

Class: Grade 11 Biology

Lesson Title: Circulatory System Kinulation

Class Size: 24

Time: 60 mins

Curriculum Outcomes:

116-7/317-1 Trace the flow of blood through the heart, describe the pulmonary and systemic pathways, and follow the flow through the complete cycle.

Learning Objectives:

1. Students will understand how blood flows through the circulatory system
2. Students will understand the difference between oxygenated and deoxygenated blood
3. Students will learn the names of the structures involved in blood transport (4 chambers, arteries, veins, lungs, 4 valves)

Materials:

- Masking tape
- Red and blue Bristol board/construction paper
- Yarn
- Balloon
- Labels for body parts

Preparation beforehand:

- Create around 6-8 double sided nametags for the different body parts that students will be, also one side blue and the other side red (lungs, legs, arms, head, kidneys, etc)
- Create 8 nametags for the four different valves (2 name tags per valve—i.e. 2 that say tricuspid, 2 pulmonary, etc.). These can be any colour.
- Create small double sided nametags for students to wear around their necks (one side blue and one side red, have enough for the remainder of the class after you have volunteers for the body parts and the valves).
- Tape out a pathway on the floor for students to follow. Here is an example of how the pathway should be taped. **Note:** In the video for this kinulation, the facilitators taped a different pathway. After reflecting in their lesson, this one is more efficient and less confusing for students to follow and has less traffic going through the middle of the heart chambers (**refer to figure 1**). Be sure to let students know that the pulmonary artery actually crosses in behind the chambers to the lungs and is not really at straight cut as this pathway is. However, this is only a simulation and is not the real heart structure.
- You can have labels on the floor for the heart chambers.

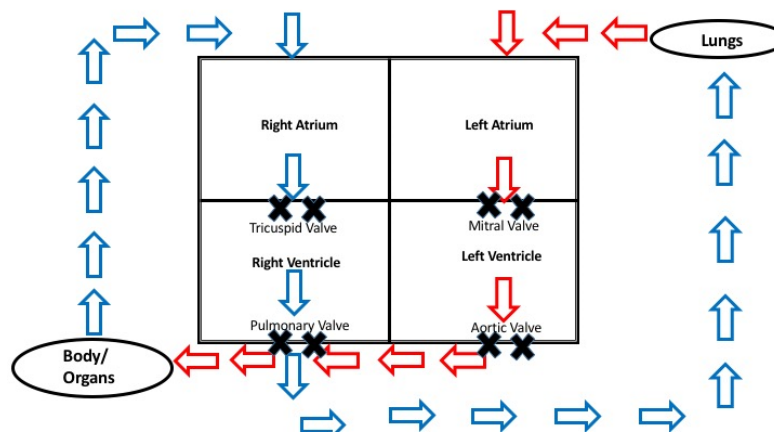


Figure 1

Introduction:

- Introduce the topic. Possible prompt questions include:
 - What are the 4 chambers of the heart we have learned about? (right atrium, right ventricle, left atrium, left ventricle)
 - In what chambers is the blood oxygenated? Deoxygenated?
 - What are the names of the 4 valves? (Tricuspid, Pulmonary, Mitral/Bicuspid, Aortic)
 - Where does the exchange of oxygen occur? What structure provides the oxygen for the blood cells? Where do they blood cells give their oxygen?
 - Why is the right atrium and ventricle shown on the left side when you look at a diagram?
- Explain what a kinulation is (broken up into kinesthetic and simulation). Tell them that these are used to help students learn difficult concepts that are otherwise difficult to picture. It allows students to become part of the demonstration, and therefore easier to remember and learn. Ask students if they would like to try one.

Activity #1 – Blood flow through the heart:

1. Ask for a volunteer to be the first blood cell and give him or her a nametag with both a blue and red side. Ask for two volunteers to act as the tricuspid valve and have these two students stand between the right atrium and right ventricle (see the two X's in figure 1).
2. Have the student who is the blood cell enter the first chamber of the heart (right atrium) and ask the student if they should be oxygenated or deoxygenated (they would have just come from the body so they should be deoxygenated, or blue).
 - a. The student should now head towards the next chamber, the right ventricle. They must pass through the tricuspid valve. Have the students who are the tricuspid valve face each other with their arms out. They can allow the blood cell to pass through by opening their arms and pushing the blood cell through into the next chamber.
3. Now the blood cell is in the right ventricle. Ask for 2 volunteers to be the pulmonary valve and have them stand just as the tricuspid valve students did.
 - a. The pulmonary valve will push the cells to the lungs. Ask students why they think this valve is called the pulmonary valve? (pulmon—lungs)
4. The blood cell will now travel to the lungs. Ask for a student to be the lungs and give them their nametag and a balloon.
 - a. What happens in the lungs? (The cells pick up oxygen)
 - b. The student playing the role of the lungs can use the balloon to blow up and physically push air onto the students who are the blood cells
 - c. What colour should the blood cell's nametag be now? (Red)
5. Ask students where they think the blood cell should go next?
 - a. It has to eventually go out to the body so it needs to go back into one of the chambers of the heart.
 - b. Have the student go into the left atrium.
6. Ask for 2 more volunteers to be the next valve. Ask students if they remember what the name of this valve is? (mitral or bicuspid valve). These students will do exactly the same thing that the previous two valves did. Have the valve allow the cell to enter into the next chamber of the heart (left ventricle)
7. Now that the blood cell is oxygenated and inside the left ventricle it is ready to be pumped out to the rest

of the body. The aortic valve is the valve that pushes the blood into the aorta and out to the rest of our organs.

- a. Ask for two volunteers to be the aortic valve
8. Have the blood cell freeze! Ask the students if the cell has oxygen (yes). Ask them who or what is the cell going to pass its oxygen to?
 - a. Now you can distribute the the red/blue sided nametags of the different body parts and organs to students. They can stand in a line or a group where it is indicated in figure 1.
 - b. They should have their tag turned to the blue side since they do not have oxygen yet.
 9. Tell the student playing the role of the blood cell that as they pass by an organ or body part that needs oxygen to give them a high five. At this point, the body part or organ will turn their tag from blue to red, and the blood cell will turn their tag from red to blue. This shows the exchange of oxygen between the blood cells and the body.
 - a. Once a body part receives oxygen, ask them to count to 10 and then turn their card back to blue to show that they used up the oxygen and are waiting for more.
 10. Ask students where the blood cell should go next? They don't have oxygen anymore so what must they do to get more? (restart the whole process to get back to the lungs)
 11. Give the remaining students blood cell tags and have them line up at the right side of the heart to begin the circulating process. Get the students to circulate through the system continuously.
 12. After a while, allow students to change roles so they can experience the different parts of the circulatory system.

Conclusion – Possible wrap-up questions:

1. Do arteries carry blood away or to the heart? Is the blood oxygenated or deoxygenated? Are there any exceptions?
2. Which side of the heart is oxygenated? Deoxygenated?

Circulatory System Steps

1. Deoxygenated blood enters the right atrium
2. Pushes through valve into the right ventricle
3. Pushes through valve to go to the lungs
4. **Gets oxygen ☺**
5. Goes back to the heart and enters the left atrium
6. Pushes through valve to go into the left ventricle
7. Pushes through valve to be pumped to the rest of the body
8. Gives oxygen to body parts, becomes deoxygenated
9. Returns to right side of heart to restart the process!