

# A Brief, Hands-On Lab Manual with Frequent Opportunities to Practice

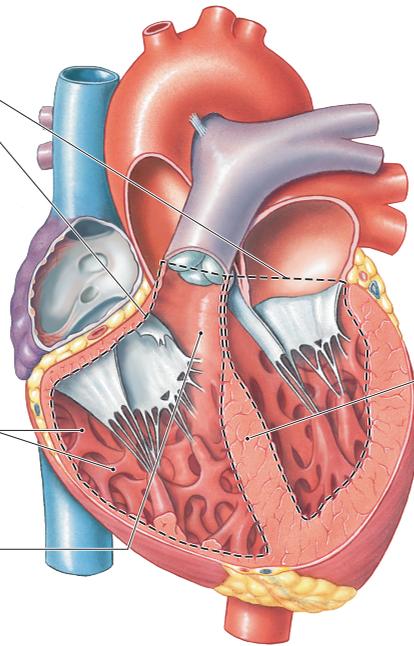
## Visual Anatomy & Physiology Lab Manual

uses stunning images from Ric Martini's *Visual Anatomy & Physiology* textbook and active-learning exercises to get students practicing in the lab.

**B** 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?  
 ▶ \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Multiple opportunities for students to label, draw, and analyze.

**IN THE CLINIC**

**Atrial Septal Defect**  
 Inside the right atrium, along the interatrial septum, there is an oval depression called the fossa ovalis. 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.

**MAKING CONNECTIONS**

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 > **PAL** >  
 ■ Anatomical Models > Cardiovascular System > Heart  
 ■ Human Cadaver > Cardiovascular System > Heart

# Prepare, Practice, and Put It All

## Q 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.

- 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 \_\_\_\_\_.
  - arm ... base
  - head ... stage
  - arm ... stage
  - stage ... base
- On a compound microscope, where is the light source located?
  - on the oculars
  - on the base
  - on the stage
  - on the cord
- True or False: The space between the objective lens and the microscope stage is called the working distance. \_\_\_\_\_
- True or False: When an image is approximately in focus, you can use the coarse adjustment knob to bring it to exact focus. \_\_\_\_\_
- The illuminated area that you view with a microscope is called the \_\_\_\_\_.
- The nosepiece on a microscope is a revolving structure that holds the \_\_\_\_\_.
- The \_\_\_\_\_ concentrates the light before it travels through the tissue on the slide.
- During this laboratory exercise, you will use a prepared slide with the letter *e* to demonstrate
  - depth of field.
  - the relationship between total magnification and field diameter.
  - the working distance.
  - inversion of image.
- The thickness of the tissue layer that is in focus is called
  - resolving power.
  - image inversion.
  - depth of field.
  - field diameter.
- During this laboratory exercise, you will use a clear millimeter ruler to
  - estimate the diameter of the field of view.
  - measure the working distance.
  - estimate the resolving power of the microscope.
  - estimate the size of a structure on a tissue section.

**NEW! Pre-Lab Quizzes** open each exercise by asking students questions that will help ensure they come to lab prepared. These quizzes are also assignable in MasteringA&P.™

## 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.

### IN THE CLINIC

#### Malignant Melanoma

Malignant melanoma is a type of skin cancer that causes unregulated reproduction of melanocytes. Because these cells produce the pigment melanin, melanomas are often easily spotted because of their dark coloration. Although these malignancies may grow slowly at first, they become aggressive and, if not caught early, have a high mortality rate. Normally, melanin protects us from genetic damage caused by ultraviolet radiation, which can lead to melanoma and other skin cancers. People who have skin with a high level of melanin have more protection against this damage. The risk of melanoma is about 20 times higher for people of European descent than for people of African descent. Because the occurrence of melanoma in people of African descent is relatively rare, its diagnosis is often delayed. As a result, when the disease is discovered, it is usually at a more advanced stage, and the chances of survival are reduced. Early detection is the key, and that requires frequent self-examination of your skin, including areas that are not exposed to sunlight.



## 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 thigh 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?

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

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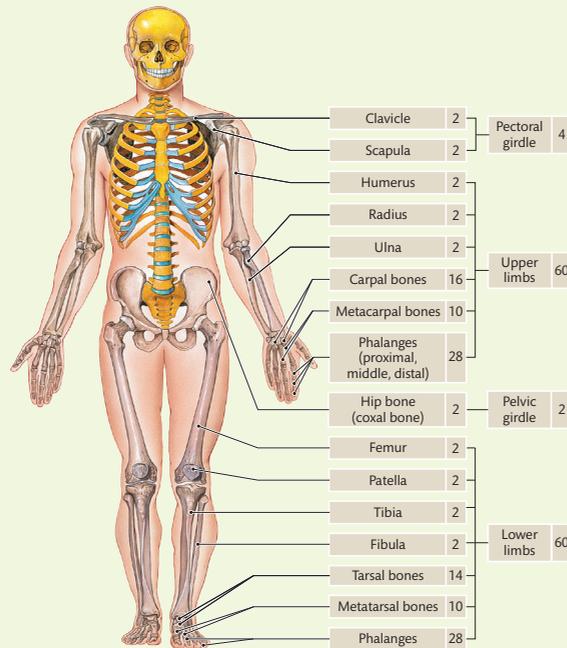
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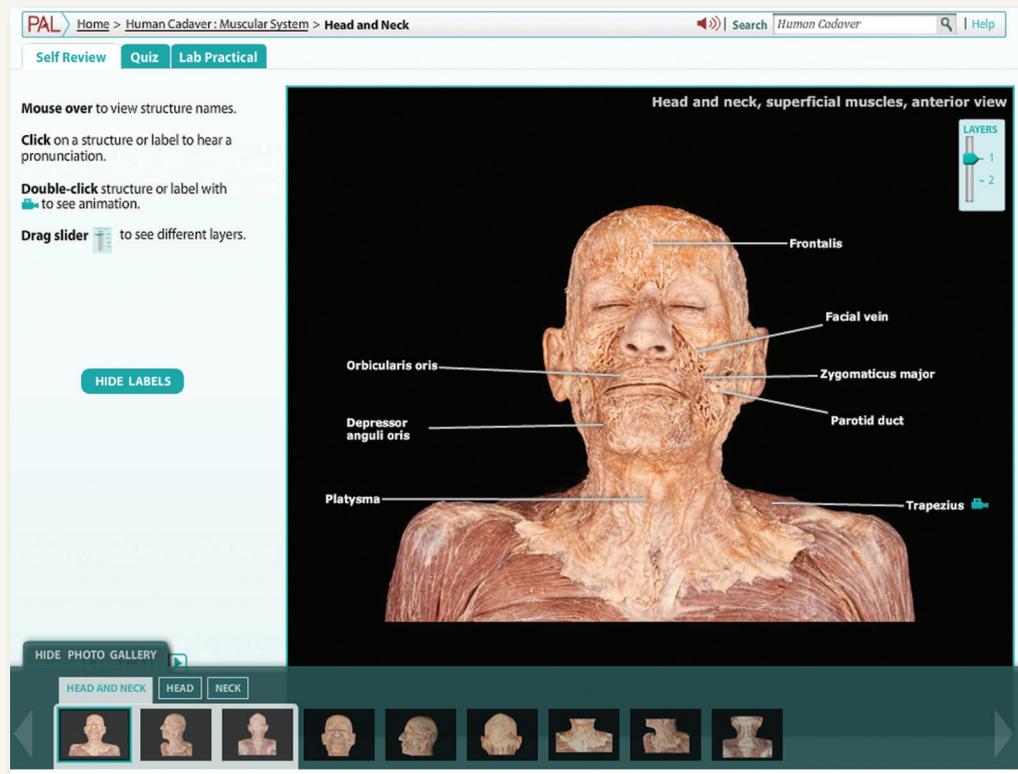


### LOOKING FORWARD »

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.

**PEX** Exercise 3: Neurophysiology of Nerve Impulses > Activity 4: The Action Potential: Importance of Voltage-Gated Na<sup>+</sup> channels

Overview Objectives Introduction Pre-lab Quiz Experiment Post-lab Quiz Review Sheet Lab Report

1. Note that the stimulus duration is set to 0.5 milliseconds.

Set the voltage to 30 mV, a suprathreshold voltage, by clicking the + button beside the voltage display. You will use a suprathreshold voltage in this experiment to make sure there is an action potential, as threshold can vary between axons.

Click **Single Stimulus** to deliver a pulse to the axon and observe the tracing that results.

Stimulus (mV)

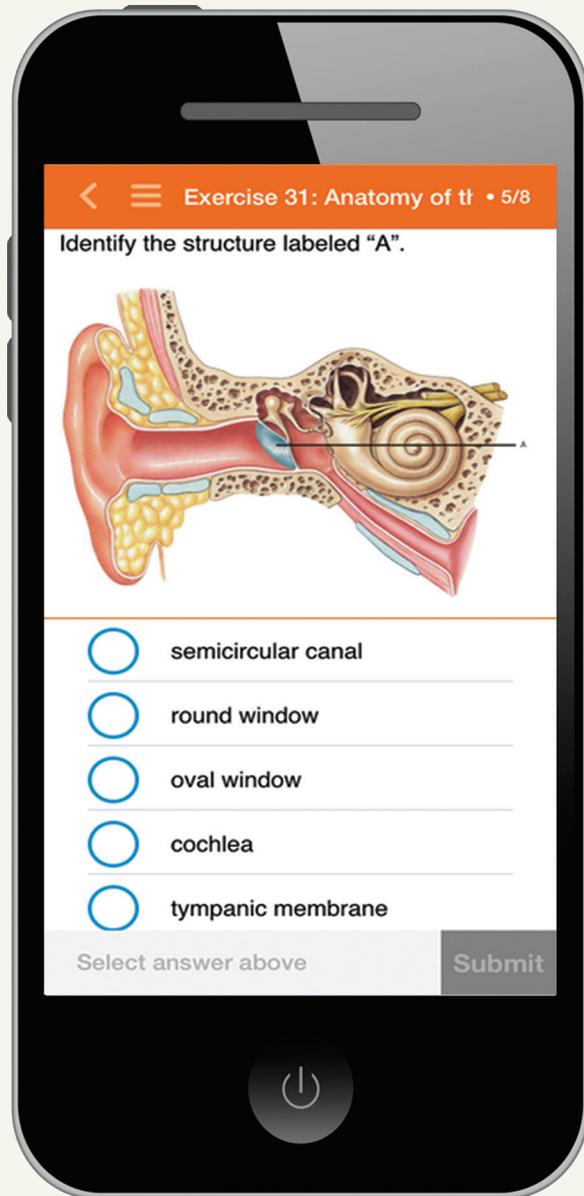
Time (msec)

Condition	Stimulus Voltage (mV)	Electrode	Peak Value of Response (µV)				
			2 sec	4 sec	6 sec	8 sec	10 sec

Record Data

Undo Reset

# with MasteringA&P™

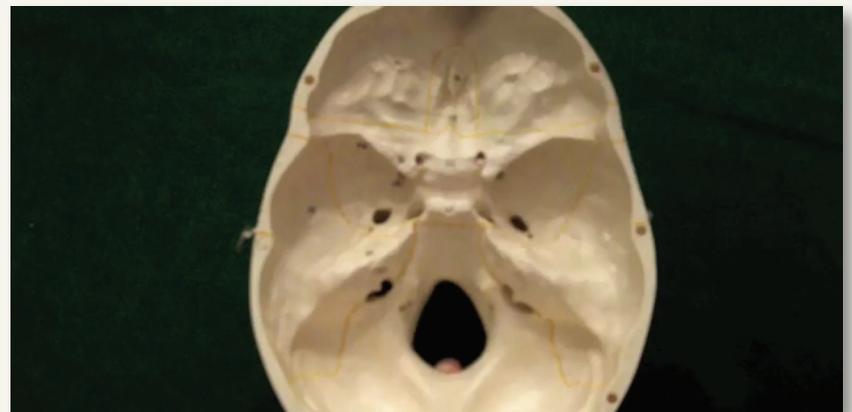


**Dynamic Study Modules** enable students to study more effectively on their own. With the Dynamic Study Modules mobile app, students can quickly access and learn the concepts they need to be more successful on quizzes and exams.

**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.



# MasteringA&P™

Name \_\_\_\_\_  
 Lab Section \_\_\_\_\_  
 Date \_\_\_\_\_

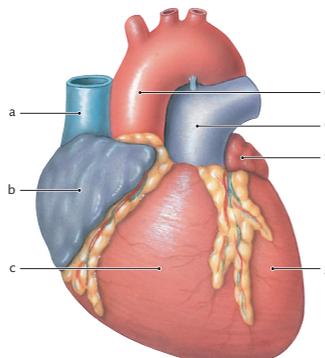
## EXERCISE 21 REVIEW SHEET

### Gross Anatomy of the Heart

- The apex of the heart is formed by the
  - right atrium.
  - left atrium.
  - right ventricle.
  - left ventricle.
- Which heart groove travels between the atria and the ventricles?
  - anterior interventricular sulcus
  - posterior interventricular sulcus
  - coronary sulcus
  - both (a) and (b)
  - (a), (b), and (c)
- The epicardium and the \_\_\_\_\_ are the same structure.
- The \_\_\_\_\_ artery forms an anastomosis with the right coronary artery.
- The adult heart structure that marks the location of an opening between the two atria in the fetal heart is called the \_\_\_\_\_.

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

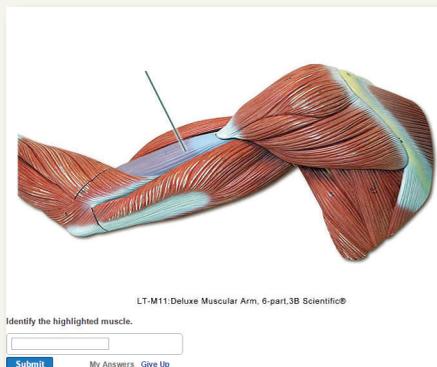
- This structure pumps deoxygenated blood into the pulmonary trunk. \_\_\_\_\_
- The pulmonary veins deliver oxygenated blood to this structure. \_\_\_\_\_
- This structure delivers deoxygenated blood to the right atrium. \_\_\_\_\_
- This structure pumps oxygenated blood into the aorta. \_\_\_\_\_
- This structure and its branches deliver deoxygenated blood to the lungs. \_\_\_\_\_



**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.

### Additional assignable MasteringA&P activities include:

- Bone & Dissection Video Coaching Activities
- A&P Flix™ for Anatomy Topics
- PAL™ Assessments
- PhysioEx™ Assessments
- Pre-Lab and Post-Lab Quizzes
- And More!



**Part A**  
 The trapezius muscle may be separated into all of the following groups, except \_\_\_\_\_.

- inferior
- lateral
- superior
- middle

Submit My Answers Give Up

**Incorrect; Try Again; 6 attempts remaining**  
 Inferior is a correct grouping.

**Part B**  
 All fibers of the trapezius muscle are innervated by the \_\_\_\_\_.

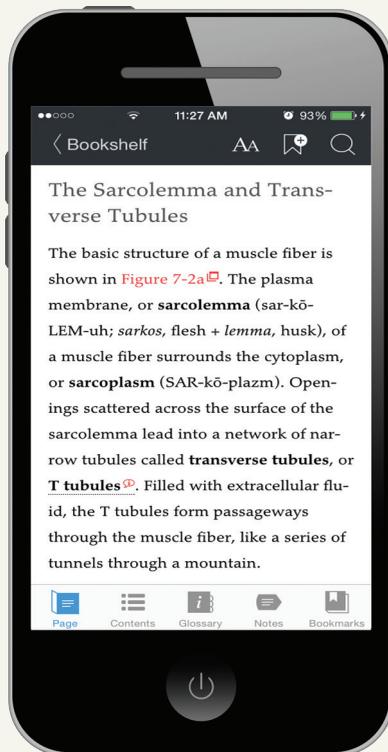
- coxal nerve
- spinal accessory nerve
- scapular nerve
- axillary nerve

Submit My Answers Give Up

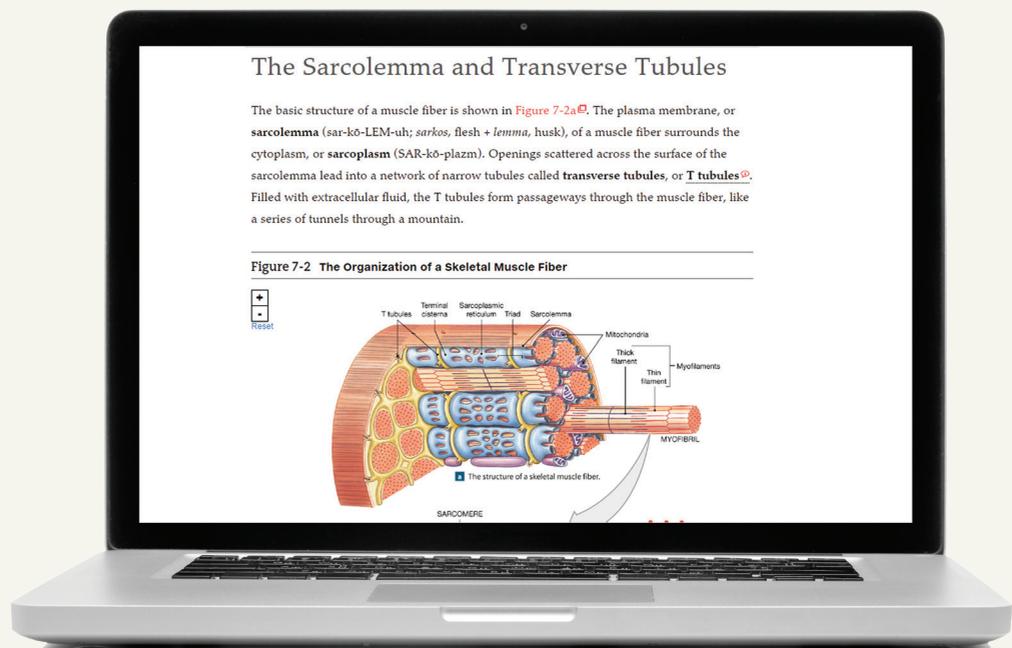
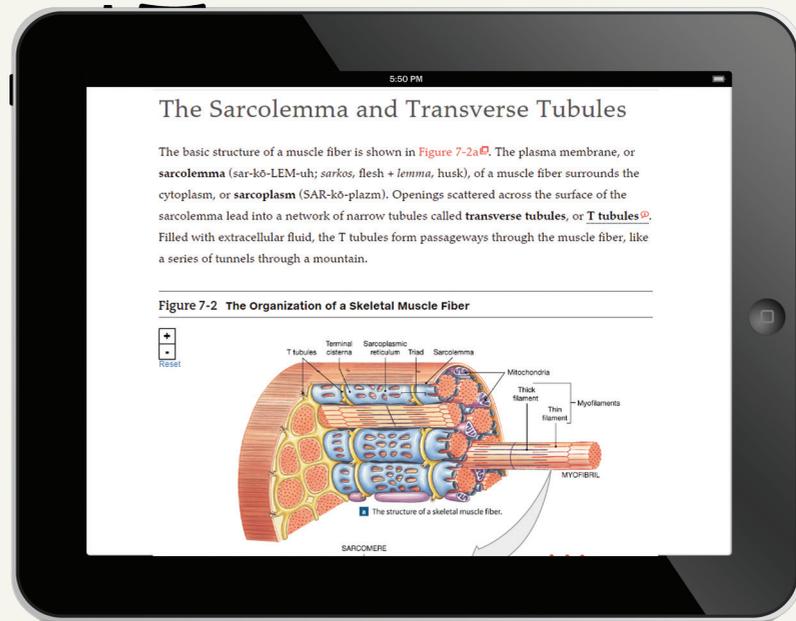
# Access the Complete Lab Manual On or Offline with eText 2.0

**NEW!** The Second Edition is available in Pearson's fully-accessible eText 2.0 platform.\*

**NEW!** The eText 2.0 mobile app offers offline access and can be downloaded for most iOS and Android phones and tablets from the iTunes or Google Play stores.

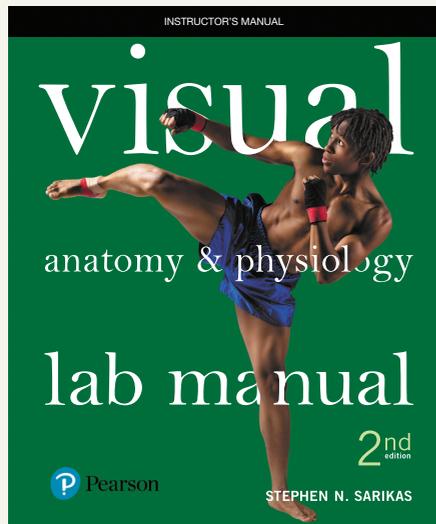


**Powerful interactive and customization functions** include instructor and student note-taking, highlighting, bookmarking, search, and links to glossary terms.



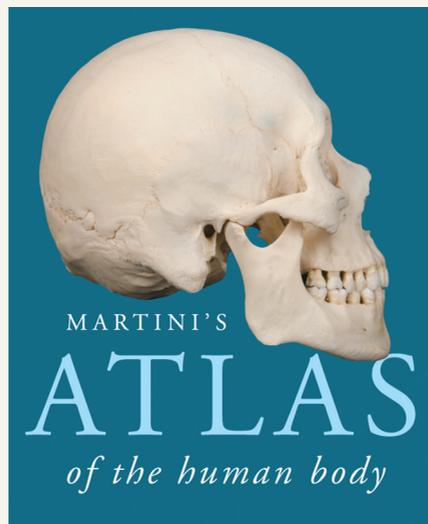
\*The eText 2.0 edition will be live for Fall 2017 classes.

# Instructor and Student Support



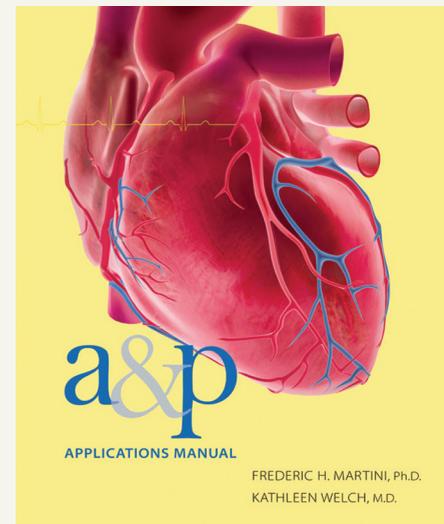
## Instructor's Manual by Lori K. Garrett

978-0-13-454796-1 / 0-13-454796-9  
This resource includes a wealth of materials to help instructors set up and run successful lab activities. Sections for every lab exercise include Time Estimates, List of Materials, To Do in Advance, Tips and Trouble Spots, and Answers.



## Martini's Atlas of the Human Body by Frederic H. Martini

978-0-321-94072-8 / 0-321-94072-5  
The Atlas offers an abundant collection of anatomy photographs, radiology scans, and embryology summaries, helping students visualize structures and become familiar with the types of images they might encounter in a clinical setting. Free when packaged with the textbook.



## A&P Applications Manual by Frederic H. Martini and Kathleen Welch

978-0-321-94973-8 / 0-321-94973-0  
This manual contains extensive discussions on clinical topics and disorders to help students apply the concepts of anatomy and physiology to daily life and their future health professions. Free when packaged with the textbook.

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