

CHAPTER 11 The Circulatory System

The heart is actually two pumps: one to move blood to the lungs, the other to push it out into the body. These two functions seem rather elementary by comparison to the complex and numerous functions performed by most of the other body organs, and yet, if either of these pumps stop, within a few short minutes all life ceases.

The heart is divided into two upper compartments, called atria or receiving chambers, and two lower compartments, called ventricles or discharging chambers. By the time a person reaches age 45, approximately 300,000 tons of blood will have passed through these chambers to be circulated to the blood vessels. These vessels—arteries, veins, and capillaries—serve different functions. Arteries carry blood from the heart, veins carry blood to the heart, and capillaries are exchange vessels or connecting links between the arteries and the veins. This closed system of circulation provides distribution of blood to the whole body (systemic circulation) and to specific regions, such as pulmonary circulation or hepatic portal circulation.

Blood pressure is the force of blood in the vessels. This force is highest in arteries and lowest in veins. Normal blood pressure varies among individuals and depends on the volume of blood in the arteries. The larger the volume of blood in the arteries, the more pressure is exerted on the walls of the arteries, and the higher the arterial pressure. Conversely, the less blood in the arteries, the lower the blood pressure.

A functional cardiovascular system is vital for survival because, without circulation, tissues would lack a supply of oxygen and nutrients. Waste products would begin to accumulate and could become toxic. Your review of this system will provide you with an understanding of the complex transportation mechanism of the body that is necessary for survival.

TOPICS FOR REVIEW

Before progressing to Chapter 12, you should have an understanding of the structure and function of the heart and the blood vessels. Your review should include a study of systemic, pulmonary, hepatic portal, and fetal circulations, and it should conclude with a thorough understanding of blood pressure and pulse.

HEART

Fill in the blanks.

1. Rhythmic compression of the heart combined with effective artificial respiration is known as _____.
2. The _____ divides the heart into right and left sides between the atria.
3. The _____ are the two upper chambers of the heart.
4. The _____ are the two lower chambers of the heart.
5. The cardiac muscle tissue is referred to as the _____.
6. Inflammation of the heart lining is _____.
7. The two AV valves are _____ and _____.
8. _____ involves the movement of blood from the right ventricle to the lungs.
9. An occlusion of a coronary artery is known as a _____.
10. _____ occurs when heart muscle cells are deprived of oxygen and become damaged or die.
11. The pacemaker of the heart is the _____ node.
12. A normal ECG tracing has three characteristic waves. They are _____, _____, and _____ waves.
13. _____ begins just before the relaxation phase of cardiac muscle activity noted on an ECG.

Choose the correct term and write the letter in the space next to the appropriate definition below.

- | | |
|----------------------|----------------------|
| A. Pericardium | H. Coronary arteries |
| B. Severe chest pain | I. Systole |
| C. Thrombosis | J. Depolarization |
| D. Pulmonary | K. Atria |
| E. Heart block | L. Apex |
| F. Ventricles | M. Epicardium |
| G. Systemic | |

- _____ 14. Covering of heart
- _____ 15. Receiving chambers
- _____ 16. Circulation from left ventricle throughout body
- _____ 17. Blood clot
- _____ 18. Semilunar valve
- _____ 19. Discharging chambers
- _____ 20. Supplies oxygen to heart muscle
- _____ 21. Angina pectoris
- _____ 22. Slow heart rate caused by blocked impulses
- _____ 23. Contraction of the heart
- _____ 24. Electrical activity associated with ECG
- _____ 25. Blunt-pointed lower edge of heart
- _____ 26. Visceral pericardium



If you have had difficulty with this section, review pages 274-283.

BLOOD VESSELS CIRCULATION

Match the term on the left with the proper selection on the right.

- | | |
|-----------------------------------|---|
| _____ 27. Arteries | A. Smooth muscle cells that guard entrance to capillaries |
| _____ 28. Veins | B. Carry blood to the heart |
| _____ 29. Capillaries | C. Carry blood into venules |
| _____ 30. Tunica adventitia | D. Carry blood away from the heart |
| _____ 31. Precapillary sphincters | E. Largest vein |
| _____ 32. Superior vena cava | F. Largest artery |
| _____ 33. Aorta | G. Outermost layer of arteries and veins |

Circle the correct answer.

34. The aorta carries blood out of the:
- A. Right atrium
 - B. Left atrium
 - C. Right ventricle
 - D. Left ventricle
 - E. None of the above
35. The superior vena cava returns blood to the:
- A. Left atrium
 - B. Left ventricle
 - C. Right atrium
 - D. Right ventricle
 - E. None of the above
36. Which one of the following vessels has its wall made up entirely of endothelial cells?
- A. Vein
 - B. Capillary
 - C. Artery
 - D. Venule
 - E. Arteriole
37. The _____ is made up of smooth muscle.
- A. Tunica media
 - B. Tunica adventitia
 - C. Tunica intima
 - D. Endothelium
 - E. Myocardium
38. The _____ function as exchange vessels.
- A. Venules
 - B. Capillaries
 - C. Arteries
 - D. Arterioles
 - E. Veins

39. Blood returns from the lungs during pulmonary circulation via the:
- A. Pulmonary artery
 - B. Pulmonary veins
 - C. Aorta
 - D. Inferior vena cava
40. The hepatic portal circulation serves the body by:
- A. Removing excess glucose and storing it in the liver as glycogen
 - B. Detoxifying blood
 - C. Removing various poisonous substances present in blood
 - D. All of the above
41. The structure used to bypass the liver in fetal circulation is the:
- A. Foramen ovale
 - B. Ductus venosus
 - C. Ductus arteriosus
 - D. Umbilical vein
42. The foramen ovale serves the fetal circulation by:
- A. Connecting the aorta and the pulmonary artery
 - B. Shunting blood from the right atrium directly into the left atrium
 - C. Bypassing the liver
 - D. Bypassing the lungs
43. The structure used to connect the aorta and pulmonary artery in fetal circulation is the:
- A. Ductus arteriosus
 - B. Ductus venosus
 - C. Aorta
 - D. Foramen ovale
44. Which of the following is *not* an artery?
- A. Femoral
 - B. Popliteal
 - C. Coronary
 - D. Inferior vena cava
45. Which of the following has valves to assist the blood flow?
- A. Veins
 - B. Arteries
 - C. Capillaries
 - D. Arterioles



If you have had difficulty with this section, review pages 285-293.

BLOOD PRESSURE PULSE

If the statement is true, write "T" in the answer blank. If the statement is false, correct the statement by circling the incorrect term and writing the correct term in the answer blank.

- _____ 46. Blood pressure is highest in the veins and lowest in the arteries.
- _____ 47. The difference between two blood pressures is referred to as blood pressure deficit.
- _____ 48. If the blood pressure in the arteries were to decrease so that it became equal to the average pressure in the arterioles, circulation would increase.
- _____ 49. A stroke is often the result of low blood pressure.
- _____ 50. Massive hemorrhage increases blood pressure.
- _____ 51. Blood pressure is the volume of blood in the vessels.
- _____ 52. Both the strength and the rate of heartbeat affect cardiac output and blood pressure.
- _____ 53. The diameter of the arterioles helps to determine how much blood drains out of arteries into arterioles.
- _____ 54. A stronger heartbeat tends to decrease blood pressure and a weaker heartbeat tends to increase it.
- _____ 55. The systolic pressure is the pressure while the ventricles relax.
- _____ 56. The diastolic pressure is the pressure while the ventricles contract.
- _____ 57. The pulse is a vein expanding and then recoiling.
- _____ 58. The radial artery is located at the wrist.
- _____ 59. The common carotid artery is located in the neck along the front edge of the sternocleidomastoid muscle.
- _____ 60. The artery located at the bend of the elbow and used for locating the pulse is the dorsalis pedis.



If you have had difficulty with this section, review pages 295-298.

UNSCRAMBLE THE WORDS

61. STMESYCI
 ○ □ □ □ □ □ □ □ □

62. NULVEE
 ○ □ □ □ □ □ □

63. RYTREA
 □ □ □ □ □ □ □

64. USLEP
 □ □ □ □ □ □



Take the circled letters, unscramble them, and fill in the statement.

How Noah survived the flood.

65. □ □ □ □ □ □ □

APPLYING WHAT YOU KNOW

66. Mr. Kehoe was experiencing angina pectoris. His doctor suggested a surgical procedure that would require the removal of a vein from another region of his body. This vein would then be used to bypass a partial blockage in his coronary arteries. What is this procedure called?

67. Mr. Stuckey has heart block. His electrical impulses are being blocked from reaching the ventricles. An electrical device that causes ventricular contractions at a rate necessary to maintain circulation is being considered as possible treatment for his condition. What is this device called?

68. Mrs. Heygood was diagnosed with an acute case of endocarditis. What is the real danger of this diagnosis?

69. Mr. Philbrick returned from surgery in stable condition. The nurse noted that each time she took Mr. Philbrick's pulse and blood pressure, the pulse became higher and the blood pressure lower than the last time. What might be the cause?

70. WORD FIND

Can you find 15 terms from this chapter? Words may be spelled top to bottom, bottom to top, right to left, left to right, or diagonally.

Y H Y S I S O B M O R H T A R
 L A C I L I B M U O A Y N I Y
 E E S Y S T E M I C C G D E U
 M V E N U L E D D C I X M D I
 E Y M U I R T A R N L E C G Y
 N O I T A Z I R A L O P E D N
 U D L A T R O P C I T A P E H
 S I U K M U E T O E S L U P U
 R P N F Y C B E D R A L Z P J
 D S A H T I T V N L I I B D W
 Q U R O I V A Q E O D A K R K
 K C R M P G A I G N D D Z Y J
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 S R M I C C Q O A W U N H O K
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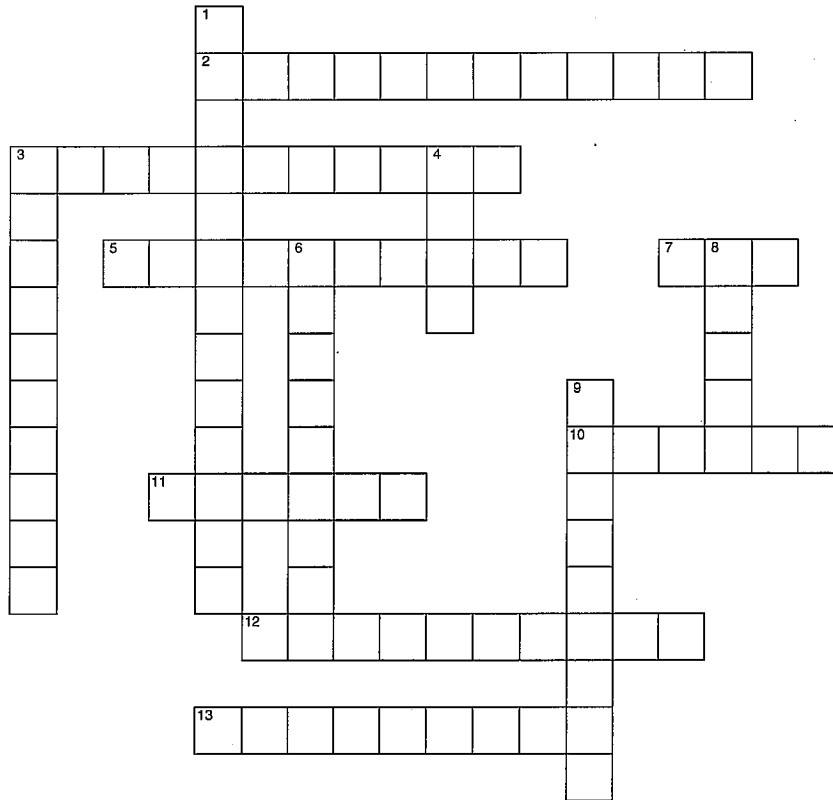
Angina pectoris	ECG	Systemic
Apex	Endocardium	Thrombosis
Atrium	Hepatic portal	Tricuspid
Depolarization	Pulse	Umbilical
Diastolic	Semilunar	Venule

DID YOU KNOW?

- Your heart pumps more than 5 quarts of blood every minute—that's 2000 gallons a day.
- Every pound of excess fat contains some 200 miles of additional capillaries.

CIRCULATORY SYSTEM

Fill in the crossword puzzle.



Across

2. Inflammation of the lining of the heart
3. Bicuspid valve (two words)
5. Inner layer of pericardium
7. Cardiopulmonary resuscitation (abbreviation)
10. Carries blood away from the heart
11. Upper chamber of the heart
12. Lower chambers of the heart
13. SA node

Down

1. Unique blood circulation through the liver (two words)
3. Muscular layer of the heart
4. Carries blood to the heart
6. Tiny artery
8. Heart rate
9. Carries blood from arterioles into venules

CHECK YOUR KNOWLEDGE

Multiple Choice

Circle the correct answer.

1. Systemic circulation involves movement of blood from the:
 - A. Left ventricle throughout the body
 - B. Right ventricle to the lungs
 - C. Capillaries in visceral abdominal organs to the liver
 - D. None of the above
2. What is the outside covering that surrounds and protects the heart called?
 - A. Endocardium
 - B. Myocardium
 - C. Pericardium
 - D. Ectocardium
3. What are the two upper heart chambers that receive blood from veins called?
 - A. Chordae tendineae
 - B. Atria
 - C. Pericardia
 - D. Ventricles
4. Which of the following events, if any, would *not* cause blood pressure to increase?
 - A. Hemorrhaging
 - B. Increasing the viscosity of blood
 - C. Increasing the strength of the heartbeat
 - D. All of the above events would cause blood pressure to increase
5. What are the components of the cardiovascular system that carry blood away from the heart called?
 - A. Arteries
 - B. Sinuses
 - C. Veins
 - D. Capillaries
6. Which of the following events, if any, does *not* precede contraction?
 - A. P wave
 - B. Atrial depolarization
 - C. Ventricular depolarization
 - D. All of these events precede contraction.
7. A structure called the foramen ovale connects which of the following?
 - A. Right atrium and right ventricle
 - B. Left atrium and left ventricle
 - C. Right and left atria
 - D. Right and left ventricles

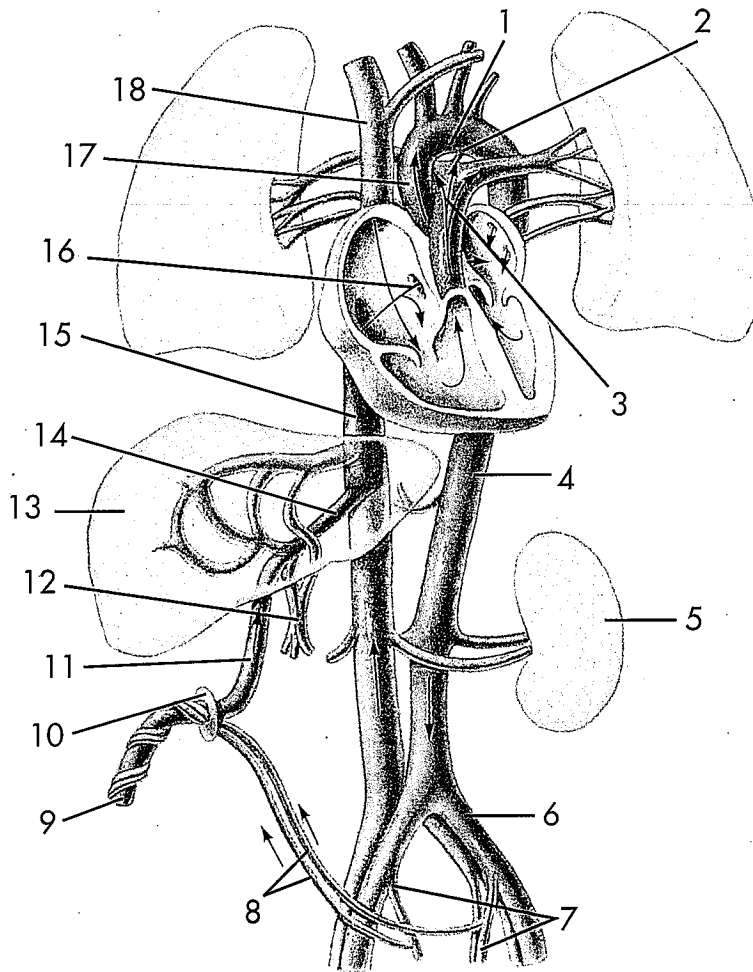
8. What is the valve that permits blood to flow from the right ventricle into the pulmonary artery called?
 - A. Tricuspid
 - B. Mitral
 - C. Aortic semilunar
 - D. Pulmonary semilunar
9. To where does the superior vena cava carry blood?
 - A. Left ventricle
 - B. Coronary arteries
 - C. Right atrium
 - D. Pulmonary veins
10. What is the innermost coat of an artery that comes into direct contact with blood called?
 - A. Lumen
 - B. Tunica externa
 - C. Tunica interna
 - D. Tunica media

Matching

Select the most appropriate answer from column B for each item in column A. There is only one correct answer for each item.

<i>Column A</i>	<i>Column B</i>
_____ 11. Heart attack	A. Sinoatrial node
_____ 12. QRS complex	B. Liver
_____ 13. Systole	C. Myocardium
_____ 14. Pulmonary circulation	D. Ventricular repolarization
_____ 15. Bicuspid	E. Angina pectoris
_____ 16. Hepatic portal circulation	F. Myocardial infarction
_____ 17. Heart muscle	G. Ventricular depolarization
_____ 18. Pacemaker	H. Ventricular contraction
_____ 19. T wave	I. Lungs
_____ 20. Chest pain	J. Mitral

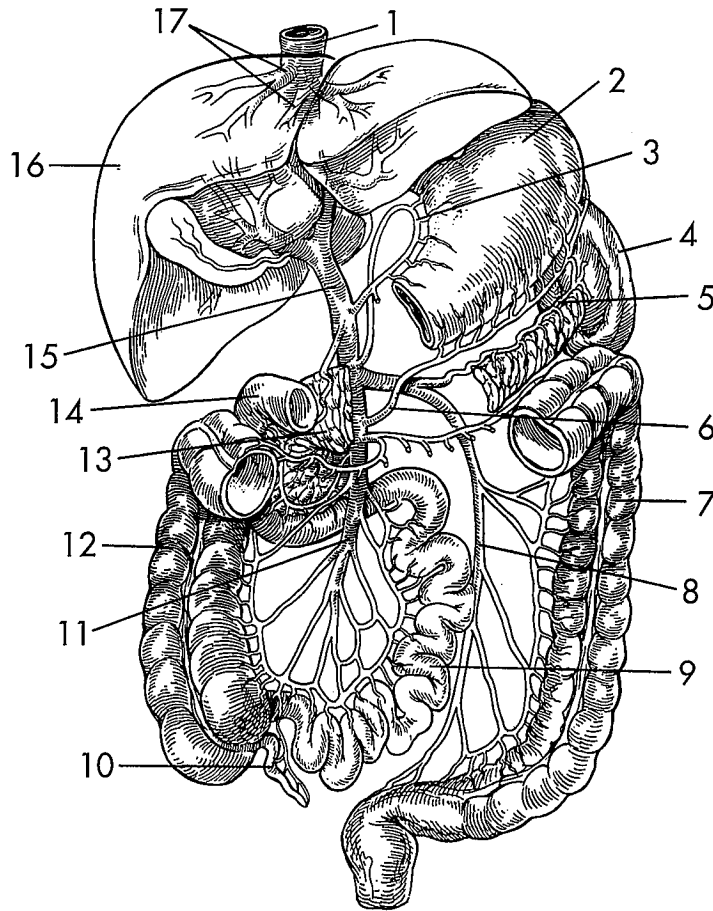
Fetal Circulation



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Hepatic Portal Circulation

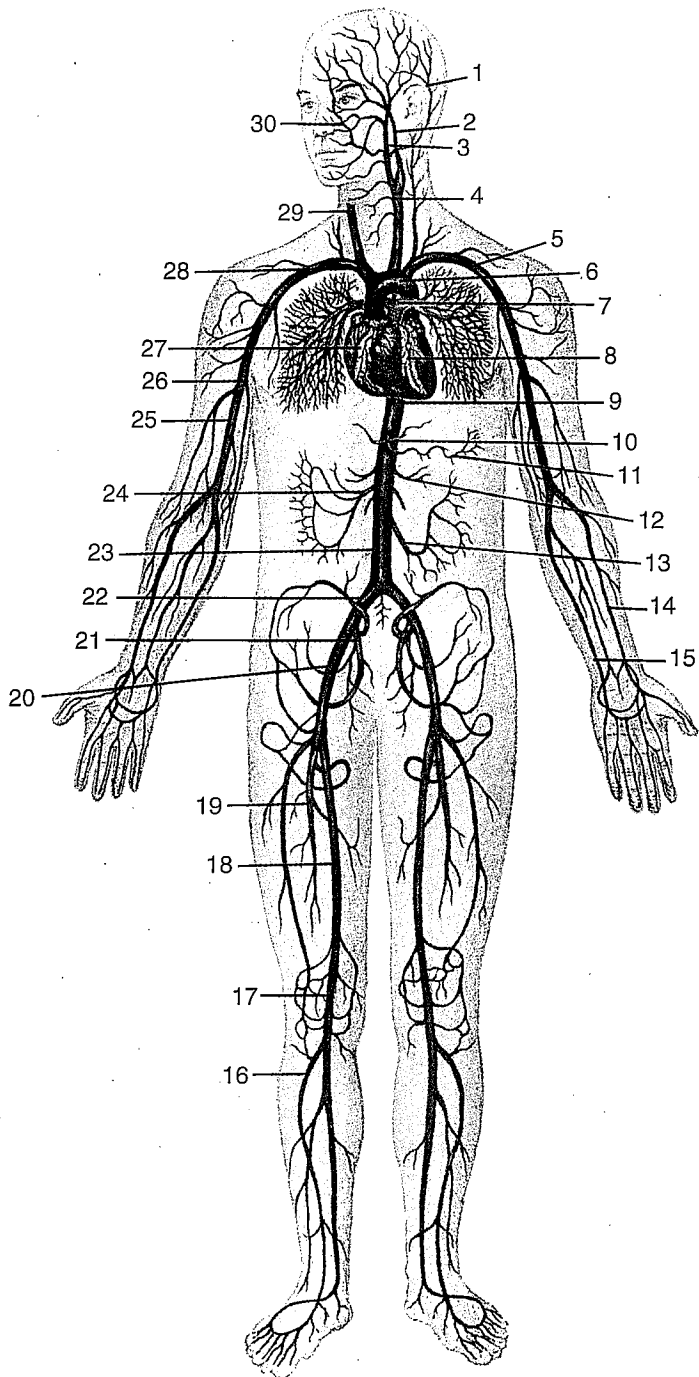


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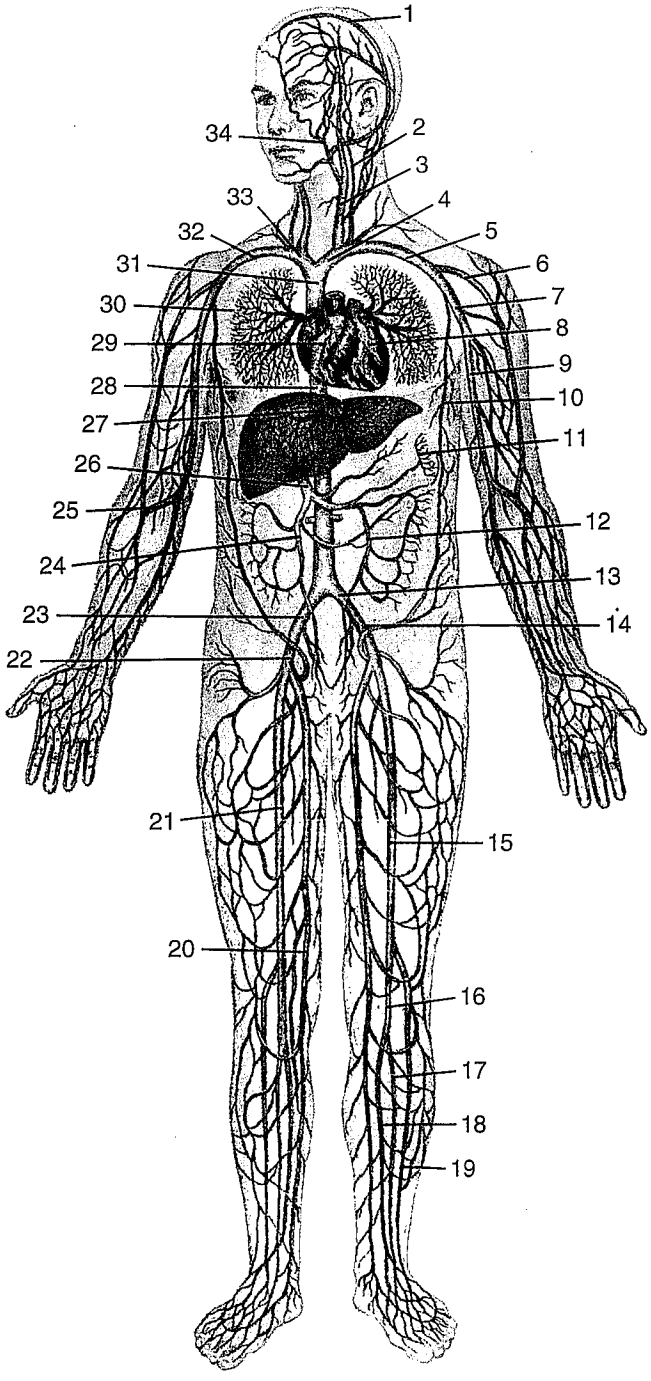
Principal Arteries of the Body

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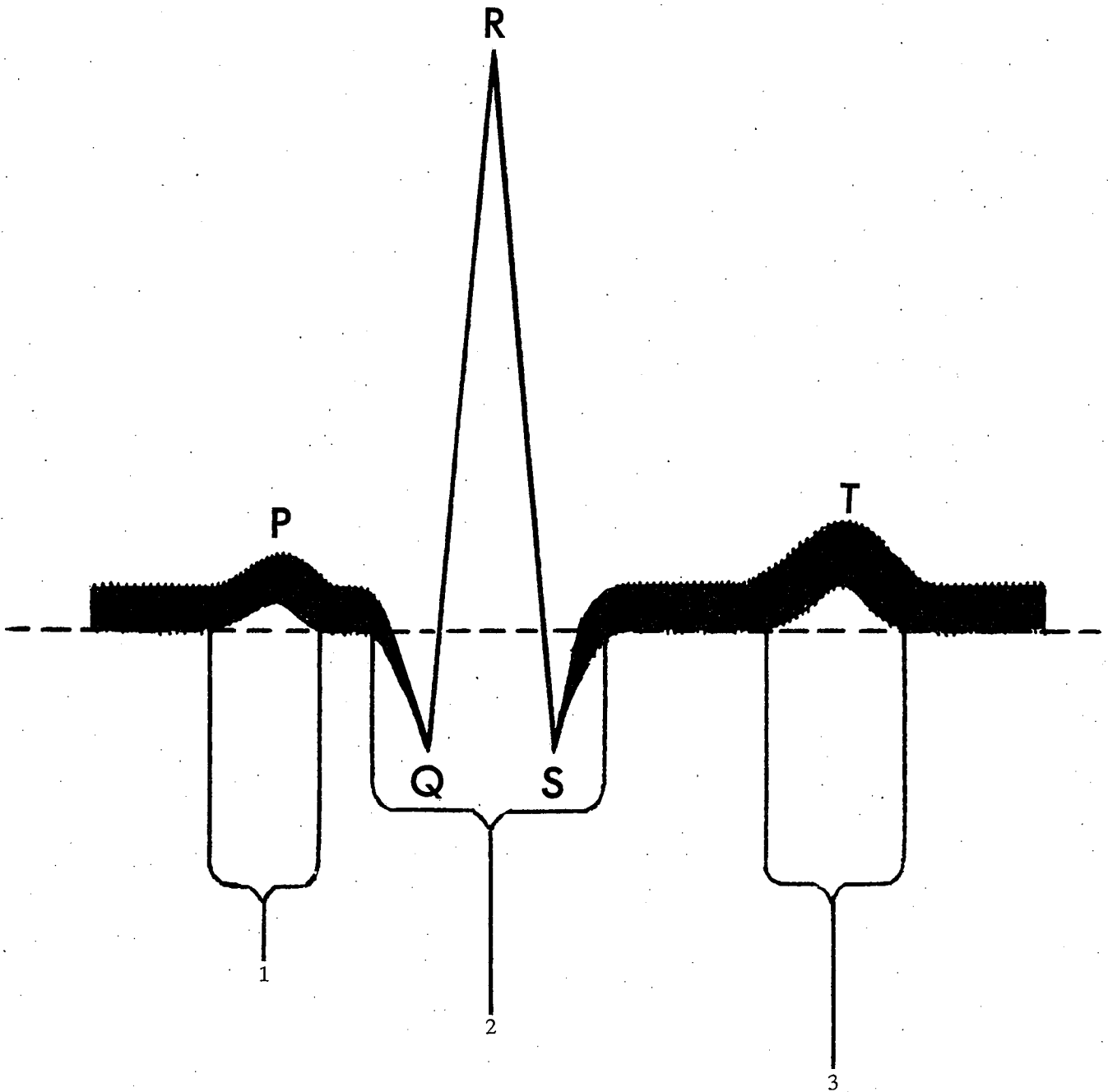
Principle Veins of the Body

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31. _____
32. _____
33. _____
34. _____

Normal ECG Deflections



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2. _____
3. _____

