Circulatory System

Part A - Multiple Choice Questions

1. B
2. C
3. C
4. B
5. A
6. B
7. A
8. C
9. A
10. C
11. C
12. D
13. D
14. A
15. B
16. A
17. D
18. C
19. B
20. C
21. B
22. C
23. A
24. B
25. C
26. C
27. A
28. D
29. C
30. B
31. C
32. A
33. C
34. C
35. C
36. C
37. A
38. D
39. B
40. D
41. C
42. D
43. D
44. D
45. A

Part B – Written Answers

Note: The answers provided here are correct, but they may NOT be the only possible answers.

1. a. A baby's first breath inflates the lungs. This decreases the resistance to blood flowing through these tissues and, for the first time, a significant quantity of blood returns to the heart through the pulmonary veins. This starts a sequence of events that convert the fetal heart into an adult heart.
   b. There are two natural events associated with the heart that follow the first breath. Firstly, the blood entering the left atrium through the pulmonary veins cause the foramen ovale to snap shut. This valve grows closed within a few days. Secondly, the greater volume of blood that can travel through the pulmonary arteries results in less blood in the arterial duct. This stimulates the endothelial cells in the arterial duct to start to divide, thus closing this short blood vessel. Eventually, all that remains of it is a ligament that attaches the pulmonary artery to the aorta.

2. For blood to get from the fingers to the toes, the blood would have to return to the heart through the brachial vein, subclavian vein and finally the superior vena cava. It would enter the right atrium, then the right ventricle and get pumped through the pulmonary artery to the lungs, where it would get oxygenated. It would return to the heart via the pulmonary vein. It would enter the left atrium, then the left ventricle and get pumped into the aorta where it would be conducted to the iliac artery down the legs to the arteries that serve the toes.

3. a. Arterial vasoconstriction will decrease the volume of blood flowing into a particular tissue.
   b. Arterial vasoconstriction will result in lowered blood pressure in the tissue that the artery was serving.

4. a. Nodal tissue is a spot of specialized tissue comprised of "neuromuscular" cells. These spots of tissue are unique because they can contract and stimulate the activity of other cells. Nodal tissue is located in two spots in the right atrium. One spot is called the SA node and the other is called the AV node.
   b. The SA node is called the pacemaker. On the average, it beats (contracts) intrinsically every 0.85 sec., which provides the natural average heart rate of 72 beats per minute. When the SA node contracts, it stimulates the contraction of the atria and stimulates the AV node. The AV node generates impulses that travel through the Purkinje fibers to the muscle amass of the ventricles and causes the ventricles to contract.
   c. The body has that can alter the intrinsic heart rate (either speed it up or slow it down, according to the bodies needs at the time) through neural pathways from the medulla oblongata at the base of the brain. For example, if the need for increased blood delivery is perceived by the medulla oblongata (as when during exercise), the medulla oblongata will generate an impulse to stimulate increased activity o the SA node. This increases the heart rate.

5. a. Globulins are blood proteins produced by the liver. Examples of globulins include prothrombin and fibrinogen, both of which are required for blood clotting.
   b. Leukocytes are white blood cells, some of which produce antibodies. Antibodies will bond onto foreign cells (identified by their antigens) and cause these cells (or viruses) to agglutinate.

6. The lymphatic system has a major role in regulating the fluid balance of the body. It will absorb excess fluid that accumulates in tissue spaces and return it to the circulatory system. It also stores white blood cells and antibodies in specializations called lymph nodes. These play a role in the immune system but identifying and destroying antigenic material.

7. Body cells are bathed by extracellular fluid. The composition of the fluid is constantly being modified by cellular metabolism and capillary fluid exchange. The substances cells utilize come from the fluid and the wastes they produce enter it. Diffusion is the transport mechanism for oxygen into the cells and for carbon dioxide out of the cells. The concentrations determining the direction of diffusion result from cellular respiration. The concentrations of oxygen and carbon dioxide in the extracellular fluid are regulated and maintained by capillary fluid exchange.

8. a. The blood at position 1 is oxygenated and contains nutrients as well as low levels of ammonia. In contrast, at position 2, the blood is deoxygenated, contains fewer nutrients and has higher levels of ammonia.
   b. Fluid movement is occurring at position 2 and position 3. This movement differs in two ways. Firstly, the fluid is moving in opposite directions. At position 2, it is moving out of the capillary into tissue spaces. At position 3, it is moving from tissue spaces into the capillary. Secondarily, the movement is a result of blood pressure at position 2 and a result of osmotic pressure at position 3.