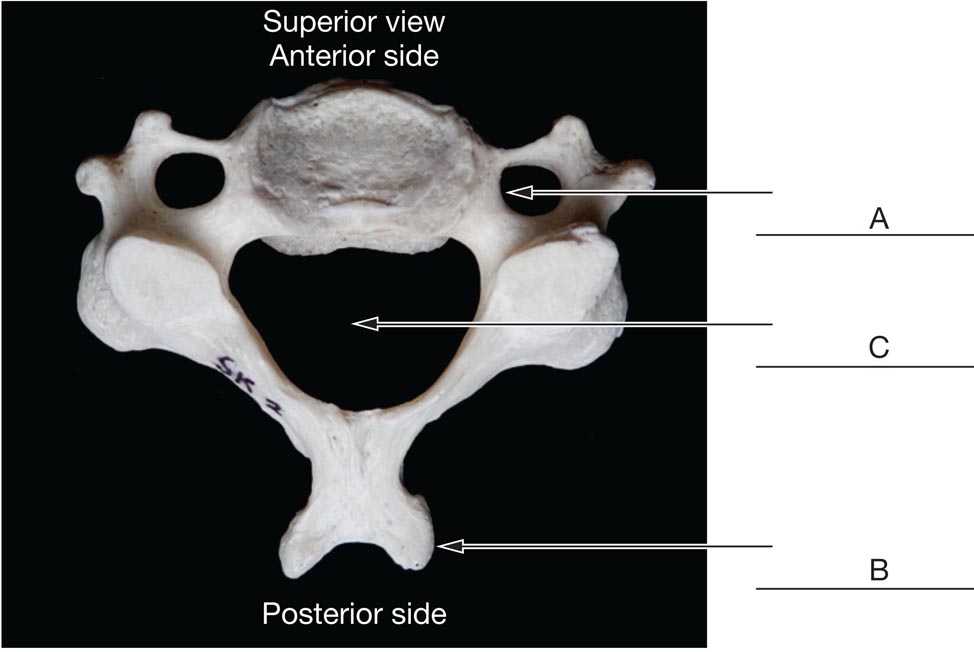
**Students should color the femur, other leg and arm bones, hand and foot bones, and phalanges as long bones; wrist or ankle bones as short bones; skull as flat bones; and vertebrae as irregular bones.**

Exercise 3: Bone Features (15 to 20 minutes)

*For this exercise, you could use your own materials to supplement or replace the images provided. If doing so, be sure to number the material accordingly.*

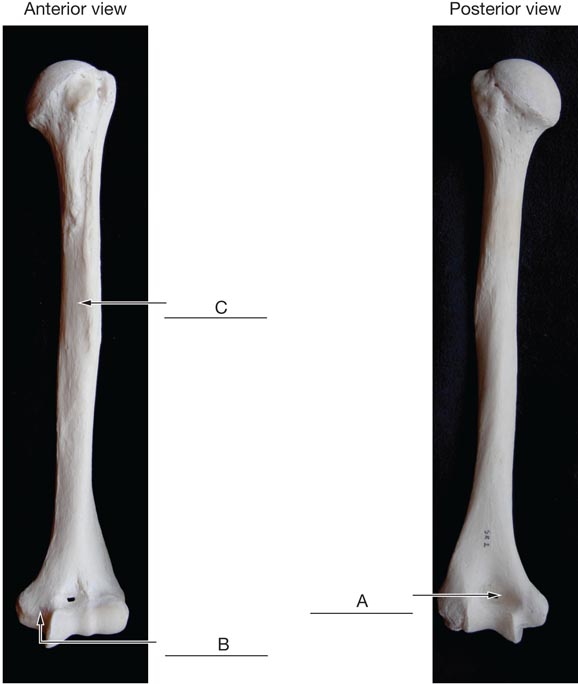
1. Examine the cervical vertebra (neck vertebra) depicted. Locate the features in bold described below, and write the corresponding letters in the blanks provided on the image.

1. The **transverse foramen** (one on each side of the vertebra) transmits the vertebral arteries that give blood to the brain.
2. The posterior end of the vertebra has a **spinous process** to which muscles and ligaments attach.
3. The foramen posterior to the body of the vertebra creates the **vertebral canal** for the spinal cord to pass through when the vertebrae are stacked up on each other in the spine.



2. Examine the humerus (upper arm bone) depicted. Locate the features in bold described below, and write the corresponding letters in the blanks provided on the image.

1. On the posterior side of the distal end of the humerus, there is a feature called the **olecranon fossa**. This is where the elbow-forming projection of the ulna (one of the lower arm bones) sits when the lower arm is extended.
2. The medial side of the distal humerus has a small projection you can feel on the inside of your arm, called the **medial epicondyle**.
3. On the shaft of the humerus, there is a projection (called the **deltoid tuberosity**) where the deltoid muscle attaches.



3. Examine the sacrum, shinbone (tibia), and hip bone (pelvis) depicted. For each bone, identify if the bone feature indicated by a red circle is a projection, depression/groove, or foramen/canal.

A. Circles on sacrum = **foramen/canal** (these are the sacral foramina).

B. Circles on tibia = **projection** (this is the tibial tuberosity).

C. Circles on hip bone = **depression/groove** (this is the acetabulum, or hip socket).

Exercise 4: Axial and Appendicular Skeleton (10 minutes)

*Students are to use the diagram of the human skeleton to show the major skeletal divisions.*

1. On the diagram, draw *circles* around bones that are part of the axial skeleton.

**Should include all the bones of the cranium, the mandible, all the vertebrae, the sacrum, the ribs, the sternum.**

2. On the diagram, draw *boxes* around bones that are part of the appendicular skeleton.

**Should include all the bones of the arm, wrist, and hand; the scapula and the clavicle; all the bones of the leg, ankle, and foot; the pelvis.**

Exercise 5: Directional Terminology (15 to 20 minutes)

*For this exercise, you could use your own materials to supplement or replace the images provided.*

1. Name three (3) bones that are proximal to the carpals.

**Answers will vary but could include these:****Scapula, clavicle, humerus, radius, ulna.**

2. Name two (2) bones that are anterior to the occipital bone.

*Answers will vary but could include these:* **Frontal, parietal, temporal, maxilla, mandible.**

3. Name one (1) bone that is superior to the temporal bone. **Parietal bone.**

4. Name four (4) bones that are distal to the femur.

**Answers will vary but could include these: Tibia, fibula, tarsals, metatarsals, phalanges.**

5. Name one (1) bone that is posterior to the sternum.

**Answers will vary but could include these: thoracic vertebrae, scapula; also potentially the ribs (although these curve and are somewhat lateral and posterior to the sternum).**

6. Name one (1) bone that is inferior to the cervical vertebrae.

**Answers will vary but could include these: thoracic vertebrae, lumbar vertebrae, sacrum, pelvis.**

7. Draw a circle around the toe of each foot that is the most medial. **Circle the big toe.**

8. Draw a box around the toe of each foot that is most lateral. **Box the little toe.**

**Answers to Lab 5 Critical Thinking Questions**

1. Relation of skeletal system to muscular system: Bones provide the support and a place of attachment for muscles; bones will have projections where muscles need extra attachment area; bones will have grooves where muscle tendons or ligaments insert on or slide over the bone (as in the neck of the femur).

Circulatory system: Bones provide protection for organs, like the heart and brain; bones produce blood cells; bones will have fossae where blood vessels lay on the bone (as in the jugular fossa) or foramina where blood vessels pass through the bone.

2. While adults usually have lamellar (mature) bone, they can have woven bone if a bone has been fractured and is undergoing significant repair.

3. Examples of use it and lose it effects on bone will vary but should address similar types of situations to those described for Exercise 1.

4. Short bones are found clustered together in areas with limited range of motion (wrist and ankle). They are well suited for the wrist because they restrict movement. Long bones are found throughout the body in areas where there are long muscles needing support, so they are suited for the lower arm. Joints between long bones often allow a great range of motion partially because they are not packed together like short bones.

5. Bones of the appendicular skeleton include the bones that comprise the appendages. This includes bones that may lie close to the midline or central axis but are more functionally tied to the appendages. The scapula is an example of this. Although it is close to the central axis, it is primarily related to arm function. Therefore, it is part of the appendicular skeleton and not the axial skeleton.

6. Cranium is superior to pelvis (pelvis is inferior to cranium).

Tibia is medial to fibula (fibula is lateral to tibia).

Sternum is anterior (or ventral) to thoracic vertebrae (vertebrae are posterior or dorsal to sternum).

Radius is distal to humerus (humerus is proximal to radius).

Femur is proximal to tarsals (tarsals are distal to femur).

Pinky toe phalanges are lateral to big toe phalanges (big toe phalanges are medial to pinky toe phalanges).

Occipital is posterior to frontal (frontal is anterior to occipital).

Lumbar vertebrae are inferior to cervical vertebrae (cervical vertebrae are superior to lumbar vertebrae).

7. The mandibular canal is an area for nerves, veins, and arteries in the mandible (lower jawbone). The hollow space is needed because it provides for important nervous and circulatory access to this area of the body.