

# ANSWERS TO CHAPTER 13

## CONTENT LEARNING ACTIVITY

### General Features of Blood Vessel Structure

- A. 1. Systemic vessels; 2. Artery; 3. Capillary; 4. Tunica intima; 5. Tunica media; 6. Tunica adventitia
- B. 1. Elastic arteries; 2. Arterioles; 3. Capillary; 4. Precapillary sphincters; 5. Venules; 6. Valves; 7. Arteriosclerosis

### Blood Vessels of the Pulmonary Circulation

1. Pulmonary trunk; 2. Pulmonary arteries; 3. Pulmonary veins

### Blood Vessels of the Systemic Circulation: Arteries

- A. 1. Ascending aorta; 2. Aortic arch; 3. Descending aorta; 4. Thoracic aorta
- B. 1. Right common carotid artery; 2. Right subclavian artery; 3. Brachiocephalic artery; 4. Left common carotid artery; 5. Left subclavian artery
- C. 1. Axillary artery; 2. Brachial artery; 3. Radial artery; 4. Ulnar artery
- D. 1. Celiac trunk; 2. Suprarenal artery; 3. Renal artery; 4. Superior mesenteric artery; 5. Common iliac artery; 6. Testicular artery; 7. Inferior mesenteric artery
- E. 1. External iliac artery; 2. Femoral artery; 3. Popliteal artery; 4. Anterior tibial artery; 5. Posterior tibial artery; 6. Internal iliac artery

### Blood Vessels of the Systemic Circulation: Veins

- A. 1. Subclavian vein; 2. Brachiocephalic vein; 3. Superior vena cava; 4. Inferior vena cava; 5. Pulmonary veins; 6. Internal jugular vein; 7. External jugular vein
- B. 1. Cephalic vein; 2. Basilic vein; 3. Median cubital vein; 4. Brachial veins; 5. Axillary vein
- C. 1. Hepatic veins; 2. Testicular vein; 3. Common iliac vein; 4. External iliac vein; 5. Internal iliac vein; 6. Renal vein; 7. Suprarenal vein

- D. 1. Inferior vena cava; 2. Hepatic portal vein; 3. Superior mesenteric vein; 4. Inferior mesenteric vein; 5. Splenic vein; 6. Gastric vein; 7. Hepatic veins
- E. 1. Great saphenous vein; 2. Small saphenous vein; 3. Popliteal vein; 4. Femoral vein

### The Physiology of Circulation

- A. 1. Blood pressure; 2. Systolic pressure; 3. Diastolic pressure; 4. Auscultatory; 5. Korotkoff sounds; 6. Systolic pressure; 7. Diastolic pressure
- B. 1. Arterioles and capillaries; 2. Veins; 3. Arterioles and capillaries; 4. Muscular arteries
- C. 1. Pulse pressure; 2. Increases; 3. Increase; 4. Increases; 5. Pulse; 6. Decreases; 7. Increases
- D. 1. Diffusion; 2. Blood pressure; 3. Osmosis; 4. Blood pressure; 5. Osmosis; 6. Lymphatic capillaries; 7. Edema

### Local and Nervous Control of Blood Vessels

1. Local control; 2. Relaxation; 3. Nervous control; 4. Vasomotor center; 5. Vasomotor tone; 6. Nervous control; 7. Local control

### Regulation of Arterial Pressure

1. Mean arterial pressure; 2. Cardiac output; 3. Peripheral resistance; 4. Mean arterial pressure; 5. Mean arterial pressure

### Baroreceptor Reflexes

1. Baroreceptors; 2. Vasoconstrict; 3. Increases; 4. Increase; 5. Increase; 6. Increase; 7. Increase

### Chemoreceptor Reflexes

1. Chemoreceptors; 2. Vasoconstrict; 3. Increases; 4. Increase; 5. Increase; 6. Increases

### Hormonal Mechanisms

1. Epinephrine; 2. Renin; 3. Angiotensin II; 4. Angiotensin II; 5. Aldosterone; 6. Antidiuretic hormone; 7. Atrial natriuretic hormone

## QUICK RECALL

1. Carry blood, exchange nutrients and gases, transport hormones, regulate blood pressure, and direct blood flow.
2. Elastic arteries, muscular arteries, arterioles, capillaries, venules, veins
3. Tunic intima, tunic media, and tunic adventitia
4. Blood pressure moves fluid out of capillaries, and osmosis moves fluid into capillaries.
5. Local control, nervous control, and hormonal control
6.  $MAP = HR \times SV \times PR$
7. Baroreceptor and chemoreceptor reflexes
8. Epinephrine, renin-angiotensin-aldosterone, antidiuretic hormone, and atrial natriuretic hormone

## WORD PARTS

1. sphincter
2. arteriosclerosis; artery; arteriole
3. atherosclerosis; arteriosclerosis
4. carotid
5. brachial; brachiocephalic
6. pulmonary

## MASTERY LEARNING ACTIVITY

1. B. The erythrocyte passes through an elastic artery, muscular artery, arteriole, capillary, venule, and vein.
2. D. Only veins have valves. Veins are thinner walled with less smooth muscle than arteries. Both veins and arteries have all three tunics.
3. B. Oxygen rich blood returns from the lungs to the heart through the pulmonary veins, passes through the left side of the heart, and exits through the aorta.
4. D. Blood going to the right hand passes from the aorta into the brachiocephalic artery and into the right subclavian artery. Blood going to the left hand passes from the aorta directly into the left subclavian artery. From the subclavian artery (either side) blood passes through the axillary artery, brachial artery, and radial artery to reach the hand.
5. D. The radial artery passes over the radius near the wrist, and the pulse can be easily taken by slight compression of the artery against the bone.
6. A. The celiac trunk branches to supply the liver, stomach and spleen.
7. A. The order is common iliac, external iliac, femoral, and popliteal arteries.
8. C. The brachial artery is used to determine blood pressure by the auscultatory method. The pressure cuff constricts the brachial artery, resulting in turbulent flow that produces Korotkoff sounds. The heart sounds, which are caused by closure of the AV and semilunar valves, are not heard with this technique.
9. B. Pulse pressure is the difference between systolic and diastolic pressure. It increases in arteriosclerosis and during exercise.
10. B. The major force moving blood out of capillaries is blood pressure, and the major force moving fluid into capillaries is osmosis. The movement caused by osmosis occurs because there is a greater concentration of proteins, but a lesser concentration of water in the blood than in the tissues. The amount of fluid leaving the arterial ends of capillaries is greater than the amount returning in the venous ends. Consequently, more fluid enters tissues than leaves. The excess is removed by the lymphatic system.
11. A. Local control of blood flow results from relaxation and contraction of the precapillary sphincters. The precapillary sphincters relax, increasing blood flow, in response to a decrease in blood oxygen or an increase in blood carbon dioxide.
12. D. Mean arterial pressure increases when heart rate, stroke volume, or peripheral resistance increase.
13. B. If blood pressure increases, the baroreceptor reflexes cause a decrease in peripheral resistance by causing vasodilation. This response is mediated by decreased sympathetic activity through the vasomotor center.
14. C. Epinephrine causes vasoconstriction of visceral blood vessels and vasodilation of skeletal muscle blood vessels. This routes blood from the viscera to skeletal muscle. Epinephrine also increases heart rate and stroke volume.
15. D. Increased blood pressure stimulates the release of atrial natriuretic hormone from the right atrium of the heart. Atrial natriuretic hormone lowers blood pressure by lowering blood volume (increases urine production). The other substances listed increase blood volume and blood pressure.



## FINAL CHALLENGES



1.
  - a. Aorta, celiac trunk, liver, hepatic vein, inferior vena cava
  - b. Aorta, superior mesenteric artery, small intestine, superior mesenteric vein, hepatic portal vein, liver, hepatic vein, inferior vena cava
  - c. Aorta, common iliac artery, internal iliac artery, urinary bladder, internal iliac vein, common iliac vein, inferior vena cava
  - d. Aorta, brachiocephalic artery, subclavian artery, axillary artery, brachial artery, radial artery, skin, cephalic vein, axillary vein, subclavian vein, brachiocephalic vein, superior vena cava
  - e. Aorta, common iliac artery, external iliac artery, femoral artery, popliteal artery; posterior tibial artery, skin, great saphenous vein, femoral vein, external iliac vein, common iliac vein, inferior vena cava
2. The weight of the blood produces pressure that increases the blood pressure in her lower limbs. Consequently, more fluid moves out of capillaries because of blood pressure than moves back into the capillaries by osmosis. The fluid accumulates in tissues as edema. In addition, because she is sitting skeletal muscles can not assist in moving blood out of her legs.
3. Sitting has resulted in a shift of fluid from the elderly person's blood into the tissues (see Final Challenge Question #2). This causes a reduction in blood volume and blood pressure. Also, because of the demands of digestion, blood is rerouted to the digestive organs. Consequently, there is reduced blood flow toward the brain. When the elderly person stands up, there is an even greater tendency for blood to remain in the lower limbs (because of gravity). Venous return decreases, which causes cardiac output to decrease (Starling's law). Decreased cardiac output results in a decrease in blood pressure. Normally, the baroreceptor reflexes correct the decrease in blood pressure by increasing heart rate and stroke volume. However, if this mechanism does not respond rapidly enough, blood pressure does not increase, blood delivery to the brain is impaired, and the person faints.
4. The child's heart rate should increase. The excitement of being swung around and around can cause release of epinephrine from the adrenal medulla. The epinephrine causes heart rate to increase. Swinging the child also causes blood to move toward the child's feet. This reduces blood return to the heart. Venous return decreases and cardiac output decreases (Starling's law). Consequently blood pressure decreases. The baroreceptor reflexes detect the decrease in blood pressure and compensate by increasing heart rate and stroke volume.
5. The myocardial infarct damages the heart and reduces its ability to pump blood. With a decrease in cardiac output there is a decrease in blood pressure and blood oxygen. The baroreceptor reflexes and the chemoreceptor reflexes compensate by increasing heart rate, stroke volume, and vasoconstriction (peripheral resistance), all of which increase blood pressure. In the days following the myocardial infarct, long-term mechanisms compensate for the still low blood pressure. The renin-angiotensin-aldosterone mechanism increases vasoconstriction and reduces fluid loss in the kidneys. With an increase in blood volume, blood pressure increases.