

Anatomy of Blood Vessels

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

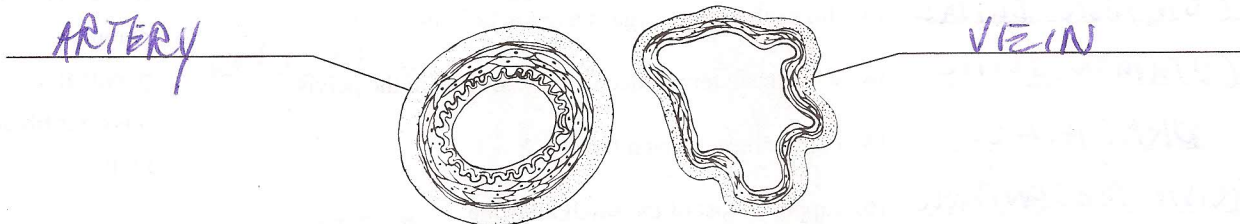
TUNICA MEDIA 6. tunic that is especially thick in arteries

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.



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 BODY BACK TO HEART. THIN WALLS OF VEIN HELP TRANSMIT PRESSURE 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.

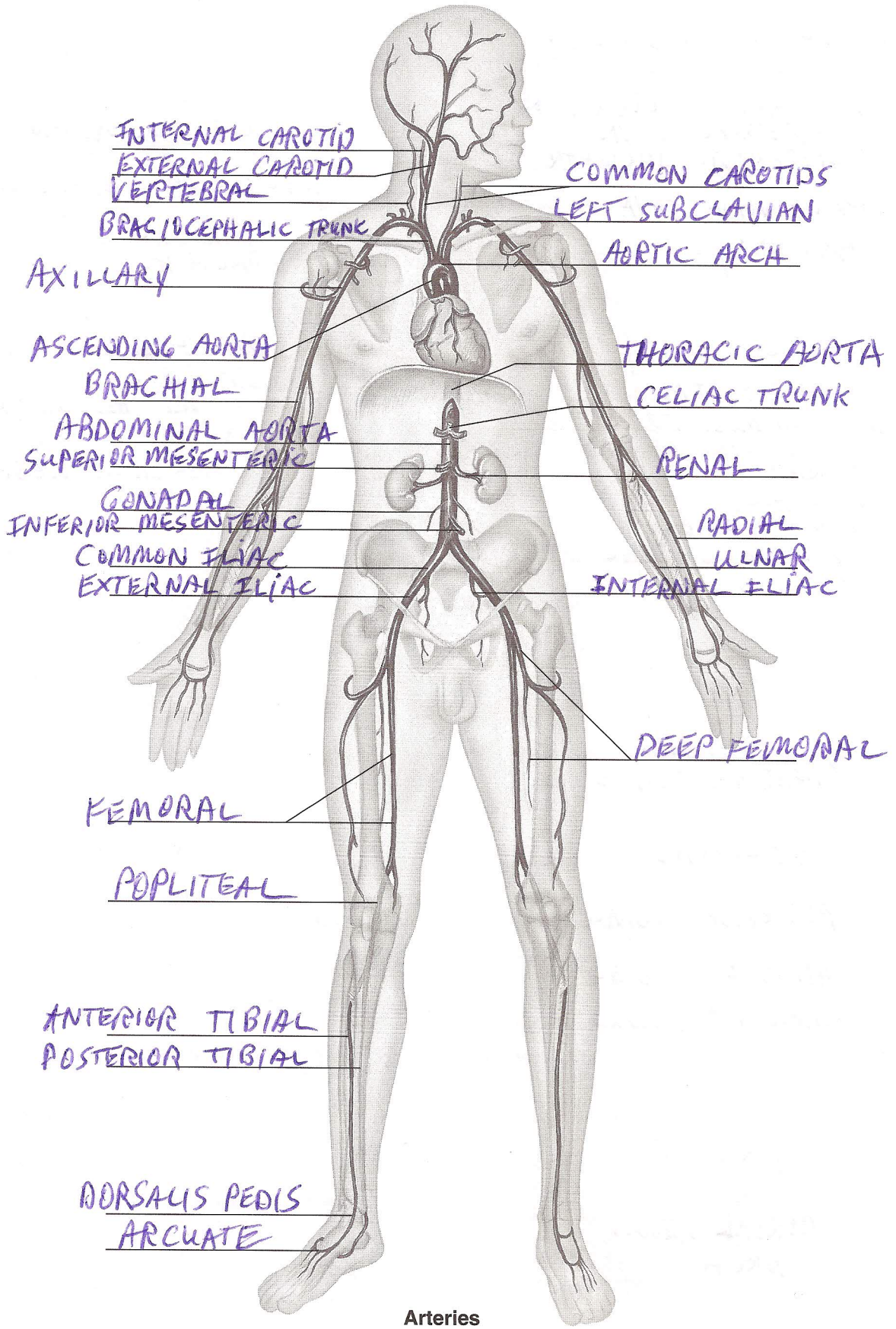
Major Systemic Arteries and Veins of the Body

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

Key:

- | | | |
|--|--|---------------------|
| <u>BRACHIOCEPHALIC</u> | 1. the arterial system has one of these; the venous system has two | anterior tibial |
| <u>CORONARY</u> | 2. these arteries supply the myocardium | basilic |
| <u>EXTERNAL CAROTID</u> | 3. the more anterior artery pair serving the brain | brachial |
| <u>GREAT SAPHENOUS</u> | 4. longest vein in the body | brachiocephalic |
| <u>DORSALIS PEDIS</u> | 5. artery on the foot checked after leg surgery | celiac trunk |
| <u>DEEP FEMORAL</u> | 6. serves the posterior thigh | cephalic |
| <u>PHRENIC</u> | 7. supplies the diaphragm | common carotid |
| <u>BRACHIAL</u> | 8. formed by the union of the radial and ulnar veins | common iliac |
| <u>CEPHALIC</u> , <u>BASILIC</u> | 9. two superficial veins of the arm | coronary |
| <u>RENAL</u> | 10. artery serving the kidney | deep femoral |
| <u>GONADAL</u> | 11. testicular or ovarian veins | dorsalis pedis |
| <u>INFERIOR MESENTERIC</u> | 12. artery that supplies the distal half of the large intestine | external carotid |
| <u>COMMON ILIAC</u> | 13. drains the pelvic organs and lower limbs | femoral |
| <u>COMMON ILIAC</u> | 14. what the external iliac vein drains into in the pelvis | gonadal |
| <u>BRACHIAL</u> | 15. major artery serving the arm | great saphenous |
| <u>SUPERIOR MESENTERIC</u> | 16. supplies most of the small intestine | inferior mesenteric |
| <u>POPLITEAL</u> | 17. what the femoral artery becomes at the knee | internal carotid |
| <u>CELIAC TRUNK</u> | 18. an arterial trunk that has three major branches, which run to the liver, spleen, and stomach | internal iliac |
| <u>EXTERNAL CAROTID</u> | 19. major artery serving the skin and scalp of the head | fibular (peroneal) |
| <u>POSTERIOR TIBIAL</u> , <u>FIBULAR</u> | 20. two veins that join, forming the popliteal vein | phrenic |
| <u>RADIAL</u> | 21. artery generally used to take the pulse at the wrist | popliteal |

6. The human arterial and venous systems are diagrammed on this page and the next. Identify all indicated blood vessels.



DURAL VENOUS SINUSES

EXTERNAL JUGULAR VEIN
VERTEBRAL VEIN
INTERNAL JUGULAR

SUPERIOR VENA CAVA
AXILLARY

HEPATIC

HEPATIC PORTAL
SUPERIOR MESENTERIC
INFERIOR VENA CAVA
ULNAR
RADIAL
COMMON ILIAC
EXTERNAL ILIAC
INTERNAL ILIAC

FEMORAL
GREAT SAPHENOUS

POPILITEAL

POSTERIOR TIBIAL

ANTERIOR TIBIAL

SMALL SAPHENOUS

AORSMA VENOUS
ARCH

LEFT SUBCLAVIAN

R+L BRACHIOCEPHALIC

CEPHALIC
BRACHIAL

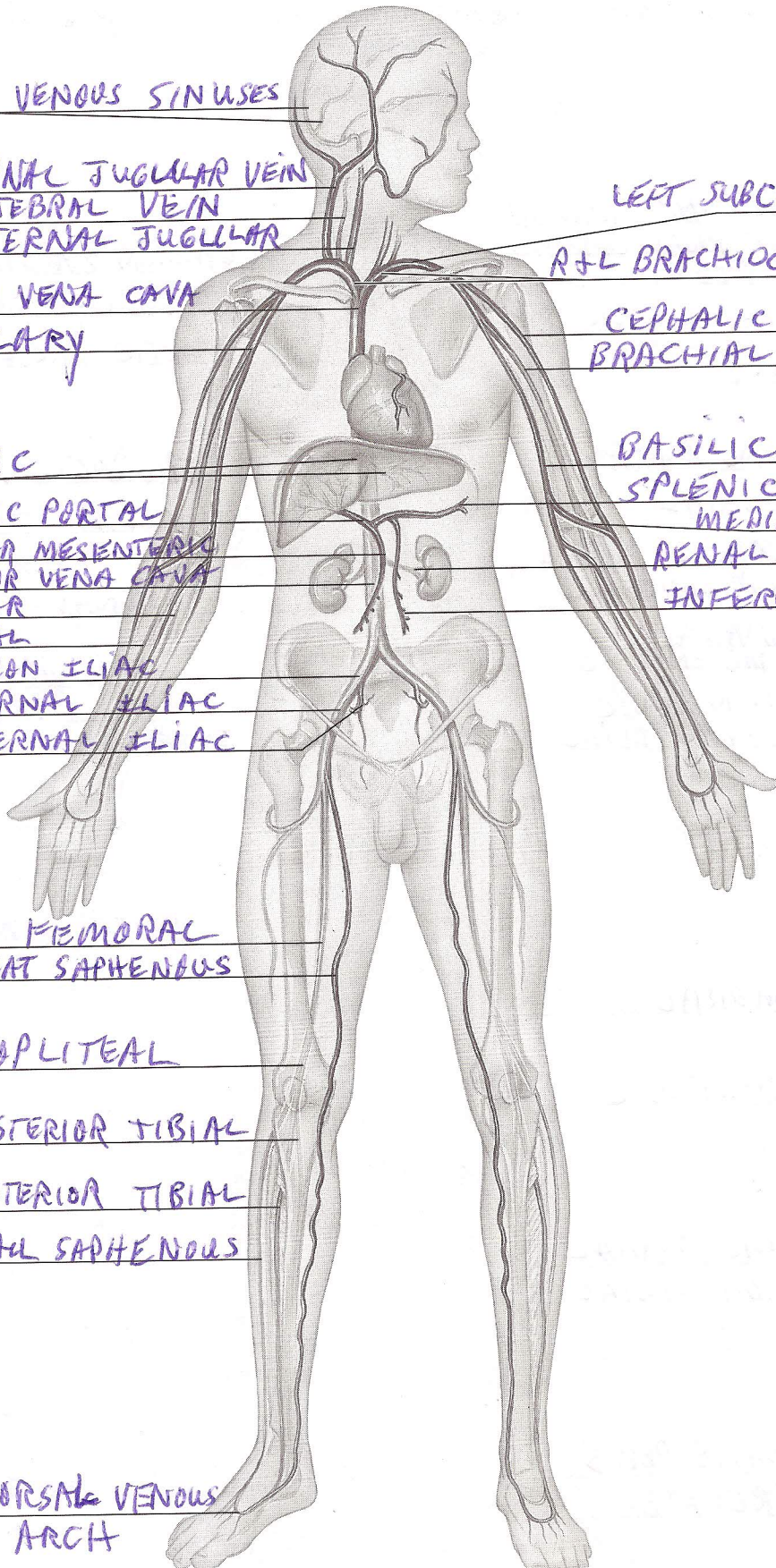
BASILIC
SPLENIC

MEDIAN CUBITAL

RENAL

INFERIOR MESENTERIC

Veins



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: ^{LEFT} RADIAL VEIN → LEFT BRACHIAL VEIN → LEFT SUBCLAVIAN VEIN → LEFT BRACHIOCEPHALIC VEIN → SUPERIOR VENA CAVA → RIGHT ATRIUM → RIGHT VENTRICLE → PULMONARY TRUNK → PULMONARY ARTERIES → ALVEOLAR CAPILLARIES → PULMONARY VEINS → LEFT ATRIUM → LEFT VENTRICLE → ASCENDING AORTA → AORTIC ARCH → BRACHIOCEPHALIC TRUNK → RIGHT SUBCLAVIAN ARTERY → ^{RIGHT} AXILLARY ARTERY → RIGHT BRACHIAL ARTERY → RIGHT RADIAL ARTERY
- b. From the pulmonary vein to the pulmonary artery by way of the right side of the brain: PULMONARY VEINS → ~~LEFT~~ LEFT ATRIUM → LEFT VENTRICLE → ASCENDING AORTA → AORTIC ARCH → BRACHIOCEPHALIC TRUNK → RIGHT COMMON CAROTID ARTERY → RIGHT INTERNAL CAROTID ARTERY → RIGHT MIDDLE CEREBRAL ARTERY → RIGHT CEREBRAL CAPILLARIES → RIGHT DURAL VENOUS SINUSES → RIGHT INTERNAL JUGULAR VEIN → RIGHT BRACHIOCEPHALIC VEIN → SUPERIOR VENA CAVA → RIGHT ATRIUM → RIGHT VENTRICLE → PULMONARY TRUNK → 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.

INFERIOR VENA CAVA → RIGHT ATRIUM → RIGHT VENTRICLE → PULMONARY TRUNK → PULMONARY ARTERIES → PULMONARY CAPILLARIES → ENDOTHELIAL CELLS → BASEMENT MEMBRANE → TYPE I ALVEOLAR CELLS → ALVEOLUS

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. ALVEOLUS → TYPE I ALVEOLAR CELLS → BASEMENT MEMBRANE → ENDOTHELIAL CELLS → PLASMA → RBC → PULMONARY VEINS → LEFT ATRIUM → LEFT VENTRICLE → SYSTEMIC CIRCULATION → AORTA → RIGHT CORONARY ARTERY → 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

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 inferior mesenteric vein), and the _____, which drains 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

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 ITS 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 → ^{SUBCLAVIAN} ~~LEFT COMMON CAROTID~~ → LEFT VERTEBRAL → BASILAR → LEFT POSTERIOR CEREBRAL → 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.

Structure	Function in fetus
Umbilical artery	CARRY DEOXYGENATED, WASTE-LADEN BLOOD TO THE PLACENTA FOR EXCHANGE
Umbilical vein	CARRY OXYGENATED, NUTRIENT-LADEN BLOOD TO THE FETUS
Ductus venosus	SHUNT ALLOWING MOST OF THE UMBILICAL VENOUS BLOOD TO ENTER THE INFERIOR VENA CAVA
Ductus arteriosus	SHUNT ALLOWING MOST OF THE OUTFLOW FROM RIGHT HEART TO BYPASS LUNGS - GO TO AORTA
Foramen ovale	OPENING - HOLE - BETWEEN RIGHT + LEFT ATRIA - ALLOWS SHUNTING OF SOME BLOOD AWAY FROM RIGHT VENTRICLE

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