
The Heart Circulates Blood

Created by: Heather Koehler (Burns Valley Elementary School), Tara Martz (Minnie Cannon Elementary School), Nola Montgomery (LCOE SCDSE), and Lori Kincaid (Lower Lake Elementary School).

Science Content Standards: Grade 5, 2b — *Students know* how blood circulates through the heart chambers, lungs, and body and how carbon dioxide and oxygen are exchanged in the lungs and tissues.

Lesson Concept: The heart has four chambers.

Conceptual Flow:

- ▶ The circulatory system transports food, gases, and cellular wastes.
 - Blood circulation removes cellular wastes and carbon dioxide.
 - Blood picks up nutrients from the digestive system.

- ▶ The heart is a specialized structure for pumping blood through the body.
 - The heart has four chambers.
 - Each side of the heart has two chambers.
 - The upper chamber is the atrium and the lower chamber is the ventricle.
 - The left side of the heart is responsible for pumping blood through arteries.
 - Atria receive blood from lungs and body cells.
 - Oxygen-poor blood returns to the heart through veins on the right side of the heart.

- ▶ Blood flows inside blood vessels.
 - Veins return blood to the heart and lungs.
 - An artery is a thick-walled blood vessel that carries blood away from the heart.
 - A capillary is the smallest blood vessel.
 - Gas is exchanged in capillaries.

- ▶ Blood contains plasma, red blood cells, white blood cells, and platelets.
 - Red blood cells carry oxygen from lungs to tissues.
 - Plasma is a mixture of water, minerals, nutrients, sugars, proteins, and other substances.
 - White blood cells defend the body against pathogens.
 - Platelets release chemicals in damaged vessels and cause fibers to form; the fibers make a “net” that traps blood cells and stops bleeding.

Teacher Background:

Structures of the cardiovascular and circulatory systems, including the heart and lungs, promote the circulation of blood and exchange of gas. The left side of the heart is responsible for pumping blood through arteries to all the tissues of the body delivering oxygen. Oxygen-poor blood returns to the heart through veins. The right side of the heart is responsible for pumping blood to the lungs, where the blood eliminates its carbon dioxide and receives a fresh supply of oxygen. Exhaling expels the carbon dioxide that was transported to the lungs by the blood; inhaling allows the intake of oxygen, which is picked up by the blood.

(Adapted and excerpted from the *Science Framework for California Public Schools: Kindergarten Through Grade Twelve*)

The right ventricle pumps oxygen-poor blood into arteries that lead to the lungs. These are the only arteries in the body that carry oxygen-poor blood. In the capillaries of the lungs, blood takes up oxygen and releases carbon dioxide. Oxygen-rich blood travels through veins to the left atrium. These are the only veins in the body that carry oxygen-rich blood. The heart pumps oxygen-rich blood from the left ventricle into arteries and then into capillaries. As the blood travels through capillaries, it transports oxygen, nutrients, and water to the cells of the body. At the same time, waste materials and carbon dioxide are carried away. Oxygen-poor blood travels back to the heart and is delivered into the right atrium by two large veins. Simply: oxygen-poor blood from the body goes to the right atrium, to the right ventricle, to the lungs. Oxygen-rich blood goes from the lungs to the left atrium, to the left ventricle, then out to the body.

(Excerpted from *Holt Life Science*, 5th grade)

Materials Needed for the Lesson:

Teacher Materials

- Overhead of “Making a Heart Model” (Instructions for Students)
- Overhead of “The Flow of Blood in the Body”
- “The Heart Model – Labeled”
- Set of materials (listed below) for teacher and students to make the heart model

Student Hands-on Materials

- “Copies of a Human Heart” – make copies and cut these apart to provide one illustration for each student. Note that the black and white copies are in this lesson. For colored copies, see the PDF file, “Copies of the Human Heart.”
- Approximately 5 oz size of **unwaxed** “Dixie” cups (2 for each student) (Most tape won’t stick to waxed cups.)
- Approximately 4 oz size of **unwaxed** cone cups (2 for each student) (get at janitor supply store)
- Yarn to hang heart model around neck

- One-inch wide masking or packaging tape (Strips of tape could be cut ahead of time and stuck to desks for easy access by students when making their heart models)
- Black marking pens
- Pencils (If available, have students use pink and red colored pencils to represent oxygen-poor and oxygen-rich blood. The purpose of using red and pink - instead of blue – is so students do not get the misconceptions that oxygen-poor blood is blue.)

Student Handouts

- Illustration of a heart (for “Engage”), cut out from “Copies of a Human Heart”
- “Making a Heart Model” (Instructions for Students)
- “The Flow of Blood in the Body” (Information for Students)
- “The Heart Model” (Student Drawing Exercise)
- “Heart Parts and Blood Flow” (Student Assessment)

A note about the heart models: The purpose of using the two different types of cups in this model of a heart is to help students remember that the top of the heart contains the atrium and the bottom of the heart contains the ventricles. The “Dixie” cup upside down has a squared off or flat shape at the top representing an “A” shape for “Atrium”; cone cups are placed with point side down to indicate the letter “V” for “Ventricle”. However, sometimes this leads to student misconceptions that the top of the heart is flat and the bottom pointed (like the cups). You may need to discuss possible misconceptions with students.

5E Lesson: The Heart Circulates Blood

Teacher Does	Student Does	Concept
<p>ENGAGE:</p> <p>▶ <i>Talk with a partner: “What do you know about the heart?”</i></p> <p>Chart student responses.</p> <p>Ask:</p> <p>▶ <i>Why do we need a heart?</i></p> <p>▶ <i>What does a heart do?</i></p> <p>Show a fist and tell students that this is about the size of our heart.</p> <p>Provide tape and an illustration of a heart (from “Copies of a Human Heart”) to each student. Tell students:</p> <p>▶ <i>Tape this picture on your self where you think your heart is located. Then look</i></p>	<p>Talk with partner.</p> <p>Expected Student Response (ESR): The heart pumps blood; the heart is in our chest; if your heart stops working, you die; your heart pumps faster when you exercise.</p> <p>ESR: It helps us to live.</p> <p>ESR: It pumps blood.</p> <p>Tape picture to body where the</p>	<p>The heart is located almost in the center of the chest.</p>

Teacher Does	Student Does	Concept
<p><i>around the room to compare where the hearts were taped.</i></p> <p>Ask:</p> <ul style="list-style-type: none"> ▶ “Where is your heart?” 	<p>heart is located. Look around to see where everyone placed their heart.</p> <p>ESR: In your chest, a little to the left.</p>	
<p>EXPLORE:</p> <p>Note: If students will be touching their partner’s model heart, assign students partners of the same gender. Provide strips of tape for each desk to facilitate the process of taping cups together.</p> <p>Display directions “Making a Heart Model” on an overhead and provide copies for students, if needed. Slowly build the model and have students follow along. Do one step at a time and check that students have completed a step before going to the next one. Attach yarn and hang model around neck.</p> <p>Hold heart model to chest and have students hold their models to their chest.</p> <p>Chant and touch:</p> <ul style="list-style-type: none"> ▶ “A for atrium, V for ventricle.” Hold up right hand, touch to right atrium; hold up right hand, touch right ventricle. <p>Do the same for left atrium and left ventricle.</p> <ul style="list-style-type: none"> ▶ <i>What are the names of the four chambers of the heart?</i> <p>With a black marker, model how to label Right Atrium “RA”, Right Ventricle “RV”, Left Atrium “LA”, Left Ventricle “LV.”</p> <p>Have students label their own heart model.</p> <p>Have same gender partner point to each other’s right side identify the atrium and ventricle; then point on the left side and identify the atrium and ventricle. Students should be aware that when they are facing each other, the right and left of the heart are based on the person who has the heart (like when you both shake each other’s right hand). Note: This may be important because a question on a standardized test may show a</p>	<p>Along with the teacher, students work with partner to build a model of the heart.</p> <p>Hang model around neck and in front of chest.</p> <p>Chant and touch “A for atrium, V for ventricle.” Hold up right hand, touch to right atrium; hold up right hand, touch right ventricle.</p> <p>Do the same for left atrium and ventricle.</p> <p>ESR: Right ventricle, right atrium, left ventricle, left atrium</p> <p>Label the four chambers.</p> <p>Label model of heart as you say the parts.</p> <p>With a partner, point to the right and then the left of the heart and identify the parts.</p>	<p>The right side of the heart pumps oxygen-poor blood to the lungs.</p> <p>The left side of the heart pumps oxygen-rich blood to the body.</p> <p>Oxygen-poor blood from the body goes to the right atrium, to the right ventricle, and to the lungs. Oxygen-rich blood goes from the lungs to the left atrium, to the left ventricle, then out to the body.</p>

Teacher Does	Student Does	Concept
<p>heart and the student may need to determine which is the left and which is the right side of the heart.</p> <ul style="list-style-type: none"> ▶ <i>Look at the heart model of your partner. "What do you notice about the right chambers and their located in reference to you?"</i> 	<p>ESR: The right ventricle and atrium are on my left and the left atrium and ventricle are on my right.</p>	
<p><u>EXPLAIN:</u></p> <p>Distribute the "The Heart Model" (Student Drawing Exercise). Ask students to complete #1 by drawing their model heart on their handout and labeling the four parts: right atrium, right ventricle, left atrium, left ventricle. Display the "Flow of Blood in the Body" (Information for Students) so all students can see and read. Ask students to trace the flow of the blood on their heart model while saying the following:</p> <ul style="list-style-type: none"> ▶ <i>Oxygen-poor blood from the body goes to the right atrium, to the right ventricle, to the lungs. Oxygen-rich blood goes from the lungs to the left atrium, to the left ventricle, then out to the body.</i> <p>Ask student to complete #2. They may ask for help from another student.</p> <p>When students have completed #2 tell them:</p> <ul style="list-style-type: none"> ▶ <i>Complete #3. Use arrows to show the flow of the blood in or out of the heart. Use light pencil lines (or a pink colored pencil) for oxygen-poor blood and dark pencil lines (or a red pencil) for oxygen-rich blood.</i> <p>(If available, red and pink colored pencils could be used.)</p> <p>Review comments from "Engage" section. Ask students what they want to change or add to their responses on the chart "What Do You Know about the Heart?".</p> <p>Assessment: Distribute "Heart Parts and Blood Flow" to students to complete individually.</p>	<p>Students draw their model heart on their handout "The Heart Model" and label the four parts.</p> <p>Follow along with teacher, tracing the flow of blood on their models, saying: Oxygen-poor blood from the body goes to the right atrium, to the right ventricle, to the lungs. Oxygen-rich blood goes from the lungs to the left atrium, to the left ventricle, then out to the body.</p> <p>Individually draw on the heart showing the flow of blood. Discuss with a partner when needed.</p> <p>Students complete #3.</p>	<p>The heart has four chambers: the right and left atrium and the right and left ventricle.</p> <p>Oxygen-poor blood from the body goes to the right atrium, to the right ventricle, to the lungs. Oxygen-rich blood goes from the lungs to the left atrium, to the left ventricle, then out to the body.</p>

Teacher Does	Student Does	Concept
<p><u>EXTEND:</u></p> <p>Look in textbooks and other reference books to see how arteries and veins are shown. Note that most books show veins as blue in color. Have students research on the internet to determine whether veins are really blue. (Veins are not blue.)</p> <p>As a homework assignment, students may wish to make a “Heart House” out of a cereal box. For directions go to: www.childrensheartinstitute.org/kidsonly/heartse.htm</p> <p>For a more detailed illustration of a human heart go to: www.childrensheartinstitute.org/kidsonly/heartflw.htm</p> <p>For illustrations and description of the heart, see “Anatomy of the Human Heart with Flash Illustration” (from Texas Heart Institute): www.texasheartinstitute.org/HIC/Anatomy/Anatomy.cfm</p>		

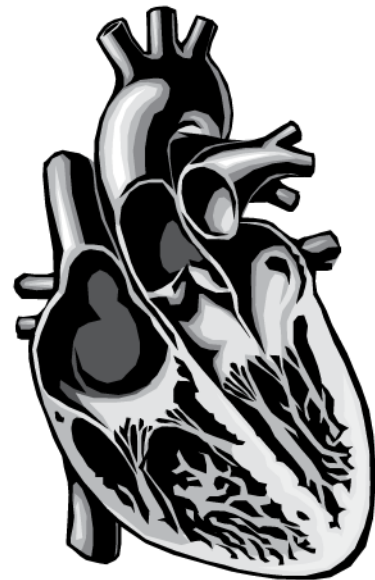
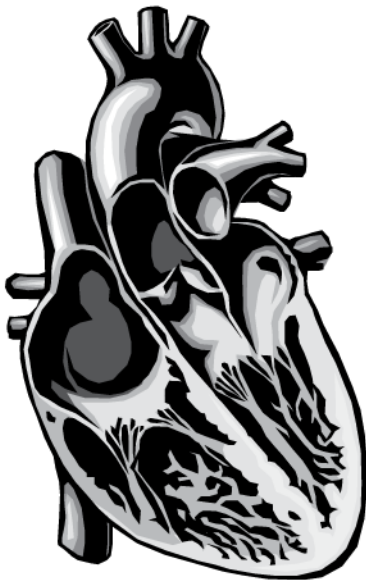
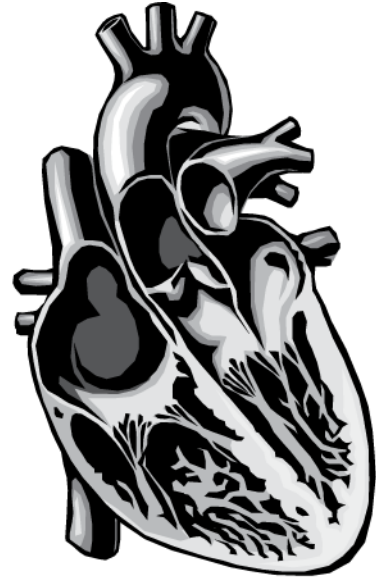
Input Question: What are the four chambers of the heart? (Explore)

Process Question: Explain the flow of the blood, using light red for oxygen-poor blood and dark red for oxygen-rich blood. (Explain)

Output Question: What do the cups in the model represent?

For "Engage" Section of the Lesson
Copy and cut apart to provide one for each student.

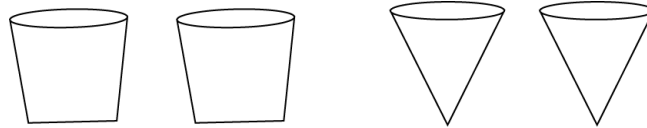
Copies of a Human Heart



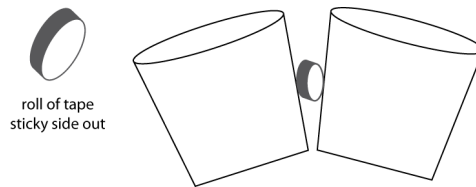
Instructions for Students

Making a Heart Model

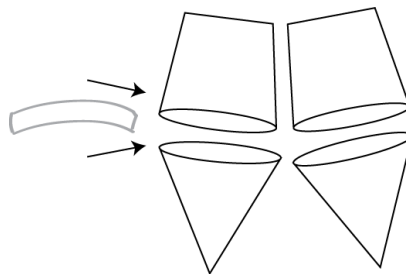
1. First: Make sure you have two (2) pointed bottom cups and two (2) flat bottom cups.



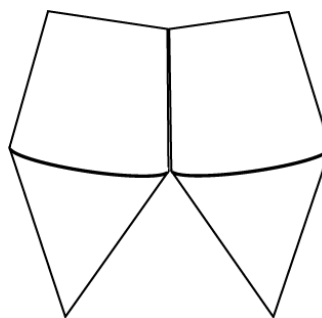
2. Next: Make a roll of tape and join the two flat bottom cups together.



3. Then: Using strips of tape, attach the pointed bottom cups' OPENING to the OPENING of the flat bottom cups.



4. You should have this:



- 5: Finally, place the model on your chest, pointed side down.

Information for Students

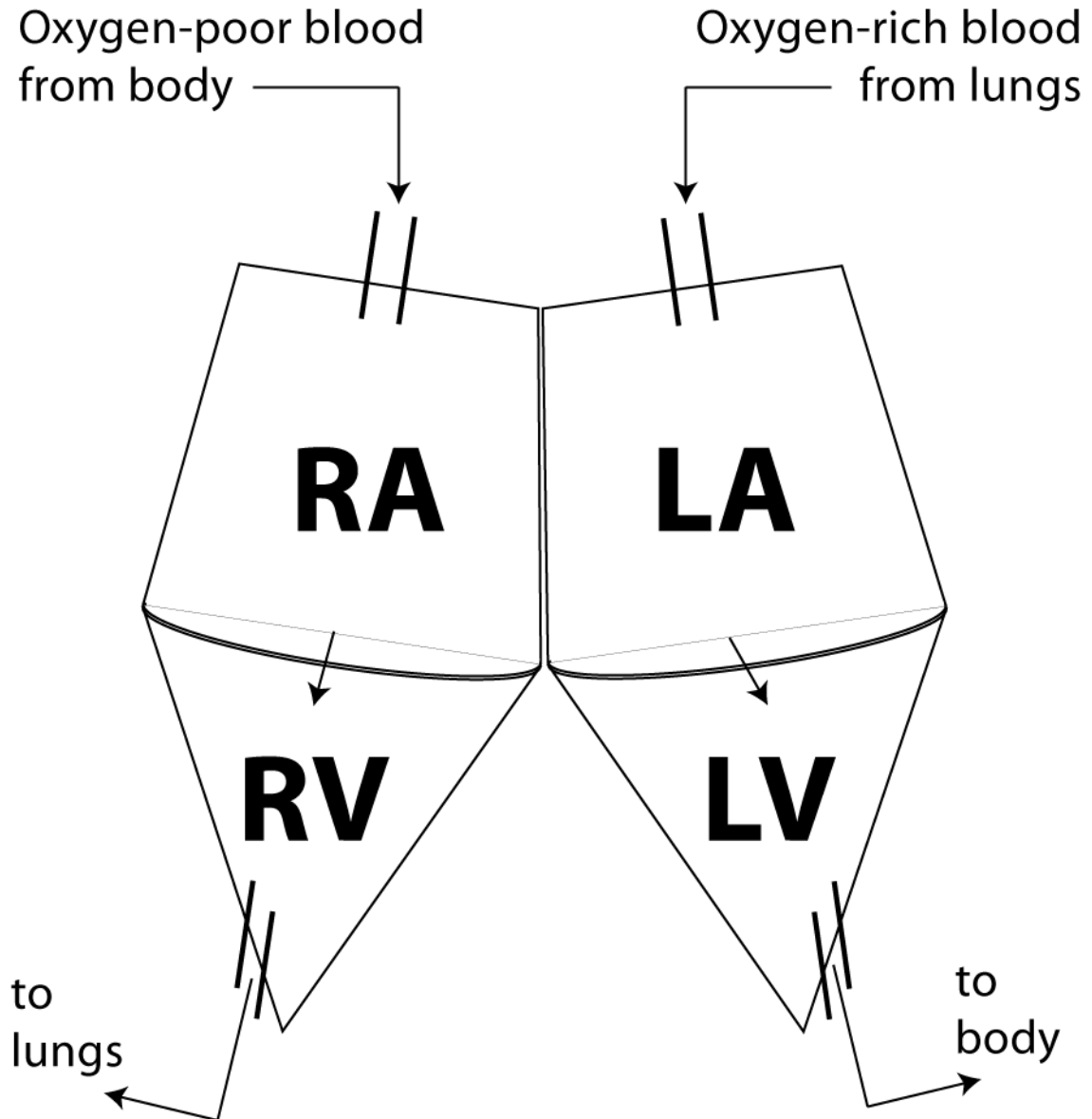
The Flow of Blood in the Body

Oxygen-poor blood from the body
goes to the right atrium,
then to the right ventricle,
then to the lungs.

Oxygen-rich blood goes
from the lungs to the left atrium,
then to the left ventricle,
then out to the body.

Information for Teacher

The Heart Model – Labeled



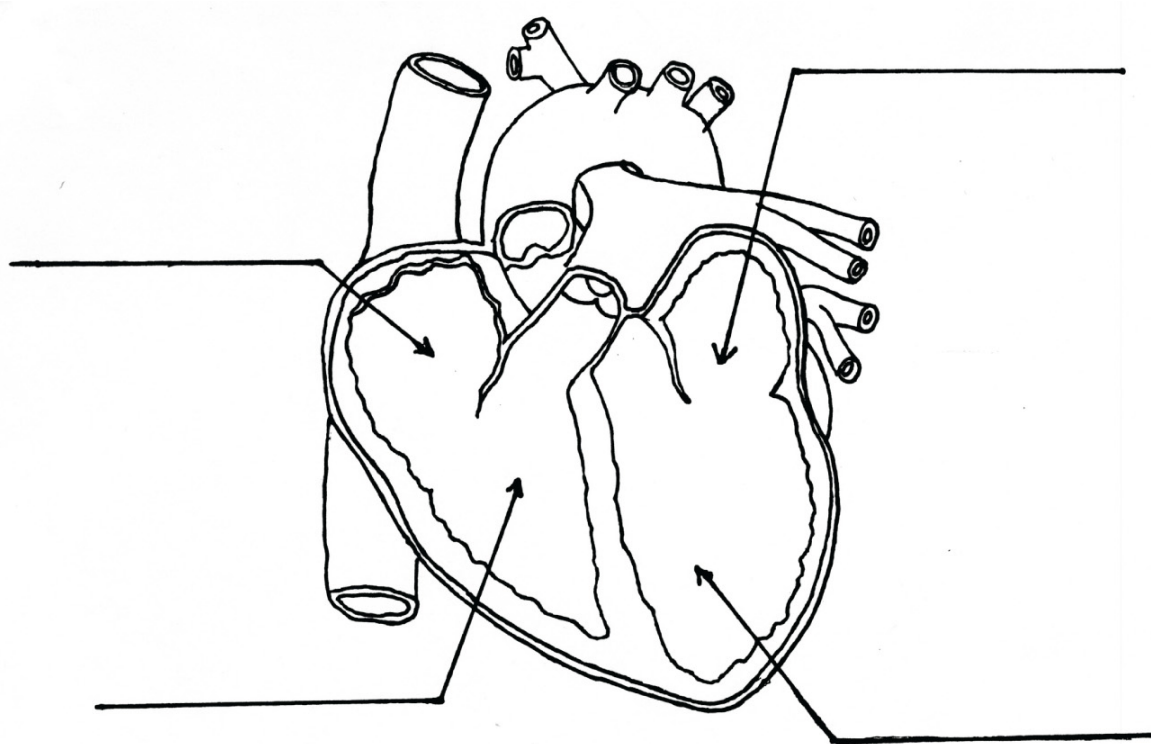
STUDENT DRAWING EXERCISE

The Heart Model

1. Using your model, draw a picture of the heart and label the four parts: right atrium, right ventricle, left atrium, and left ventricle.
2. Using arrows, show the flow of the blood, and label: from body, to body, from lungs, to lungs.
3. Draw arrows using light pencil lines (or pink colored pencil) for oxygen-poor blood and dark pencil lines (or red colored pencil) for oxygen-rich blood.

STUDENT ASSESSMENT

Heart Parts and Blood Flow



Oxygen-poor blood from the body goes to the _____ atrium, then to the _____ ventricle, then to the lungs.

Oxygen-rich blood goes from the lungs to the _____ atrium, then to the left _____, then out to the body.