The Cardiovascular System

OBJECTIVES

After studying this chapter, you should be able to:

1. Describe how the heart is positioned in the thoracic cavity.
2. List and describe the layers of the heart wall.
3. Name the chambers of the heart and their valves.
4. Name the major vessels that enter and exit the heart.
5. Describe blood flow through the heart.
6. Explain how the conduction system of the heart controls proper blood flow.
7. Describe the stages of a cardiac cycle.
8. Compare the anatomy of a vein, an artery, and a capillary.
9. Name the major blood circulatory routes.

A. Completion

Fill in the blank spaces with the correct term.

1. The cardiovascular system consists of the __ and the __ __.
2. ___ assist in the chemical reaction within cells.
3. Oxygen and nutrients from digested food help make the chemical energy ___.
4. Most of the heart is on the ___ side of the body’s midline.
5. The membrane surrounding the heart is the ___ ___.
6. The outer layer of the membrane is the ___ __, and the inferior inner layer is the ___ ___.
7. The outer layer of the heart is the ___.

NAME: ________________________ DATE: __________
8. The middle layer of the heart is the ___.
9. The inner layer of the heart is the ___.
10. The upper chambers of the heart are called the ___.
11. The lower chambers of the heart are called the ___.
12. The heart is separated into left and right sides by a(n) ___.
13. The three veins supplying blood to the right atrium are the ___ and ___ vena cavae and the ___ ___.
14. In the lungs, blood gives up ___ ___ and receives ___.
15. The heart muscle is supplied with blood by the ___.
16. The descending aorta becomes the ___ aorta.
17. Of the four heart chambers, the ___ ___ has the thickest walls.
18. There are ___ valves in the heart and these are the ___ ___ ___ ___ and the ___ ___.
19. All of the valves have three cusps except the ___, which has ___ cusps.
20. The superior vena cava drains the ___ portion of the body, and the inferior vena cava the ___ portion.
21. Deoxygenated blood is ___ ___ in color, whereas oxygenated blood is ___ ___.
22. The conduction system of the heart is actually a(n) ___ system.
23. The sinoatrial node (SA) is known as the ___.
24. The atrioventricular bundle is also known as the ___ of ___.
25. The actual contractions of the ventricles are stimulated by ___ ___.
26. Regulation of the beats of the heart resides in the ___ ___ system.
27. Contraction of the heart is the ___ and the relaxation phase is the ___.
28. Blood supply to the heart is via the ___ ___ route.
29. The one temporary circulatory route is ___ ___.
30. The three layers of blood vessels are the ___ ___ and the ___ ___.
31. ___ ___ are small arteries.
32. ___ ___ are small veins.
33. ___ ___ are vessels consisting of a single cell layer.
34. The first branch of the aortic arch is the ___ ___ artery.
35. The ___ ___ arteries supply the head, neck, and brain.
36. A myocardial ___ results from the death of heart muscle cells caused by a blockage in coronary arteries.
37. After an angioplasty, a metal-mesh tube called a(n) ___ is inserted into the vessel.
38. ___ ___ of the heart valves is a narrowed opening through the valves.

B. Matching

Match the term on the right with the definition on the left.

ARTERIES

39. divides into vertebral, axillary
   a. celiac trunk and brachial arteries
40. 10 pairs
   b. kidneys
41. supply the lungs
   c. diaphragm
C. Key Terms

Use the text to look up the following terms. Write the definition or explanation.

60. Anastomosis:

61. Anterior interventricular sulcus:

62. Arch of the aorta:

63. Arrhythmia:
64. Atherosclerosis:

65. Auricle:

66. Cephalic vein:

67. Chordae tendinae:

68. Conduction myofibers:

69. Coronary sulcus:

70. Diastole:

71. Epicardium:

72. Hepatic portal circulation:

73. Interventricular septum:
74. Lumen:

75. Musculi pectinati:

76. Myocardium:

77. Pacemaker:

78. Papillary muscles:

79. Pericardial fluid:

80. Pulmonary circulation:

81. Pulmonary semilunar valve:

82. Right and left bundle branches:

83. Serous pericardium:
84. Systemic circulation:

85. Systole:

86. Trabeculae corneae:

87. Vascular:

D. Labeling Exercise

88. Label the chambers, vessels, valves, and septum of the heart as indicated in Figure 14-1.
A. _____________________________
B. _____________________________
C. _____________________________
D. _____________________________
E. _____________________________
F. _____________________________
G. _____________________________
H. _____________________________
I. _____________________________
J. _____________________________
K. _____________________________
L. _____________________________
89. Label the arteries as indicated in Figure 14-2.

Figure 14-2
A. __________________________
B. __________________________
C. __________________________
D. __________________________
E. __________________________
F. __________________________
G. __________________________
H. __________________________
90. Label the veins indicated in Figure 14-3.

Figure 14-3
E. Coloring Exercise

91. Using Figure 14-4, color the veins blue and the arteries red.
F. Critical Thinking

Answer the following questions in complete sentences.

92. Given a blood pressure reading of 130/86, which is the systole and which is the diastole?

93. If a person has angina pectoris and is probably having an MI, explain what may be happening to the heart.

94. Why is the saphenous vein used for heart bypass surgery?

95. How does the cardiovascular system integrate with the skin to control body temperature?

96. Why do our muscles tire during exercise?

97. How does the lymphatic system work with the cardiovascular system to protect the body?
98. Why does the blood not flow backward in our veins?

99. What does adrenaline do to our cardiovascular system?

100. How does the conduction system control proper blood flow?

101. Why does cardiac output of a 70-year-old person often decrease by 75%?

102. Why is walking one of the best exercises to maintain good heart performance?

103. Distinguish among a cardiovascular technologist, an electrocardiographic technician, and a cardiac sonographer.
G. Crossword Puzzle

Complete the crossword puzzle using the following clues.

ACROSS

3. Another name for the mitral valve
4. SA node
6. 3-cusp valve regulating blood flow
11. Abnormal narrowing of the heart valve
13. Upper heart chamber
14. Relaxation phase of a heartbeat
15. Three veins that send blood to the right atrium
16. Carries oxygenated blood from the heart
18. Lower heart chamber
20. External appendage of the atrium
21. Smallest blood vessel
22. Supplies blood to the lungs
23. Thigh vein draining into the inferior vena cava
26. Subclavian artery
28. Heart attack

DOWN

1. Contraction phase of a heartbeat
2. Hollow core of a blood vessel
5. Small artery
7. Cardiac muscle layer
8. Largest artery
9. Hormone promoting female vascular health
10. Returns deoxygenated blood to the heart
12. Help protect CV organs
17. Valve between the right atrium and right ventricle
19. Arterial disease caused by plaque buildup
24. Outermost layer of heart
25. Inflammation of the inner heart layer
27. Longest vein
29. Area of damaged cardiac tissue
32. Small vein
30. Inflammation of the pericardium
31. High blood pressure
33. Organ supplied by the renal arteries
34. Helps maintain kidney function
35. Hole in the interatrial septum
36. Middle layer of the arterial wall
37. Junction of two or more blood vessels

CASE STUDY

Ester, a 75-year-old woman, is admitted to an acute care facility with extreme shortness of breath and the feeling that she is suffocating. Upon preliminary assessment, the health care provider notes that Ester also has very swollen feet and ankles. When asked about her medical history, Ester states that she was diagnosed with high blood pressure around 8 years ago.

QUESTIONS

1. Based on her medical history and current symptoms, what condition might Ester have developed?

2. What pathological changes might be causing Ester's symptoms?

3. What are the major risk factors for the development of this disorder?

CHAPTER QUIZ

1. Which of the following is NOT transported by the blood?
   a. oxygen  
   b. urine  
   c. hormones  
   d. waste  
   e. nutrients

   Answer:

2. The normal heartbeat is about how many times per minute?
   a. 60  
   b. 100  
   c. 90  
   d. 72  
   e. none of the above

   Answer:
3. The heart is composed primarily of
   a. fat                      d. muscle
   b. blood                   e. cartilage
   c. lymph

Answer:

4. The serous pericardium is known as what layer of the pericardial sac?
   a. fibrous                  d. visceral
   b. intima                   e. precordial
   c. parietal

Answer:

5. The epicardium can also be referred to as the
   a. parietal pericardium      d. parietal peritoneum
   b. pericardial cavity        e. serous peritoneum
   c. visceral peritoneum

Answer:

6. The endocardium is made up of which type of tissue?
   a. epithelial                d. osseous
   b. connective               e. none of the above
   c. muscle

Answer:

7. The atrial appendage similar to a dog's ear is the
   a. auricle                  d. bicuspid
   b. trabeculae               e. tricuspid
   c. septum

Answer:

8. The right atrium receives blood from all parts of the body EXCEPT the
   a. brain                    d. liver
   b. hands                    e. lungs
   c. kidneys

Answer:

9. The superior vena cava is also known as the
   a. small vena cava           d. anterior vena cava
   b. pulmonary vein           e. coronary sinus
   c. posterior vena cava

Answer:

10. The smallest of the four heart chambers is the
    a. right atrium              d. left ventricle
    b. left atrium              e. coronary sinus
    c. right ventricle

Answer:
11. The only heart valve with two cusps is the
   a. tricuspid  
   b. mitral  
   c. pulmonary  
   d. aortic  
   e. semilunar  

   **Answer:**

12. Blood receives oxygen in the
   a. liver  
   b. kidneys  
   c. lungs  
   d. heart  
   e. pancreas  

   **Answer:**

13. Blood deposits which of the following in the lungs?
   a. oxygen  
   b. urine  
   c. hormones  
   d. carbon dioxide  
   e. renin  

   **Answer:**

14. Blood from the lungs returns to the heart through how many veins?
   a. 2  
   b. 4  
   c. 6  
   d. 8  
   e. 3  

   **Answer:**

15. Blood from the lungs returns to which of the following?
   a. right ventricle  
   b. left ventricle  
   c. right atrium  
   d. left atrium  
   e. superior vena cava  

   **Answer:**

16. An increase or a decrease in heart rate is controlled by which part of the nervous system?
   a. central  
   b. autonomic  
   c. peripheral  
   d. forebrain  
   e. temporal  

   **Answer:**

17. Contraction of the ventricles is stimulated by the
   a. SA node  
   b. AV node  
   c. bundle branches  
   d. bundle of His  
   e. Purkinje's fibers  

   **Answer:**

18. A cardiac cycle consists of contractions of
   a. both atria  
   b. an atrium and a ventricle  
   c. two ventricles  
   d. two atria then two ventricles  
   e. all four chambers at once  

   **Answer:**
19. A complete cycle of blood flow is called
   a. pulmonary circulation  
   b. coronary circulation  
   c. hepatic portal circulation  
   d. cerebral circulation  
   e. systemic circulation  

   **Answer:**

20. Two major properties of arteries are
   a. irritability/contractility  
   b. thickness/irritability  
   c. hollowness/thinness  
   d. elasticity/contractility  
   e. anastomosis/fragility  

   **Answer:**

21. Which vessels have walls one cell thick?
   a. venules  
   b. arteries  
   c. capillaries  
   d. arterioles  
   e. veins  

   **Answer:**

22. Veins have something that arteries do not. Which of the following is it?
   a. irritability  
   b. valves  
   c. junctions  
   d. smooth muscle  
   e. contractility  

   **Answer:**

23. When the aorta arches and begins descending down along the spine, then goes through the diaphragm, it is known as the
   a. abdominal aorta  
   b. thoracic aorta  
   c. subclavian artery  
   d. esophageal artery  
   e. brachiocephalic artery  

   **Answer:**

24. The left common carotid artery branches from the
   a. right common carotid artery  
   b. aortic arch  
   c. left subclavian artery  
   d. thoracic artery  
   e. axillary artery  

   **Answer:**

25. The final branches of the abdominal aorta are the
   a. popliteal arteries  
   b. femoral arteries  
   c. common iliac arteries  
   d. tibial arteries  
   e. inferior mesenteric arteries  

   **Answer:**

26. Veins that drain the arm include all of the following EXCEPT the
   a. brachial  
   b. cephalic  
   c. vertebral  
   d. basilic  
   e. median cubital  

   **Answer:**
27. All of the following veins drain into the superior vena cava EXCEPT the
   a. internal jugular
   b. azygos
   c. internal iliac
   d. vertebral
   e. subclavian

   **Answer:**

28. Which of the following does NOT drain into the inferior vena cava?
   a. azygos
   b. hepatic portal
   c. saphenous
   d. gonadal
   e. popliteal

   **Answer:**

29. Which of the following is NOT an inflammatory condition?
   a. endocarditis
   b. atherosclerosis
   c. pericarditis
   d. gastritis
   e. myocarditis

   **Answer:**

30. Two common congenital heart defects are
   a. thrombosis/angina
   b. hypertension/septal defect
   c. stenotic heart valves/hypertension
   d. angina/stenotic heart valves
   e. septal defect/stenotic heart valves

   **Answer:**

31. From the AV node, a tract of conducting fibers runs through the cardiac mass to the top of the interventricular septum. This tract is called the
   a. bundle of His
   b. SA node
   c. right bundle branch
   d. conduction myofiber
   e. Purkinje's branch

   **Answer:**

32. The major cause of death and heart disease in older Americans is
   a. heart arrhythmia
   b. coronary artery disease
   c. an angioplasty
   d. a stenosed heart valve
   e. an incompetent heart valve

   **Answer:**

33. What is the name for a slow heart beat rate of less than 60 beats per minute?
   a. angina
   b. hypertension
   c. bradycardia
   d. tachycardia
   e. septal defect

   **Answer:**