

Study Guide – Answer Key

Circulatory System

1. Explain why the following statement “arteries always carry oxygenated blood and veins always carry deoxygenated blood” is false using specific examples.

Some arteries, such as the pulmonary arteries and umbilical arteries, carry deoxygenated blood. Some veins, such as the pulmonary veins and umbilical vein, carry oxygenated blood.

2. Describe how blood flow is controlled in each of the three major types of blood vessels.

Arteries: thick middle layer of muscle, allows vessels to dilate or constrict

Capillaries: precapillary sphincter muscles can divert blood past capillary beds

Veins: valves prevent backflow and movement of skeletal muscles help move blood through veins

3. Why is there no pulse in veins?

Too far away from the heart (very low blood pressure and velocity by this point)

4. What forces blood in veins back to heart?

Movement of skeletal muscles

5. The veins have very low blood pressure and blood velocity. Then how is the blood successfully returned to the heart?

Movement of skeletal muscles pushes the blood along and the valves prevent backflow when the muscles relax.

6. Where are the sphincter muscles located and what is their function?

The “pre-capillary” sphincter muscles are located between the arterioles and capillaries. They allow blood to be shunted past capillary beds and towards areas that need more oxygen and nutrients.

7. List several specific substances that diffuse across the capillary walls.

Out of the blood: oxygen and nutrients

Into the blood: carbon dioxide and wastes

8. How does the circulatory system aid in thermoregulation?

If the body is hot, blood can be sent through the capillary beds close to the surface of the skin to reduce body temperature.

If the body is cold, blood will be sent away from extremities and focus on the core to keep organs running properly.

9. Name the three types of blood cells in the whole portion of blood (common and scientific). Give a basic function of each.

Red blood cells (erythrocytes): carry gases (oxygen and carbon dioxide)

White blood cells (leukocytes): fight infection and provide immunity

Platelets (thrombocytes): hold with blood clotting

10. Give one way that the body ensures that oxygen transport is as efficient as possible.

Double loop system allows blood to travel specifically to the lungs to gain oxygen and remove carbon dioxide.

Red blood cells which are adapted to carrying oxygen (no nucleus, lots of hemoglobin, many of them)

11. What organelle is a mature human red blood cell missing? What cellular process can a red blood cell not carry out?

Mature red blood cells have no nucleus which means that they cannot create proteins or replicate themselves

12. Describe one relationship between fibrinogen and blood clotting. Or leukocytes and agglutination.

Fibrinogen is a plasma protein that creates fibrin threads that help create the blood clot.

Leukocytes are white blood cells that create antibodies. Antibodies attach to pathogens and cause them to clump, or agglutinate, after which they are destroyed by other white blood cells.

13. Define capillary exchange and describe the two major forces involved.

Capillary exchange is the diffusion of materials into and out of the blood, to and from the tissues. Blood pressure is higher than osmotic pressure at the arteriole end, substances move out of the blood. Blood pressure is lower than osmotic pressure at the venule end, substance move into the blood.

14. Why does water and other substances move out of plasma and into tissue spaces at the arteriole end of a capillary bed, yet into plasma from the tissue spaces at the venule end?

Blood pressure is higher than osmotic pressure at arteriole end: substances diffuse out

Blood pressure is lower than osmotic pressure at the venule end: substances diffuse back in

15. Name the four valves in the heart. Give the specific role for each pair of valves.

Atrioventricular bicuspid & tricuspid valves: stops backflow into the atria from the ventricles

Pulmonary and aortic semilunar valves: stops backflow into the ventricles

16. Explain the function of the chordae tendineae in the heart.

Ensures the AV valves don't fail, holds them shut, when the ventricles contract

17. What causes the "lub-dub" sound heard at the chest wall?

The closing of the valves. "Lub" is the AV valves closing, "dub" is the semilunar valves closing

18. Describe the intrinsic and extrinsic control of the heartbeat.

Intrinsic control: the heart can control its own beat using the SA and AV nodes in the right atrium

Extrinsic control: the autonomic nervous system can alter heart rate if needed

19. Compare (similarities) and contrast (differences) the SA node and the AV node.

Similarities: both found in the right atrium, both cause contractions of cardiac muscle

Differences: SA node fires first (causes atria to contract) then the AV node fires (causing the ventricles to contract)

20. Why is the SA node called the pacemaker?

It sets the rhythm of the cardiac cycle as it fires every 0.85 seconds.

21. Contrast diastole and systole **using the cardiac cycle**. Describe the contraction and relaxation of specific parts of the heart during various phases.

Systole refers to the contraction, squeezing, of the heart chambers

Diastole refers to the relaxing of the heart chambers

Time (sec)	Atria	Ventricles
0.15	systole (contract)	diastole (relax)
0.30	diastole (relax)	systole (contract)
0.45	diastole (relax)	diastole (relax)

22. Explain the cardiac cycle using the following terms: AV node, diastole, SA node, systole

First the SA node fires, which causes the atria to contract (systole) while the ventricles are still relaxed (diastole). Shortly after, the AV node fires, causing the ventricles to contract (systole) and the atria will have relaxed (diastole).

23. Name three blood vessels that can easily be used to find a pulse. Identify the pulse location for each one.

Carotid artery (neck), brachial artery (arm), radial artery (wrist)

24. Identify each of the "circuits" in a double-circuit system and what side of the heart they originate from.

Pulmonary circuit: right side of the heart

Systemic circuit: left side of the heart

25. Describe the pathway of blood from the fingers to the toes. Or from the brain to the liver. *Based on major vessels in 10.4*

- Fingers → subclavian vein → inferior vena cava → right atrium → right ventricle → lungs → left atrium → left ventricle → aorta → iliac artery → toes
- Brain → subclavian vein → inferior vena cava → right atrium → right ventricle → lungs → left atrium → left ventricle → aorta → mesenteric arteries → hepatic portal vein

26. Give one way that the body ensures that oxygen transport is as efficient as possible.

Oops! Same as 10.

27. Identify the oxygenated nature of blood and the direction of blood flow in the various blood vessels of an umbilical cord.

The umbilical vein takes oxygenated, nutrient rich, blood TO the fetal heart. The umbilical arteries carry the deoxygenated blood AWAY from the fetal heart.

28. Explain the function of the placenta.

Provides the area for gas, nutrient, and waste exchange between the fetal and maternal circulatory systems.

29. What two fetal heart specializations allow the blood to bypass the non-functional pulmonary circuit? Describe or illustrate their location.

Oval opening: between left and right atria

Arterial duct: connection between pulmonary artery and aorta

30. Describe several roles of the lymphatic system.

- Pick up excess tissue fluid and deliver it back to the circulatory system
- Absorb fats (lipids) from the digestive system and transport them to the bloodstream
- Defend against disease