Name: _____ **Class:** _____ **Date:** _____ **ID: A**

Circulatory system

Multiple Choice
Identify the choice that best completes the statement or answers the question.

____ 1. Red blood cells carry oxygen attached to —
a. the nucleus.
b. the plasma membrane.
c. hemoglobin.
d. iron.

____ 2. At the site of a wound, a web forms that eventually facilitates the formation of a scab. What is this web is composed of?
a. Red blood cells
b. Fibrin
c. Hemoglobin
d. White blood cells

____ 3. A person with type AB blood requires a blood transfusion. Which of the following types of blood can be given?
a. Type A
b. Type B
c. Type O
d. All of the above

____ 4. Vessels that carry blood away from the heart are called —
a. arteries.
b. veins.
c. capillaries.
d. cells.

____ 5. Oxygen-depleted blood from the body enters which chamber of the heart?
a. Right ventricle
b. Left ventricle
c. Right atrium
d. Left atrium

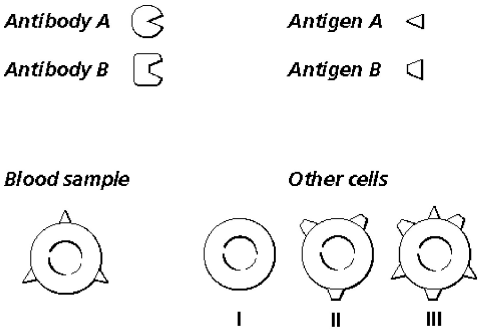

Figure 37-4

____ 6. What antibodies does the sample shown in Figure 37-4 have?
a. A
b. B
c. both
d. neither

____ 7. Which blood cell can the specimen shown in Figure 37-4 be given with no harm?
a. I
b. II
c. III
d. I and II

____ 8. Which type of blood cell can the specimen shown in Figure 37-4 donate to with no harm?
a. I
b. II
c. III
d. all of them

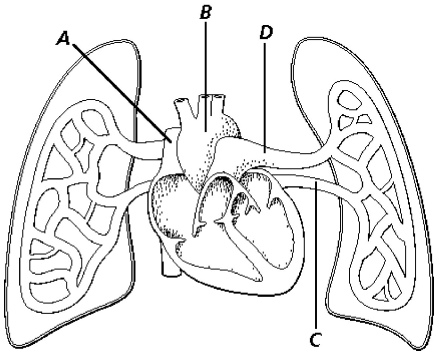

Figure 37-5

____ 9. What is the destination of blood a B in Figure 37-5?
a. the heart
b. both lungs
c. the body
d. the left lung

____ 10. How is the blood located in the vein at C in Figure 37-5 different than the blood in all other veins of the body?
a. it is rich with oxygen
b. it is rich with carbon dioxide
c. it doesn't reach the lung
d. it doesn't reach the heart

____ 11. Why is blood pumped through D before B in Figure 37-5?
a. to enrich it with oxygen
b. to enrich it with carbon dioxide
c. to enrich it with water
d. to enrich it with blood cells

True/False
Indicate whether the statement is true or false.

____ 12. Homeostasis in respiration is controlled by the cerebrum.

____ 13. Your blood type can be changed with a blood transfusion.

____ 14. Different blood types result from different antibodies being present on the membranes of red blood cells.

____ 15. If you have type B blood, then you have anti-A antibodies in your plasma.

____ 16. Risks involving incompatible Rh factors are greatest for a woman's first child.

____ 17. If you have type A blood and anti-A is added during a transfusion, no clumps will form.

____ 18. Your pulse represents the pressure that blood exerts as it pushes the walls of a vein.

____ 19. Blood enters the heart through the atria.

____ 20. The only veins that carry oxygen-rich blood are the venae cavae.

____ 21. The blood in the veins is prevented from flowing backward because of valves in these blood vessels.

____ 22. Red blood cells are produced in the spleen.

____ 23. Human red blood cells are produced by the liver.

Matching

Match each item with the correct statement below.

a. hemoglobin
b. antigen
c. trachea
d. nephron
e. artery
f. atrium
g. alveoli
h. urine
i. aorta
j. platelets
k. pulse
l. antibody
m. plasma
n. capillary
o. ventricle
p. vein

____ 24. Regular surge of blood through an artery
____ 25. Largest blood vessel in the body
____ 26. A lower chamber of the heart
____ 27. An upper chamber of the heart
____ 28. A large blood vessel that carries blood from the tissues to the heart
____ 29. A kind of large, muscular, thick-walled elastic vessel that carries blood away from the heart
____ 30. Protein that reacts with an antigen
____ 31. Microscopic blood vessel
____ 32. Foreign substance that stimulates an immune response
____ 33. Cell fragments that help blood to clot after an injury
____ 34. Iron-containing protein that picks up oxygen after it enters the blood vessels in the lungs
____ 35. Fluid portion of blood in which blood cells move

Short Answer

36. What cells and substances would you expect to find suspended or dissolved in plasma?

37. A human blood sample at a blood bank has A antigens in the red blood cells and anti-B antibodies in the plasma. What type is the blood? Who can receive it?

38. How does a pacemaker set the heart rate?

39. What problem may arise when a woman with Rh^- blood is pregnant with an Rh^+ fetus?

40. Distinguish between systolic pressure and diastolic pressure.

41. Arteriosclerosis slowly reduces blood flow through the arteries to the brain. Explain how this may affect a patient who has this condition.

As the graph in Figure 37-1 shows, a marathon runner is able to increase the amount of blood pumped by the heart (cardiac output) from 5 L/min while resting to 30 L/min while competing. The runner's stroke volume (pumping capacity per heartbeat) measured in mL/beat, and heart rate, measured in beats/min, are also increased.

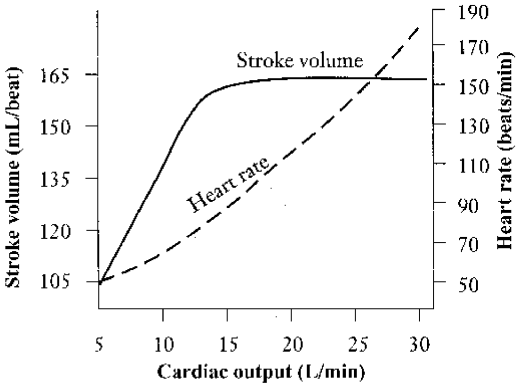

Figure 37-1

42. Based on Figure 37-1, which has the greater effect on cardiac output, stroke volume or heart rate?
43. What is the stroke volume when the cardiac output is 20 mL/min? Refer to Figure 37-1.
44. When the runner's cardiac output is 20 L/min, what is the heart rate? Use Figure 37-1.
45. Describe the pathway a waste molecule takes out of the body through the kidney.
46. Why is an Rh incompatibility (mother Rh-, baby Rh+) not a problem during the first pregnancy?

Problem

The vertebrate heart can beat spontaneously. If the heart of a vertebrate is removed and placed in a balanced salt solution with nutrients, it will continue to beat for hours. In fact, the muscle from each part of the heart beats at its own rate if it is not under the control of the pacemaker.

In a physiology laboratory experiment, a frog is anesthetized and the heart is exposed. Recall that the frog has a three-chambered heart, with right and left atria and a single ventricle. It also has a sinus venosus, which receives oxygen-depleted blood from all parts of the body except the lungs. The sinus venosus is where contraction begins. (This role is assumed by the pacemaker in the mammalian heart.) For this experiment, the nerve connections to the heart are blocked. The sinus venosus, the right atrium, and the ventricle are each attached to a stylus for marking on a kymograph (an instrument that records changes in pressure). In the graphs of Figure 37-2, rises represent contractions.

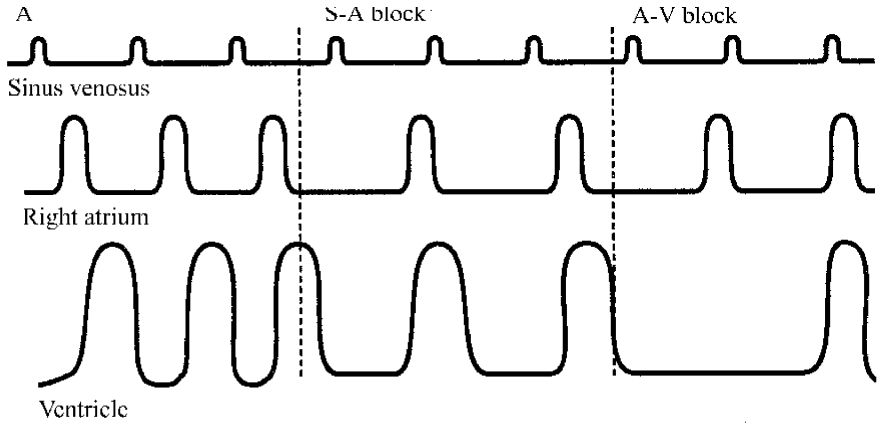

Figure 37-2

47. What can you conclude about the rate of beat of the different parts of the heart from this experiment? Refer to Figure 37-2.

48. How does blocking the action between the atrium and the ventricle, which is called an A-V block, affect the beat of the sinus venosus, the atrium, and the ventricle? Refer to Figure 37-2.

49. What could you do to find out the effect of blocking the atrium? See Figure 37-2.

50. Based on Figure 37-2, how does blocking the sinus venosus affect the rate at which the atrium and ventricle beat?

51. To understand how the heart beats when the impulse from the sinus venosus is blocked, a string is tied tightly around the heart between the sinus venosus and the atrium. In Figure 37-2, this is called an S-A block. How does the S-A block affect the rate of the beat of the sinus venosus?

52. Interpret the data in A in Figure 37-2.

Circulatory system
Answer Section

MULTIPLE CHOICE

1. ANS: C
   Hemoglobin, an iron-containing protein, is found in red blood cells. It binds to oxygen and transports it through the blood.

   PTS: 1
2. ANS: B
   Protein fibers, called fibrin, are linked together in a network to form a web at the site of a wound. This network traps escaping blood cells, eventually forming a protective scab over the wound.

   PTS: 1
3. ANS: D
   An individual with type AB blood has no anti-A or anti-B antibodies. Therefore, he or she can receive blood containing any combination of these antigens.

   PTS: 1
4. ANS: A
   Arteries carry blood from the heart to the rest of the body and veins carry blood from the body to the heart.

   PTS: 1
5. ANS: C
   Oxygen-poor blood from the body enters the right atrium through the venae cavae.

   PTS: 1
6. ANS: C PTS: 1 DIF: A OBJ: 37-4
   NAT: C1 | C5
7. ANS: A PTS: 1 DIF: A OBJ: 37-4
   NAT: C1 | C5
8. ANS: C PTS: 1 DIF: A OBJ: 37-4
   NAT: C1 | C5
9. ANS: C PTS: 1 DIF: B OBJ: 37-5
   NAT: A1 | C1 | F1
10. ANS: A PTS: 1 DIF: B OBJ: 37-5
    NAT: A1 | C1 | F1
11. ANS: A PTS: 1 DIF: A OBJ: 37-5
    NAT: A1 | C1 | F1

TRUE/FALSE

12. ANS: F PTS: 1
13. ANS: F PTS: 1
14. ANS: F PTS: 1

15. ANS: T PTS: 1
16. ANS: F PTS: 1
17. ANS: F PTS: 1 DIF: B OBJ: 37-4
    NAT: C1 | C5
18. ANS: F PTS: 1 DIF: B OBJ: 37-5
    NAT: A1 | C1 | F1
19. ANS: T PTS: 1 DIF: B OBJ: 37-5
    NAT: A1 | C1 | F1
20. ANS: F PTS: 1 DIF: B OBJ: 37-5
    NAT: A1 | C1 | F1
21. ANS: T PTS: 1 DIF: B OBJ: 37-5
    NAT: A1 | C1 | F1
22. ANS: F PTS: 1 DIF: B OBJ: 37-4
    NAT: C1 | C5
23. ANS: F PTS: 1 DIF: B OBJ: 37-4
    NAT: C1 | C5

MATCHING

24. ANS: K PTS: 1 DIF: B OBJ: 37-5
    NAT: A1 | C1 | F1
25. ANS: I PTS: 1 DIF: B OBJ: 37-5
    NAT: A1 | C1 | F1
26. ANS: O PTS: 1 DIF: B OBJ: 37-5
    NAT: A1 | C1 | F1
27. ANS: F PTS: 1 DIF: B OBJ: 37-5
    NAT: A1 | C1 | F1
28. ANS: P PTS: 1 DIF: B OBJ: 37-5
    NAT: A1 | C1 | F1
29. ANS: E PTS: 1 DIF: B OBJ: 37-5
    NAT: A1 | C1 | F1
30. ANS: L PTS: 1 DIF: B OBJ: 37-4
    NAT: C1 | C5
31. ANS: N PTS: 1 DIF: B OBJ: 37-5
    NAT: A1 | C1 | F1
32. ANS: B PTS: 1 DIF: B OBJ: 37-4
    NAT: C1 | C5
33. ANS: J PTS: 1 DIF: B OBJ: 37-4
    NAT: C1 | C5
34. ANS: A PTS: 1 DIF: B OBJ: 37-4
    NAT: C1 | C5
35. ANS: M PTS: 1 DIF: B OBJ: 37-4
    NAT: C1 | C5

SHORT ANSWER

36. ANS:
red and white blood cells; platelets; carbon dioxide and other gases; hormones; enzymes; proteins; inorganic salts; antibodies; nutrients

PTS: 1

37. ANS:
It is type A blood. A person with type A blood can receive it.

PTS: 1 DIF: A OBJ: 37-4 NAT: C1 | C5

38. ANS:
The pacemaker generates an electrical impulse that spreads over both atria, signaling the two atria to contract at almost the same time. It also triggers cells at the base of the right atrium to send an electrical impulse over the ventricles.

PTS: 1 DIF: B OBJ: 37-6 NAT: A1 | B3 | C5

39. ANS:
Toward the end of pregnancy or at delivery, the fetal blood may leak through the placenta and mix with the mother's blood. If the mother is Rh^-, she will produce antibodies against the Rh antigen. If she becomes pregnant again, the antibodies will cross the placenta and attack the red blood cells of an Rh^+ fetus. If the fetus is Rh^-, there is no problem.

PTS: 1 DIF: B OBJ: 37-4 NAT: C1 | C5

40. ANS:
When the ventricles contract, blood pressure rises sharply. This high pressure is called systolic pressure. As the ventricles relax, blood pressure drops; the lowest pressure occurs just before the ventricles contract again and is called diastolic pressure.

PTS: 1 DIF: B OBJ: 37-5 NAT: A1 | C1 | F1

41. ANS:
If the patient's blood flow is cut down, the amount of oxygen and nutrients that reach the brain is reduced. The patient may become confused and unable to perform normally.

PTS: 1 DIF: A OBJ: 37-5 NAT: A1 | C1 | F1

42. ANS:
The heart rate has the greater effect because as the graph shows, cardiac output is at its maximum only when the heart rate reaches its maximum. Cardiac output is well below its maximum when stroke volume reaches its maximum.

PTS: 1 DIF: A OBJ: 37-5 NAT: A1 | C1 | F1

43. ANS:
160 mL/beat

PTS: 1 DIF: B OBJ: 37-5 NAT: A1 | C1 | F1

44. ANS:
120 beats/min

PTS: 1 DIF: B OBJ: 37-5 NAT: A1 | C1 | F1

45. ANS:
From the blood, the waste molecule is filtered out by the nephron, passed to the ureter, to the bladder, and to the outside through the urethra.

PTS: 1 DIF: B OBJ: 37-7 NAT: C5 | F1 | G1

46. ANS:
During the first pregnancy, the mother is not exposed to the antigen until very late in the pregnancy, usually during birth. It is at that time the mother begins to manufacture antibodies. These antibodies could only affect future pregnancies with Rh+ babies.

PTS: 1 DIF: B OBJ: 37-7 NAT: C5 | F1 | G1

PROBLEM

47. ANS:
Answers will vary but may include that each area of the heart beats at its own rate unless influenced by the sinus venosus or by the lower part of the atrium. Also, students may conclude that although the sinus venosus controls the rhythm of the heart, other heart tissue can initiate contraction if the sinus venosus is blocked.

PTS: 1 DIF: A OBJ: 37-6 NAT: A1 | B3 | C5

48. ANS:
The sinus venosus and atrium continue to beat, but each at its own rate. The ventricle slows down considerably.

PTS: 1 DIF: A OBJ: 37-6 NAT: A1 | B3 | C5

49. ANS:
You could tie another string around the heart, between the atrium and the ventricle.

PTS: 1 DIF: A OBJ: 37-3 NAT: C1 | C5 | F1

50. ANS:
The atrium and the ventricle beat more slowly after the block.

PTS: 1 DIF: A OBJ: 37-6 NAT: A1 | B3 | C5

51. ANS:
It doesn't change the rate.

PTS: 1 DIF: A OBJ: 37-6 NAT: A1 | B3 | C5

52. ANS:
The sinus venosus of the frog heart contracts slightly before the atrium. The atrium contracts slightly before the ventricle. The atrium and the ventricle contract at the same rate as the sinus venosus.

PTS: 1 DIF: A OBJ: 37-6 NAT: A1 | B3 | C5