Chapter 10 – The Circulatory & Lymphatic Systems

Complete using BC Biology 12, pages 298 – 325

10.1 The Blood Vessels

1. Label the blood vessels in this diagram, using the following list of terms. Use Figure 10.1 to help if needed.
   - arterioles
   - artery
   - capillaries
   - valve
   - vein
   - venules

2. Match the statements to the terms: artery, vein, capillary
   - a. ___________________________ Thickest walls
   - b. ___________________________ Has valves
   - c. ___________________________ Takes blood away from the heart
   - d. ___________________________ Takes blood to the heart
   - e. ___________________________ Exchanges CO₂ and O₂ with tissues
   - f. ___________________________ Nervous stimulation causes these to constrict during hemorrhaging; also act as a blood reservoir

3. STRANGE BUT TRUE! The ______________________ of the _______ is one region of the body that is nearly capillary-free. Why? __________________________ How do the cells in this region get nutrients? ___________
4. Label the diagram below using Figure 10.2.

![Diagram of blood flow](image)

a. ______________________

b. ______________________

c. ______________________

d. ______________________

e. ______________________

5. Explain how it is possible for blood to bypass capillary beds. Use the terms labelled in the figure above.

___________________________________________________________________________

___________________________________________________________________________

___________________________________________________________________________

6. What is the term given to the sleepiness people may feel after eating? ______________________

As recent evidence suggests it is not due to decreased blood supply to the brain, what is the suspected reason for this feeling? ______________________

What is the largest artery in the body? ______________________

What is the largest vein in the body? ______________________

7. Blood is considered to be a ______________________ tissue.

8. Name the three broad functions of blood and give an example of each

   a. ______________________ : ______________________

   b. ______________________ : ______________________

   c. ______________________ : ______________________

9. Plasma is mostly ______________________ (90-92%) and ______________________ (7-8%).

10. Place the correct plasma protein in the blank: fibrinogen, albumin, lipoproteins, or all plasma proteins

   a. ______________________ transports cholesterol

   b. ______________________ helps blood clot

   c. ______________________ transports bilirubin (breakdown product of hemoglobin)

   d. ______________________ helps maintain the pH and osmotic pressure of the blood
11. The red blood cells, scientifically called ________________, are made in the ________________
of the ________________, the ________________, the ________________, and the ends of the ________________. Upon maturation, they are biconcave disks that lack a ________________ and contain ________________ (a red pigment). After about 120 days, red blood cells are destroyed in the ________________ and ________________.

12. The condition of ________________ is characterized by an insufficient number of red blood cells or not enough hemoglobin. What are three basic causes for this condition?
   (1) ________________
   (2) ________________
   (3) ________________

   What is the most common type of anemia? ________________

13. Circle the items that describe hemoglobin correctly:
   a. each molecule contains three polypeptide chains
   b. each molecule contains four polypeptide chains
   c. heme contains iron
   d. globin contains iron
   e. makes leukocytes red
   f. makes erythrocytes red
   g. becomes oxyhemoglobin when carrying oxygen
   h. becomes deoxyhemoglobin when carrying oxygen

14. White blood cells, scientifically called ________________, differ from the red blood cells in that they are usually ________________, have a ________________, lack ________________ and without staining appear ________________. White blood cells fight ________________ and play a role in the development of ________________ and the ability to ________________

15. Name the two divisions of white blood cells.
   • ________________: contain enzymes and proteins which help defend against microbes
   • ________________: also known as mononuclear cells and include the cells that are able to produce antibodies for long term immunity

16. Platelets, scientifically called ________________, result from fragmentation of certain large cells called ________________, in the red bone marrow. They are involved in the process of ________________ or ________________.

17. The following shows the reactions that occur as blood clots:
   
   platelets $\rightarrow$ prothrombin activator
   prothrombin $\rightarrow$ thrombin
   fibrinogen $\rightarrow$ fibrin threads

   Does the left-hand side or right-hand side list substances that are always present in the blood? ________________

   Which substances function as enzymes? ________________

   Which substance is the actual clot? ________________
18. Several nutrients are necessary for clotting to occur. Vitamin________ is needed for the production of prothrombin. The element __________________________ is needed for conversion of prothrombin to thrombin. __________________________ refers to a group of inherited clotting disorders caused by a deficiency in a __________________________. The most common type, __________________________, accounts for about 90% of all cases and almost always occurs in ____________ because the faulty gene is found on the ___ chromosome. Since ______________ have 2 __________ they have a backup copy of the gene.

19. Complete the table below using Table 10.3 *Not in order!

<table>
<thead>
<tr>
<th>Name</th>
<th>Composition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Formed elements and plasma</td>
</tr>
<tr>
<td></td>
<td>Plasma minus fibrinogen</td>
</tr>
<tr>
<td></td>
<td>Tissue fluid within lymphatic vessels</td>
</tr>
<tr>
<td></td>
<td>Liquid portion of blood</td>
</tr>
<tr>
<td></td>
<td>Plasma minus most proteins</td>
</tr>
</tbody>
</table>

20. A __________________________ is a cell that is ever capable of dividing and producing new cells that go on to __________________________. Multipotent stem cells are known to be found in the __________________________ and have the ability to give rise to other stem cells for the various __________________________.

Why are researchers so interested in stem cells? __________________________

21. What is the benefit of using a person’s own stem cells as opposed to using donor stem cells? __________________________

22. Label this diagram of capillary exchange using these terms:

- amino acid
- glucose
- oxygen
- water (2)
- arterial end
- net pressure in
- tissue fluid
- blood pressure (2)
- net pressure out
- venous end
- carbon dioxide
- osmotic pressure (2)
- wastes
23. Explain the diagram in the last question.

24. Why is there excess tissue fluid, and what happens to it?

10.3 The Human Heart

25. Distinguish between the…
   a. myocardium:
   b. pericardium:
   c. and endocardium:

26. Label the parts of the heart, using the following list of terms.

   - aorta
   - semilunar valves (2)
   - AV (bicuspid) valve
   - AV (tricuspid) valve
   - chordae tendineae
   - inferior vena cava
   - left atrium
   - left ventricle
   - pulmonary artery
   - pulmonary veins
   - right atrium
   - right ventricle
   - septum
   - superior vena cava

27. Why is the left ventricle more muscular than the right ventricle?

28. Trace the path of blood…
   a. through the heart from the vena cava to the lungs.
   b. the lungs to the aorta.
29. When the heart beats the two __________________ contract at the same time, then the two __________________ contract at the same time, then all of the chambers _________________.

30. Fill in the following table with the words systole (contraction) and diastole (relaxation) to show what happens during the 0.85 seconds of one heartbeat.

<table>
<thead>
<tr>
<th>Cardiac Cycle</th>
<th>Time</th>
<th>Atria</th>
<th>Ventricles</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.15 sec</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.30 sec</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.40 sec</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

31. When a heart beats, the familiar ________________ sound occurs. This is best heard using a ________________. When the atria contract, this forces blood through the ________________ valves into the chambers called the ________________. The closing of these valves is the lub sound. Next, the ventricles contract and force the blood into the arteries. Now the __________________ valves close, making the dub sound.

32. Match the phrases to these nodes: SA node, AV node
   a. ____________________ pacemaker
   b. ____________________ contraction of ventricles
   c. ____________________ base of right atrium near the septum
   d. ____________________ Purkinje fibers

* Draw the SA and AV nodes onto the heart diagram on the last page

33. Match the actions to these divisions of the nervous system: parasympathetic system, sympathetic system
   a. ____________________ normal body functions
   b. ____________________ active under times of stress
   c. ____________________ releases norepinephrine to speed up heart
   d. ____________________ slows heart rate

34. Does the adrenal gland hormone, epinephrine, speed or slow the heart rate? ____________________

35. What is the significance of each of the following in an electrocardiogram (ECG)?
   a. P wave ____________________
   b. QRS wave ____________________
   c. T wave ____________________
   d. Label the following ECG diagram with P, Q, R, S, and T
36. Various types of abnormalities, known as __________________, can be detected by an ECG.
   Name the abnormalities or equipment based on the descriptions below.
   a. __________________: most common type, results in a fast & irregular heartbeat
   b. __________________: fluttering sensation in the heart as result of AF
   c. __________________: serious medical condition, commonly follows a heart attack by
      can be caused by injury or drug overdose
   d. __________________: small devices used to determine whether a person is suffering
      from VF and if necessary to apply appropriate electrical shock

10.4 The Vascular Pathways

37. Name and distinguish between the two circuits of the circulatory system.
   a. __________________: __________________
   b. __________________: __________________

38. Usually, arteries carry oxygenated blood and veins carry deoxygenated blood.
   Name two vessels in which this is not the case.
   a. __________________
   b. __________________

39. Trace the path of blood
   To the left atrium: From the legs:
   right ventricle legs
   a. __________________ c. __________________
   lungs d. __________________
   b. __________________
   left atrium

40. Trace the path of the blood
   To the liver: From the liver:
   aorta liver
   a. __________________ c. __________________
   digestive tract d. __________________
   b. __________________
   liver

41. Why are coronary arteries more likely to clog than other arteries? __________________

42. Define portal system: __________________
43. What force accounts for blood flow in arteries?

44. Why does this force fluctuate?

45. What causes the blood pressure and velocity to drop off?

46. Since there is little muscle surrounding the veins, what factors account for blood flow in the veins?

47. What keeps blood from flowing backward in veins?

48. A ________________ is the device used to measure blood pressure. Blood pressure is usually measured on the _____________________________. Why use this artery?

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49. Why does fetal circulation differ from regular circulation?

50. Much of the blood entering the right atrium is shunted into the left atrium through the ________________ between the two atria. Also, any blood that does enter the right ventricle and is pumped into the pulmonary trunk is shunted into the aorta by way of the _________________.

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10.5  Fetal Circulation  

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pages 314 - 315
51. Match each term to its correct description

<table>
<thead>
<tr>
<th>umbilical arteries</th>
<th>umbilical vein</th>
<th>ductus venosus</th>
<th>umbilicus</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. __________________ navel</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. __________________ connection of umbilical vein from liver to inferior vena cava</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. __________________ takes nutrient and oxygen rich blood to the fetus</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. __________________ takes blood that has delivered its oxygen and nutrients back to the mother</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

52. Explain the function of the placenta. ____________________________

10.6 The Lymphatic System pages 315 - 318

53. What is tissue fluid comprised of? ____________________________

   a. Another term for this fluid is ____________________________.

54. Describe an edema and its causes. ____________________________

55. Two primary lymphoid organs: ____________________________

    Two secondary lymphoid organs: ____________________________

56. Why do physicians feel for the presence of swollen or tender lymph nodes? ____________________________

10.7 Innate & Adaptive Immunity pages 318 - 321

Not specifically covered in this course but an interesting topic!
57. Complete the table. Your knowledge of the disorders will not be tested but rather is provided for interest sake.

<table>
<thead>
<tr>
<th>Disorder</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accumulation of soft masses of fatty materials beneath linings of arteries. What are these deposits called?</td>
<td></td>
</tr>
<tr>
<td>High blood pressure. What would be a high blood pressure reading for you?</td>
<td></td>
</tr>
<tr>
<td>Can occur as a birth defect or degenerate due to age or infections. What do they often get replaced by?</td>
<td></td>
</tr>
<tr>
<td>Arteriole in the brain bursts or is blocked by a blood clot.</td>
<td></td>
</tr>
<tr>
<td>Partial blockage of a coronary artery.</td>
<td></td>
</tr>
<tr>
<td>Complete blockage of a coronary artery. A portion of the heart muscle dies due to a lack of oxygen.</td>
<td></td>
</tr>
<tr>
<td>Ballooning of the blood vessel, most often in the abdominal aorta or the arteries leading to the brain.</td>
<td></td>
</tr>
</tbody>
</table>
Chapter 10 Review Questions

1. ____  8. ____  15. ____  22. ____
2. ____  9. ____  16. ____  23. ____
3. ____  10. ____  17. ____  24. ____
4. ____  11. ____  18. ____  25. ____
5. ____  12. ____  19. ____  26. ____
6. ____  13. ____  20. ____  27. ____
7. ____  14. ____  21. ____  28. ____

29. Composition of blood:

30. (a) ____________________________________________
    (b) ____________________________________________

31. ____  32. ____  33. ____  34. ____

35. Complete the table

<table>
<thead>
<tr>
<th>Other name</th>
<th>Red Blood Cells</th>
<th>White Blood Cells</th>
<th>Platelets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site of Production</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Structure &amp; Appearance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Function</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

36. ____________________________________________

37. ____  38. ____  39. ____  40. ____

41. ____

43. Complete the table

<table>
<thead>
<tr>
<th>Blood Vessel</th>
<th>Structure</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Artery</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arteriole</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capillary</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Venule</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vein</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
44. Function of circulatory system with respect to each of the following

(a) clotting ____________________________

(b) transport ____________________________

(c) pH balance ___________________________

(d) thermoregulation _____________________

(e) protection from infection ___________________

46. Parts of the heart

(A) __________________ (I) __________________

(B) __________________ (J) __________________

(C) __________________ (K) __________________

(D) __________________ (L) __________________

(E) __________________ (M) __________________

(F) __________________ (N) __________________

(G) __________________ (O) __________________

(H) __________________

47. Match the description to the blood vessel

(a) __ (f) __ (k) __ (p) __

(b) __ (g) __ (l) __ (q) __

(c) __ (h) __ (m) __

(d) __ (i) __ (n) __

(e) __ (j) __ (o) __

48. Distinguish between…

(a) Artery

Vein

(b) Atrium

Ventricle

(c) Blood

Interstitial Fluid

(d) Plasma

Formed elements

(e) Tricuspid valve

Bicuspid valve

(f) Systemic circuit

Pulmonary circuit
(g) Atrioventricular valve
  Semilunar valve
(h) Intrinsic control
  Extrinsic control
(i) Left side of heart
  Right side of heart

49. 

52. 

53. 

59. 

61. 

62. 

65. Match the description to the fetal circulatory feature
   (a) ___     (l) ___     (k) ___     (p) ___
   (b) ___     (g) ___     (l) ___     (q) ___
   (c) ___     (h) ___     (m) ___     (r) ___
   (d) ___     (i) ___     (n) ___     (s) ___
   (e) ___     (j) ___     (o) ___

73. (a) Show your work

(b) Show your work

Mark the review questions using the answer key on pages 544 - 546