Module 11

l. Antigen - A protein or carbohydrate that, when introduced in the body, triggers the production of an antibody

m. Arteries - Blood vessels that carry blood away from the heart

n. Capillaries - Tiny, thin-walled blood vessels that allow the exchange of gases and nutrients between the blood and cells

o. Veins - Blood vessels that carry blood back to the heart

p. Pulmonary circulation - Circulation of the blood over the air sacs of the lungs

q. Systemic circulation - Circulation of the blood through the tissues of the body, except for the pulmonary circulation

r. Systolic phase - The phase of the cardiac cycle in which the ventricles contract

s. Diastolic phase - The phase of the cardiac cycle in which the ventricles relax

t. Cardiac cycle - One complete round of systole and diastole

u. Arterioles - The smallest arteries that still have three tunics

v. Venules - Small veins that do not have three tunics but instead have only an endothelium, a basement membrane, and a few smooth muscle cells

2. Blood is denser than water. So, the balloon would sink.

3. The pH of blood ranges from 7.35 to 7.45. It has to be tightly controlled, because many of the chemical reactions which control the body work properly only in a narrow range of pH.

4. Blood is made of plasma about (55%) and formed elements about (45%).

5. About 50% of blood is water.

6. Plasma is mostly water. It also contains proteins, ions, nutrients, gases, regulatory chemicals, and waste.

7. Erythrocytes (red blood cells) make up most of the blood's formed elements. There are also leukocytes (white blood cells) and thrombocytes (blood platelets).

8. Hemoglobin carries oxygen in the blood. It also carries some carbon dioxide, but not much.

9. Iron must be present, as that is the site at which oxygen molecules bind to the hemoglobin.

10. Red blood cells have no nucleus, once they are mature. They therefore cannot make the proteins that they need. They cannot repair damage or replace degenerated proteins.

11. The granulocytes are neutrophils, basophils, eosinophils. The agranulocytes are lymphocytes and monocytes.

12. Neutrophils fight infections by phagocytosis.
Basophils release histamine and heparin.
Eosinophils are anti-inflammatory.
Lymphocytes produce antibodies.
Monocytes fight infections by phagocytosis.

13. Blood cells are formed from stem cells found in bone marrow.

14. Hemostasis involves vasoconstriction, platelet plug formation, and blood coagulation.

15. A thrombus is the plug formed in platelet plug formation.

16. In stage 1, prothrombinase is made. In stage 2, thrombin is made. In stage 3, fibrin is made.

17. Coagulation factors play a critical role in stage 1 of coagulation.

18. If a blood coagulation factor is present, then coagulation may or may not be occurring. If an activated factor is present, coagulation is occurring, because factors are only activated during the coagulation process.

19. Type $O^-$ is the universal donor. Its red blood cells do not carry ABO or Rh antigens. So, regardless of the antibodies in the recipient's blood, there will be no substantial reaction, except for the possibility of a reaction between the *donor's* antibodies and the *recipient's* red blood cells.

20. Type $AB^+$ is the universal recipient. It has no antibodies. So, regardless of the antigens in the donor's blood, the recipient has no antibodies to attack the cells. Of course, the *donor's* antibodies can attack the *recipient's* cells, but the donor's antibodies are diluted. They don't last long, either.

21. A and B are dominant over O and co-dominant with each other. Since A and B are dominant over O, the parents could each have an O allele that is just not expressed. So, the child could be type A, type B, type AB, or type O. If the mother gives an O

and the father gives an A, for example, the child is A. If the father gives an O and the mother gives a B, the type is B. If the mother gives an O and the father gives an O, the type is O. If the father gives an A and the mother gives a B, the type is AB.

22. Rh-positive is dominant. So, they each must have an Rh-negative allele. That way, they each donated the recessive allele to the child, and the child was Rh-negative as a result.

23. Deoxygenated ("blue") blood travels into the right atrium from the superior and inferior vena cava and the coronary sinus. It then goes to the right ventricle and leaves the heart through the pulmonary trunk to the lungs. It travels through the pulmonary arteries, into arterioles, and then into the capillaries of the lungs. There, it picks up oxygen and becomes red in color. The blood then flows into venules, veins, and back to the heart through the pulmonary veins. It enters the heart in the left atrium, travels to the left ventricle, and then leaves the heart through the aorta. It then travels through arteries, arterioles, and finally capillaries. At that point, it gives oxygen to the tissues (it is now deoxygenated) and travels back to the heart in venules, veins, and finally the superior and inferior vena cava and coronary sinus.

24. "Systolic" refers to ventricular contraction. That's when the blood pressure in the aorta is highest. "Diastolic" refers to ventricular relaxation, when blood pressure in the aorta is the lowest. So, 120 is the systolic pressure and 80 is the diastolic pressure.

25. The sinoatrial node is a small knot of special cardiac tissue that generates action potentials that signal atrial contraction. The atrioventricular node is a knot of special cardiac tissue that generates action potentials that cause ventricular contraction. The sinoatrial node is the pacemaker, since it starts the process and causes the AV node to undergo action potentials at the SA node's "pace."

26. The blood pressure is lowest via the veins.

27. This is especially true in the veins because skeletal muscle contraction helps pump blood back to the heart in the veins.

28.
a. superior vena cava
b. right pulmonary arteries (blue)
c. right pulmonary veins (red)
d. pulmonary trunk
e. right auricle
f. right atrium
g. right ventricle
h. inferior vena cava
i. aorta
j. left pulmonary arteries
k. left pulmonary veins
l. left ventricle
m. right atrium
n. left atrium

29. a. superior vena cava
b. pulmonary semilunar valve
c. right atrium
d. right atrioventricular canal
e. right atrioventricular valve or tricuspid valve
f. chordae tendineae
g. right ventricle
h. papillary muscles
i. aorta
j. pulmonary trunk
k. left atrium
l. left atrioventricular canal
m. left atrioventricular valve or bicuspid valve
n. aortic semilunar valve
o. left ventricle
p. interventricular septum

30. Once it leaves the lungs, it travels back to the heart via the pulmonary veins and enters the left atrium. It then passes through the left atrioventricular canal and the left atrioventricular valve. It then enters the left ventricle. It passes through the aortic semilunar valve and out through the aorta. It then goes to the body's tissues and comes back, perhaps through the superior vena cava. If you didn't list that, don't worry. It could have come back through the inferior vena cava or the coronary sinus. It then enters the right atrium, passes through the right atrioventricular canal and right atrioventricular valve, and into the right ventricle. It then passes through the pulmonary semilunar valve and into the pulmonary trunk, where it travels to the lungs again.