The two ventricles are thick-walled chambers that pump blood into the great arteries.

1. Identify the two inferior heart chambers:
   - Left ventricle
   - Right ventricle

2. Within the right ventricle, identify the following regions:
   - The inferior portion receives blood from the right atrium. Its walls are covered by an irregular network of muscular elevations called the trabeculae carneae.
   - Superiorly, the right ventricle narrows into a cone-shaped chamber, the conus arteriosus, which leads to the pulmonary trunk. The wall of the conus arteriosus is smooth and lacks trabeculae carneae.

3. Inside the left ventricle, the aortic vestibule is the smooth-walled, superior region that leads to the aorta. It is similar to the conus arteriosus in the right ventricle. Describe another structural similarity between the two ventricles.

4. Place the thumb and index finger of one hand on either side of the wall that separates the two ventricles. This structure is the interventricular septum. Notice that this wall is much thicker than the interatrial septum.

5. On the surface of the heart, what two sulci form the anterior and posterior margins of the interventricular septum?

IN THE CLINIC

Atrial Septal Defect

Inside the right atrium, along the interatrial septum, there is an oval depression called the fossa ovale. This depression marks the site of the foramen ovale, an opening that connects the atria in the fetal heart. The foramen ovale has a valve that allows blood to travel from the right atrium to the left atrium but not in the reverse direction. This specialization in the fetal circulation allows most of the oxygen-rich blood from the placenta to bypass the lungs and pulmonary circulation and pass directly to other vital organs via the systemic circulation. At birth, the foramen ovale closes when the valve fuses with the interatrial septum. Incomplete closure of the foramen ovale, called an atrial septal defect, allows oxygen-rich blood in the left atrium to mix with oxygen-poor blood in the right atrium. This malformation can be repaired surgically to prevent the two blood supplies from blending.

Speculate on the function of the trabeculae carneae.

NEW! Clear directions to find study tools in MasteringA&P™

Want more practice? Go to MasteringA&P > Study Area > Menu > Lab Tools > A&P, >
- Anatomical Models > Cardiovascular System > Heart
- Human Cadaver > Cardiovascular System > Heart
Prepare, Practice, and Put It All

Prepare, Practice, and Put It All

**PRE-LAB QUIZ**

Before you begin, read all the activities in Exercise 2 and the required reading in your textbook that is assigned by your instructor.

1. When carrying a microscope, you should hold it securely with both hands. One hand should be on the __________, and the other hand should be under the __________.
   a. arm . . . base
   b. head . . . stage
   c. arm . . stage
   d. stage . . base

2. On a compound microscope, where is the light source located?
   a. on the oculars
   b. on the base
   c. on the stage
   d. on the cord

3. True or False: The space between the objective lens and the microscope stage is called the working distance. __________

4. True or False: When an image is approximately in focus, you can use the coarse adjustment knob to bring it to exact focus. __________

5. The illuminated area that you view with a microscope is called the __________.

6. The nosepiece on a microscope is a revolving structure that holds the __________.

7. The __________ concentrates the light before it travels through the tissue on the slide.

8. During this laboratory exercise, you will use a prepared slide with the letter e to demonstrate
   a. depth of field.
   b. the relationship between total magnification and field diameter.
   c. the working distance.
   d. inversion of image.

9. The thickness of the tissue layer that is in focus is called
   a. resolving power.
   b. image inversion.
   c. depth of field.
   d. field diameter.

10. During this laboratory exercise, you will use a clear millimeter ruler to
    a. estimate the diameter of the field of view.
    b. measure the working distance.
    c. estimate the resolving power of the microscope.
    d. estimate the size of a structure on a tissue section.

**MAKING CONNECTIONS**

During this activity, you observed that the lumen of a blood vessel, a passageway for blood, is lined by a simple squamous epithelium, which is a very thin cell layer. You also observed that the lumen of the esophagus, a passageway for food to the stomach, is lined by a stratified squamous epithelium, which is much thicker. Why do you think these two structures have epithelia that are so strikingly different?

Making Connections

give students an opportunity to pause, internalize information, and apply their understanding.
Together in the Lab

In the Clinic boxes throughout the lab manual help students connect what they learn in lab to the real world.

BEFORE YOU MOVE ON . . .

◄ LOOKING BACK

The appendicular skeleton comprises the bones of the upper and lower limbs (the appendages). In this laboratory exercise, you learned that each upper limb includes a clavicle and scapula (1/2 pectoral girdle) and the bones of the arm, forearm, wrist, and hand. Each lower limb includes a coxal (hip) bone (1/2 pelvic girdle) and the bones of the thigh, leg, and foot. You also observed that the organization of the bones in the upper limb is comparable to those in the lower limb. For example, the arm and thighb each contain one large long bone; the forearm and leg each contain two smaller long bones that are roughly parallel. Despite these similarities, there are important structural and functional differences between the upper and lower limbs.

Consider these questions *

1. Why are the bones of the lower limb larger than those of the upper limb?

2. What is the fundamental difference in function between the foot and the hand?

► LOOKING FORWARD

Be aware that the skeletal system not only includes all the bones of the body, but also the cartilage, tendons, and ligaments associated with the articulations (joints). Tendons and ligaments are both composed of dense regular connective tissue. At a joint, a tendon connects a muscle to a bone; a ligament connects one bone to another bone. In the next laboratory exercise (Laboratory Exercise 9), you will study articulations. Think of articulations as the functional junctions between bones. They bind various parts of the skeletal system together, are locations on the body where movement occurs, allow bone growth and development, and permit parts of the skeleton to change shape.

NEW! Before You Move On feature wraps up each exercise by asking students to think critically about the lab they just completed, and then connect that information to next lab.
Continuous Learning
Before, During, and After Lab

**Practice Anatomy Lab (PAL™ 3.0)** is a virtual anatomy study and practice tool that gives students 24/7 access to the most widely used lab specimens, including the human cadaver, anatomical models, histology, cat, and fetal pig.

PAL 3.0 is easy to use and includes built-in audio pronunciations, rotatable bones, and simulated fill-in-the-blank lab practical exams.

**PhysioEx 9.1** is an easy-to-use lab simulation program that allows students to conduct experiments that are difficult in a wet lab environment because of time, cost, or safety concerns.

Students are able to repeat labs as often as they like, can perform experiments without animals, and are asked to stop frequently and predict within the labs.
Dynamic Study Modules enable students to study more effectively on their own. With the Dynamic Study Modules mobile app, students can quickly access and learn the concepts they need to be more successful on quizzes and exams.

NEW! Instructors can now select which questions to assign to students.

Bone and Dissection Videos help students identify bones and learn how to do organ dissections.
Assignable Review Sheets, based on the Review Sheets that appear at the end of each lab exercise, are available in a gradable format in MasteringA&P so that instructors can easily assign them for homework.

**Exercise 21 Review Sheet**

**Gross Anatomy of the Heart**

1. The apex of the heart is formed by the
   a. right atrium.
   b. left atrium.
   c. right ventricle.
   d. left ventricle.

2. Which heart groove travels between the atria and the ventricles?
   a. anterior interventricular sulcus
   b. posterior interventricular sulcus
   c. coronary sulcus
   d. both (a) and (b)
   e. (a), (b), and (c)

3. The epicardium and the ________________ artery form an anastomosis with the right coronary artery.

4. The ________________ is the adult heart structure that marks the location of an opening between the two atria in the fetal heart.

**Questions 6–10:** Answer the following questions by selecting the correct labeled structure. Answers may be used once or not at all.

6. This structure pumps deoxygenated blood into the pulmonary trunk.

7. The pulmonary veins deliver oxygenated blood to this structure.

8. This structure delivers deoxygenated blood to the right atrium.

9. This structure pumps oxygenated blood into the aorta.

10. This structure and its branches deliver deoxygenated blood to the lungs.

**Additional assignable MasteringA&P activities include:**
- Bone & Dissection Video Coaching Activities
- A&P Flix™ for Anatomy Topics
- PAL™ Assessments
- PhysioEx™ Assessments
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The Sarcolemma and Transverse Tubules

The basic structure of a muscle fiber is shown in Figure 7-2a©. The plasma membrane, or sarcolemma (sar-kō-lem-muh; sarco, flesh + lemma, husk), of a muscle fiber surrounds the cytoplasm, or sarcoplasm (sar-kō-plazm). Openings scattered across the surface of the sarcolemma lead into a network of narrow tubules called transverse tubules, or T tubules©. Filled with extracellular fluid, the T tubules form passageways through the muscle fiber, like a series of tunnels through a mountain.

Powerful interactive and customization functions include instructor and student note-taking, highlighting, bookmarking, search, and links to glossary terms.

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