

# The Circulatory System

**Grade:** 4

**Presented by:** Joyce Aguila and Jennifer Okiyama, Park Street Elementary, Marietta, GA

**Length of Lessons:** Fourteen Lessons

## I. Abstract

This is a fourth grade science unit that focuses on the human circulatory system. During this unit, the students will develop an understanding of the heart, other major organs involved in the circulatory system, and components such as the capillaries, blood, arteries, veins, and blood cells. The students will learn the major functions of the circulatory system, the concept of blood pressure, and discuss and research the work of William Harvey.

## II. Overview

A. Concept Objectives: The student will:

1. Understand how the circulatory system works in our body.
2. Become familiar with the major components of the circulatory system and their functions.
3. Research the accomplishments of William Harvey.

B. The specific content from the Core Knowledge Sequence to be covered will be:

1. The pioneering work of William Harvey
2. The heart and its four chambers
3. Aorta and blood (red and white cells, platelets, hemoglobin, plasma, and antibodies)
4. The filtering function of liver and spleen
5. Fatty deposits and causes of heart attacks
6. Blood types

C. Skill Objectives: The student will:

1. Research and complete a written report on the works of William Harvey.
2. Label a diagram on the four chambers of the heart (auricles and ventricles).
3. Complete a flow chart of the path that blood takes through the heart.
4. Explain how oxygen is released to the cells and carbon dioxide is released through the capillary walls.
5. Explain the function of blood vessels, arteries, veins, and capillaries.
6. Identify the function of the red blood cells, white blood cells, platelets, hemoglobin, plasma, and antibodies.
7. Participate and learn how to take their pulse through various physical activities.
8. Graph the results of their pulse reading during the different activities.
9. Be able to explain the process of coagulation.
10. Explain the filtering function of the liver and spleen.
11. Identify various causes of heart problems including fatty deposits and heart attacks.

## III. Background

A. Van Cleave, J. *The Human Body for Every Kid*. New York: John Wiley & Sons, 1995, ISBN 0471024082.

B. Hirsch, Jr. E.D. *What Your Fourth Grader Needs to Know*. New York: Dell Publishing, 1992, ISBN 0-385-31260-1.

- C. *The Human Body*. New York: Troll Associates, ISBN 0-8167-2235-8.
- D. Hirsch, E.D. *What Your Second Grader Needs to Know*. New York: Dell Publishing, 1991, ISBN 0-385-31027-7.

#### IV. Resources

Please see Bibliography.

#### V. Lessons

##### **Lesson One: Introduction to the Circulatory System**

###### A. Objectives:

1. *Lesson Content*: The student will pull from their prior background knowledge on the circulatory system.
2. *Concept Objective*: The student will create a KWL chart on the circulatory system.
3. *Skill Objective*: The student will share his background knowledge with the rest of the class to create a class KWL chart.

###### B. Materials:

1. Paper, pencils
2. Video: *The Magic School Bus: Inside Ralphie*
3. KWL Chart (see Appendix A)
4. Chart paper

###### C. Background Notes:

###### D. Key Vocabulary: KWL

###### E. Procedures/Activities:

1. Explain to the students that they will be creating a KWL chart to see what prior knowledge they have about the circulatory system.
2. Demonstrate the formation of a KWL by setting up the class KWL.
3. Allow each student to form their own KWL on notebook paper.
4. Allow each student to share one concept that they know and one question that they have about the circulatory system.
5. As a culminating activity for the lesson, the students will view the video *The Magic School Bus: Inside Ralphie* and take notes on the presented facts for future reference.
6. Share notes from the video with group to make a large group chart.

###### F. Evaluation/Assessment:

1. Teacher observation of KWL chart
2. Check for completion of notes

###### G. Standardized Test/State Test Connection: Building, reading, and interpreting charts and tables.

##### **Lesson Two and Three: William Harvey Research Report**

###### A. Objectives:

1. *Lesson Content*: The student will gain an appreciation and understanding of the works of William Harvey.
2. *Concept Objective*: The student will explore various research tools to gain information about the life and accomplishments of William Harvey.
3. *Skill Objective*: The student will write a research report on the life and accomplishments of William Harvey.

###### B. Materials:

1. Research outline (see Appendix B)
2. Encyclopedias

3. Internet Access/Web Sites (see Appendix for addresses)
  4. CD-ROM Encyclopedias
  5. Library access
  6. Lined paper, pencil
- C. *Background Notes:*
- D. *Key vocabulary:* pioneer, heart, circulation, veins, arteries, blood
- E. *Procedures/Activities:*
1. Introduce students to research outline to be used in gathering of information for the report. Note: This project should be integrated with other subject areas to optimize learning time.
  2. Introduce students to the rubric that will be used for evaluation of their essay.
  3. Introduce students to the various methods of research (i.e. Bookmarked Internet Websites, print encyclopedias, children's literature, *Encarta*, or other CD encyclopedias).
  4. Allow students to work in partners to gather information from available sources during language arts, social studies, and science blocks.
- F. *Evaluation/Assessment:* Check research outline for completion.
- G. *Standardized Test/State Test Connection:* Reading to find information, main idea, decoding, research methods, summarizing, library skills

#### **Lesson Four: William Harvey through the Writing Process**

- A. *Objectives:*
1. *Lesson Content:* The student will participate in the various steps of the writing process.
  2. *Concept Objective:* The student will gain an understanding of the various processes involved in writing a research report.
  3. *Skill Objective:* Using his research notes, the student will formulate a five paragraph report on William Harvey.
- B. *Materials:*
1. Paper, pencil
  2. Word processing program
  3. Rubric for assessing (see Appendix C)
- C. *Background Notes:*
- D. *Key Vocabulary:* Rough draft, Revision, Edit, Publish
- E. *Procedures/Activities:*
1. Have the students read and review notes for accuracy with a partner.
  2. After reviewing, students will write their rough draft individually.
  3. During language arts time only, the students will revise, edit, and publish in the coming days.
- F. *Evaluation/Assessment:* Use rubric to assess. Note: These grades may be applied to the subject areas of language arts, science, and social studies.
- G. *Standardized Test/State Test Connection:* Punctuation, grammar, paragraph and sentence formation, spelling, sequencing

#### **Lesson Five: Circulatory System Vocabulary**

- A. *Objectives:*
1. *Lesson Objectives:* The student will learn the basic circulatory vocabulary.
  2. *Concept Objectives:* The student will define the vocabulary words.
  3. *Skill Objectives:* The student will be able to match the vocabulary words with the correct definition.
- B. *Materials:*

1. Vocabulary list for each students (see Appendix D for list)
  2. Heart cut-out (see Appendix E for pattern)
  3. Dictionaries
  4. Pencils, markers, scissors
- C. *Background Notes:*
- D. *Key Vocabulary:* chamber, circulation, pulse, platelets, antibodies, capillaries, coagulation, liver, blood types, aorta, blood pressure, erythrocytes (red blood cells), hemoglobin, plasma, arteries, veins, spleen, atrium, valve, ventricle, lungs, vena cava
- E. *Procedures/Activities:*
1. Instruct the students to define the given words using dictionaries.
  2. Have die-cuts of hearts already prepared so that each student receives 22 hearts
  3. When completed, students are to write one word and definition per heart; with the definition on one half and the word on the other half.
  4. Cut the hearts in half.
  5. When completed, the students can play a matching game with their vocabulary and definitions.
- F. *Evaluation/Assessment:* Check completion of vocabulary hearts
- G. *Standardized Test/State Test Connections:* Vocabulary, Dictionary Skills (guide words, choosing the applicable definitions, alphabetizing)

### **Lesson Six and Seven: The Structure of the Heart**

- A. *Objectives:*
1. Lesson Content: The student will learn the basic structure of the heart.
  2. Concept Objective: The student will learn the parts and functions of the heart.
  3. Skill Objective: The students will match the names and functions with a diagram of the heart's structure.
- B. *Materials:*
1. A diagram of the heart (see Appendix F)
  2. A model of the human heart from Educational Insights (see Bibliography for information)
  3. Handout of the nine major steps in the pathway (see Appendix G)
  4. Poster board
  5. Markers, crayons, pencils
  6. Bus die-cut (see Appendix H for pattern) 1 per student for tracing
  7. Glue
  8. Rubric for Assessment (see Appendix I)
- C. *Background Notes:*
- D. *Key Vocabulary:* valve, atrium, capillaries, veins, aorta, vena cava, arteries, ventricle, circulation
- E. *Procedures/Activities:*
1. Show the students the model of the heart.
  2. Discuss the pathway of blood through the heart and body, emphasizing vocabulary words. (see Appendix for nine major steps)
  3. Review the rubric which will be used for assessment with the students.
  4. Note: for clarification of procedures, the teacher may want to write the directions for this activity on the board for the students.
  5. Have students work with a partner to create a chart (on poster board) that illustrates and explains the flow of blood through the heart and body. (see Appendix)
  6. Students will trace the die-cut bus onto poster board 9 times for the major steps in the pathway.

7. The students write the functions/path on the buses.
  8. Color buses and decorate poster.
- F. *Evaluation/Assessment:* Assess poster using rubric. (see Appendix I)
- G. *Standardized Test/State Test Connections:* Vocabulary, following written and oral directions, sequencing, using ordinal words (first, second, etc.)

### **Lesson Eight and Nine: Oxygen and Carbon Dioxide Exchange**

#### A. *Objectives:*

1. *Lesson Content:* The students will learn about the exchange of oxygen and carbon dioxide through the circulatory system.
2. *Concept Objective:* The students will learn that oxygen and carbon dioxide are exchanged through the blood.
3. *Skill Objective:* The students will label a diagram of veins, arteries, and capillaries, illustrating the exchange of oxygen and carbon dioxide through the capillary walls.

#### B. *Materials:*

1. Crayons: red, blue, yellow
2. Handout "Oxygen/Carbon Dioxide" (see Appendix J)
3. Pencils
4. Construction paper cards for role play labels (8)
5. Body length butcher/bulletin board paper (one for every two students)
6. Markers
7. Scissors
8. Body outline example (see Appendix K)
9. Rubric for assessing body outline (see Appendix L)

#### B. *Background Notes:*

- C. *Key Vocabulary:* veins, arteries, capillaries, oxygen, carbon dioxide, exchange, hemoglobin

#### D. *Procedures/Activities:*

1. Explain the process of exchange using an overhead transparency of the handout from the Appendix.
2. Role play the major steps of this exchange with students representing the veins, arteries, red blood (oxygen), blue blood (carbon dioxide), hemoglobin, lungs, heart, and body. One student represents the heart holding a sign with their role. Do the same for each of the other parts. The only students who move are the ones holding hemoglobin card and the red and blue blood cards. Have these three students follow the pathway while the teacher explains the exchange.
3. Explain the directions for the handout.
4. Allow students to complete handout with a partner using appropriate crayons for representing features.
5. Have students trace the outline of their partners onto the butcher paper.
6. While working together in pairs students will draw the arteries, veins, capillaries, heart, and lungs onto their outline.
7. Label and color the outline with the appropriate terms and colors.
8. Students should create a legend to identify the listed features.

#### E. *Evaluation/Assessment:*

1. Teacher observation of role play.
2. Check student handout.
3. Check body outline for accuracy using rubric. (see Appendix L)

- F. *Standardized Test/State Test Connections:* Sequencing, reading and labeling a diagram

## **Lesson Ten: Function of the Blood**

### **A. Objectives:**

1. *Lesson Content:* The student will learn the functions of the different parts of the blood.
2. *Concept Objective:* The student will become aware that the blood has specific functions, and that blood has different parts.
3. *Skill Objective:* The student will construct a mini-book entitled “Pump Power!” which defines and illustrates the parts and functions of the blood.

### **B. Materials:**

1. Pencils
2. *The Incredible Human Body* by Esther Weiner: for the booklet called “Pump Power!” (see Bibliography for more information)
3. Crayons
4. Scissors
5. Stapler
6. Appendix M

### **C. Background Notes:**

- D. *Key vocabulary:* White blood cells, red blood cells, platelets, plasma, arteries, heart, veins, capillaries

### **E. Procedures/Activities:**

1. Review the video facts from *Magic School Bus: Inside Ralphie*
2. Discuss how “Ralphie’s” body fought off the germs.
3. Explain the functions of the red and white blood cells.
4. Explain how platelets and plasma work in the blood.
5. Show a model of a blood drop that demonstrates its composition. (see Appendix M)
6. Assemble the “Pump Power!” mini-booklet while the students are coloring their booklets.
7. Read and discuss the information presented in the booklet after all books are assembled.

### **F. Evaluation/Assessment:** Teacher observation of discussion

- G. *Standardized Test/State Test Connection:* Comprehension, vocabulary, following multi-step directions

## **Lesson Eleven: Blood Coagulation**

### **A. Objectives:**

1. *Lesson Content:* The student will learn about the process of coagulation.
2. *Concept Objective:* The student will understand why we have coagulation and how it works.
3. *Skill Objective:* The student will simulate the process of coagulation through a hands-on experiment.

### **B. Materials:** (one per group)

1. Clear drinking glasses
2. Index cards
3. Scissors
4. Paper hole puncher
5. Cotton ball
6. One sheet each of red, white, and yellow construction paper
7. Rulers
8. Science journals

9. Pencils
- C. *Background Notes:*
- D. *Key Vocabulary:* Coagulation, red blood cells, white blood cells, platelets, plasma, blood clotting, scab, fibrin
- E. *Procedures/Activities:*
1. Ask the students, “When you had a cut, what eventually happened to the cut?”
  2. Discuss the process of coagulation with all terms involved.
  3. Pass out all supplies listed above.
  4. Have students complete the following steps with the materials:
    - a. Fold the index card in half, and cut a one inch wide and half inch long notch from the center of the folded edge.
    - b. Unfold the card and place it across the top of the glass.
    - c. Use the hole puncher to cut ten circles from each of the three colors of construction paper.
    - d. Drop half of the circles into the notch in the index card.
    - e. Discuss: The hole in the card is like a cut in the skin.
    - f. Pull a small piece from the cotton ball, and stretch it across the hole in the card so that a thin layer of cotton fibers covers the hole.
    - g. Drop the remaining circles onto the covered hole.
    - h. Discuss: The cotton acts as a scab and prevents any blood from leaving the body, or germs from entering the body.
  5. Explain that a break in the skin, a cut, usually breaks the wall of one or more of the blood vessels. The blood flows out of the opening and the body begins the process of coagulation. Strands of fibrin are formed. These strands weave a web across the opening of the cut that prevents blood from flowing.
  6. As a conclusion to the activity have students write about and illustrate the activity in their science journals.
- F. *Evaluation/Assessment:*
1. Teacher observation of group activity.
  2. Check writing and illustration in journals.
- G. *Standardized Test/State Test Connection:* Following multi-step directions, summarizing through writing, understanding symbol representation

## **Lesson Twelve: Check Your Heart Rate!**

- A. *Objectives:*
1. *Lesson Content:* The student will learn how to take their pulse.
  2. *Concept Objective:* The student will understand the procedure of taking a pulse and how the pulse varies with different physical activities.
  3. *Skill Objective:* The student will participate in various physical activities to compare pulses and graph the results.
- B. *Materials:*
1. Watch or clock with a second hand
  2. Graph paper
  3. Pencils
  4. Chart for tracking results of each activity’s pulse (see Appendix N)
- C. *Background Notes:*
- D. *Key vocabulary:* Pulse, graph, rate
- E. *Procedures/Activities:*
1. Explain to the students how the heart pumps at different rates depending on the activity.

2. Discuss times from their background when students have felt their heart beating. (Ex.: After running or playing sports)
  3. Demonstrate and practice how to find a pulse on the wrist or neck.
  4. Explain the four procedures involved in the activities to be graphed.
  5. Ask the students, "What do you think will happen to your heart rate as we participate in the different activities?"
  6. Explain to the students that the time for taking the pulse is ten seconds and that number will be multiplied by six to get their one-minute pulse.
  7. Work through the different activities as a whole group.
  8. Complete the chart with the correct information. (see Appendix N for chart)
  9. Use graph paper to create a graph of the final results.
- F. *Evaluation/Assessment:*
1. Teacher observation of activities.
  2. Check chart for completion.
  3. Check graph of results.
- G. *Standardized Test/State Test Connection:* Understanding charts and graphs, following multi-step directions, sequence, multiplication

### **Lesson Thirteen: Functions of the Liver and Spleen**

- A. *Objectives:*
1. *Lesson Content:* The student will learn about the functions of the liver and spleen.
  2. *Concept Objective:* The student will understand that the liver filters the blood, and that the spleen produces red blood cells.
  3. *Skill Objective:* The student will recall the functions of the liver and spleen.
- B. *Materials:*
1. Previous outlined body from lessons eight and nine
  2. Crayons
  3. Pencils
  4. Glue
  5. Outline image of liver and spleen (see Appendix O)
  6. Markers
- C. *Background Notes:*
- D. *Key Vocabulary:* liver, spleen, filter, produce
- E. *Procedures/Activities:*
1. Explain what a filter is while pulling from the students' background knowledge. (Ex.: Air condition filter, coffee filter)
  2. Show an illustration of the spleen and explain that it's primary function is to produce red blood cells.
  3. Show an illustration of the liver and explain that it's primary function is to filter the blood.
  4. Give each set of partners one illustration of the liver and spleen.
  5. Explain that they are to write the function of each body part onto the illustration and trace with markers.
  6. After writing and tracing, have students color their illustrations and attach to their body outline in the appropriate place using glue.
- F. *Evaluation/Assessment:*
1. Check body outlines for correct placement of liver and spleen.
  2. Check functions listed on the illustrations.
- G. *Standardized Test/State Test Connection:* Following multi-step directions, summarizing



## **Lesson Fourteen: Heart Diseases**

### **A. Objectives:**

1. *Lesson Content:* The student will learn about the various causes of heart disease.
2. *Concept Objective:* The student will understand how choices of lifestyle affect their health.
3. *Skill Objective:* The student will take notes about heart attacks caused by an overabundance of cholesterol in the blood stream and possible preventions of heart attacks after observing a demonstration that illustrates the build-up of fatty deposits in the circulatory system.

### **B. Materials:**

1. Paper
2. Pencils
3. Rulers
4. Straws
5. Melted Crisco shortening
6. Ice water
7. Paper towels
8. Spoons
9. Science journals
10. Clear bowl
11. Overhead projector (optional)

### **C. Background Notes:**

### **D. Key Vocabulary:** Fatty deposits, solids, liquids, cholesterol, clogged

### **E. Procedures/Activities:**

1. Explain that today you are going to discuss heart diseases such as heart attacks.
2. Ask students to share information about relatives who have a history of heart disease.
3. Explain that most heart disease is a result of clogged arteries due to the build up of fatty deposits. (Build a visual image by recalling instances in the home when sinks or toilets were clogged.)
4. Demonstrate the following activity for the class while they take notes in their science journals.
  - a. Melt Crisco shortening on a hot plate or in a microwave.
  - b. Place clear bowl of ice water onto the overhead projector.
  - c. Drop spoonfuls of melted Crisco into ice water.
  - d. Observe what happens to the Crisco as it hits the water. (It solidifies.)
  - e. Allow one student to use a straw to attempt to suck water through the straw.
  - f. Observe what happens when the solidified Crisco is pulled through the straw.
5. Explain that this is also what occurs when fatty deposits known as cholesterol build up in the blood stream.
6. Discuss that there are ways to prevent this build up such as a well-balanced diet and exercise regimens while the students take notes.

### **F. Evaluation/Assessment:**

1. Teacher observation.
2. Check student notes.

### **G. Standardized Test/State Test Connection:** Summarizing through notes

**V. POSSIBLE CULMINATING ACTIVITIES**

- A. Video: *Pumping Life: The Heart and Circulatory System*
- B. Invite another grade level for a museum-style tour of the class projects.
- C. Invite a doctor, nurse, or speaker from the Red Cross or American Heart Association to speak to the class.
- D. Create brochures about healthy living.

**V. HANDOUTS/ WORKSHEETS**

**Appendix A**

Name\_\_\_\_\_

Date\_\_\_\_\_

**Circulatory System KWL**

<b>What I Know...</b>	<b>What I Want to Know...</b>	<b>What I Learned...</b>

## Appendix B

### William Harvey Research Report

Name

Date

**Research Partner's Name**

**Directions:**

1. You must use at least: one Internet search, one Encyclopedia, one CD-ROM to find information.
2. Both you and your partner must write down your own information.
3. This sheet is just a guide for you to use; if you find other important information, you may include it.
4. This sheet is a pre-writing guide, base your five-paragraph report on the questions on this page.
5. Please write these answers on your own paper.

**The following questions are to be answered in your report:**

1. When was William Harvey born and when did he die?
2. Where was he born?
3. Information about his personal life, include the following facts: brothers, sisters, wife's name, children's name, etc.
4. Information pertaining to his education:
5. What is William Harvey known for?
6. What led William Harvey to research this topic?
7. How did William Harvey discover this?
8. How have people used this information?

Write down the three sources you used:

Internet web site name and address:

CD-ROM name

Encyclopedia name, publication date, and volume number

## Appendix C

### *William Harvey Research Report Rubric*

Name

Date

Criteria	Possible Points	Earned Points
Report is neat and legible	10	
3 different sources are used	20	
Report is complete	20	
Information is accurate	20	
Spelling is correct	5	
Punctuation is correct	5	
Grammar is correct	5	
5 complete paragraphs	5	
Prewriting sheet is turned in	5	
Paper is turned in on time	5	
	Total Possible Points 100	Total Earned Points =

## Appendix D

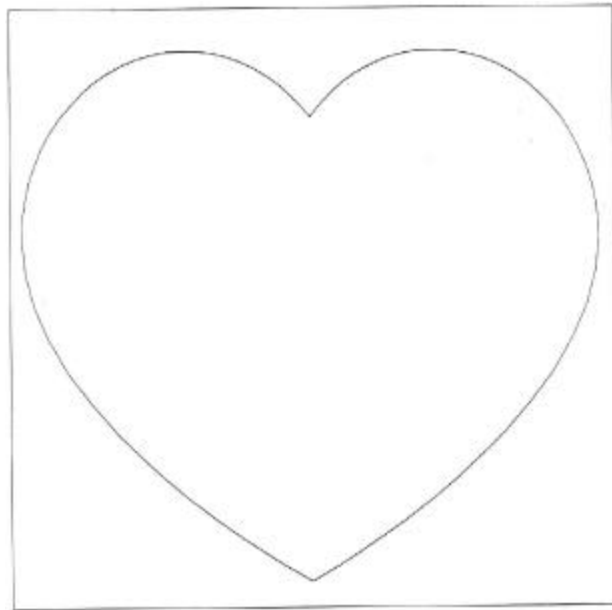
Name \_\_\_\_\_

### Circulatory System Vocabulary:

1. Chamber:
2. Circulation:
3. Pulse:
4. Platelets:
5. Antibodies:
6. Capillaries:
7. Coagulation:
8. Liver:
9. Blood types (four):
10. Aorta:
11. Blood pressure:
12. Erythrocytes (red blood cells):
13. Hemoglobin:
14. Plasma:
15. Arteries:
16. Veins:
17. Spleen:
18. Atrium:
19. Valve:
20. Ventricle:
21. Lungs:
22. Vena cava:

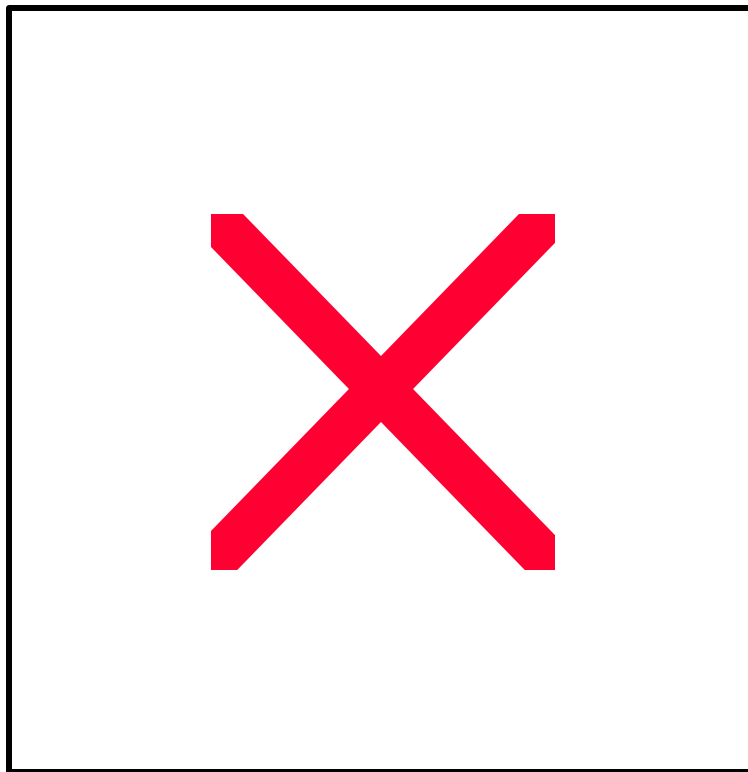
**Appendix E**

**Heart Pattern for Vocabulary List**



**Appendix F**

**Heart Diagram**

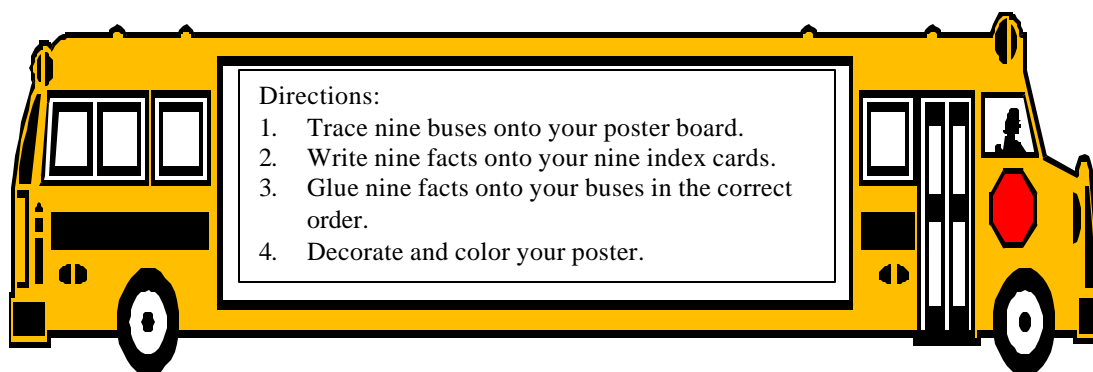


## Appendix G

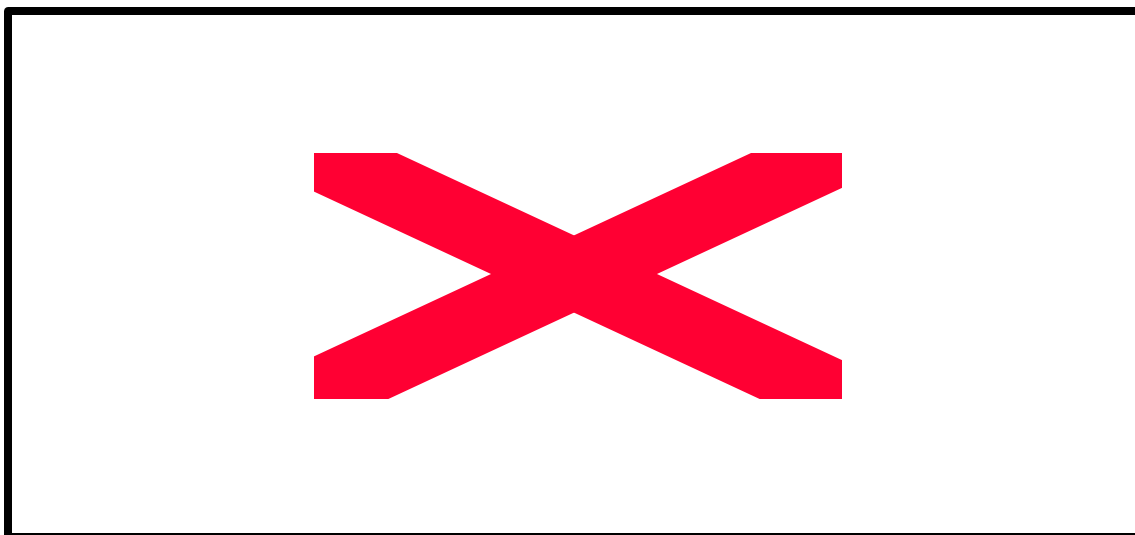
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### Nine Steps of the Circulatory System

1. Oxygen is inhaled into the lungs and then is passed through the capillary walls into the blood stream.
2. Veins carry the blood to the left side of the heart.
3. The left side of the heart pumps the blood through the aorta and on through the body.
4. Oxygen is released to the cells.
5. Carbon dioxide is picked up by the blood.
6. The vena cava takes the blood back to the right side of the heart.
7. The right side of the heart pumps the blood through the arteries to the lungs.
8. Carbon dioxide leaves the blood through the capillary walls.
9. The lungs send the carbon dioxide out of the body.



## Appendix H Bus Die-Cut



**Appendix I**

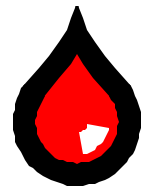
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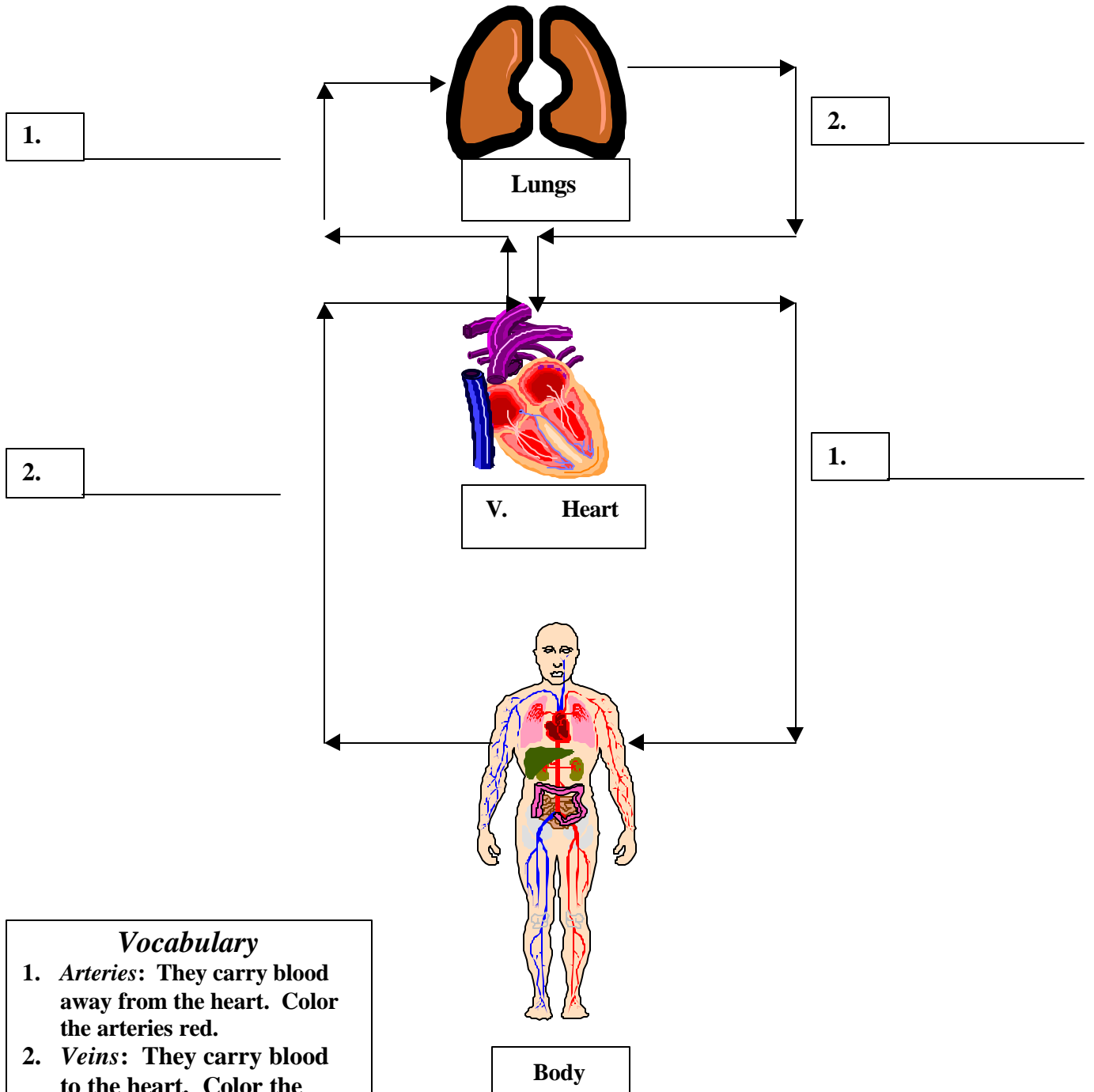
*Nine Steps of the Circulatory System: Rubric*

<i>Criteria</i>	Total Possible	Total Earned
1. Neatness-----	10-----	_____
2. Spelling-----	10-----	_____
3. Punctuation-----	10-----	_____
4. Nine Steps (Correct Order)-----	63(7 pts. each)-----	_____
5. Extra Effort-----	7-----	_____
	100-----	_____





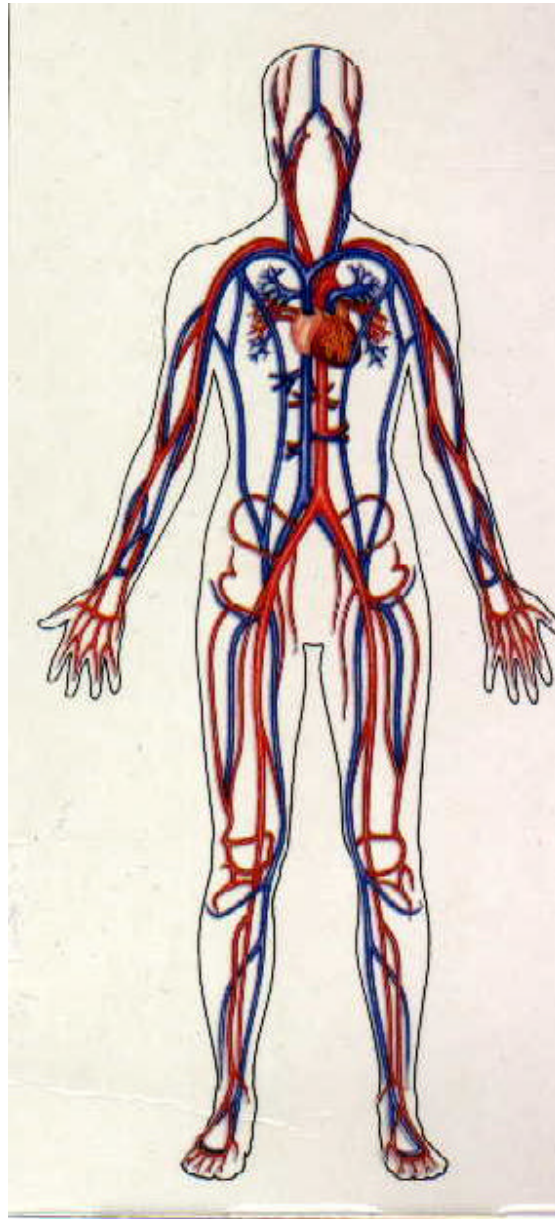
Appendix J: Oxygen/Carbon Dioxide Exchange



**Vocabulary**

- Arteries:** They carry blood away from the heart. Color the arteries red.
- Veins:** They carry blood to the heart. Color the veins blue.
- Capillaries:** They allow the blood to exchange the oxygen and carbon dioxide.

## Appendix K



### Appendix L

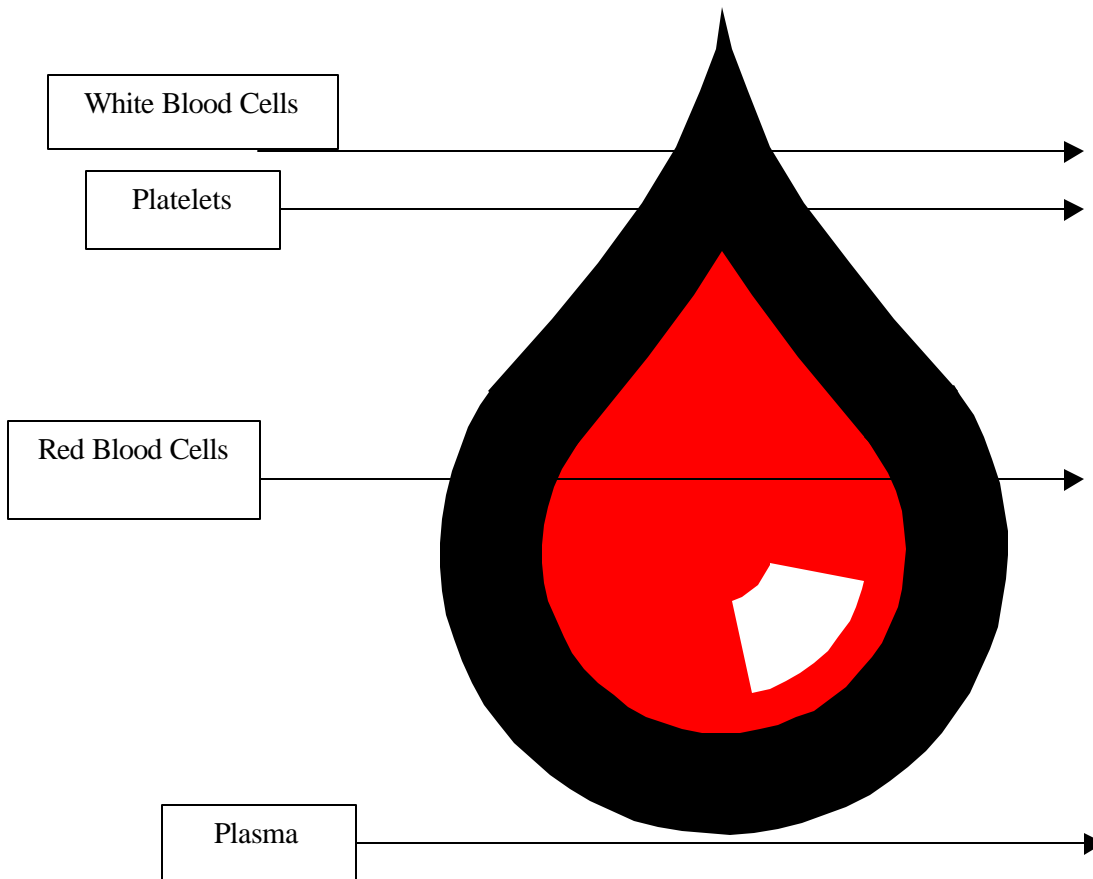
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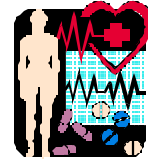
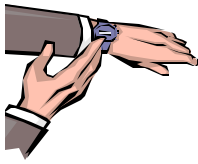
#### Circulatory System: Body Outline (Rubric)

<i>Criteria</i>	<b>Total</b>	<b>Possible</b>	<b>Total</b>	<b>Earned</b>
1. Neatness-----	10-----	10-----	-----	-----
2. Spelling-----	10-----	10-----	-----	-----
3. Cooperation-----	10-----	10-----	-----	-----
4. *Parts Drawn-----	20-----	20-----	-----	-----
5. *Parts Labeled-----	20-----	20-----	-----	-----
6. *Parts Colored-----	15-----	15-----	-----	-----
7. *Parts Included in Legend-----	15-----	15-----	-----	-----
	100-----	-----	-----	-----

\*Parts Include: body, heart, lungs, veins, arteries, capillaries

### Appendix M The Composition of a Drop of Blood by Percentage





### Appendix N

**\*\*Sit quietly for 3 minutes. Take your pulse and record. Do these exercises for 1 minute. Take your pulse for 10 seconds and record.**

Name \_\_\_\_\_

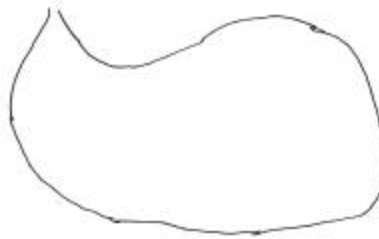
Date \_\_\_\_\_

### *Check Your Heart Rate!!!*

*Activity                      Pulse Rate for 10 Seconds x 6 = Pulse Rate for 1 Minute*

1. **Sitting**
2. **Walking in Place**
3. **Jumping Jacks**
4. **Chair Steps**

### Appendix O Liver



### Spleen



## Appendix P

### Internet Sites for Students and Teachers

**General Information:** These sites contain labeled parts with definition. Some may have animated hearts.

<http://www.mirrors.org.sg/hol/systems/circulation.html>

<http://tjjunior.advanced.org/4245/>

<http://www.medtropolis.com/vbody/>

<http://sln.fi.edu/biosci/heart.html>

[http://www.imcpl.lib.in.us/nov\\_circ.htm](http://www.imcpl.lib.in.us/nov_circ.htm)

<http://bart.northnet.com.au/~amcgann/A%20Look%20Inside%20the%20Human%20Body%20%20website/Index.html>

**The American Heart Association: labeled diagram of the heart:**

[http://207.211.141.25/Heart\\_and\\_Stroke\\_A\\_Z\\_Guide/cirsys.html](http://207.211.141.25/Heart_and_Stroke_A_Z_Guide/cirsys.html)

**An online quiz on the parts of the body:**

[http://www.gen.umn.edu/faculty\\_staff/jensen/1132/webanatomy/wa\\_heart1.html](http://www.gen.umn.edu/faculty_staff/jensen/1132/webanatomy/wa_heart1.html)

[http://www.gen.umn.edu/faculty\\_staff/jensen/1132/webanatomy/wa\\_heart\\_xsection1.html](http://www.gen.umn.edu/faculty_staff/jensen/1132/webanatomy/wa_heart_xsection1.html)

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