

Tissues

A cells and tissue lab activity using Visible Body's Anatomy & Physiology

Arne Christensen, PhD, Associate Professor of Biology, Anna Maria College

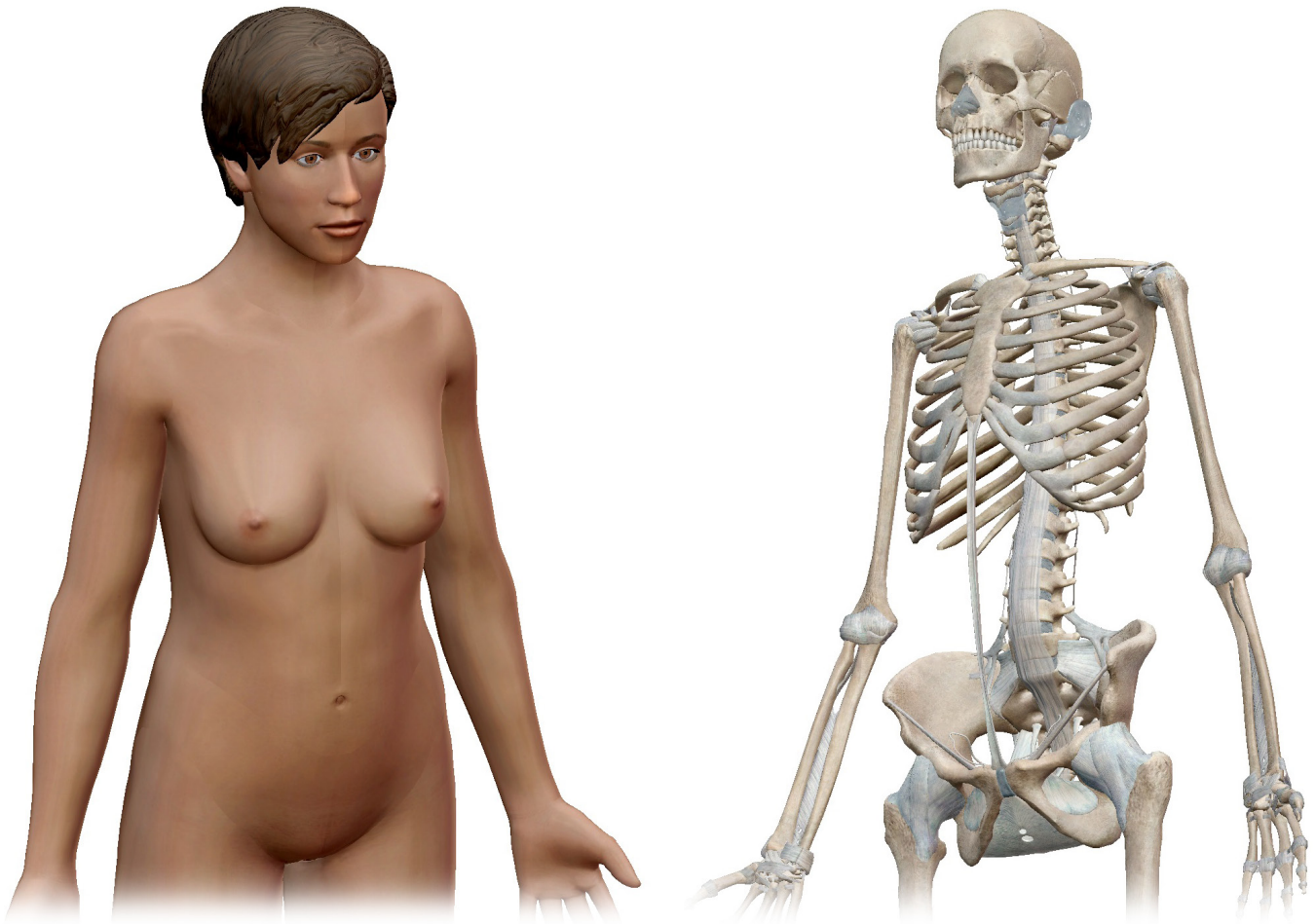
PRE-LAB EXERCISES

Open the A&P app, and from the left-side menu, select Cells and Tissue and then choose Chapter 4. Tissues.

Use the modules to guide your exploration of the tissue types in the body. Be sure to use the book icon to learn more about the cellular concepts that you are exploring.

You are responsible for the identification of **all bold terms** and all answers to the questions.

A. Explore the 3D anatomical view in Module 4.1 Tissue Types in the Body and answer the following questions.



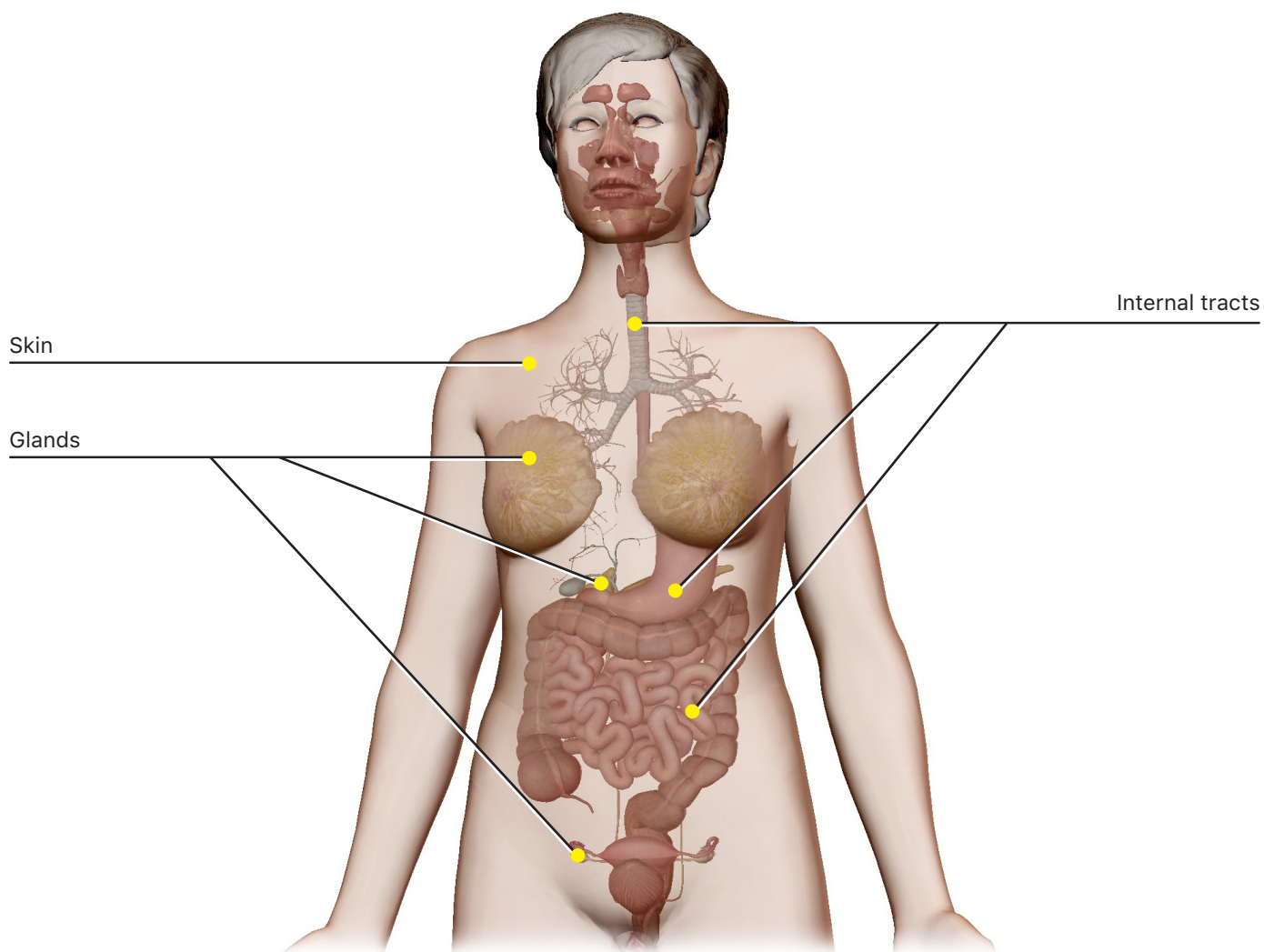


1. In the following table, list the four major types of body tissue and provide a general description of each type.

Type of body tissue	General description

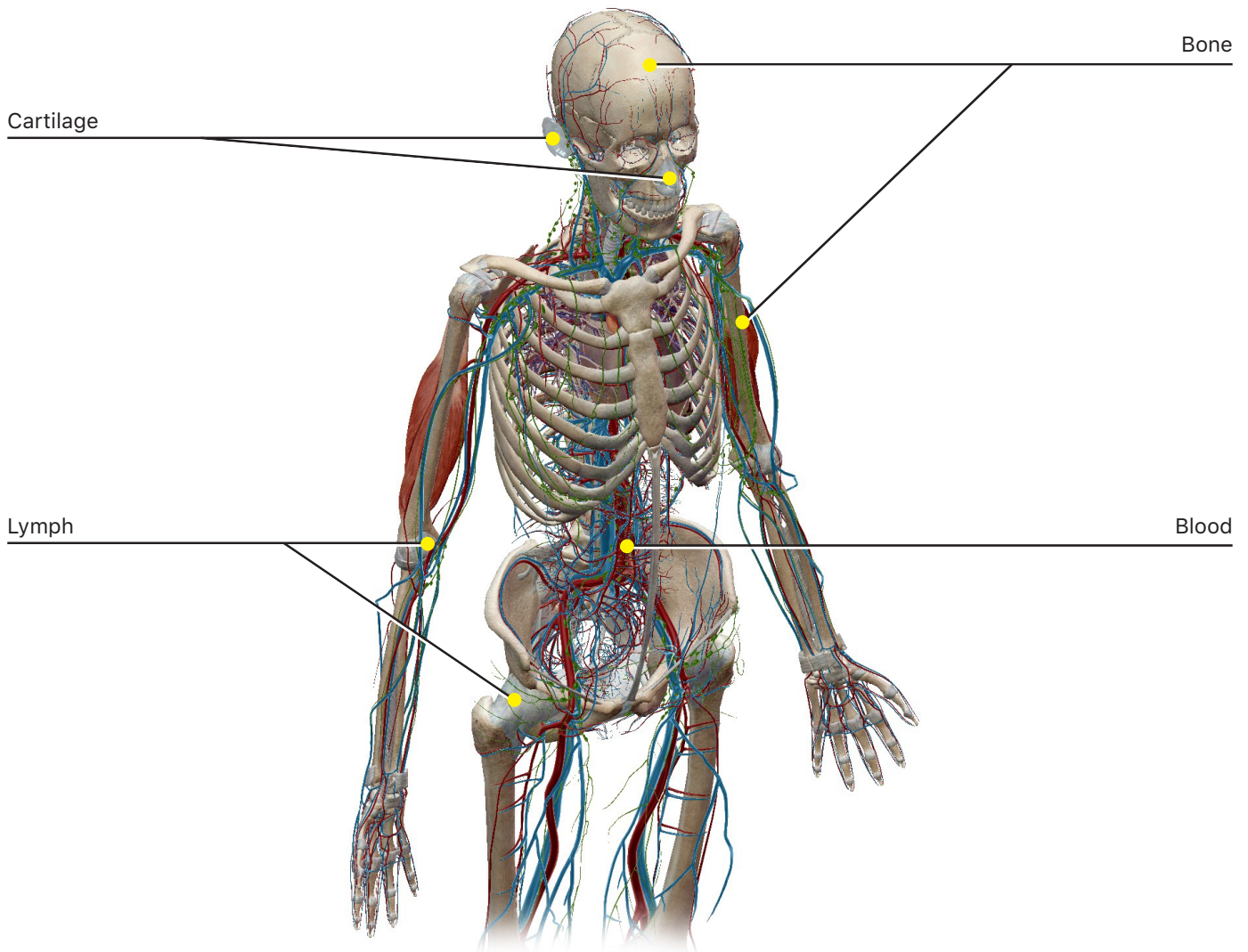
2. What are two types of specialized connective tissue that consist of cells in a fluid matrix (not a ground substance with fibers)?

B. Explore the 3D anatomical views in Modules 4.2 Epithelial Tissue, 4.6 Connective Tissue, 4.17 Muscle Tissue, and 4.19 Nervous Tissue. Use these modules to answer the following questions about the structure and functions of the four major types of body tissues.



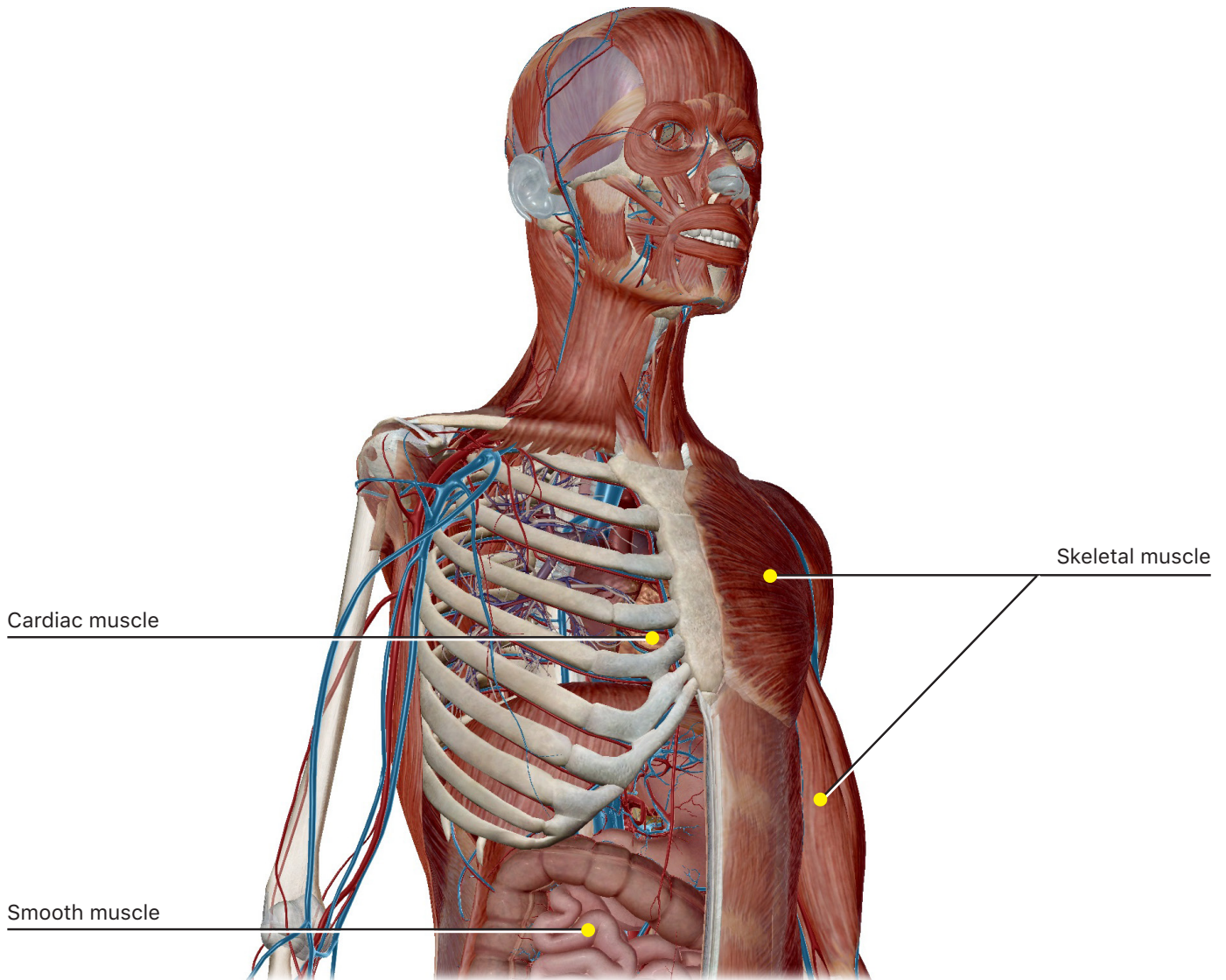
1. First, explore Module 4.2 Epithelial Tissue to learn about the two types of **epithelial tissue**: epithelial sheets (including skin) and glands. What observations can you make about the unique characteristics of epithelial sheets and glands?

2. Next, explore Module 4.6 Connective Tissue to learn about the four types of connective tissue, which have wildly different material properties. In the following table, provide examples of the different types of connective tissue.



Type of connective tissue	Examples
Loose connective tissue	
Dense connective tissue	
Special connective tissue (fibrous matrix)	
Special connective tissue (fluid matrix)	

3. Then, explore Module 4.17 Muscle Tissue to learn about the three types of **muscle tissue**. Describe where you would find each type of muscle tissue in the body.



4. Finally, explore Module 4.19 Nervous Tissue to learn about the two types of cells that compose nervous tissue. What are these types of cells, and what are their functions?

IN-LAB EXERCISES

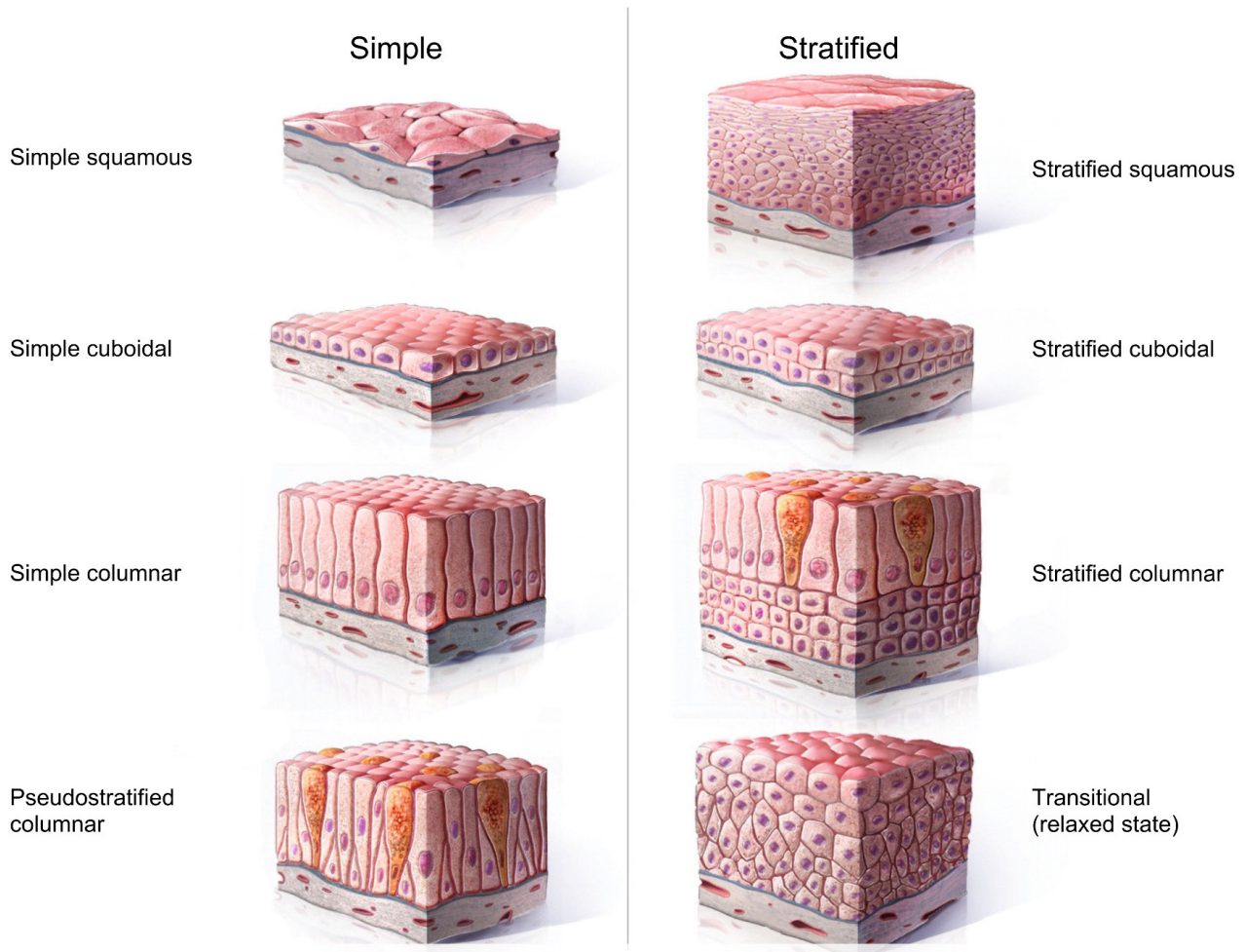
Use the following modules in **Visible Body's Anatomy & Physiology** app to guide your exploration of body tissues. Be sure to select the book icon under the structure names to learn more about the structures you are exploring.

You are responsible for the identification of **all bold terms** and all answers to the questions.

Go to the Cells and Tissue unit and select Chapter 4. Tissues.

A. Epithelial Tissue

1. Explore the 3D anatomical view in Module 4.2 Epithelial Tissue for an overview of where epithelial sheets and glands can be found in the body. Then, open the illustration slideshow in Module 4.3 Types of Epithelial Tissue, examine Slide 1 – Simple and Stratified Epithelium, and answer the following questions about the different types of epithelial sheets.

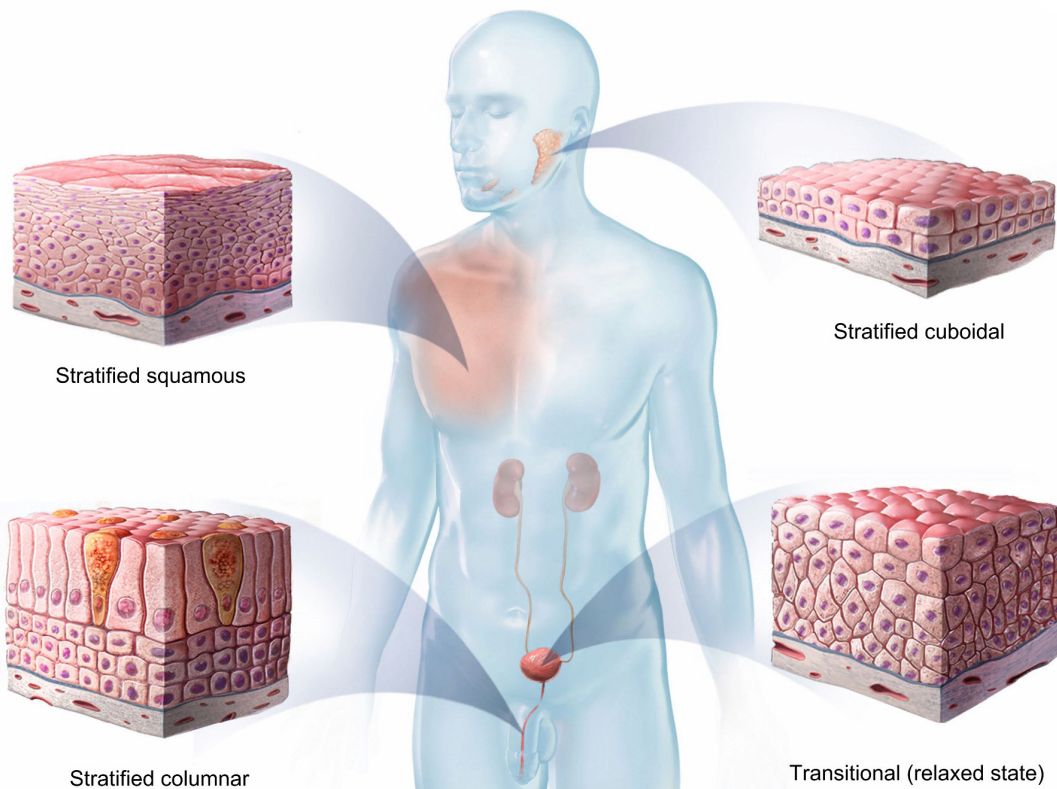
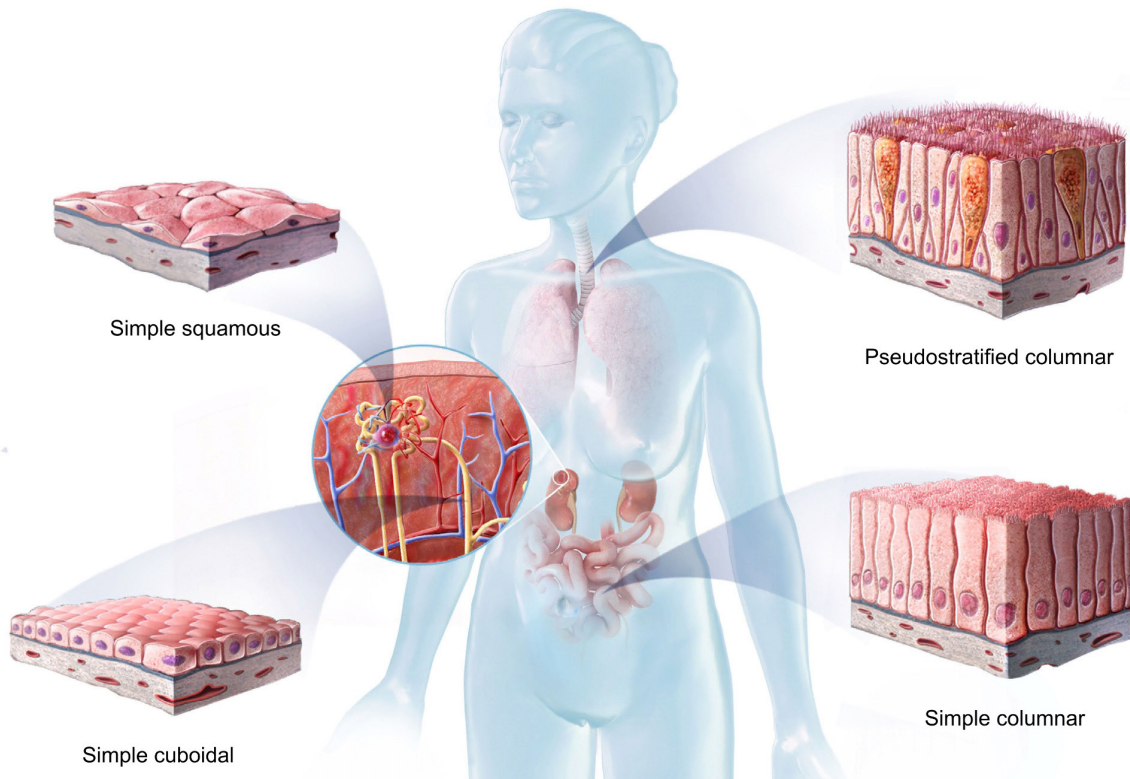


a. In general, _____ facilitate absorption and filtration, whereas _____ tend to protect underlying tissues from abrasion.

b. Epithelial sheets are classified by their number of cell layers and their shape. In the following table, describe the appearance of each type of epithelium.

Simple squamous	Stratified squamous
Simple cuboidal	Stratified cuboidal
Simple columnar	Stratified columnar
Pseudostratified columnar	Transitional

2. Explore the illustration slideshows in Modules 4.4 Simple Epithelium and 4.5 Stratified Epithelium. In each module, examine the first slide to learn about where the eight types of simple and stratified epithelium can be found in the body. Then, use the dots under the image to examine a series of histology micrographs and learn about how each type's structure facilitates its function. Use these modules to answer the following questions.



a. In the following spaces, list the four types of **simple epithelium** and give an example of where each type can be found in the body.

i.

ii.

iii.

iv.

b. In the following spaces, list the four types of **stratified epithelium** and give an example of where each type can be found in the body.

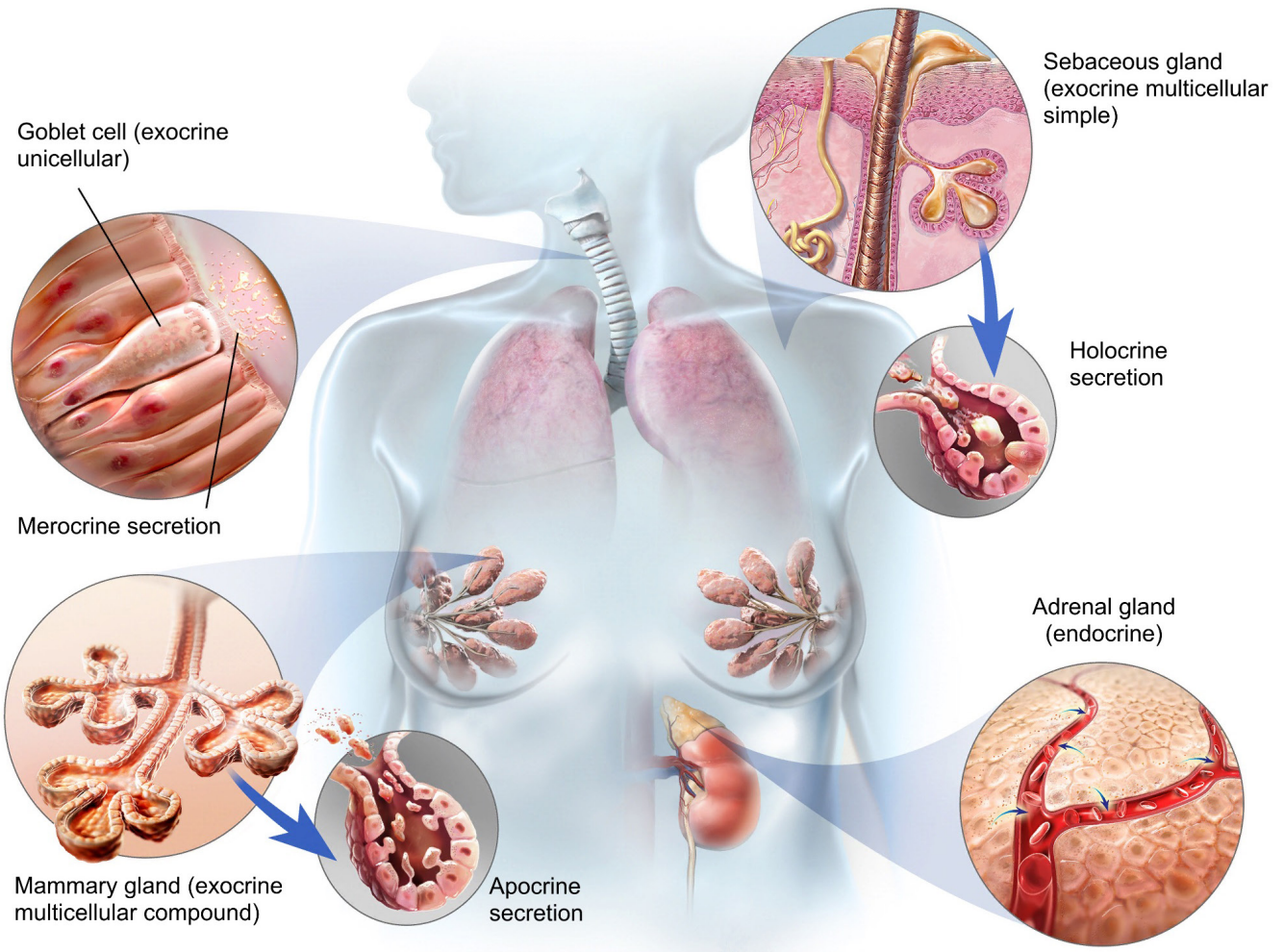
i.

ii.

iii.

iv.

3. Open the illustration slideshow in Module 4.3 Types of Epithelial Tissue, select the second dot under the image to examine Slide 2 – Exocrine and Endocrine Glands, and then answer the following questions about the different types of glands.

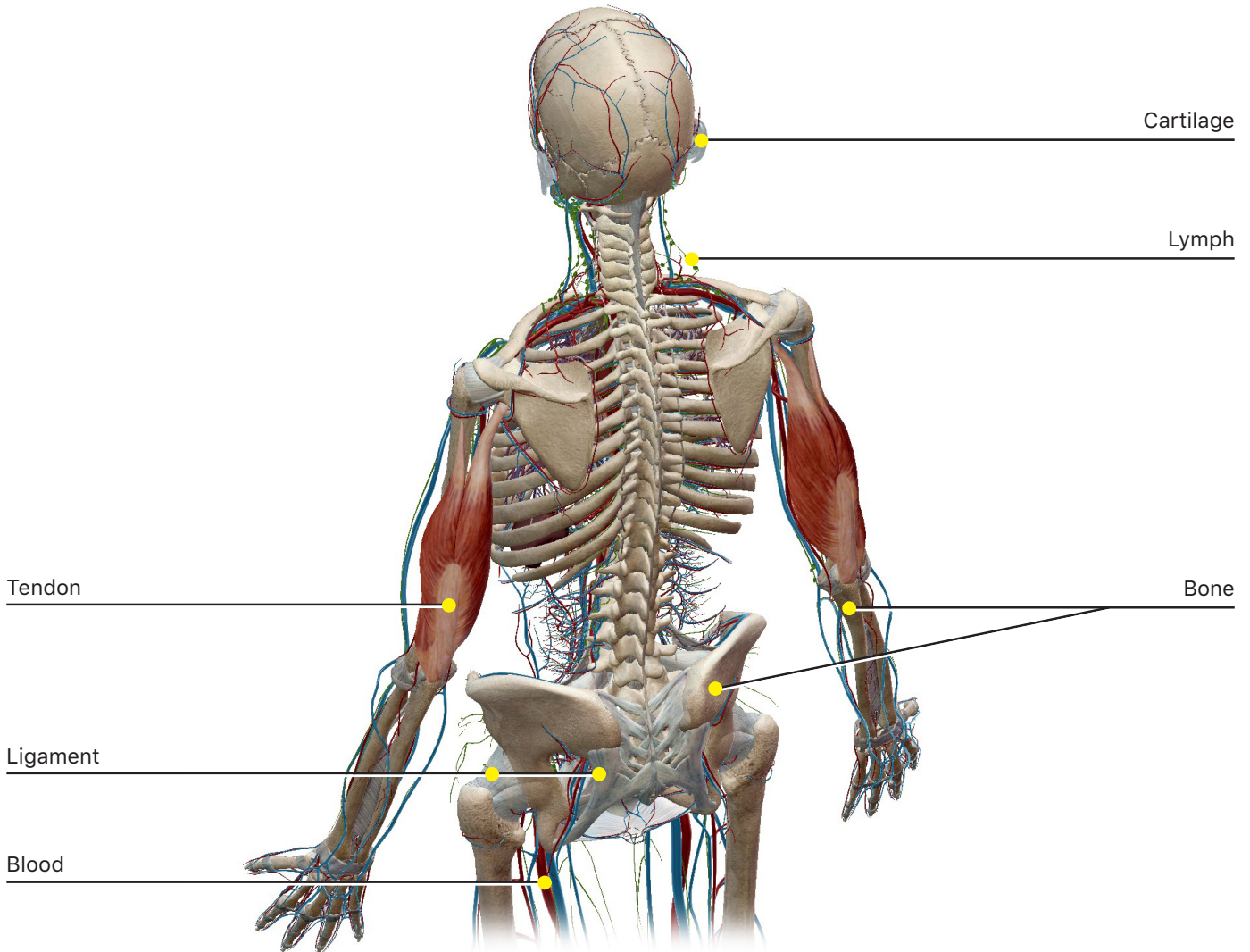


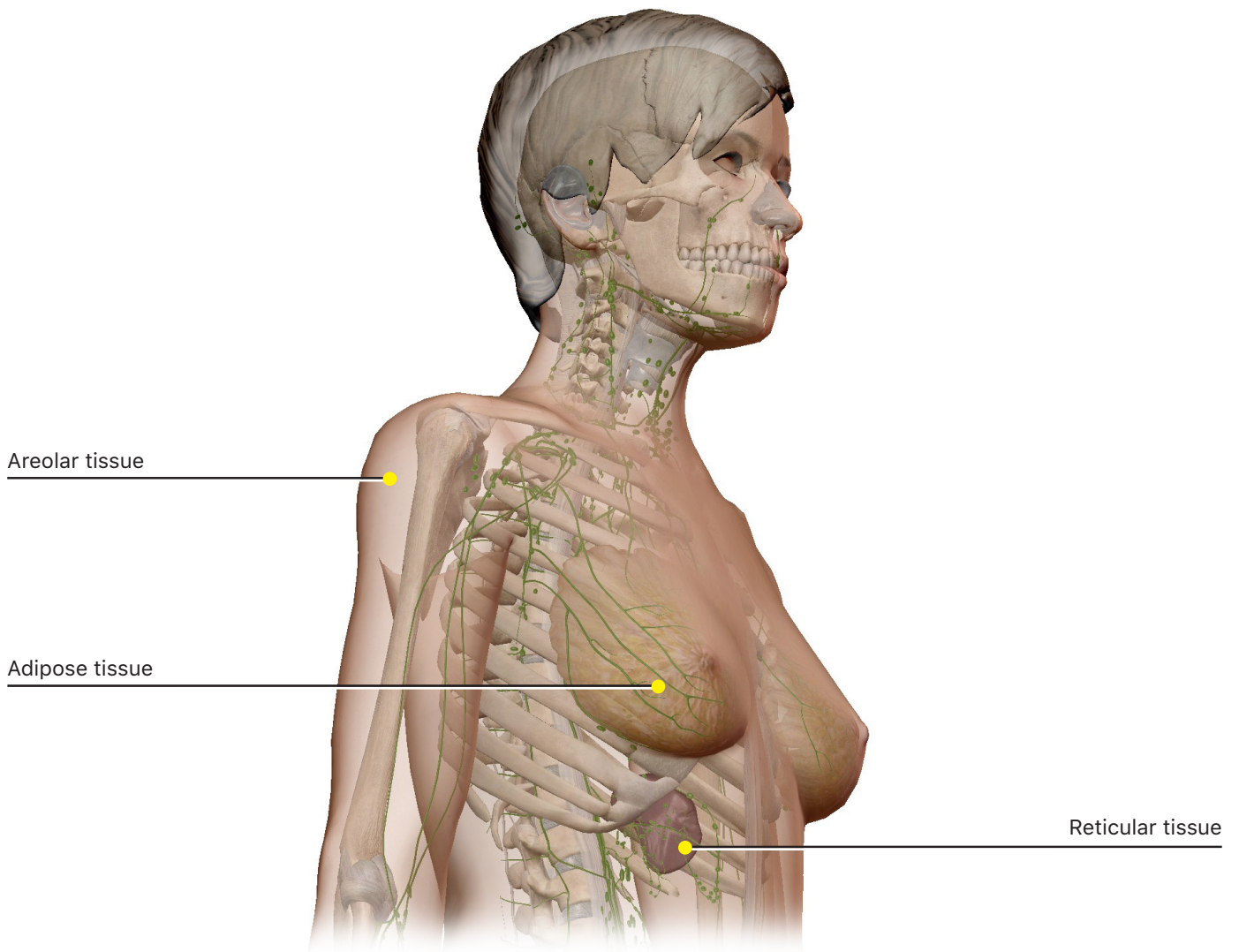
a. _____ secrete hormones into the bloodstream, whereas _____ secrete substances into ducts and onto the skin or the lumen of a hollow organ.

b. Goblet cells and mammary glands are both exocrine glands—how are they similar and how are they different?

B. Connective Tissue

1. Explore the 3D anatomical views in Modules 4.6 Connective Tissue and 4.7 Connective Tissue Proper: Loose to get an overview of connective tissue and learn about where **loose connective tissue** can be found in the body. Then, explore the illustration slideshow in Module 4.8 Types of Loose Connective Tissue, using the dots under the image to examine a series of histology micrographs and learn about how the structure of **areolar tissue**, **adipose tissue**, and **reticular tissue** facilitates their functions. Use these modules to answer the following questions.





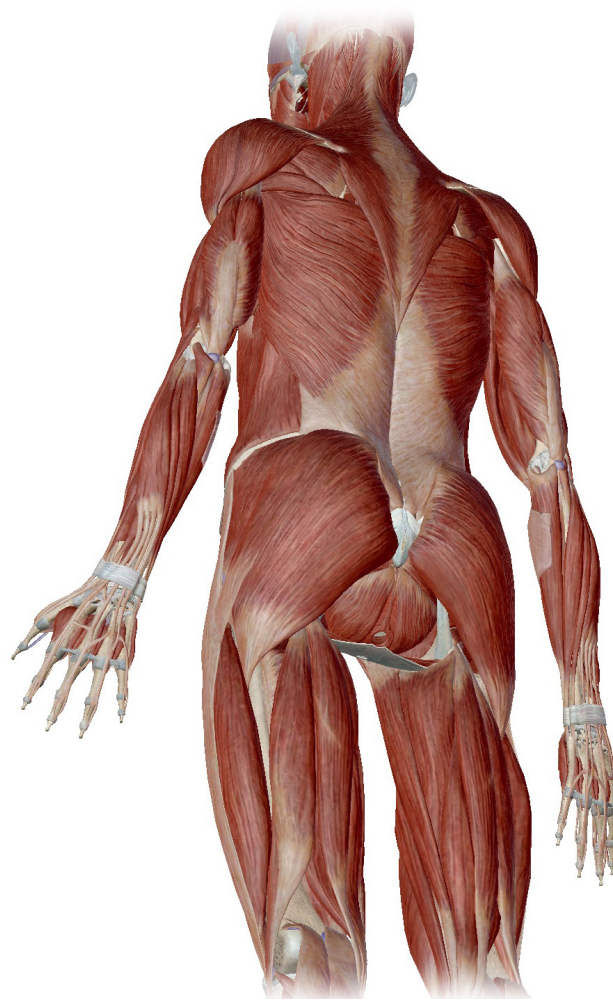
a. Loose connective tissue contains cells that are interspersed in an extracellular matrix that is characterized by its loosely arranged _____ and abundant _____.

b. In the following table, describe the types of cells and the extracellular matrix of each type of loose connective tissue.

Type of loose connective tissue	Cells	Extracellular matrix
Areolar tissue		
Adipose tissue		
Reticular tissue		

c. The micrographs of areolar and adipose tissue both show cells (fibroblasts and adipocytes), but the density of cells in the two tissues is very different. What do you think causes this difference?

2. Explore the 3D anatomical view in Module 4.9 Connective Tissue Proper: Dense to learn about where **dense connective tissue** can be found in the body. Then, explore the illustration slideshow in Module 4.10 Types of Dense Connective Tissue, using the dots under the image to examine a series of histology micrographs and learn about how the structure of **dense regular connective tissue** and **dense irregular connective tissue** facilitates their functions. Use these modules to answer the following questions.



a. Unlike loose connective tissue, which has loosely arranged fibers, dense connective tissue has tightly packed fibers. How does this structure affect how the tissue responds to forces and tension?

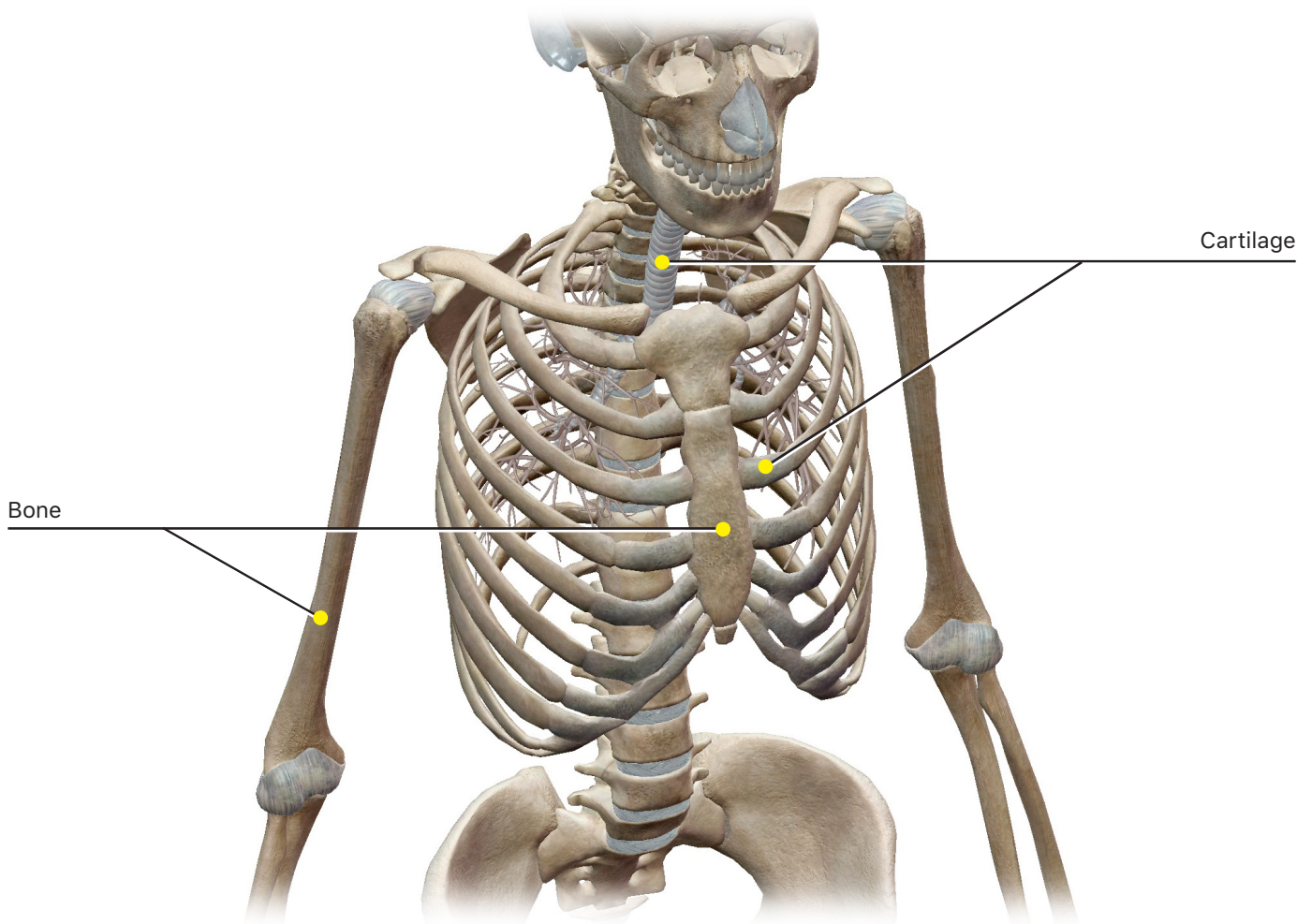
b. In the following table, describe the types of cells and the extracellular matrix fibers that are present in each type of dense connective tissue.

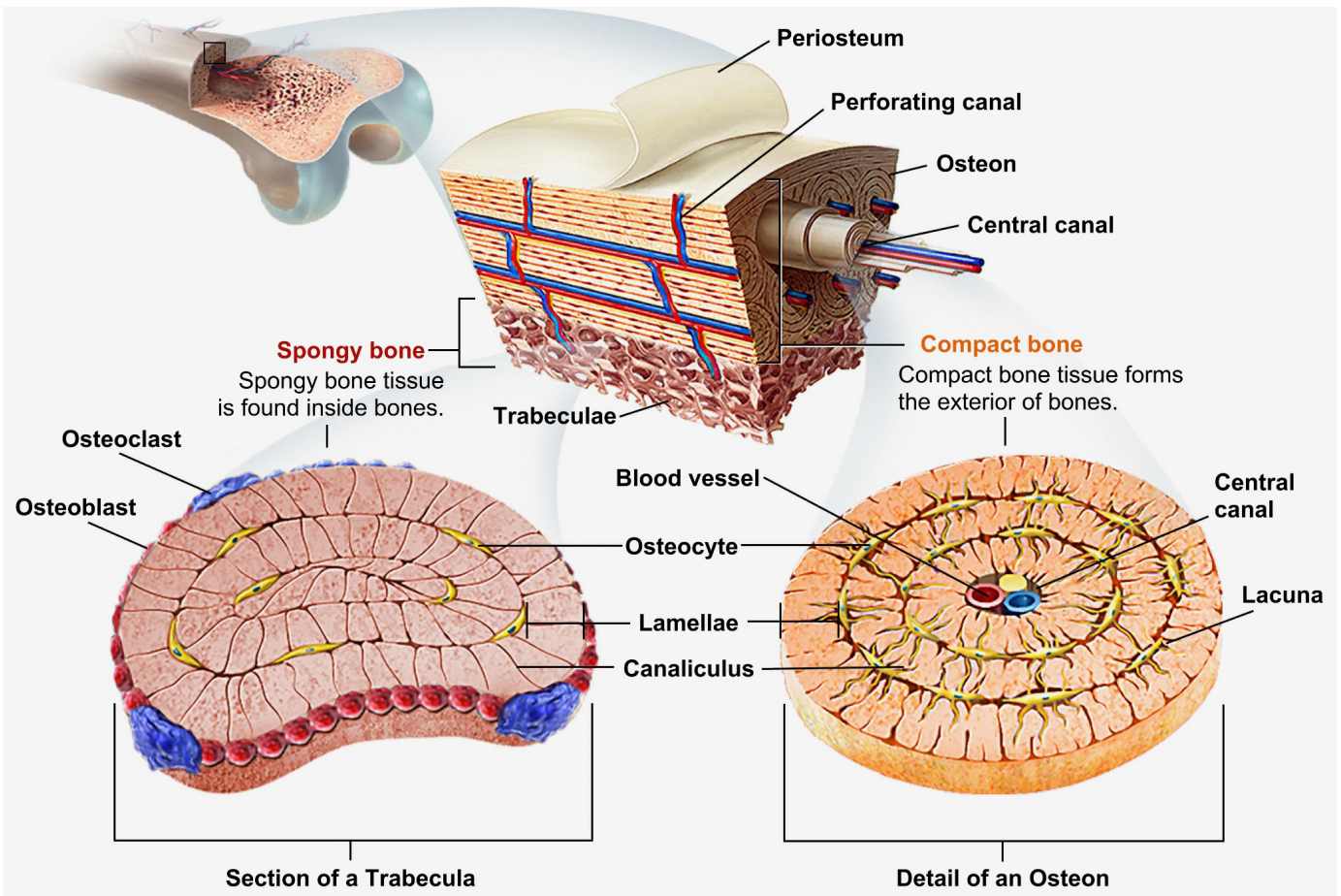
Type of dense connective tissue	Types of cells	Extracellular matrix fibers
Dense regular connective tissue		
Dense irregular connective tissue		

c. How does the arrangement of fibers differ in the two types of dense connective tissue?

d. Dense regular connective tissue forms tendons, ligaments, aponeuroses, and fascia. Dense irregular connective tissue forms the reticular dermis, digestive tract submucosa, and organ and joint capsules. How does the arrangement of fibers in dense regular and dense irregular connective tissue determine the capacity for each tissue to withstand tension?

3. Explore the 3D anatomical views in Modules 4.11 Special Connective Tissue: Bone and Cartilage and 4.13 Cartilage to learn about where **bone** and **cartilage** can be found in the body. Next, examine the illustration in Module 4.12 Bone Tissue to learn about the composition and functions of **compact bone** and **spongy bone**. Then, explore the illustration slideshow in Module 4.14 Cartilage Histology, using the dots under the image to examine a series of histology micrographs and learn about how the structure of **hyaline cartilage**, **elastic cartilage**, and **fibrocartilage** facilitates their functions. Use these modules to answer the following questions.





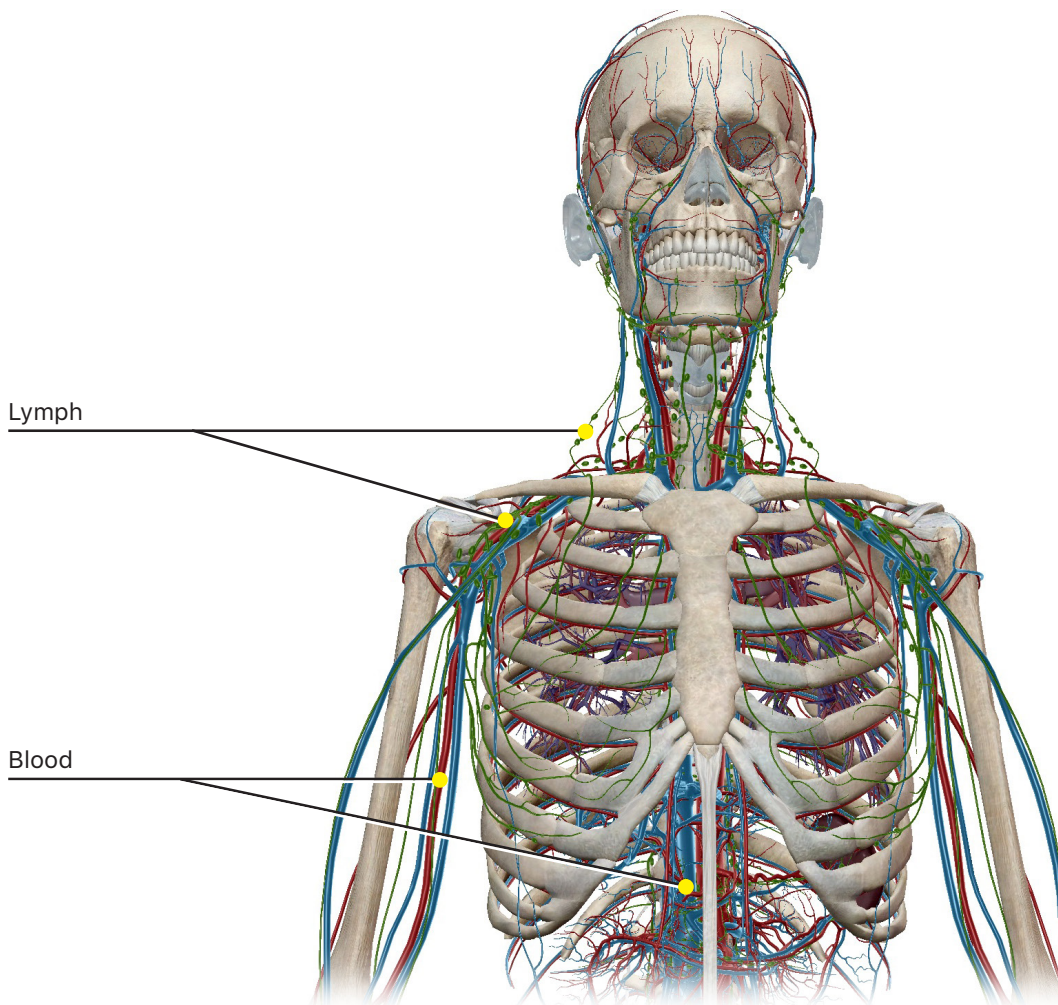
a. In the following table, describe the types of cells and the nature of the extracellular matrix that compose bone and cartilage.

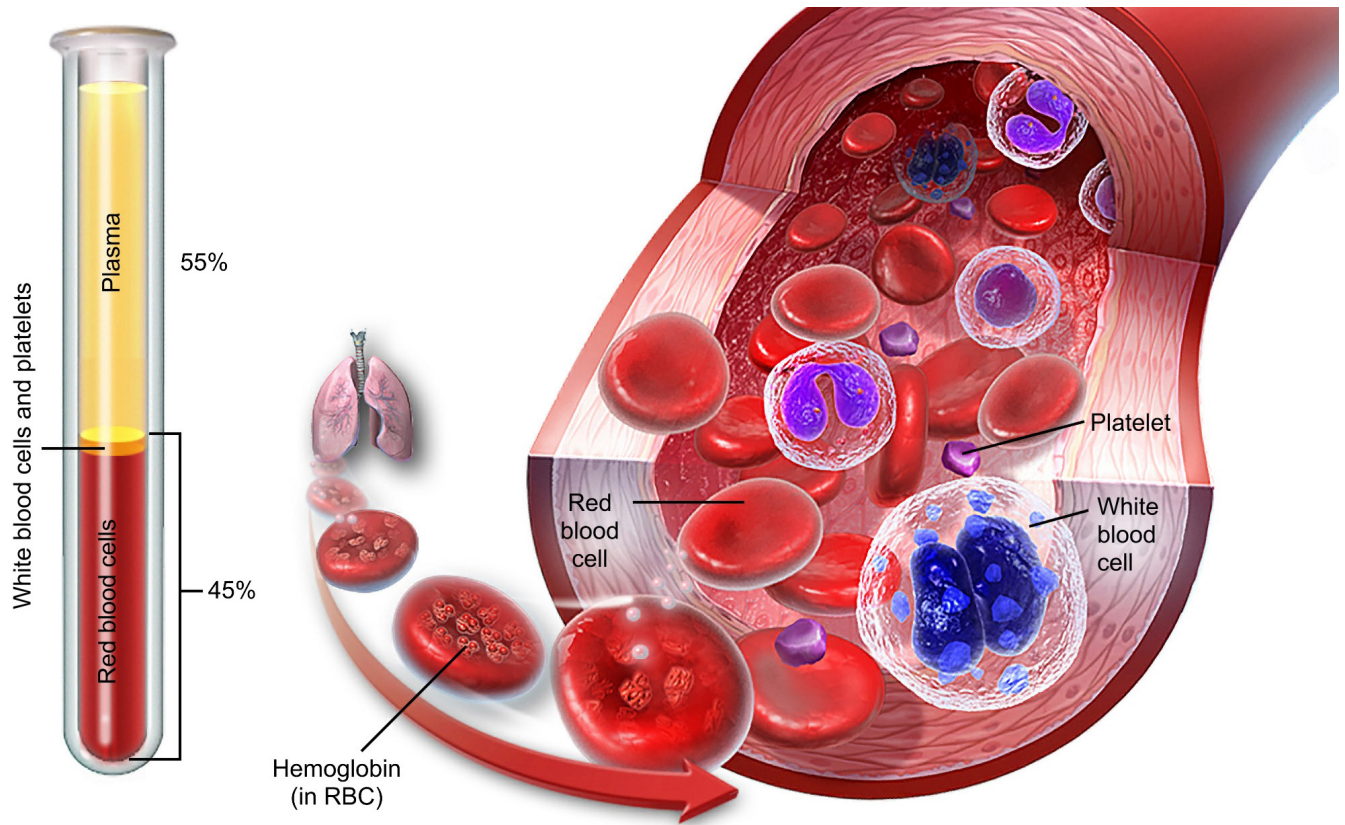
Type of connective tissue	Cells	Extracellular matrix
Bone tissue		
Cartilage tissue		

b. In the following table, describe the extracellular matrix of each type of cartilage and where it can be found in the body.

Type of cartilage	Extracellular matrix	Body location
Hyaline cartilage		
Elastic cartilage		
Fibrocartilage		

4. Explore the 3D anatomical view in Module 4.15 Special Connective Tissue: Blood and Lymph to learn about the structure of **blood** and **lymph** and where blood and lymphatic vessels can be found in the body. Then, examine the illustration in Module 4.16 Blood to learn about the composition and functions of blood. Use these modules to answer the following questions.





a. In the following table, describe the types of cells and the nature of the extracellular matrix that compose blood and lymph.

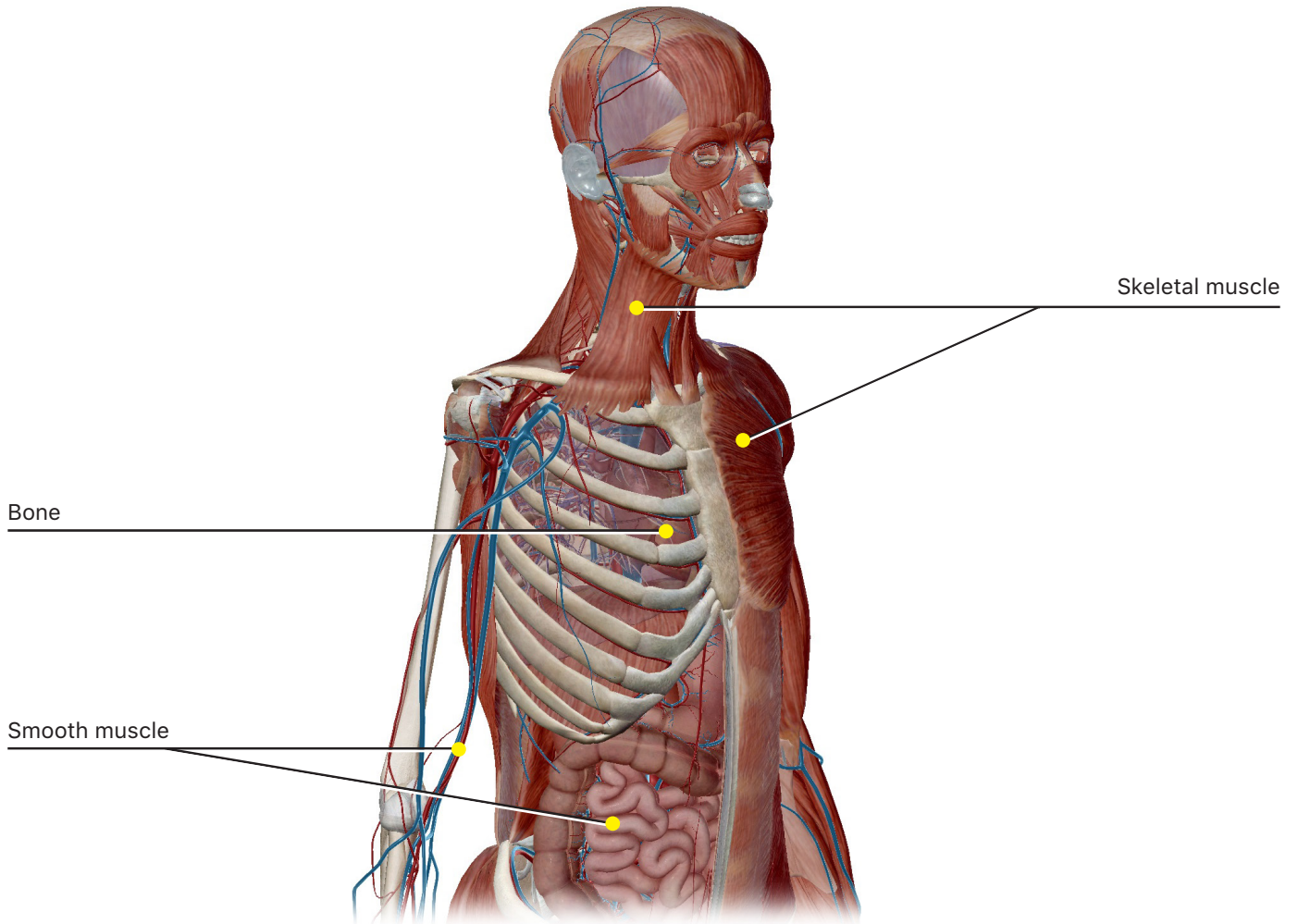
Type of connective tissue	Cells	Extracellular matrix
Blood		
Lymph		

b. What are six critical functions of blood?

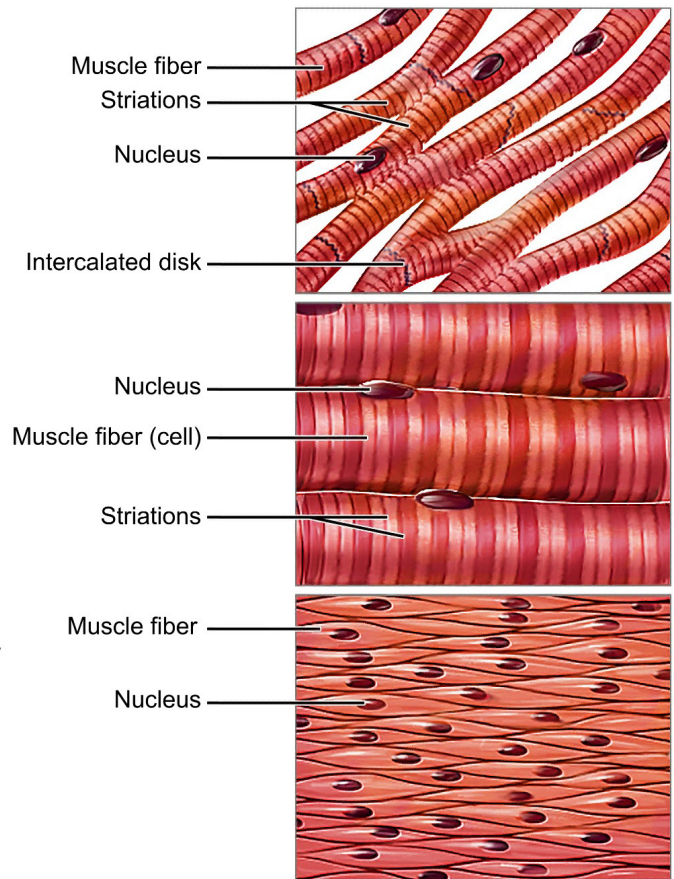
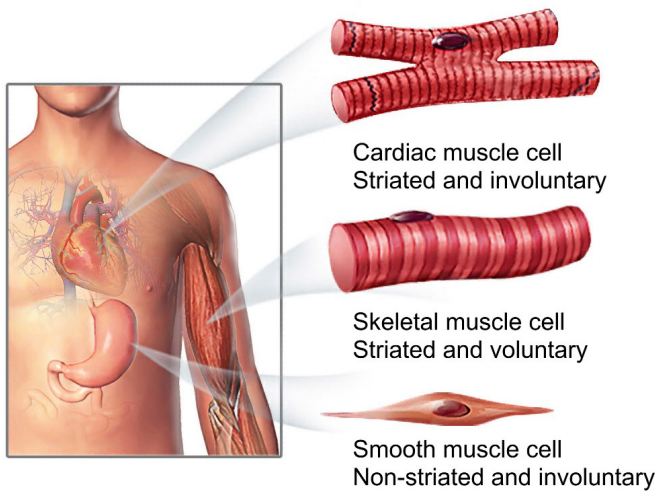
- i.
- ii.
- iii.
- iv.
- v.
- vi.

C. Muscle Tissue

1. Explore the 3D anatomical view in Module 4.17 Muscle Tissue, examine the illustration in Module 4.18 Types of Muscle Tissue, and then answer the following questions about the structure and functions of **skeletal muscle**, **smooth muscle**, and **cardiac muscle**.



Types of muscle fiber



a. Skeletal, smooth, and cardiac muscle tissue are made up of cells that can contract and relax, but each type of muscle tissue has a unique appearance and type of stimulation. In the following table, provide a general description of each type of muscle tissue that includes its location in the body, cellular appearance, and the type of command that stimulates its contraction.

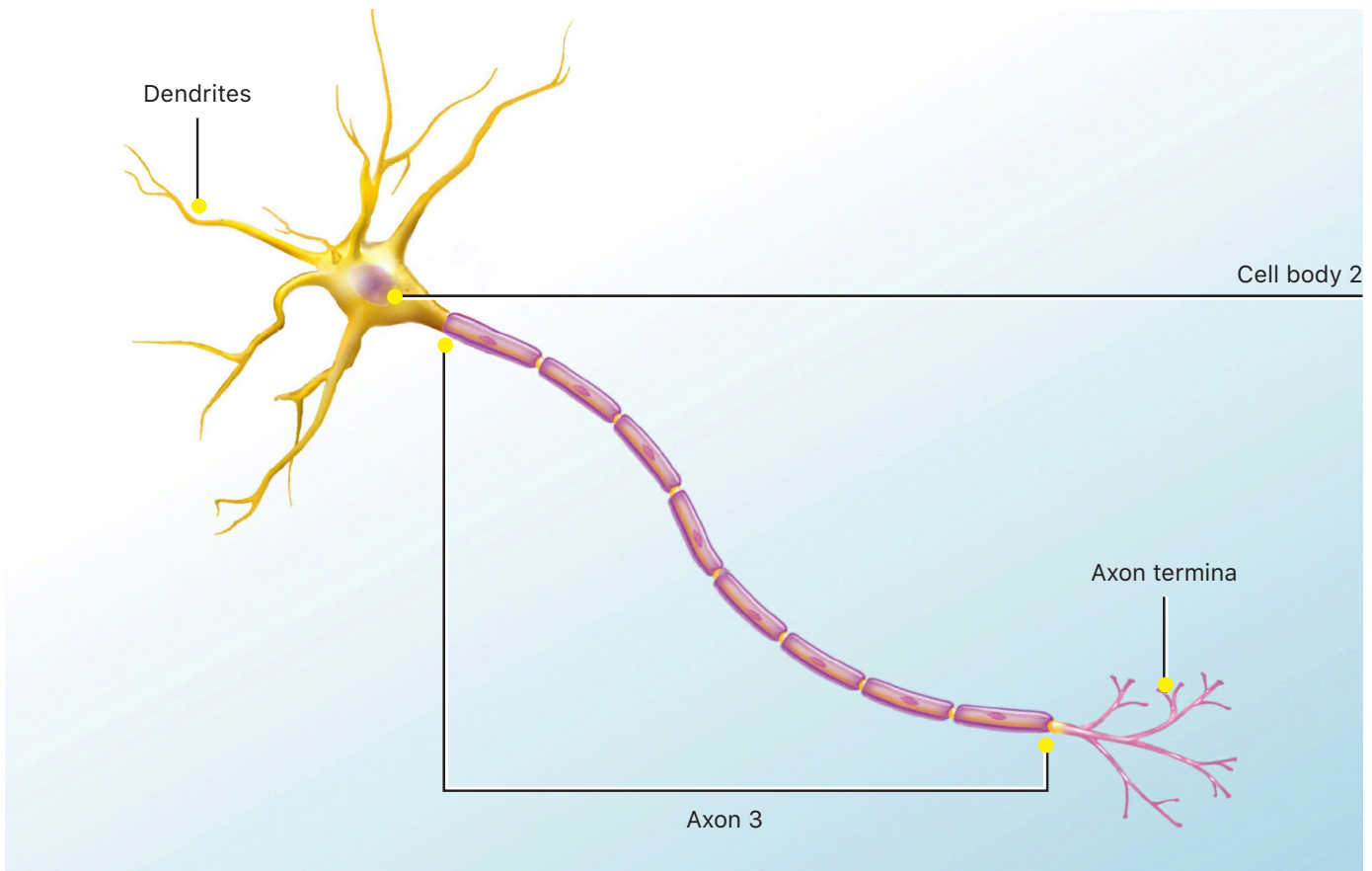
Type of muscle tissue	Body location and function	Cellular appearance	Type of command
Skeletal Muscle			
Smooth Muscle			
Cardiac Muscle			

D. Nervous Tissue

1. Explore the 3D anatomical view in Module 4.19 Nervous Tissue, examine the illustration in Module 4.20 Neuron Structure, and then answer the following questions about the structure and functions of **neurons** and **neuroglia**.



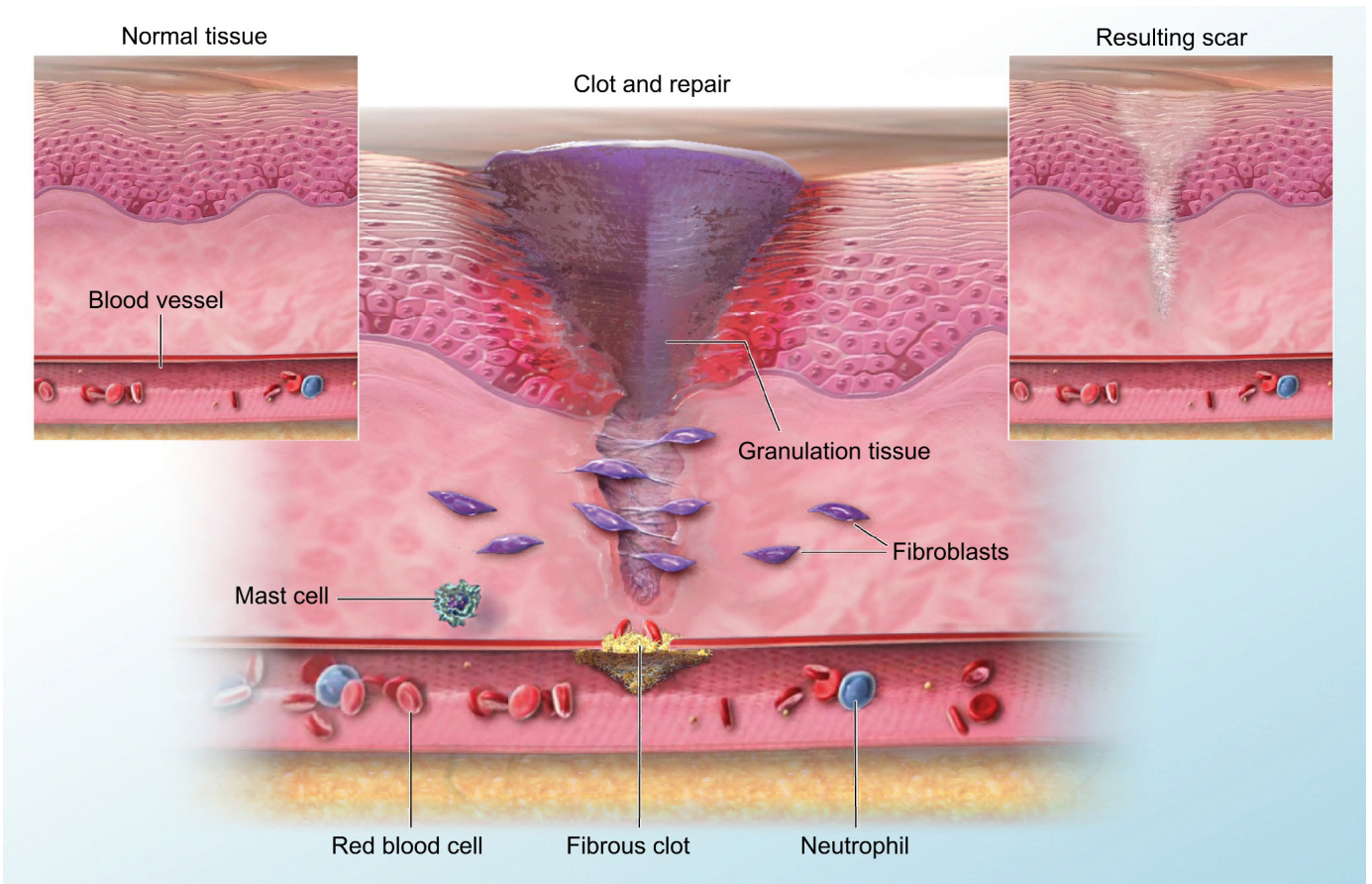
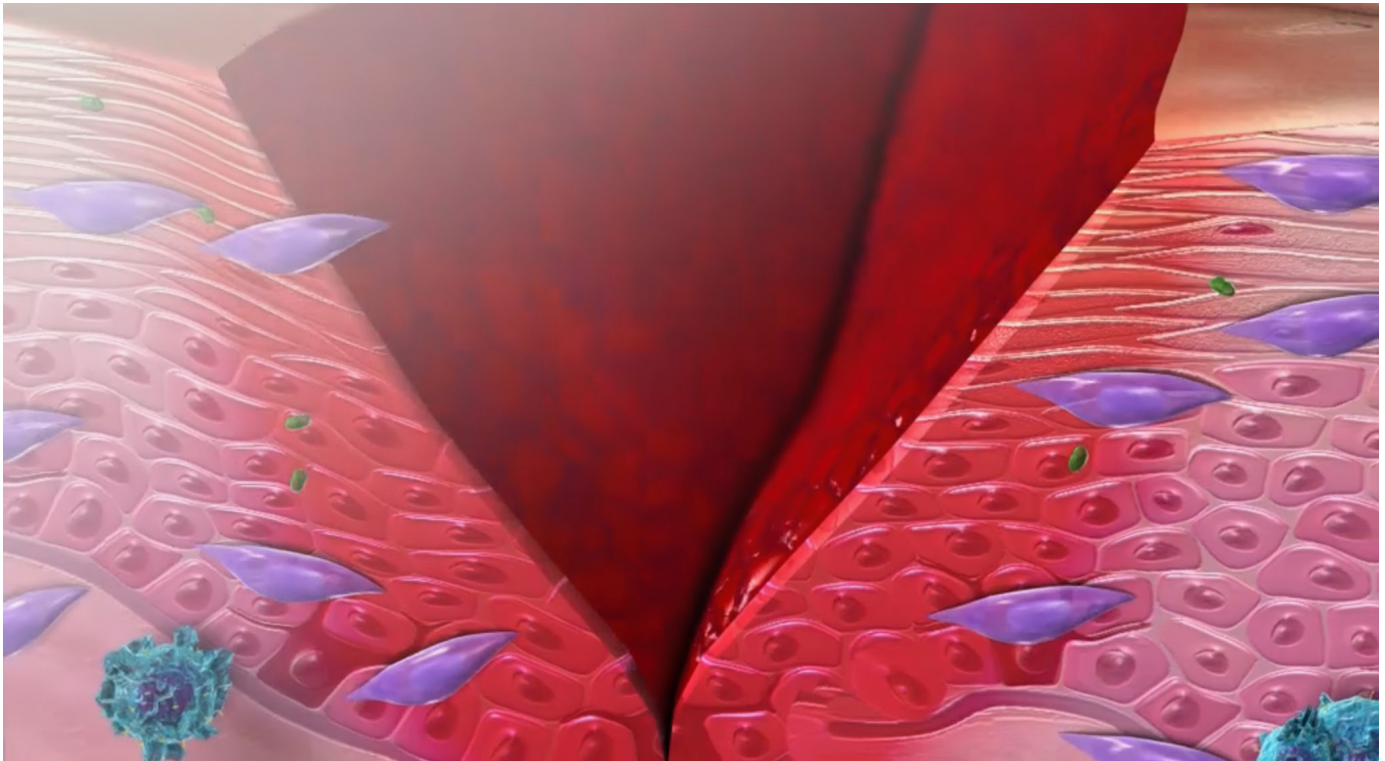
a. Neurons can only pass signals in a single direction. In the following illustration, label the axon, axon terminal, cell body, and dendrites. Then, number the labeled structures (1–4) to reflect the path a signal takes through the neuron.



b. Neurons conduct electrical signals along their axons in one direction. What structure do some neurons have that increases conduction speed?

E. Tissue Repair

1. Watch the video in Module 4.21 Tissue Repair, examine the illustration in Module 4.22 Tissue Repair and Scarring, and then answer the following questions about the process of wound healing.



a. In the following list, number the steps of wound healing after a soft tissue injury.

___ Inflammation occurs in the area as tissue repair begins.

___ Mast cells release histamine that dilates blood vessels and increases blood flow to the repair site, further promoting clot formation.

___ Platelets from torn vessels form a mesh-like clot that prevents blood loss.

___ Neutrophils and macrophages consume bacteria and remove damaged tissue and debris.

___ The tissue created by fibroblasts matures and regains its normal function.

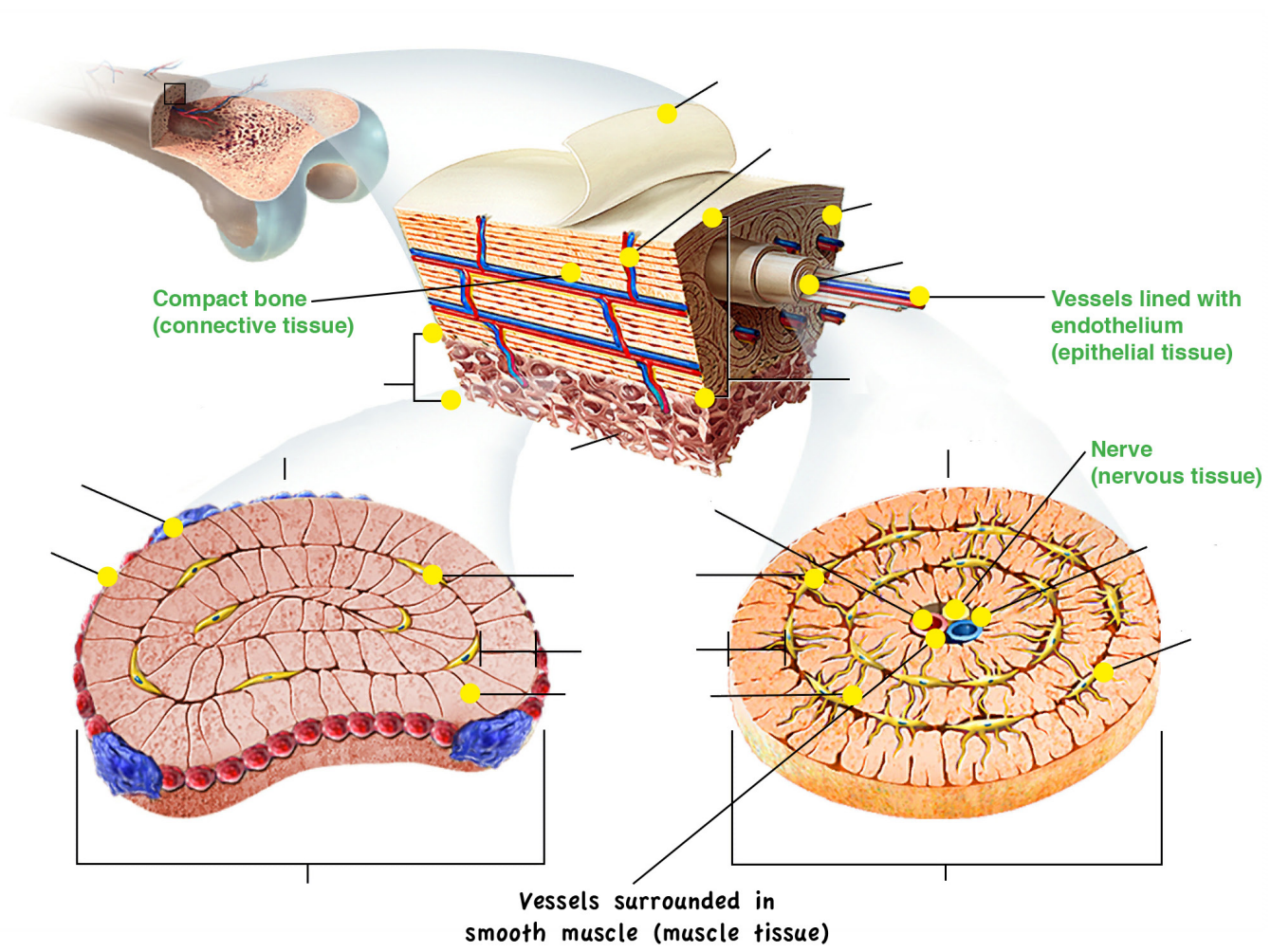
___ Fibroblasts build new tissue by secreting collagen that takes the shape of the original tissue.

PUTTING IT ALL TOGETHER

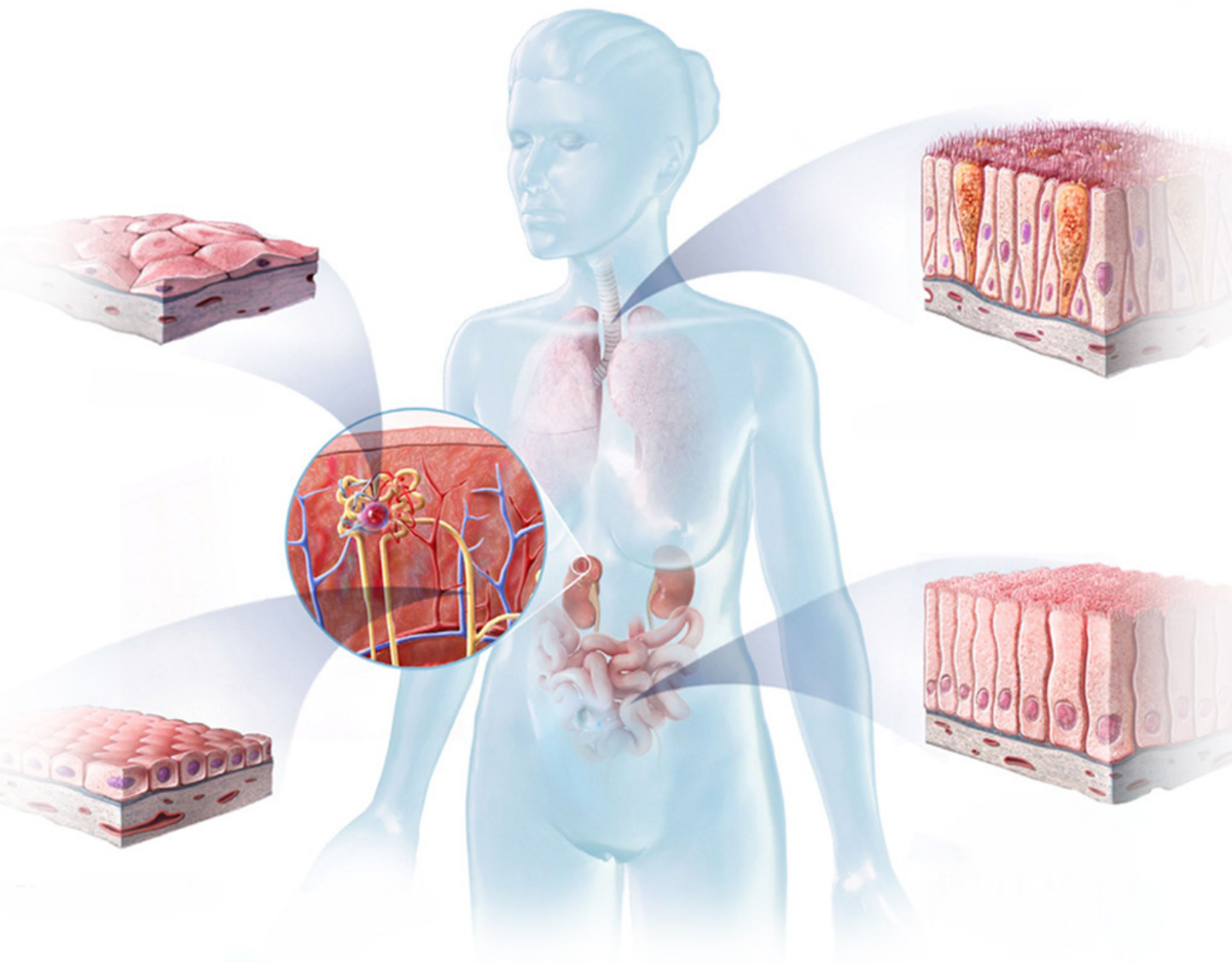
1. There are four major types of body tissue, and most parts of the body, including most organs, contain all four. For example, the heart pumps blood (connective tissue) through rhythmic contractions (influenced by the nervous system) of the myocardium (muscle tissue), and a sheet of cells called the endocardium (epithelial tissue) lines the heart chambers.

Even very small regions of the body contain multiple types of body tissue. If some unlucky person steps on a tiny thumbtack (ouch!) and a little droplet of blood forms, how many types of tissue would likely be involved in the injury?

2. Examine the illustration in Module 4.12 Bone Tissue to learn about bones, which are organs that contain all four major body tissue types, and bone tissue, which is a type of connective tissue. Directly on the following illustration, add arrows and labels to point to examples of where each major body tissue can be found. As an example, we've labeled the smooth muscle tissue found in the blood vessel walls (for more information on the components of blood vessel walls, refer to Modules 15.9 Smooth Muscle in Blood Vessel Walls and 30.5 Blood Vessel Wall Histology).



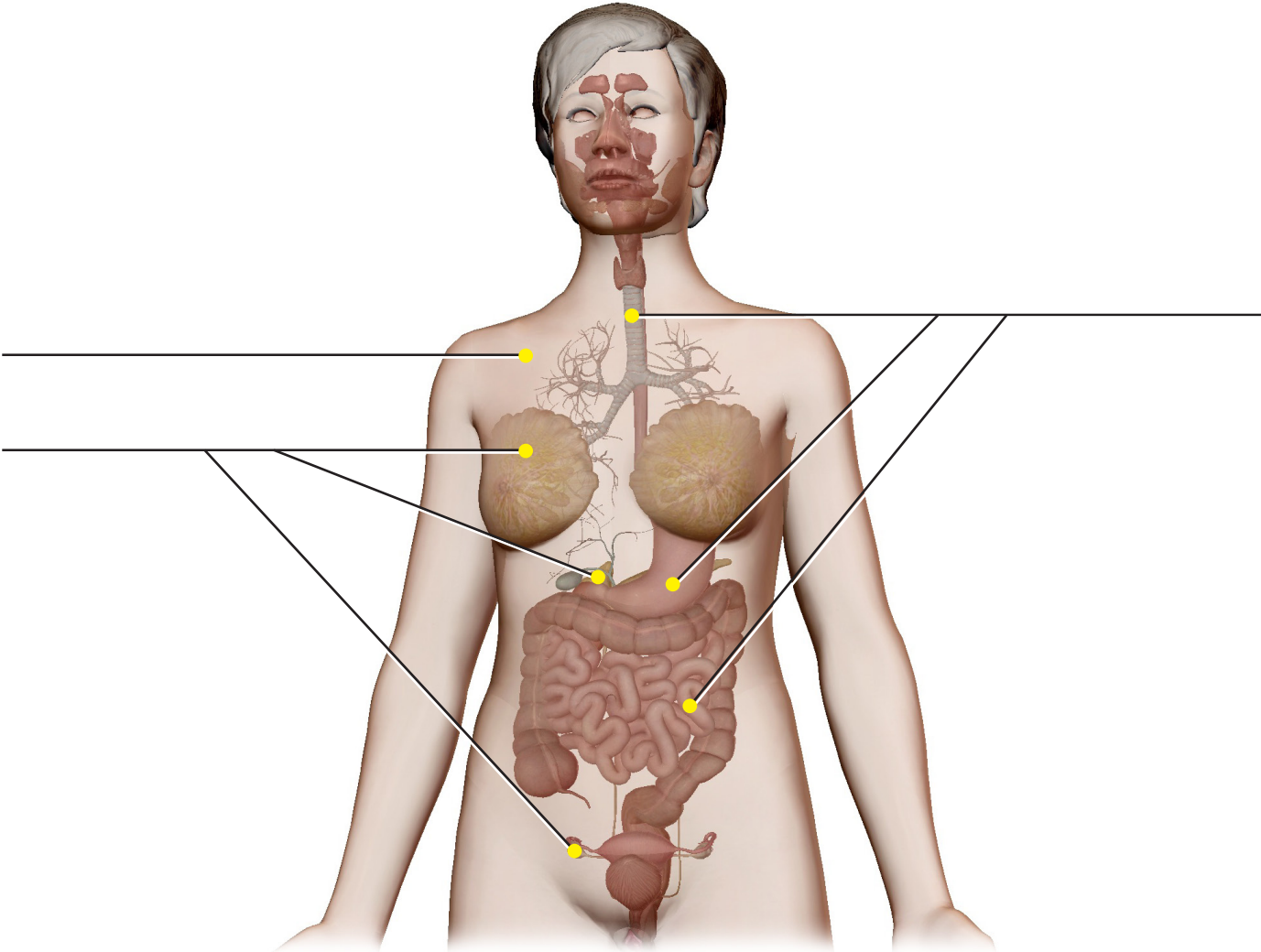
TIME TO PRACTICE!
TAKE QUIZ 4.A TISSUES MULTIPLE CHOICE



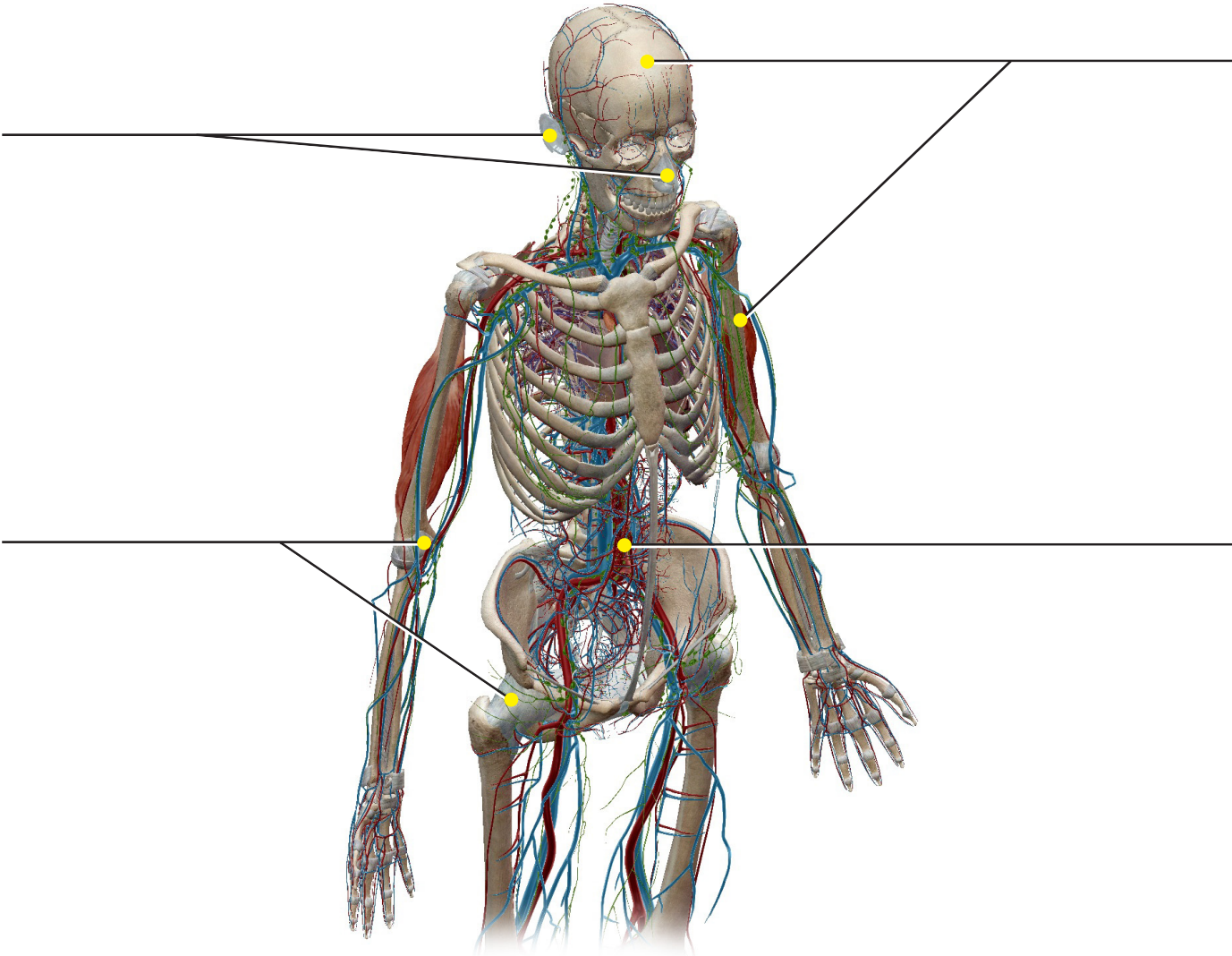
Student Practice

Label all the structures on the following images.

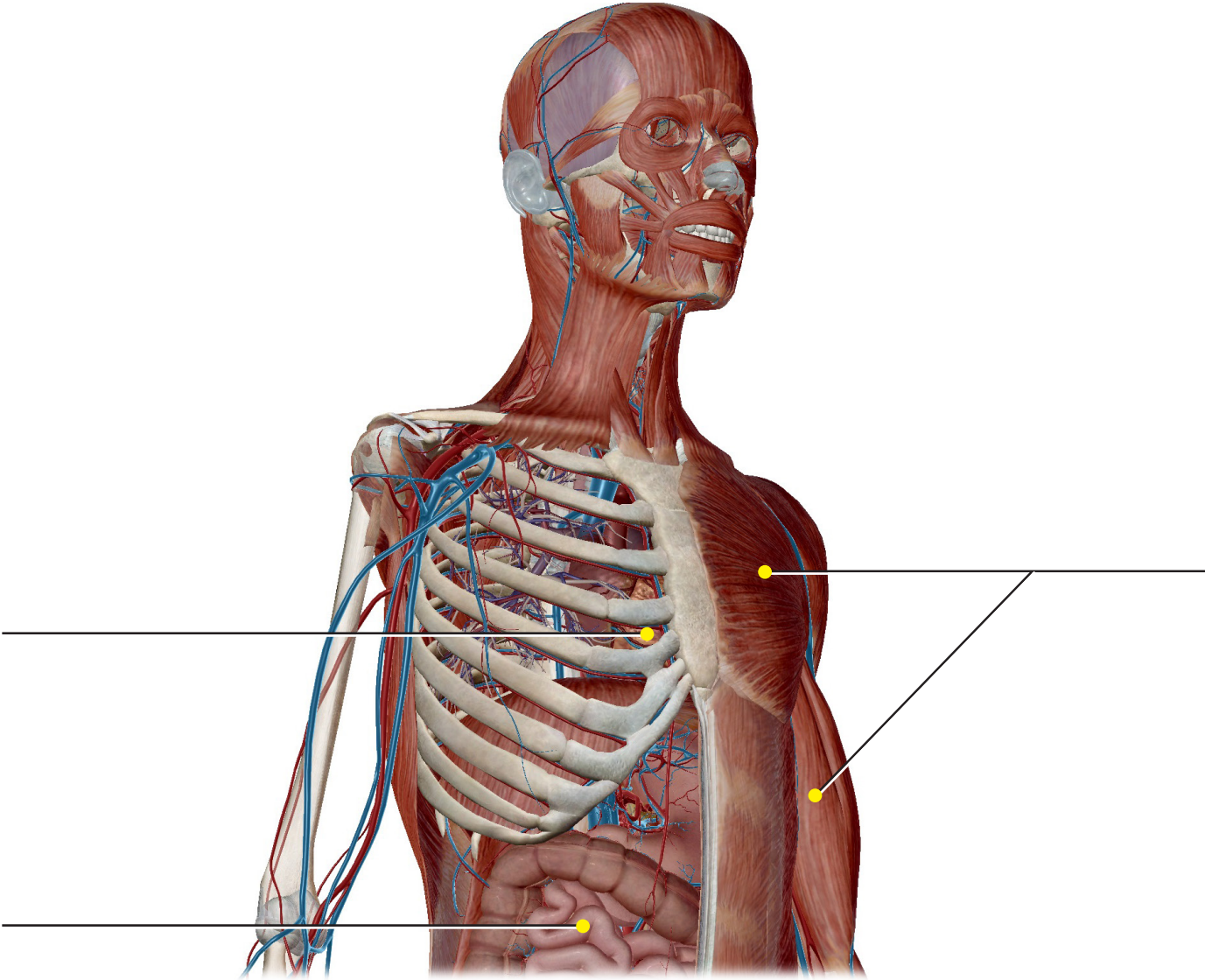
Module 4.2 Epithelial Tissue



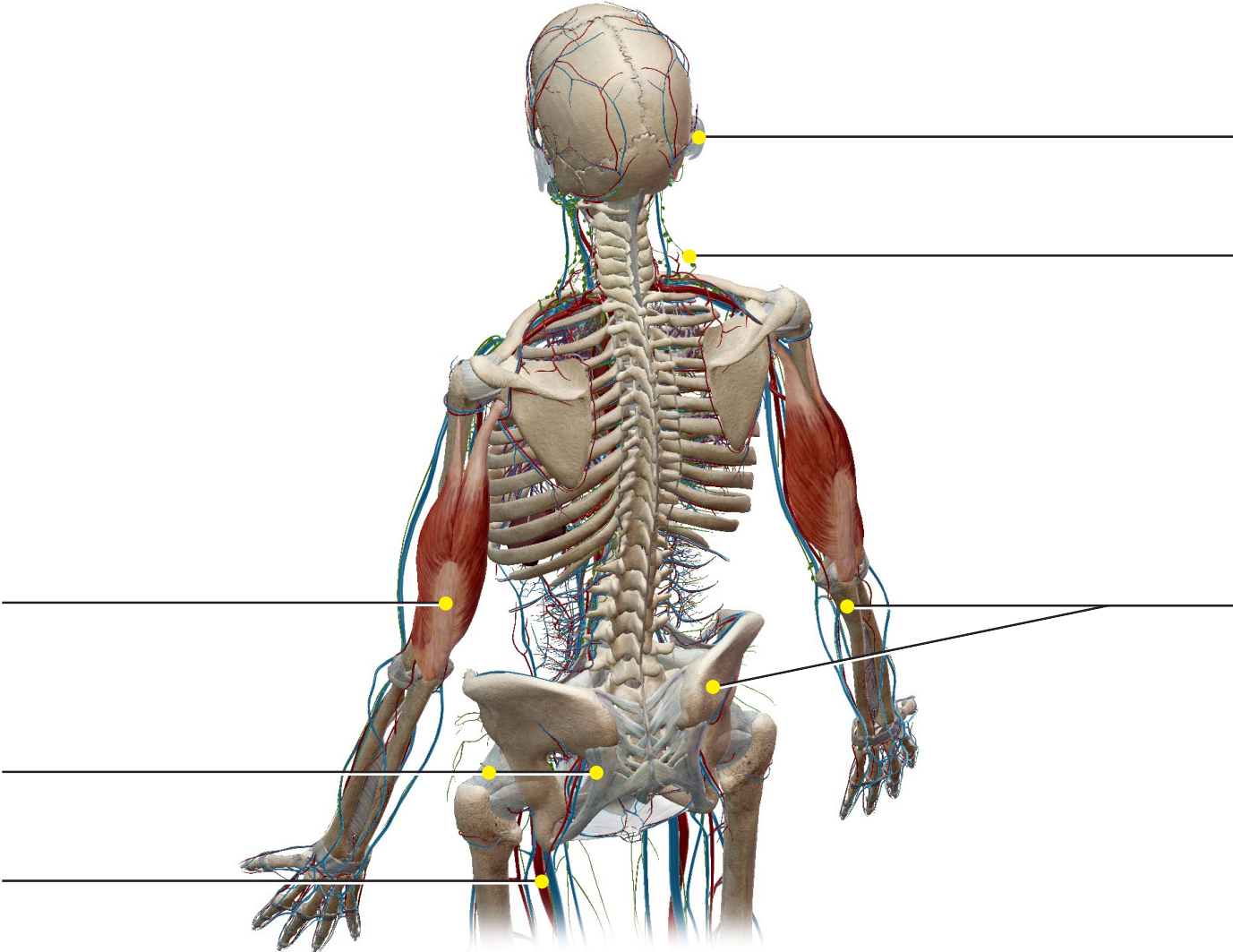
Module 4.6 Connective Tissue



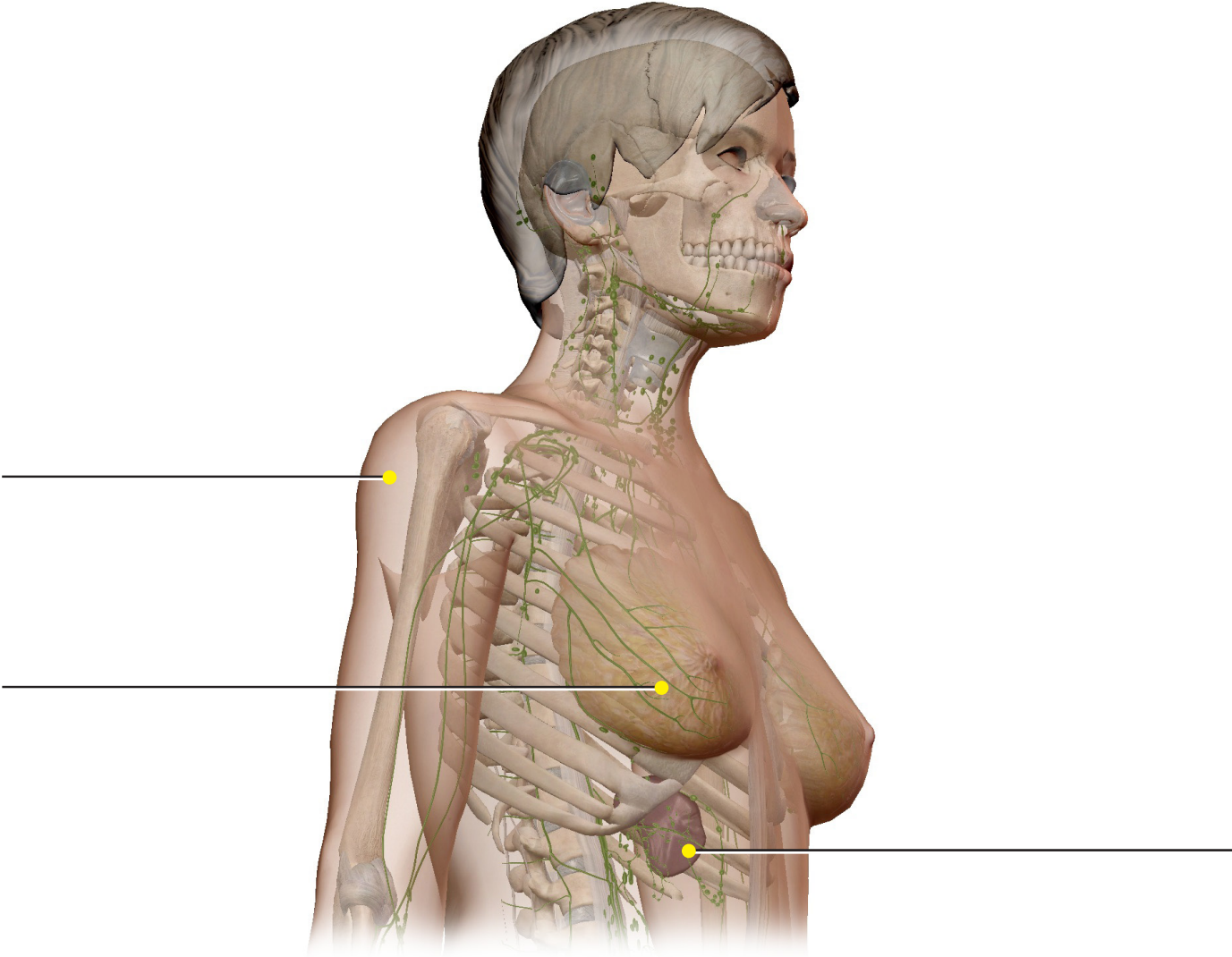
Module 4.17 Muscle Tissue



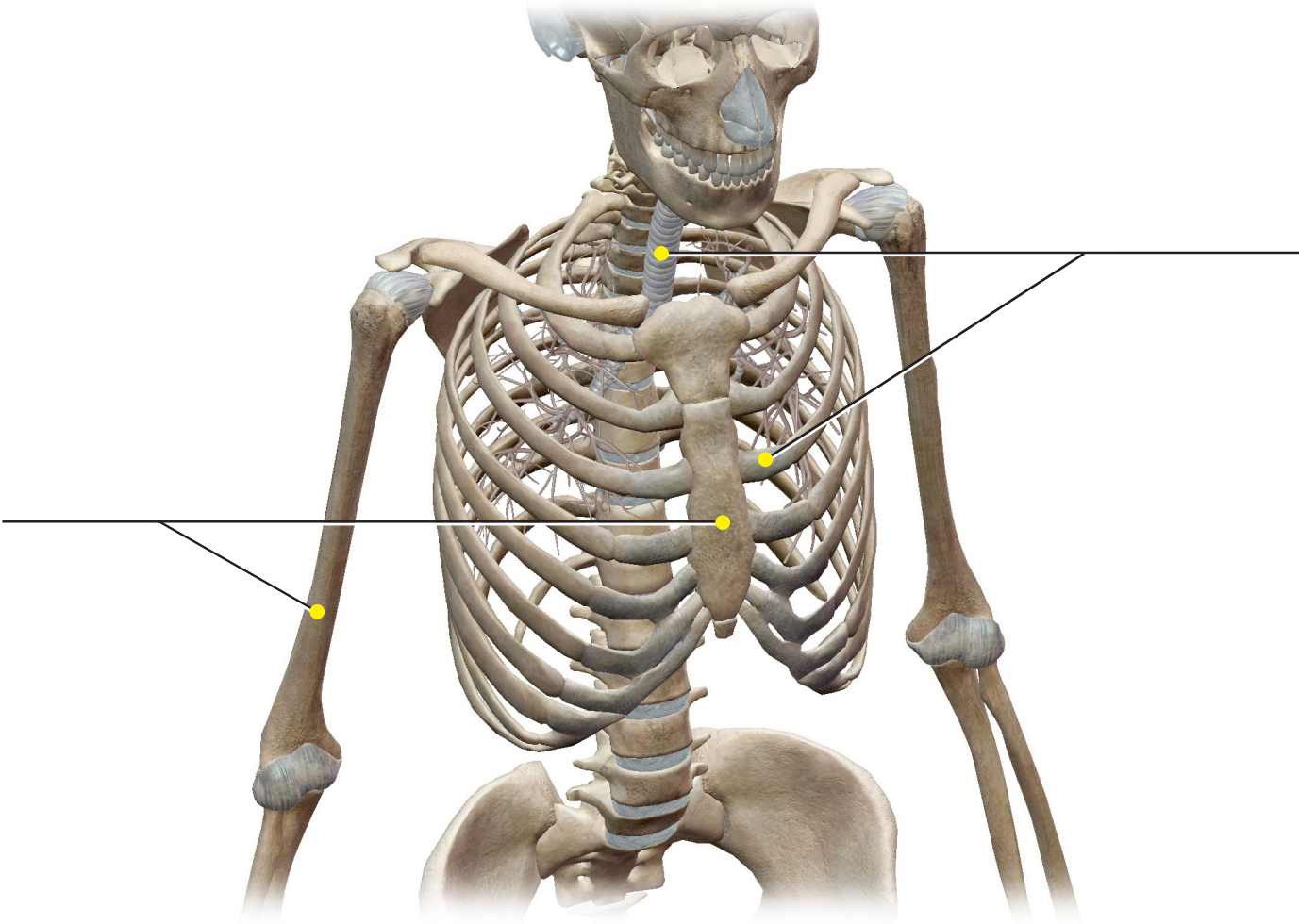
Module 4.6 Connective Tissue



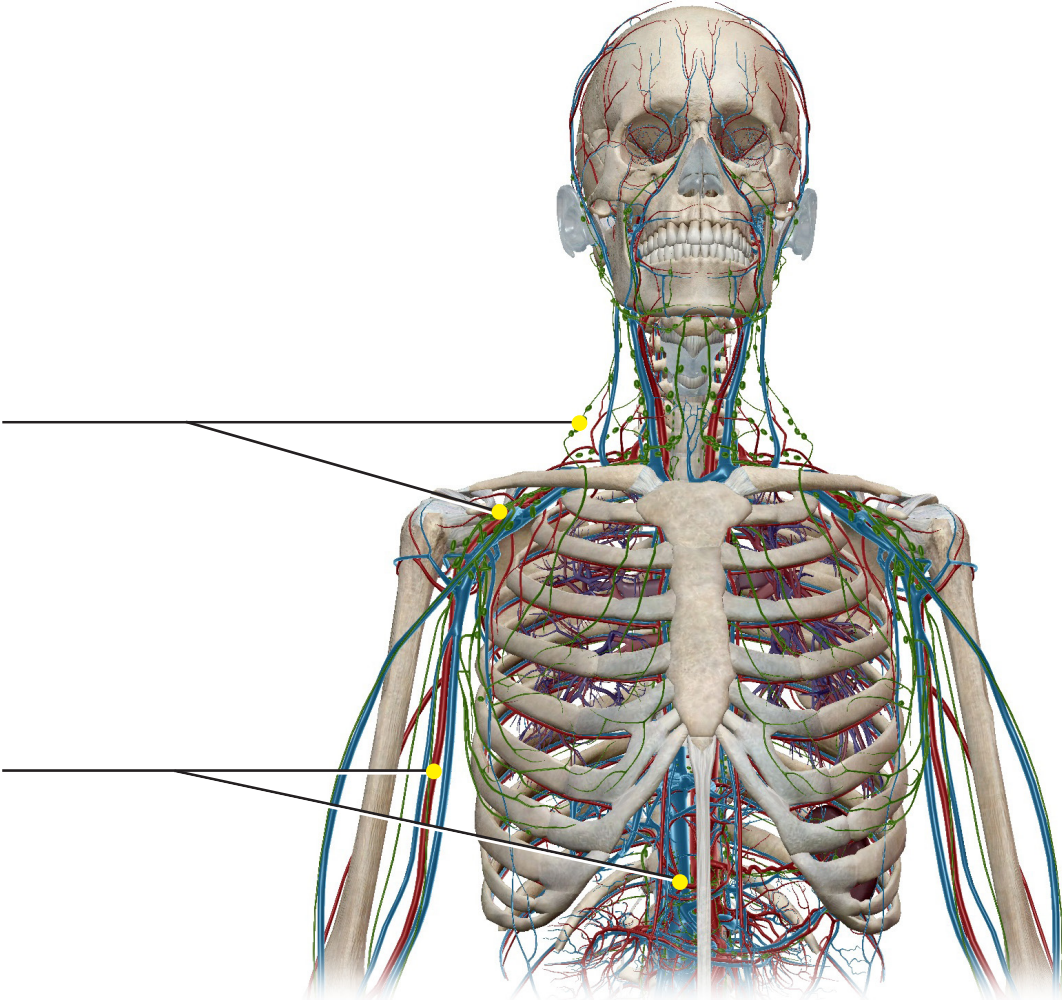
Module 4.7 Connective Tissue Proper: Loose



Module 4.11 Special Connective Tissue: Bone and Cartilage



Module 4.15 Special Connective Tissue: Blood and Lymph



Module 4.17 Muscle Tissue

