THE CIRCULATORY SYSTEM

VOCABULARY REVIEW  Distinguish between the terms in each of the following pairs of terms.

1. ventricle, atrium

2. sinoatrial node, atrioventricular node

3. artery, vein

4. pulmonary circulation, systemic circulation

MULTIPLE CHOICE  Write the correct letter in the blank.

_____ 1. Which of the following is most important to the heartbeat?
   a. aortic valve  b. sinoatrial node  c. lymph node  d. tricuspid valve

_____ 2. During its circulation from the left atrium to the left ventricle, what percentage of the blood enters the pulmonary circulation?
   a. 25%  b. 50%  c. 100%  d. None of the above

_____ 3. Exchange of nutrients and waste between blood and body tissues occurs across
   a. arterioles.  b. capillaries.  c. arteries.  d. veins.

_____ 4. Which one of the following characteristics is unique to the pulmonary circulation?
   a. capillaries that exchange gases with the surrounding tissue
   b. arteries that carry blood away from the heart
   c. an artery that originates at the right ventricle
   d. an artery that originates at the right atrium

_____ 5. The lymphatic system is important for the normal function of the body because it
   a. carries newly formed blood to the cardiovascular system.
   b. returns excess intercellular fluid to the cardiovascular system.
   c. provides an alternate route for blood during strenuous exercise.
   d. carries oxygen to the lymph nodes.
SHORT ANSWER Answer the questions in the space provided.

1. Trace the flow of blood through the heart.

2. Describe the function of the lymphatic system.

3. Critical Thinking If the aortic valve could not close completely, would the diastolic pressure or systolic pressure be affected the most? Explain your answer.

STRUCTURES AND FUNCTIONS Use the figure of the human heart below to answer the following questions.

1. Label each part of the figure in the spaces provided.

2. How would a defect of the mitral valve affect circulation?
VOCABULARY REVIEW  Explain the relationship between the terms in each of the following pairs of terms.

1. leukocyte, phagocyte

2. antigen, antibody

3. erythrocyte, hemoglobin

4. platelet, fibrin

MULTIPLE CHOICE  Write the correct letter in the blank.

1. When oxygen is carried by the blood, it is bonded to
   a. platelets.  b. antibodies.  c. plasma.  d. hemoglobin.

2. Phagocytes
   a. carry hemoglobin.  c. engulf microorganisms.  b. synthesize erythrocytes.  d. produce antibodies.

3. Platelets
   a. are formed in lymph nodes.  c. produce hemoglobin.  b. are involved with blood clotting.  d. are whole cells.

4. Mature red blood cells
   a. live for several years.  c. promote clotting.  b. are the largest cells in the blood.  d. do not have a nucleus.

5. If someone is receiving a blood transfusion, which of the following is most important to know?
   a. the number of erythrocytes in the donated blood
   b. if the father of the blood donor is Rh⁺
   c. the donor’s blood type
   d. if the blood recipient has eaten within the last six hours
SHORT ANSWER Answer the questions in the space provided.

1. How is oxygen transported in the blood? ____________________________

2. List two structural differences and two functional differences between erythrocytes and leukocytes. ____________________________

3. Explain why a person with type AB blood can donate blood only to a person with the same blood type. ____________________________

4. Describe the role of platelets in blood clotting. ____________________________

5. Critical Thinking How might lack of dietary iron affect the oxygen-carrying capacity of the blood? ____________________________

STRUCTURES AND FUNCTIONS Use the table below to answer the following questions.

<table>
<thead>
<tr>
<th>Blood types</th>
<th>Antigen on red blood cells</th>
<th>Can give blood to</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>A</td>
<td>A, AB</td>
</tr>
<tr>
<td>B</td>
<td>B</td>
<td>B, AB</td>
</tr>
<tr>
<td>AB</td>
<td>A and B</td>
<td>AB</td>
</tr>
<tr>
<td>O</td>
<td>none</td>
<td>A, B, AB, O</td>
</tr>
</tbody>
</table>

1. Explain why type O blood can be donated in a blood transfusion regardless of the recipient’s blood type. ____________________________

2. Describe the antibody-antigen interactions that would occur if an Rh\(^{-}\) person with type B blood received blood from an Rh\(^{+}\) person with type AB blood. ____________________________
THE RESPIRATORY SYSTEM

VOCABULARY REVIEW  Explain the relationship between the terms in each of the following pairs of terms.

1. epiglottis, trachea ________________________________

2. expiration, larynx ________________________________

3. bronchi, bronchioles ________________________________

4. alveoli, inspiration ________________________________

MULTIPLE CHOICE  Write the correct letter in the blank.

____ 1. Cilia that line the walls of air passageways
   a. move the inspired air to the alveoli.       b. move the expired air to the nasal cavity.       c. moisten the expired air.       d. clean the inspired air.

____ 2. The exchange of gases that occurs at an alveolus depends on
   a. elevated blood pressure.       b. mucus carrying dissolved oxygen.       c. concentration gradients.       d. bronchioles closing during expiration.

____ 3. Carbon dioxide is transported in the blood
   a. bound to hemoglobin.       b. plasma.       c. as bicarbonate ions.       d. All of the above

____ 4. Inspiration occurs when
   a. the diaphragm pushes upward.       b. thoracic volume increases.       c. blood pressure increases.       d. thoracic pressure increases.

____ 5. The rate of breathing is controlled by cells within
   a. a specialized node located in the bronchus.       b. the diaphragm.       c. the brain.       d. stretch receptors located between the ribs.
**SHORT ANSWER** Answer the questions in the space provided.

1. Is the nasal cavity a part of the respiratory system? Explain your answer.

   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

2. How is most carbon dioxide transported in the blood?

   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

3. Describe how the skeleton is involved with expiration.

   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

4. **Critical Thinking** Oxygen deficiency is called hypoxia. Suggest two possible causes of inadequate delivery of oxygen to body tissues.

   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

**STRUCTURES AND FUNCTIONS** Use the figure below to answer the following questions.

1. What drives the diffusion of oxygen into the blood and carbon dioxide from a blood cell to an alveolus?

   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

2. In the lungs, is carbon dioxide more concentrated in the alveoli or in the blood? Explain your answer.

   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

3. Does the exchange of carbon dioxide depend on the concentration of oxygen in the alveoli and the blood? Explain your answer.

   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
Section 47-1

VOCABULARY REVIEW
1. Each side of the heart is divided into an upper chamber (an atrium) and a lower chamber (a ventricle).
2. The sinoatrial node sends electrical impulses to the atrioventricular node, which then relays electrical impulses to the muscles of the ventricles and causes them to contract.
3. Arteries are large, muscular vessels that carry blood away from the heart. Veins carry blood to the heart.
4. In pulmonary circulation, blood travels between the heart and lungs. In systemic circulation, blood travels between the heart and other body tissues.

MULTIPLE CHOICE
1. b  
2. d  
3. b  
4. c  
5. b

SHORT ANSWER
1. Deoxygenated blood moves from the right atrium to the right ventricle and then to the lungs. Oxygenated blood returns from the lungs to the left atrium and then moves into the left ventricle. Oxygenated blood is pumped from the left ventricle and circulates throughout the body. Deoxygenated blood returns to the right atrium.
2. It returns fluids that have collected in the tissues to the bloodstream. It also traps foreign particles, microorganisms, and other tissue debris.
3. Diastolic; if blood flowed back into the left ventricle after contraction, less blood would remain in the arteries, reducing the blood pressure when the heart is relaxed.

STRUCTURES AND FUNCTIONS
1. a. aorta; b. superior vena cava; c. right atrium; d. tricuspid valve; e. right ventricle; f. inferior vena cava; g. pulmonary artery; h. left atrium; i. pulmonary veins; j. mitral valve; k. left ventricle
2. Blood would leak from the left ventricle back into the left atrium, causing reduced systemic blood flow and possible oxygen deficiency.
Section 47-2

VOCABULARY REVIEW
1. Leukocytes help defend the body from disease. Phagocytes are a type of leukocyte that engulf invading microorganisms.
2. An antigen is a protein or carbohydrate that causes the body to produce antibodies, which are defensive proteins.
3. Erythrocytes synthesize large amounts of hemoglobin, which carries oxygen.
4. Platelets are cell fragments involved with blood clotting. Fibrin is a protein that traps red blood cells during clotting.

MULTIPLE CHOICE
1. d  2. c  3. b  4. d  5. c

SHORT ANSWER
1. In the blood, oxygen is bonded to molecules of hemoglobin in red blood cells for transport.
2. Structural differences include: no nucleus in the RBC, but a nucleus in the WBC; one type of RBC, but several types of WBC; and a higher number of RBC in circulation, but a lower number of WBC in circulation. Functional differences include: RBCs transport gases, while WBCs fight diseases; a short life span for RBCs, and a long life span for WBCs.
3. All other blood types contain anti-A or anti-B antibodies. A person with type AB blood will have RBCs with A and B antigens, and mixing anti-A or anti-B antibodies with type AB blood would be harmful.
4. Platelets congregate at a damaged site, sticking together and forming a small plug. Platelets release clotting factors, which begin a series of reactions to produce fibrin. Fibrin produces a net that traps other cells and forms a clot.
5. Because hemoglobin requires a molecule of iron to complete its formation, lack of dietary iron might impair the synthesis of hemoglobin. Hemoglobin carries oxygen; therefore, lack of hemoglobin could impair the oxygen carrying capacity of blood.

STRUCTURES AND FUNCTIONS
1. Type O blood does not contain antigens that would react with any antibodies that the recipient might have.
2. Antibodies to antigens A and Rh will cause agglutination, resulting in blocked vessels in the recipient’s body.

Section 47-3

VOCABULARY REVIEW
1. When food is swallowed, the epiglottis covers the trachea. During inspiration, the epiglottis allows air to pass into the trachea.
2. Vocal sounds are produced when air is expired past the vocal chords in the larynx.
3. The trachea branches into two bronchi, each of which leads to a lung. Bronchi branch into smaller tubes called bronchioles.
4. Alveoli are filled with air during inspiration.

MULTIPLE CHOICE
1. d  2. c  3. d  4. b  5. c

SHORT ANSWER
1. Yes; it conducts air between the external environment and the lungs.
2. Most CO₂ is transported as bicarbonate ions. When CO₂ diffuses into plasma, it interacts with an enzyme that converts CO₂ to carbonic acid. The carbonic acid spontaneously breaks down to bicarbonate ions and a proton. Bicarbonate ions are very soluble in the plasma. About a quarter of CO₂ is bound to hemoglobin.
3. The ribs are important for expiration. The muscles between the ribs relax during expiration permitting the ribs to fall. As a result, the thoracic cavity decreases in volume.
4. One possible cause is poor oxygen delivery to cells because of red blood cell deficiency. Other possibilities include impaired blood circulation, defective hemoglobin (sickle cell anemia), damaged lungs, heart, or diaphragm (emphysema), fluid in the alveoli (pneumonia), and living at a very high altitude.

STRUCTURES AND FUNCTIONS
1. concentration gradients
2. CO₂ is more concentrated in the blood. This causes CO₂ to flow from the blood to the lungs and out of the body.
3. No; oxygen and CO₂ each have a concentration gradient. Thus, exchange of one gas is independent of the other.