

Blood Vessels

A circulatory system lab activity using Visible Body's Human Anatomy Atlas

**Blythe Nilson, Associate Professor of Biology,
University of British Columbia Okanagan**

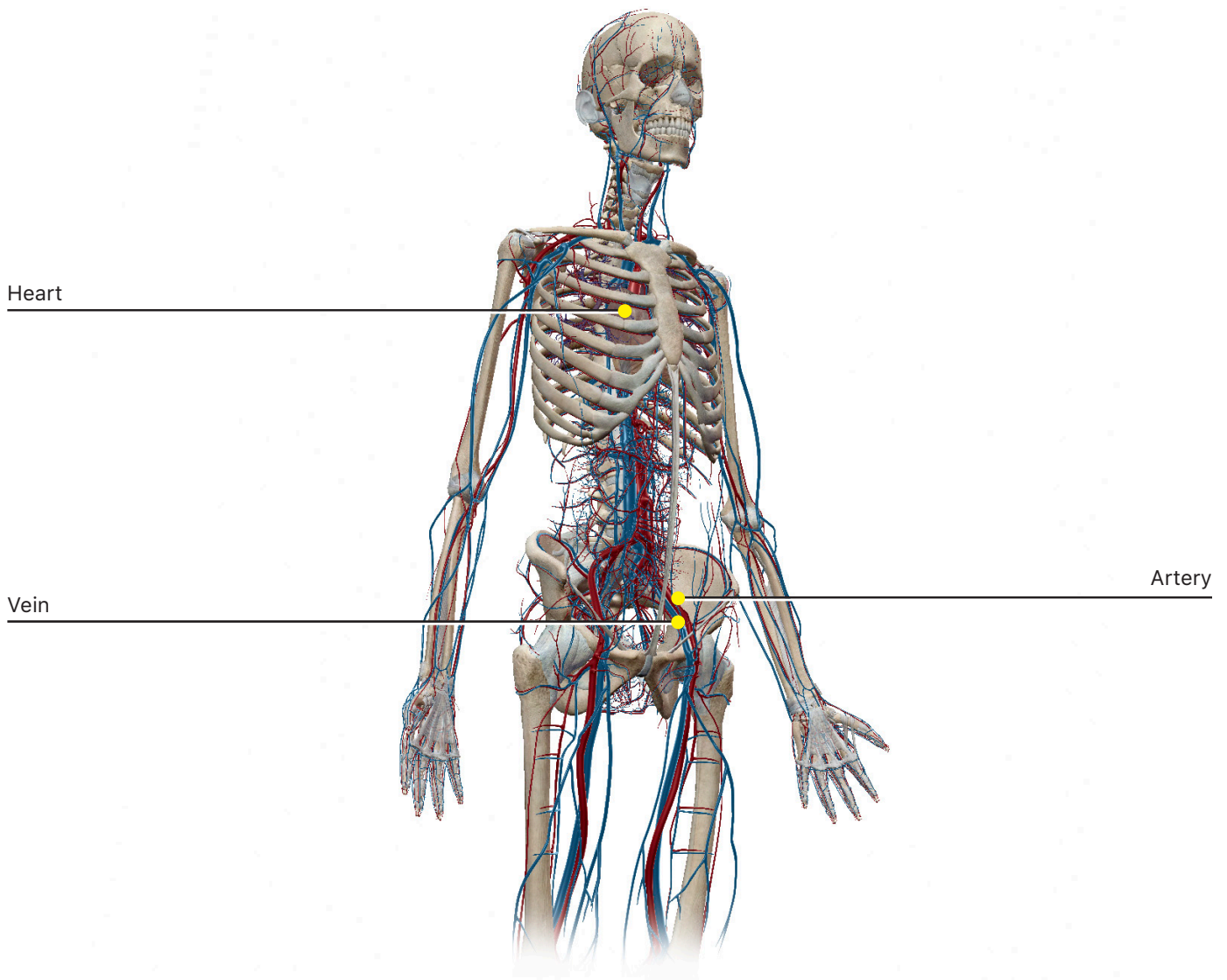
PRE-LAB EXERCISES

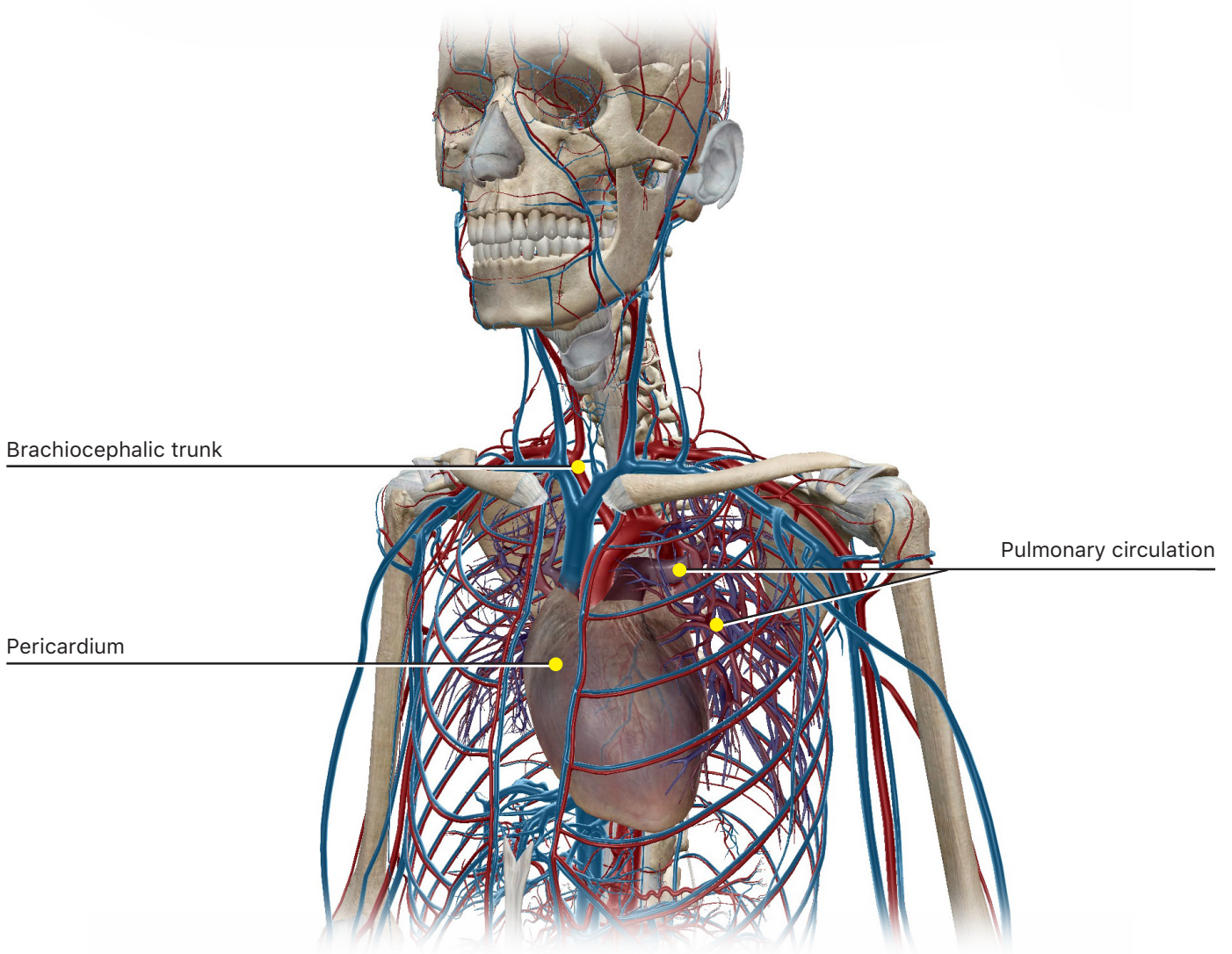
Open the Atlas app. From the Views menu, go to System Views and scroll down to Circulatory System Views.

You are responsible for the identification of all **bold terms**.

A. Circulatory System Overview

In the Circulatory System Views section, select View 1. Circulatory System. The skeletal system is included in this view. Note that blood vessels travel throughout the entire body.





1. Where would you find the **blood vessels** with the largest diameter?

2. Select a few vessels in the leg and read their names. The large blue-colored vessels are _____ and the large red-colored vessels are _____.

3. In the system tray on the left side of the screen, deselect the skeletal system icon to remove the skeletal system structures from the view. The largest **arteries** and **veins** are all connected to the _____.

4. Select the **heart** to highlight the pericardium. Use the Hide button in the content box to hide the pericardium from the view and observe the heart muscle and the **vasculature** of the heart.

a. What is the largest artery that supplies the heart?

b. What are the two large, blue-colored veins that enter the right side of the heart?

c. What is the large, red-colored artery that exits from the top of the heart?

5. Select any of the purple-colored branching vessels inside the rib cage and use the arrow in the content box to find and choose **Pulmonary circulation** from the hierarchy list. This will highlight the circulatory route that takes **deoxygenated blood** to the **lungs** and returns **oxygenated blood** back to the heart. The largest of these vessels, the _____, immediately branches into the right and left _____ as it leaves the heart.

6. Make sure the pericardium is still hidden, and then select the **aorta**. Use the arrow in the content box to find and choose **Great vessels** from the hierarchy list. How many great vessels are there and what are their names? *Hint: You may have to move the view around and observe it from all angles to see all the great vessels.*

7. By definition, _____ carry blood away from the heart and _____ carry blood to the heart. *Hint: Select any vein, use the up-arrow in the content box to find and choose Veins from the list, and use the book icon to read the definition. Do the same for arteries.*

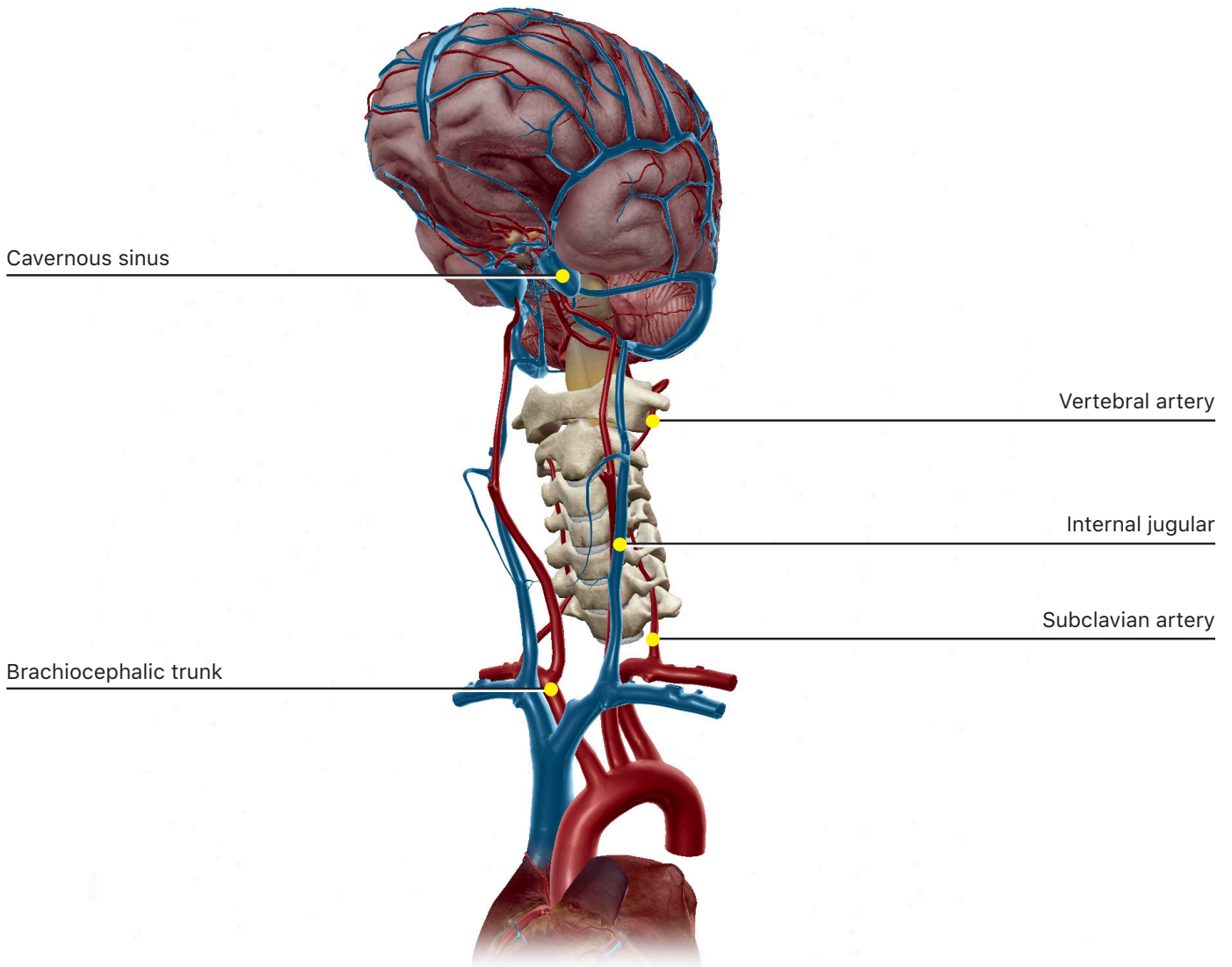
IN-LAB EXERCISES

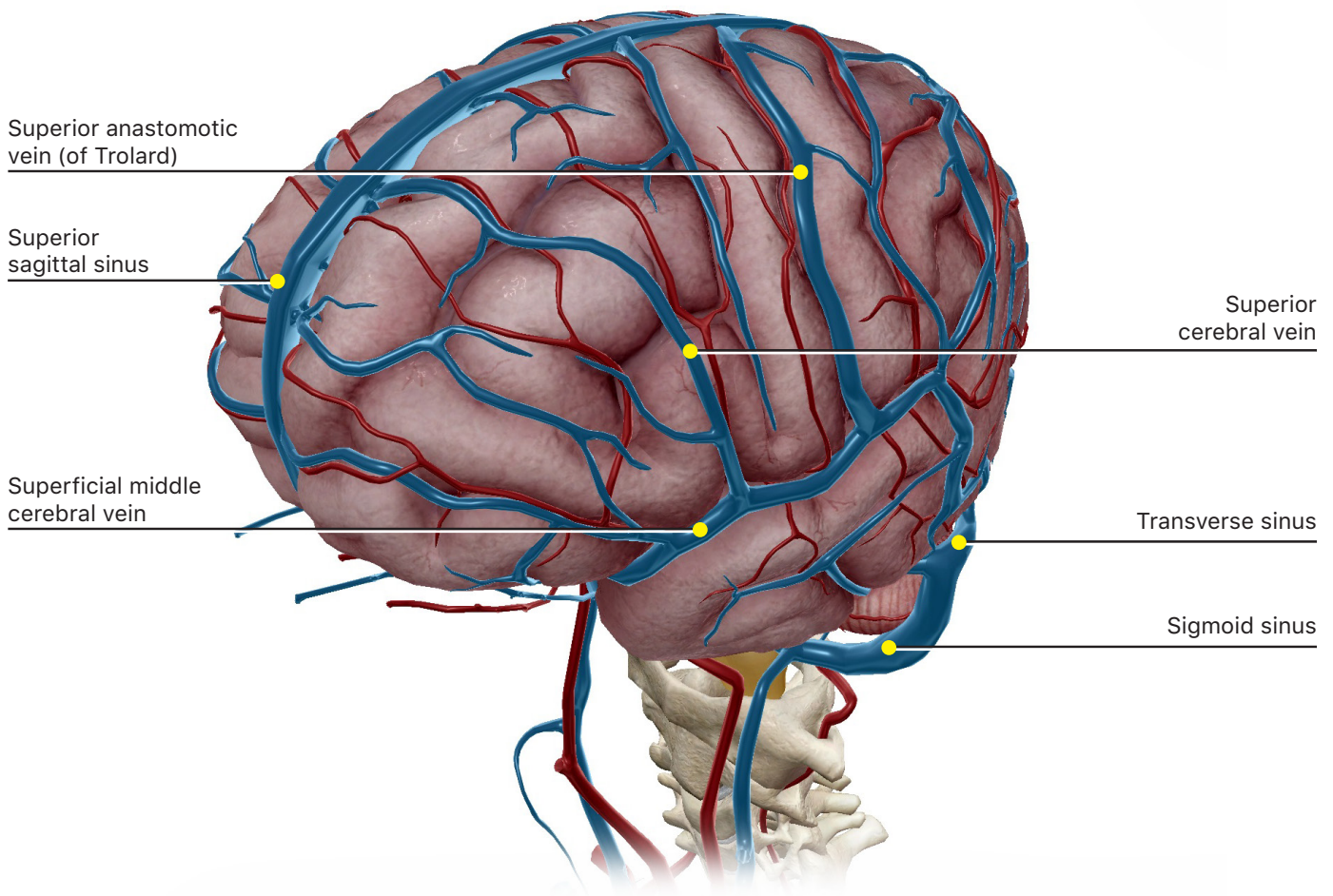
Open the Atlas app. From the Views menu, go to System Views and scroll down to the Circulatory System Views.

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

A. Vasculature of the Brain and the Circle of Willis

In the Circulatory System Views section, select View 3. Vasculature of the Brain. Use this view to answer the following questions.





1. Which three arteries branch from the aorta to supply the head?

2. The **brachiocephalic trunk** branches into the _____ and _____ arteries.

3. Branches of the **subclavian arteries** travel through foramina in the transverse arches of the cervical vertebrae on their way to the head. What are these branches called?

a. Follow one of the **vertebral arteries** to the point where it enters the skull. Rotate the view to observe it from the side and select the skeletal system icon in the system tray on the left side of the screen to show the whole skeletal system in the view. Note the sharp curves made by the vertebral artery as it leaves the axis and enters the skull. This is of clinical significance because this region of the artery is easily torn during overstretching, manipulation, or trauma.

4. Refresh the view and rotate it to observe the superior portion of the brain. What is the unpaired, large vessel that drains blood from the brain?

a. Where is this chamber located?

b. **Dural sinuses** are channels between the layers of the dura mater that contain venous blood. They are larger in diameter than regular veins and are often referred to as chambers.

5. Locate one of the **superior anastomotic veins** (of Trolard). **Anastomoses** are connected vessels that form a network, providing alternate blood supply routes. These veins lie between which two lobes of the brain?

6. Select any of the veins that parallel the superior anastomotic veins. This group of veins is called _____ . The regions of the brain that are drained by these veins are the _____ .

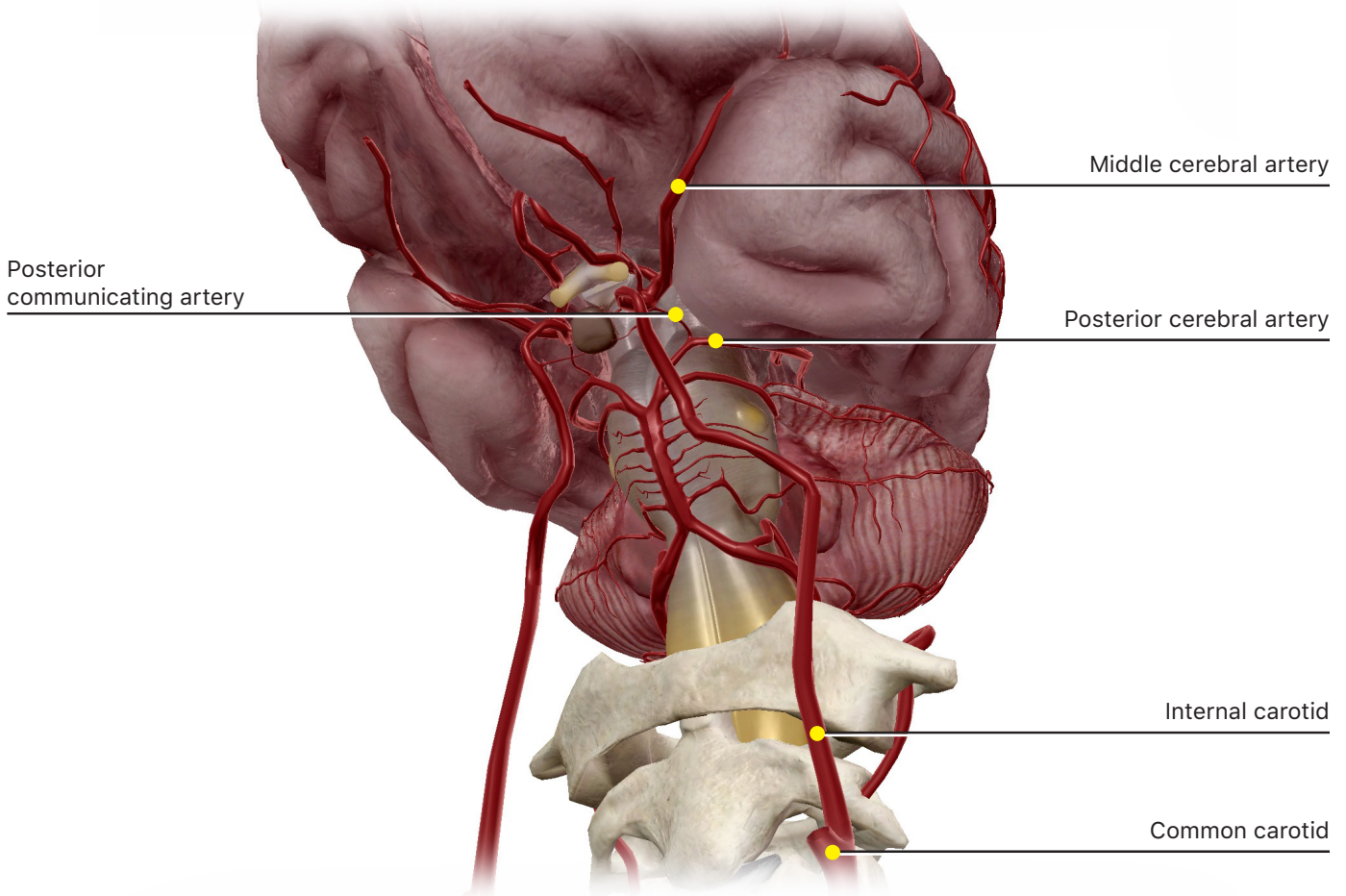
7. The superior anastomotic veins and the **superior cerebral veins** join to form the **superficial middle cerebral vein** and the _____ , which drain into the _____ .

8. Posteriorly, the **transverse sinuses** and the **superior sagittal sinus** meet at the _____ , which drains into the _____ , which in turn drains into the _____ .

9. The **sigmoid sinuses** are located near the posterior lobes of the _____ .

10. Rotate the view to observe the anterior structures. Locate the large, paired **cavernous sinuses**. They receive blood from the ophthalmic region. Blood from the cavernous sinuses travels through two petrosal sinuses and the sigmoid sinus to drain into the _____ . In the system tray on the left side of the screen, select and deselect the skeletal system icon to add and remove the skeletal system structures from the view and observe where the **internal jugular veins** leave the skull and enter the neck.

Go back to the Circulatory System Views and select View 4. Circle of Willis. Use this view to answer the following questions.



1. Locate the **common carotid arteries**. Branches of these arteries, the _____, travel through the neck and enter the skull.
2. Rotate the view to observe the network of arteries on the inferior side of the brain. The circle formed by anastomosing arteries at the base of the brain is the _____.
3. The **vertebral arteries** join to form the _____, which sends off several small branches, called _____, to the pons. The anterior inferior cerebellar arteries, which branch from the _____, and the posterior inferior cerebellar arteries, which branch from the _____, supply the _____.
4. Each **internal carotid artery** ends by forming several branches, the largest of which is the _____. Other branches travel inferior to the frontal lobes to supply the eyes. These are the _____.

5. The anterior portion of the **circle of Willis** is formed by the _____, which travels between the right and left frontal lobes. These paired arteries are joined at the anterior-most part of the circle of Willis by the _____. Locate the **posterior communicating artery**, which joins the **posterior cerebral artery** to the **middle cerebral artery**.

6. Rotate the view to observe the many collateral routes formed by the circle of Willis.

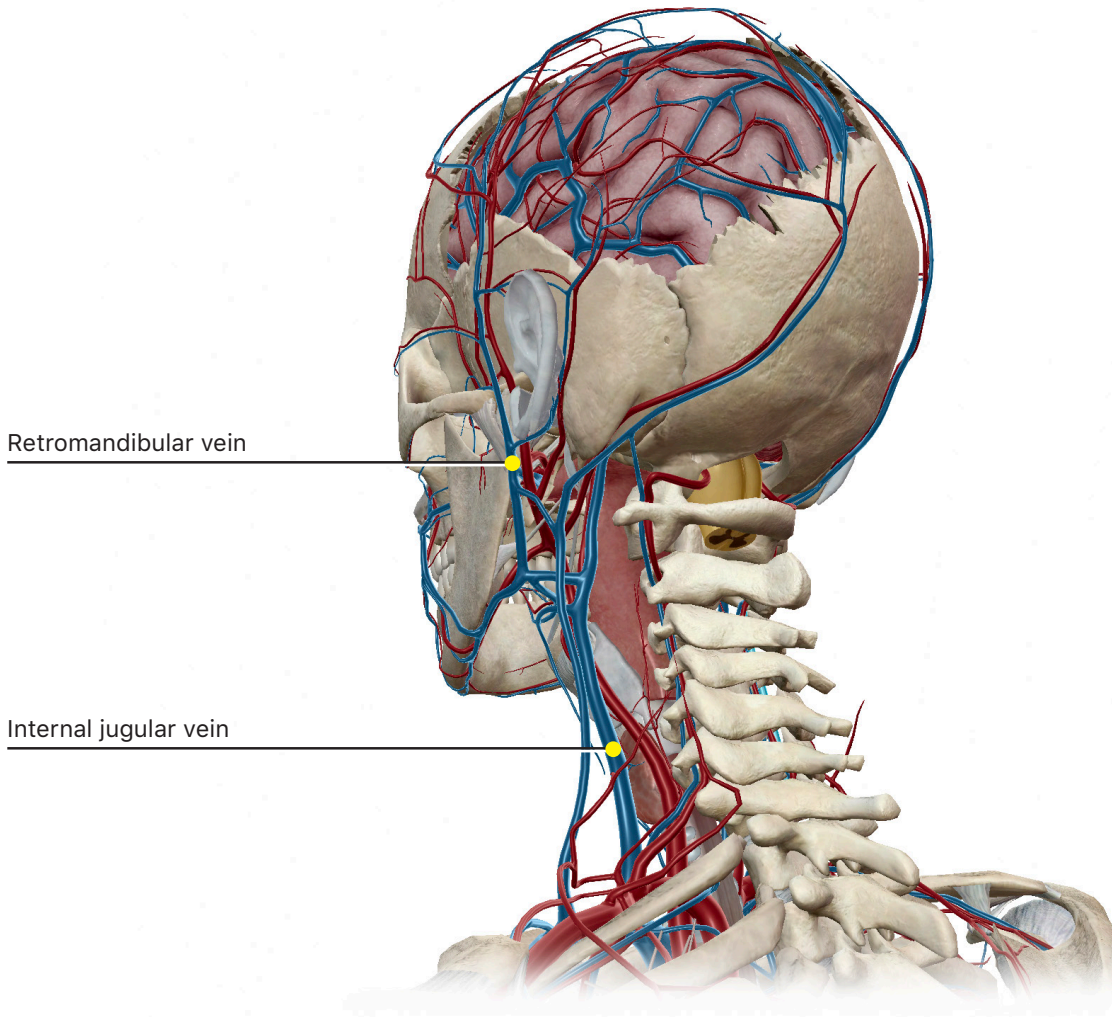
a. What prominent landmark of the nervous system is enclosed by the circle of Willis?

b. Which endocrine system landmark is enclosed by the circle of Willis?

7. Rotate the view to observe the superior surface of the brain. Branches from the circle of Willis supply the entire brain. Two pairs of large arteries, the _____ and _____ arteries, travel in the longitudinal fissure between the two hemispheres. From these two pairs of arteries, several sets of arteries travel laterally across the brain to join the middle _____. Their branches supply the cerebrum.

B. Carotid and Jugular Vessels

In the Circulatory System Views section, select View 5. Carotid and Jugular. Use this view to answer the following questions.

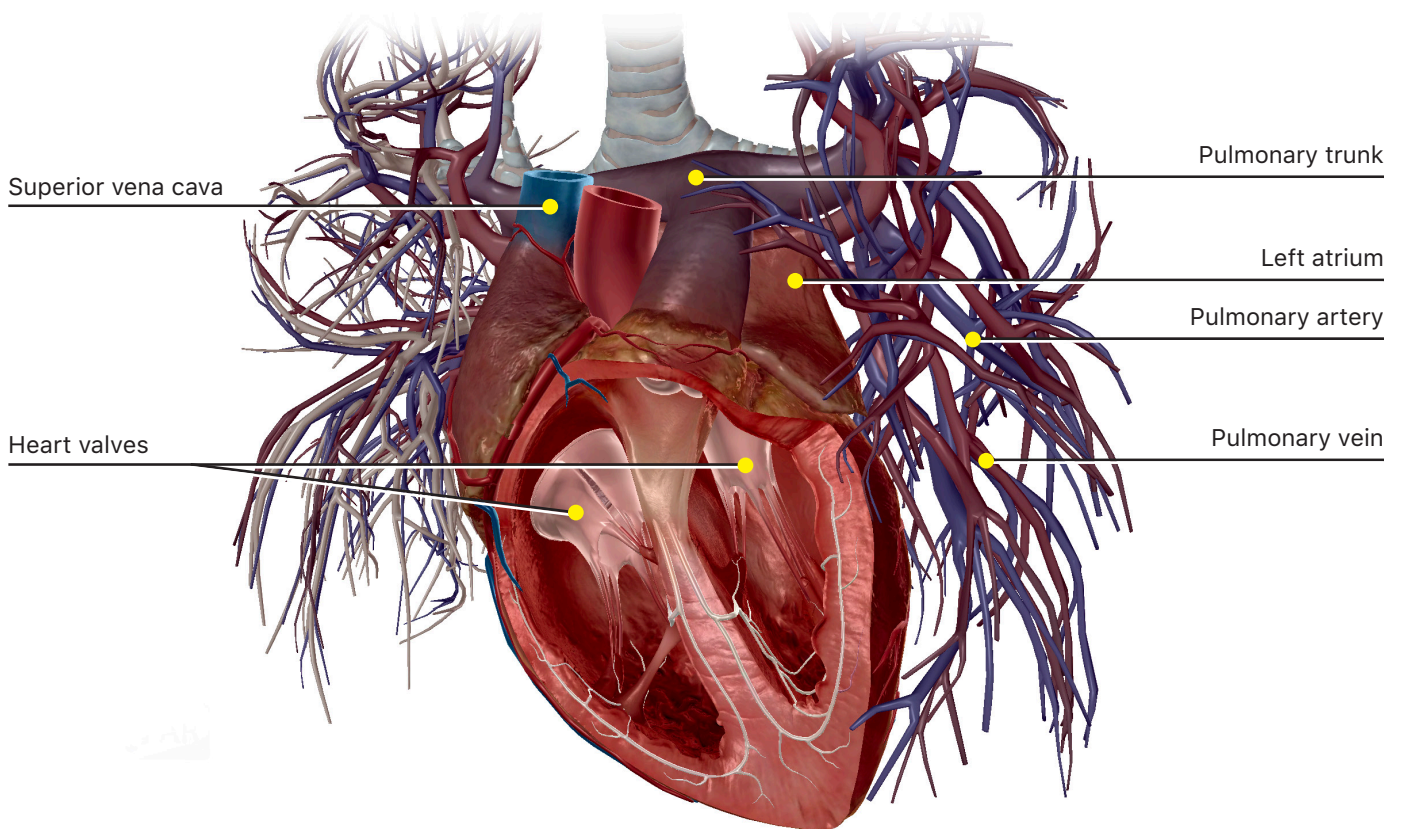


1. Locate the two large **internal jugular veins** that leave the skull and travel down the neck. Each one exits the skull through a space between the temporal and occipital bones called the _____.
2. External to the skull, the posterior portion of the scalp is drained by the paired _____.
3. The sides of the scalp are drained by the _____, which pass over the temporal bones in front of the ears, and the _____, which pass behind the ears. These veins join to form the **retromandibular vein**.
4. The occipital veins and branches of the retromandibular vein join to travel down the outside of the neck as the _____.

5. The external jugular veins drain into the _____ and the **internal jugular veins** drain into the _____.
6. Locate the veins that travel with the vertebral arteries through the transverse foramina of the cervical vertebrae. These are the _____.

C. Pulmonary and Azygos Circulation

In the Circulatory System Views section, select View 6. Pulmonary. Use this view to answer the following questions.



1. Select any of the purple-colored branching vessels, use the arrow in the content box to find and choose Pulmonary circulation from the list, and use the book icon to read the definition. Pulmonary circulation travels between the _____ and the _____.
2. Rotate the view to observe the great vessel that leaves the heart and splits into two branches, one for each lung. Before it branches, this vessel is called the _____, and its branches are called _____.

3. While viewing the posterior side of the heart, select the large surface of the lower heart to highlight the sternocostal surface. Use the Hide button in the content box to hide this surface and rotate the view to observe the opening to the **pulmonary trunk**.

a. Which heart chamber pumps blood into the pulmonary trunk?

b. Which **valve** controls backflow of blood from the pulmonary trunk into the heart?

4. Once inside the lungs, these arteries split into increasingly smaller branches that eventually reach the **pulmonary capillary beds**, which wrap around the alveoli of the lungs. This is the site of

_____.

5. The **pulmonary arteries** are unique because they are the only arteries that carry _____ . Therefore, they are colored purple, not red, in the view.

6. Why are the **pulmonary veins** colored a dark shade of purple, instead of blue like the **superior vena cava**, in this view?

7. Select the left lung and use the Hide button in the content box to hide it. If you want to hide the trachea and bronchi as well, deselect the respiratory system icon in the system tray on the left side of the screen to remove these structures from the view. Rotate the view to observe it from the back and locate the four veins, two on each side, that return blood from the lungs to the heart.

a. What are the upper veins called?

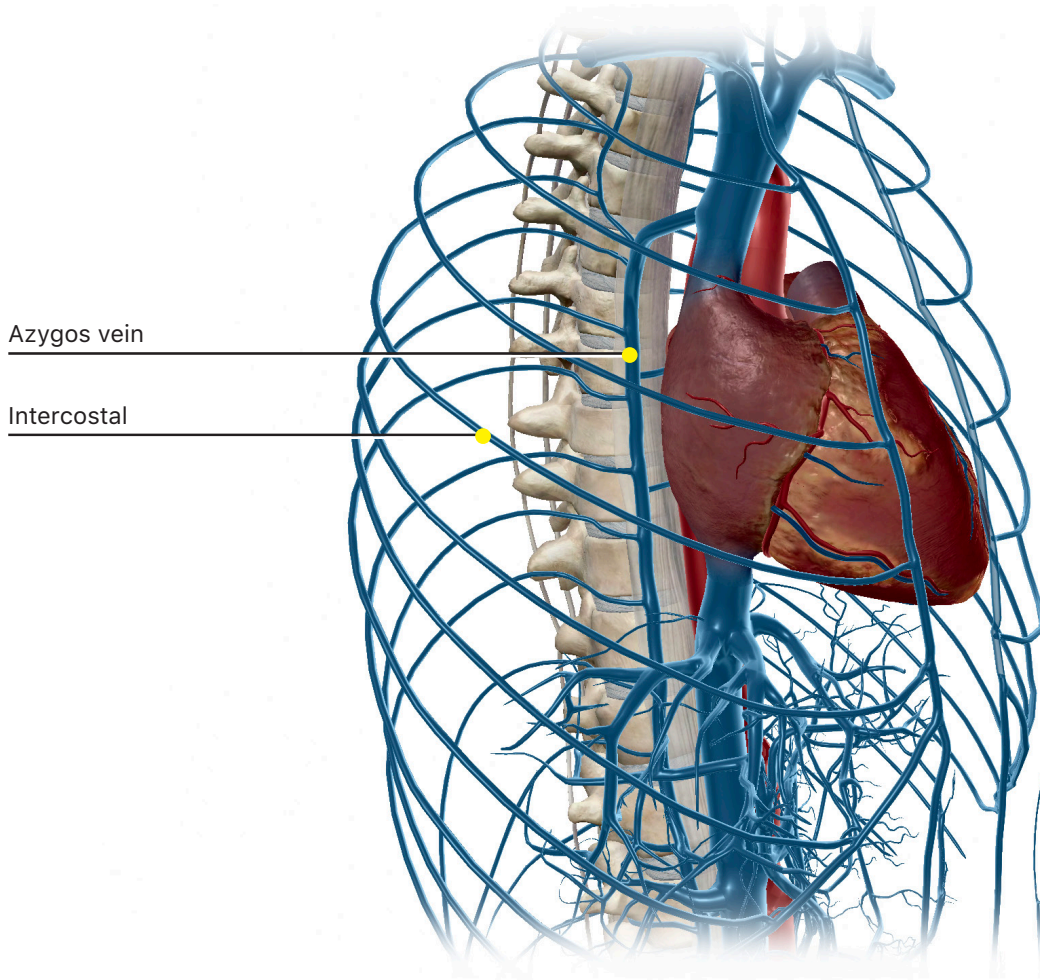
b. What are the lower veins called?

c. Which heart **chamber** collects blood from all four of these veins?

TIME TO PRACTICE!

GO TO THE CIRCULATORY SYSTEM QUIZZES AND TAKE QUIZ 1 HEAD AND NECK, QUIZ 11 HEAD AND NECK, QUIZ 2 CIRCLE OF WILLIS, AND QUIZ 20 PULMONARY CIRCULATION .

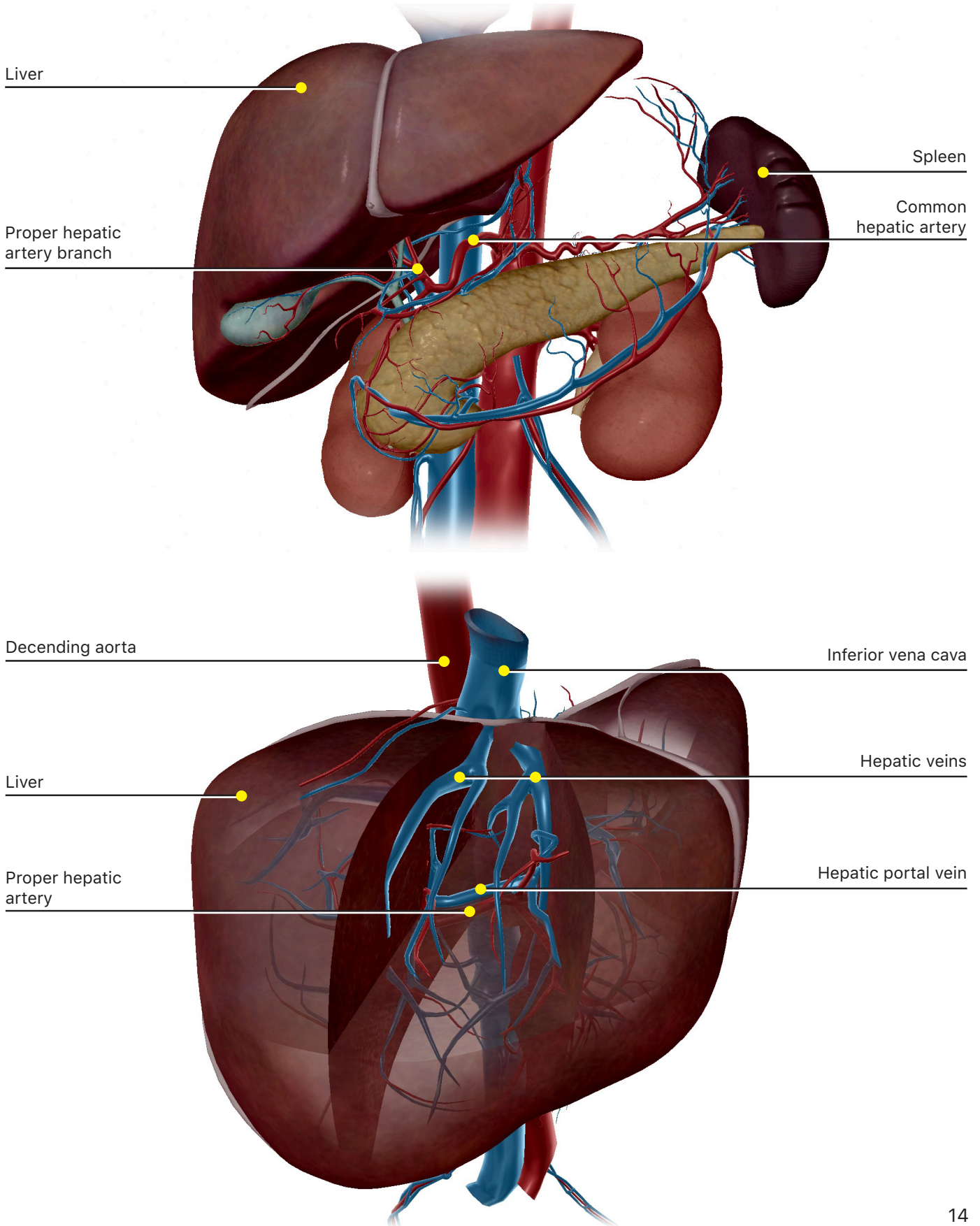
Go back to the Circulatory System Views and select View 8. Azygos System. Use this view to answer the following questions.



1. Locate the unpaired **azygos vein** running parallel to the inner surface of the spinal column. Pairs of _____ extend from the azygos vein, following the ribs to the front of the chest.
2. Anteriorly, these parallel veins connect to the left and right _____, which run up and down the front of the chest.

D. Liver and Lower Digestive System Circulation

In the Circulatory System Views section, select View 10. Liver Circulation. Use this view to answer the following questions.



1. Locate the **common hepatic artery** as it branches from the abdominal aorta. This artery and its branches supply six organs. What are they?

-
-
-
-
-
-

2. Select the **spleen** and use the Hide button in the content box to hide it. Rotate the view to observe the arteries that enter the inferior side of the **liver**. The common hepatic artery branch that supplies the liver is the _____. This artery terminates in left and right branches that enter the liver, supplying it with freshly oxygenated blood.

3. Rotate the view to observe the veins that enter the liver from below. Locate the large vein that enters the liver next to the **proper hepatic artery branches**. This vein is the _____.

- a. The **hepatic portal vein** delivers oxygen-depleted blood, which carries food absorbed by the small intestine that will be processed by the liver before entering the heart. Which organs are drained by this vein?

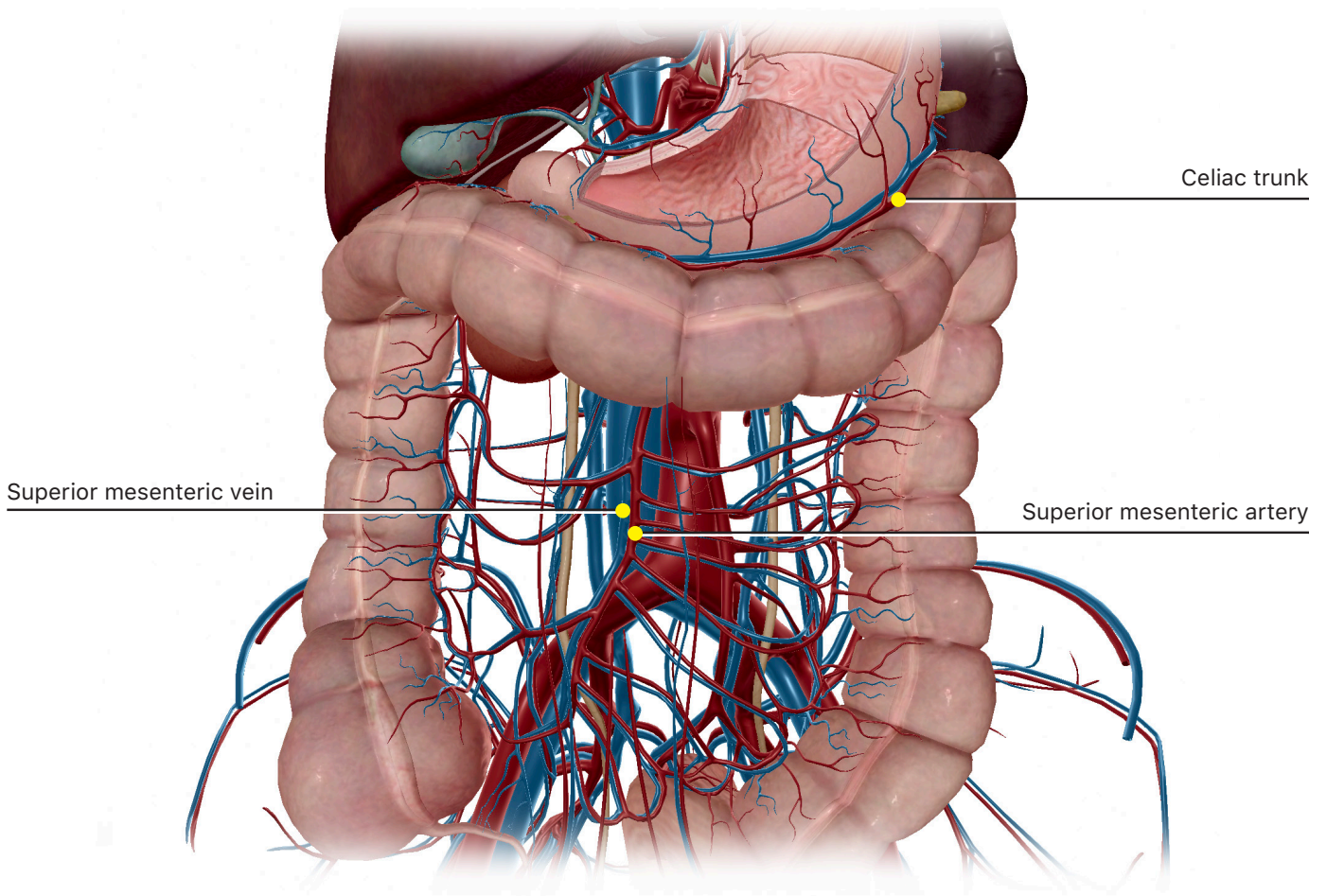
4. **Portal veins** are vessels that carry blood from one set of **capillary beds**—in this case, from the digestive system—and deliver it to another set of capillary beds—in this case, to the liver—without passing through the heart first. As the hepatic portal vein enters the liver, it branches into small, permeable, capillary-like vessels called _____. Products of digestion that are absorbed by the intestines enter the liver through these permeable vessels. Other products, such as materials reabsorbed from the colon and the products of red blood cell recycling from the spleen, also enter the liver for processing.

5. Select the (VII) right posterolateral segment of the liver and use the Hide button in the content box to hide it and observe the paired veins that drain the liver. These are the _____, which empty into the _____.

TIME TO PRACTICE!

[GO TO THE CIRCULATORY SYSTEM QUIZZES AND TAKE QUIZ 12 VENOUS SINUSES, QUIZ 4 THORAX, QUIZ 5 ABDOMEN I, QUIZ 6 ABDOMEN II, QUIZ 14 THORAX, AND QUIZ 15 ABDOMEN.](#)

Go back to the Circulatory System Views and select View 11. Lower Digestive. Use this view to answer the following questions.



1. In the system tray on the left side of the screen, deselect the skeletal system icon to remove the skeletal structures from the view and rotate the view to observe the back of the intestines. Note the network of vessels that supply the intestines. Rotate the view to observe it from the front, and then select and hide the jejunum and ileum. Locate the multiple loops of paired arteries and veins on the left side, near the descending colon. The looping arteries are the _____ of the unpaired, straight _____, which extends along the front of the abdomen.

a. List the organs that receive blood from these arteries.

-
-
-
-
-

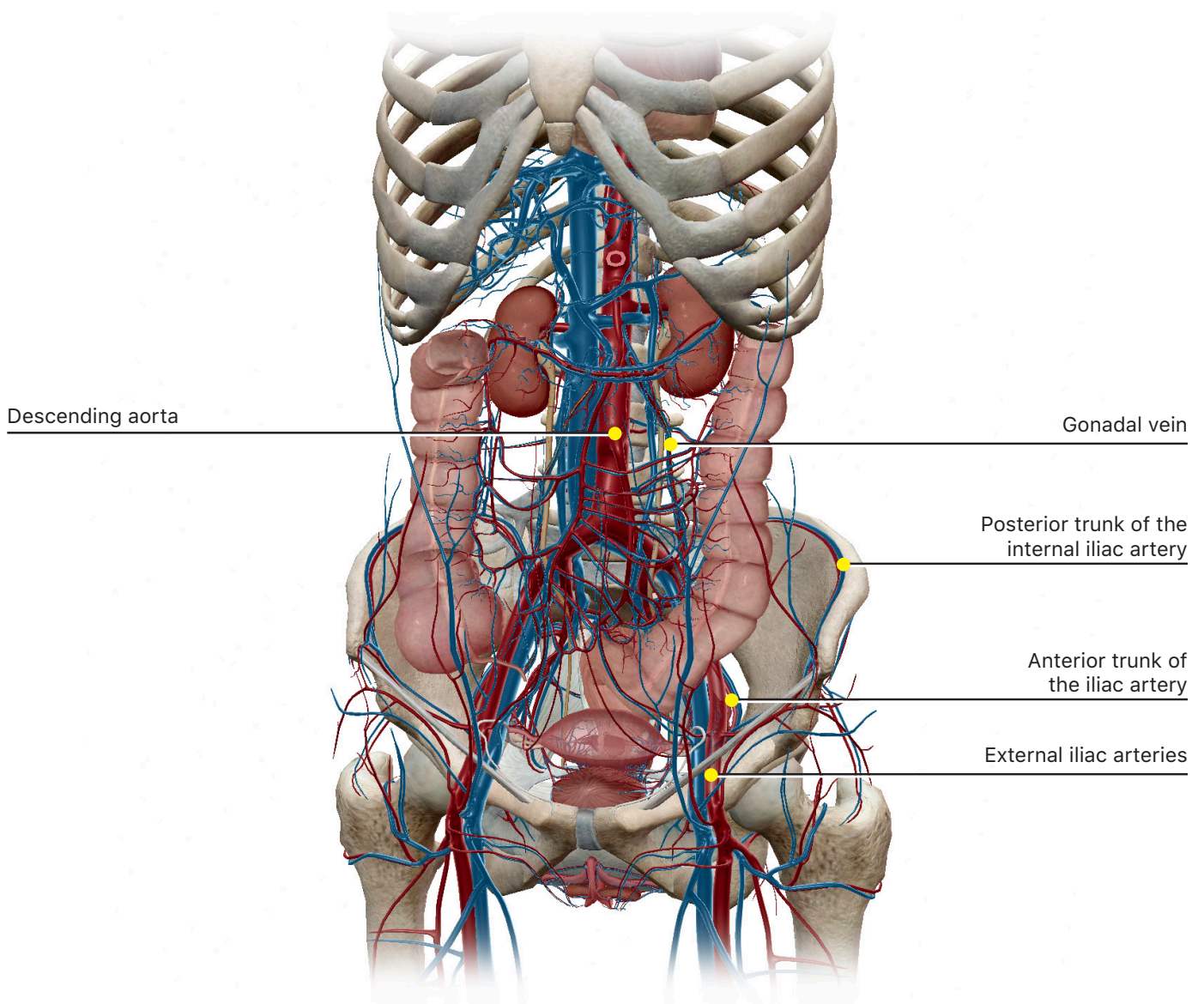
b. Paired with these arteries are the looping _____ of the _____.

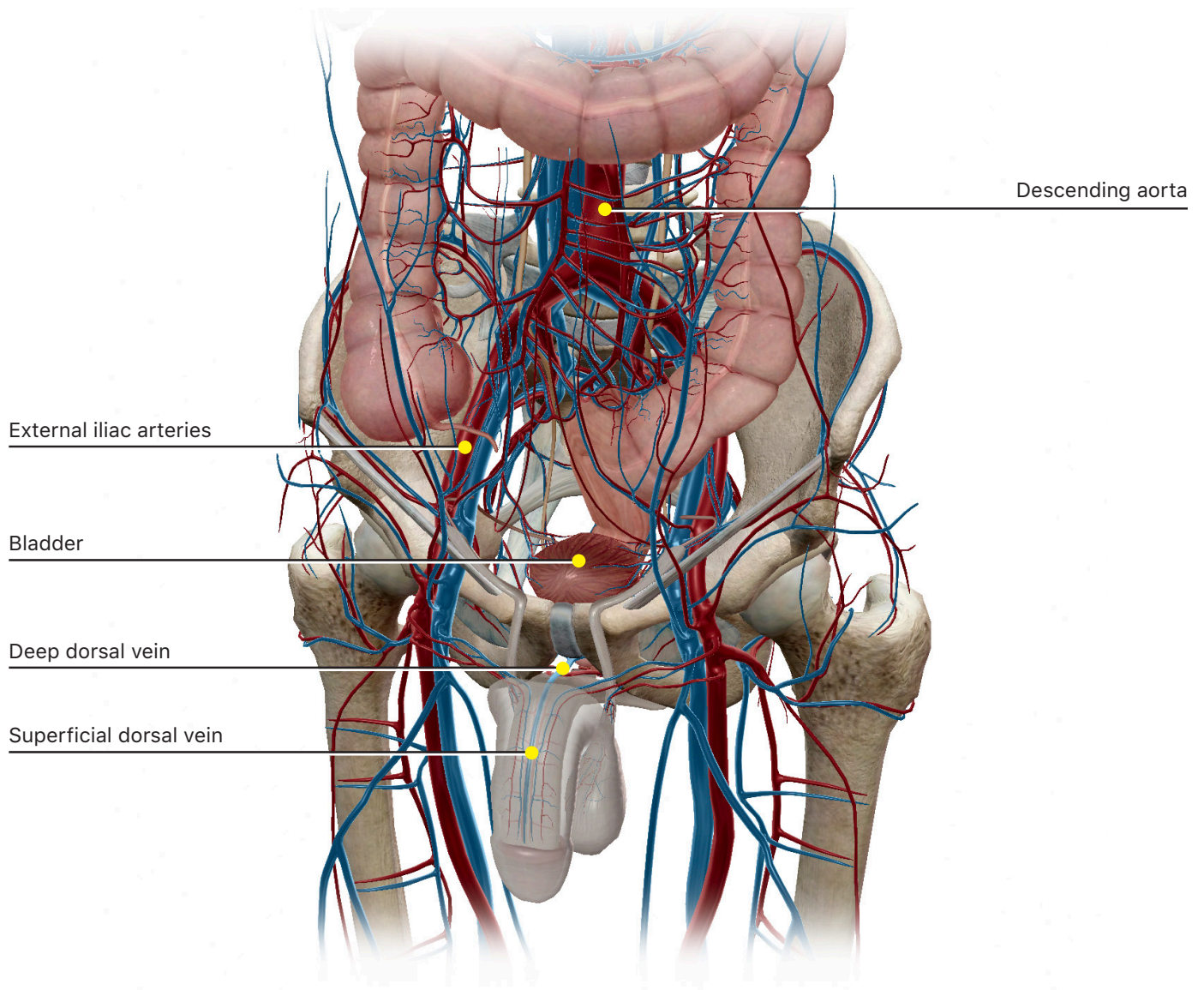
2. The **superior mesenteric artery** branches from the _____ just below the **celiac trunk**.

3. In the system tray on the left side of the screen, deselect the digestive system icon to remove the digestive structures from the view, and then highlight the **superior mesenteric vein** and follow its path upward. At the level of the kidneys, it becomes the _____. Now, you can follow the routes of materials that are absorbed by the small intestines and delivered to the liver. Refresh the view to see everything in place and follow the route of the hepatic portal system past the digestive organs.

E. Pelvic Circulation

In the Circulatory System Views section, select View 12. Pelvic Circulation. Use this view to answer the following questions.





1. Locate the **descending aorta** where it branches into the left and right _____ at the top of the pelvis. In turn, these arteries branch into the _____, which continue through the pelvis past the ilium, and the _____ which travel into the pelvis near the sacrum.

2. The **external iliac arteries** continue into the legs as the _____.

3. Name the two branches of the **internal iliac arteries** and list the tissues each branch supplies.

-
-

4. In the system tray on the left side of the screen, deselect the urinary and digestive system icons to remove the urinary and digestive structures from the view. Locate the left or **right anterior trunk of the internal iliac artery**. Locate and name the seven branches of this trunk (in males).

-
-
-
-
-
-
-

a. Which branch of the anterior trunk travels along the interior face of the ilium and passes through the pelvic inlet?

b. In the system tray on the left side of the screen, select the urinary system icon to show the urinary structures in the view. Which artery supplies the bladder?

c. In males, which artery supplies the penis?

5. Use the gender toggle at the top of the screen, next to the search bar, to switch to the female version of the view. Then, in the system tray on the left side of the screen, deselect the skeletal system icon to hide the skeletal structures from the view and rotate the view to observe the back of the uterus. What is the name of the artery that supplies most of the uterus via its branches?

a. This artery is a branch of the _____.

6. The _____ branch of the **uterine artery** supplies the ovaries (in females).

7. Locate the left or **right posterior trunk of the internal iliac artery**. Locate and name the two main branches of this trunk.

-
-

8. Which **plexus** drains each of the following organs.

a. The ovaries: _____

b. The uterus: _____

c. The bladder: _____

9. Fill-in the blanks to complete the following statements.

a. The **vesical venous plexus** drains into the _____.

b. The **ovarian venous plexus** drains into the _____.

c. The **uterine venous plexus** drains into the _____, traveling upward on either side of the pelvis.

d. The **uterine veins** and __superior vesical veins__ drain into the anterior trunks of the _____.

e. The **gonadal vein** travels high into the abdomen before entering the _____.

10. Draining the lower extremities, the large _____ become the _____ at the inguinal ligament.

11. At the brim of the pelvis, the _____ unite with the _____ to form the _____.

12. Use the gender toggle at the top of the screen, next to the search bar, to switch back to the male version of the view. The _____ drains the skin of the penis, becomes the _____, and eventually enters the **pudendal plexus**.

13. Select the penis to highlight the Dartos fascia and use the Hide button in the content box to hide it. Next, select one of the testicles to highlight the spermatic fascia and use the Hide button to hide it. Note the plexus of veins that drains the testis. Follow this plexus as it travels up toward the pelvis, and as it nears the bladder, observe how the veins unite to form the _____.

a. In the system tray on the left side of the screen, select the skeletal system icon to show the skeletal structures in the view. Note how these veins travel along the pelvis and enter the pelvic cavity.

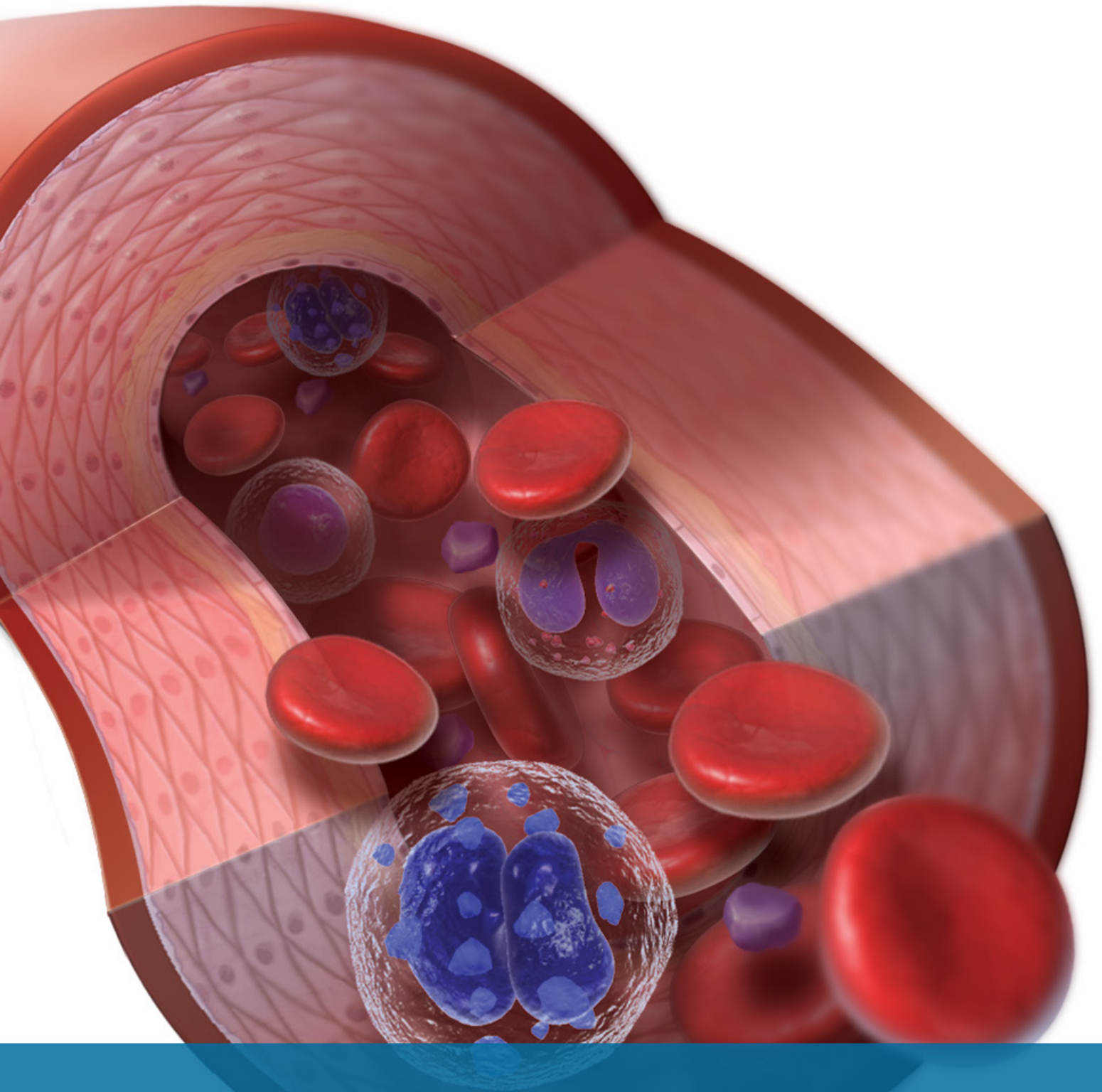
b. In the system tray on the left side of the screen, select the muscular system icon to show the muscles in the view. Note how these veins, along with accompanying arteries and nerves, travel from the external testes into the pelvis, between the pelvic muscles.

TIME TO PRACTICE!

**GO TO THE CIRCULATORY SYSTEM QUIZZES AND TAKE QUIZ 7 INTESTINES,
QUIZ 16 INTESTINES, AND QUIZ 17 PELVIS.**

PUTTING IT ALL TOGETHER

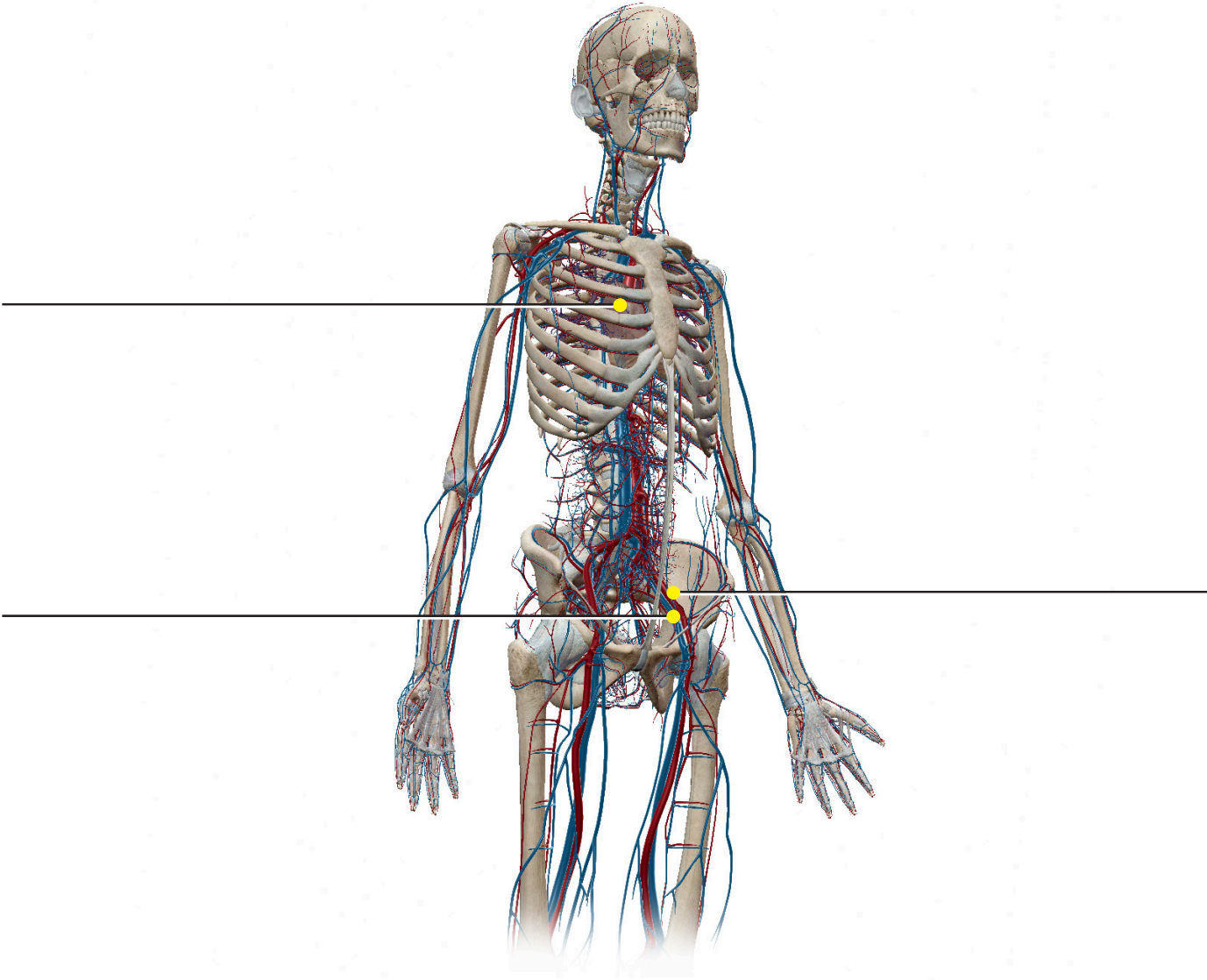
1. The largest artery in the body is the _____ and the largest veins are the _____.
2. What is the definition of a vein?
3. Which are the only arteries that carry deoxygenated blood away from the heart?
4. List the structures of the heart through which blood passes, starting with the venae cavae and ending with the aorta.
5. What is a portal system?
6. What is the role of the hepatic portal system?



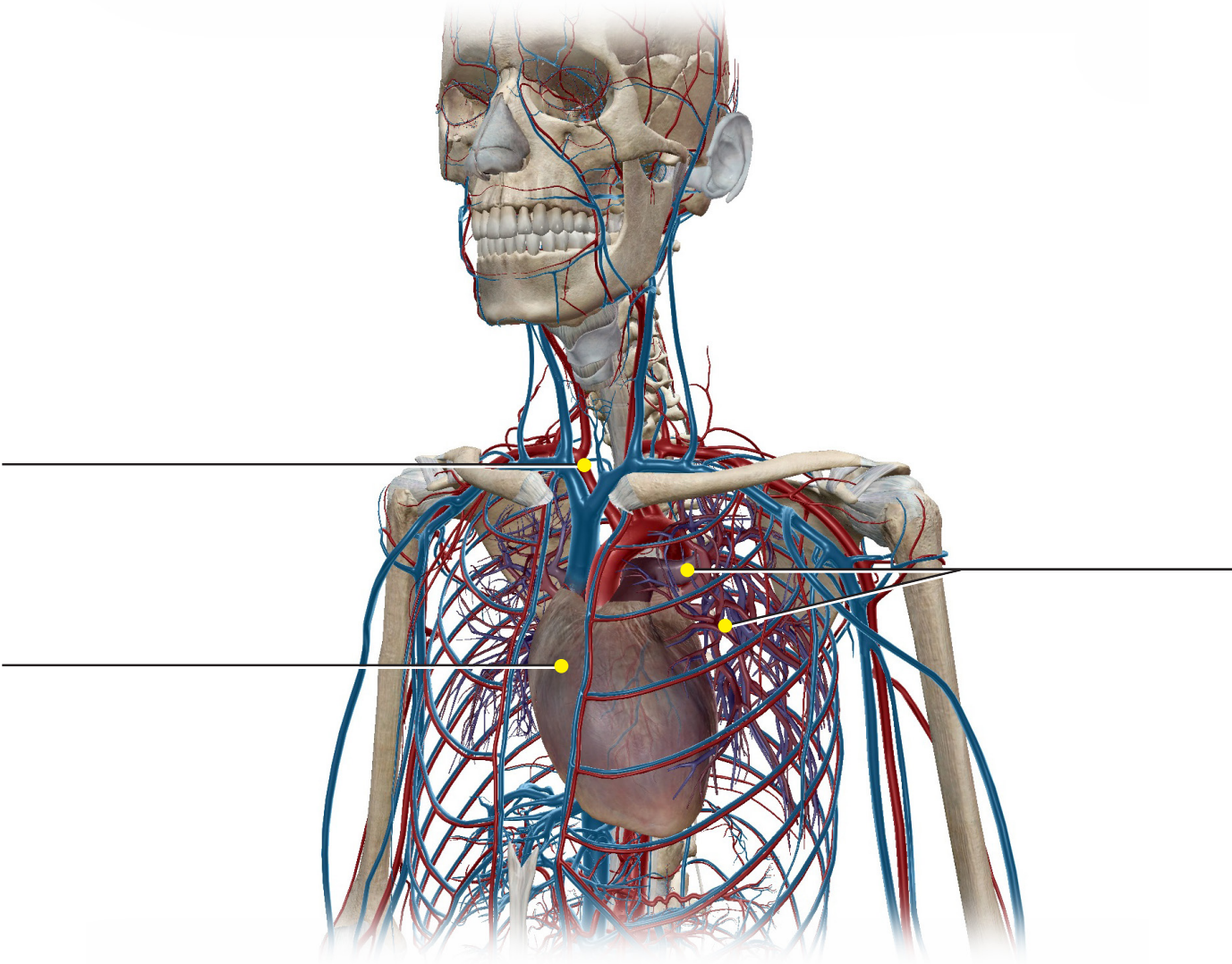
Student Practice

Label the structures in the following figures.

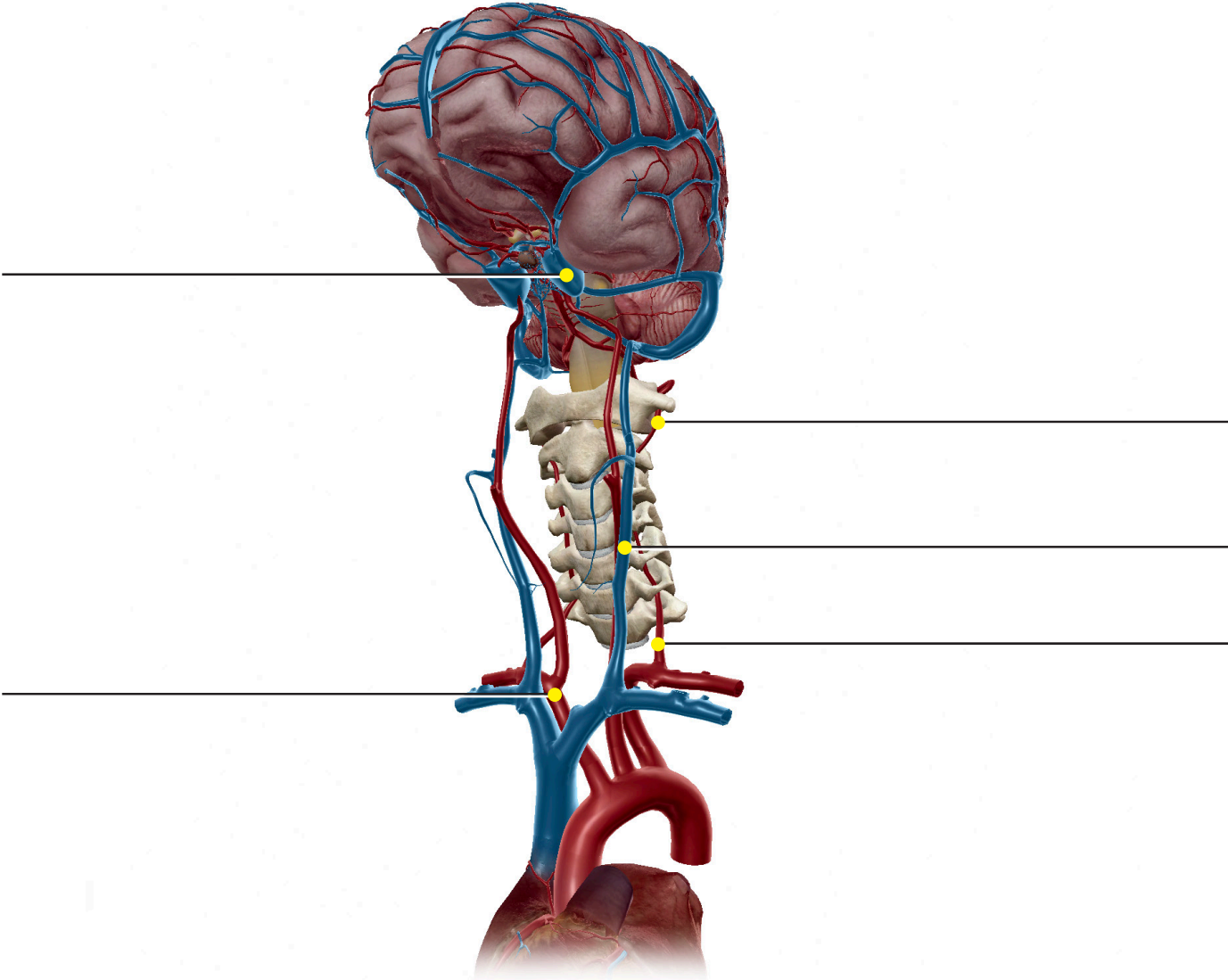
Source: Circulatory System Views: View 1. Circulatory System (I)



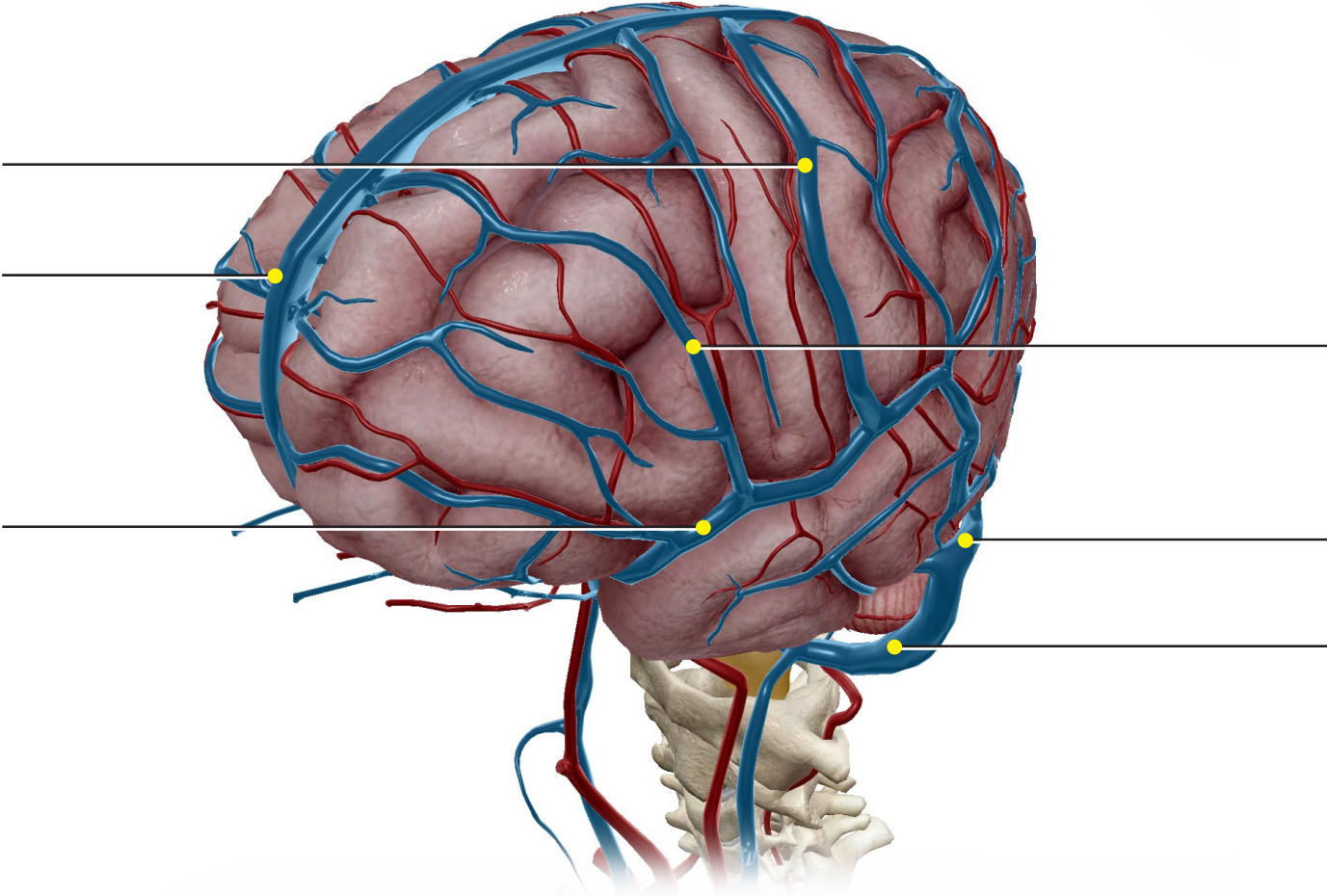
Source: Circulatory System Views: View 1. Circulatory System (II)



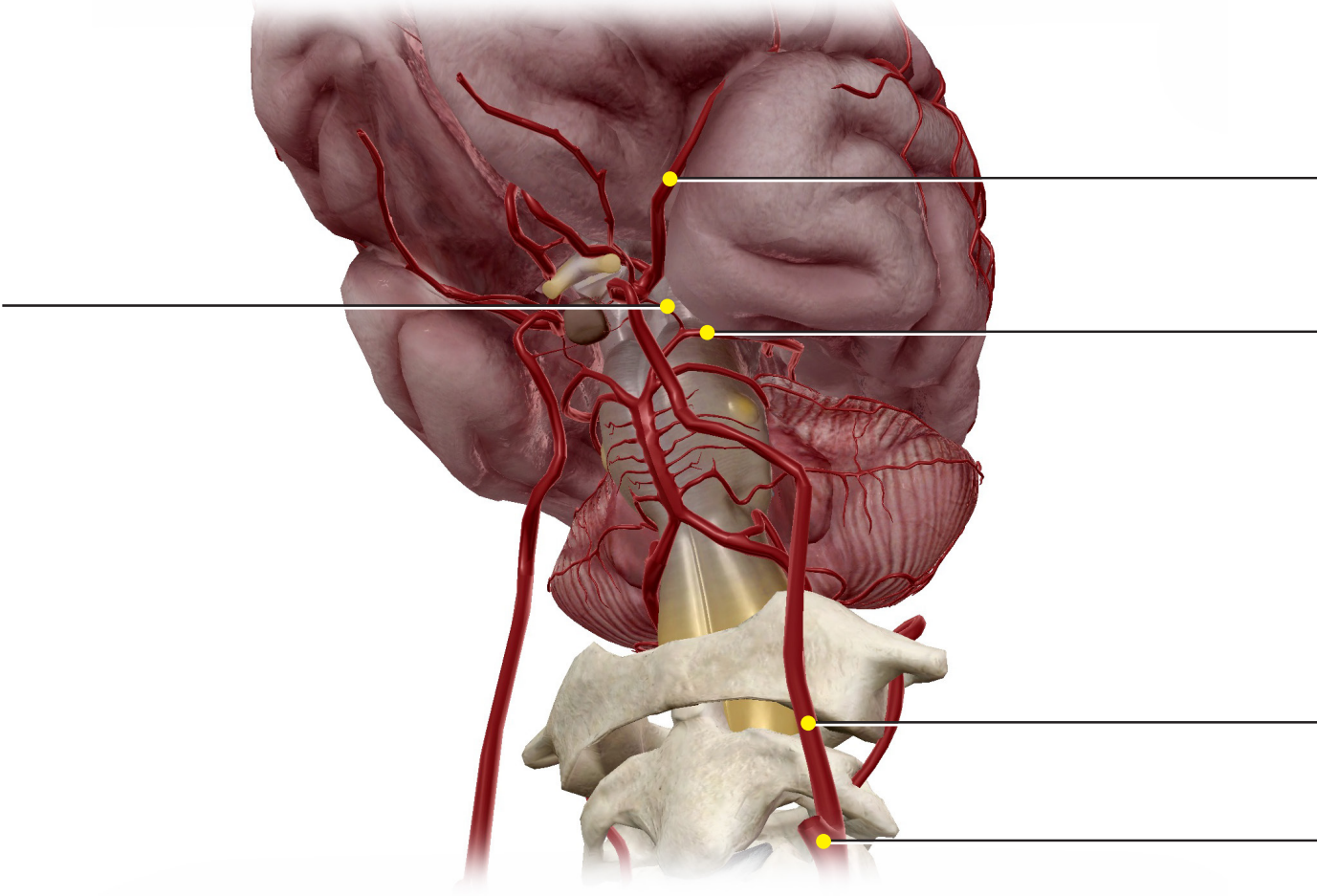
Source: Circulatory System Views: View 3. Vasculature of the Brain (I)



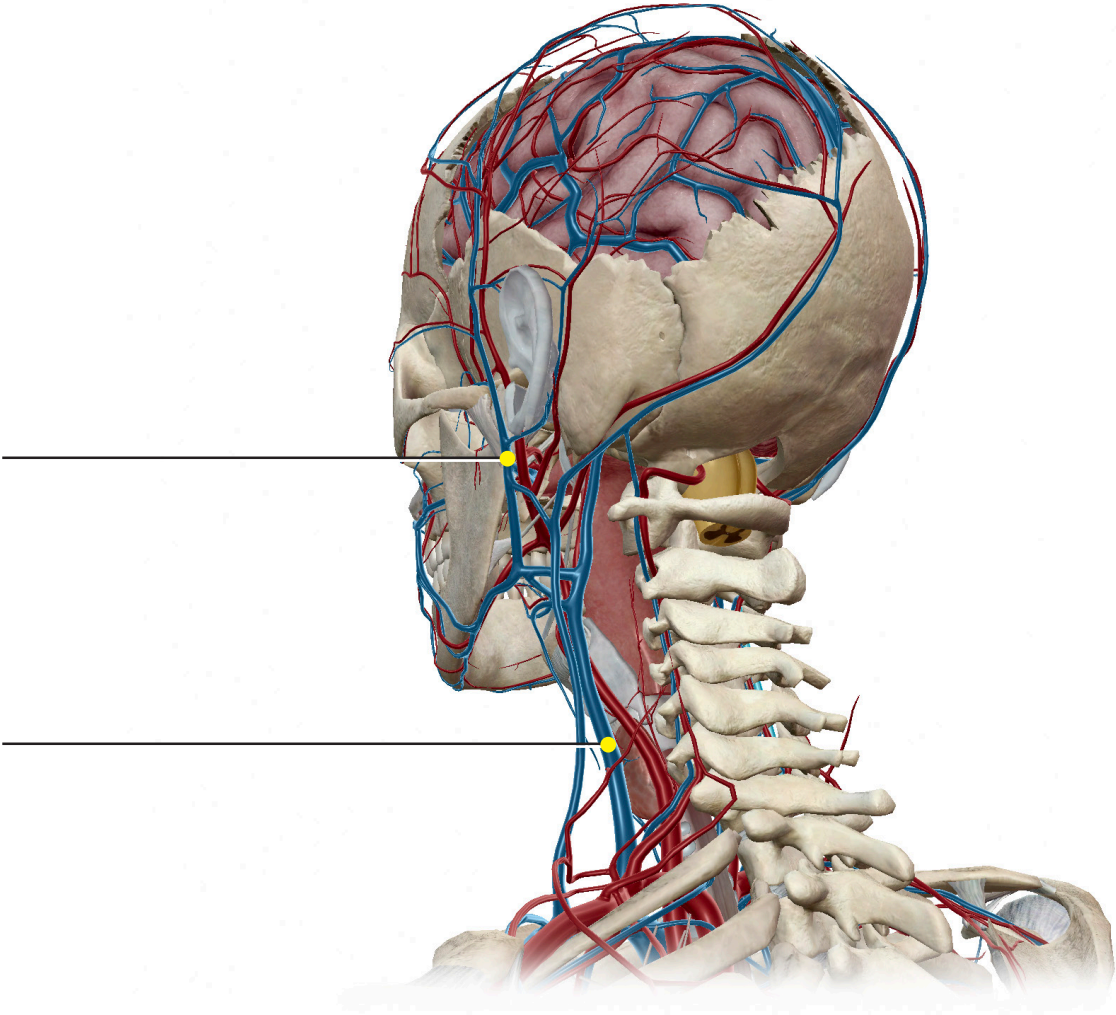
Source: Circulatory System Views: View 3. Vasculature of the Brain (II)



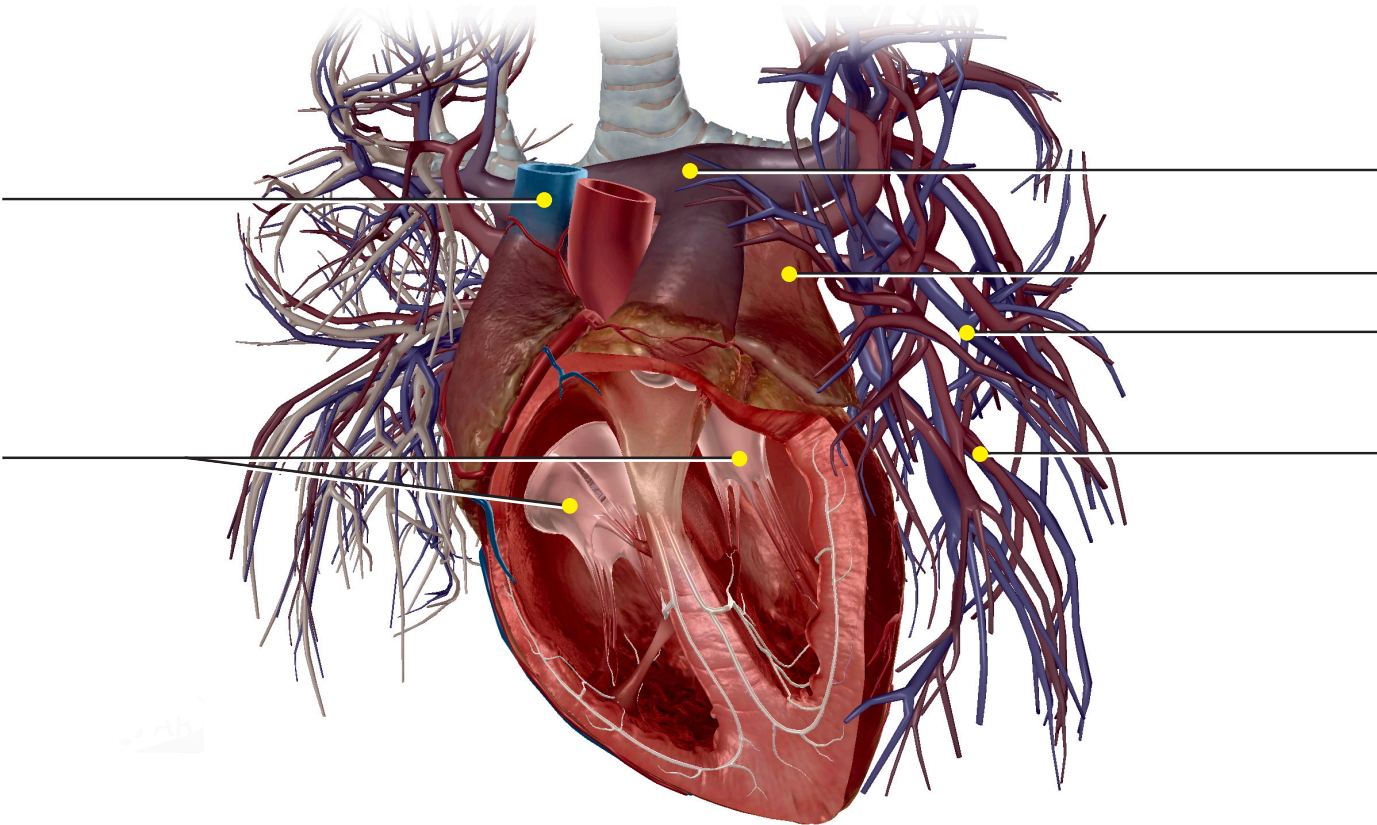
Source: Circulatory System Views: View 4. Circle of Willis



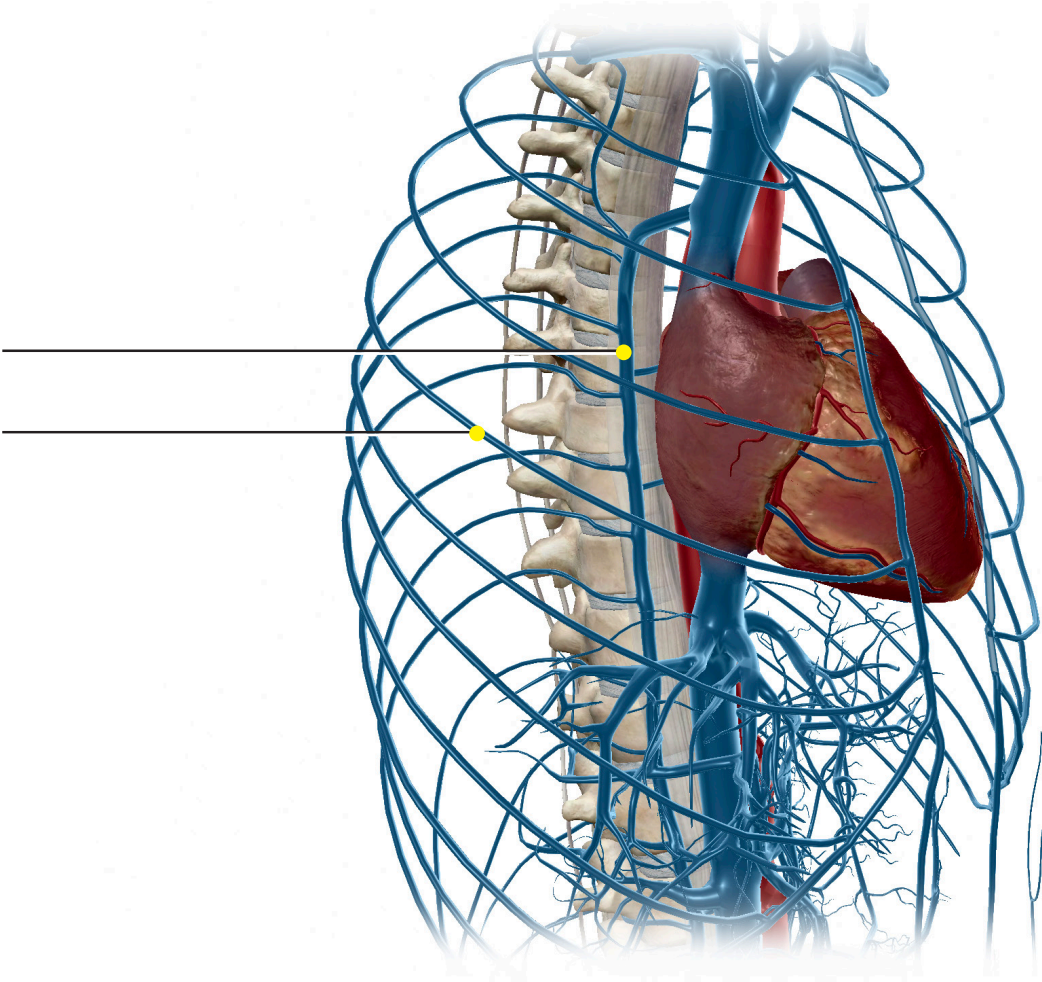
Source: Circulatory System Views: View 5. Carotid and Jugular



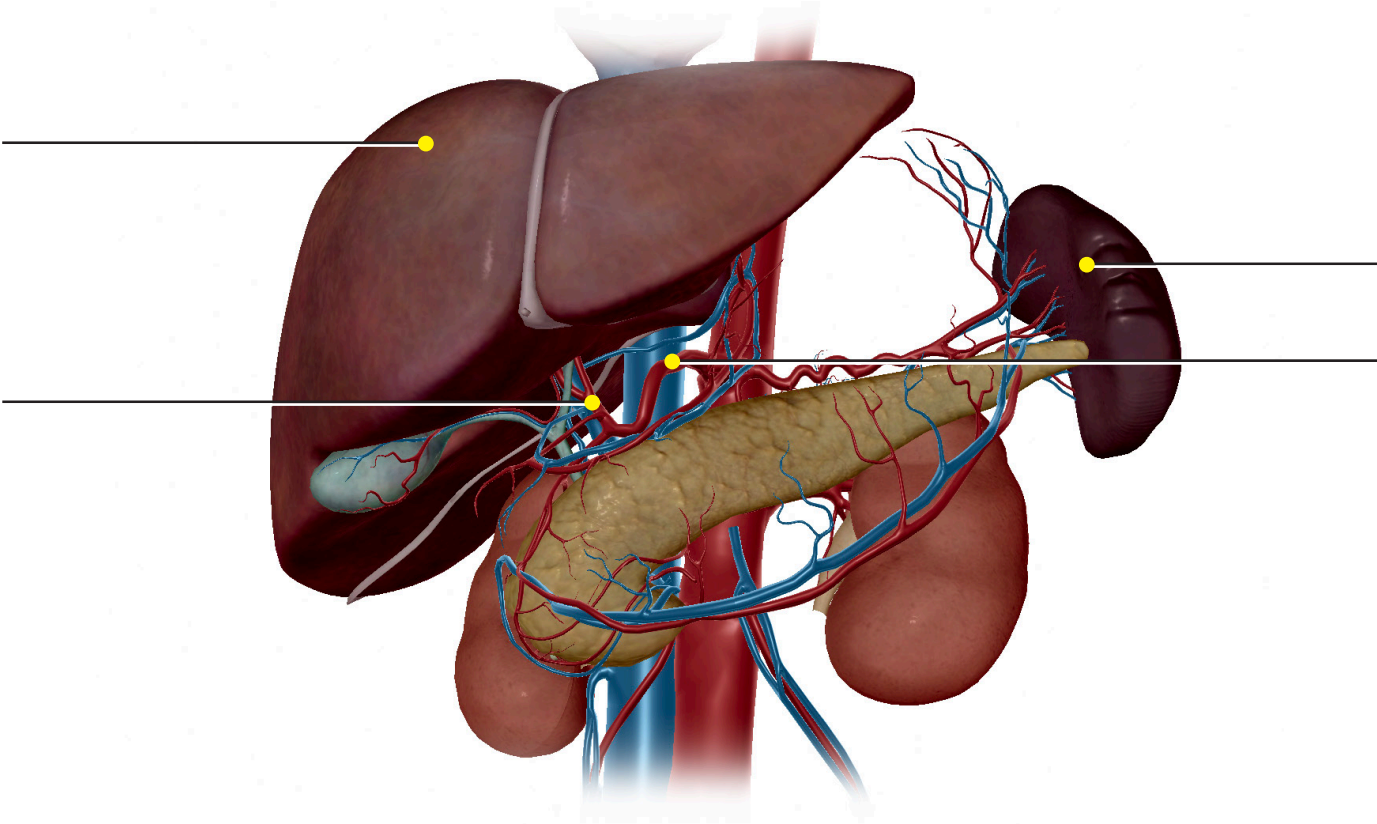
Source: Circulatory System Views: View 6. Pulmonary



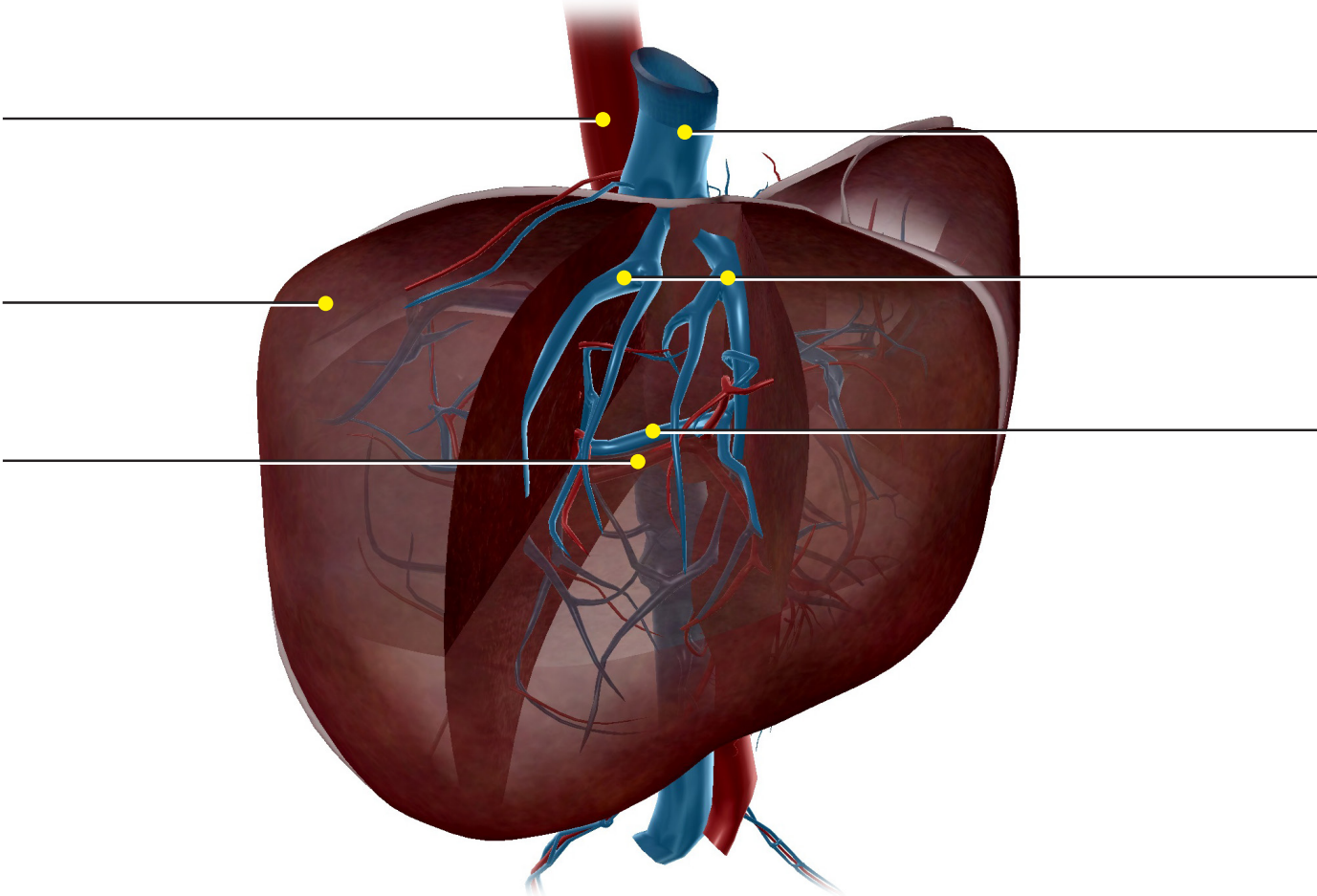
Source: Circulatory System Views: View 8. Azygos System



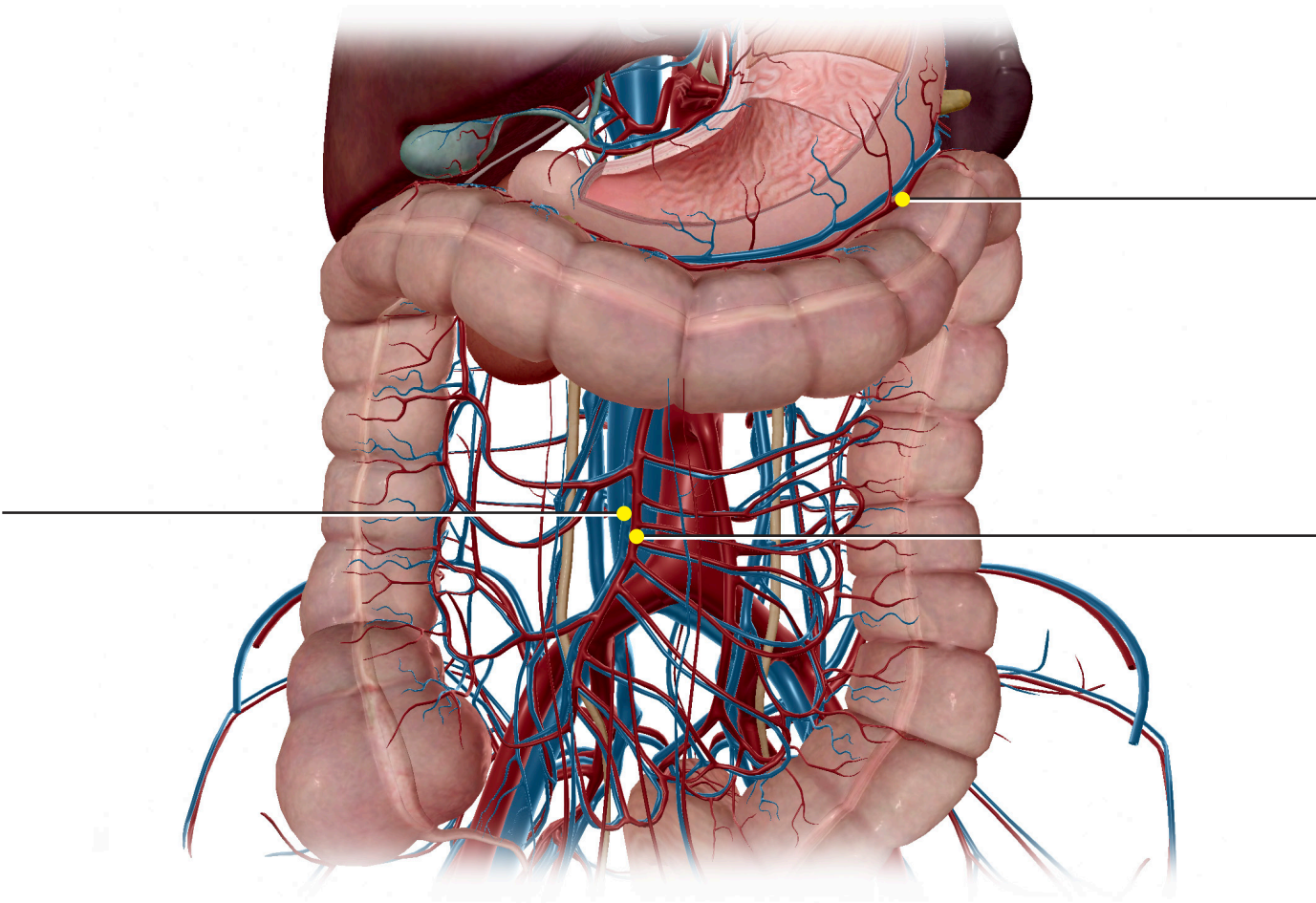
Source: Circulatory System Views: View 10. Liver Circulation



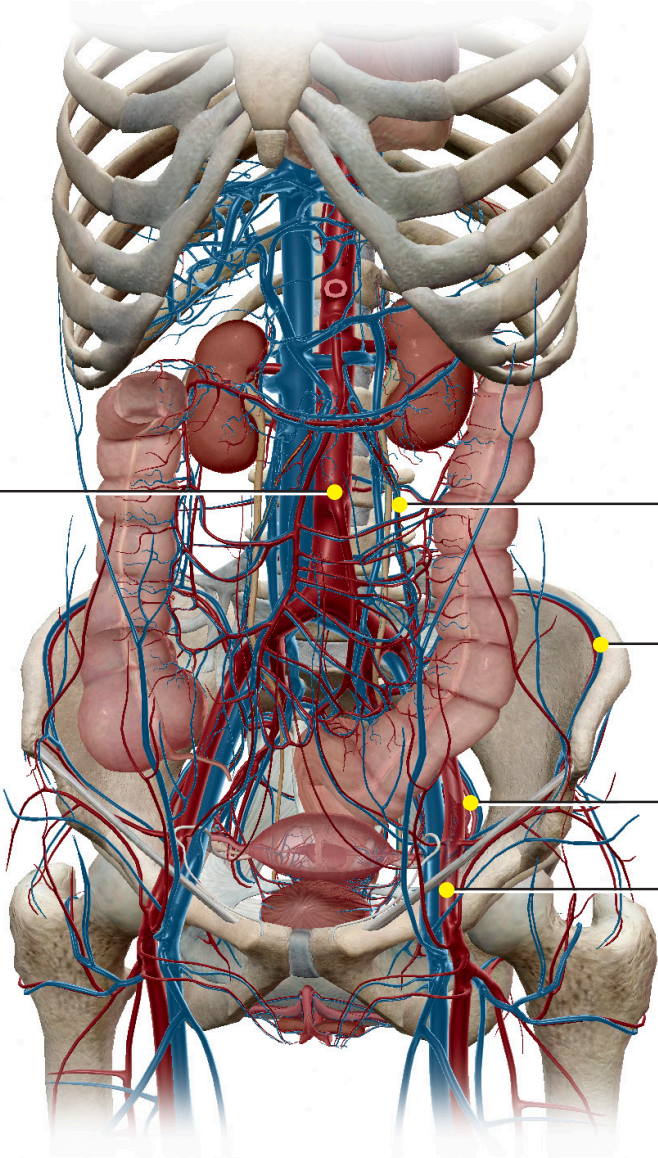
Source: Circulatory System Views: View 10. Liver Circulation



Source: Circulatory System Views: View 11. Lower Digestive



Source: Circulatory System Views: View 12. Pelvic Circulation (Female)



Source: Circulatory System Views: View 12. Pelvic Circulation (Male)

