

VISIBLE  BODY®

## **Blood Vessels Part I**

A circulatory system lab activity using Visible Body Suite

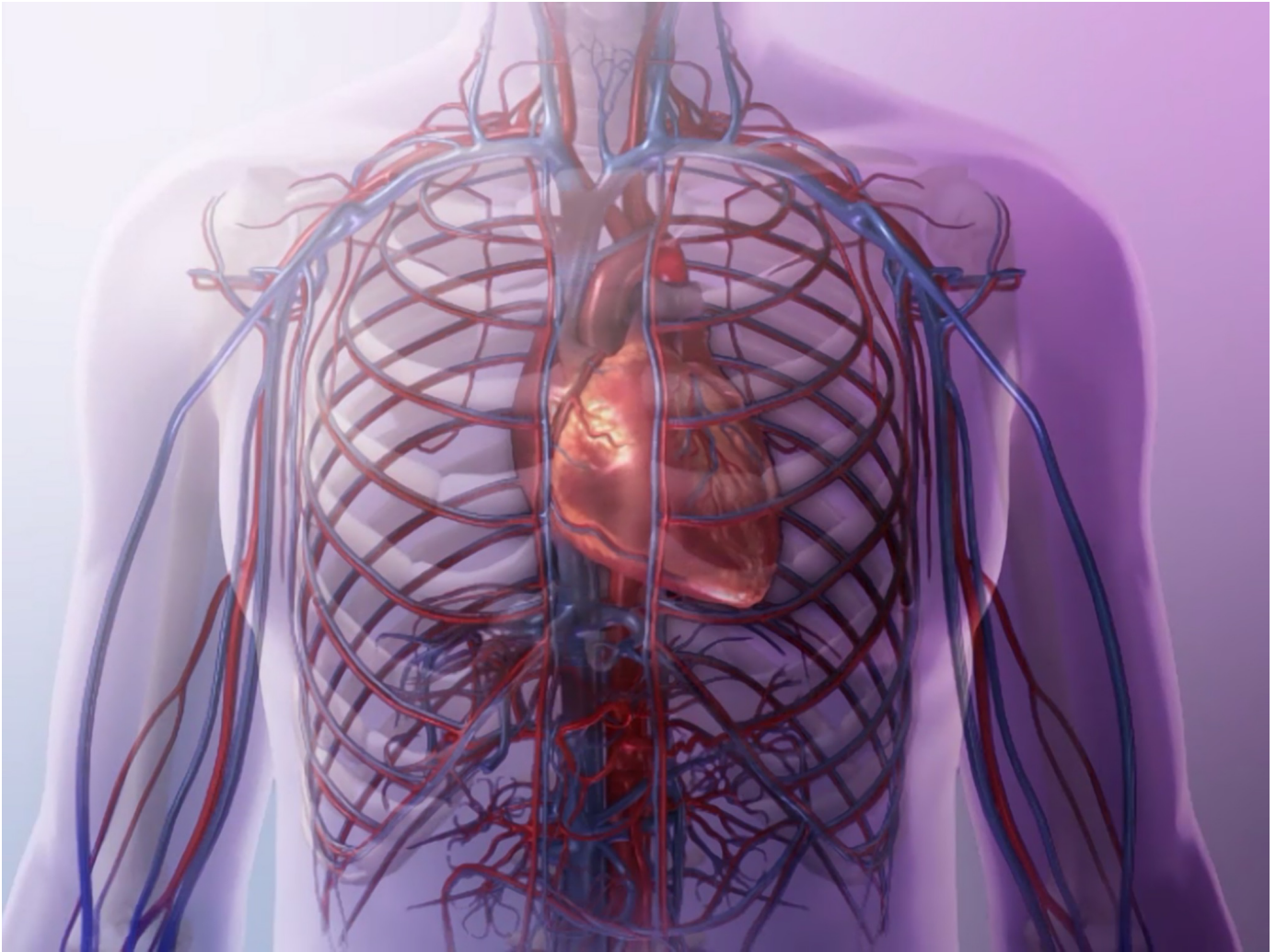
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University of British Columbia Okanagan**

## **PRE-LAB EXERCISES**

Open Visible Body Suite. From the main menu, select Anatomy & Physiology. Click or tap on Unit 7. Circulatory System. You can also use the Search function to find any of the modules in this lab.

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

### **A. Watch the video in Module 27.1 Circulatory System Functions and answer the following questions.**

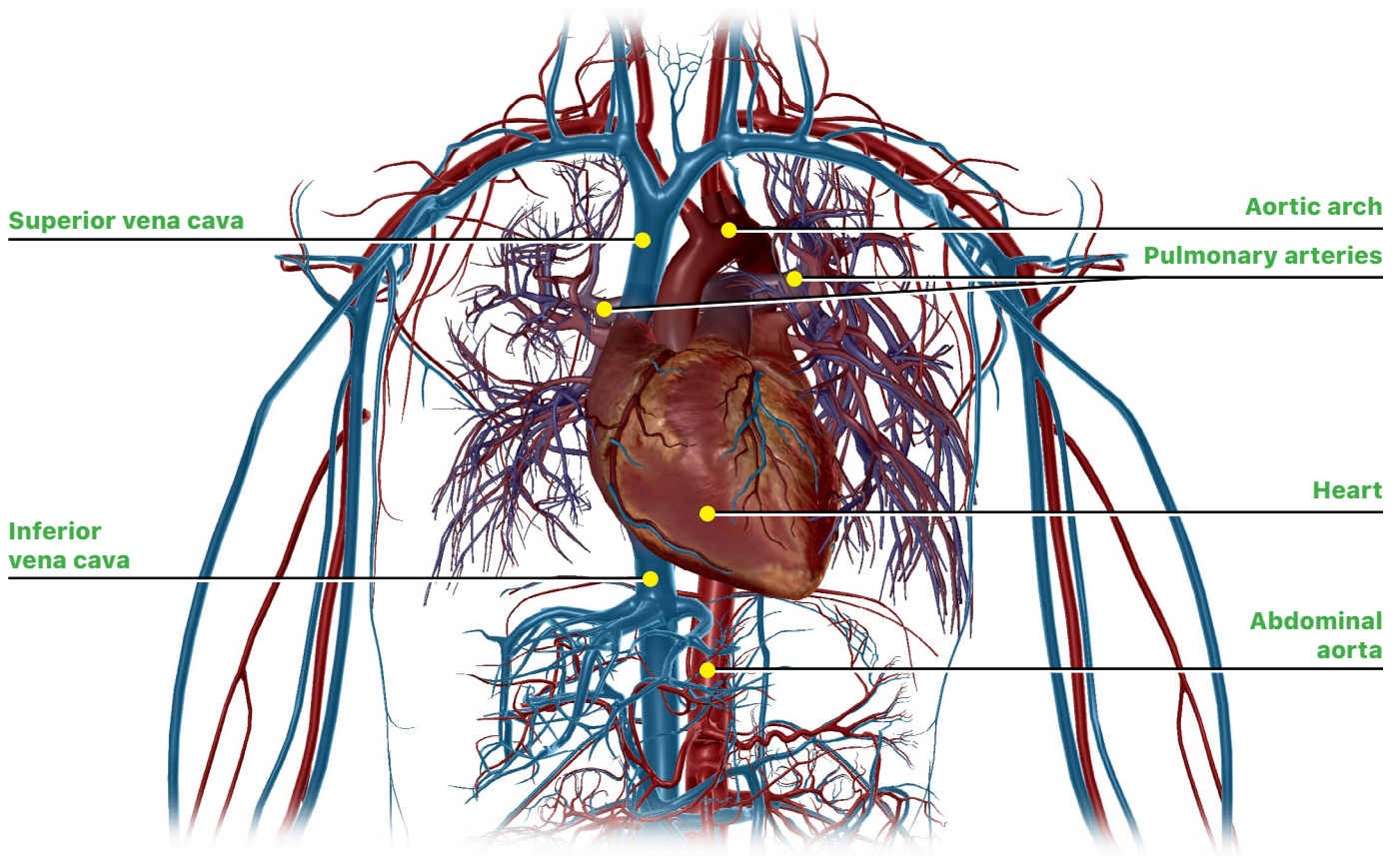


1. What are the two main components of the **circulatory system**?
2. **Blood** is carried away from the **heart** by \_\_\_\_\_, and it is carried back to the heart by \_\_\_\_\_.
3. Circulating blood carries \_\_\_\_\_ from the **lungs** to body tissues and removes waste \_\_\_\_\_, carrying it back to the lungs to be exhaled.





**B. Explore the 3D anatomical view in Module 27.2 Circulatory Anatomy and answer the following questions.**



1. Select the heart from the left-side menu and use the book icon to read the definition.
  - a. What is the main purpose of the heart?
  - b. Select the heart and use the Hide Others button to hide the other structures in the view. Rotate the view to observe the several large blood vessels attached to the heart.
2. Select **arteries** from the left-side menu. Note that that the largest arteries are those leaving the heart. As they branch, they get narrower in diameter.
  - a. Use the Hide Others button to hide the other structures in the view and observe the routes of the arteries. Select the largest artery, traveling from the heart downward through the torso. What is this artery called?

b. Select one of the arteries in the lung region, which are colored purple, instead of red like the rest of them. These arteries are called \_\_\_\_\_. They are colored purple because they are the only arteries that carry deoxygenated blood (to the lungs). As hemoglobin in blood cells picks up oxygen, it becomes bright red.

3. Select **veins** from the left-side menu. Note that most veins are paired with arteries.

a. Use the Hide Others button to hide the other structures in the view and observe the routes of the veins. Select the largest vein entering the heart from the bottom. What is this vein called?

b. Select one of the veins in the lung region, which are colored red, instead of blue like the rest of them. These veins are called \_\_\_\_\_. They are colored red because they are the only veins that carry oxygenated blood (from the lungs). Most veins are colored blue because they carry deoxygenated blood.





## IN-LAB EXERCISES

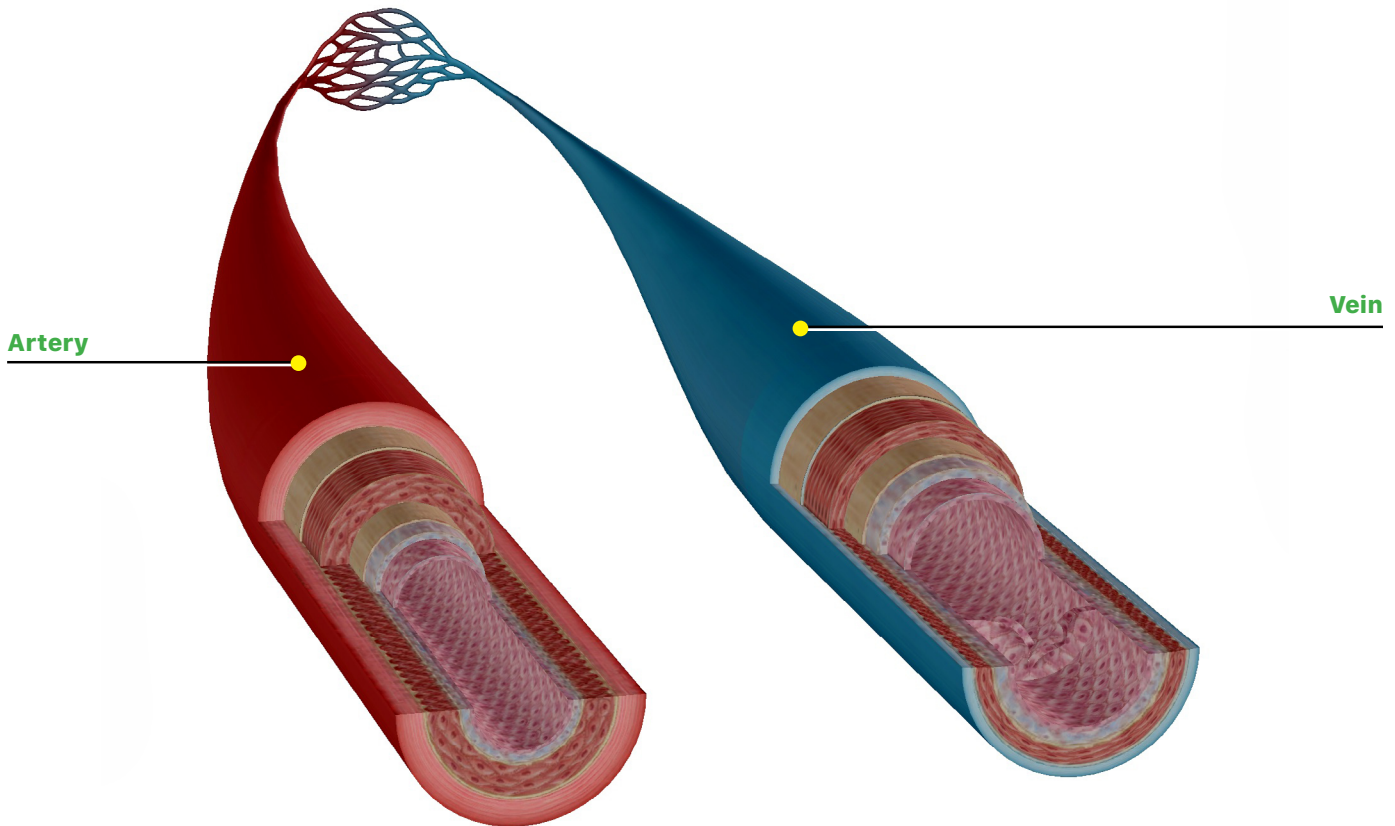
Use the following modules in Visible Body Suite to guide your exploration of blood vessels and circulation. You can manipulate the images to see different views and isolate each structure. Be sure to select the book icon under the structure name to read information specific to that structure.

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

In the Circulatory System unit, scroll to Chapter 30. Blood Vessels and Circulation.

### A. Types of Blood Vessels and Blood Vessel Anatomy

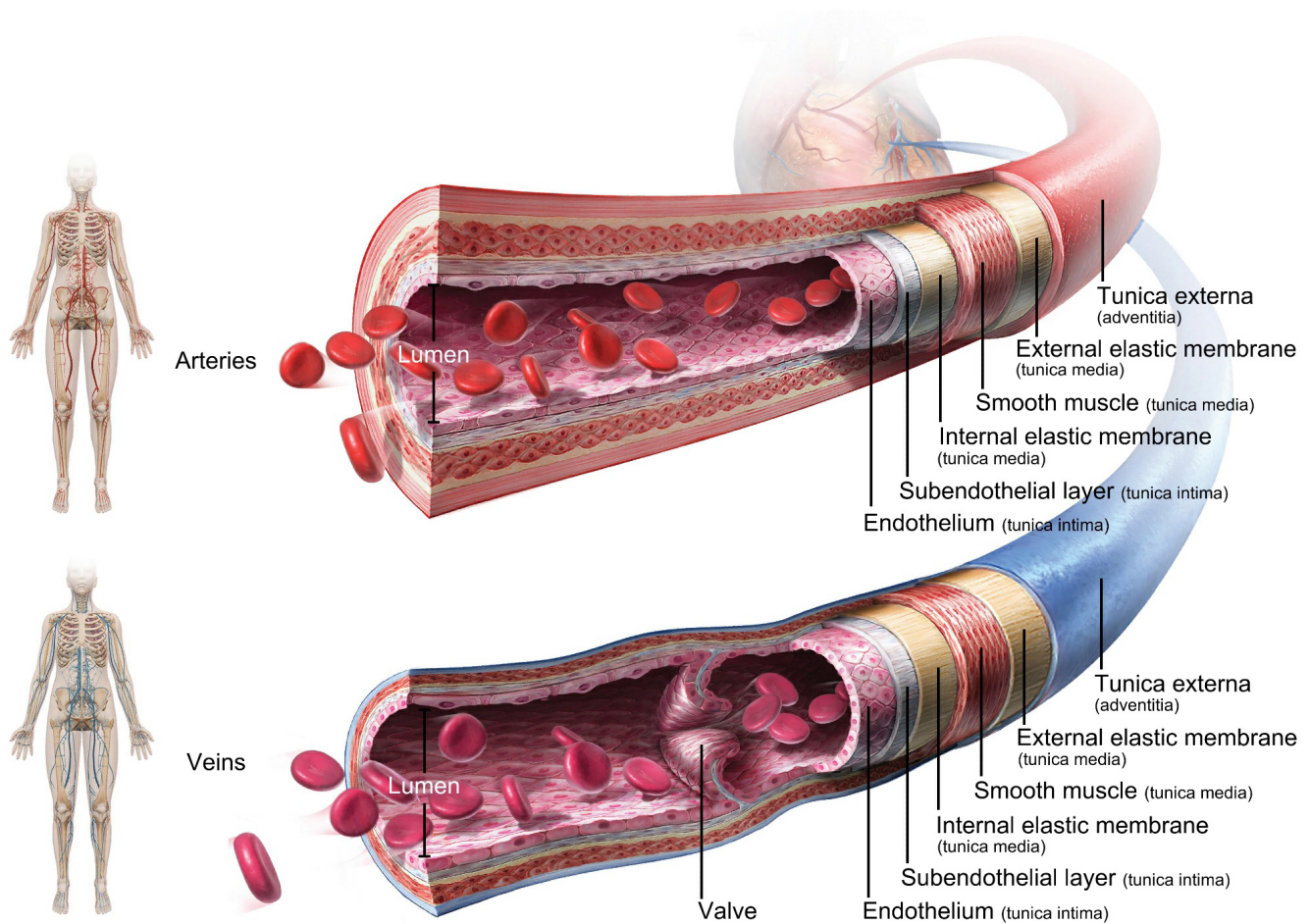
1. Explore the 3D anatomical view in Module 30.1 Types of Blood Vessels and answer the following questions.



- a. What are the five main categories of blood vessels?
- b. Which vessels have the smallest diameter?
- c. Which vessel type is responsible for the diffusion of gases between blood and body tissues?



2. Examine the illustration in Module 30.2 Blood Vessel Walls and answer the following questions.

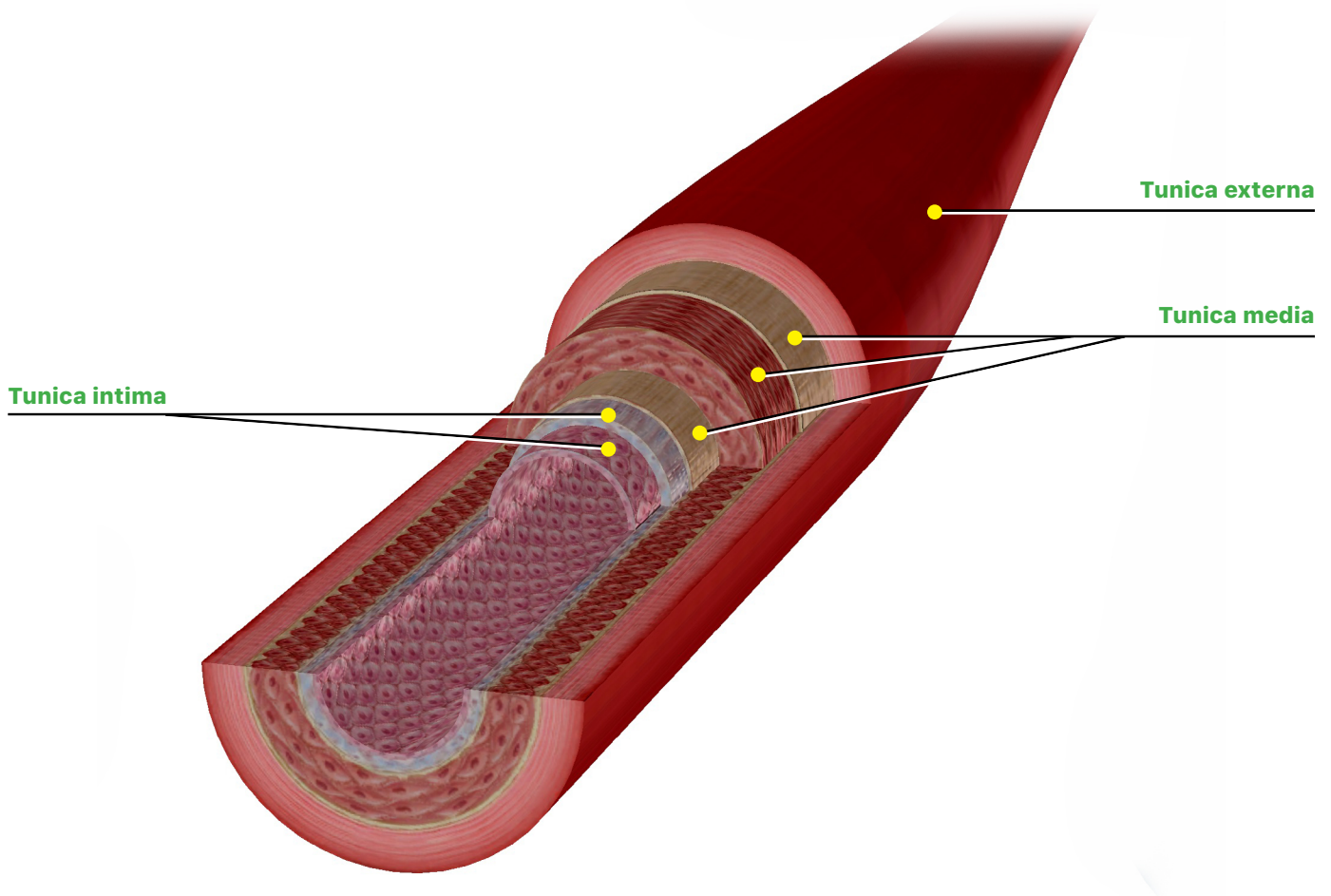


a. What is the **lumen** of a blood vessel?

b. What are the main differences between the **walls** of arteries and veins?



3. Explore the 3D anatomical view in Module 30.3 Artery Structure and answer the following questions.



- a. Blood vessel walls are composed of layers called \_\_\_\_\_.
- b. The outermost tunic of blood vessel walls is the \_\_\_\_\_. For large arteries, this layer must be tough enough to withstand large pressure fluctuations. The main component of this tunic is \_\_\_\_\_. In the largest vessels, this tunic is so thick that it has its own blood supply—a system of small vessels called the \_\_\_\_\_.
- c. The middle tunic of blood vessel walls is the \_\_\_\_\_. This tunic is composed mostly of \_\_\_\_\_ and \_\_\_\_\_. Select this tunic.
- i. How many layers does this tunic have?



ii. What are the names of these layers?

iii. Which of these layers is responsible for controlling the diameter of the lumen of arteries?

d. Select the **tunica intima** from the left-side menu. In this large artery, there are \_\_\_\_\_ **layers** in this tunic.

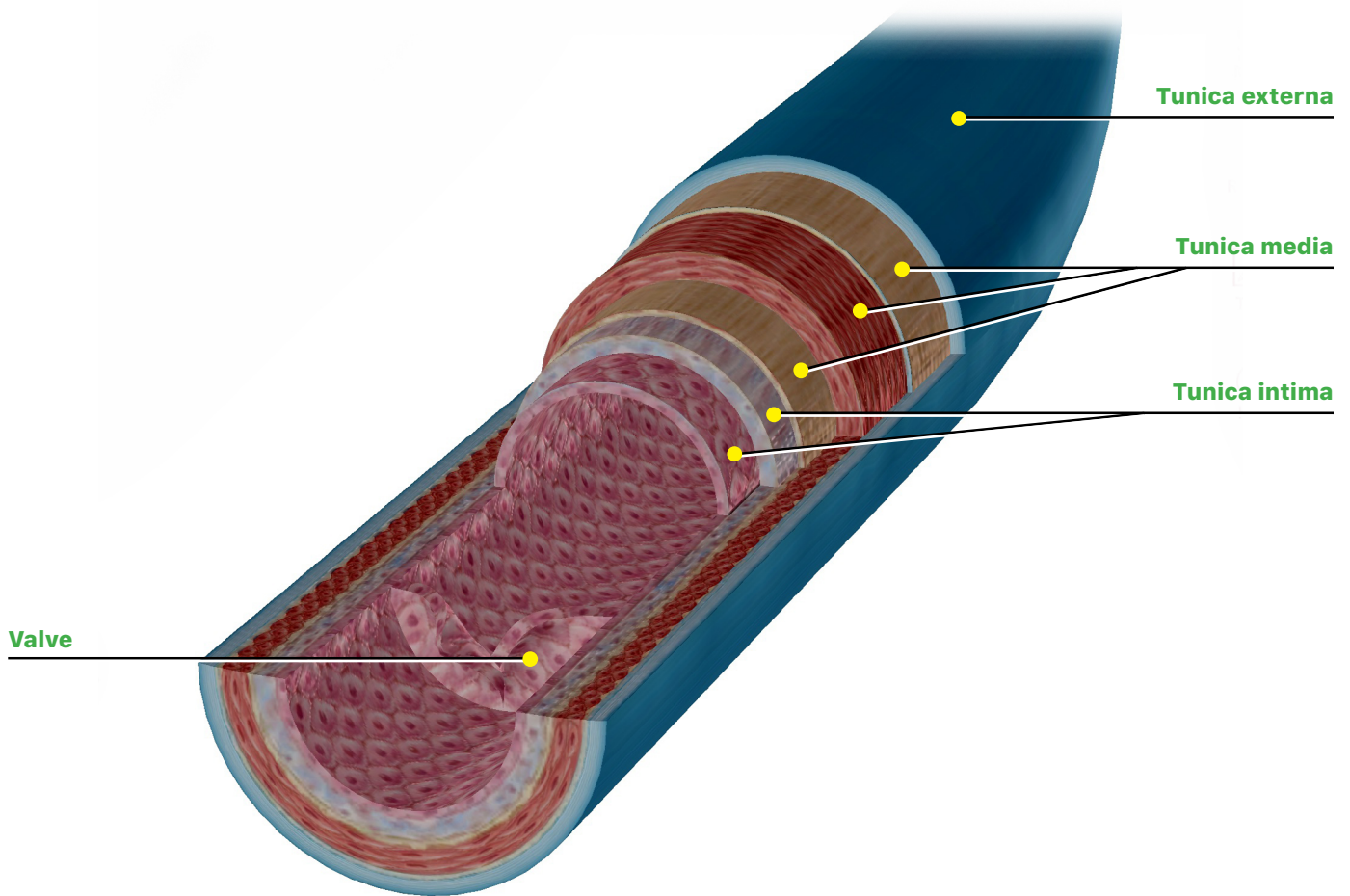
i. What are the names of these layers?

ii. The \_\_\_\_\_ is a smooth **epithelial layer** that greatly reduces friction, allowing blood to flow easily. It is continuous with the \_\_\_\_\_.

e. Which of the three tunics is responsible for most of the differences in the total thickness of vessel walls?



4. Explore the 3D anatomical view in Module 30.4 Vein Structure and answer the following questions.



a. Veins have the same tunics as arteries, but they differ in thickness and composition. Select the tunica media from the left-side menu.

i. Which layer of this tunic is significantly thinner in veins than in arteries?

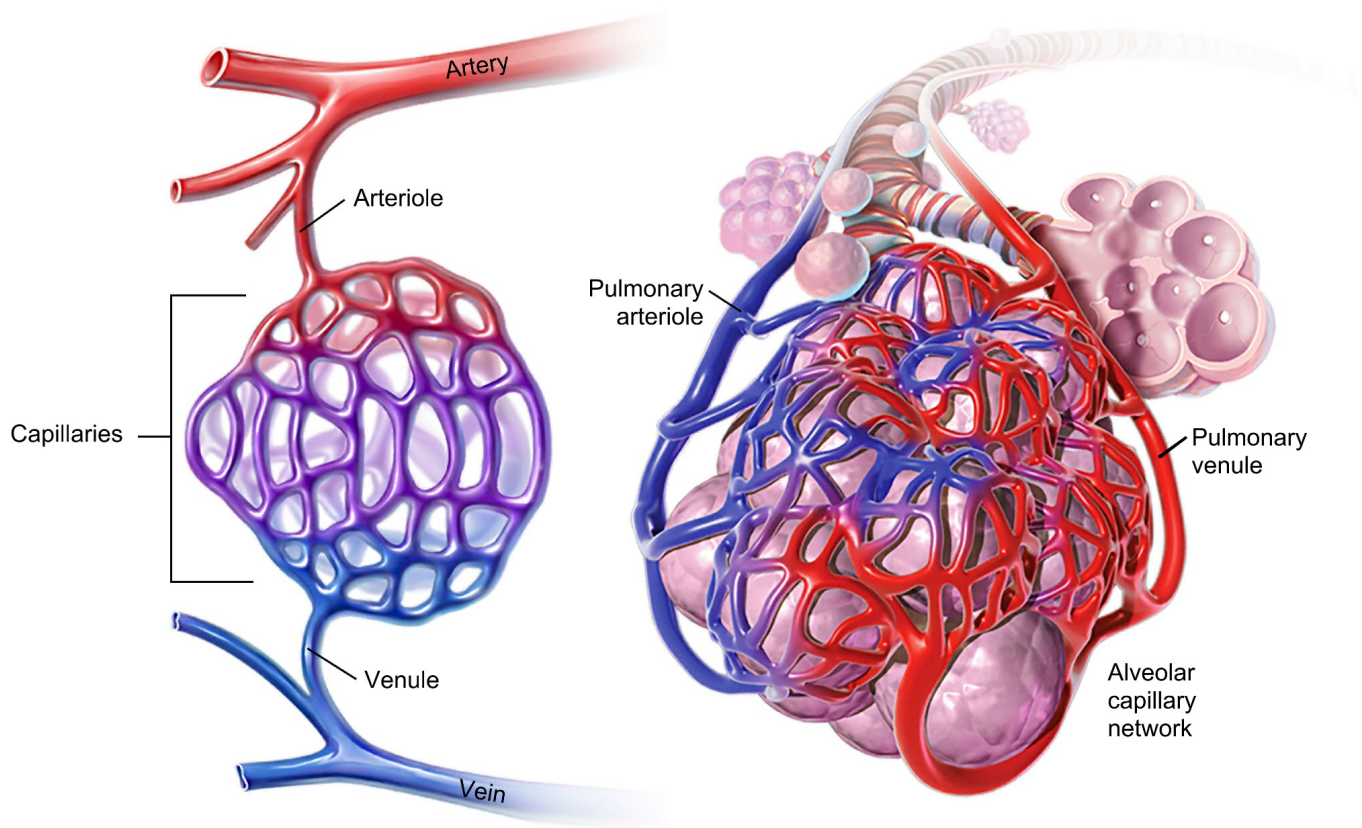
ii. Veins do not have the ability to significantly constrict their lumen diameter, and so the pressure in veins is always quite \_\_\_\_\_.

b. What structure is found in the lumens of veins that is not present in arteries?

i. What is the function of these structures?

ii. These structures are extensions of the \_\_\_\_\_ layer of the tunica \_\_\_\_\_.

5. Examine the illustration in Module 30.6 Capillaries and answer the following questions.



a. Capillaries do not have the same tunics that arteries and veins have. Capillary walls consist of a one-cell thick layer of endothelium. This is adapted for gas exchange, as oxygen and carbon dioxide must be able to pass rapidly across capillary walls. Look at the image on the left side of the illustration and note that the capillaries form an **anastomosing** network called a **capillary bed**. Why does the capillary bed change from red on the **arteriole** side to purple on the **venule** side in this image?

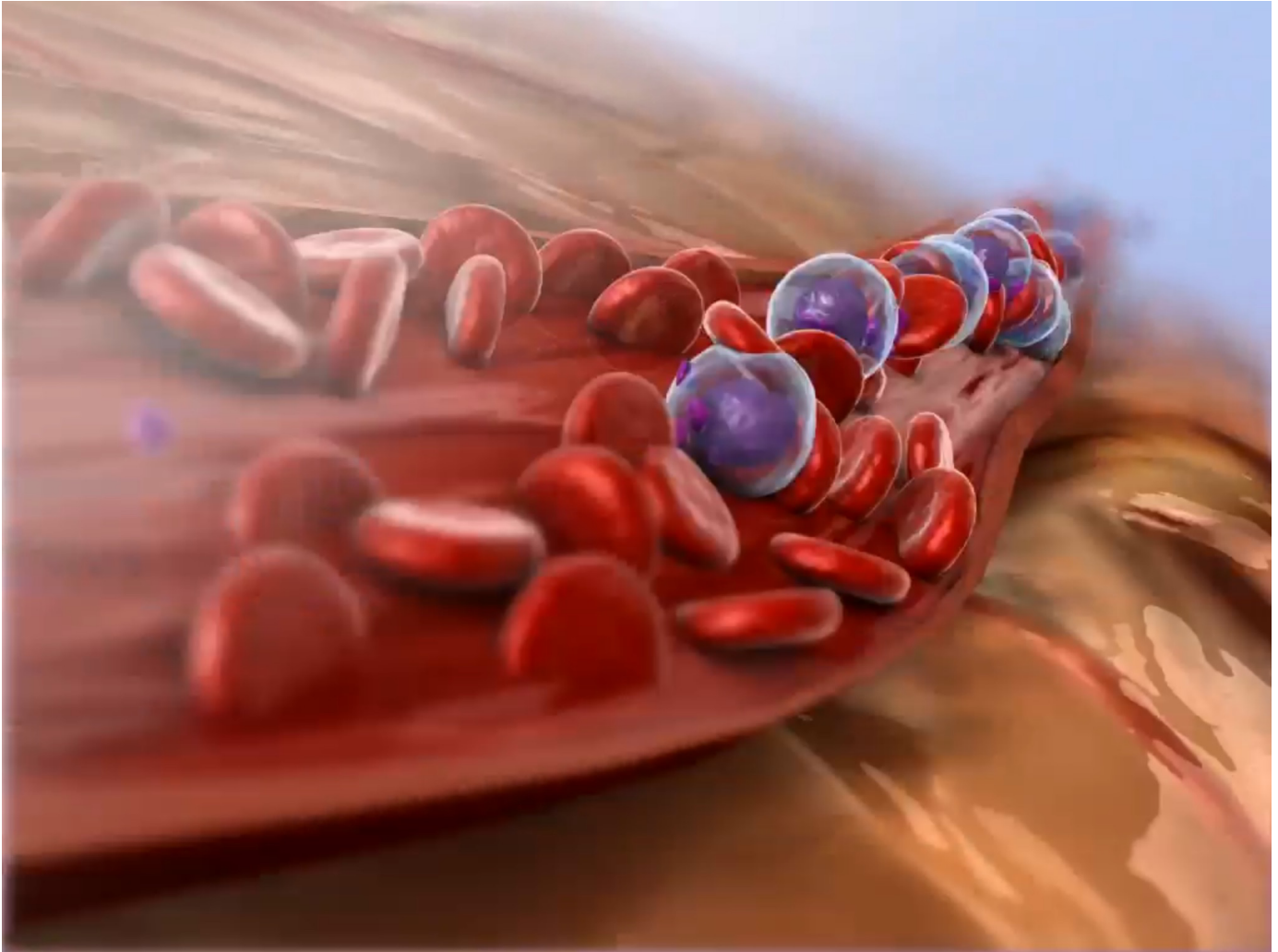
b. Look at the image on the right side of the illustration, which shows a capillary bed surrounding an **alveolus** in the lungs. Why does the capillary bed change from purple on the arteriole side to red on the venule side?





## **B. Blood Pressure**

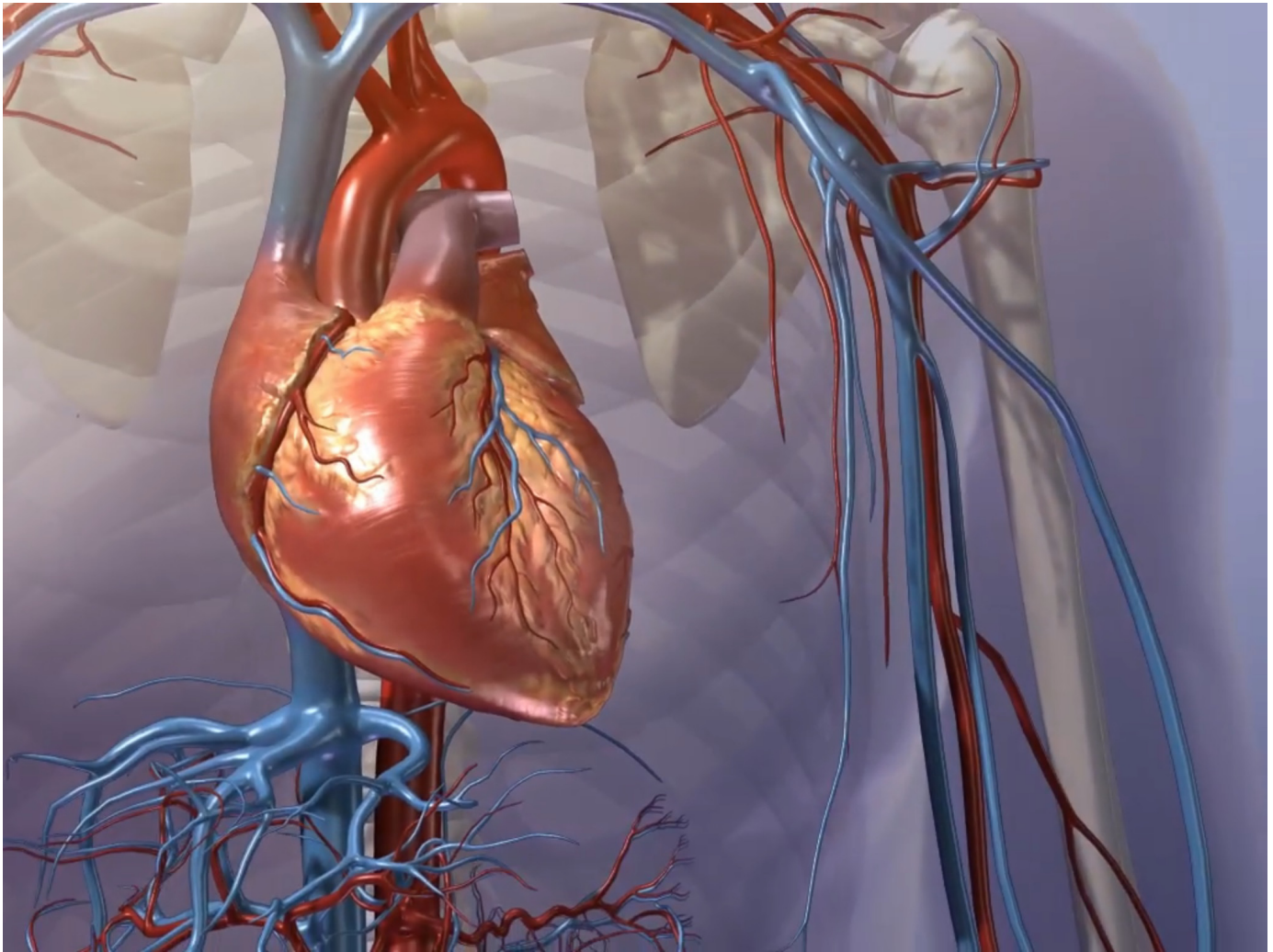
1. Watch the video in Module 30.7 Blood Pressure and answer the following questions.



- a. What is blood pressure?
- b. What creates blood pressure?
- c. When the heart relaxes between contractions, what causes blood to temporarily slow down?



2. Watch the video in Module 30.8 Measuring Blood Pressure and answer the following questions.



a. Circle the correct answer: Blood pressure is measured in:

- i. arteries
- ii. veins
- iii. capillaries

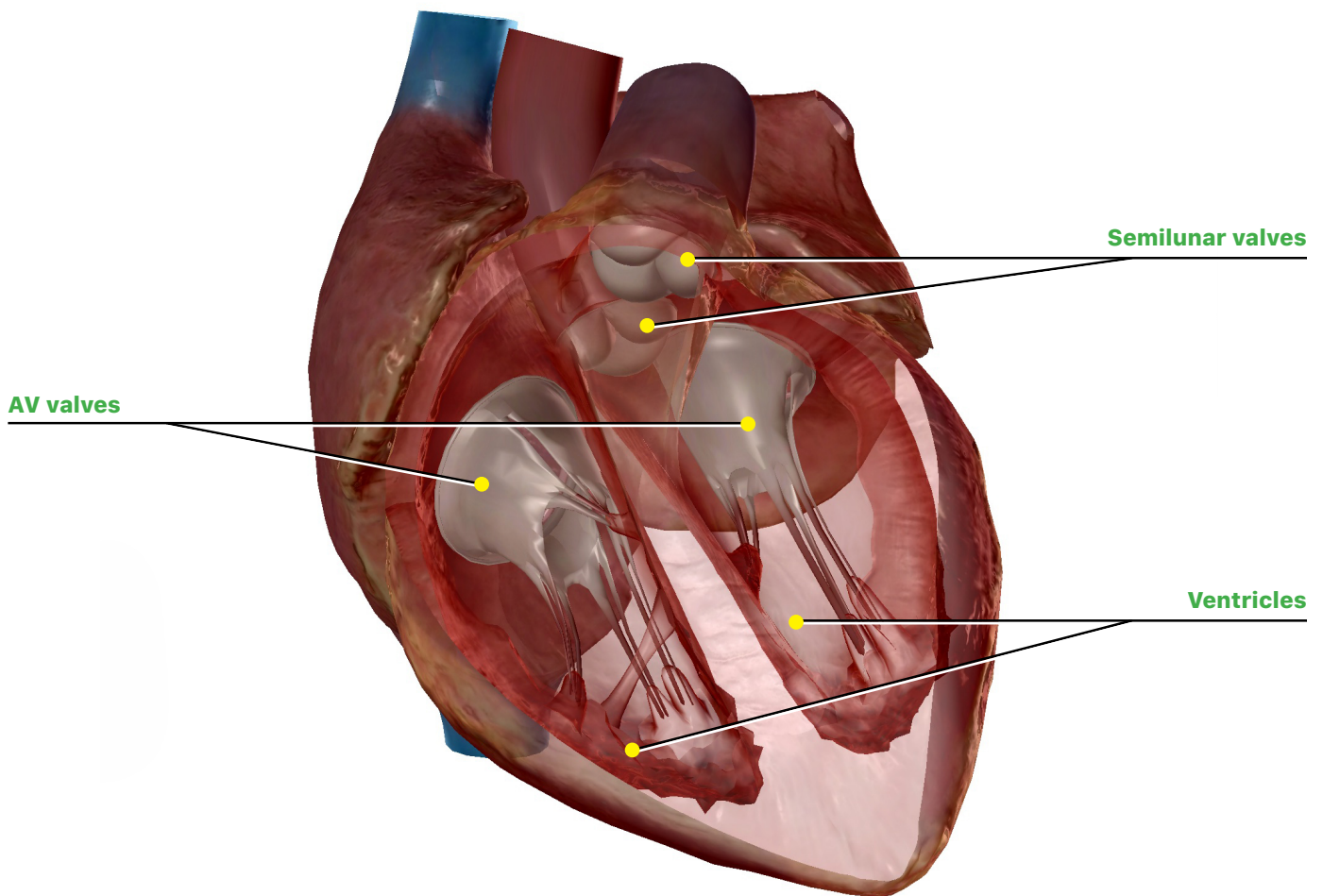
b. Systolic pressure is the point of \_\_\_\_\_ pressure, caused by the contraction of the \_\_\_\_\_.

c. Diastolic pressure is the point of \_\_\_\_\_ pressure, occurring when the \_\_\_\_\_ are relaxed and the \_\_\_\_\_ are closed.

d. Blood pressure measurements are recorded as systolic pressure/diastolic pressure. What is **average blood pressure**?



3. Examine the 3D anatomical view in Module 30.9 Systolic and Diastolic Pressure and answer the following questions.



- a. Select the **ventricles** from the left-side menu to highlight the inner surface of these two chambers. Note that the muscular layer of these chamber walls is very thick. The time during which ventricles are contracting is called \_\_\_\_\_. The time during which they are relaxing is called \_\_\_\_\_.
- b. Select the **semilunar valves** from the left-side menu. In this view, the valves are closed. Which arteries are blocked by these closed valves?
- c. Select the **AV valves** from the left-side menu to view the valves between the atria and the ventricles.
  - i. What does AV stand for?

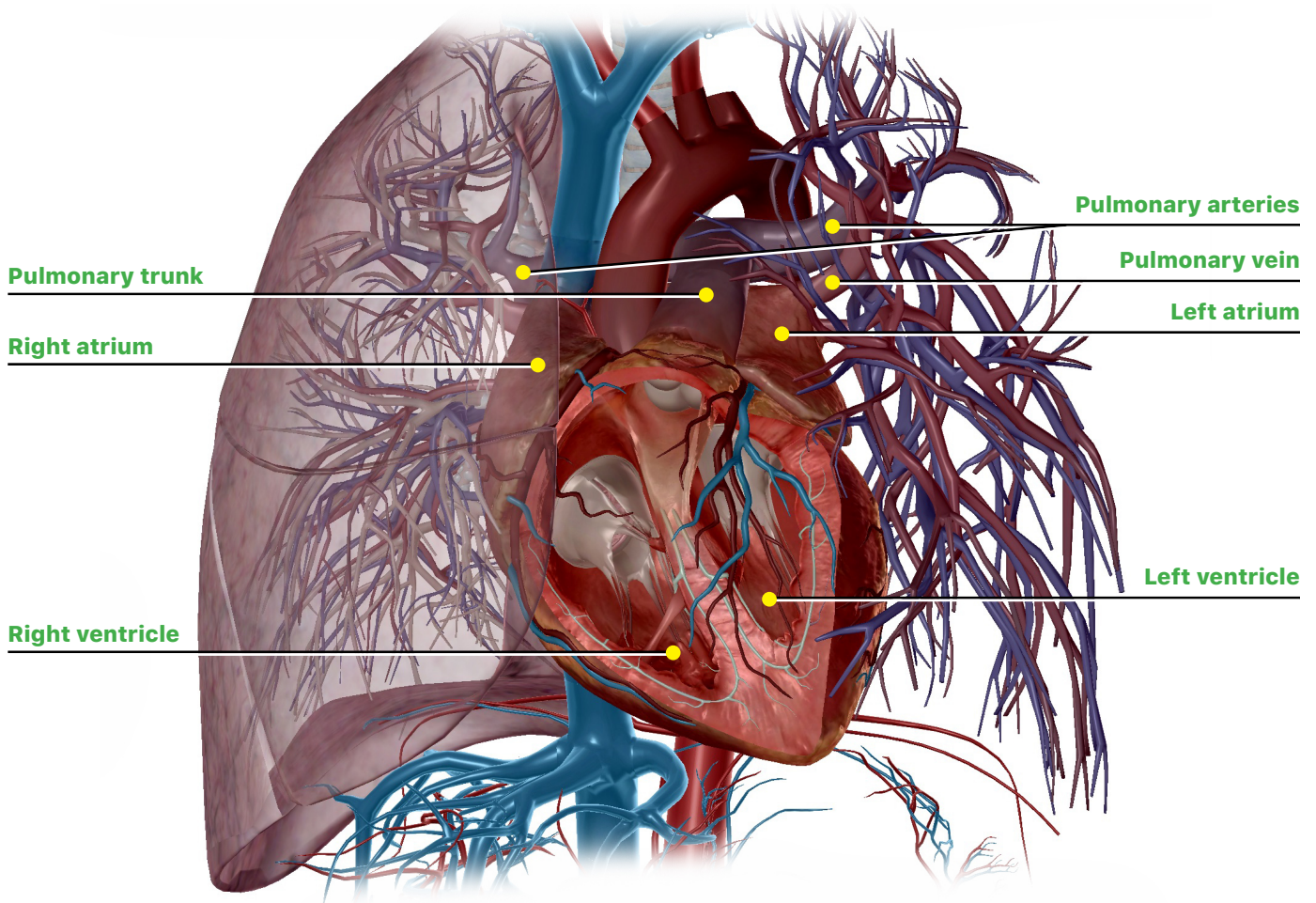


ii. In this view, the AV valves are open, allowing blood to flow into the ventricles.  
The valve between the left atrium and the left ventricle is called the \_\_\_\_\_ valve. The valve between the right atrium and the right ventricle is called the \_\_\_\_\_ valve.

d. In this view, is the heart in **systole** or **diastole**?

### **C. Pulmonary Circulation**

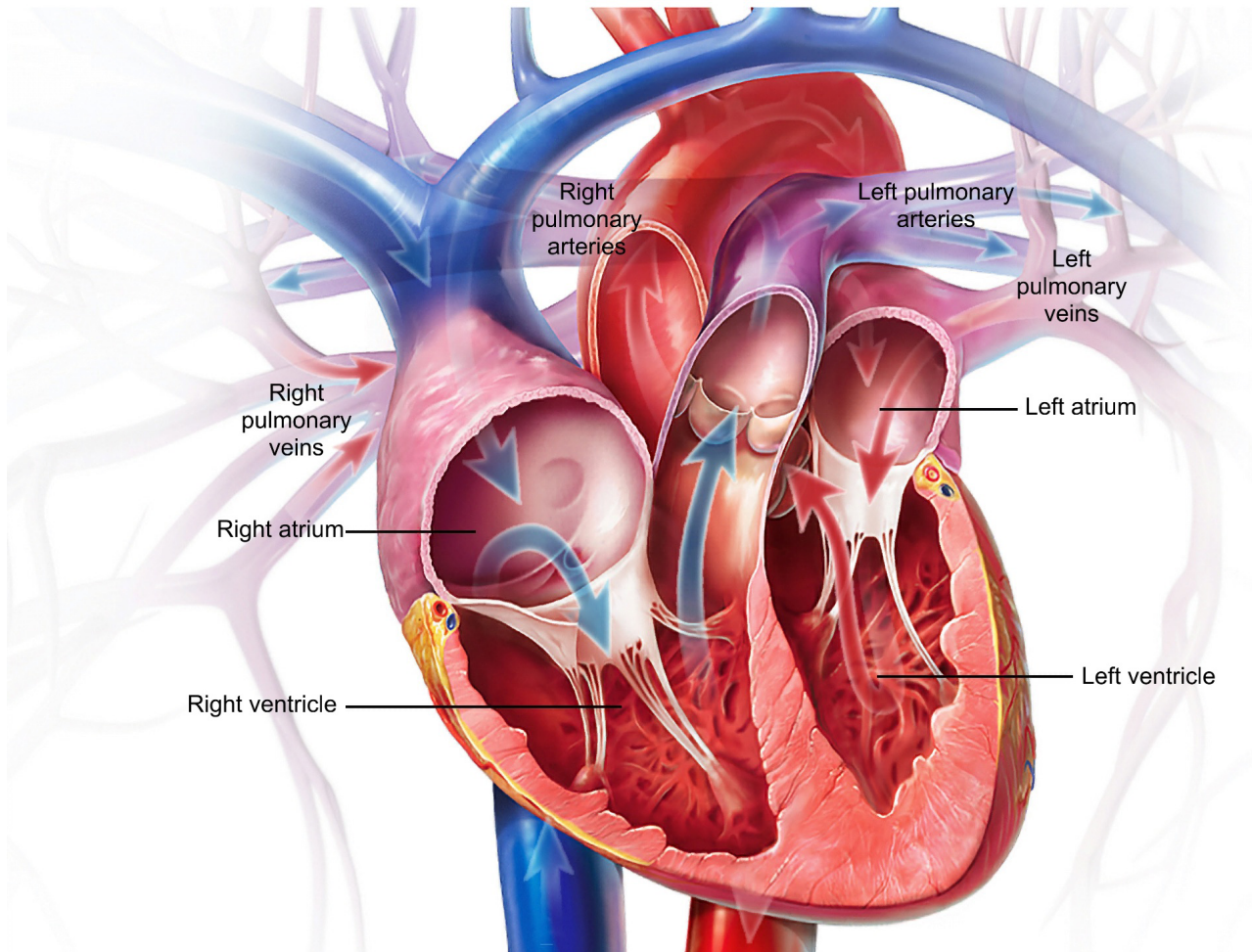
1. Explore the 3D anatomical view in Module 30.10 Circulatory Routes and answer the following questions.



a. What are the two main circulatory routes in the body?

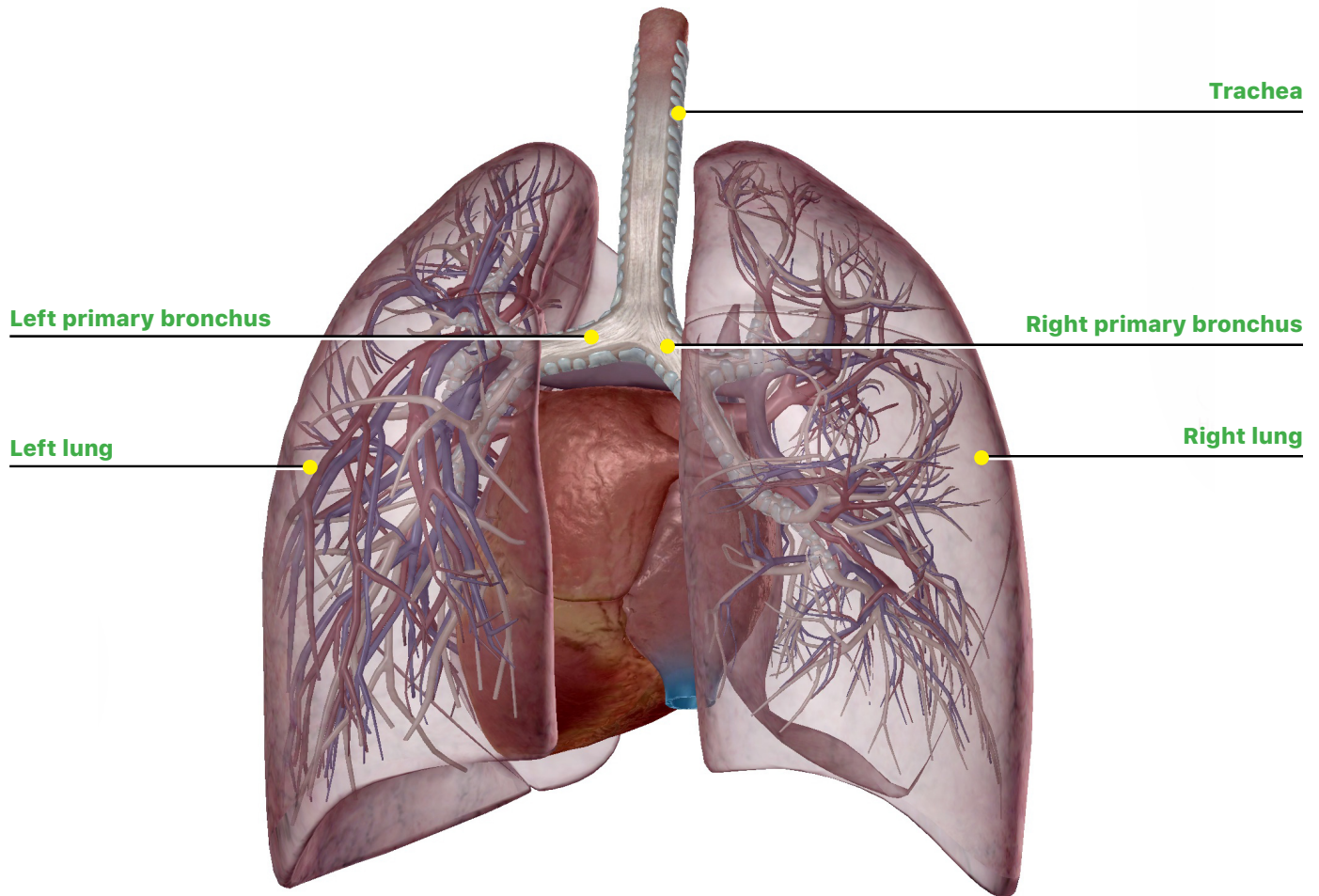
- b. Select **pulmonary circulation** from the left-side menu. Describe the route blood takes after it passes through the pulmonary valve until it returns to the heart.
- c. Which **heart chamber** receives the blood from the lungs?
- d. What is unique about **pulmonary arteries**?
- e. How many **pulmonary veins** are there, in total?
- f. Use the Hide Others button to hide the other structures in the view and observe pulmonary circulation in isolation.
- g. Select **systemic circulation** from the left-side menu. The systemic route begins as blood leaves the \_\_\_\_\_ of the heart and carries blood to all tissues of the body.
- h. Which heart chamber receives deoxygenated blood as it returns from the tissues?
- i. The two systemic vessels that return blood to the heart are the \_\_\_\_\_ and the \_\_\_\_\_.

2. Examine the illustration in Module 30.11 Pulmonary Circulation and use it to label the following image with the names of the major vessels that enter and leave the heart. Indicate which vessels carry oxygenated blood.



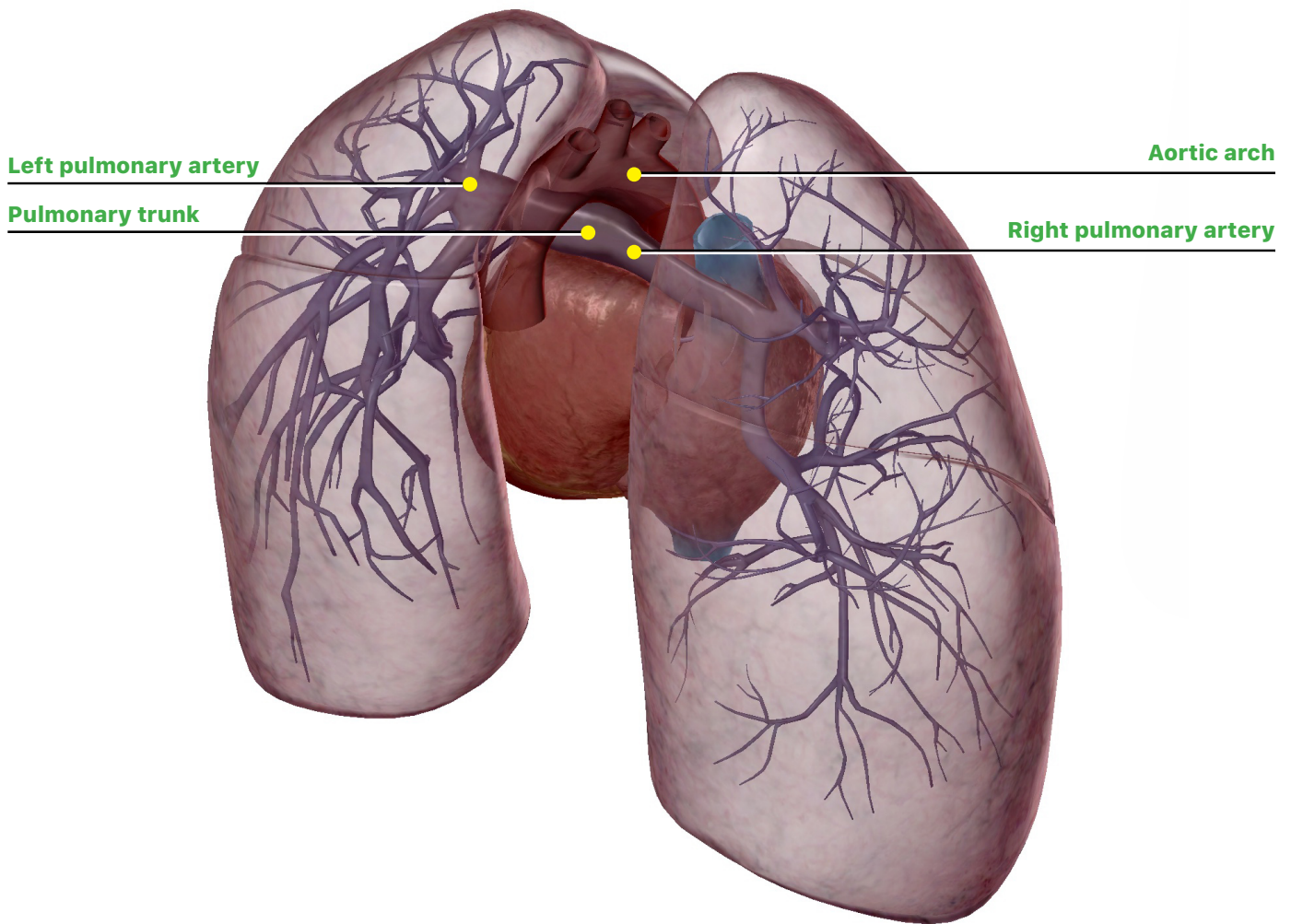


3. Explore the 3D anatomical view in Module 30.12 Pulmonary Circulation and Bronchi and answer the following questions.



- Select the **trachea** from the left-side menu and use the book icon to read the definition. This **cartilaginous** tube conducts \_\_\_\_\_ from the upper airway to the **bronchi** and the lungs.
- The trachea divides into left and right \_\_\_\_\_.
- Select the bronchi from the left-side menu and rotate the view to see how it branches into smaller passageways in the lungs. At the end of each branch are air sacs called \_\_\_\_\_, where gas exchange occurs.

4. Explore the 3D anatomical view in Module 30.14 Pulmonary Arteries and answer the following questions.

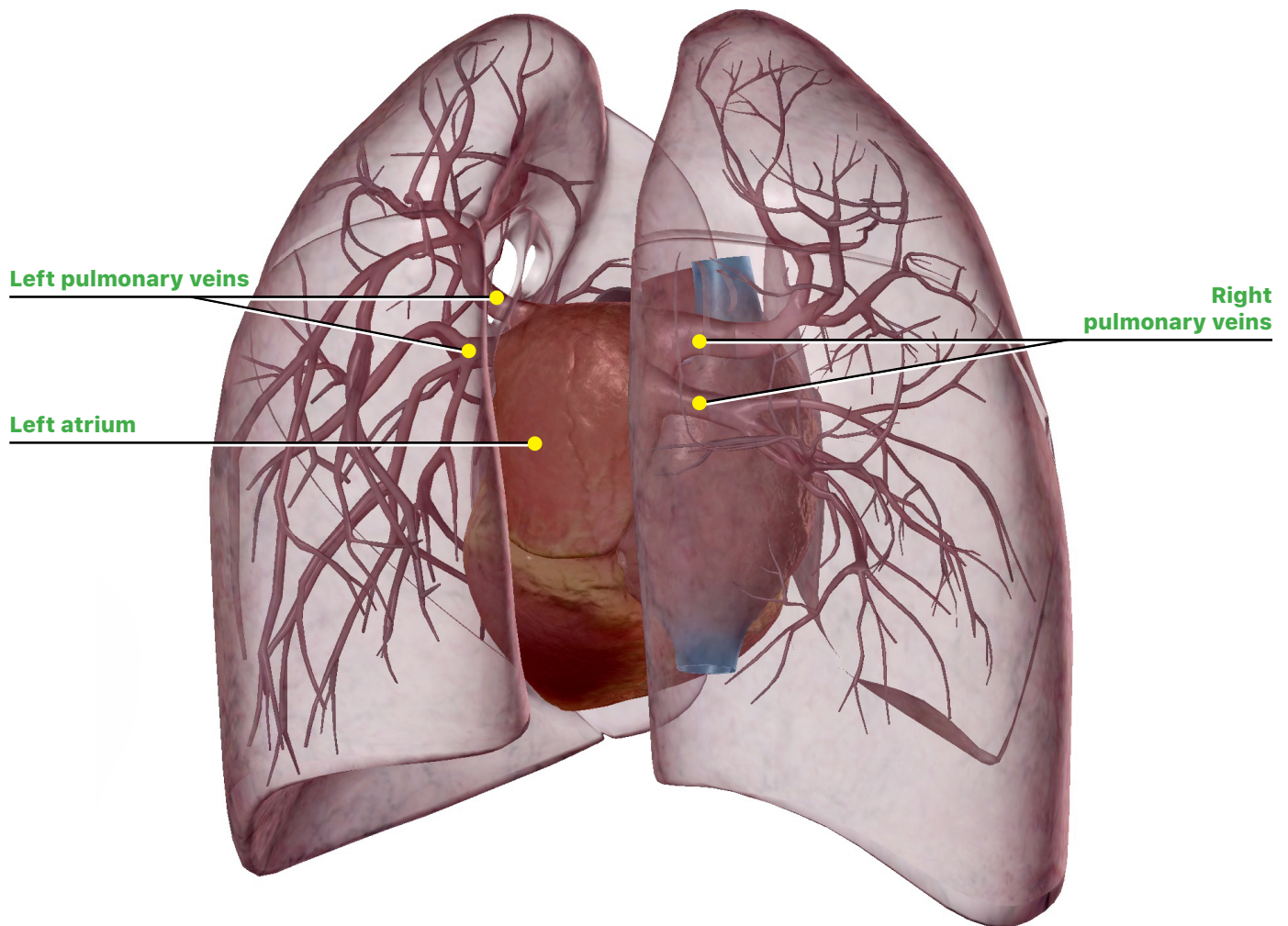


a. Select the right ventricle from the left-side menu. As deoxygenated blood leaves the right ventricle, it passes through the \_\_\_\_\_ valve.

b. Select the **pulmonary trunk** from the left-side menu. The pulmonary trunk is about \_\_\_\_\_ long. At the **aortic arch**, it divides into the left and right \_\_\_\_\_.

c. Select the pulmonary arteries from the left-side menu. As the pulmonary arteries enter the lungs, they branch into \_\_\_\_\_ and eventually terminate in networks of \_\_\_\_\_ that surround the alveoli. Gas exchange occurs here.

5. Explore the 3D anatomical view in Module 30.15 Pulmonary Veins and answer the following questions.



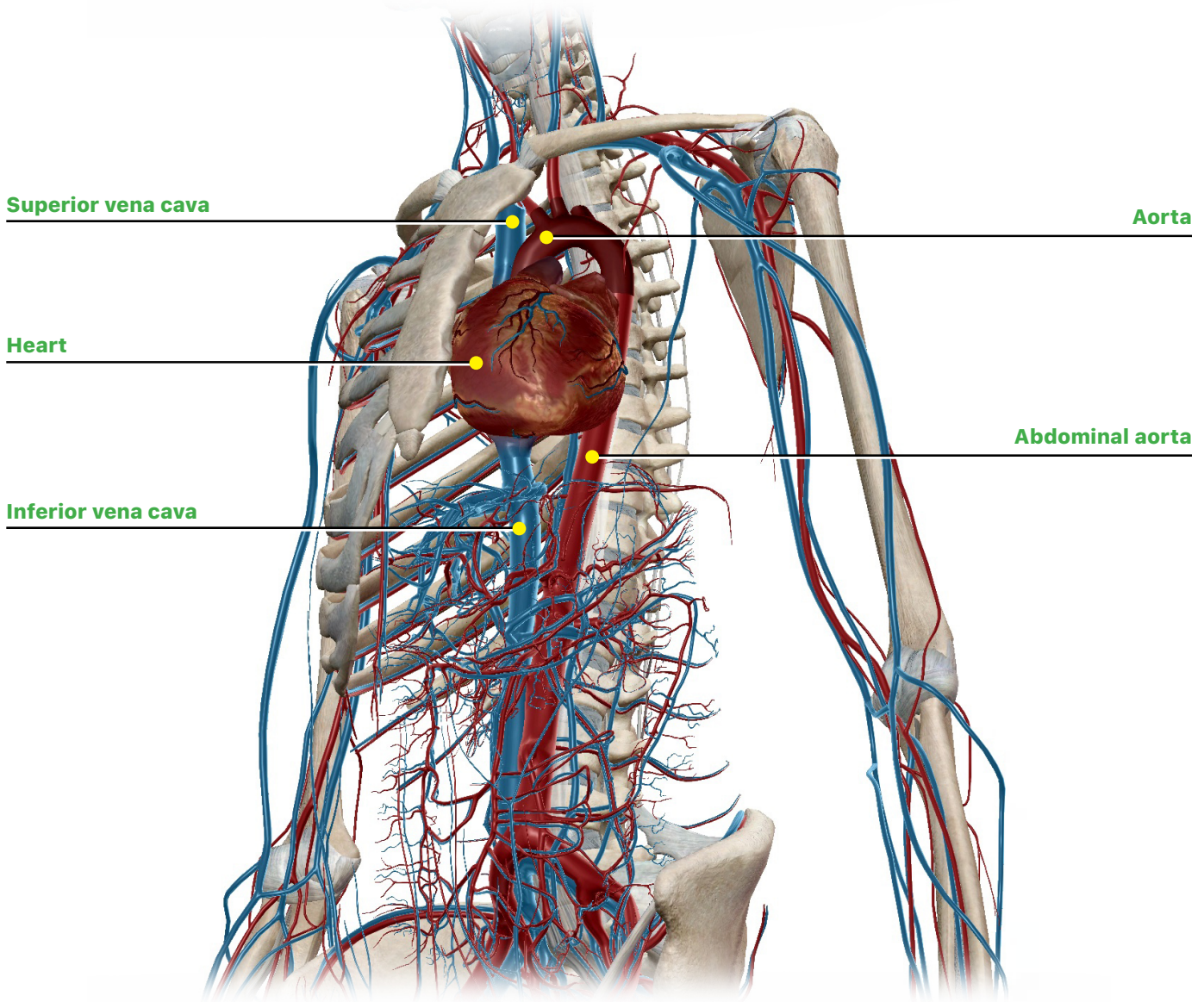
- Select the pulmonary veins from the left-side menu and use the book icon to read the definition. \_\_\_\_\_ from the pulmonary capillary beds join to form the pulmonary veins. These veins carry oxygenated blood to the \_\_\_\_\_ of the heart.
- Use the Hide Others button to hide the other structures from the view and observe pulmonary venous circulation. How many pulmonary veins enter the left atrium on each side?
- What is unusual about the pulmonary veins?





## D. Systemic Circulation Overview

1. Examine the 3D anatomical view in Module 30.16 Systemic Circulation and answer the following questions.



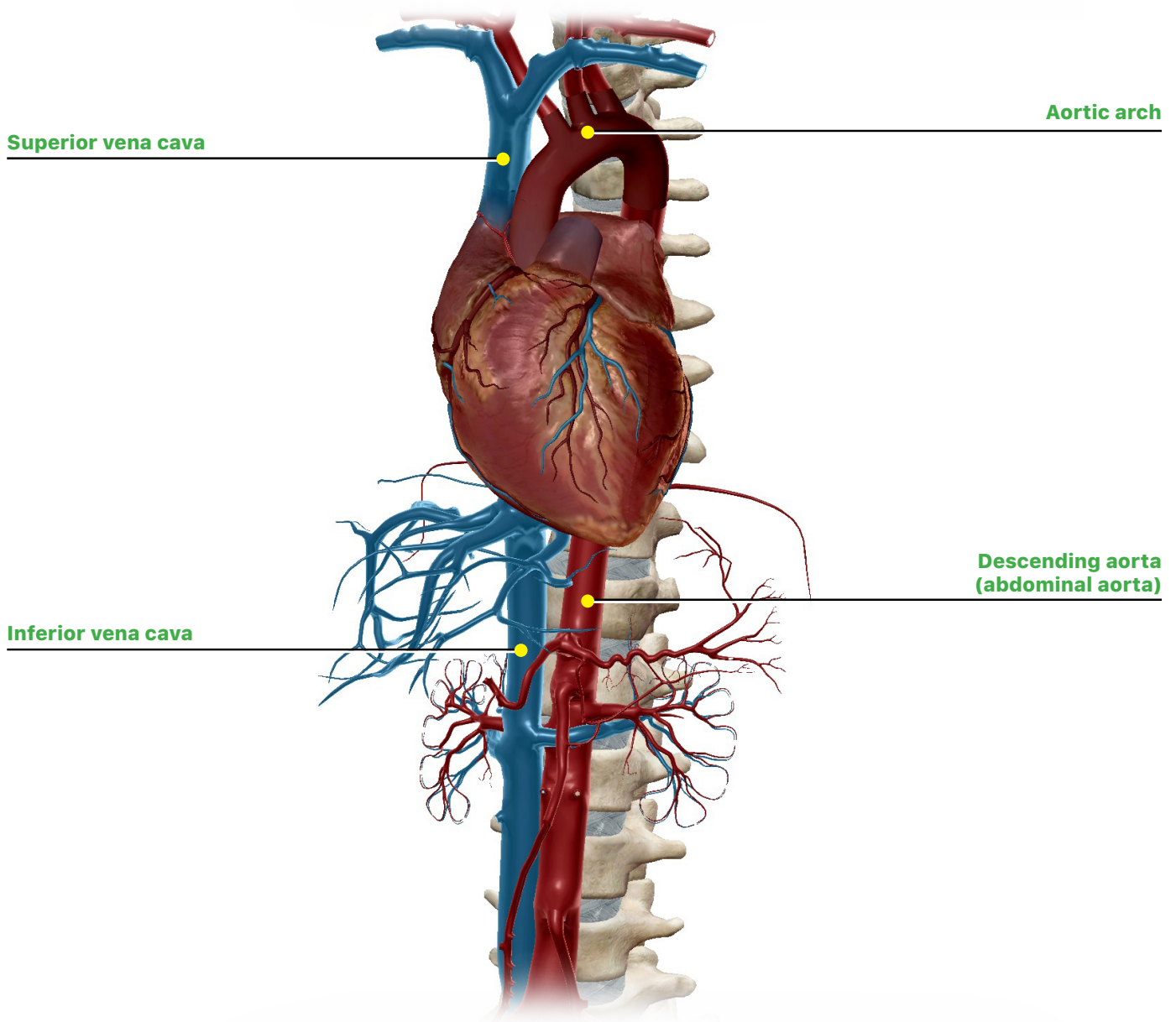
- Systemic circulation begins as blood is pumped through the \_\_\_\_\_, as it leaves the \_\_\_\_\_ ventricle of the heart.
- Select the **aorta** from the left-side menu. Note how the aorta curves after leaving the heart and descends through the **thorax** and the **abdomen**.
- Select the **systemic arteries** from the left-side menu. Systemic arteries carry oxygenated blood throughout the body. Arteries branch until they become \_\_\_\_\_, where gas exchange occurs in the tissues.





d. Select the **systemic veins** from the left-side menu. Systemic veins return deoxygenated blood to the \_\_\_\_\_ of the heart via the \_\_\_\_\_ and \_\_\_\_\_ **venae cavae** (vena cavae).

2. Explore the 3D anatomical view in Module 30.17 Great Vessels and Branches and answer the following questions.



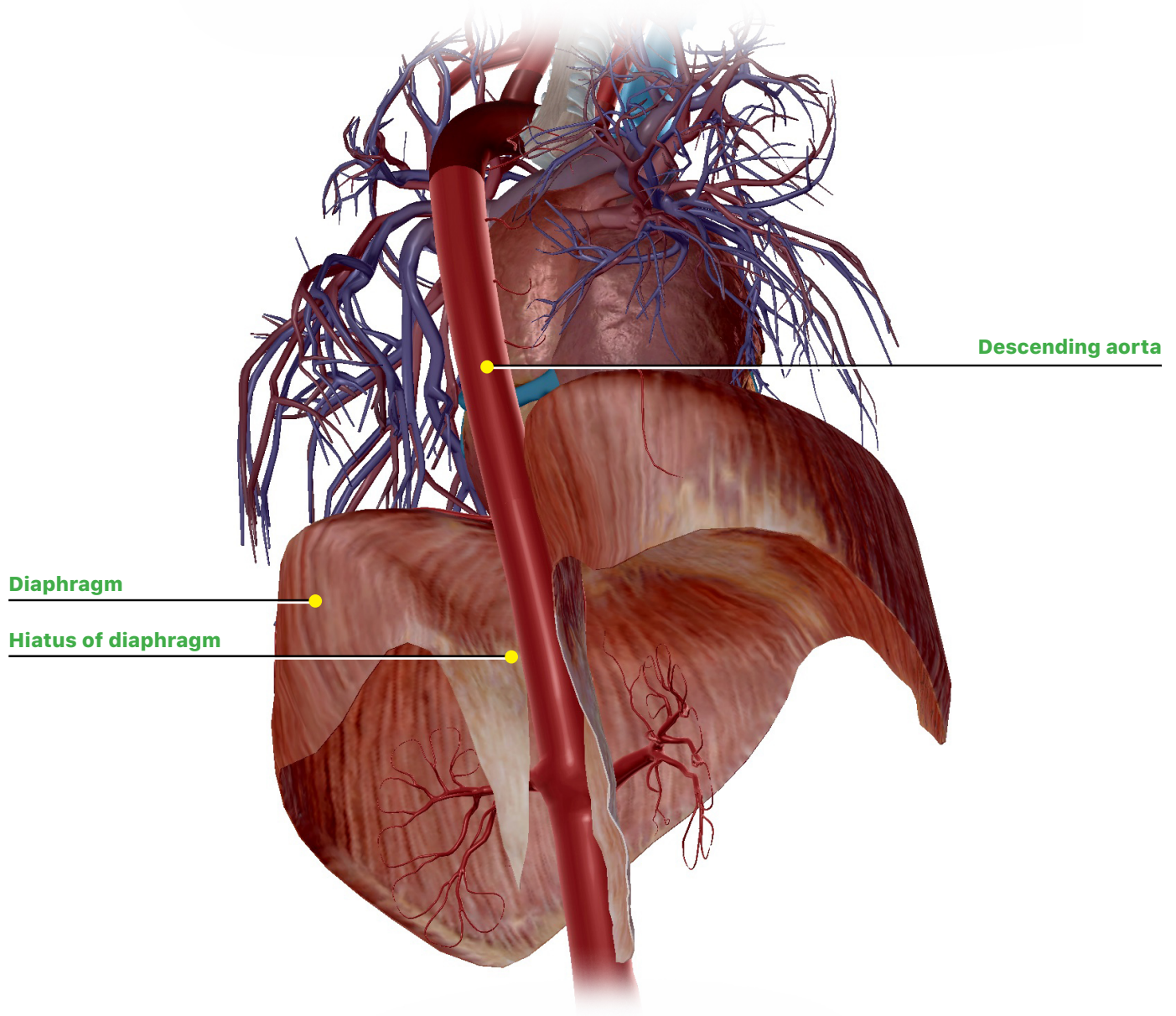
a. Select the **aortic arch** from the left-side menu. Which is the largest artery in the body?

i. As the aorta extends upward for a short distance, it is called the \_\_\_\_\_.

- ii. The portion that curves to arch over the root of the left lung is called the \_\_\_\_\_.
- b. Select the **descending aorta** (thoracic) from the left-side menu. The descending aorta travels through the thorax and the abdomen. The thoracic portion extends from the lower border of the \_\_\_\_\_ thoracic vertebra to the \_\_\_\_\_ in the diaphragm.
- c. Name the two categories of branches from the **thoracic aorta**.
- d. Select the descending aorta (abdominal) from the left-side menu. A continuation of the thoracic aorta, the **abdominal aorta** begins at the diaphragm and ends at the body of the \_\_\_\_\_, where it branches into the two \_\_\_\_\_.
- e. Select the **superior vena cava** from the left-side menu. This is formed by the joining of the two \_\_\_\_\_. It enters at the top of the \_\_\_\_\_ of the heart. What region is drained by the superior vena cava?
- f. Select the **inferior vena cava** from the left-side menu. This is formed by the junction of the two \_\_\_\_\_ at the level of the \_\_\_\_\_ vertebra. What part of the body is drained by the inferior vena cava?

g. OPTIONAL: Explore the 3D anatomical view in Module 29.2 Location of Heart in the **Thoracic Cavity**. Select each lung and use the Hide button to hide the lungs. Rotate the view to find the descending aorta and select it. Note the way the abdominal aorta passes through the **hiatus** in the back part of the **diaphragm**.

h. Note that the pulmonary trunk, covered in the Pulmonary Circulation section, is also one of the great vessels.



## **PUTTING IT ALL TOGETHER**

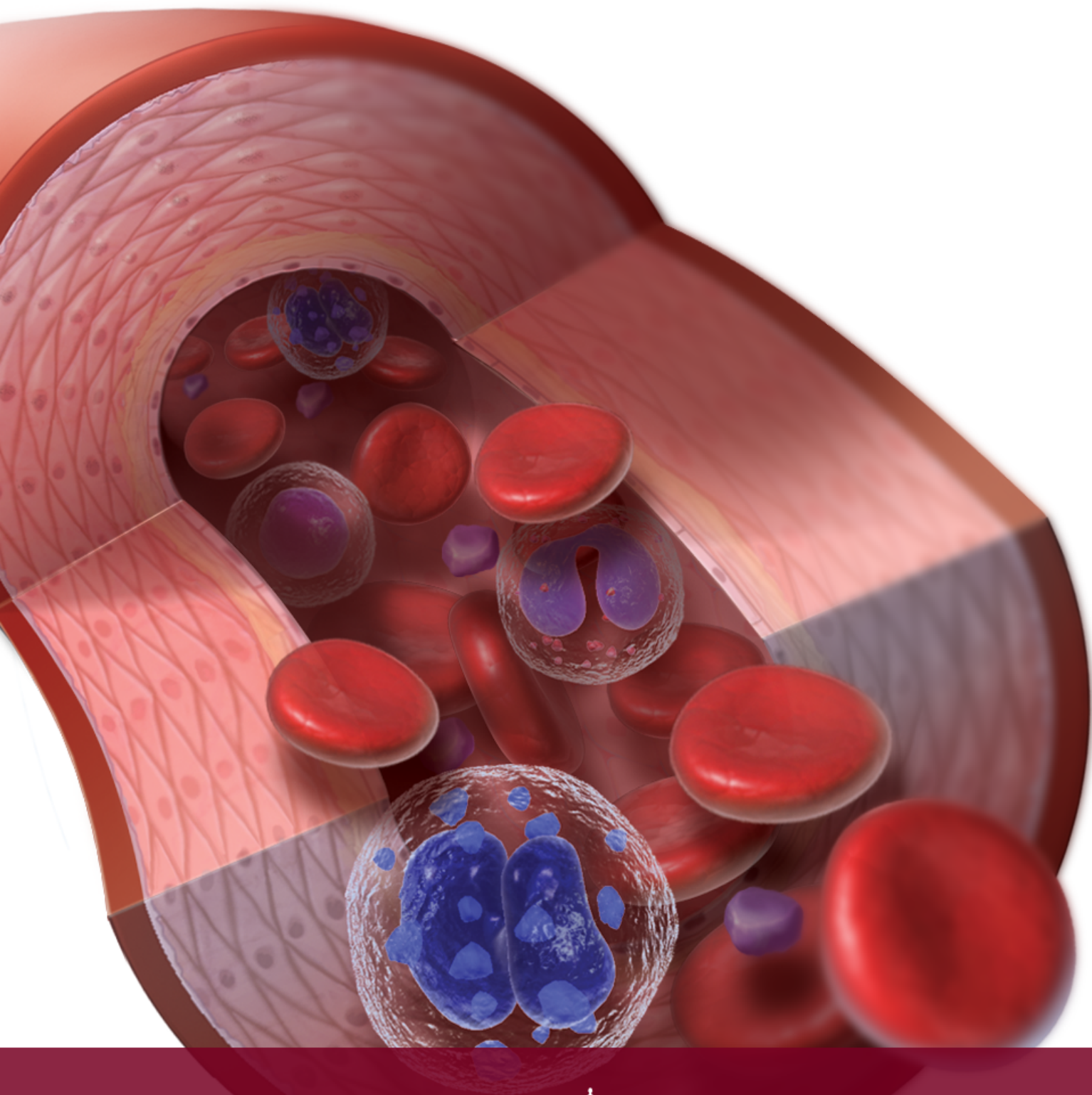
1. Draw a simple circuit showing the pulmonary and systemic circulatory systems.
2. Compare the arteries and veins of the pulmonary circuit with those of the systemic circuit.
3. Review blood pressure in arteries and veins and explain why most veins have valves but arteries do not.

**TIME TO PRACTICE!**

**GO TO THE QUIZZES MENU AND COMPLETE CIRCULATORY SYSTEM QUIZ 30.A.**





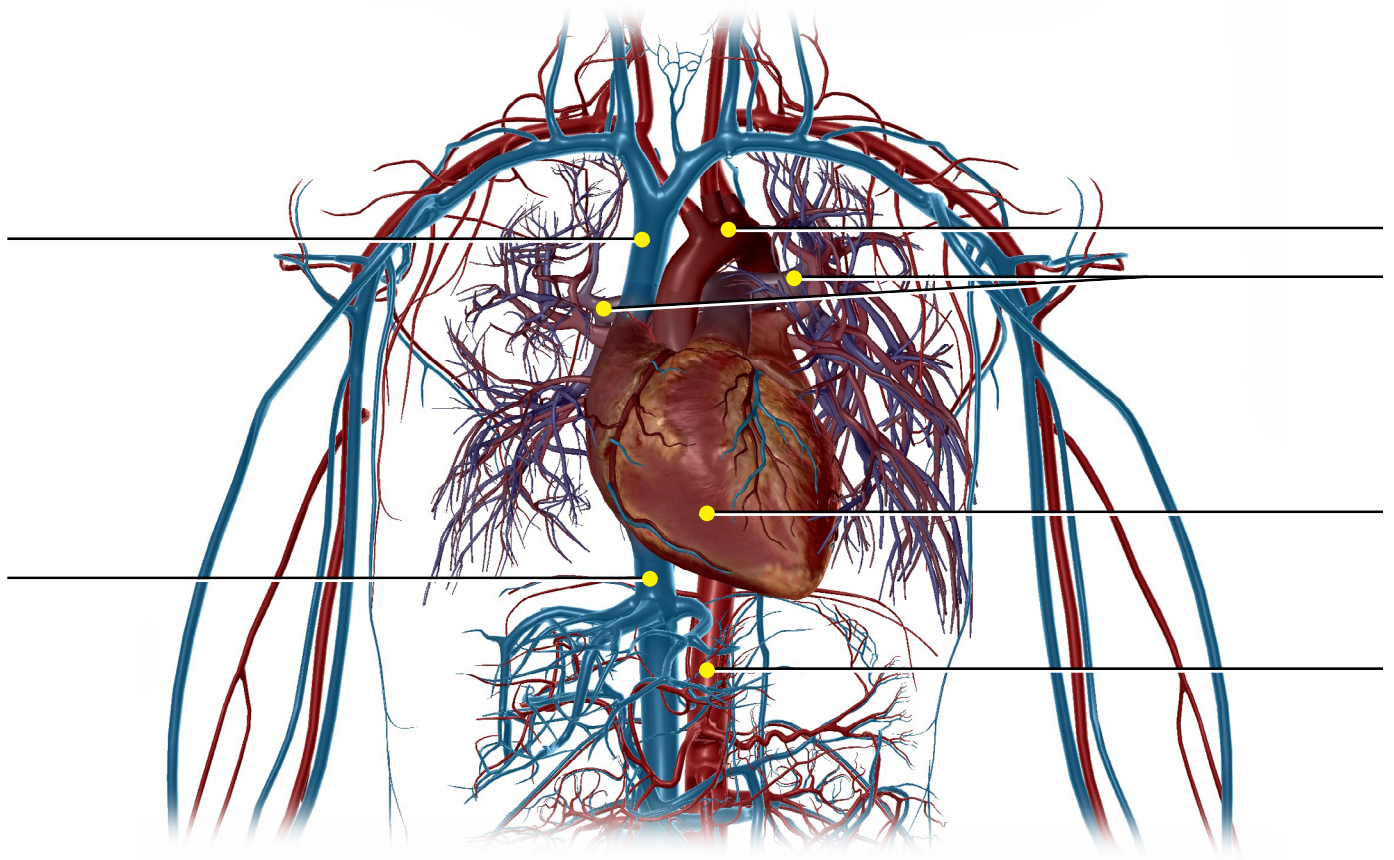


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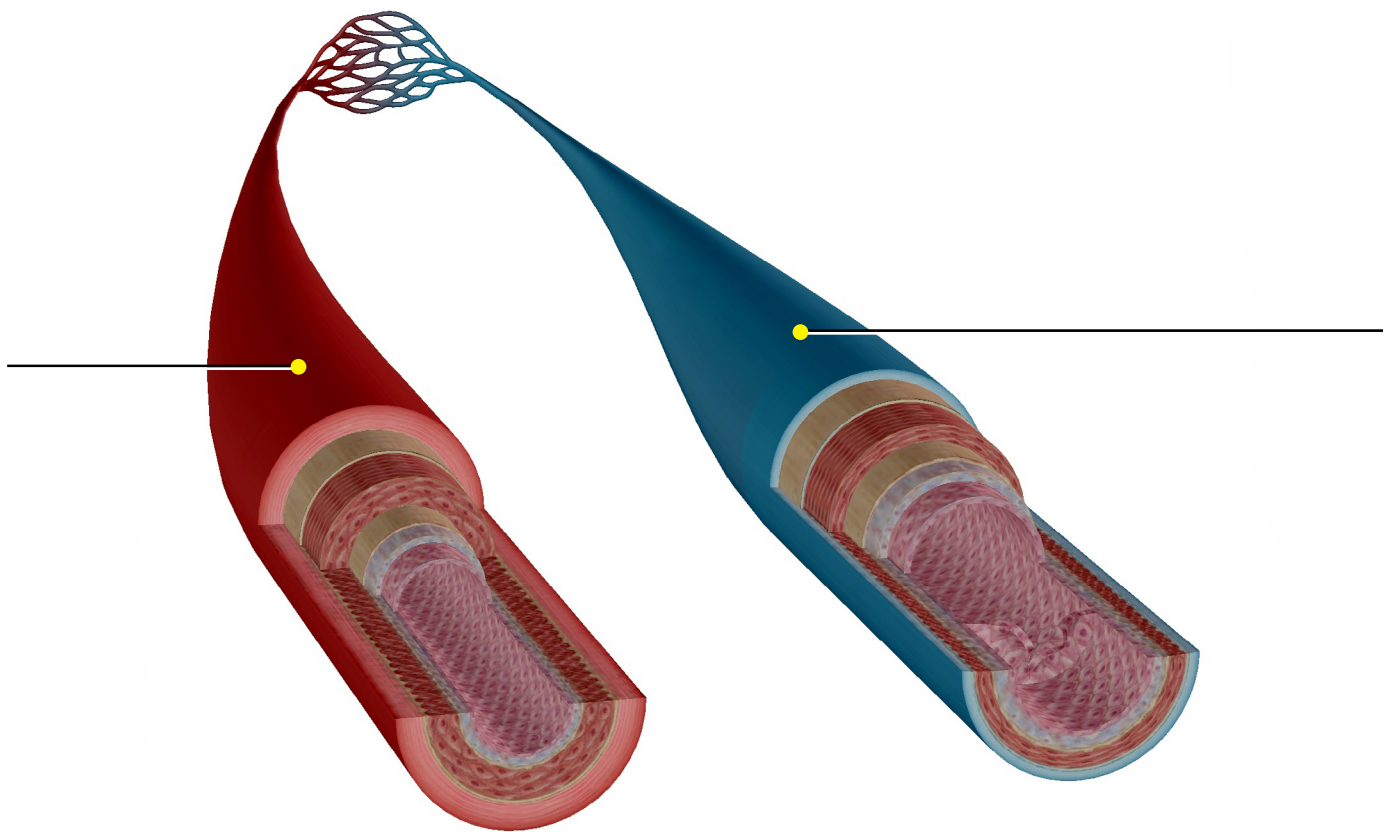
# Student Practice

Label the structures in the following figures.

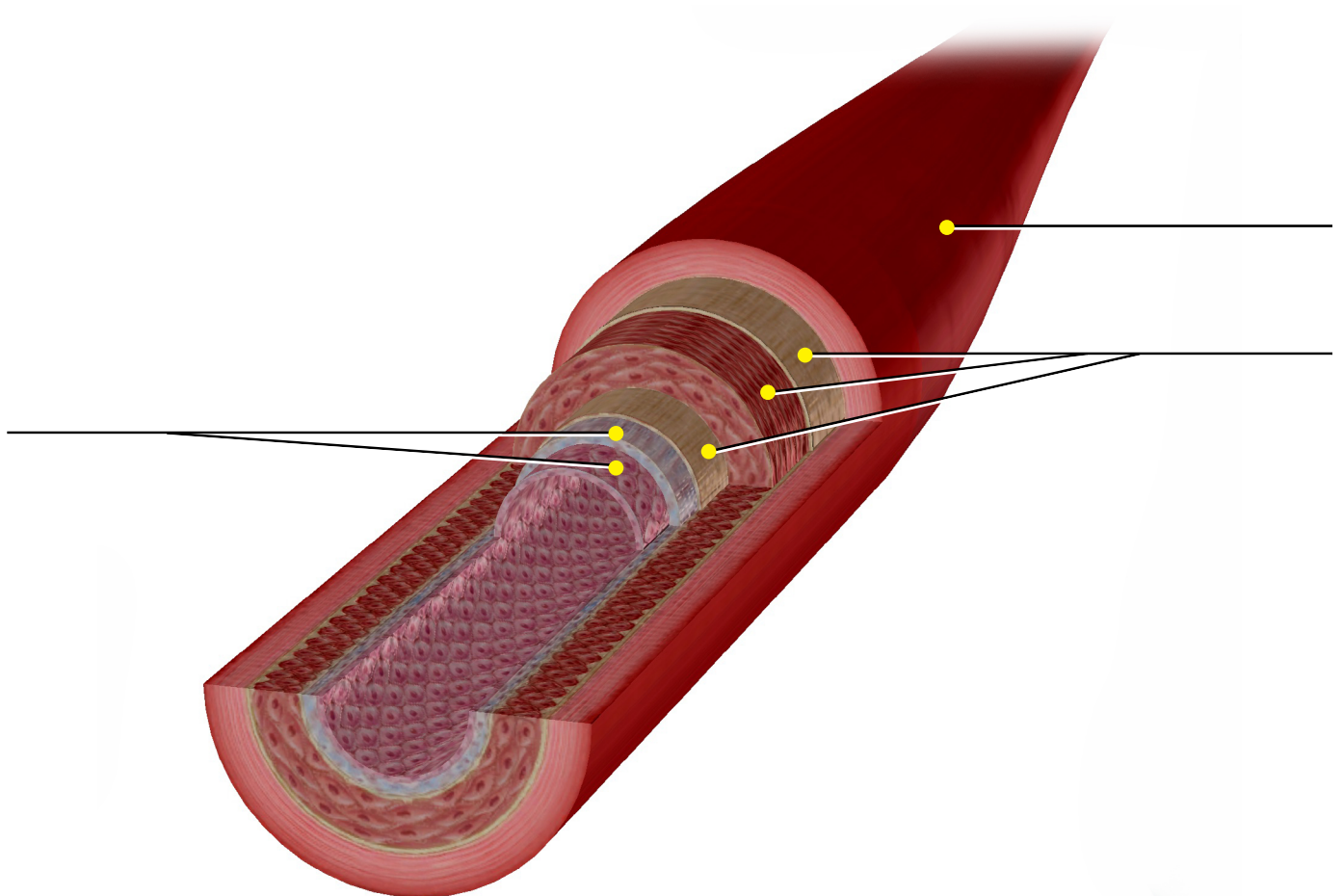
## **Module 27.2 Circulatory Anatomy**



## **Module 30.1 Types of Blood Vessels**

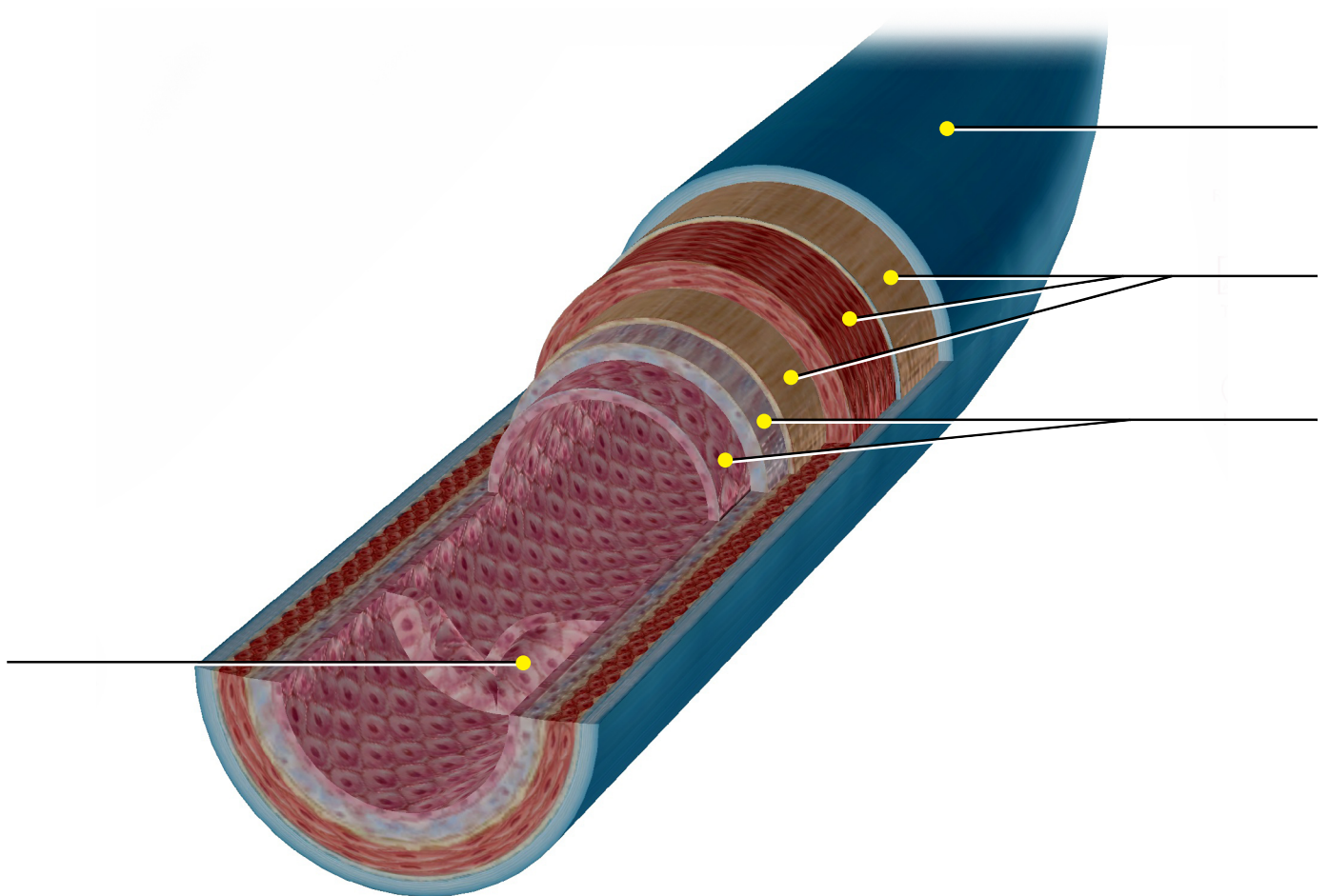


## **Module 30.3 Artery Structure**

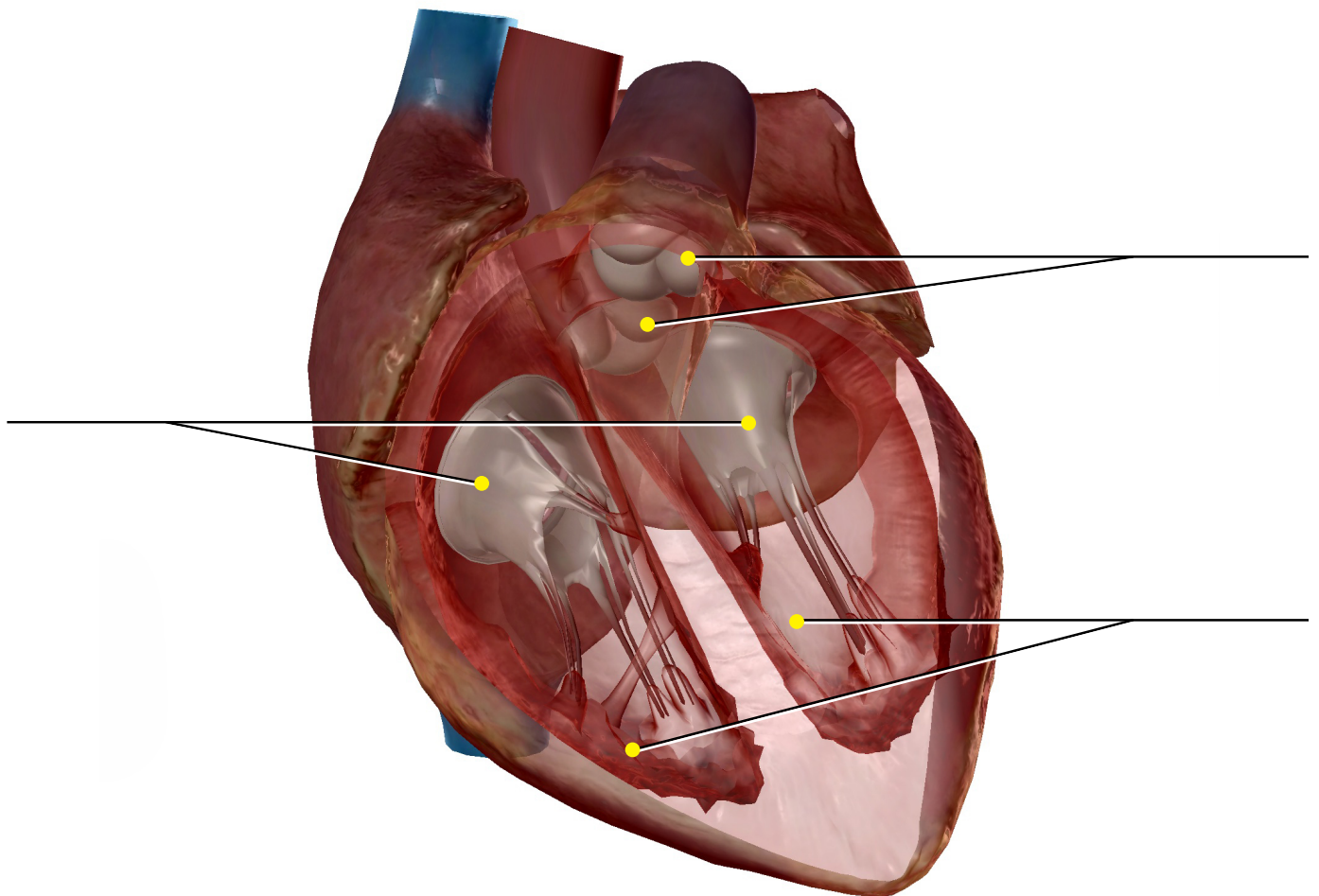




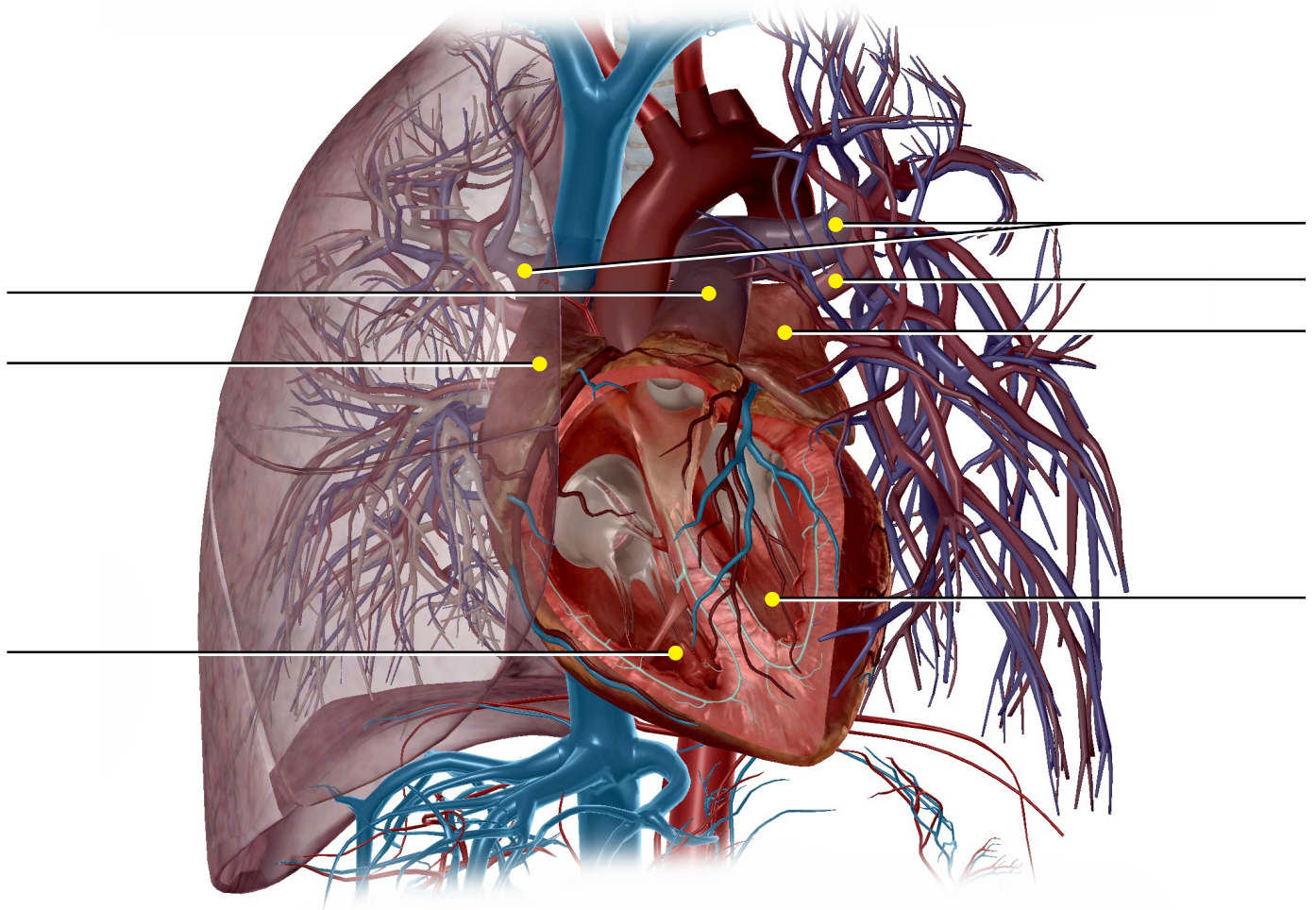
## **Module 30.4 Vein Structure**



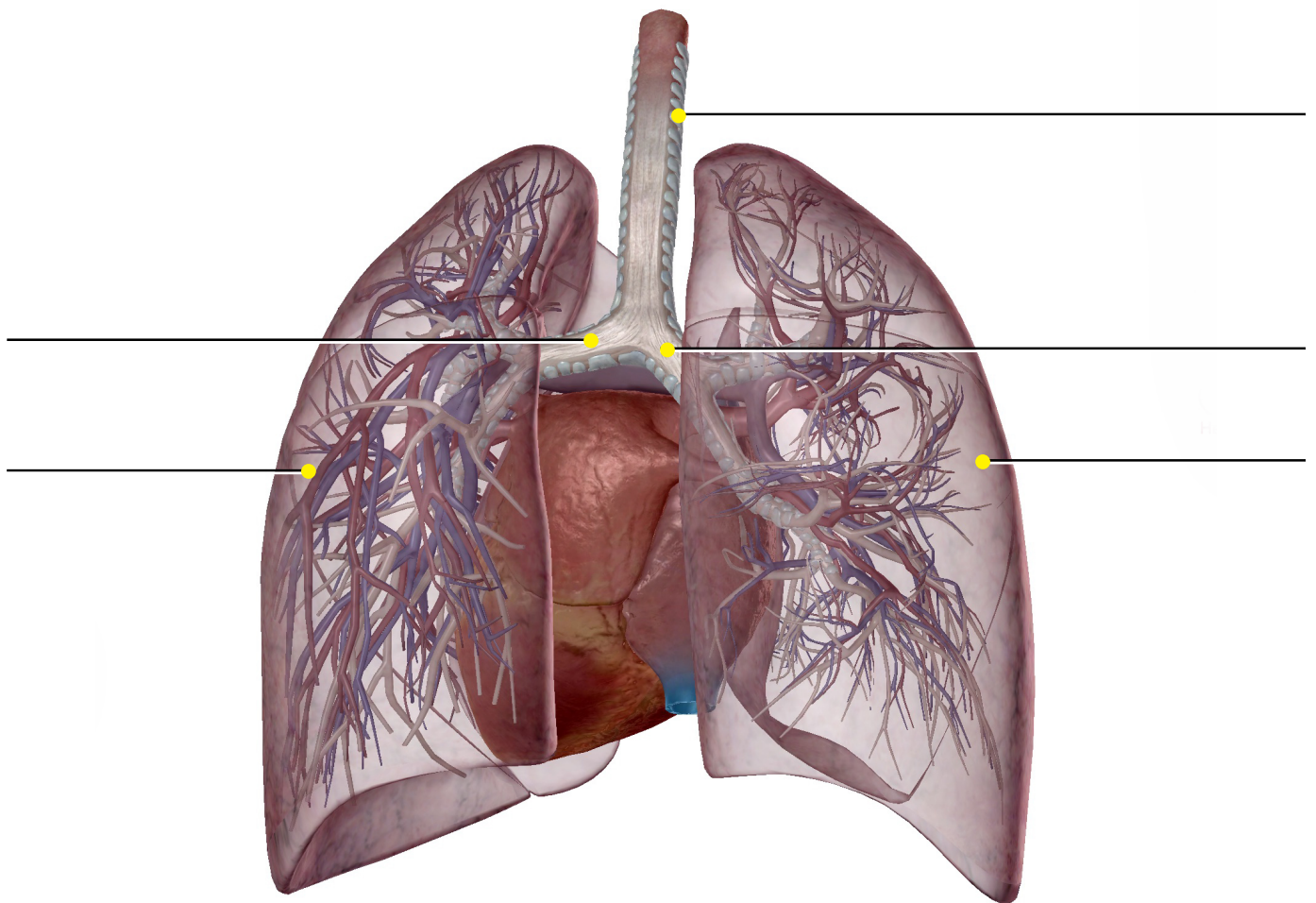
## Module 30.9 Systemic and Diastolic Pressure



## **Module 30.10 Circulatory Routes**

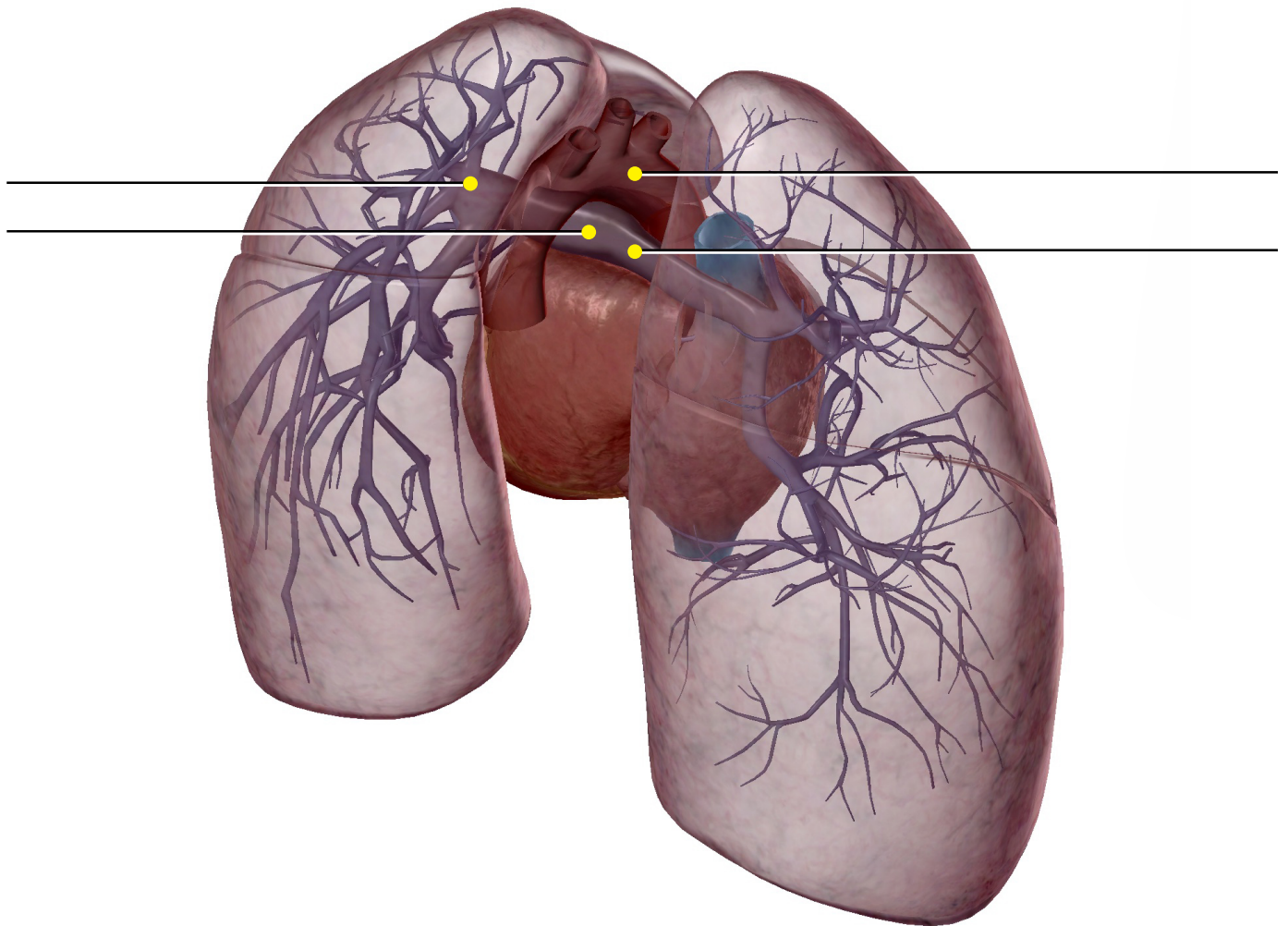


## **Module 30.12 Pulmonary Circulation and Bronchi**

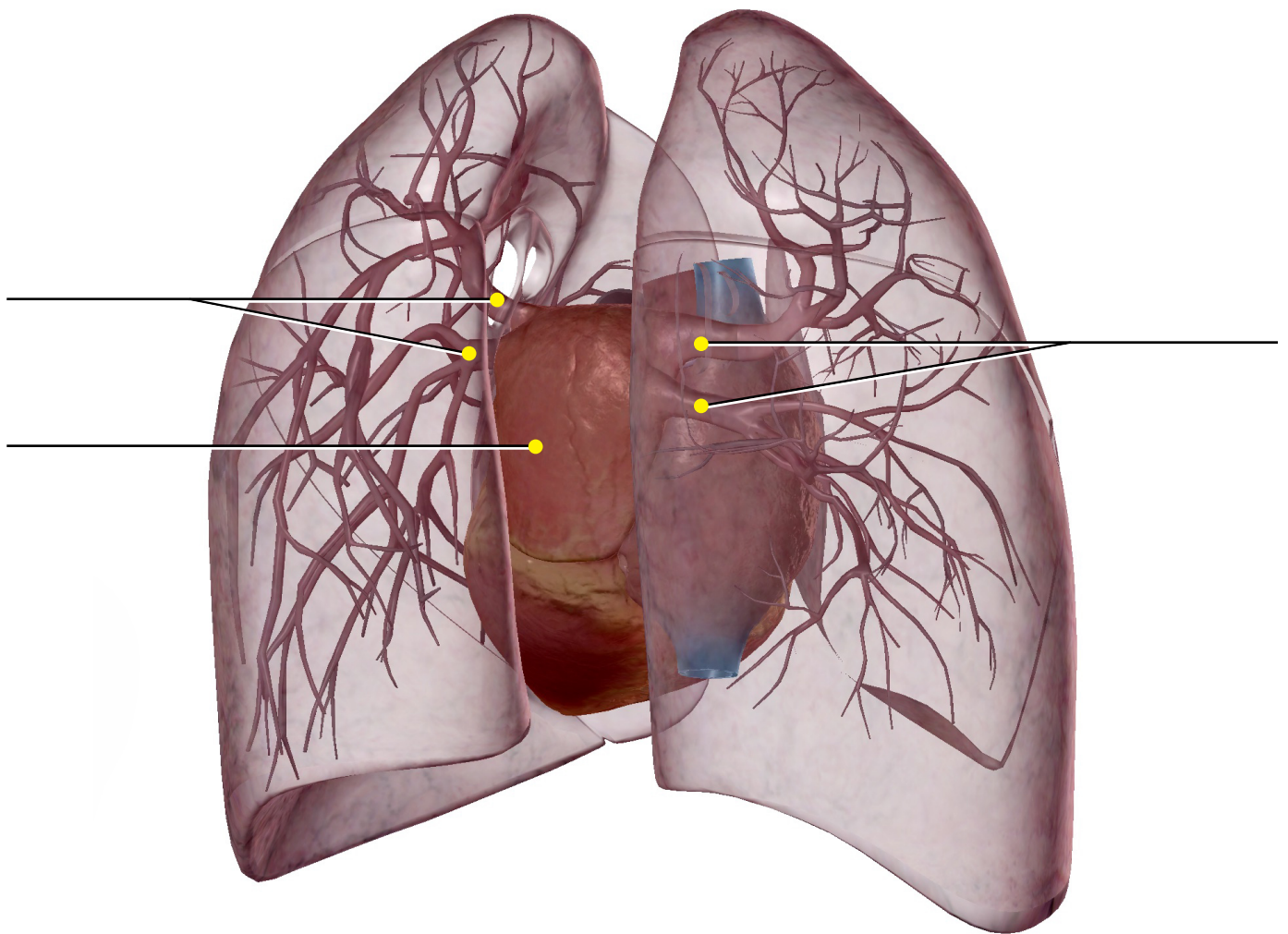




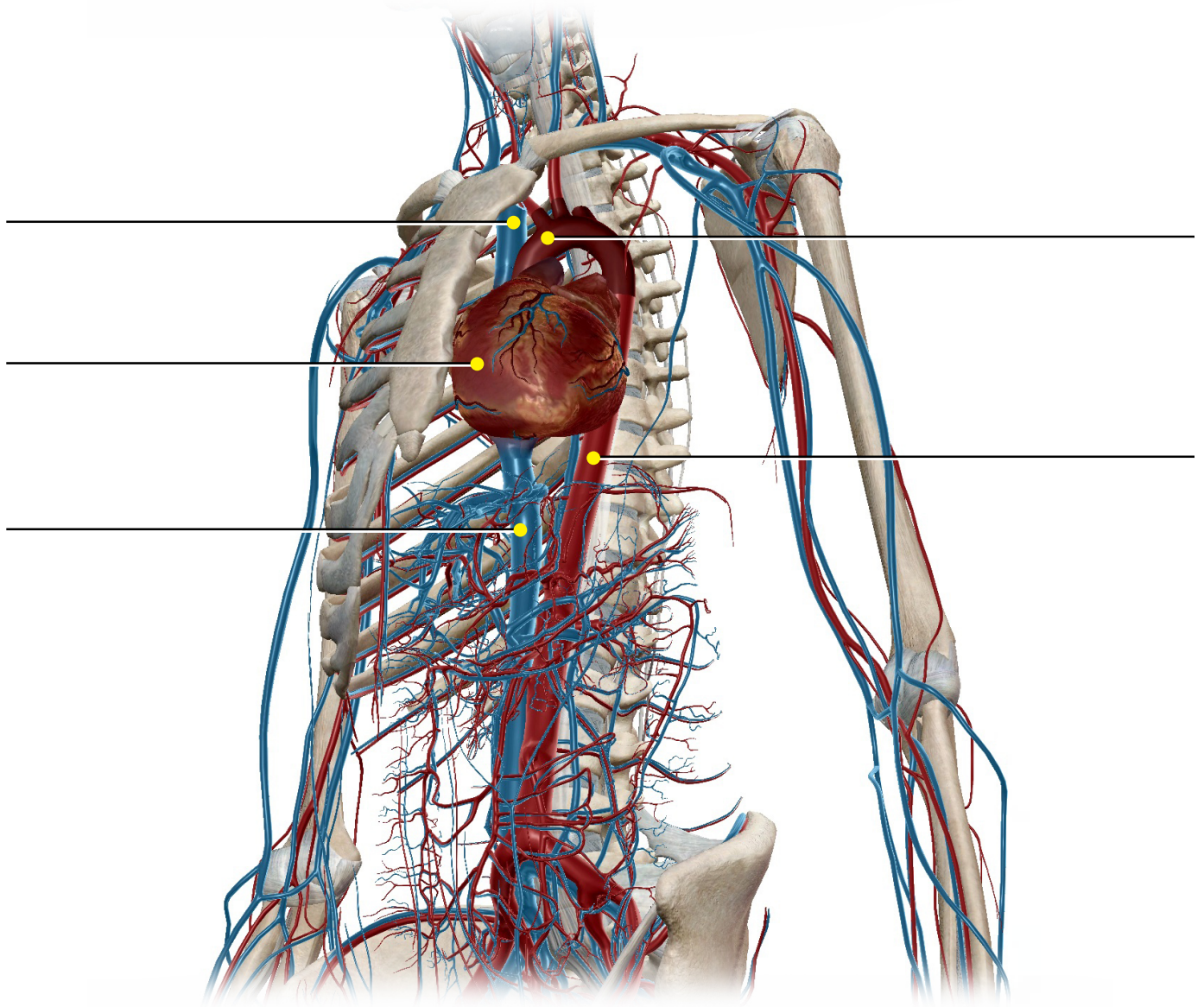
## **Module 30.14 Pulmonary Arteries**



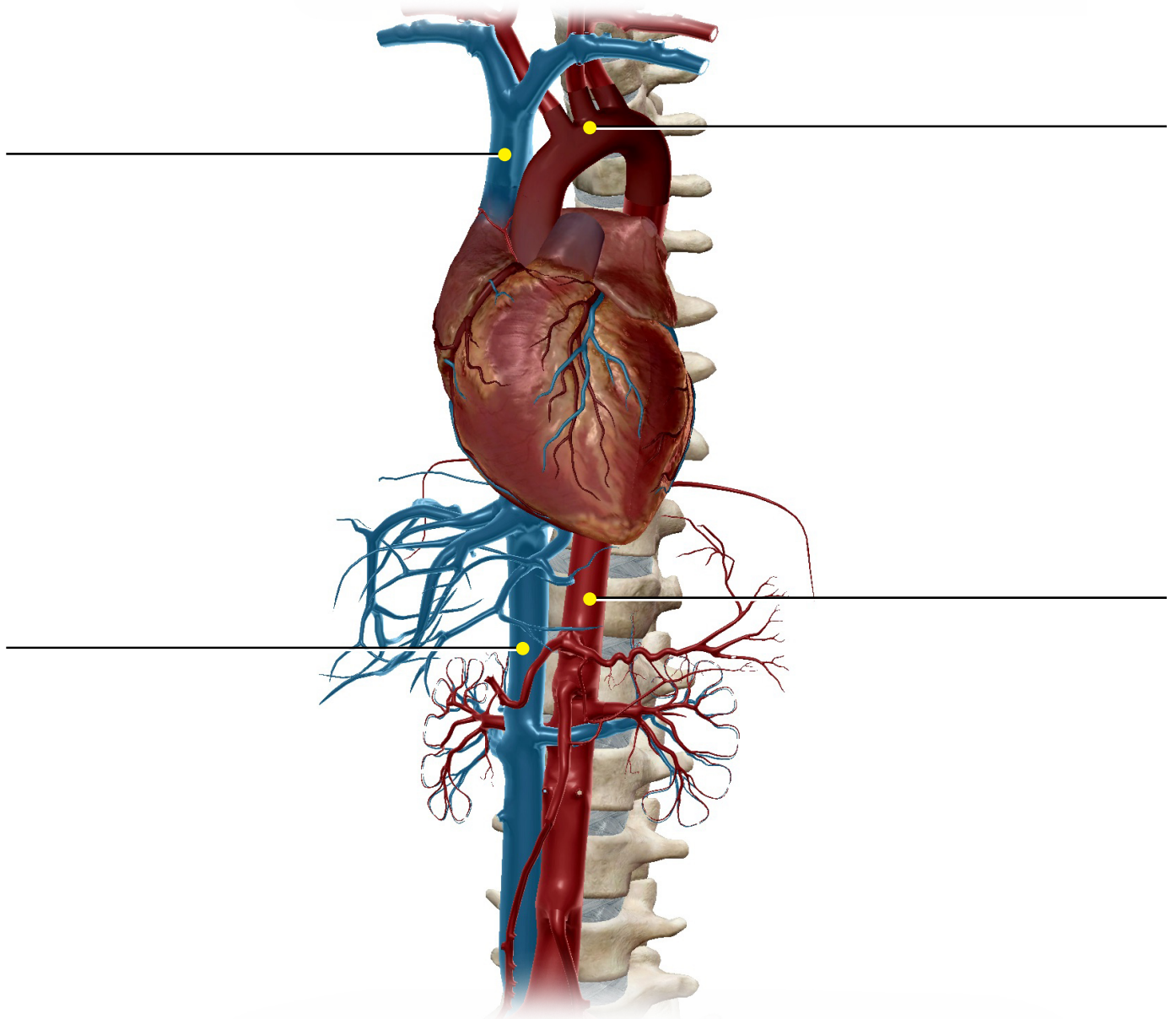
## **Module 30.15 Pulmonary Veins**



## **Module 30.16 Systemic Circulation**



## Module 30.17 Great Vessels and Branches





**(Optional) Module 29.2 Location of the Heart in the Thoracic Cavity**

