VISIBLE BODY®

The Human Heart

A circulatory system lab activity using Visible Body Suite

Molli Crenshaw, Instructor of Biology, TCU

PRE-LAB EXERCISES:

A. Watch the video in Module 29.1 Heart Function and make the following observations:

1. What is the function of the heart in relationship to the circulatory system?

2. According to the video, an adult heart is approximately the size of a _____.

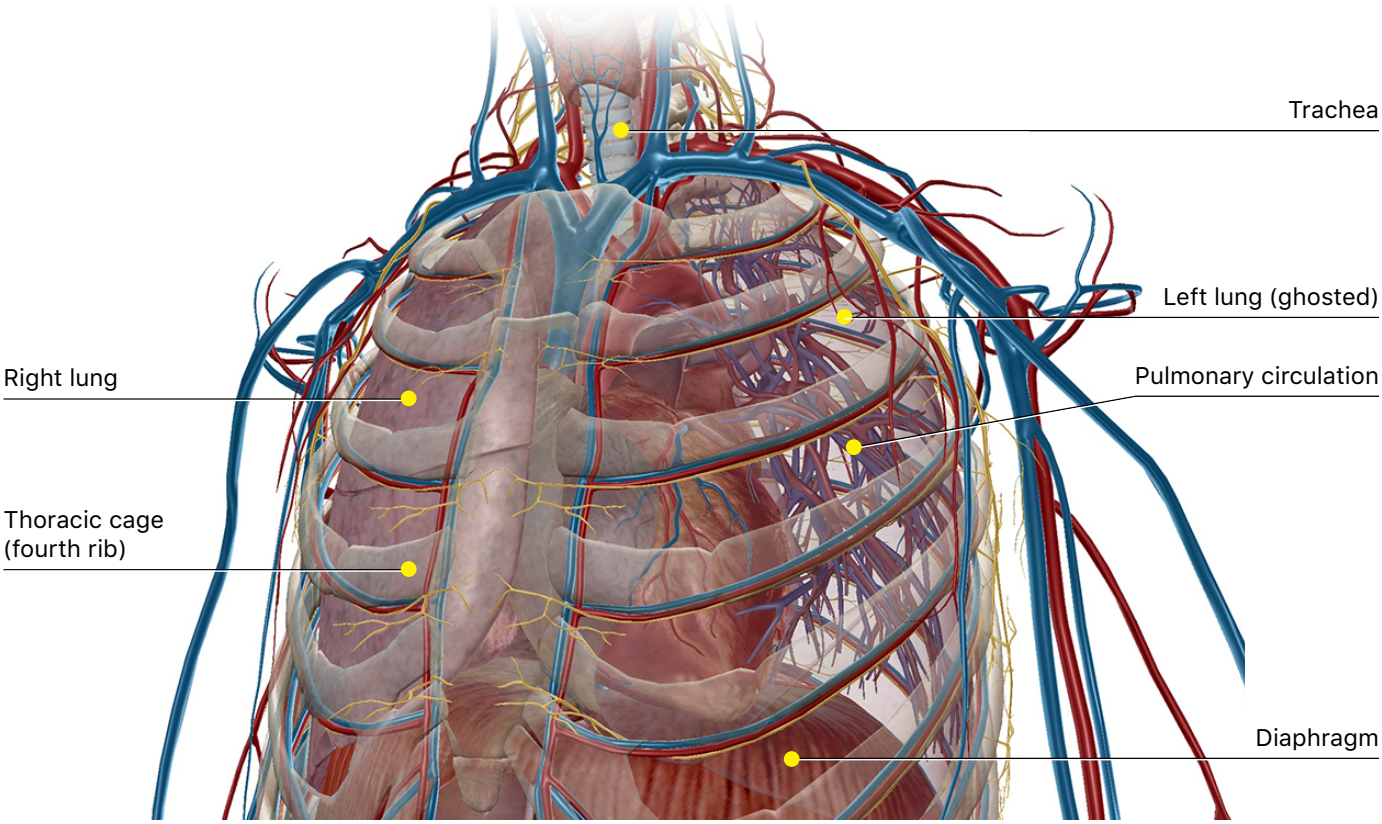
3. What are the names of the two chambers found on each side of the heart?

4. Why do you think the heart is called a "double-pump"?

5. "Blue blood" designates deoxygenated blood – this blood is only seen in the chambers of which side of the heart?

6. "Red blood" designates oxygenated (or oxygen-rich) blood – this blood is only seen in the chambers of which side of the heart?

7. What is the name of the thin sac that surrounds the heart? According to the video, what are its functions?



B. Use Modules 29.2 Location of the Heart in the Thoracic Cavity, 29.3 Location of the Heart in the Thoracic Cage, and 29.4 Inferior View of Thoracic Cavity, Transverse Section to make the following observations:

1. In each exercise, click on “heart” in the left-hand toolbar, then select “fade others”

2. What is the location of the heart in reference to the diaphragm?

3. What is the location of the heart in reference to the right and left lungs? Which lung experiences the greatest displacement due to the location of the heart?

4. What is the placement of the heart in regard to the trachea?

5. What is the placement of the heart in regard to the esophagus?

6. What is the function of the thoracic cage in regard to the heart?

Watch the video in Module 29.5 Heart Tissue and make the following observations:

1. In the space below, make a simple sketch demonstrating the three layers of the heart wall as shown in the video:

2. List the three ways the outermost layer of the heart is described:

_____

_____

_____

3. What is the middle layer of the heart called?

a. What is the function of this layer?

b. This layer most likely comprises which type of muscle tissue?

4. What is the inner layer of the heart wall?

a. What does it layer?

b. What is it continuous with outside of the heart?

IN-LAB EXERCISES:

Obtain a heart model or a preserved heart specimen. Use the following modules to guide your exploration of the heart. As you explore the identification of structures, use the textbook icon to answer questions below. You are responsible for the identification of all bolded terms.

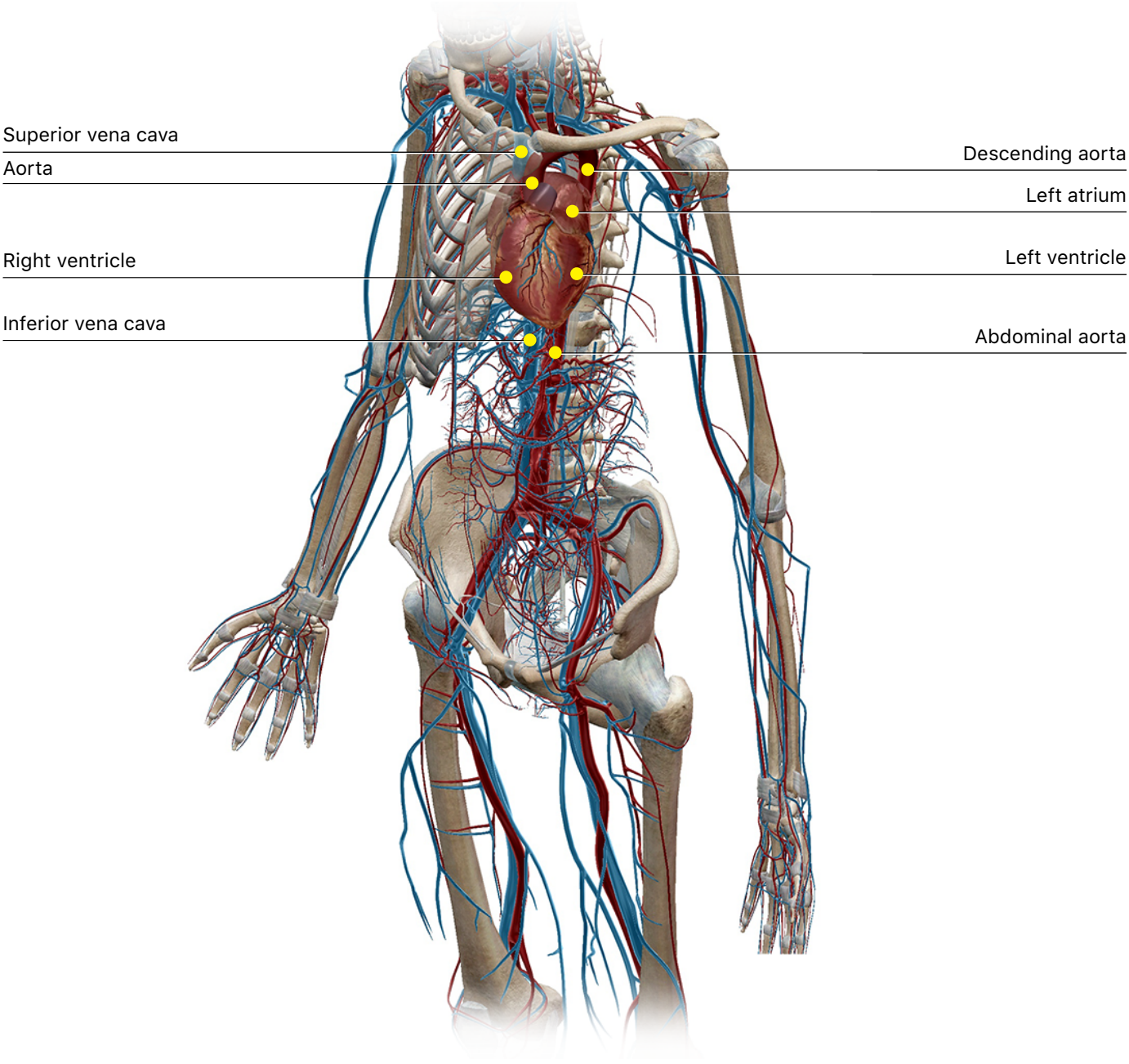
External Anatomy of the Heart:

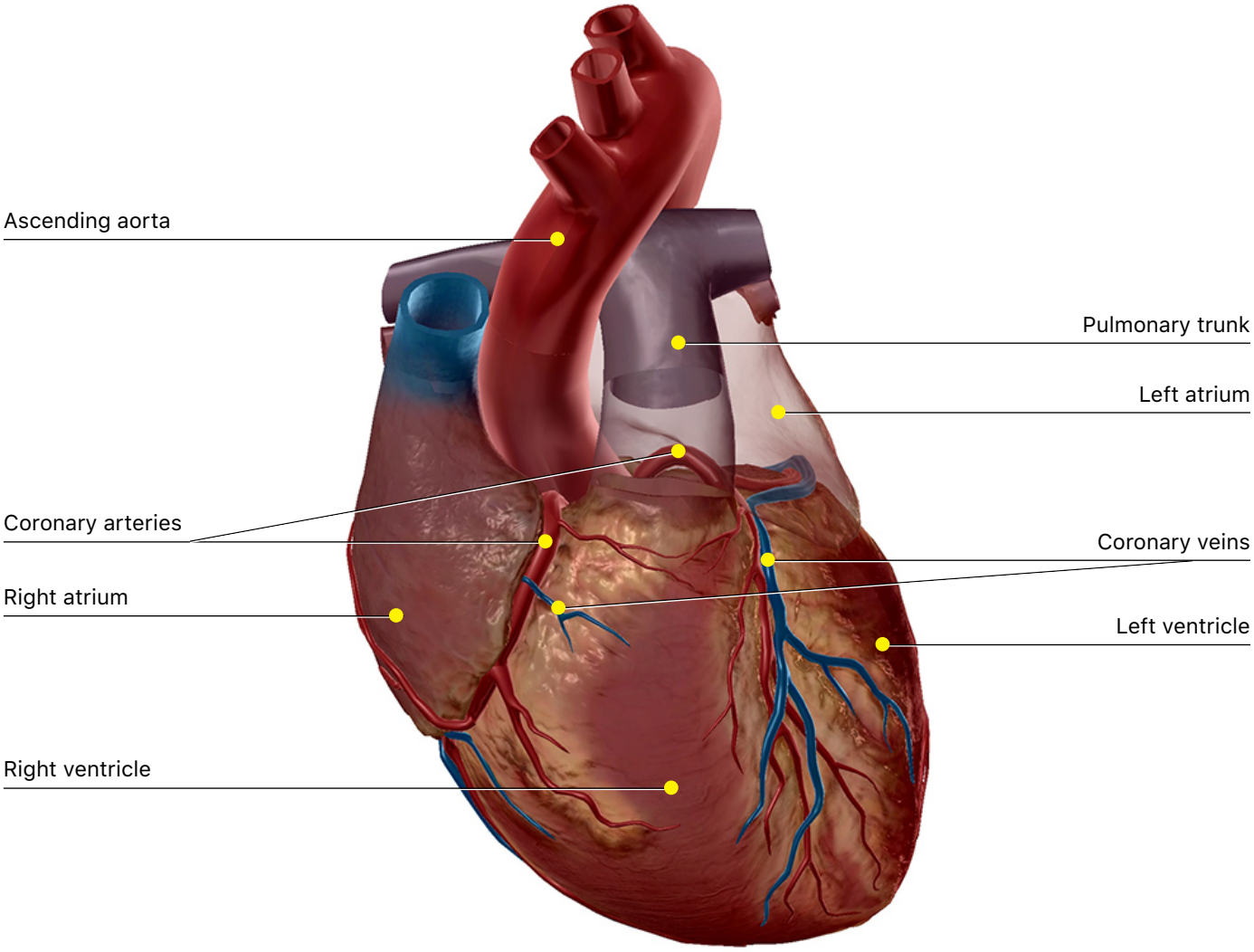
1. If your specimen is still contained within the thoracic cavity of an organism, you should begin by identifying the *pericardial sac*, a dual-layered sac which encloses the heart:

a. The innermost layer is the **parietal layer of the serous pericardium**, and is separated from the heart wall by **pericardial fluid**

b. The outermost layer is the **parietal layer of the serous pleura**

c. The surface of the heart is covered by the visceral layer of the serous pericardium, and is often referred to as the epicardium.





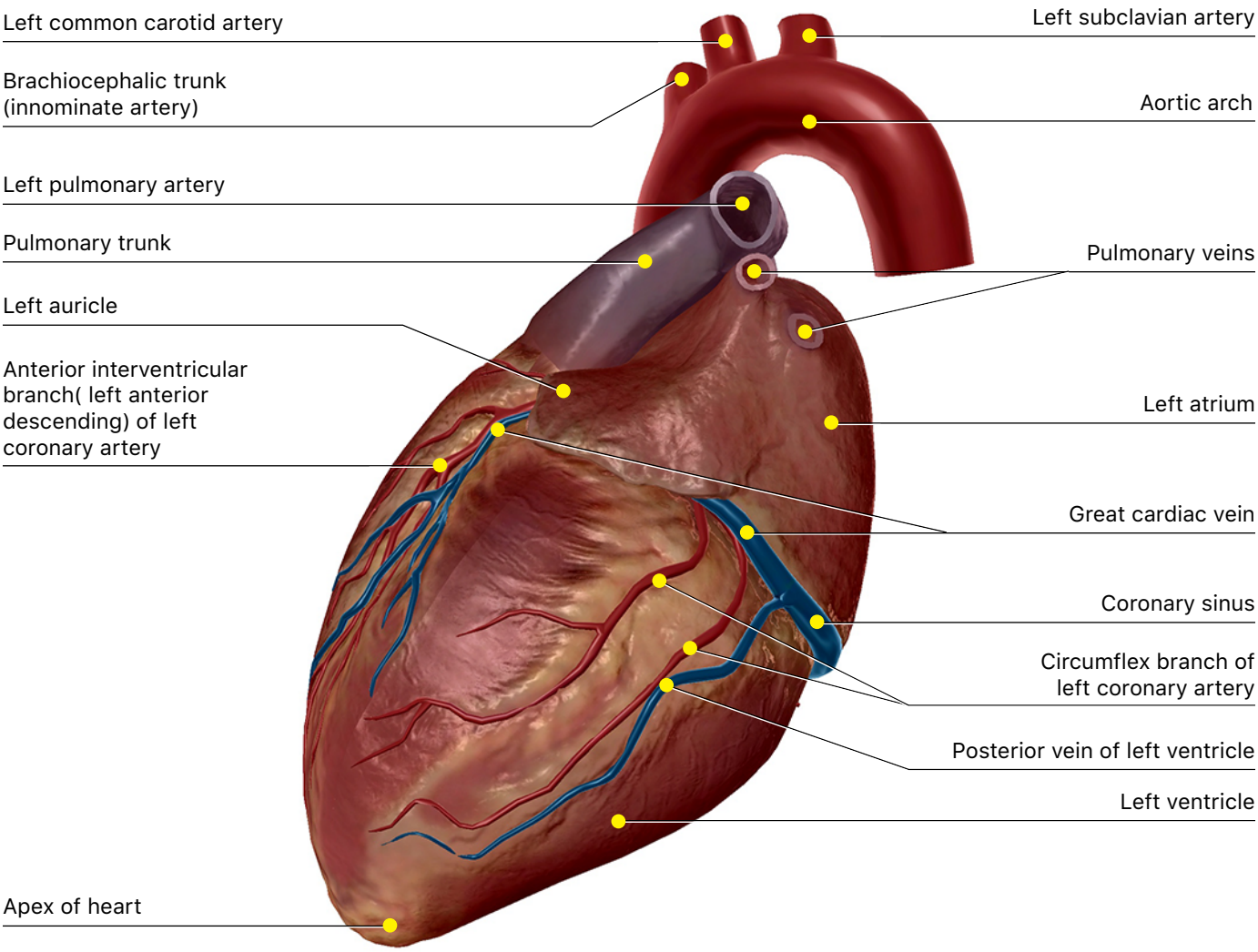
2. Use module 29.18: Coronary Circulation to identify the following structures and summarize their functions:

a. Coronary arteries

b. Coronary veins

c. Ascending aorta

d. Right atrium



3. Use Module 29.19 Coronary Veins, 29.20 Left Coronary Arteries, and 29.21 Right Coronary Arteries to identify the following structures, and summarize their functions where indicated:

a. **Coronary Veins:**

i. What is the oxygen quality of the blood carried in these veins?

ii. **Coronary sinus**; the coronary sinus is a convergence of coronary veins which drains directly into the _____.

iii. **Great cardiac vein**

iv. **Anterior cardiac vein**

v. **Small cardiac vein**

vi. **Posterior vein of the left ventricle**

vii. **Middle cardiac vein**

b. **Coronary Arteries:**

i. What is the oxygen quality of the blood carried in these arteries?

ii. **Left coronary artery**

iii. **Circumflex branch**

iv. **Anterior interventricular branch**; what does the term "interventricular" indicate about this vessel's location?

v. **Anterior artery of the right ventricle**

vi. **Right marginal artery**

vii. **Right coronary artery**

viii. **Posterior interventricular branch**

ix. **Atrial branch**

x. **Branch to the sinoatrial node**

xi. **Conus branch**

4. Use Module 29.8 Heart Chamber Anatomy to identify the following structures, and summarize their functions where indicated:

a. The **right atrium** and the **left atrium**

i. What is the purpose of the **atrial septum**?

ii. Which atrium is the largest?

iii. Which atrium has the thickest walls?

vi. Identify the **pectinate muscles** within the right atrium.

v. Fill in the blanks: The right atrium receives deoxygenated blood from the _____ and the _____ and empties into the _____. The left atrium receives oxygenated blood from the _____, and empties into the _____.

b. The **left ventricle** and the **right ventricle**

i. The right ventricle receives blood from the _____ (see previous questions) and is responsible for pumping deoxygenated blood into the _____ through the _____ valve (to be identified below).

ii. The left ventricle receives blood from the _____ (see previous questions) and is responsible for pumping oxygenated blood into the _____ through the _____ valve (to be identified below).

iii. Which ventricle has the thickest walls? Why?

iv. Which ventricle forms the **apex** of the heart?

v. What are **trabeculae carneae**?

5. Watch the video in Module 29.9 Heart Chambers and view Module 29.10 Heart Chamber Functions to answer the following questions:

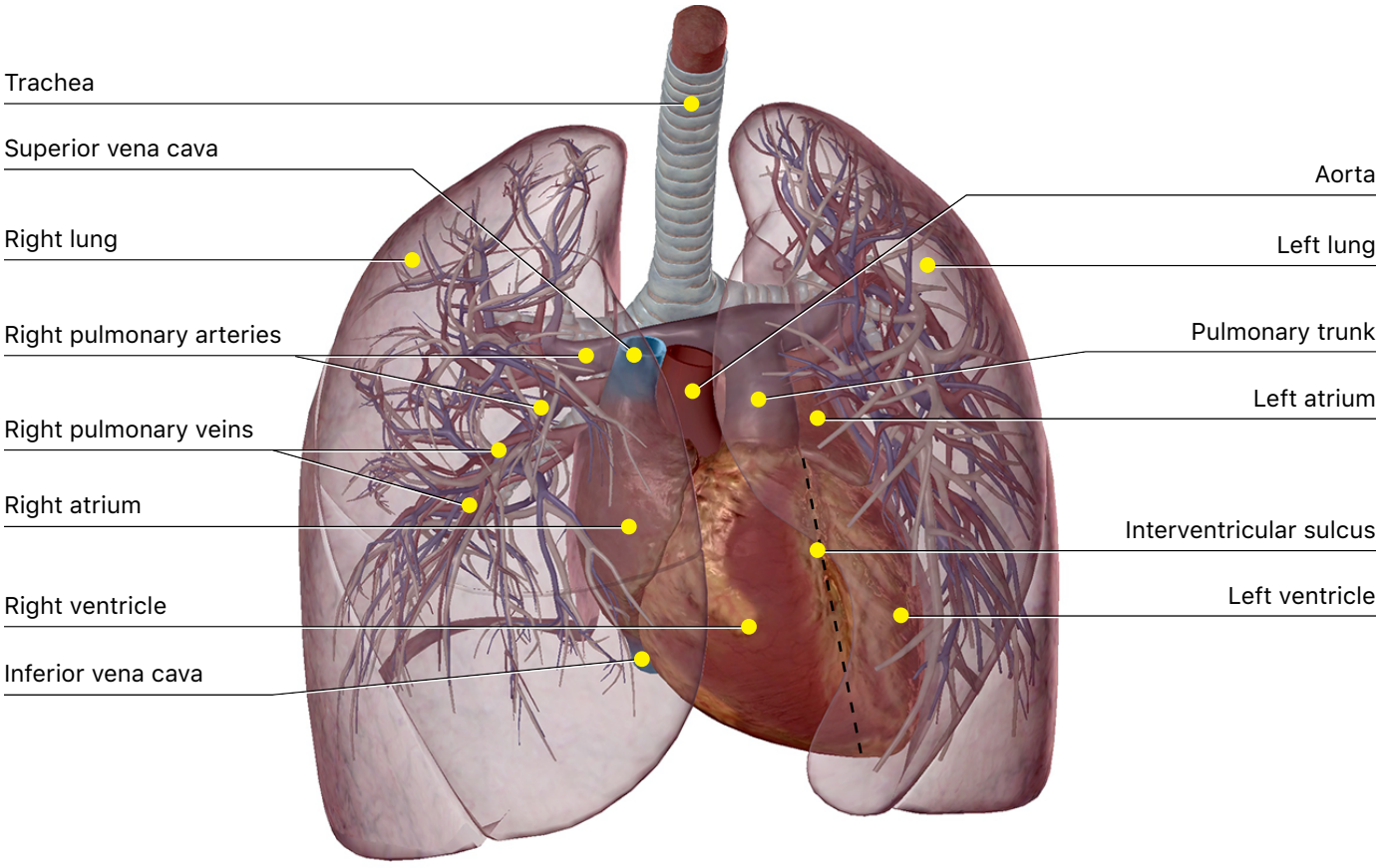
a. What is the oxygen quality of blood pumped by the right atrium and the right ventricle?

b. Blood leaving the right ventricle flows to the _____ for _____.

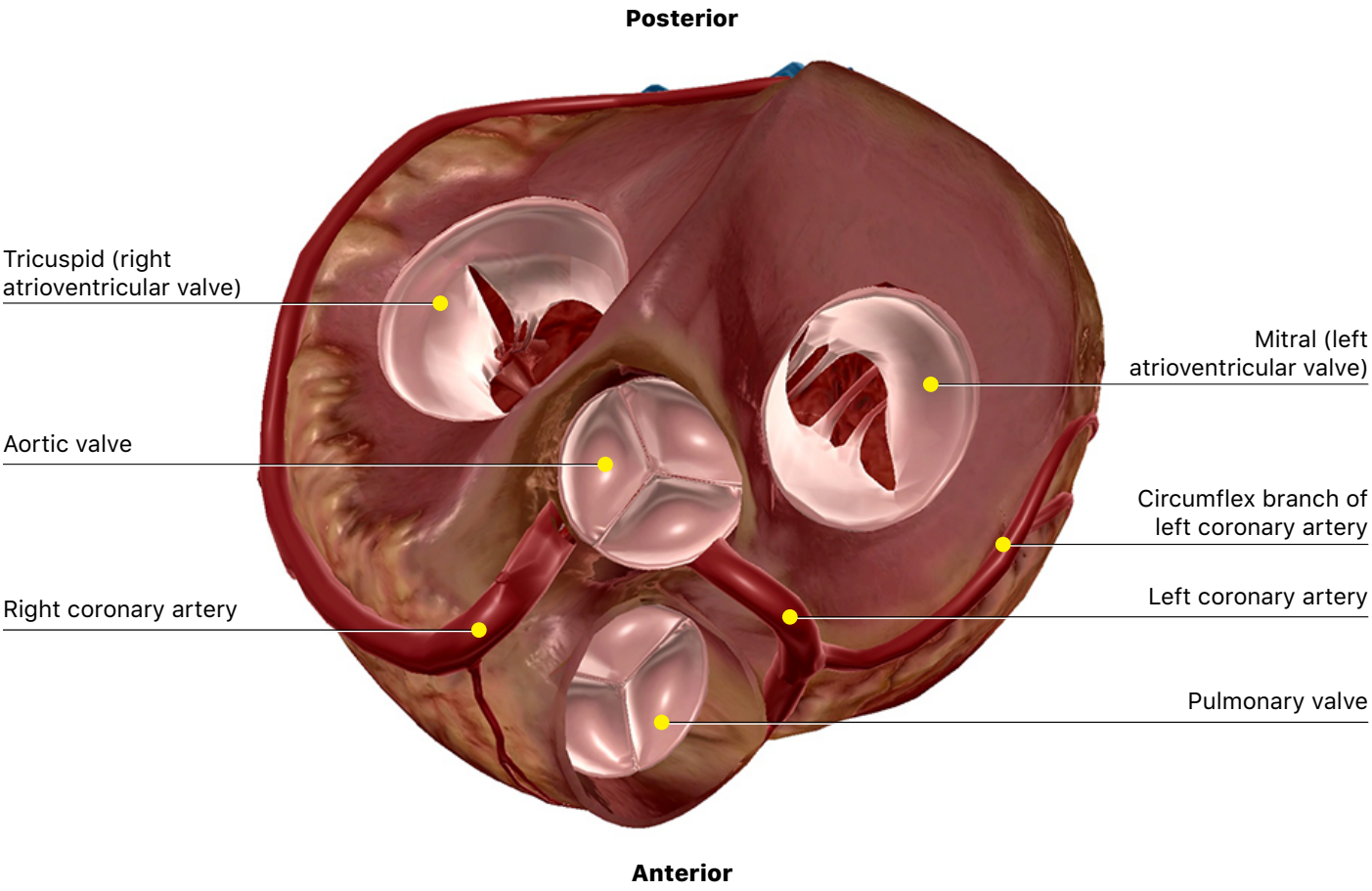
c. What is the oxygen quality of blood pumped by the left atrium and the left ventricle?

d. Blood leaving the left atrium flows through systemic arteries with the purpose of _____.

e. In Module 30.13 Pulmonary Arteries and Veins, click on the **aorta**, and select "fade others." Rotate the heart, and identify which of the four heart chambers the aorta will receive blood from:



Modules 29.11 Heart Valve Anatomy, 29.12 Heart Valves, and 29.13 Heart Valve Function



6. Watch the video in Module 29.12 Heart Valves, and view Modules 29.11 Heart Valve Anatomy and 29.13 Heart Valve Function to answer the following questions:

a. What is the alternate name for the **right atrioventricular (AV) valve**? What does this name signify?

b. Blood passes through the right AV valve as it moves from the _____ to the _____.

c. What is the oxygen quality of blood passing through this valve?

d. What is the alternate name for the **left atrioventricular (AV) valve**?

e. Blood passes through the left AV valve as it moves from the _____ to the _____.

f. What is the oxygen quality of blood passing through this valve?

g. Blood passes through the **pulmonary valve** as it moves from the _____to the _____.

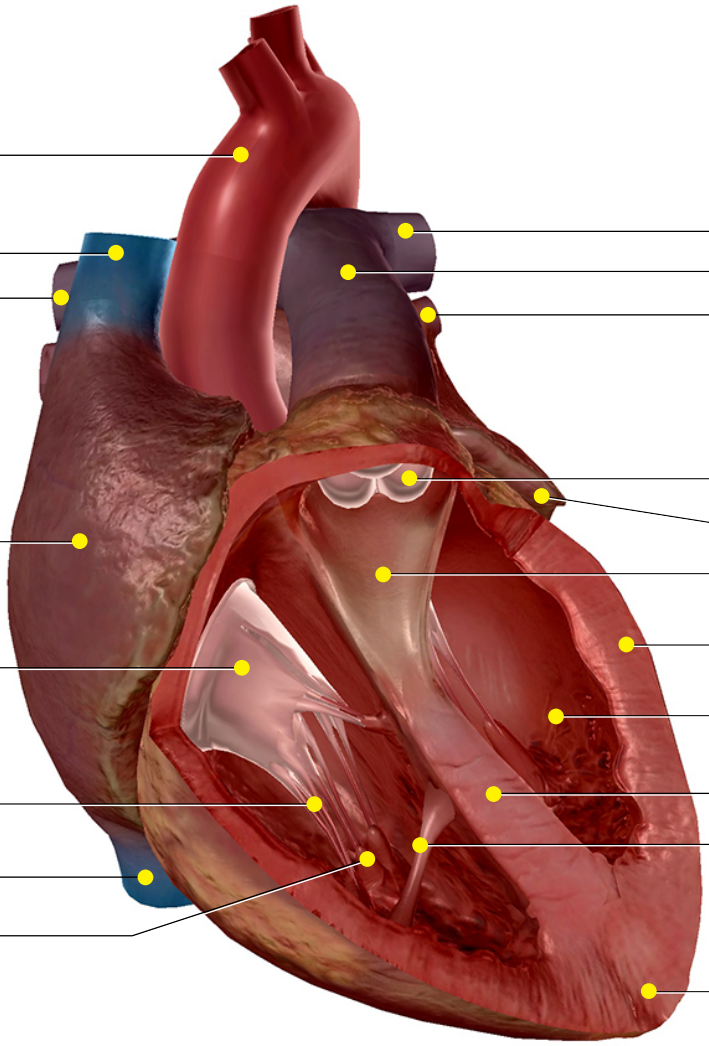
h. What is the oxygen quality of blood passing through this valve?

i. Blood passes through the **aortic valve** as it moves from the _____ to the _____.

j. What is the oxygen quality of blood passing through this valve?

k. Based on your reading and on content from the video, what is the purpose of the four heart valves?

Module 29.14 Heart Internal Anatomy



7. Use Module 29.14 Heart Internal Anatomy to answer the following questions:

a. What is the **interventricular (ventricular) septum**?

b. What conical pouch gives rise to the pulmonary trunk?

c. Which heart chamber contains the **moderator band**?

d. Which heart chambers contain **papillary muscles**?

e. During contraction, the papillary muscles pull on long, fibrous structures known as:

f. What do these **chordae tendineae** prevent?

8. Use Module 30.10 Circulatory Route to answer the following questions:

a. Pulmonary circulation delivers _____ blood from the _____to the _____ and _____ _____ from the _____ to the _____.

b. Systemic circulation delivers _____ blood from the _____ _____ to the _____ and _____ from the _____to the _____.

9. Use Modules 30.11 Pulmonary Circulation, 30.12 Pulmonary Circulation and Bronchi, 30.13 Pulmonary Arteries and Veins, 30.14 Pulmonary Arteries, and 30.15 Pulmonary Veins to answer the following questions:

a. The **pulmonary trunk** is _____ (directional term) to the **aorta**.

b. The **pulmonary trunk** receives _____ blood from the _____.

c. The **right and left pulmonary arteries** convey _____blood from the _____ to the _____ for gas exchange.

d. The **pulmonary veins** return _____ blood from the lungs to the _____ for distribution via systemic circulation to the rest of the body.

e. The **trachea** and the **bronchi** are anterior/posterior *(circle one)* to the heart pulmonary vessels.

10. Use Modules 30.16 System Circulation and 30.17 Great Vessels and Branches to answer the following questions:

a. What quality of blood is transported through **systemic veins**?

i. What quality of blood is transported through systemic arteries?

ii. How does this compare to the quality of blood transported through pulmonary veins and arteries?

b. The **inferior vena cava** returns _____ blood to the _____(name a specific heart chamber).

c. The **superior vena cava** returns _____ blood to the _____(name a specific heart chamber).

d. From earlier material, which chamber does the **coronary sinus** return blood to?

e. The **aorta** is the largest artery in the body.

i. The **aortic arch** receives _____ blood from the _____ traveling through the _____valve.

ii. List the three arterial branches of the aortic arch:

_____

_____

_____

iii. The aortic arch is renamed the **descending aorta** as it passes the _____.

iv. The region of the **descending aorta** that supplies blood to the thorax and the abdomen is the _____.

v. The **thoracic aorta** continues as the _____ and functions as the main trunk supplying the abdomen.

PUTTING IT ALL TOGETHER:

A. Watch the video in Module 29.26 Cardiac Cycle and fill in the blanks using information obtained in the earlier parts of the lab exercise. For added practice, identify anatomic structures on lab models of preserved specimens while walking through the cycle.

1. While the right atrium is relaxed, it will fill with _____blood from which three structures associated with the systemic circuit?

2. As the right atrium contracts, it will propel this blood through the open _____ valve and into the _____ (heart chamber). As this heart chamber fills, rising pressure will cause the right AV valve to open/close (circle one), while the pulmonary valve will open/close (circle one).

3. Blood passing through the open pulmonary valve will enter the pulmonary trunk/aorta (circle one), and pass through the right and left pulmonary arteries/veins (circle one) on its way to the lungs.

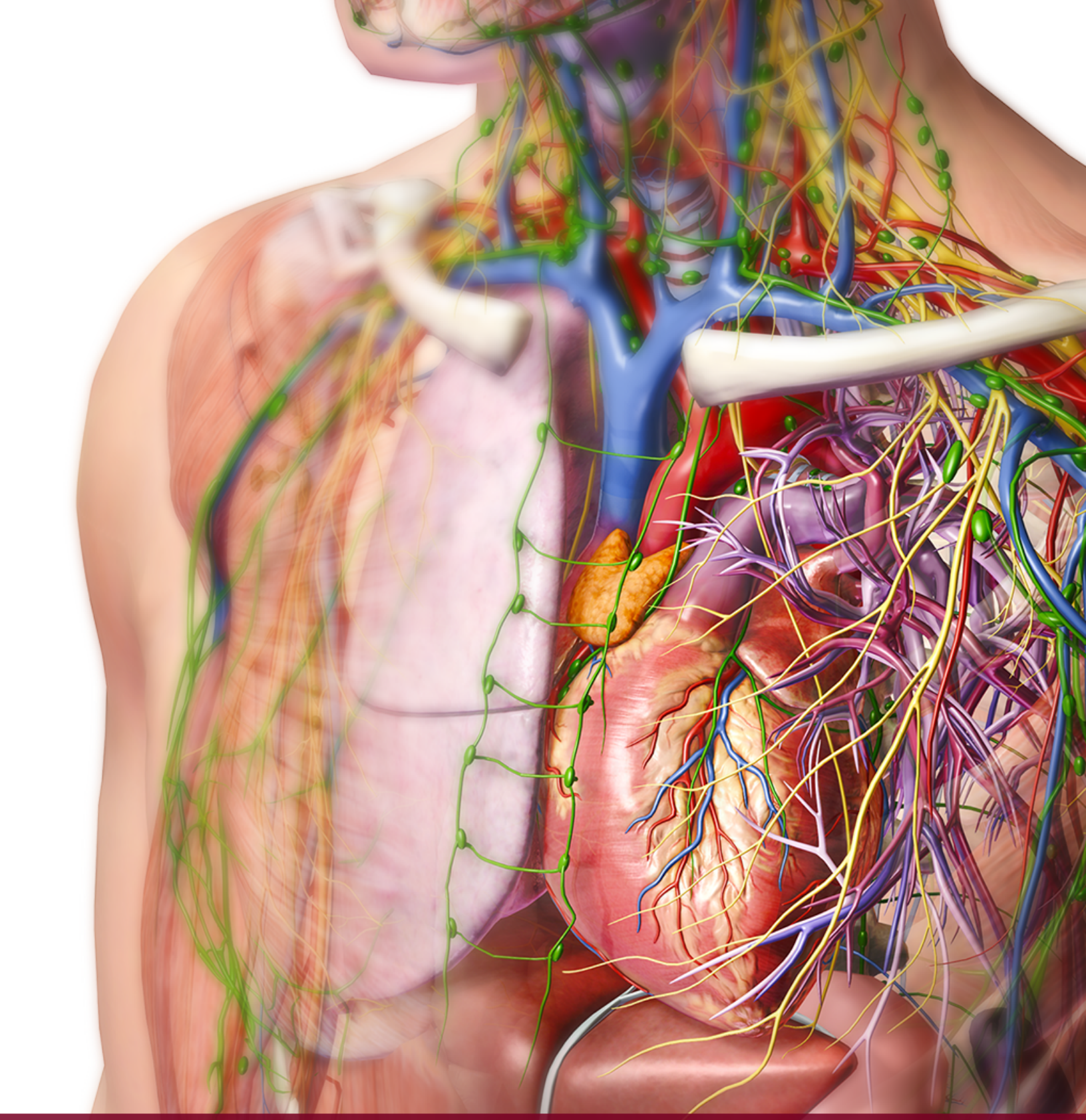
4. Gas exchange will occur in the lungs, allowing _____ blood to return to the heart. This cycle of circulation is known as _____ circulation.

5. Blood will return to the heart through the pulmonary arteries/veins (circle one).

6. These pulmonary veins will empty _____ blood into the right atrium/left atrium (circle one).

7. As the left atrium contracts, blood will be propelled through the open _____ valve and into the _____ (heart chamber). As this heart chamber fills, rising pressure will cause the left AV valve to open/close (circle one), while the aortic valve will open/close (circle one).

8. Blood passing through the open aortic valve will enter the _____ on its way to supplying body tissues. This is the beginning of what is known as _____ circulation.

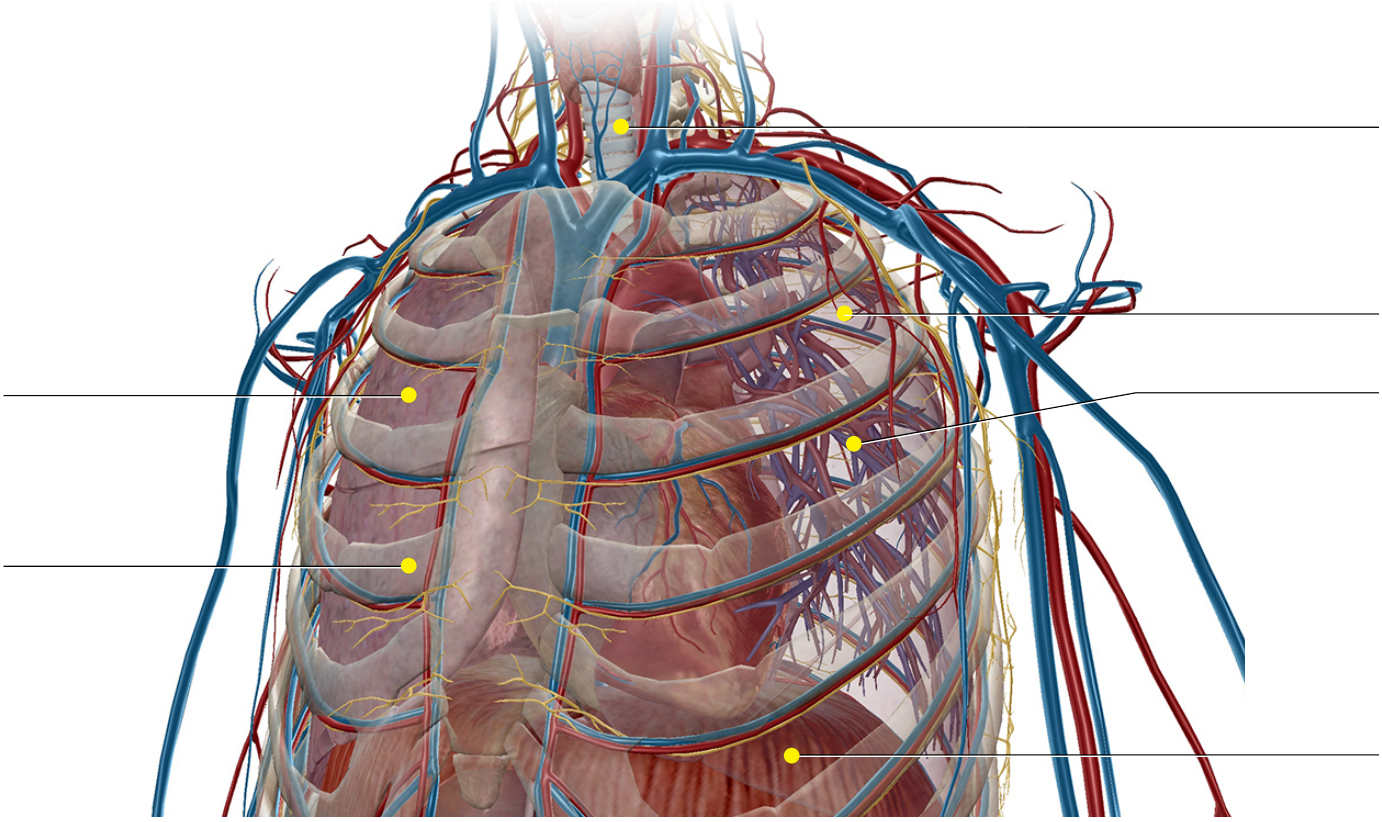


VISIBLE BODY®

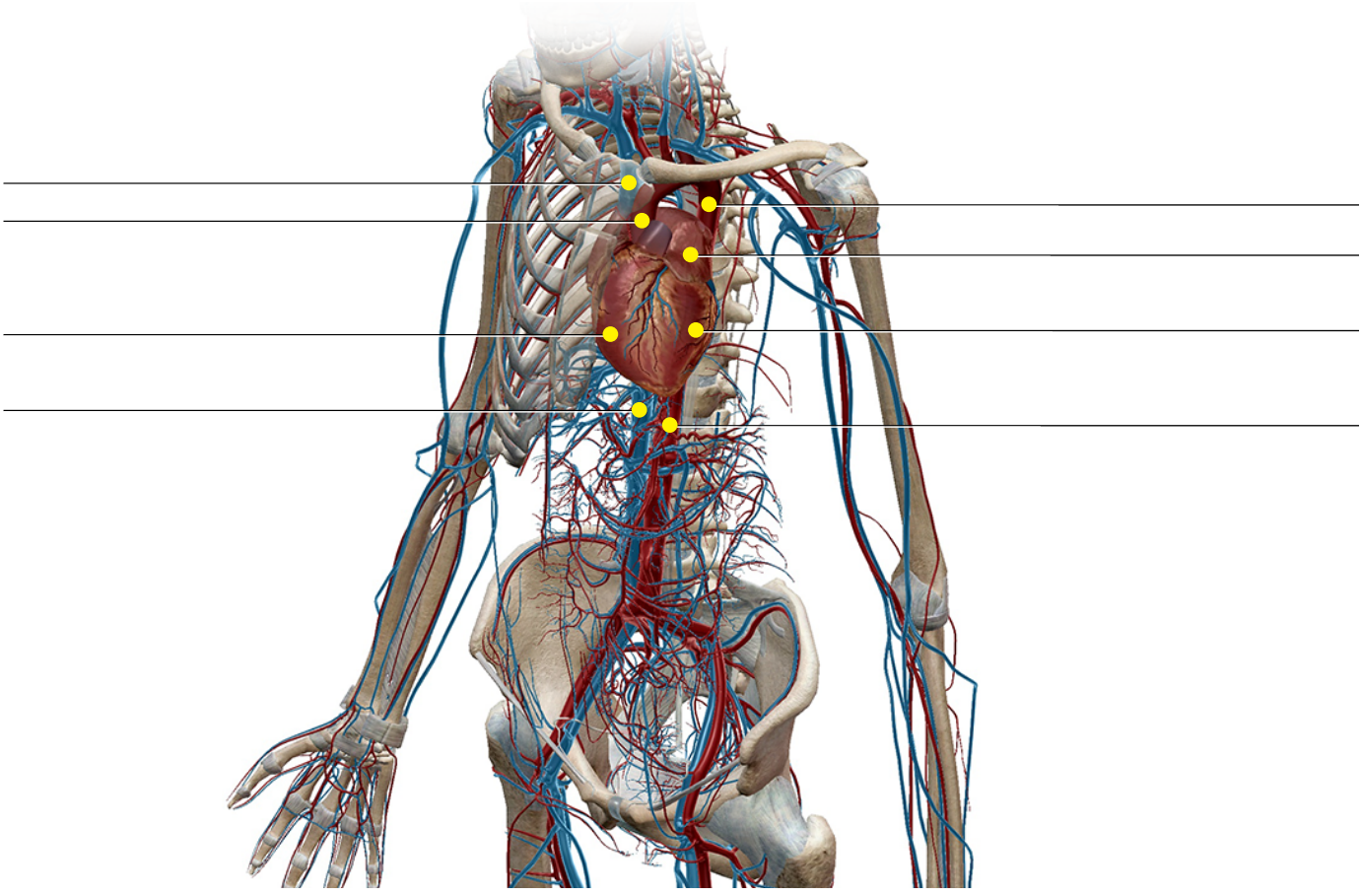
Student Practice

Label the structures in the following figures.

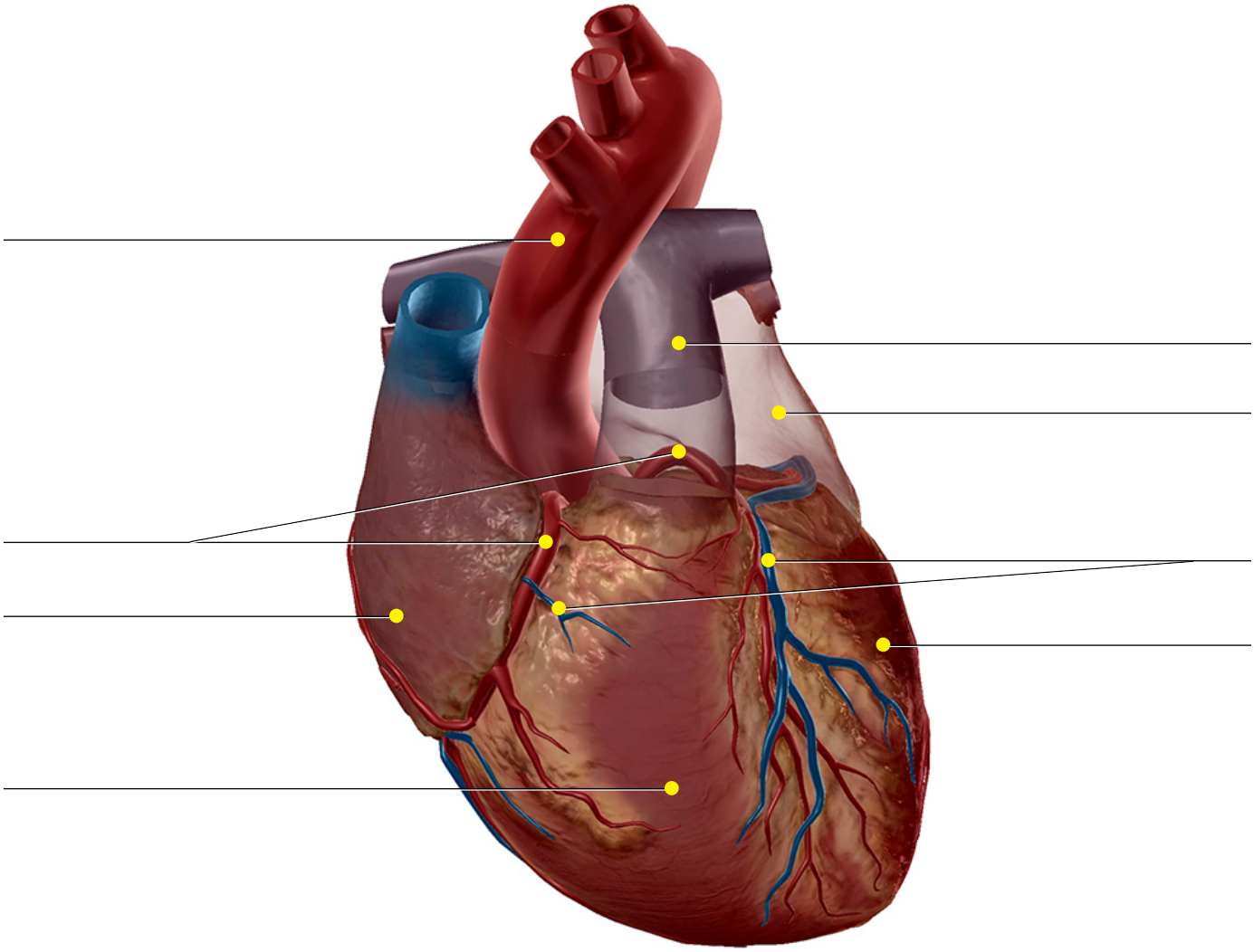
Modules 29.2 Location of Heart in the Thoracic Cavity, 29.3 Location of Heart in the Thoracic Cage, and 29.4 Inferior View of Thoracic Cavity, Transverse Section



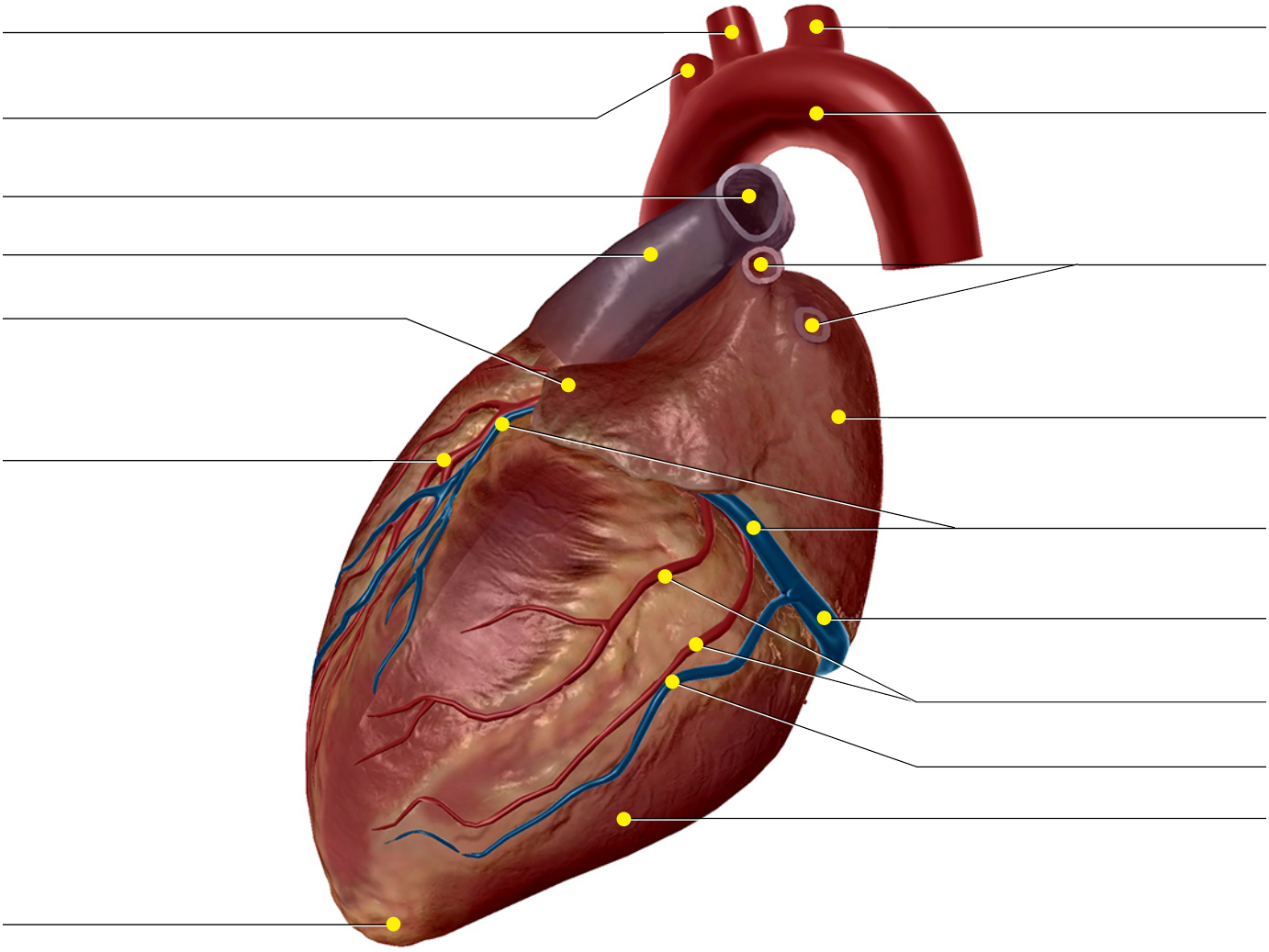
Module 30.16 Systemic Circulation



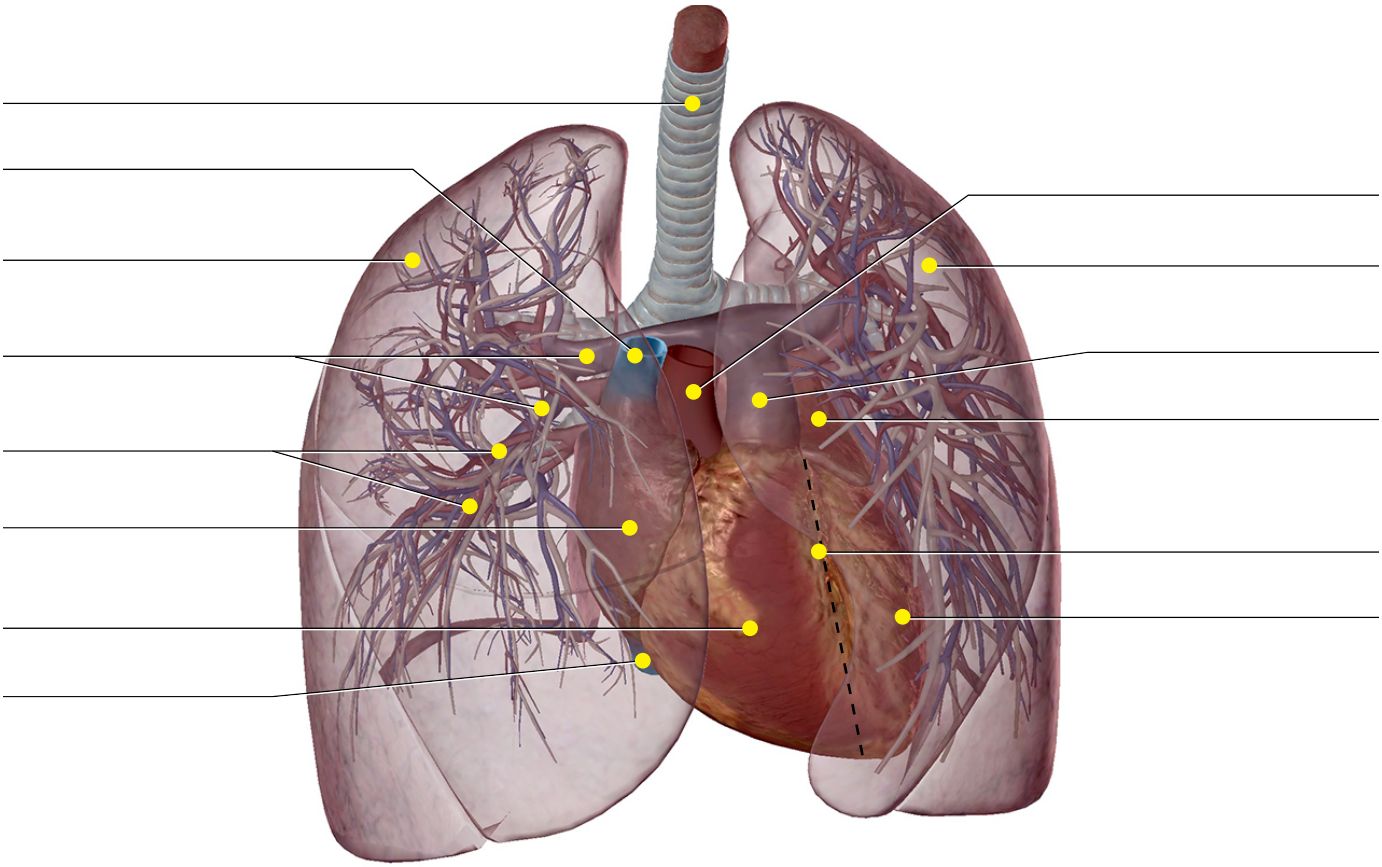
Module 29.18 Coronary Circulation



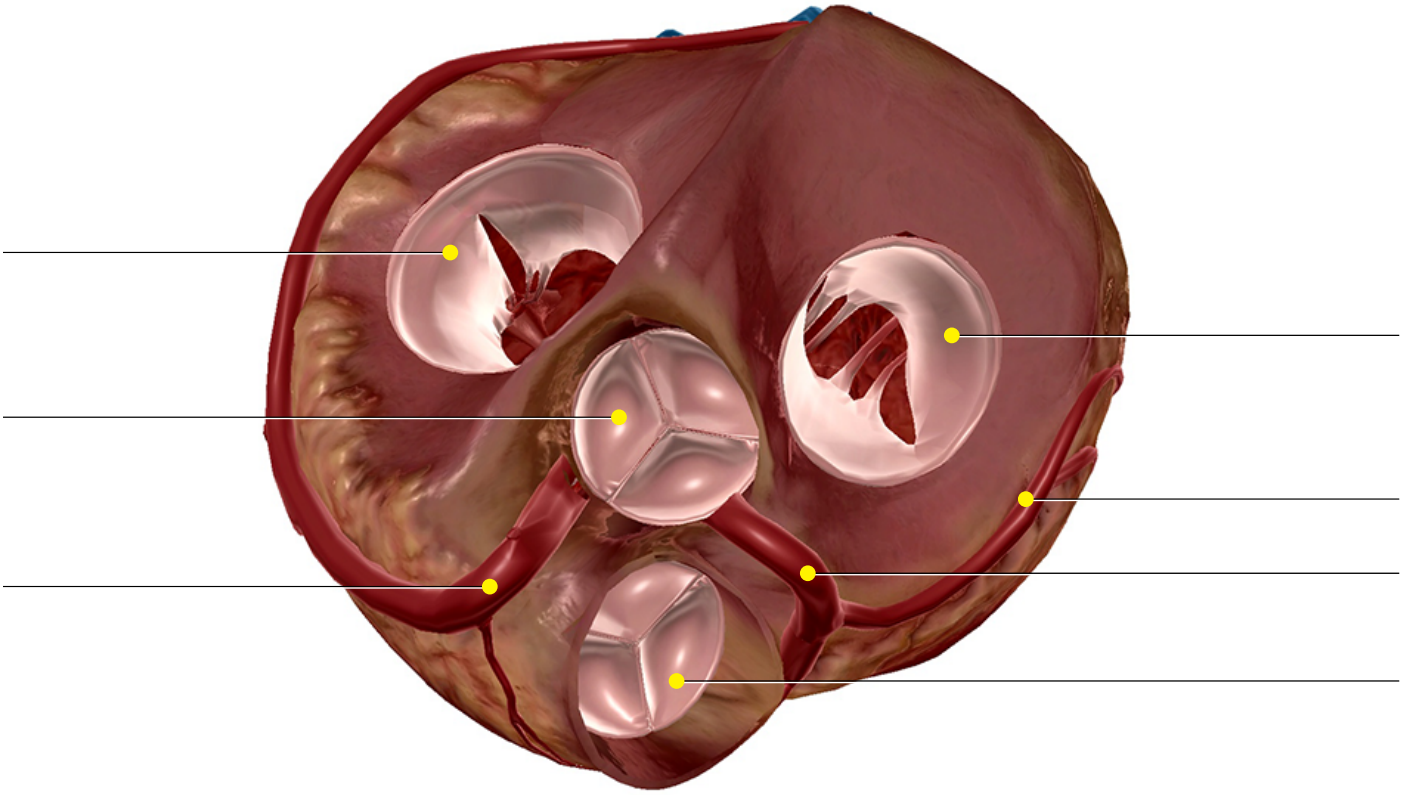
Modules 29.18 Coronary Circulation, 29.19 Coronary Veins, and 29.20 Coronary Arteries



Module 30.13 Pulmonary Arteries and Veins



Module 29.11 Heart Valve Anatomy, 29.12 Heart Valves, and 29.13 Heart Valve Function



Module 29.14 Heart Internal Anatomy