Chapter 37

Circulatory and Respiratory Systems

Section 37-1 The Circulatory System (pages 943-950)

This section describes the circulatory system and its functions.

Functions of the Circulatory System (page 943)

1. Why do large organisms require a circulatory system? Most of their cells are not in direct contact with the environment, so they cannot rely on diffusion. Therefore, they need a circulatory system to transport substances from one part of the organism to another.

2. What is a closed circulatory system? It is one that has a circulating fluid pumped through a system of vessels.

3. List the three components of the circulatory system.

The Heart (pages 944-946)

4. Is the following sentence true or false? The heart is composed almost entirely of muscle. ______ true

Match each heart structure with its description.

<table>
<thead>
<tr>
<th>Structure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>b 5. pericardium</td>
<td>a. Thick layer of muscle in the walls of the heart</td>
</tr>
<tr>
<td>a 6. myocardium</td>
<td>b. Sac of tissue that encloses and protects the heart</td>
</tr>
<tr>
<td>c 7. atrium</td>
<td>c. Upper chamber of the heart</td>
</tr>
<tr>
<td>d 8. ventricle</td>
<td>d. Lower chamber of the heart</td>
</tr>
</tbody>
</table>

9. The heart pumps about ______ 72 ______ times per minute.

10. Dividing the right side of the heart from the left side is a wall called a(an) ______ septum ______.

11. Is the following sentence true or false? The heart functions as four separate pumps. ______ false

12. Complete the compare/contrast table.

<table>
<thead>
<tr>
<th>THE CIRCULATORY SYSTEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of Circulatory Pathway</td>
</tr>
<tr>
<td>Pulmonary circulation</td>
</tr>
<tr>
<td>Systemic circulation</td>
</tr>
</tbody>
</table>

13. What happens to blood when it reaches the lungs? ______ Carbon dioxide leaves the blood and oxygen is absorbed.______

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Chapter 37, Circulatory and Respiratory Systems  (continued)

14. Why is the blood that enters the heart from the systemic circulation oxygen-poor? __The cells of the body have absorbed much of the oxygen the blood once contained and loaded the blood with carbon dioxide.__

15. Circle the letter of each sentence that is true about blood flow through the heart.
   a. Blood enters the heart through the right and left atria.
   b. Blood enters the heart through the right and left ventricles.
   c. Blood flows from the ventricles to the atria.
   d. Blood flows out of the heart through the right and left atria.

16. Flaps of connective tissue called __valves__ prevent blood from flowing backward in the heart.

17. Each heart contraction begins in a small group of cardiac muscle cells called the __sinoatrial__ node.

18. Cells that set the pace for the beating of the heart as a whole are called the __pacemaker__.

Blood Vessels  (pages 946–947)

19. Complete the concept map.

![Types of Blood Vessels]

- Arteries
- Capillaries
- Veins

20. Circle the letter of each sentence that is true about arteries.
   a. Most carry oxygen-poor blood.  c. They have thin walls.
   b. They can expand under pressure.  d. The largest is the aorta.

21. Is the following sentence true or false? The smallest of the blood vessels are the capillaries. __true__

22. What work is done in the capillaries? __They bring nutrients and oxygen to the tissues and absorb carbon dioxide and other waste products.__

23. What keeps blood flowing toward the heart in the largest veins? __One-way valves keep blood flowing toward the heart.__
Blood Pressure (pages 948–949)

24. The force of blood on the walls of arteries is known as          blood pressure.

25. Is the following sentence true or false? Blood pressure increases when the heart relaxes.     false

Match each type of blood pressure with the force it measures.

<table>
<thead>
<tr>
<th>Type of Pressure</th>
<th>Force It Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>b. 26. systolic</td>
<td>a. Force of the blood when the ventricles relax</td>
</tr>
<tr>
<td>a. 27. diastolic</td>
<td>b. Force of the blood when the ventricles contract</td>
</tr>
</tbody>
</table>

28. Is the following sentence true or false? An average adult’s blood pressure is 140/80.     false

29. How does the autonomic nervous system regulate blood pressure?  It releases neurotransmitters that cause the smooth muscles around blood vessels to relax when blood pressure is too high or to contract when blood pressure is too low.

30. How do the kidneys regulate blood pressure?  They remove more water from the blood and thereby reduce blood volume when blood pressure is too high.

Disorders of the Circulatory System (pages 949–950)

31. A condition in which fatty deposits build up on the walls of arteries is called          atherosclerosis.

32. High blood pressure also is called          hypertension.

33. Is the following sentence true or false? High blood pressure increases the risk of heart attack and stroke.     true

34. Circle the letter of each sentence that is true about heart attack.
   a. It is caused by atherosclerosis in the coronary arteries.
   b. It occurs when part of the heart muscle begins to die.
   c. Its symptoms include nausea and chest pain.
   d. It requires immediate medical attention.

35. Is the following sentence true or false? A stroke may be caused by a clot in a blood vessel leading to the brain.     true

36. List the four keys to avoiding cardiovascular disorders.
   a. Exercise
   b. Weight control
   c. Sensible diet
   d. Not smoking
Section 37–2 Blood and the Lymphatic System (pages 951–955)

This section describes the functions of the different components of blood. It also outlines the role of the lymphatic system.

Blood Plasma (page 951)

1. The straw-colored fluid portion of blood is called **plasma**.

2. Circle the letter of each sentence that is true about plasma.
   a. It makes up 90 percent of the volume of blood.
   b. It is about 55 percent water.
   c. It contains only dissolved gases and salts.
   d. It contains both nutrients and enzymes.

Match each type of plasma protein with its function.

<table>
<thead>
<tr>
<th>Type of Protein</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>albumin</td>
<td>a. Helps blood clot</td>
</tr>
<tr>
<td>globulin</td>
<td>b. Transports substances</td>
</tr>
<tr>
<td>fibrinogen</td>
<td>c. Fights infections</td>
</tr>
</tbody>
</table>

Blood Cells (pages 952–954)

6. List the three types of blood cells.
   a. **Red blood cells**
   b. **White blood cells**
   c. **Platelets**

7. Circle the letter of each sentence that is true about red blood cells.
   a. They are the least numerous cells in the blood.
   b. Their role is to transport oxygen.
   c. They contain hemoglobin.
   d. They are produced in the bone marrow.

8. Is the following sentence true or false? Mature red blood cells have two nuclei. ______ true ______ false

9. Circle the letter of each sentence that is true about white blood cells.
   a. They contain a nucleus.
   b. They attack foreign substances.
   c. They contain hemoglobin.
   d. They are also called leukocytes.

10. Is the following sentence true or false? Most white blood cells live for an average of 120 days. ______ true ______ false

11. White blood cells that engulf and digest foreign cells are called **phagocytes**.
Match the type of white blood cell with its function.

<table>
<thead>
<tr>
<th>Cell Type</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>b 12. eosinophils</td>
<td>a. Produce antibodies</td>
</tr>
<tr>
<td>c 13. basophils</td>
<td>b. Attack parasites</td>
</tr>
<tr>
<td>a 14. lymphocytes</td>
<td>c. Release histamines</td>
</tr>
</tbody>
</table>

15. What does a sudden increase in the number of white cells tell a physician? The body is fighting a serious infection.

16. List the two components of blood that make clotting possible.
   a. Plasma proteins
   b. Platelets

17. Number the drawings below to show the correct sequence in which a blood clot forms when a blood vessel is injured.

   1 2 3

18. A genetic disorder that results from a defective protein in the clotting pathway is hemophilia.

The Lymphatic System (pages 954–955)

19. What is the lymphatic system? It is a network of vessels that collects the fluid lost by the blood and returns it to the circulatory system.

20. The fluid lost by blood is called lymph.

21. Circle the letter of each choice that is a function of lymph nodes.
   a. Trapping bacteria
   b. Helping blood to clot
   c. Preventing backward flow of lymph
   d. Producing lymphocytes

Reading Skill Practice

When you read a section with difficult material, writing a summary can help you identify and remember the main ideas and supporting details. Write a concise paragraph summing up the material under each heading in Section 37–2. Each of your paragraphs should be much shorter than the text under that heading in your book. Include each of the boldfaced vocabulary terms in your summary. Do your work on a separate sheet of paper.

In their summaries, students should correctly use the boldfaced vocabulary terms as they briefly describe the structure and function of blood plasma, blood cells, and the lymphatic system.