Microscopic Structure of the Blood Vessels

1. Use the key choices to identify the blood vessel tunic described. (Some choices may be used more than once.)

   Key: tunica intima        tunica media        tunica externa

   **TUNICA INTIMA** 1. most internal tunic

   **TUNICA MEDIA**  2. bulky middle tunic contains smooth muscle and elastin

   **TUNICA INTIMA**  3. its smooth surface decreases friction

   **TUNICA INTIMA**  4. tunic of capillaries

   **INTIMA, MEDIA, EXTERNA**  5. tunic(s) of arteries and veins

   **TUNICA MEDIA**  6. tunic that is especially thick in arteries

   **TUNICA EXTERNA**  7. most superficial tunic

2. Servicing the capillaries is the basic function of the organs of the circulatory system. Explain this statement.

   **ARTERIES, ARTERIOLES, VENULES & VEIN ARE MOSTLY CONDUCTING PIPING WHEREAS THE VERY IMPORTANT FUNCTION OF EXCHANGE OF NUTRIENTS & WASTES OCCURS IN THE CAPILLARY BEDS**

3. Cross-sectional views of an artery and of a vein are shown here. Identify each by labeling the appropriate leader line. Also respond to the related questions that follow.

   ![Cross-sectional views of an artery and a vein](image)

   Which of these vessels may have valves? **VEINS**

   Which of these vessels depends on its elasticity to propel blood along? **ARTERIES**

   Which depends on the skeletal muscle pump and changes during breathing? **VEINS** Explain this dependence.

   **AFTER BLOOD HAS PASSED THROUGH CAPILLARIES INTO VEINS BLOOD PRESSURE IS NOT ENOUGH TO RETURN BLOOD TO THE HEART. SKELETAL MUS. CONTRACTION & VALVES IN VEIN HELP PROPEL BLOOD BACK TO HEART. BREATHING CAUSES NEGATIVE PRESSURE IN THORACIC CAVITY, HELPS PROPEL BLOOD FROM LOWER BOAT BACK TO HEART, THIN WALLS OF VEIN HELP TRANSMIT PRESSURE'S CHANGE TO BLOOD**
4. Why are the walls of arteries relatively thicker than those of the corresponding veins? *So It Will Be Easier To Compress Them With Skeletal Mus.* + Have Greater Effect On Blood Flow From Breathing.

**Major Systemic Arteries and Veins of the Body**

5. Use the key on the right to identify the arteries or veins described on the left.

**Key:**
- anterior tibial
- basilic
- brachial
- brachiocephalic
- celiac trunk
- cephalic
- common carotid
- common iliac
- coronary
- deep femoral
- dorsalis pedis
- external carotid
- femoral
- gonadal
- great saphenous
- inferior mesenteric
- internal carotid
- internal iliac
- fibular (peroneal)
- phrenic
- popliteal
- posterior tibial
- radial
- renal
- subclavian
- superior mesenteric
- vertebral

1. the arterial system has one of these; the venous system has two
2. these arteries supply the myocardium
3. the more anterior artery pair serving the brain
4. longest vein in the body
5. artery on the foot checked after leg surgery
6. serves the posterior thigh
7. supplies the diaphragm
8. formed by the union of the radial and ulnar veins
9. two superficial veins of the arm
10. artery serving the kidney
11. testicular or ovarian veins
12. artery that supplies the distal half of the large intestine
13. drains the pelvic organs and lower limbs
14. what the external iliac vein drains into in the pelvis
15. major artery serving the arm
16. supplies most of the small intestine
17. what the femoral artery becomes at the knee
18. an arterial trunk that has three major branches, which run to the liver, spleen, and stomach
19. major artery serving the skin and scalp of the head
20. two veins that join, forming the popliteal vein
21. artery generally used to take the pulse at the wrist
6. The human arterial and venous systems are diagrammed on this page and the next. Identify all indicated blood vessels.
7. Trace the blood flow for the following situations:

a. From the capillary beds of the left thumb to the capillary beds of the right thumb:

   \[ \text{LEFT RADIAL VEIN} \rightarrow \text{LEFT BRACHIAL VEIN} \rightarrow \text{LEFT SUBCLAVIAN VEIN} \rightarrow \text{LEFT BRACHIOCEPHALIC VEIN} \rightarrow \text{SUPERIOR VENA CAVA} \rightarrow \text{RIGHT ATRIUM} \rightarrow \text{RIGHT VENTRICLE} \rightarrow \text{PULMONARY TRUNK} \rightarrow \text{PULMONARY ARTERIES} \rightarrow \text{ALVEOLAR CAPILLARIES} \rightarrow \text{PULMONARY VEINS} \rightarrow \text{LEFT ATRIUM} \rightarrow \text{LEFT VENTRICLE} \rightarrow \text{ASCENDING AORTA} \rightarrow \text{AORTIC ARCH} \rightarrow \text{BRACHIOCEPHALIC TRUNK} \rightarrow \text{RIGHT SUBCLAVIAN ARTERY} \rightarrow \text{BRACHIAL ARTERY} \rightarrow \text{AUXILIARY ARTERY} \rightarrow \text{RIGHT BRACHIAL ARTERY} \rightarrow \text{RIGHT RADIAL ARTERY} \rightarrow \text{BRACHIAL ARTERY} \rightarrow \text{AUXILIARY ARTERY} \rightarrow \text{PULMONARY VEINS} \rightarrow \text{LEFT ATRIUM} \rightarrow \text{LEFT VENTRICLE} \rightarrow \text{ASCENDING AORTA} \rightarrow \text{AORTIC ARCH} \rightarrow \text{BRACHIOCEPHALIC TRUNK} \rightarrow \text{RIGHT COMMON CAROTID ARTERY} \rightarrow \text{RIGHT INTERNAL CAROTID ARTERY} \rightarrow \text{RIGHT MIDDLE CAROTID ARTERY} \rightarrow \text{RIGHT INTERNAL CAROTID ARTERY} \rightarrow \text{RIGHT DURAL VEINS/SINUSES} \rightarrow \text{RIGHT INTERNAL JUGULAR VEIN} \rightarrow \text{RIGHT BRACHIOCEPHALIC VEIN} \rightarrow \text{SUPERIOR VENA CAVA} \rightarrow \text{RIGHT ATRIUM} \rightarrow \text{RIGHT VENTRICLE} \rightarrow \text{PULMONARY TRUNK} \rightarrow \text{PULMONARY ARTERIES} \]

b. From the pulmonary vein to the pulmonary artery by way of the right side of the brain:

\[ \text{LEFT ATRIUM} \rightarrow \text{LEFT VENTRICLE} \rightarrow \text{ASCENDING AORTA} \rightarrow \text{AORTIC ARCH} \rightarrow \text{BRACHIOCEPHALIC TRUNK} \rightarrow \text{RIGHT SUBCLAVIAN ARTERY} \rightarrow \text{BRACHIAL ARTERY} \rightarrow \text{AUXILIARY ARTERY} \rightarrow \text{RIGHT BRACHIAL ARTERY} \rightarrow \text{RIGHT RADIAL ARTERY} \rightarrow \text{BRACHIAL ARTERY} \rightarrow \text{AUXILIARY ARTERY} \rightarrow \text{PULMONARY VEINS} \rightarrow \text{LEFT ATRIUM} \rightarrow \text{LEFT VENTRICLE} \rightarrow \text{ASCENDING AORTA} \rightarrow \text{AORTIC ARCH} \rightarrow \text{BRACHIOCEPHALIC TRUNK} \rightarrow \text{RIGHT COMMON CAROTID ARTERY} \rightarrow \text{RIGHT INTERNAL CAROTID ARTERY} \rightarrow \text{RIGHT MIDDLE CAROTID ARTERY} \rightarrow \text{RIGHT INTERNAL CAROTID ARTERY} \rightarrow \text{RIGHT DURAL VEINS/SINUSES} \rightarrow \text{RIGHT INTERNAL JUGULAR VEIN} \rightarrow \text{RIGHT BRACHIOCEPHALIC VEIN} \rightarrow \text{SUPERIOR VENA CAVA} \rightarrow \text{RIGHT ATRIUM} \rightarrow \text{RIGHT VENTRICLE} \rightarrow \text{PULMONARY TRUNK} \rightarrow \text{PULMONARY ARTERIES} \]

Special Circulations

Pulmonary Circulation

8. Trace the pathway of a carbon dioxide gas molecule in the blood from the inferior vena cava until it leaves the bloodstream. Name all structures (vessels, heart chambers, and others) it passes through en route.

\[ \text{INFERIOR VENA CAVA} \rightarrow \text{RIGHT ATRIUM} \rightarrow \text{RIGHT VENTRICLE} \rightarrow \text{PULMONARY TRUNK} \rightarrow \text{PULMONARY ARTERIES} \rightarrow \text{PULMONARY CAPILLARIES} \rightarrow \text{ENDOTHELIAL CELLS} \rightarrow \text{BASEMENT MEMBRANE} \rightarrow \text{TYPE I ALVEOLAR CELLS} \rightarrow \text{ALVEOLES} \]

9. Trace the pathway of an oxygen gas molecule from an alveolus of the lung to the right atrium of the heart. Name all structures through which it passes.

\[ \text{ALVEOLES} \rightarrow \text{TYPE I ALVEOLAR CELLS} \rightarrow \text{BASEMENT MEMBRANE} \rightarrow \text{ENDOTHELIAL CELLS} \rightarrow \text{PLASMA} \rightarrow \text{RBC} \rightarrow \text{PULMONARY VEINS} \rightarrow \text{LEFT ATRIUM} \rightarrow \text{LEFT VENTRICLE} \rightarrow \text{SYSTEMIC CIRCULATION} \rightarrow \text{AORTA} \rightarrow \text{RIGHT CORONARY ARTERY} \rightarrow \text{RIGHT ATRIAL TISSUE} \]
10. Most arteries of the adult body carry oxygen-rich blood, and the veins carry oxygen-depleted, carbon dioxide-rich blood.

How are the pulmonary arteries and veins different? **PULMONARY ARTERIES CARRY OXYGEN-POOR BLOOD & PULMONARY VEINS CARRY OXYGEN-RICH BLOOD**

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**Hepatic Portal Circulation**

11. What is the source of blood in the hepatic portal system? **VENOUS BLOOD COMING FROM ALL ORGANS OF THE DIGESTIVE TRACT**

12. Why is this blood carried to the liver before it enters the systemic circulation? **SO THE LIVER CAN CONTROL THE NUTRIENTS GOING INTO THE BLOOD**

13. The hepatic portal vein is formed by the union of the **SPLenic VEIN**, which drains the **Spleen**, **Pancreas**, **Stomach**, and the **Superior Mesenteric** (via the interior mesenteric vein), and the **Small Intestine** and **proximal colon**. The **Left GASTRIC** vein, which drains the lesser curvature of the stomach, empties directly into the hepatic portal vein.

14. Trace the flow of a drop of blood from the small intestine to the right atrium of the heart, noting all structures it encounters or passes through on the way. **SMALL INTESTINE → SUPERIOR MESENTERIC VEIN → HEPATIC PORTAL VEIN → LIVER TISSUE → HEPATIC VEIN → INFERIOR VENA CAVA → RIGHT ATRIUM**

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**Arterial Supply of the Brain and the Circle of Willis**

15. Branches of the internal carotid and vertebral arteries cooperate to form a ring of blood vessels encircling the pituitary gland, at the base of the brain. What name is given to this communication network? **CIRCLE OF WILLIS**

What is its function? **TO ALLOW FOR CONTINUOUS BLOOD FLOW TO THE BRAIN EVEN IF ONE OF IT'S FEEDING VESSELS IS CLOGGED**

16. What portion of the brain is served by the anterior and middle cerebral arteries? **THE Bulk of the cerebrum**

Both the anterior and middle cerebral arteries arise from the **INTERNAL CAROTID** arteries.
17. Trace the usual pathway of a drop of blood from the aorta to the left occipital lobe of the brain, noting all structures through which it flows. Aorta $\rightarrow$ left common carotid $\rightarrow$ left vertebral $\rightarrow$ basilar $\rightarrow$ left posterior cerebral $\rightarrow$ left occipital lobe.

**Fetal Circulation**

18. The failure of two of the fetal bypass structures to become obliterated after birth can cause congenital heart disease, in which the youngster would have improperly oxygenated blood. Which two structures are these?

Foramen ovale and Ductus arteriosus

19. For each of the following structures, indicate its function in the fetus. Circle the blood vessel that carries the most oxygen-rich blood.

<table>
<thead>
<tr>
<th>Structure</th>
<th>Function in fetus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Umbilical artery</td>
<td>Carry deoxygenated, waste-laden blood to the placenta for exchange</td>
</tr>
<tr>
<td>Umbilical vein</td>
<td>Carry oxygenated, nutrient-laden blood to the fetus</td>
</tr>
<tr>
<td>Ductus venosus</td>
<td>Shunt allowing most of the umbilical venous blood to enter the inferior vena cava</td>
</tr>
<tr>
<td>Ductus arteriosus</td>
<td>Shunt allowing most of the outflow from right heart to bypass lungs, go to aorta</td>
</tr>
<tr>
<td>Foramen ovale</td>
<td>Opening -hole-between right and left atria allows shunting of some blood away from right ventricle</td>
</tr>
</tbody>
</table>

20. What organ serves as a respiratory/digestive/excretory organ for the fetus? **Placenta**