

# 16

## Circulatory System

### I. Functions and Major Components of the Circulatory System

☞ *Concept:* An efficient circulatory system is necessary for maintaining the life of complex multicellular organisms.

#### A. Multiple Choice Questions

- \_\_\_ 1. Of the following body systems, which one does *not* interact closely with the circulatory system in maintaining homeostasis?
- (a) integumentary system                      (d) reproductive system  
(b) respiratory system                        (e) endocrine system  
(c) digestive system
- \_\_\_ 2. The structural components of the circulatory system include
- (a) the heart and lungs.  
(b) the heart and blood vessels.  
(c) the heart and lymph nodes.  
(d) the heart, blood vessels, and lymph nodes.
- \_\_\_ 3. All exchanges of fluid, nutrients, and wastes between the blood and tissues occur across the walls of
- (a) capillaries.                                      (c) leukocytes.  
(b) lymph ductules.                                (d) the heart.

#### B. True–False Questions

- \_\_\_ 1. There are an estimated 60,000 miles of vessels throughout the body of an adult.
- \_\_\_ 2. Red blood cells, called erythrocytes, transport respiratory gases attached to hemoglobin molecules.
- \_\_\_ 3. Tissue fluid differs from interstitial fluid in its ionic concentration.

### II. Blood

☞ *Concept:* Blood, a highly specialized connective tissue, consists of formed elements—erythrocytes, leukocytes, and platelets (thrombocytes)—that are suspended and carried in the blood plasma. The constituents of blood function in transport, immunity, and blood-clotting mechanisms.

#### A. Multiple Choice Questions

- \_\_\_ 1. Which of the following is *not* descriptive of blood?
- (a) pH of 7.35 to 7.45  
(b) viscosity of 2.5 to 3.0  
(c) specialized connective tissue  
(d) temperature within the thorax of about 38°C (100.4°F)
- \_\_\_ 2. A normal hematocrit from a healthy adult would be
- (a) 25%.    (d) 55%.  
(b) 35%.    (e) 65%.  
(c) 45%.

- \_\_\_\_\_ 3. Which of the following statements concerning erythrocytes is *false*?
- (a) Each mature erythrocyte contains a single, centrally positioned nucleus.
  - (b) Each contains approximately 280 million hemoglobin molecules.
  - (c) They are produced in the bone marrow and are destroyed by phagocytic cells in the liver, spleen, and bone marrow.
  - (d) They get their energy through anaerobic respiration.
- \_\_\_\_\_ 4. The most abundant type of leukocyte is
- (a) the neutrophil.
  - (b) the lymphocyte.
  - (c) the monocyte.
  - (d) the eosinophil.
  - (e) the basophil.
- \_\_\_\_\_ 5. Which of the following statements concerning platelets is *false*?
- (a) They are capable of ameboid movement.
  - (b) They are fragmented megakaryocytes.
  - (c) They have a life span of about 120 days.
  - (d) They are destroyed by the spleen and liver.
- \_\_\_\_\_ 6. The anticoagulant heparin is released by a specific kind of leukocyte called
- (a) a monocyte.
  - (b) a neutrophil.
  - (c) a basophil.
  - (d) an eosinophil.
- \_\_\_\_\_ 7. An abnormal increase in erythrocytes is termed
- (a) anemia.
  - (b) leukocytosis.
  - (c) hemopenia.
  - (d) polycythemia.
- \_\_\_\_\_ 8. The antibodies of immunity produced by lymphocytes are
- (a) the fibrinogens.
  - (b) the alpha globulins.
  - (c) the beta globulins.
  - (d) the albumins.
  - (e) the gamma globulins.
- \_\_\_\_\_ 9. When fibrinogen is removed from the plasma of blood, the remaining product is
- (a) serum.
  - (b) fibrin.
  - (c) globulin.
  - (d) hematocrit.
  - (e) hemoglobin.

## **B. True–False Questions**

- \_\_\_\_\_ 1. A cubic millimeter of blood contains roughly 5 million erythrocytes and between 5,000 and 9,000 leukocytes.
- \_\_\_\_\_ 2. Mature erythrocytes lack a nucleus and mitochondria and cannot mitotically divide.
- \_\_\_\_\_ 3. Each erythrocyte contains approximately 280 million hemoglobin molecules.
- \_\_\_\_\_ 4. Platelets and fibrinogen are cells within blood that play an important role in clotting.
- \_\_\_\_\_ 5. Of the three principal types of blood cells, only the leukocytes have nuclei and are capable of mitosis.
- \_\_\_\_\_ 6. Alpha and beta globulins are produced by lymphoid tissues and are antibodies of immunity.

### III. Heart

☞ *Concept:* The structure of the heart enables it to serve as a transport system pump that keeps blood continuously circulating through the blood vessels of the body.

#### A. Multiple Choice Questions

- \_\_\_\_\_ 1. Which cavity/area grouping best describes the location of the heart?  
(a) pericardial, mediastinum, and thoracic  
(b) endocardial, pericardial, and thoracic  
(c) endocardial, pericardial, and mediastinum  
(d) endocardial, pericardial, and mediastinum
- \_\_\_\_\_ 2. The thickest layer of the heart is  
(a) the myocardium. (c) the epicardium.  
(b) the endocardium. (d) the pericardium.
- \_\_\_\_\_ 3. Which of the following statements concerning the right atrium is *false*?  
(a) It receives venous blood through three openings.  
(b) The SA node is contained within the posterior wall.  
(c) When contracted, it empties across the right atrioventricular valve into the right ventricle.  
(d) Its wall consists of three layers.  
(e) None of the above apply.
- \_\_\_\_\_ 4. The strong tendinous cords called chordae tendineae  
(a) support the pericardium surrounding the heart.  
(b) strengthen the interventricular septum.  
(c) prevent the atrioventricular valves from everting.  
(d) form the conduction system of the heart.  
(e) form the fibrous skeleton of the heart.
- \_\_\_\_\_ 5. Which of the following statements concerning the right ventricle is *false*?  
(a) It contains papillary muscles.  
(b) It pumps only deoxygenated blood.  
(c) Blood enters the cavity through the right atrioventricular valve and exits through the pulmonary valve.  
(d) It is not able to hold as much blood as the left ventricle.  
(e) It is lined with trabeculae carneae of the endocardium.
- \_\_\_\_\_ 6. The left atrioventricular valve is on the same side of the heart as  
(a) the superior vena cava. (d) the opening of the coronary sinus.  
(b) the tricuspid valve. (e) the aortic valve.  
(c) the pulmonary valve.
- \_\_\_\_\_ 7. Which statement comparing the atria with the ventricles is *true*?  
(a) Unlike the ventricles, the atria receive only oxygenated blood.  
(b) The atria cannot hold as much blood as the ventricles.  
(c) The walls of the atria are thinner.  
(d) Trabeculae carneae reinforce the walls of both the atria and the ventricles.  
(e) Both b and c are true.
- \_\_\_\_\_ 8. Which of the following structures are involved in pulmonary circulation?  
(a) the right ventricle, pulmonary trunk, and left atrium.  
(b) the superior vena cava, right atrium, and right ventricle.  
(c) the left ventricle, aorta, and inferior vena cava.  
(d) the right atrium, right ventricle, and left atrium.

- \_\_\_\_\_ 9. A coronary embolism (blood clot) of the right marginal artery of the heart would affect the flow of blood to the myocardium of
- (a) the right atrium. (c) the right atrium and right ventricle.  
(b) the left atrium. (d) the left atrium and left ventricle.
- \_\_\_\_\_ 10. The correct sequence of electrical impulses through the conduction system of the heart is
- (a) the AV node, SA node, atrioventricular bundle, and conduction myofibers.  
(b) the SA node, atrioventricular bundle, AV node, and conduction myofibers.  
(c) the MS node, ERA node, bundle of Her, and feminist fibers.  
(d) the SA node, AV node, atrioventricular bundle, and conduction myofibers.
- \_\_\_\_\_ 11. During systole,
- (a) the atrioventricular valves are open.  
(b) the conduction myofibers are being stimulated.  
(c) the pulmonary and aortic valves are open.  
(d) the SA node is depolarizing.  
(e) both b and c apply.
- \_\_\_\_\_ 12. The ECG deflection produced during atrial depolarization is
- (a) the P wave. (c) the QRS wave.  
(b) the T wave. (d) the U wave.
- \_\_\_\_\_ 13. The part of the ECG recording that occurs at the beginning of diastole is
- (a) the P wave. (c) the QRS wave.  
(b) the T wave. (d) the flat line following the T wave.
- \_\_\_\_\_ 14. Closing the AV valves produces
- (a) the first heart sound (lub).  
(b) the second heart sound (dub).  
(c) both a and b.  
(d) neither a nor b.
- \_\_\_\_\_ 15. The first heart sound (lub) immediately follows the occurrence of
- (a) the P wave. (c) the T wave.  
(b) the QRS wave. (d) the U wave.
- \_\_\_\_\_ 16. Heart murmurs are usually the result of defective
- (a) coronary arteries. (c) pacemaker activity.  
(b) valves. (d) electrical conduction fibers.

## **B. True–False Questions**

- \_\_\_\_\_ 1. The double-layered pericardial sac is also known as the parietal pericardium.
- \_\_\_\_\_ 2. The outer serous layer of the pericardium secretes pericardial fluid.
- \_\_\_\_\_ 3. The endocardium of the heart is continuous with the endothelium of blood vessels.
- \_\_\_\_\_ 4. Chordae tendineae secure the atrioventricular, pulmonary, and aortic valves in position.
- \_\_\_\_\_ 5. Two pulmonary arteries carry blood from the heart to the lungs, whereas four branches of the pulmonary veins return the blood back to the heart.
- \_\_\_\_\_ 6. The left ventricle is able to hold the most blood, since it pumps blood to the most distal parts of the body.

- \_\_\_\_\_ 7. Systemic circulation includes all the blood flow within the body except the pulmonary circulation to the lungs and the coronary circulation to the heart.
- \_\_\_\_\_ 8. All of the blood that flows through the coronary arteries enters the coronary sinus before draining into the right atrium.
- \_\_\_\_\_ 9. In order for the SA node to depolarize, it must receive an autonomic impulse through the cardiac accelerator nerve.
- \_\_\_\_\_ 10. Stimulation of the conduction myofibers causes the ventricles to contract and blood to be simultaneously ejected into the pulmonary and systemic circulations.
- \_\_\_\_\_ 11. Depolarization of the SA node causes systole, and depolarization of the AV node causes diastole.
- \_\_\_\_\_ 12. The sound of the left atrioventricular valve is best heard with a stethoscope placed at the second intercostal space, just to the left of the sternum.

#### IV. Blood Vessels

☞ *Concept:* The structure of arteries and veins allows them to transport blood from the heart to the capillaries and from the capillaries back to the heart. The structure of capillaries permits the exchange of blood plasma and dissolved molecules between the blood and surrounding tissues.

##### A. Multiple Choice Questions

- \_\_\_\_\_ 1. In what sequence would the tunicas be pierced in doing a venipuncture to withdraw blood for analysis?
  - (a) tunica superficialis, tunica media, and tunica interna
  - (b) tunica externa, tunica media, and tunica interna
  - (c) tunica externa, tunica muscularis, and tunica interna
  - (d) tunica superficialis, tunica muscularis, and tunica interna
- \_\_\_\_\_ 2. At any given moment, the greatest volume of blood in the body is found within
  - (a) the veins and venules.
  - (b) the capillaries.
  - (c) the heart.
  - (d) the arteries and arterioles.
  - (e) the pulmonary vessels.
- \_\_\_\_\_ 3. A structure that does *not* contain an endothelium is
  - (a) an artery.
  - (b) an arteriole.
  - (c) a capillary.
  - (d) a venule.
  - (e) none of the above.
- \_\_\_\_\_ 4. Each of the following is a type of capillary *except*:
  - (a) a fenestrated capillary.
  - (b) a precapillary capillary.
  - (c) a discontinuous capillary.
  - (d) a continuous capillary.

- \_\_\_\_\_ 5. Which of the following statements is *true* concerning veins?
- (a) They all transport deoxygenated blood.
  - (b) They all have valves.
  - (c) They all transport blood toward the heart.
  - (d) They have thinner walls and larger lumina than do arteries.
  - (e) Both c and d are true.

## B. True–False Questions

- \_\_\_\_\_ 1. The endothelium consists of a layer of elastic fibers, or elastin.
- \_\_\_\_\_ 2. Arterioles are between 20 and 30 micrometers in diameter, and capillaries are between 7 and 10 micrometers.
- \_\_\_\_\_ 3. Fenestrated capillaries are responsible for the selective diffusion characteristic of the blood-brain barrier.
- \_\_\_\_\_ 4. The average pressure in veins is only 2 mmHg; by contrast, the average arterial pressure is about 100 mmHg.

## V. Principal Arteries of the Body

☞ *Concept:* The aorta ascends from the left ventricle to a position just above the heart, where it arches to the left and then descends through the thorax and abdomen. Branches of the aorta carry oxygenated blood to all of the cells of the body.

### A. Multiple Choice Questions

- \_\_\_\_\_ 1. An artery that does *not* branch from the aortic arch is
- (a) the brachiocephalic trunk.
  - (b) the right subclavian artery.
  - (c) the left common carotid artery.
  - (d) the left subclavian artery.
- \_\_\_\_\_ 2. A thrombus (clot) in a vertebral artery would restrict blood flow to
- (a) the brain.
  - (b) the larynx.
  - (c) the thorax.
  - (d) the scalp and facial muscles.
- \_\_\_\_\_ 3. The convergence of arteries on the inferior side of the brain surrounding the pituitary gland forms
- (a) the hypophyseal system.
  - (b) the hormonal feedback system.
  - (c) the cerebral arterial circle.
  - (d) the blood-brain barrier.
  - (e) the portal system.
- \_\_\_\_\_ 4. The sensitive meninges covering the brain are served by
- (a) the internal carotid and basilar arteries.
  - (b) the occipital and maxillary arteries.
  - (c) the internal and external carotid arteries.
  - (d) the vertebral and facial arteries.
- \_\_\_\_\_ 5. As blood flows through the brachiocephalic trunk and the subclavian, brachial, and radial arteries to serve the muscles of the right hand, the vessel that is missing in the sequence is
- (a) the cubital artery.
  - (b) the subscapular artery.
  - (c) the humeral artery.
  - (d) the axillary artery.
  - (e) the right common carotid artery.

- \_\_\_\_\_ 6. A person's blood pressure is generally taken with a cuff around the humerus, which constricts
- (a) the subclavian artery.                      (d) the radial artery.  
 (b) the humeral artery.                        (e) the median artery.  
 (c) the brachial artery.
- \_\_\_\_\_ 7. Of the following vessels, the one that does *not* branch from the abdominal portion of the aorta is
- (a) the common hepatic artery.  
 (b) the inferior phrenic artery.  
 (c) the renal artery.  
 (d) the celiac trunk.  
 (e) the inferior mesenteric artery.
- \_\_\_\_\_ 8. As blood flows through the external iliac, femoral, anterior tibial, and dorsal pedal arteries to serve the dorsum of the foot, the vessel that is missing in the sequence is
- (a) the deep femoral artery.                      (d) the popliteal artery.  
 (b) the peroneal artery.                        (e) the calcaneal artery.  
 (c) the patellar artery.

## B. True–False Questions

- \_\_\_\_\_ 1. The right and left coronary arteries are the only branches that arise from the ascending aorta.
- \_\_\_\_\_ 2. The carotid sinus in the brain contains baroreceptors, which monitor blood pressure, and chemoreceptors, which respond to chemical changes in the blood.
- \_\_\_\_\_ 3. Capillaries within the pituitary gland form a portal system.
- \_\_\_\_\_ 4. The radial artery is an important site at which to record the pulse.
- \_\_\_\_\_ 5. The splenic artery serves the spleen, pancreas, and stomach.
- \_\_\_\_\_ 6. The superior and inferior mesenteric arteries are the only unpaired vessels that arise from the abdominal portion of the aorta.
- \_\_\_\_\_ 7. The femoral triangle is clinically important because it is a common area from which to withdraw blood.
- \_\_\_\_\_ 8. Circumflex arteries form a ring around adjacent bones.

## VI. Principal Veins of the Body

☞ *Concept:* After systemic blood has passed through the tissues, this oxygen-poor blood is returned through veins of progressively larger diameters to the right atrium of the heart.

### A. Multiple Choice Questions


- \_\_\_\_\_ 1. Which of the following regarding veins is *false*?
- (a) They lack a smooth muscle layer (tunica media).  
 (b) They transport blood toward the heart.  
 (c) They are more numerous than arteries and are both superficial and deep.  
 (d) Most of them have valves.
- \_\_\_\_\_ 2. The internal jugular vein, the common carotid artery, and the vagus nerve are surrounded in the neck by the protective
- (a) cervical sheath.                              (c) nuchal sheath.  
 (b) nuchal retinaculum.                        (d) carotid sheath.

- \_\_\_\_\_ 3. The three veins draining blood through the brachial region are  
 (a) the humeral, basilic, and cephalic veins.  
 (b) the humeral, basilic, and brachial veins.  
 (c) the brachial, basilic, and cephalic veins.  
 (d) the brachial, humeral, and deep circumflex veins.
- \_\_\_\_\_ 4. A frequent site for venipuncture in removing a sample of blood or adding fluids to the blood is  
 (a) the median cubital vein. (d) the radial vein.  
 (b) the brachial vein. (e) the ulnar vein.  
 (c) the axillary vein.
- \_\_\_\_\_ 5. A vein that does *not* drain blood into the inferior vena cava is  
 (a) the azygos vein. (d) the renal vein.  
 (b) the hepatic vein. (e) the inferior phrenic vein.  
 (c) the lumbar vein.
- \_\_\_\_\_ 6. As blood flows through the anterior tibial, popliteal, femoral, and external iliac veins and the inferior vena cava to return venous blood from the lower extremity to the heart, the vessel that is missing in the sequence is  
 (a) the deep femoral vein. (d) the common iliac vein.  
 (b) the hepatic portal vein. (e) the inferior mesenteric vein.  
 (c) the renal vein.
- \_\_\_\_\_ 7. Of the following veins, the one that is *not* superficial is  
 (a) the median cubital vein. (d) the great saphenous vein.  
 (b) the basilic vein. (e) the brachial vein.  
 (c) the cephalic vein.
- \_\_\_\_\_ 8. In the most direct route from the left leg to the right arm of an adult, blood must pass through all of the following vessels *except*  
 (a) the hepatic portal vein. (d) the brachiocephalic artery.  
 (b) the pulmonary vein. (e) the left external iliac vein.  
 (c) the inferior vena cava.

## B. True–False Questions

- \_\_\_\_\_ 1. The venous sinuses that drain blood from the brain are positioned between the two layers of dura mater.
- \_\_\_\_\_ 2. There are two brachiocephalic veins but only one brachiocephalic artery (trunk).
- \_\_\_\_\_ 3. Blood drains from the deep cervical region through the hemiazygos vein.
- \_\_\_\_\_ 4. The great saphenous vein is the longest vessel of the body.
- \_\_\_\_\_ 5. Of all the vessels in the body, the inferior vena cava has the largest diameter.
- \_\_\_\_\_ 6. All of the blood draining from the stomach, pancreas, spleen, small intestine, and large intestine must pass through the hepatic portal system prior to draining into the inferior vena cava.

## VII. Fetal Circulation

 *Concept:* All of the respiratory, excretory, and nutritional needs of the fetus are provided for by diffusion across the placenta instead of by the fetal lungs, kidneys, and gastrointestinal tract. Fetal circulation is adaptive to these conditions.

## A. Multiple Choice Questions

- \_\_\_ 1. The umbilical cord includes  
(a) one umbilical vein and one umbilical artery.  
(b) two umbilical veins and one umbilical artery.  
(c) one umbilical vein and two umbilical arteries.  
(d) two umbilical veins and two umbilical arteries.
- \_\_\_ 2. Which of the following fetal structures contain(s) the most oxygen-rich blood?  
(a) left atrium (d) ductus venosus  
(b) umbilical arteries (e) umbilical vein  
(c) foramen ovale
- \_\_\_ 3. The first structure to close upon birth of the baby is  
(a) the pulmonary trunk. (c) the foramen ovale.  
(b) the ductus arteriosus. (d) the father's banking account.
- \_\_\_ 4. Following the birth of the baby, the umbilical vein becomes  
(a) the ligamentum teres (round ligament).  
(b) the ligamentum venosum.  
(c) the ligamentum arteriosum.  
(d) the umbilical ligament.

## B. True–False Questions

- \_\_\_ 1. Capillary exchange between the maternal and fetal circulation occurs within the placenta.
- \_\_\_ 2. Since the fetal lungs are collapsed, all of the blood is shunted away from these organs and enters directly into the systemic circulation.
- \_\_\_ 3. The umbilical arteries of the fetus arise from the abdominal aorta.
- \_\_\_ 4. The closure of the foramen ovale at birth is due to greater pressure within the right side of the heart as compared to the left side.

## VIII. Lymphatic System

☞ *Concept:* The lymphatic system, consisting of lymphatic vessels and various lymphoid tissues and organs, helps to maintain fluid balance in tissues and to absorb fats from the gastrointestinal tract. It also is part of the body's defense system against disease.

## A. Multiple Choice Questions

- \_\_\_ 1. Which of the following is *not* a function of the lymphatic system?  
(a) transport of interstitial fluid back to the blood  
(b) transport of absorbed fats from the intestine to the blood  
(c) immunological defense  
(d) filtration of metabolic waste
- \_\_\_ 2. The thoracic duct empties lymph directly into  
(a) the right atrium. (c) the left subclavian vein.  
(b) the cisterna chyli. (d) the superior vena cava.
- \_\_\_ 3. All of the following are lymphoid organs *except*  
(a) the thymus. (d) the tonsils.  
(b) the spleen. (e) organs c and d.  
(c) the pancreas.

## B. True–False Questions

- \_\_\_ 1. Anemia is the accumulation, or retention, of an excessive amount of tissue fluid.
- \_\_\_ 2. Although they occur at different locations in the body, interstitial fluid and lymph are basically the same.
- \_\_\_ 3. All lymph drainage eventually passes through the thoracic duct before entering the subclavian vein.
- \_\_\_ 4. The spleen, thymus, and tonsils are lymphoid organs.

## IX. Developmental Exposition of the Circulatory System

### A. Multiple Choice Questions

- \_\_\_ 1. The embryonic formation of the heart occurs primarily during
  - (a) days 20–30.
  - (b) days 30–40.
  - (c) weeks 8–9.
  - (d) weeks 10–12.
- \_\_\_ 2. A persisting fetal opening between the atria of the heart is
  - (a) the ductus arteriosus.
  - (b) the foramen ovale.
  - (c) the coronary sinus.
  - (d) the bulbus cordis.
  - (e) the sinus venosus.
- \_\_\_ 3. The persisting fetal shunt between the pulmonary trunk and the aorta is
  - (a) the ductus arteriosus.
  - (b) the foramen ovale.
  - (c) the truncus arteriosus.
  - (d) the ductus venosus.

## B. True–False Questions

- \_\_\_ 1. The development of the heart from cardiogenic mesoderm requires only about 7 days.
- \_\_\_ 2. Congenital heart problems are most likely to develop during the transition from embryo to fetus at the eighth week.
- \_\_\_ 3. All mammals, including humans, have a single aortic arch from the heart that courses to the left.

## X. Clinical Considerations

### A. Matching Questions

Match the condition or disease with its description.

- \_\_\_ 1. bradycardia                      (a) congenital heart defect
- \_\_\_ 2. coarctation                      (b) slow heart beat (< 60 beats/min)
- \_\_\_ 3. phlebitis                        (c) plaques in the lumina of arteries
- \_\_\_ 4. aneurysm                        (d) referred pain from the heart
- \_\_\_ 5. thrombus                        (e) blood clot
- \_\_\_ 6. tachycardia                      (f) bulging of an artery
- \_\_\_ 7. angina pectoris                (g) constriction of a vessel
- \_\_\_ 8. tetralogy of Fallot              (h) rapid heart beat (> 100 beats/min)
- \_\_\_ 9. atheroma                        (i) inflammation of a vein

## XI. Chapter Review

### A. Completion Questions

1. Oxygen from inhaled air attaches to \_\_\_\_\_ molecules within the \_\_\_\_\_ and is transported to the cells for aerobic respiration.
2. The circulatory system is frequently divided into the \_\_\_\_\_ system, which consists of the heart and blood vessels, and the \_\_\_\_\_ system, which consists of lymph vessels and lymph nodes.
3. Heart development is first apparent at the eighteenth day in the \_\_\_\_\_ area of the mesoderm layer.
4. An opening between the atria of the heart, called the \_\_\_\_\_, persists throughout fetal development.
5. Pericardial fluid is secreted by the \_\_\_\_\_ layer of the parietal pericardium.
6. The visceral pericardium of the heart is also known as the \_\_\_\_\_.
7. The chordae tendineae are secured to the ventricular wall by the cone-shaped \_\_\_\_\_.
8. The mitral valve is also known as the \_\_\_\_\_ valve.
9. The heart chambers that pump and receive blood from the lungs and the vessels that transport blood to and from the lungs constitute the \_\_\_\_\_.
10. \_\_\_\_\_ is ventricular contraction and \_\_\_\_\_ is ventricular relaxation.
11. During diastole, pressure in the systemic arteries averages about \_\_\_\_\_.
12. Abnormal heart sounds called \_\_\_\_\_ are caused by defective heart valves.
13. Closing of the \_\_\_\_\_ valve of the heart can best be heard with a stethoscope placed at the second intercostal space, just to the right of the sternum.
14. The \_\_\_\_\_ serves as the pacemaker of the heart.
15. The \_\_\_\_\_ wave of an electrocardiogram occurs as a result of ventricular depolarization.
16. Immediately after the QRS wave, the \_\_\_\_\_ sound is produced as the atrioventricular valves close.
17. The carotid sinus contains \_\_\_\_\_, which monitor blood pressure, and \_\_\_\_\_ within the carotid body, which respond to blood chemistry.
18. Within the braincase, the two vertebral arteries unite to form the \_\_\_\_\_ artery at the level of the pons.
19. Within the villi of the small intestine, lymph capillaries called \_\_\_\_\_ transport the products of fat absorption away from the GI tract.
20. Lymph nodes are composed of \_\_\_\_\_ tissue, which contains phagocytic cells.

## B. Matching Questions

*Set 1:* Match the artery with the organ(s) it serves.

- |                                   |  |
|-----------------------------------|--|
| ___ 1. phrenic artery             | (a) stomach and esophagus                |
| ___ 2. vertebral artery           | (b) brain                                |
| ___ 3. superior mesenteric artery | (c) diaphragm                            |
| ___ 4. renal artery               | (d) meninges of the brain                |
| ___ 5. external iliac artery      | (e) gluteal muscles                      |
| ___ 6. coronary artery            | (f) stomach, pancreas, spleen, and liver |
| ___ 7. left gastric artery        | (g) small intestine and pancreas         |
| ___ 8. occipital artery           | (h) kidney                               |
| ___ 9. internal iliac artery      | (i) thigh muscles                        |
| ___ 10. celiac artery             | (j) heart                                |

*Set 2:* Match the vein with the body region or organ(s) it drains.

- |                                  |                       |
|----------------------------------|-----------------------|
| ___ 1. right gastroepiploic vein | (a) large intestine   |
| ___ 2. azygos vein               | (b) scalp and face    |
| ___ 3. inferior mesenteric vein  | (c) liver             |
| ___ 4. internal iliac vein       | (d) posterior ribcage |
| ___ 5. external jugular vein     | (e) gallbladder       |
| ___ 6. popliteal vein            | (f) brain             |
| ___ 7. ulnar vein                | (g) stomach           |
| ___ 8. hepatic vein              | (h) hand              |
| ___ 9. internal jugular vein     | (i) knee              |
| ___ 10. cystic vein              | (j) genital region    |

*Set 3:* Match the blood cell or substance with its description or function.

- |                       |  |
|-----------------------|--|
| ___ 1. albumin        | (a) transports lipids and fat-soluble vitamins |
| ___ 2. gamma globulin | (b) large agranulocyte                         |
| ___ 3. fibrinogen     | (c) clotting protein in plasma                 |
| ___ 4. erythrocyte    | (d) most abundant leukocyte                    |
| ___ 5. beta globulin  | (e) antibody produced by lymphocytes           |
| ___ 6. platelet       | (f) releases the anticoagulant heparin         |
| ___ 7. hemoglobin     | (g) most abundant formed element               |
| ___ 8. neutrophil     | (h) provides osmotic pressure                  |
| ___ 9. monocyte       | (i) smallest formed element                    |
| ___ 10. basophil      | (j) has an affinity for O <sub>2</sub>         |