



LEARNING OBJECTIVES:

- Describe the anatomy of a heart
- Recall how the heart and circulatory system function

STANDARDS:

- 1.4-LS1-1.
- 2.4-LS1-2.

SUPPLIES NEEDED FOR ACTIVITIES:

- Heart Model
- Tennis balls, 1 per pair of students (Stress ball, or other similar sized object)
- Two containers (one empty, one with 4 liters of water or rice). Labels: empty container “Body” and water container “Heart”
- One 2 oz. plastic condiment cup labeled “Heartbeat”
- Timing device

SUPPLIES NEEDED FOR OPTIONAL ACTIVITIES:

- Stethoscope and alcohol wipes [Stethoscope activity]
- Red and Blue Paper, cut into small ticket size pieces [Circulatory System Game]

NOTE: This content connects well with the Health Literacy portion of the Iowa Core Standards (21st Century Skills).

INTRODUCTION:

What part of your body runs on electricity? (pause for response) It's your heart! That might sound silly, but it's true. In this lesson we are going to learn about our hearts; what they are made of, how they work, and what they do for us 24/7. Even when we aren't thinking about it! A lot of times when we think of a heart, we imagine the kind you might see on a Valentine's Day card.



But that's not what is beating inside of our chest all day, every day! Our hearts are made of strong muscles, and their job is to pump blood throughout our entire body. How much pumping does your heart do? A lot! Think about a gallon of milk. How many gallons of blood do you think your heart pumps each day? 100? 1,000? Nope, it's a lot higher! Your heart pumps 20,000 gallons of blood throughout your body each day! Now obviously you don't have 20,000 gallons of blood in you—that's why your heart and lungs work together to recycle and recirculate your blood throughout your body so that your whole body has the oxygen and nutrients it needs.

HOW THE HEART WORKS

The heart is an amazing part of the body. It pumps approximately 4 liters (a little more than a gallon) of blood every minute. It beats about 100,000 times a day, about 35 million times in a year. During an average lifetime, your heart will beat more than 2.5 billion times and you don't even have to think about it!

[The following activities help students understand how the heart works. You can pick one or complete both depending on your time.]

ACTIVITY 1: HEART SQUEEZE

Let's do an experiment to see just how hard our heart works.

- **DO:** We'll time ourselves for 1 minute as we squeeze and release a tennis ball* 70 times because the average pulse rate is 70 bpm (beats per minute). We'll count together as we go. *Instructor should give signal to start and stop and can count aloud.*
- **REFLECT:** Wow! How does your hand feel? Your heart does this every minute of every day of every week of every month of every year you are alive!
- **APPLY:** Place your hand on your heart. Let's count our beats for 1 minute. Ask students to count their beats in their head so they don't disrupt others attention. Signal start and stop time but do not count aloud. How many beats did you count? Was it between 60-80 beats? That is a normal resting heart rate which is when we are still and not active. When you go to recess or are active, you may notice this number increases as your heart needs to work harder. Try this with your family and see what types of activities change the rate of heartbeats.

*If you don't have a tennis ball, you could use stress balls, a washcloth or pair of socks wadded in a ball.

ACTIVITY 2: HEART PUMP

Our hearts work like machines pumping about 4 liters of blood to our bodies each minute. Do you think you can work as hard as your heart?

Set two containers next to each other: one empty (labeled 'Body') and one with 4 liters of water or rice (labeled 'Heart'). Ask for a volunteer to move the 4 liters (representing the blood) from one container (representing the heart) to the other (representing the body) with a cup (labeled 'Heartbeat') (representing one heartbeat) in one minute.

- **DO:** We'll time ourselves for 1 minute as we try to move the water or rice from one container to the other. *Instructor should give signal to start and stop.*
- **REFLECT:** How did it go? Were you able to move all of the rice or water? Write down what happened with the experiment. Were you surprised in any way?
- **APPLY:** Place your hand on your heart. *Let's count our beats for 1 minute. Ask students to count their beats in their head so they don't disrupt others attention. Signal start and stop time but do not count aloud.* How many beats did you count? Was it between 60-80 beats? That is a normal resting heart rate which is when we are still and not active. When you go to recess or are active, you may notice this number increases as your heart needs to work harder. Try this with your family and see what types of activities change the rate of heartbeats.

Since the heart is such an important pump, you want to keep it free from heart disease that may lead to a heart attack or stroke. When the heart stops, life stops. So, when you take care of your heart, you take care of your life.

VOCABULARY

Atrium: the atrium (Latin atrium, “entry hall”) is the upper chamber through which blood enters the ventricles of the heart. There are two atria in the human heart – the left atrium receives blood from the pulmonary (lung) circulation, and the right atrium receives blood from the venae cava (venous circulation).

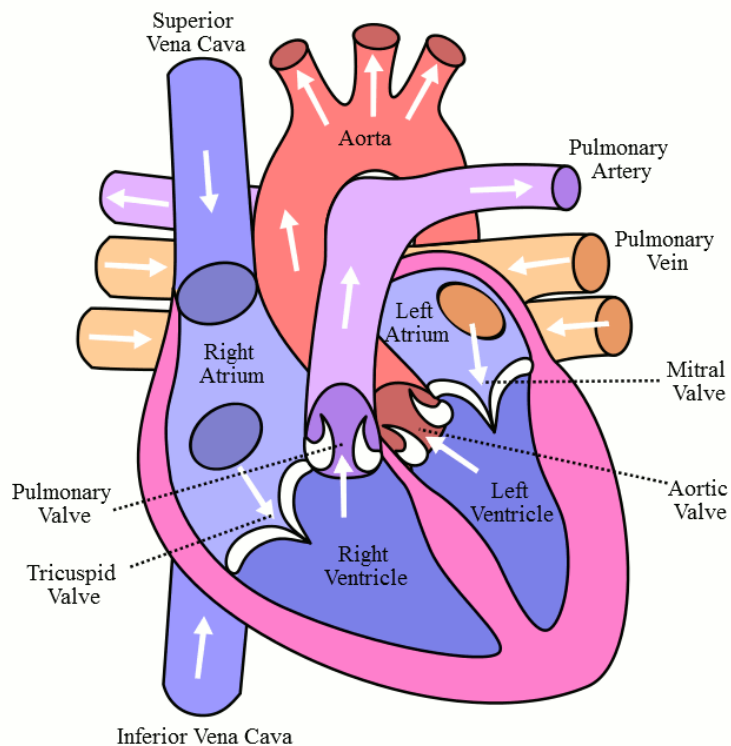
Ventricle: two lower chambers of the heart. The right ventricle receives blood from the right atrium and pumps it into the lungs via the pulmonary artery, and the left ventricle receives blood from the left atrium and pumps it into the circulation system via the aorta.

The **Circulatory System** is made of all the vessels that carry the blood throughout the body. Vessels carry blood to and from the heart.

Question to youth:

Is the heart an organ or a muscle? The answer is both. The heart is an organ made of muscle.

The heart has two upper chambers and two lower chambers. The upper chambers (right atrium and left atrium) receive blood. The lower chambers (right ventricle and left ventricle) pump blood. *Show students the heart model.*



Blood Circulation, 2013. https://commons.wikimedia.org/wiki/File:Blood_Circulation.gif#metadata.

Oxygen poor blood (blood without oxygen) enters the right top chamber of the heart and then is pumped down to the right lower chamber so it can be pumped out to the lungs.

1. In the lungs, waste (carbon dioxide) is taken from the blood, and oxygen is put into the blood.
2. The oxygen rich blood (blood with oxygen), returns to the heart and enters the upper left chamber (left atria).
3. The blood then is pumped down to the lower left chamber (left ventricle) and is pumped to all of the body organs and tissues via the aorta.

This cycle keeps going and going, never stopping.

ACTIVITY 3 [OPTIONAL]: STETHOSCOPE

A heartbeat, which sounds like lub-dub, can be heard during the pumping phase. The “lub” sound of a heartbeat are the valves closing between the atriums and ventricles. The “dub” sound are the valves in the large blood vessels leading out of the heart snapping shut. All this happens in less than a second!

- **DO:** Use the stethoscope to listen to the “lub-dub” of the heartbeat and visualize the valves opening and snapping shut. *Remember to use proper hygiene procedures and wipe down the stethoscope with disinfecting wipes or alcohol swabs between users.*
- **REFLECT:** What did you hear your heart doing? Write down descriptions of the sounds you heard.
- **APPLY:** When we visit the doctor, they check our hearts with a stethoscope to make sure our heart is working effectively. If that “lub-dub” sound isn’t consistent they may need to further explore the heart’s health. If you have a stethoscope at home you can practice listening to family member’s hearts. If you don’t have a stethoscope try putting your ear up close to their chest and see if you can hear it.

ACTIVITY 4: CIRCULATORY SYSTEM GAME [OPTIONAL]

This interactive game will help students understand how the circulatory system works by playing the role of the different parts of the system. Review the directions of how to setup the game and then have your students take turns playing the different roles.

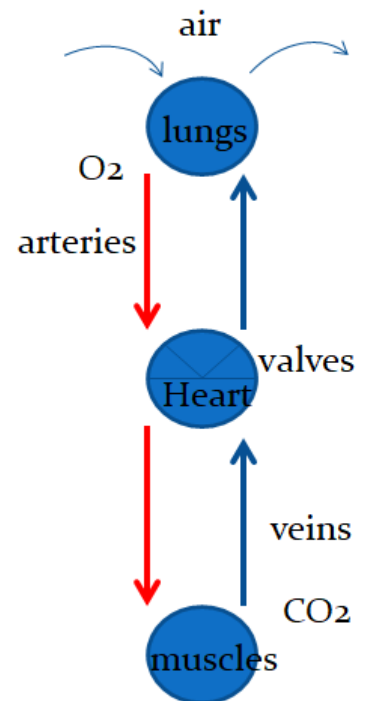
Setup: Assign roles to students. An alternative with smaller group numbers could be to label desks with Heart and Muscle on two ends of room and place colored tickets on desktop(s) for participants to pick up.

- **Lungs:** One student collects the **blue tickets** (represents unoxygenated blood) and gives out the **red tickets** (represents oxygenated blood).
- **Heart:** Two students back to back, raising their hands up and down letting the other students move only in one direction.
- **Muscles:** One student collects the **red tickets** (represents oxygenated blood) and gives out the **blue tickets** (represents unoxygenated blood).
- **Blood:** 2-6 students (based on available space) line up on a pre-defined pathway and move from the lungs to the muscles (from the artery pathway holding **red tickets**) and back (from the vein pathway holding **blue tickets**), after passing from the heart.

One helper: is making sure the muscles and lungs have enough supplies of red and blue tickets.

Instructions:

- **DO:** *The teacher will read a story and the “whole body” needs to respond to the story as it is read.*



Story:

It is morning and I just woke up (the blood in my body moves slowly in the circulatory system since my body doesn't need much energy).

I realized I forgot to turn the alarm on and I am running late to school. I need to get ready quickly, brush my teeth and leave the house (my body needs more oxygen to produce energy to move so the blood moves faster).

Oh no, the bus is approaching the bus stop. I need to run as fast as I can to catch it (the blood now moves very fast in the circulatory system).

Phew, I made it and I am now on the bus and in my seat. Wow, I am still breathing fast! (that means the blood is still moving fast but begins to slowly decrease in speed).

Now, that I was able to catch my breath I can start talking to my friends sitting next to me (blood moves slower).

- **REFLECT:** When blood is circulating, which organ accepts oxygenated blood and releases unoxygenated blood? (Muscle) Which organ accepts unoxygenated blood and releases oxygenated blood to be sent back through the body? (Lungs) What did you notice about the speed of the blood circulating related to particular actions in the story? Why is it important for us to keep our heart healthy?
- **APPLY:** Think about how your heart or chest feels when you're active during the day. When is it working hard and when is it more relaxed? Be mindful of your activity and try to be active and get your heart pumping for at least 60 minutes everyday.

Now, let's get back to that point about your heart running on electricity. How does that work? Well, your heart muscle cells are very small, and they respond to an electrical impulse, or force. There's a little spot called the sinoatrial node in your heart that keeps track of this electricity — when it's time for the heart muscle to move or pump, the SA node sends an electrical signal. This signal travels through your heart, telling each part or area when it needs to pump or squeeze together. That's what makes up your heartbeat!

TAKAWAY POINTS FROM TODAY: REFLECTION AND APPLICATION

- The human heart is an amazing organ—it's made of muscle and runs on electricity. How many times does it beat each day? (about 100,000 times each day!)
- The chambers of the heart work together in order to send oxygenated blood to the rest of your body so that you can move and stay alive. How many chambers are there in your heart? (4 chambers; two atria and two ventricles)
- What do we call the blood vessels that carry oxygen-rich blood from your heart out to your body? (Arteries)
- What do we call the blood vessels that carry blood with the used oxygen back to the heart? (Veins)
- Today we learned what the heart is made of and how it works. Now that we know the heart is made of muscle, what do you think we can do to keep our heart muscles strong? (Application question)

Now that we know about the important work our heart does, in our next lesson, we will learn more about how to keep our hearts healthy!

Resources:

Centers for Disease Control and Prevention

Partnering for Youth Cardio-Fit Project, Chesapeake Charities & AstraZeneca HealthCare Foundation.

- http://kidshealth.org/kid/grownup/conditions/heart_disease.html#cat20895
- <http://science.howstuffworks.com/life/human-biology/heart6.htm>
- <https://www.bbc.co.uk/bitesize/clips/zncg9j6>

Another lesson from the SWITCH Curriculum that complements this lesson is the Increase your Beats activity from Elementary Classroom Module.

Circulatory System Game Tickets: Template to print out labeled tickets. Print **Oxygenated Labels on Red Paper** and **Unoxygenated Labels on Blue Paper**. Print two copies of each page and cut out tickets.

Written in 2020 in collaboration between Iowa State University Extension and Outreach 4-H Youth Development and the Iowa Heart Center Foundation.

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