Human Anatomy - Circulatory System
Worksheet

1. How does oxygen from the air you breathe get to the cells in your big toe? Two main systems have to work together to accomplish this amazing feat. First, the air must travel through the passageways of your respiratory system. Second, oxygen must diffuse into your bloodstream. Let’s join the journey of an oxygen molecule as it enters the bloodstream after passing through the wall of a tiny, thin capillary.

2. After diffusing through the capillary wall, the oxygen waits for less than a second before it is picked up by a red blood cell. Deoxygenated blood is usually represented in diagrams as being blue even though this is not an accurate color. Your blood without oxygen is a deep, dark red. When red blood cells pick up oxygen, they turn a bright red color. When oxygen binds to hemoglobin, the oxygen changes the shape of the hemoglobin molecule, which also changes the color of the blood. It’s all about chemistry!

3. 40 - 50% of your blood volume is made of red blood cells that transport oxygen picked up in the lungs to body tissues, and return carbon dioxide from body tissues back to the lungs. White blood cells make up about 1% of blood volume in a healthy person, and are an important part of the immune system. Platelets are 20% of the size of red blood cells. You may have 150,000 to 350,000 platelets in your bloodstream right now, but they are tiny and do not even equal 1% of your blood volume. Platelets are very important as they help to clot your blood when you get cut or bruised.

4. Red blood cells, white blood cells, and platelets are all manufactured by another body system. Use the Model Gallery in your Backpack and add the missing system to the scene. Then use a Note to label the location where red blood cells, white blood cells, and platelets are produced. Then take a photo.
5. About 55% of your blood volume is plasma. Approximately 92% of plasma is water. Use what you know about the properties of water. Why would water be the best liquid for your body to use as the fluid that makes up the majority of your blood supply? Include evidence to support your answer.

6. Let’s get back to our journey. The oxygen molecule has been picked up by a red blood cell in a capillary that was right next to the lung tissue. Capillary beds are groups of tiny, thinly walled tubes that are only big enough for red blood cells to pass through in single file. Individual capillaries join with other capillaries to form a venule. You can picture this by thinking about all neighborhood roads that lead cars onto a main road.

7. Venules join together to form the pulmonary veins, which are the main highways that return blood from the lungs to the left side of the heart. Note that right and left are always determined as if the heart were inside your body. Use Notes to label venules, a vein, and the right and left sides of the heart. Then take a photo.

8. Oxygenated blood is pumped through two of the four chambers found in the heart. The first chamber is called the left atrium. There is a valve that acts like a doorway that separates the left atrium from the left ventricle. This valve is called the bicuspid or the atrioventricular valve. Use the Cutting Plane and the Camera in your Tools to peer into the heart and see the chambers and the valves. Write down your observations.
9. Blood is pumped out of the left ventricle, through the aortic valve, before exiting the heart through the aorta, the largest artery in your body. The aorta of a blue whale is so large that you could crawl right through it! Your aorta makes a u-turn and heads down your back to bring blood to the lower part of your body. Use Dissect Mode, the Camera, and the Cutting Plane to further investigate. Write down your observations.

10. Arteries carry blood away from the heart. These tubes have muscular walls that are able to pump just like the heart chambers do. Arteries also have their own pulse that mimics the pulse of the heart. You can take your pulse by feeling for the arteries that are in the grooves of your neck or on the inside of your wrist. Try to find your pulse. Write down your observations.

11. Soon the red blood cell with our oxygen molecule exits the main arterial highway, the aorta, and enters arterioles, the scientific term for smaller arteries. These arterioles extend down your legs and continue to branch off into capillaries. Use Notes to label at least one artery and one arteriole. Then take a photo.
12. Once in a capillary bed, like the one in your big toe, the oxygen molecule can diffuse from the red blood cell into a cell. As the oxygen molecule diffuses out of the red blood cell, carbon dioxide, a waste product of cellular respiration, diffuses into the same red blood cell. Describe the pathway the red blood cell will take as it travels back up the leg to the right side of the heart.

13. Another couple of pumps and the red blood cell carries the carbon dioxide through the right atrium, tricuspid valve, right ventricle, and pulmonary valve before coursing out of the heart, through the pulmonary artery, through smaller arterioles, and back to the capillary bed that surrounds the lungs. Use the Cutting Plane and the Camera again to explore the interior of the heart. Write down your observations.

14. Here gases are exchanged as the carbon dioxide diffuses into the lungs and another oxygen molecule is picked up, and the cell is ready to make the journey once again. You have now journeyed with one red blood cell as it completed one circuit of the circulatory system. What curious question(s) do you have about the circulatory system?