



Circulatory System—Heart Stations

Standard Addressed: Life Science

Students know how blood circulates through the heart chambers, lungs, and body and how carbon dioxide (CO₂) and oxygen (O₂) are exchanged in the lungs and tissues. Structures of the cardiovascular and circulatory systems, including the heart and lungs, promote the circulation of blood and the exchange of gas.

Lesson Objective:

Students will conduct a series of investigations that model the functions and parts of the heart. Students will be able to correctly annotate a diagram of the circulatory system and will identify, label and correctly place veins, arteries, capillaries and a heart diagram on a human body outline.

Materials:

“The Me I Can’t See” pretest, Stations’ Task Cards, actual animal hearts (sheep and cow), water, heart diagrams (1/student), notebook starters, scissors, glue, red and blue yarn, science notebook. Master graphs for class data, class set of: 2x15in. strip of yellow paper, red crayon, 1in. circles of red paper, slightly larger, wavy white circles, small irregular tan shapes, fibers of brown yarn.

Student Talk Strategies: (Descriptions at end of lesson)

- Think-Pair-Share
- Numbered Heads

Classroom Management:

Students should be familiar with procedures for working in stations and transition routines when moving from station to station. Teach about using the materials responsibly and staying on task. Collaborative work strategies and responsibilities should be explicitly taught before releasing students to stations in their work groups of 3 or 4.

ENGAGE: *Connect to Prior Knowledge and Experience, Create Emotionally Safe Learning Environment, Preview New Vocabulary*

Estimated time: 20 minutes

| Teacher’s Role | Teacher Questions | Students’ Role |
|---|--|---|
| 1. Teacher passes out “The Me I Can’t See” pretest. Explain that this is not a graded exercise. | 1. Dig into your memories and show what you already know about what’s inside your body. This is an individual activity. After this first activity, the | 1. After students have had 8-10 minutes to work, students will continue with <u>Think, Pair, Share</u> by showing their work to a partner and the pair will share their notes with the class. |

| | | |
|--|---|--|
| | students will continue with Think, Pair, Share: Share with the person next to you how you could investigate this question and report to class. | |
|--|---|--|

EXPLORE: Hands-On Learning, Contextualize Language, Use of Scaffolding (Graphic Organizers, Thinking Maps, Cooperative Learning), Use of Multiple Intelligences, Check for Understanding
Estimated time: 40 minutes to 1 hour

| Teacher’s Role | Teacher Questions | Students’ Role |
|--|--|--|
| <p>1. Teacher organizes students into groups of 3 to 4.</p> <p>It is important to emphasize that scientists always keep notes about their investigations.</p> <p>2. Teacher reviews each activity for the students and shows them the task cards 1-5.</p> <p>3. Teacher reminds students that they will be working independently at each of the stations, except the one with the heart, to establish the behavior and work expectations at the beginning.</p> <p><u>Tips & Notes:</u> If another adult (aide, teacher, or parent volunteer) is available, have them monitor the other stations, particularly the “heart as a pump (water transfer)” activity which can get out of hand if the students are too excited and careless with the water.</p> | <p>1. Tell students: It isn’t science unless you write it down.</p> <p>Each student response sheet has questions to guide the students’ thinking and writing.</p> | <p>Station 1 – Sheep and Cow Heart: students observe actual animal hearts and compare them.</p> <p>Station 2 -Heart as a Pump Activity: students transfer water from one container to another to mimic how much blood the heart pumps in 1 minute.</p> <p>Station 3 – Your Heart Is A Muscle: students model aspects of heart function.</p> <p>Station 4 -- Pulse-Taking Activity: students observe and record information about their own bodies.</p> <p>Station 5 – Heart Diagram: students complete and annotate a diagram of the heart.</p> |

EXPLAIN: Listening, Speaking, Reading, and Writing to Communicate Conceptual Understanding
Estimated time: 25 minutes

| Teacher’s Role | Teacher Questions | Students’ Role |
|-----------------------|--------------------------|-----------------------|
|-----------------------|--------------------------|-----------------------|

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| <p>1. Teacher asks students to report out their findings from the investigation and paraphrases what the students say.</p> <p>2. Teacher expects students to use academic vocabulary when describing the results of each task: Blood vessels, artery, capillaries, veins, pulse</p> | <p>1. What differences and similarities do you see between the real heart you saw and the heart diagram?</p> <p>Think, Pair, Share: Share with the person next to you how you could investigate this question and report to class.</p> | <p>1. Students compare the structure of the heart with the drawn diagram.</p> <p>Students Think, Pair, Share to report their observations from the different tasks.</p> |
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EVALUATE: *Thinking Maps, Summarize Lesson and Review Vocabulary, Variety of Assessment Tools, Games to Show Understanding*
Estimated time: 30 minutes

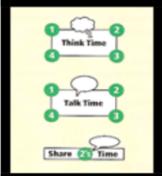
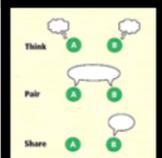
| Teacher’s Role | Teacher Questions | Students’ Role |
|---|---|---|
| <p>1. Teacher checks for student understanding by looking at annotated diagrams of the circulatory system.</p> <p>2. Using Numbered Heads, teacher calls on certain students to place red and blue yarn on a large body drawn on chart paper. These represent veins, arteries, and capillaries.</p> <p>3. Teacher checks heart diagrams to be sure they are correctly labeled.</p> | <p>1. Using your annotated diagram of the circulatory system, tell me how the blood flows through the body.</p> <p>2. Numbered Heads: One group member will use red yarn to show oxygen rich blood. Another group member will use blue yarn to show oxygen poor blood.</p> <p>3. Show me where the ventricles are. Show me the atrium. Show me the valves.</p> | <p>1. Students correctly color and annotate a diagram of the circulatory system.</p> <p>2. Students also add “veins, arteries, and capillaries” to the large body chart using red and blue yarn.</p> <p>3. Students color a heart diagram and add it to the large body chart.</p> |

EXTEND: *Group Projects, Plays, Murals, Songs, Connections to Real World, Connections to Other Curricular Areas*
Estimated time: 60 minutes

| Teacher’s Role | Teacher Questions | Students’ Role |
|---|---|---|
| <p>1. Pulse Activity- The entire class’s data is plotted on two graphs—one for resting, one for active.</p> <p>2. Teacher can provide materials for students to</p> | <p>1. Let’s graph your resting pulse and your active pulse.</p> <p>What do you notice about the two graphs?</p> | <p>1. Students use their recorded pulse rates from Station 4.</p> <p>Students will be able to compare the graphs and discover a definite trend.</p> <p>2. Students make a construction paper model of</p> |

Student Talk Strategies

Adapted from *Avenues*, Hampton Brown, 2007.

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|--|---|--|
| <p>Numbered Heads</p>  | <ul style="list-style-type: none"> • Students number off within each group. • Teacher prompts or gives a directive. • Students think individually about the topic. • Groups discuss the topic so that any member of the group can report for the group. • Teacher calls a number and the student from each group with that number reports for the group. | <ul style="list-style-type: none"> • Group discussion of topics provides each student with language and concept understanding. • Random recitation provides an opportunity for evaluation of both individual and group progress. |
| <p>Think, Pair, Share</p>  | <ul style="list-style-type: none"> • Students think about a topic suggested by the teacher. • Pairs discuss the topic. • Students individually share information from their discussion with the class. | <ul style="list-style-type: none"> • The opportunity for self-talk during the individual think time allows for the student to formulate thoughts before speaking. • Think time allows students to think about the concepts and the language before producing. • Discussion with a partner reduces performance anxiety and enhances understanding. |

Teacher Background Information

“How are arteries and veins different?”

The **artery** has thicker walls. It needs to be strong and elastic because it expands in response to the pressure of each pulse of blood pumped by the heart.

“How does the body get the nutrients from the blood?”

The blood moves from arteries into the tiny **capillaries** that serve cells and tissues. Individual capillaries are often less than a human hair in diameter. The walls of capillaries are thin so that materials like oxygen, carbon dioxide, and nutrients can pass from the blood stream into and back out of cells.

“Why can’t you feel your pulse through a vein?”

By the time blood moves into the **veins** for the return trip to the heart, there is less pressure, so the vein walls do not need to be as thick and strong as artery walls. You cannot take a **pulse** using a vein because the blood flowing through it is flowing more smoothly than in the arteries. Veins can easily be seen just under the surface of our forearms and wrists. The veins are not where you can feel your pulse. You have to press your fingertips deeper just below the base of your thumb to feel an artery in order to detect a pulse.

“What happens when you get cut?”

When a blood vessel is injured, if the blood flows out smoothly, a vein has been cut, but if the blood flows out in spurts, an artery has been cut. The pressure of the pulse makes arteries bleed faster than veins.

The Me I Can't See

What Do I Already Know About My Body

Draw a picture of what is **inside** your body:

What parts are there?

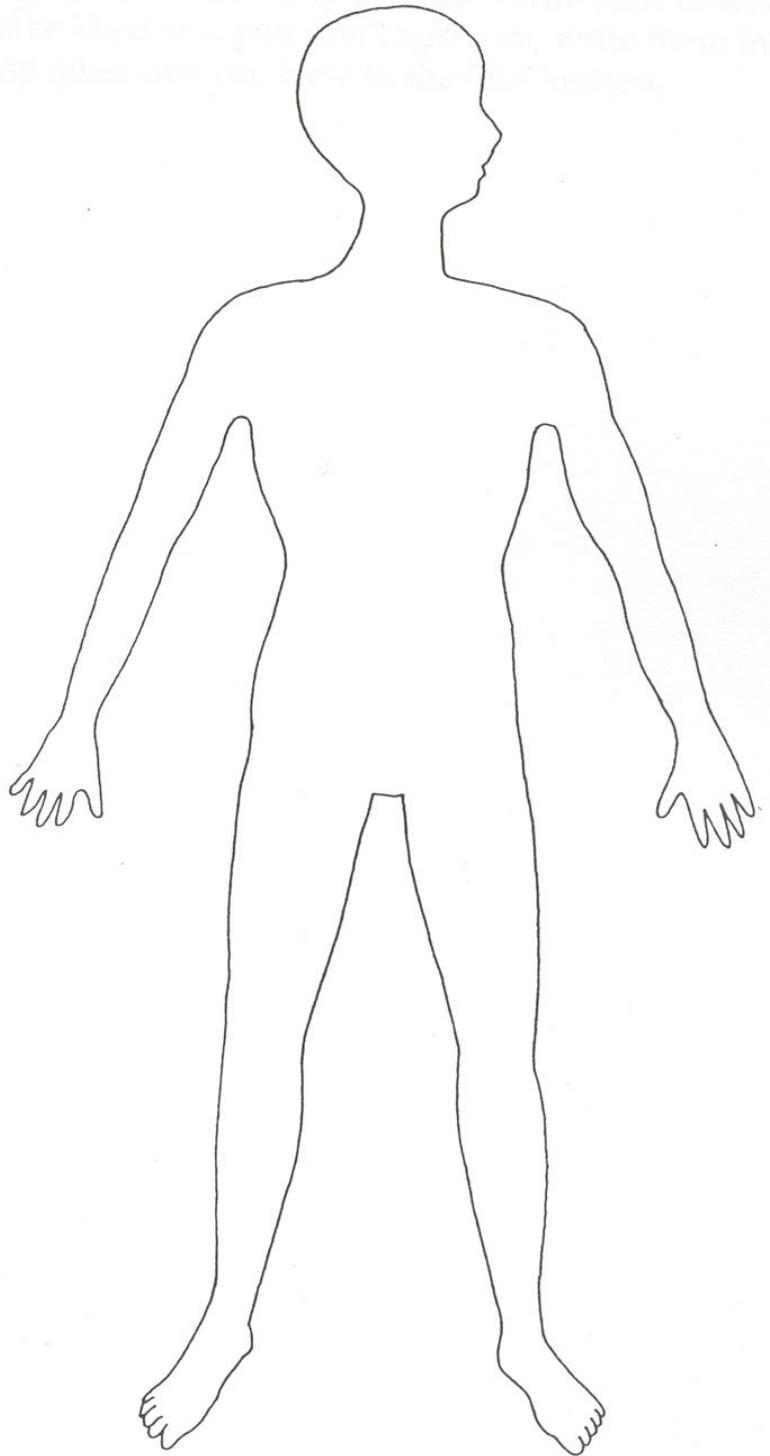
What do you think they look like?

Where are they located?

How are they connected?

Draw in the parts you know and write their names.

Show how you think the parts are connected.



Station 1

Sheep and Cow Heart

1. Draw the sheep heart.
2. Write some of your observations about the sheep heart.
3. Draw the cow heart.
4. Write some of your observations about the cow heart.
5. Compare and Contrast the sheep heart and the cow heart.
6. Write sentences about the similarities and the differences between a sheep and a cow heart.

Station 1 – Student Response Sheet

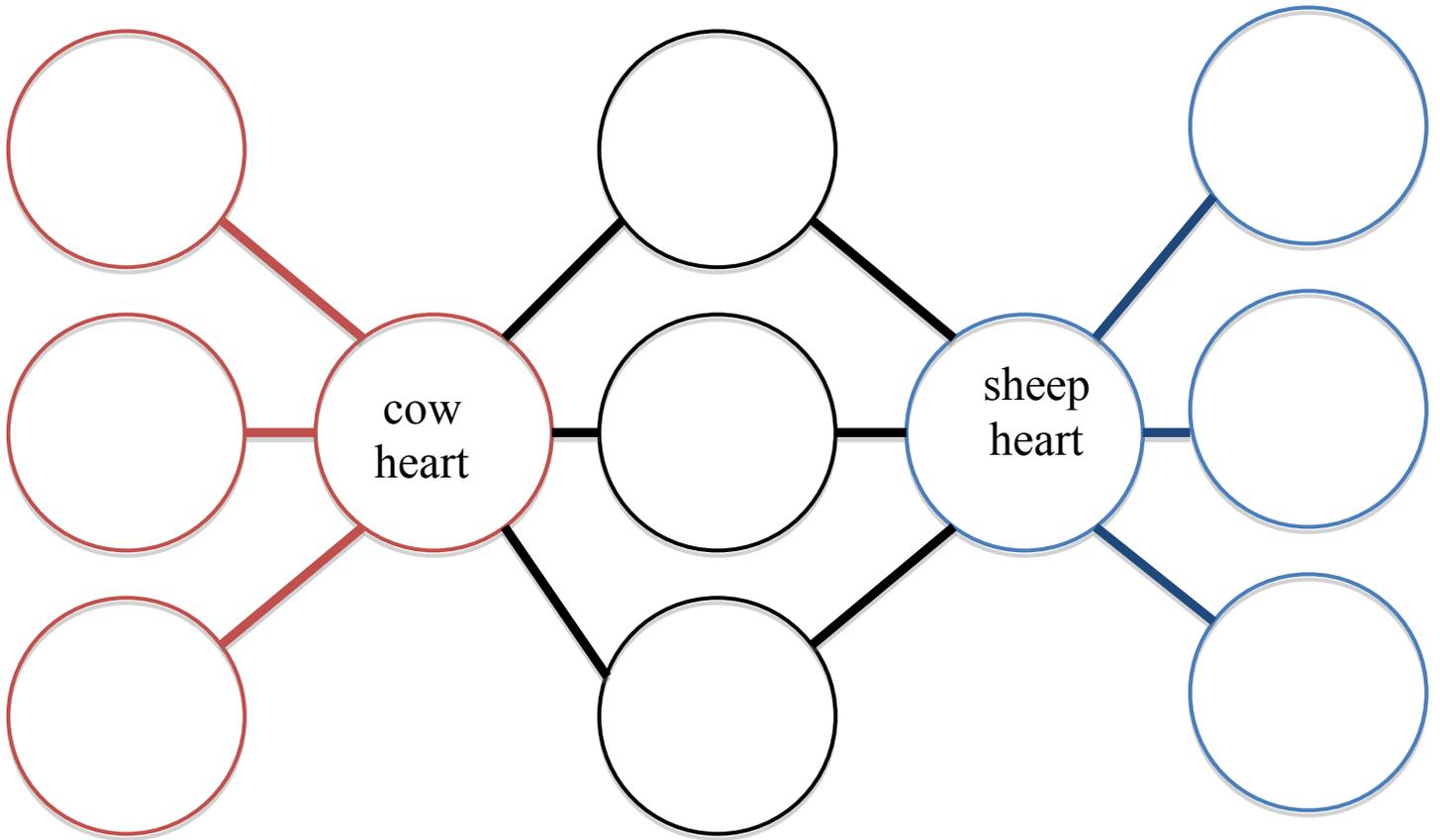
Sheep and Cow Heart

Sheep Heart

2. Write your observations about the sheep heart.

Cow Heart

4. Write some of your observations about the cow heart.



Compare and contrast: cow heart and sheep heart

The cow heart is _____ than the sheep heart, but both

_____.

Both _____ and _____ have

_____.

Station 2

How much blood does the heart pump?

Materials: a bucket with 4 liters of water, an empty bucket, a 5-ounce cup and a timer.

Task: one person needs to transfer the water from one bucket to the other. Another team member will time it, to see how fast you can transfer the water from one bucket to the next.

Learning: How long did it take to transfer the water? The amount of water the cup holds represents the amount of blood your heart pumps each time it beats. It takes your heart about one minute to pump 4 liters of blood.

Calculate: How much blood does your heart pump in a day?

In your notebook, write what you learned.

Station 2 – Student Response Sheet

How much blood does the heart pump?

1. How long did it take to transfer the water?

The amount of water the cup holds represents the amount of blood your heart pumps each time it beats. It takes your heart about one minute to pump 4 liters of blood.

2. How much blood does your heart pump in a day?

Station 3

Your heart is a muscle!

Materials: one tennis ball per student
timer

1. Hold a tennis ball in your hand.
Squeeze the tennis ball tightly.

The force needed to squeeze the ball is similar to the force needed to squeeze blood out of the heart.

2. Squeeze the ball as hard as you can about 70 times in one minute.

How does your hand feel after one minute?

What does this demonstrate about the heart muscle?

RECORD YOUR IDEAS

Station 3 – Student Response Sheet

Your heart is a muscle!

The force needed to squeeze a tennis ball is similar to the force needed to squeeze blood out of the heart. Squeeze the ball as hard as you can about seventy times in one minute.

1. How does your hand feel after one minute?

2. What does this demonstrate about the heart muscle?

Station 4

Listen to your heart and feel your pulse!

1. Use the stethoscope, listen to your heart.
Count the beats you hear in 15 seconds.

2. Make a table to record everyone's findings.

| Name | Heartbeats/15 seconds | Heartbeats/1 minute (n x 4 = heartbeats per min.) |
|------|-----------------------|--|
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| | | |

3. Find your pulse at your wrist or neck. (The tapping feeling of the pulse is caused by blood as it is pushed along by the heart.) Count your pulse for 15 seconds.

4. Make a table and record everyone's findings.

| Name | Heartbeats/15 seconds | Heartbeats/1 minute (n x 4 = heartbeats per min.) |
|------|-----------------------|--|
| | | |
| | | |
| | | |
| | | |

Station 5

Blood and the Heart

1. Read the description of the blood path as it flows through the heart. Use crayons to trace the flow of the blood. Use blue for oxygen-poor blood and red for oxygen-rich blood.
2. Glue to your notebook
3. Explain to your buddy the flow of blood.

Blood Flow

The human heart has four chambers. There are two **atria**, or atria, and two **ventricles**. The right atrium receives blood containing wastes from body cells. This oxygen-poor blood goes to the right ventricle, which pumps it to the lungs. In the lungs, wastes are removed and oxygen is picked up. Oxygen-rich blood goes to the left atrium, then to the left ventricle. The left ventricle pumps it to all body parts.

Station 5 – Student Response Sheet

Blood and the Heart

This is a diagram of the human heart. Using a crayon, trace the



The Children's Heart Institute
HASAN ABDALLAH, M.D., FAAP, FAAC

www.childrenheartinstitute.org

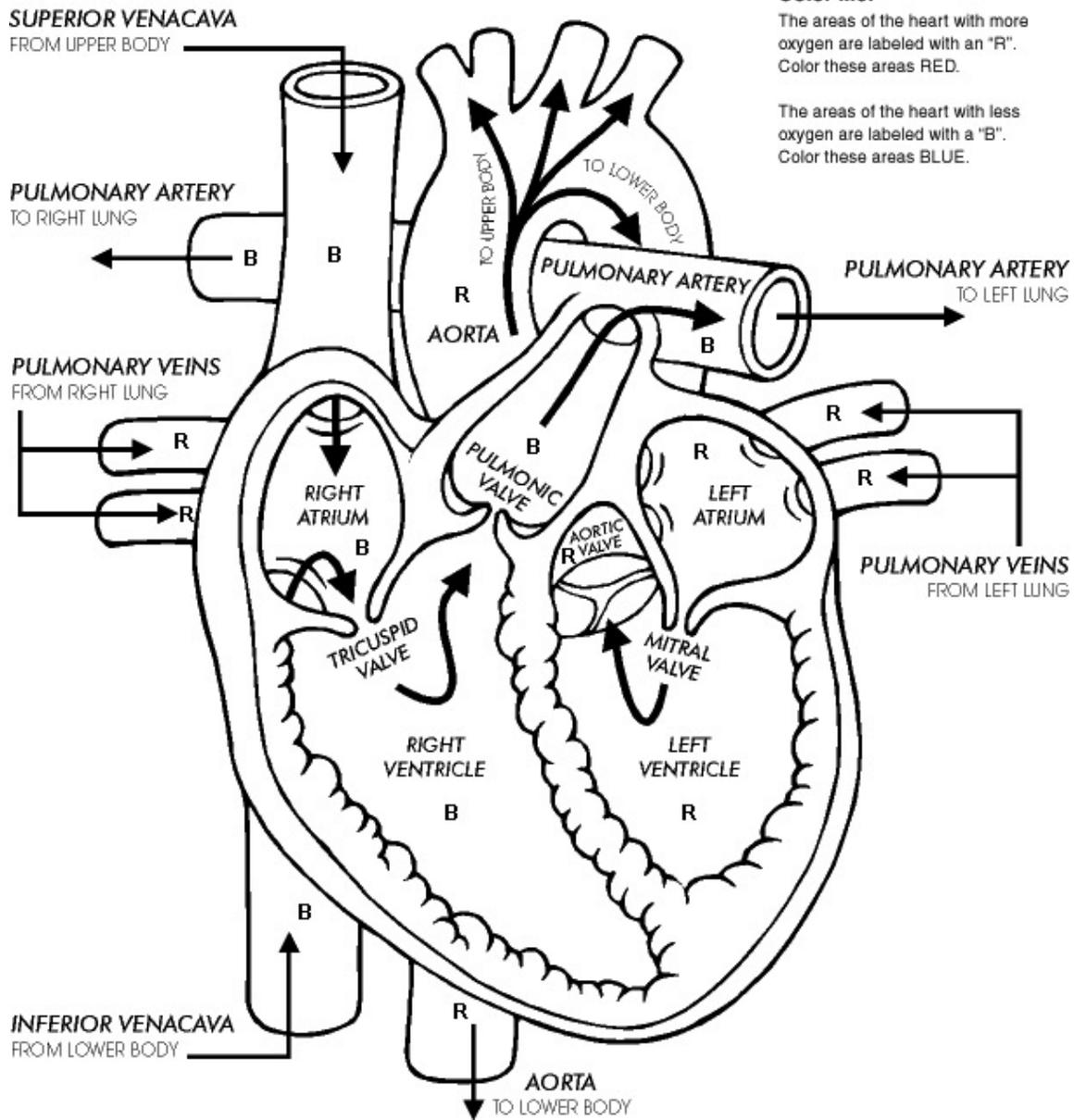
The Heart

This drawing shows how blood flows through the heart.

Color Me:

The areas of the heart with more oxygen are labeled with an "R". Color these areas RED.

The areas of the heart with less oxygen are labeled with a "B". Color these areas BLUE.



flow of the blood as you learn about it.

The Blood in the Body

(sung to the tune of “The Wheels on the Bus”)

Dr. Terry Shanahan, UC Irvine Learn English Through Science, April 26, 2003

The blood in the body goes round and round,
Round and round,
Round and round.
The blood in the body goes round and round
All day long.

The blood enters the heart through the right atrium,
Right atrium,
Right atrium.
The blood enters the heart through the right atrium,
Then is pumped through the ventricle.

From the right ventricle, blood goes to the lungs,
To the lungs,
To the lungs.
From the right ventricle, blood goes to the lungs,
Where it gets oxygen.

From the lungs, the blood returns,
Blood returns,
Blood returns.
From the lungs, the blood returns
Into the left atrium.

From the left atrium, the blood is pumped,
Blood is pumped,
Blood is pumped.
From the left atrium, the blood is pumped
Into the left ventricle.

From the left ventricle, the blood flows out,
Blood flows out,
Blood flows out.
From the left ventricle, blood flows out
Through the aorta.

From the aorta, blood goes to the body,
To the body,
To the body.
From the aorta, blood goes to the body
Through the veins and capillaries.