

2. Organs of a closed circulatory system:

- | | | | |
|----------|--|----|-----------|
| _____ A. | Have valves | a. | Arteriole |
| _____ B. | Regulate blood flow | b. | Artery |
| _____ C. | Lead to heart | c. | Capillary |
| _____ D. | Contains atria and ventricles | d. | Heart |
| _____ E. | Smaller than arteries (next size smaller) | e. | Vein |
| _____ F. | Leads away from the heart | f. | Venule |
| _____ G. | 2, 3 or 4 chambers depending on organism | | |
| _____ H. | Larger than capillaries (next size larger) | | |
| _____ I. | Exchange gases, food and waste materials | | |
| _____ J. | Microscopic blood vessels | | |
| _____ K. | Can shut down and send blood to where needed | | |
| _____ L. | Usually found more on surface of body | | |

3. List the number and types of chambers in a mammal heart _____
4. What is the advantage of the 4 chambered heart in mammals? _____

5. A 4 chambered heart allows _____ to regulate their body temperature because more _____ is produced during _____ .
6. Mammals have a higher _____ demand because their _____ is higher.
7. The heart is located under the _____ and is surrounded by the _____ .
8. The atria _____ blood; the ventricles _____ blood.
9. What is the cardiac cycle? _____
10. Define systole _____
Define diastole _____
11. In a blood pressure of 120/80, which number represents the systolic pressure? _____
Which number represents the diastolic pressure? _____
12. The atrioventricular (A-V) valve(s) is/are located:
- between the right atrium and ventricle
 - between the left atrium and ventricle
 - where the pulmonary artery leaves right ventricle
 - where the aorta leaves the left ventricle
 - both a and b
 - both c and d

13. The semilunar valve(s) is/are located:
- between the right atrium and ventricle
 - between the left atrium and ventricle
 - where the pulmonary artery leaves right ventricle
 - where the aorta leaves the left ventricle
 - both a and b
 - both c and d
14. What is the function of a valve? _____
15. What happens when someone has a heart murmur? _____
16. Heart rate (beats/min) x stroke volume (vol/beat) = _____ (vol/min)
17. The sinoatrial (S-A) node is also called the _____ of the heart because it _____.
18. The S-A node generates electrical impulses and initiates contraction of the _____. The electrical impulse moves to the _____ and completes atrial contraction. The electrical impulse moves to the Bundle of His which divides and sends the impulse to the right and left bundle branches and Purkinje fibers causing the _____ to contract.
19. Indicate the location of the S-A and A-V nodes:
S-A _____ A-V _____
20. What records the electrical activity of the heart? _____
21. The heart rate set by the S-A node can be influenced by _____.
22. Rate change in heart:
- | | |
|--|---------------------|
| _____ A. Increases heart rate when frightened | a. Body temperature |
| _____ B. Nerves that speed up heart rate | b. Epinephrine |
| _____ C. Increase of 1°C increases heart rate 10 bpm | c. Parasympathetic |
| _____ D. Nerves that lower heart rate | d. Sympathetic |

Use the following blood vessel choices to answer questions 23 - 29.

a. artery b. arteriole c. capillary d. venule e. vein

23. Which has the most surface area and the slowest blood flow? _____
24. Which two vessels lead into and away from capillaries? _____
25. Which has precapillary sphincters? _____
26. Which has a high pressure and rapid blood flow? _____
27. Which has valves? _____
28. Which one is squeezed by muscles to help move the blood? _____
29. A bruise is an injury to a collection of which blood vessels? _____

30. Electrical activity in the heart. (1) Label the nodes and specialized muscle fibers (underlined). (2) Add arrows to indicate the direction the impulse is spreading.

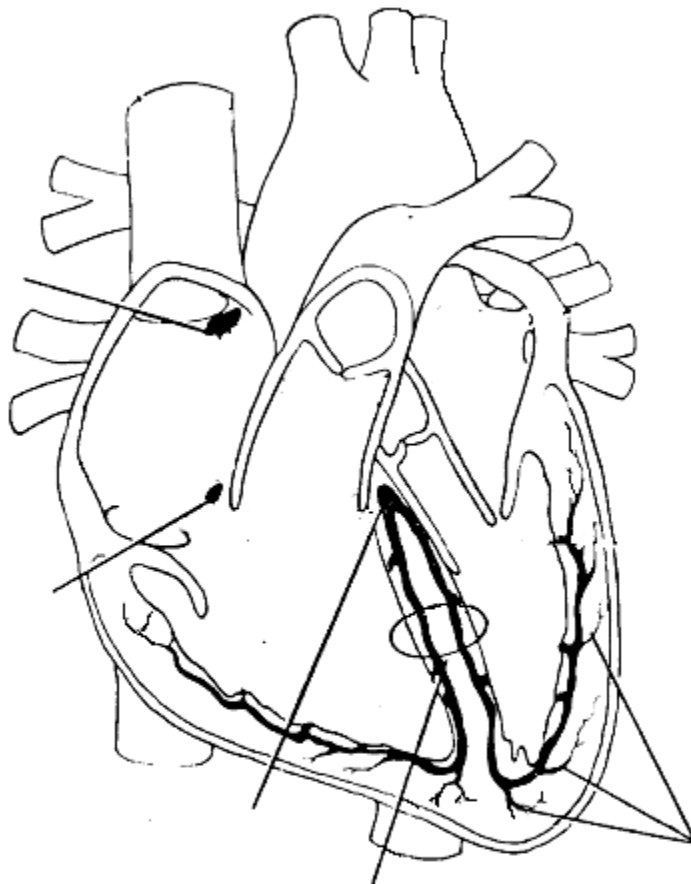


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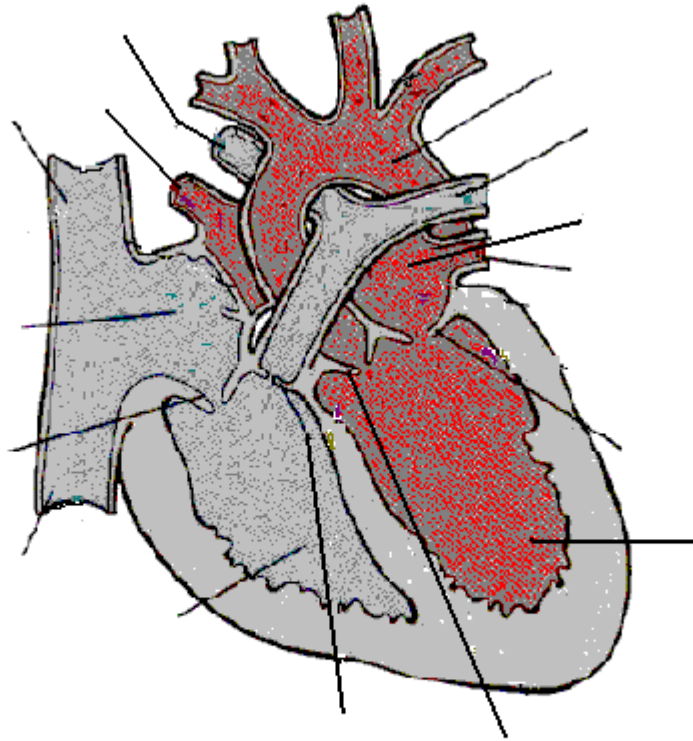
http://www.southalabama.edu/biology/shardo/bly152/cardiovascular/heart_electric_nonav.html

1. Sinoatrial node initiates contraction of both atria.
2. Electrical impulse moves to atrioventricular node and completes atrial contraction.
3. Electrical impulse moves to Bundle of His which divides and
4. sends impulse to right and left bundle branches.
5. Electrical impulse travels to Purkinje fibers and both ventricles contract.

31. In which arteries can a pulse be detected? _____
What is measured by a pulse? _____
32. Contraction of smooth muscles in which blood vessel increases blood pressure in the arteries?

33. Blood pressure is higher in _____ and lower in _____ .
34. Blood pressure is the _____ force that blood puts on vessel walls and is greatest at the _____ end of capillaries. It forces _____ and _____ through clefts in capillaries to interstitial fluid.
35. About _____ of the fluid reenters by _____ near the _____.
36. The remaining fluid goes to the _____ system which drains into the _____ system at the _____ vein.

37. Flow of blood. Label the vessels and heart structures (underlined words) involved in flow of blood. Draw blue arrows to show flow of deoxygenated blood. Draw red arrows to show flow of oxygenated blood. (*If you don't have these colors, provide the key to your color scheme.*)



Modified from:

<http://www.sci.sdsu.edu/Faculty/Paul.Paolini/ppp/lecture20/sld005.htm>

1. Blood comes from the upper and lower body tissues via capillaries. (Blood has $\downarrow O_2$, $\uparrow CO_2$)
2. Blood goes to venules.
3. Blood from the upper body goes to the superior vena cava and from the lower body to the inferior vena cava.
4. Blood enters the right atrium.
5. Blood enters the right ventricle through the right atrioventricular valve.
6. Blood enters the right and left pulmonary arteries through the semilunar valve.
7. Blood goes to the lungs and capillary beds. It gets oxygenated and CO_2 is released.
8. Blood returns to the heart via right and left pulmonary veins.
9. Blood enters left atrium.
10. Blood enters left ventricle through the left atrioventricular valve.
11. Blood enters the aorta through the semilunar valve.
12. Blood goes to the arteries.
13. Blood goes to the arterioles.
14. Blood enters capillary beds in the upper and lower body tissues. (Blood has $\uparrow O_2$, $\downarrow CO_2$)
Oxygen is diffused into the tissues and CO_2 is removed from the tissues.

38. Which sequence most accurately describes a sequence of blood flow? _____

- a. right atrium → right ventricle → pulmonary artery
- b. right atrium → left atrium → left ventricle → aorta
- c. left atrium → left ventricle → pulmonary artery
- d. left ventricle → left atrium → aorta
- e. right atrium → right ventricle → aorta

39. Which sequence most accurately describes a sequence of blood flow? _____

- a. pulmonary vein → pulmonary artery → right atrium
- b. pulmonary artery → left atrium → left ventricle
- c. pulmonary artery → pulmonary capillaries → pulmonary vein → left atrium
- d. left ventricle → aorta → pulmonary artery
- e. pulmonary artery → pulmonary capillaries → pulmonary vein → right atrium

40. Blood Clotting Mechanism

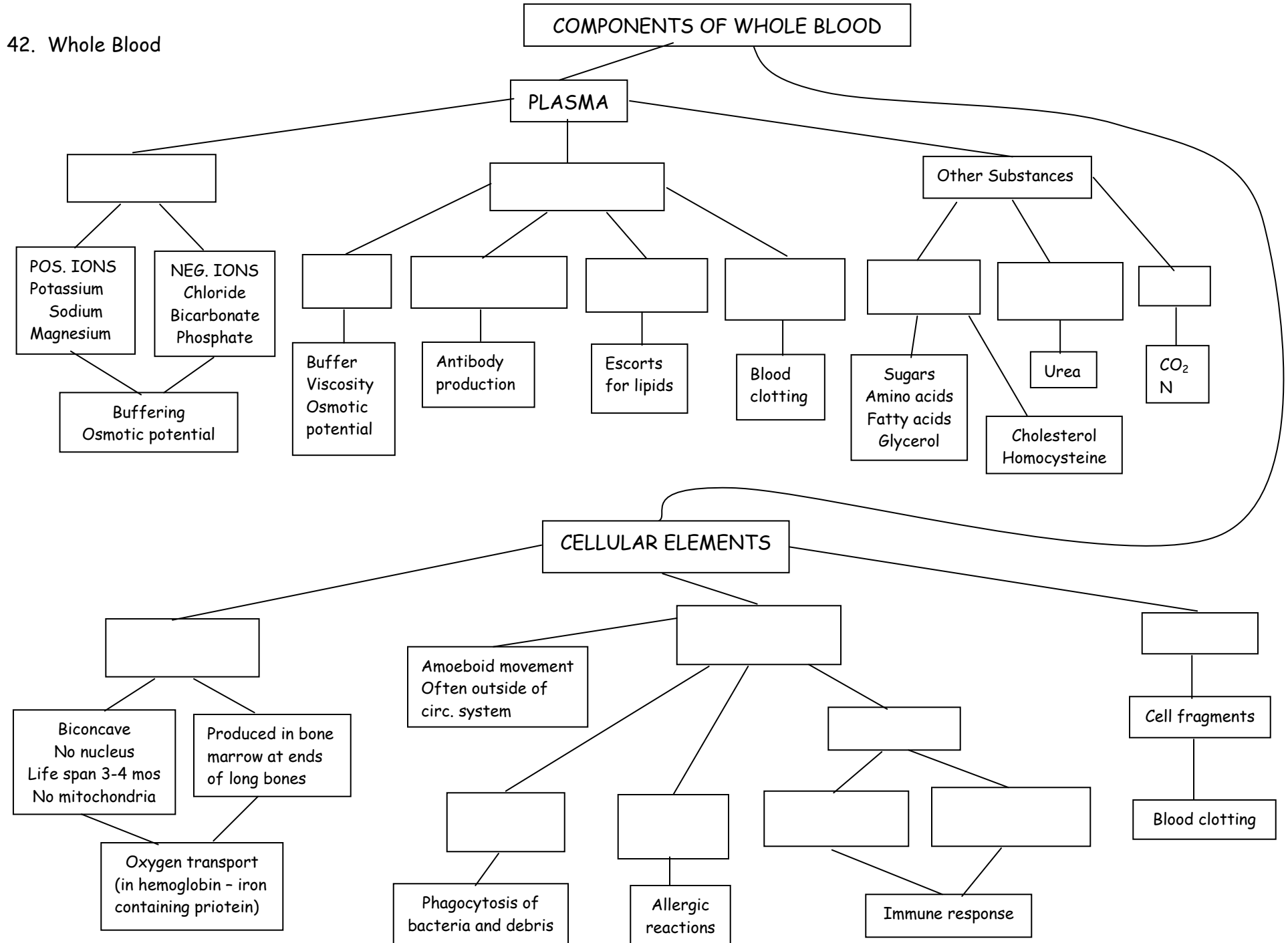
_____ (from injury) release _____
 (enzyme; activator) which combines with _____ (produced by liver;
 inactive) + _____ + vitamin K (normal plasma constituent; inactive)
 forming _____ (enzyme; active) which reacts with _____
 _____ (blood protein produced by liver; inactive) forming _____
 _____ (thread-like material that catches RBCs and forms clot; active).

41. Cardiovascular Disease

| | |
|----|---|
| A. | Clot in blood vessel in brain |
| B. | Plaque deposits on inner walls of arteries |
| C. | Blockage in heart artery |
| D. | Silent killer; promotes atherosclerosis |
| E. | Ruptured blood vessel in brain |
| F. | Hardened plaque deposits in artery walls |
| G. | Heart quivers during MI; no blood pumped |
| H. | Symptom of atherosclerosis and arteriosclerosis |

| | |
|----|-----------------------|
| a. | Myocardial infarction |
| b. | Fibrillation |
| c. | Stroke |
| d. | Hemorrhagic stroke |
| e. | Atherosclerosis |
| f. | Arteriosclerosis |
| g. | Angina pectoris |
| h. | Hypertension |

42. Whole Blood



Answer Key

2. (A) e; (B) a; (C) e; (D) d; (E) a; (F) b; (G) d; (H) f; (I) c; (J) c; (K) a; (L) e
3. 2 atria, 2 ventricles
4. no mixing of oxygenated and unoxygenated blood; more efficient in sending oxygenated blood to body tissues
5. endotherms; heat; cellular respiration
6. oxygen; metabolism
7. sternum; pericardium
8. collect; pump
9. alternating sequence - filling atria with blood and pumping blood from ventricles
10. systole - contraction of heart; diastole - relaxation of heart
11. 120 - systolic pressure; 80 - diastolic pressure
12. e
13. f
14. prevents back flow of blood
15. valves are not closing properly; blood is flowing back
16. cardiac output
17. pacemaker; sets contraction rate
18. atria; atrioventricular node; ventricles
19. S-A - wall of right atrium; A-V - wall between right atrium and right ventricle
20. electrocardiogram
21. nerves, hormones, body temperature
22. (A) b; (B) d; (C) a; (D) c
23. c
24. b, d
25. b
26. a
27. e
28. e
29. c
30. see next page
31. carotid arteries in neck and radial arteries in wrists; heart rate
32. arterioles
33. arteries; veins
34. hydrostatic; arteriole; water; solutes
35. 85%; osmosis; venule
36. lymphatic; circulatory; subclavian
37. see next page
38. a
39. c

40. **Platelets and damaged cells** (from injury) release **thromboplastin** (enzyme; activator) which combines with **prothrombin** (produced by liver; inactive) + **calcium** + vitamin K (normal plasma constituent; inactive) forming **thrombin** (enzyme; active) which reacts with **fibrinogen** (blood protein produced by liver; inactive) forming **fibrin** (thread-like material that catches RBCs and forms clot; active).

41. (A) c; (B) e; (C) a; (D) h; (E) d; (F) f; (G) b; (H) g

30. Heart electrical activity

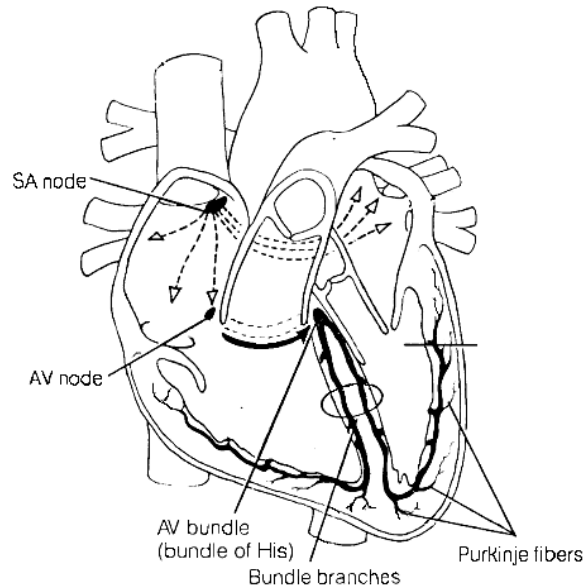
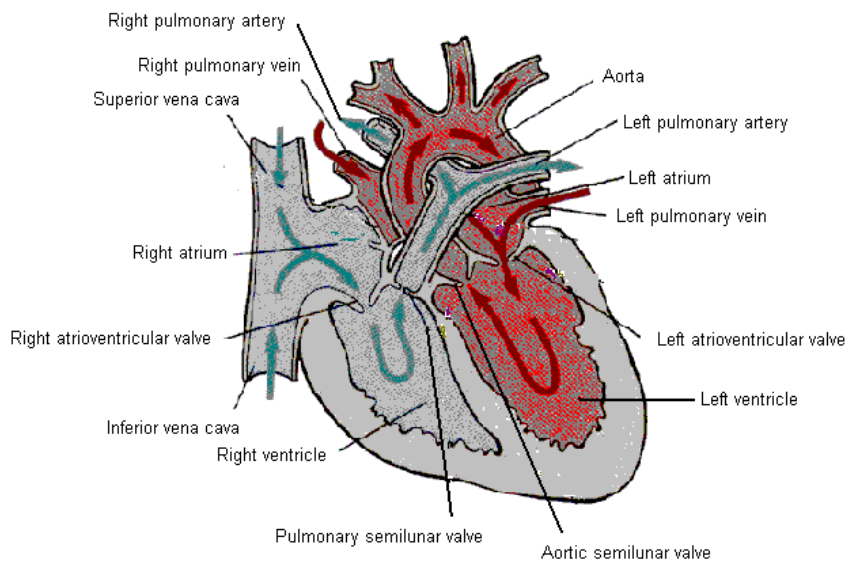


Diagram modified from:
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37. Heart and blood circulation



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NOTE: Questions 38-39 are taken from *Biology*, 5th ed., Solomon, Berg and Martin, 1999, pg. 927

42. Whole Blood

