

# The Circulatory System

**Grade Level or Special Area:** Fourth Grade

**Written by:**

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**Length of Unit:**

Six lessons, approximately six days, 45-60 minutes per day

## I. ABSTRACT

This unit covers the function and structure of the circulatory system. The students will use class discussions, activities, and investigative strategies to discover the chambers of the heart, blood cells, blood pressure, clotting, blood types, liver and spleen functions, and how to have a healthy heart. This unit uses a variety of teaching methods, including writing, planning, cooperative learning, modeling, and testing.

## II. OVERVIEW

### A. Concept Objectives

1. Students understand the processes of scientific investigation and design, conduct, communicate about, and evaluate such investigations. (*Colorado Model Content Standard # 1*)
2. Students understand the characteristics and structure of living things, the processes of life, and how living things interact with each other and their environment. (*Colorado Model Content Standard # 3*)
3. Students understand common properties, forms, and changes in matter and energy. (*Colorado Model Content Standard # 2*)
4. Students understand interrelationships among science, technology and human activity and how they can affect the world. (*Colorado Model Content Standard #5*)

### B. Content from the *Core Knowledge Sequence*

1. Fourth Grade Science: The Human Body (p. 104)
  - a. The Circulatory System
    - i. Heart: four chambers (auricles and ventricles), aorta
    - ii. Blood
      - a) Red blood cells (corpuscles), white blood cells (corpuscles), platelets, hemoglobin, plasma, antibodies
      - b) Blood vessels: arteries, veins, capillaries
      - c) Blood pressure, pulse
      - d) Coagulation (clotting)
    - iii. Filtering function of liver and spleen
    - iv. Fatty deposits can clog blood vessels and cause a heart attack
    - v. Blood types (four basic types: A, B, AB, O) and transfusions

### C. Skill Objectives

1. Students will label the four chambers of the heart.
2. Students will write a letter describing why the heart is important.
3. Students will describe the function of the heart.
4. Students will identify the components that make up blood.
5. Students will create a model of a drop of blood.
6. Students will describe the purpose of each component that makes up blood.
7. Students will identify the three types of blood vessels.
8. Students will distinguish between arteries, veins, and capillaries.
9. Students will analyze the function of arteries, veins, and capillaries.
10. Students will find their pulse in their neck and wrist.

11. Students will compare their heart rate before and after exercise.
12. Students will determine why heart rate changes with exercise.
13. Students will write a story about platelets.
14. Students will describe the function of the liver.
15. Students will describe the function of the spleen.
16. Students will draw an outline of the human body, labeling the liver, heart, and spleen.
17. Students will evaluate factors of a healthy heart.
18. Students will create a healthy menu using a food pyramid.
19. Students will distinguish between healthy and unhealthy foods.

### III. BACKGROUND KNOWLEDGE

- A. For Teachers
  1. *What Your 4<sup>th</sup> Grader Needs to Know*, Hirsch, E.D.
  2. *The Heart and Blood*, Parker, Steve
- B. For Students
  1. Ability to write a letter in correct format (*Core Knowledge Sequence*, 2<sup>nd</sup> Grade, page 43)
  2. Ability to write a story in paragraph form (*Core Knowledge Sequence*, 3<sup>rd</sup> Grade, page 65)
  3. Food Pyramid (*Core Knowledge Sequence*, 2<sup>nd</sup> Grade, page 60)
  4. Cells (*Core Knowledge Sequence*, 2<sup>nd</sup> Grade, page 60)
  5. Knowledge that circulatory system is composed of heart and blood (*Core Knowledge Sequence*, 1<sup>st</sup> Grade, page 38)

### IV. RESOURCES

- A. *A Drop of Blood*, by Paul Showers (Lesson Two, optional)

### V. LESSONS

#### Lesson One: The Heart (approximately 45 minutes)

- A. *Daily Objectives*
  1. Concept Objective(s)
    - a. Students understand the characteristics and structure of living things, the processes of life, and how living things interact with each other and their environment.
  2. Lesson Content
    - a. The Circulatory System
      - i. Heart: four chambers (auricles and ventricles), aorta
  3. Skill Objective(s)
    - a. Students will label the four chambers of the heart.
    - b. Students will write a letter describing why the heart is important.
    - c. Students will describe the function of the heart.
- B. *Materials*
  1. Heart Diagram (Appendix A), one for each student
  2. Heart Diagram transparency
  3. Human Body Corporation worksheet (Appendix B), one for each student
  4. Human Body Corporation letter checklist (Appendix C), copy for teacher
  5. Pencil and Paper
- C. *Key Vocabulary*
  1. Atrium: chamber in the upper part of the heart which receives blood from the body or lungs; also called the auricle

2. Ventricle: chamber in the lower part of the heart which pumps blood to the lungs or around the body

D. *Procedures/Activities*

**Note: Before the lesson, you will need to make a transparency of the Heart Diagram (Appendix A).**

1. Tell students that they are going to begin learning about the circulatory system. Ask them if they know what the circulatory system does. (It pumps and carries blood throughout the body.) Ask them if they know the main organ in the circulatory system. (It is the heart.)
2. Tell the students that today they will be learning about the heart. Ask them what would happen if their heart stopped beating. (They would die.) Ask them why they cannot live if their heart does not beat. Guide the discussion so that the students understand that the heart pumps blood throughout the body, and that the blood carries oxygen to all their organs.
3. Explain that the heart has four chambers. Pass out the Heart Diagram (Appendix A).
4. Put the transparency of Appendix A on the overhead. Tell students that they will be labeling the four chambers of the heart. Explain that the heart is divided into atria (plural form of atrium), and ventricles.
5. Tell students that the two top chambers are the atria, and the two bottom chambers are the ventricles. The atria hold blood coming into the heart, and the ventricles hold blood going out of the heart. The blood going into the heart from the lungs or body goes into the atria. The ventricles pump blood from the heart to the lungs or body. The right ventricle pumps blood to the lungs and the left ventricle pumps blood to the rest of the body.
6. Have students label number one on the Heart Diagram “right atrium”. Label the right atrium on the overhead for them to follow as an example. Have them label number three “left atrium”. Ask students why the right atrium is on the left side of their paper, and the left atrium is on the right side of their paper. If students cannot guess the answer, tell them that they are looking at the heart as if it were someone else’s heart, like looking in a mirror. Have them hold the Heart Diagram against their chest, in front of their heart, with the diagram side facing out. Have them observe that the right atrium is now on their right side, and the left atrium is now on their left side.
7. Ask students to label the left ventricle and the right ventricle. Label the ventricles on the overhead projector for students to see. (Number two should be the right ventricle, and number four should be the left ventricle.)
8. Tell students to keep this diagram so that they can use it to study later.
9. Now that students have learned the function and structure of the heart, tell them that they are going to put their knowledge to use.
10. Pass out the Human Body Corporation worksheet (Appendix B). Read the directions at the top of the page aloud to the students. Read through the steps of writing the letter to the students. Tell students that they will need to write their letter on a separate sheet of paper.
11. Collect letters when students are finished
12. **Special needs adaptations:** Special needs students may choose to write a paragraph describing the function of the heart, instead of a letter.

E. *Assessment/Evaluation*

1. Satisfactory completion of Human Body Corporation letter (use checklist, Appendix C to grade letters)

## **Lesson Two: Blood Structure and Types (approximately 45 minutes)**

### **A. Daily Objectives**

1. Concept Objective(s)
  - a. Students understand the characteristics and structure of living things, the processes of life, and how living things interact with each other and their environment.
  - b. Students understand interrelationships among science, technology and human activity and how they can affect the world.
2. Lesson Content
  - a. The Circulatory System
    - i. Blood
      - a) Red blood cells (corpuscles), white blood cells (corpuscles), platelets, hemoglobin, plasma, antibodies
      - ii. Blood types (four basic types: A, B, AB, O) and transfusions
3. Skill Objective(s)
  - a. Students will identify the components that make up blood.
  - b. Students will create a model of a drop of blood.
  - c. Students will describe the purpose of each component that makes up blood.

### **B. Materials**

1. *A Drop of Blood*, by Paul Showers (optional)
2. Blood Model worksheet (Appendix E), one for each student
3. Blood Vocabulary Sheet (Appendix D), one for each student
4. 22 red hot candies per group of two or three students
5. Approximately one white jelly bean per every four groups of students (each group will need  $\frac{1}{4}$  of a white jelly bean)
6.  $\frac{1}{2}$  cup of corn syrup per group of two or three students
7. One plastic baggy per group of two or three students
8. Two candy sprinkles per group of two or three students
9. Spoon for each student (optional)

### **C. Key Vocabulary**

1. Red blood cells: cells in the blood that carry oxygen and give the blood its color
2. White blood cells: cells in the blood that help fight germs and illnesses
3. Plasma: yellowish liquid in the blood that carries nutrients from your food to the rest of your body
4. Hemoglobin: protein in red blood cells that contains iron and combines with oxygen
5. Platelets: small pieces of cells in blood that help blood clot when skin is cut
6. Antibody: chemical in white blood cells that helps fight disease and illnesses

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

1. Before you begin the lesson, ask the students to raise their hand if they have ever seen blood in real life. (Usually all of them will raise their hands, but you will have to make sure to keep them on topic, as they will want to share their “blood stories”.) Ask them what the blood looked like. Ask them if they know what blood is made up of. Tell them that they will be learning about blood today.
2. Read *A Drop of Blood*, by Paul Showers, to the class. (This is an optional activity.)
3. Tell the class that blood is made up of red blood cells, white blood cells, platelets, hemoglobin, and plasma. Pass out Blood Vocabulary Sheet (Appendix D).

4. Read over the Blood Vocabulary Sheet (Appendix D) with the students. Tell the students that there are many more red blood cells in blood than white blood cells. Tell them that white blood cells are larger.
  5. Tell students that there are four blood types. Ask them if they know what these types are (A, B, AB, and O). Tell them that these types have differences in the red blood cells, so they cannot safely mix the blood in a person's body. Tell them that if someone loses a lot of blood, they can have a blood transfusion. A blood transfusion is the giving of blood from one person to another. You can only get blood from someone who has the same blood type as you.
  6. Tell students that they are now going to make a model of a drop of blood. Put students in groups of two or three. Pass out Blood Model worksheet (Appendix E).
  7. Pass out to each group of students 22 red hot candies, ¼ of a white jelly bean, and two candy sprinkles. Give each student a baggie with ½ cup corn syrup in it. Tell students to write on their worksheet what each of the objects stands for as you tell them. Tell them that the red hots represent red blood cells, the white jelly bean represents white blood cells, the candy sprinkles represent platelets, and the corn syrup represents plasma. Have them put all of the candies in the baggie with the corn syrup.
  8. Discuss with the students the fact that there are many more red blood cells than white blood cells. Have students answer the questions on the worksheet. Collect worksheets when students are finished. You may wish to distribute spoons so that students can eat their blood model.
  9. Have students clean up their blood model and throw away baggies.
  10. **Special Needs adaptations:** Pair special needs students with another student to answer questions on worksheet. For writing-impaired students, have them verbally answer the questions.
- E. *Assessment/Evaluation*
1. Satisfactory completion of Blood Model worksheet (Appendix E), see answer key (Appendix F)

### **Lesson Three: Blood Vessels (approximately 45 minutes)**

- A. *Daily Objectives*
1. Concept Objective(s)
    - a. Students understand the processes of scientific investigation and design, conduct, communicate about, and evaluate such investigations.
    - b. Students understand the characteristics and structure of living things, the processes of life, and how living things interact with each other and their environment.
  2. Lesson Content
    - a. The Circulatory System
      - i. Blood vessels: arteries, veins, capillaries
  3. Skill Objective(s)
    - a. Students will identify the three types of blood vessels.
    - b. Students will distinguish between arteries, veins, and capillaries.
    - c. Students will analyze the function of arteries, veins, and capillaries.
- B. *Materials*
1. One paper towel roll, cut to six inches
  2. One straw, cut to six inches
  3. One piece of 8 ½ by 11 inch paper
  4. Tape

5. Five white circles labeled “oxygen” (you can cut these out of white paper)
  6. Five blue circles labeled “waste” (you can cut these out of blue paper or color white paper)
  7. Stopwatch
  8. ¼ cup sugar or salt
  9. Beaker or measuring cup with spout
  10. Blood Vessel worksheet (Appendix G), one for each student
  11. Appendix H, one copy for the teacher
- C. *Key Vocabulary*
1. Blood vessel: tube-like structure that carries blood throughout the body
  2. Artery: blood vessels that carry blood away from the heart
  3. Vein: blood vessels that return blood to the heart
  4. Capillary: smallest blood vessels that carry blood between arteries and veins
- D. *Procedures/Activities*
1. Ask students if they know what a blood vessel is and what it does (it is a tube-like structure that carries blood throughout the body). Give students a chance to give answers.
  2. Tell students that they will be learning about blood vessels today. Tell them that there are three types of blood vessels: arteries, veins, and capillaries.
  3. Tell students that blood vessels work in the circulatory system to move blood throughout the body. Blood vessels move nutrients and vitamins from the food we eat to other parts of our body so that it can be used. They also carry oxygen and waste materials through the body.
  4. Explain that the body is not filled with blood. Tell students that it runs in tubes that allow nutrients to travel to cells and carries wastes away from cells.
  5. Explain that they carry oxygen for your body to use. Oxygen enters the circulatory system at the lungs, and then is carried to the body through blood vessels. Remind students that red blood cells in the blood vessels actually carry the blood. Tell students that the oxygen is a gas and cannot just travel with the blood. They must have something to carry them. The red blood cells act as a “dump truck”, and transport the oxygen.
  6. Do a quick demonstration of how the red blood cells carry oxygen in the blood vessels. Choose one student to act as the lungs, one to act as an organ, and three students to act as “dump trucks” (red blood cells). Have the student playing the lungs stand on one side of the room, and the student playing the organ stand on the other side of the room. Have the students playing the red blood cells stand between the lungs and the organ. Have the rest of the students make two lines between the lungs and the organ, with the three red blood cells inside the two lines. Give the student playing the lungs five white circles labeled “oxygen”, and give the student playing the organ five blue circles labeled “waste”. Tell the students playing the red blood cells to start moving between the lungs and the organ. If they go to the organ first, they need to pick up a blue circle. If they go to the lungs first, they need to pick up a white circle. They should then keep circling between the lungs and the organ. They should exchange their blue circle at the lungs for a white one, and exchange their white circle at the organ for a blue one. Tell them that they cannot go beyond the boundary of the blood vessel.
  7. After a few minutes, have the students go back to their seats. Ask what would have happened if the blood vessel “wall” had not been there (the red blood cells would not have been able to travel directly between the two organs).
  8. Tell students that we need blood vessels so that our blood is transported correctly in our body. Ask them if they remember the three types of blood vessels

(arteries, veins, capillaries). Explain that arteries are the largest blood vessels. They are the thickest also. They carry blood away from the heart. Explain that veins are smaller than arteries and have thinner walls. Veins carry blood to the heart. Veins have less oxygen in them than arteries which is why they appear blue. Have students look at their wrists and find the blue veins. Explain that capillaries are the smallest blood vessel. Capillaries have very thin walls, and are “leaky”. They allow nutrients and waste to leak out through their thin walls.

9. Tell students that they are going to see a demonstration of how arteries, veins, and capillaries transport blood. Pass out Blood Vessel worksheet (Appendix G).
10. Hold up the paper towel roll, and tell students that this represents an artery. Take the 8 ½ by 11 inch sheet of paper and roll it into a tube that has a diameter of one inch. Tape the tube together. Cut it so that it is six inches long. Tell students that it represents a vein. Show students the straw and tell them that it represents a capillary. Show student the ¼ cup of sugar in a beaker and tell them that it represents blood. Have students complete number one on the Blood Vessel worksheet, which asks them guess which blood vessel will the sugar pass through the quickest.
11. Ask students how long they think it will take for the “blood” to travel through the “artery”. Put a cup under the paper towel roll, and have a student get ready to start the stopwatch. Tell the student to start the stopwatch, and begin pouring the sugar into the paper towel roll. Have the student hit stop as soon as the sugar is completely through the roll. Write the time on the board. Pour the sugar back into the beaker.
12. Ask students how long they think it will take for the “blood” to travel through the “vein”. Put a cup under the paper roll, and have a student get ready to start the stopwatch. As the student begins the stopwatch, pour the sugar through the paper roll. Have the student hit stop when the sugar has passed through. Write the time on the board. Pour the sugar back into the beaker.
13. Ask students how long they think it will take for the “blood” to travel through the “capillary”. Put a cup under the straw, and have the student get ready to start the stopwatch. When they start the stopwatch, begin pouring the sugar through the straw. When it has passed through, have the student hit stop on the stopwatch. Write the time on the board.
14. Have students finish answering the questions on the Blood Vessel worksheet. Discuss with students why arteries would need to be able to pump blood quickly (they carry more blood from the heart), and why capillaries would need more time to carry blood (they need time for nutrients to filter out to cells and for wastes to filter in to be carried away). Clean up the area, and have students pass in worksheet.
15. **Possible extensions:** Students could work in groups and find other objects that represent the three types of blood vessels.

E. *Assessment/Evaluation*

1. Satisfactory completion of Blood Vessel worksheet (Appendix G), see answer key (Appendix H)

**Lesson Four: Blood Flow and Clotting (approximately 45-60 minutes)**

A. *Daily Objectives*

1. Concept Objective(s)
  - a. Students understand the processes of scientific investigation and design, conduct, communicate about, and evaluate such investigations.

- b. Students understand common properties, forms, and changes in matter and energy.
  - 2. Lesson Content
    - a. The Circulatory System
      - i. Blood
        - a) Blood pressure, pulse
        - b) Coagulation (clotting)
  - 3. Skill Objective(s)
    - a. Students will find their pulse in their neck and wrist.
    - b. Students will compare their heart rate before and after exercising.
    - c. Students will determine why heart rate changes with exercise.
    - d. Students will write a story about platelets.
- B. *Materials*
  - 1. Clock or watch
  - 2. Heart Rate Worksheet (Appendix I), one for each student
  - 3. Appendix J, one copy for the teacher
  - 4. Paper and pencil for each student
  - 5. Platelet Story rubric (Appendix K), one copy for each student
- C. *Key Vocabulary*
  - 1. Heart rate: measurement of how fast or slow the heart beats
  - 2. Pulse: the ripple of pressure in the arteries and veins caused by the heartbeat
  - 3. Fibrin: yellow fibers produced by platelets that help a wound clot
- D. *Procedures/Activities*
  - 1. Begin the class by asking students how many of them exercise every day. Tell them that exercise can be running, walking, or even playing games on the playground. Most of them should raise their hands. Ask them if their body feels differently after exercising. Ask them what things are different after exercising, and make a list on the board. (Some will say that their hearts are pounding, or that they are out of breath or tired.)
  - 2. Ask the students what it means when we say our hearts are pounding. (Usually they will say that it feels like their hearts are beating faster.)
  - 3. Write on the board: Do our hearts beat faster after we exercise? Ask students how we can test this idea. If no one comes up with the answer, tell them that we can time our heart rate. Explain that heart rate is how fast the heart beats. Ask students how we can measure our heart rate. (They may say by feeling our hearts and counting, or someone may come up with the word “pulse”.)
  - 4. Write the word “pulse” on the board. Ask students what pulse is. Tell students that pulse is the beating of your heart that you can feel. Explain that you can feel it because when your heart beats, it puts pressure on the veins and arteries, and the pressure causes a pulse.
  - 5. Explain to students that the pulse can be found at several places in the body, but that the most common places are in the wrist and at the neck. Tell students that they can measure their pulse by counting the number of beats per minute. Tell students that when measuring their pulse, they should always use their second and third finger on their hand, not their thumb, because the thumb has a pulse.
  - 6. Have students find the pulse in their neck. Tell them to put their index finger at the outside corner of their eye. Then let their fingers fall, as if they were tears falling down to their neck, right under their jaw. Demonstrate as you give directions. Have them lightly press on the spot until they can feel their pulse.
  - 7. Now have students find the pulse in their wrist. Demonstrate as you explain to students to put their index and middle finger of one hand sideways on the other

- wrist, just below the palm. Have them slide their fingers down slowly, pressing lightly, until they feel the pulse.
8. Tell students that they are going to take their pulse. Have them decide which place, their neck or wrist, is easier for them, and give them a few minutes to find their pulse. While they are finding their pulse, pass out Heart Rate Worksheet (Appendix I). Have students answer the first question on the page, which asks them to write down where they are taking their pulse from.
  9. Tell students that they are going to fill out the chart on number two as they follow the directions that you are giving them. Have students put their fingers on the spot where they are taking their pulse from. Tell them that they are going to count the number of beats in one minute. Use the clock in the classroom or a watch. Give students a countdown from five to begin counting. When one minute is up, tell the class to stop counting. Have them write down their heart rate on the box in number two next to “sitting”.
  10. Now tell students that they are going to exercise, then count their heart rate again. Begin timing, and have students march in place next to their desk. If it is crowded, assign students to places in the classroom. When one minute is up, have students stop and find their pulse. Tell them to begin counting. Time them for one minute, and then have them stop counting, and write down the number on the next box on the chart.
  11. Tell the students to sit down in their chairs or on the floor and rest for one minute. Tell them after the minute they are going to count their heart rate again. After the minute of rest, time the students for one minute, having them count their heart rate again. When the time is up, have them write down the number on the next box on the chart on the Heart Rate Worksheet.
  12. Have the students stand up. Tell them that they are going to run in place for one minute, then take their pulse again. Start them running in place, and then begin timing them. When one minute is up, have them stop running and count their heart rate again. After one minute of counting, have students write the number in the next box on the chart.
  13. Now have students rest again for one minute. After one minute, have them count their pulse again for one minute. When the time is up, have them write down the number on the next box on the chart.
  14. Next, have the students walk around the room for one minute. Tell them that they will take their pulse again after walking. When the minute is up, have them stop where they are at, and find their pulse. Have them begin counting, and time them for one minute. After the minute is up, have them go to their seats and write down the number in the last blank in the box on the chart.
  15. Have students try to answer numbers three, four, and five. After students have answered the questions, discuss with them how their heart rate changed after exercising (it was speeding up after they exercised), how it changed after they rested (it slowed down), and why the heart rate would speed up when exercising (the body needs more oxygen to exercise, so the heart has to pump faster). Refer to Heart Rate Worksheet answer key (Appendix J) if needed.
  16. Explain to students that doctors will often take someone’s blood pressure by putting a cloth tube on a patient’s arm and inflating it. There is a machine hooked up the tube that measures how fast or slow the blood is pumping through the veins. The blood is pushed through the vein at a certain speed and force. The speed and force is measured to give a blood pressure number. Tell students that sometimes people can have high blood pressure if their veins or arteries get clogged with fatty deposits. The blood has to push harder to get through.

17. Ask students what happens if someone falls and cuts their skin. Most kids will probably say that it bleeds. Ask them what happens after about 10 minutes. Most will say that it stops bleeding. Ask them how it stops bleeding (platelets group together to form a clot). Tell them to think back to lesson on blood.
  18. If you don't get platelets mentioned, write the word platelet on the board. Ask students what platelets are (tiny pieces of cells). Tell them that platelets help cuts to stop bleeding by grouping together around the cut and forming a clot. The platelets produce fibrin, which is a thread-like material that forms a bond over the cut.
  19. Have students close their eyes. Tell them to imagine that they are shrinking to the size of a platelet. They are traveling through the blood in their body. The body has a cut and they are traveling toward it to help. They can see the cut up ahead! They can also see hundreds of other platelets rushing to help also. They join the group of platelets to form a bond around the cut skin. With the help of the other platelets, they have stopped the bleeding!
  20. Now tell students to open their eyes. Tell them to get out a piece of paper and a pencil. Tell them that they are going to write down a story of what happened as they were a platelet. Tell them to be creative and describe what it was like to help stop the bleeding. Tell them that the story must be in paragraph form, and it must be at least two paragraphs. They also need to draw a picture to go with their story. Pass out the Platelet Story Rubric (Appendix K) to students and go over how it will be graded. You may give students class time to work on the story or assign it as homework as time allows.
  21. **Special Needs adaptations:** For students unable to walk or march, have them exercise their arms, if possible. For students who are unable to exercise, have them close their eyes and visualize a fun or exciting activity. (This can speed up the heartbeat.) For the writing exercise, have special needs students write one paragraph describing how a platelet works.
  22. **Possible extension:** Have a health instructor or a dietician speak to the class about a healthy heart and diet.
- E. *Assessment/Evaluation*
1. Satisfactory completion of the Platelet story and picture (see Appendix K for grading rubric)

**Lesson Five: Body Filters (approximately 30-45 minutes)**

- A. *Daily Objectives*
1. Concept Objective(s)
    - a. Students understand the processes of scientific investigation and design, conduct, communicate about, and evaluate such investigations.
    - b. Students understand the characteristics and structure of living things, the processes of life, and how living things interact with each other and their environment.
  2. Lesson Content
    - a. The Circulatory System
      - i. Filtering function of liver and spleen
  3. Skill Objective(s)
    - a. Students will describe the function of the liver.
    - b. Students will describe the function of the spleen
    - c. Students will draw an outline of the human body, labeling the liver, heart, and spleen.

B. *Materials*

1. Paper and pencil for each student
2. Drawing Rubric (Appendix L), one copy for each student

C. *Key Vocabulary*

1. Liver: organ in the circulatory system that breaks down red blood cells and distributes nutrients to the body
2. Spleen: organ in the circulatory system that helps the body fight infection, and in babies, produces red and white blood cells

D. *Procedures/Activities*

1. Begin the class by drawing a basic outline of the human body on the board. (It does not have to be done well, just enough so that the students can get an idea of perspective.) Ask a volunteer to come up and draw in the heart, in the correct place (under the left shoulder, a little off from the center). If student is not correct ask someone else to help.
2. Ask students to tell you what they remember about what the heart does in the circulatory system. Discuss for several minutes the function of the heart (pump blood throughout the body), blood vessels (carry blood throughout the body), and where they are located in the body. You do not have to draw the blood vessels in the body, but you may if you wish.
3. Tell students that there is another part to the circulatory system. Ask students if any of them knows what the liver and spleen do in the body. (You may get some guesses or blank stares). Draw on the body outline on the board the approximate location of the liver and spleen. (The liver is located on the right side of the body, under the ribs. The spleen is located on the left side of the body, behind the stomach.)
4. Ask students if they remember what red blood cells do (carry oxygen). Tell students that sometimes red blood cells get damaged or change their shape so that they cannot carry oxygen anymore. These blood cells are taken to the liver. The liver hold about a pint of blood at all times. The liver breaks them down, and they are recycled to create new red blood cells. Tell students that the liver is on the right side of the body, under the ribs and right above the stomach. Have students try to find their liver.
5. Discuss with the class how recycling works. Have students give examples of items that can be recycled (plastic, glass, paper), and describe what happens to them when they are recycled.
6. Have students get with a partner in the class and talk with their partner about what might happen if the damaged red blood cells were not recycled. Give the students a few minutes to discuss, and then generate class discussion about what may happen. Relate it to recycling garbage, and what would happen if garbage could not be recycled. Lead students into a discussion in which they understand that the red blood cells could build up and cause harm to the body if they were not recycled.
7. Next, tell students that the spleen also recycles red blood cells, but it does something else with the circulatory system also. When your body is young, the spleen makes red and white blood cells. When you grow into an adult, the spleen is not necessary anymore, and can be safely removed. The spleen holds white blood cells, and these white blood cells “eat” diseases and old red blood cells that cannot be recycled. Tell students that the spleen is on the left side of the body, behind the stomach. Have students try to find their spleen.
8. Tell students that they are now going to draw the human body. Erase the picture on the board. Make a list on the board of the parts of the body they need to draw.

They should draw the heart, liver, and spleen. Tell them that they need to label the heart, liver, and spleen. Have students write next to each labeled part what that part does. Pass out Drawing Rubric (Appendix L) to students and go over it with them.

9. **Special needs adaptations:** For special needs students, have outlines of the body already prepared, with a drawing of the liver and spleen. Have them label and color the liver and spleen.

E. *Assessment/Evaluation*

1. Correct drawing with labels and function (see Drawing Rubric, Appendix L)

**Lesson Six: Heart Health (approximately 45 minutes)**

A. *Daily Objectives*

1. Concept Objective(s)
  - a. Students understand the characteristics and structure of living things, the processes of life, and how living things interact with each other and their environment.
  - b. Students understand interrelationships among science, technology, and human activity and how they can affect the world.
2. Lesson Content
  - a. The Circulatory System
    - i. Fatty deposits can clog blood vessels and cause a heart attack
3. Skill Objective(s)
  - a. Students will evaluate factors of a healthy heart.
  - b. Students will create a healthy menu using a food pyramid.
  - c. Students will distinguish between healthy and unhealthy foods.

B. *Materials*

1. Healthy Heart handout (Appendix M), one copy for each student
2. Restaurant menu worksheet (Appendix N), one copy for each student
3. Restaurant menu rubric (Appendix O)
4. For each group of four or five students: empty cereal boxes, fruit juice cans, milk cartons, frozen waffle boxes, bread wrappers, canned fruit cans and other food labels
5. Paper and crayons for each group of four or five students

C. *Key Vocabulary*

1. Plaque: fatty lumps of material that build up on the walls of blood vessels
2. Heart attack: situation in which the heart is deprived of oxygen, causing the cells to die
3. Stroke: situation in which a blood vessel ruptures because of pressure building up

D. *Procedures/Activities*

1. Ask students what it means to have a healthy heart. Make a list on the board of the students' suggestions. Ask student if having a healthy heart is important, and why. Review with the class the heart's role in the circulatory system (pump blood throughout the body), and what could happen if the heart is not healthy. Ask students what things can make a heart unhealthy (bad diets, not enough exercise, stress, etc.).
2. Tell the students that doctors have given us a lot ways to keep our hearts healthy. One of the most important ways is by exercising. Ask students why it would be important to exercise (exercising makes the heart beat faster, and makes it stronger).

3. Tell the students that eating healthy foods also keeps our heart healthy. Tell students that to have a healthy heart, they need to eat a variety of foods from all the food groups. Pass out the Healthy Heart handout (Appendix M). Discuss with students the foods in each level of the pyramid. Remind students that the bottom level of the pyramid is the foods you should eat the most of, and the top level is the foods you should have the least of.
  4. Tell students that it is important to eat foods with iron and Vitamin C. Iron is what lets hemoglobin in the blood hold on to oxygen. Vitamin C helps the body get iron from food.
  5. Ask students if a diet high in fat is healthy. They should reply with a no. Have students name foods high in fat, and write them on the board (bacon, French fries, cheeseburgers, fried foods, etc.).
  6. Ask students if they know what fatty foods can do to the body. Discuss with the class how fatty foods can cause plaque to build up on the inside of blood vessels. Ask students what might happen to arteries if the walls get clogged with plaque. (Blood and oxygen cannot get through, and the heart cells would die.) This can cause a heart attack or a stroke. Explain to students that a heart attack is when the heart can no longer pump blood. A stroke is when a blood clot or piece of plaque causes a blood vessel to burst.
  7. Divide the class into groups of four or five. Distribute food containers and labels from a variety of foods to each group. Pass out Restaurant menu worksheet (Appendix N). Tell students that they are going to create a breakfast menu for a restaurant that serves healthy foods. Tell them to use their Healthy Heart handout to create their menu. Tell them that they need to fill out the Restaurant menu worksheet, and also create a sign for their restaurant. Tell them that the sign must indicate that they are a healthy restaurant, and give the title and location of the restaurant.
  8. **Possible extension:** Have students create a menu for lunch and dinner. You could have a healthy food day, and have students bring in healthy foods for the class.
- E. *Assessment/Evaluation*
1. Satisfactory completion of Restaurant menu worksheet (Appendix N), see Restaurant menu rubric (Appendix O)

## VI. CULMINATING ACTIVITY

- A. Circulatory System Summative Evaluation (Appendix P) (use Appendix Q to grade)

## VII. HANDOUTS/WORKSHEETS

- A. Appendix A: The Heart
- B. Appendix B: Human Body Corporation Worksheet
- C. Appendix C: Human Body Corporation Letter Checklist
- D. Appendix D: Blood Vocabulary Sheet
- E. Appendix E: Blood Model Worksheet
- F. Appendix F: Blood Model Worksheet answer key
- G. Appendix G: Blood Vessel Worksheet
- H. Appendix H: Blood Vessel Worksheet answer key
- I. Appendix I: Heart Rate Worksheet
- J. Appendix J: Heart Rate Worksheet answer key
- K. Appendix K: Platelet Story rubric
- L. Appendix L: Drawing rubric
- M. Appendix M: Healthy Heart Handout

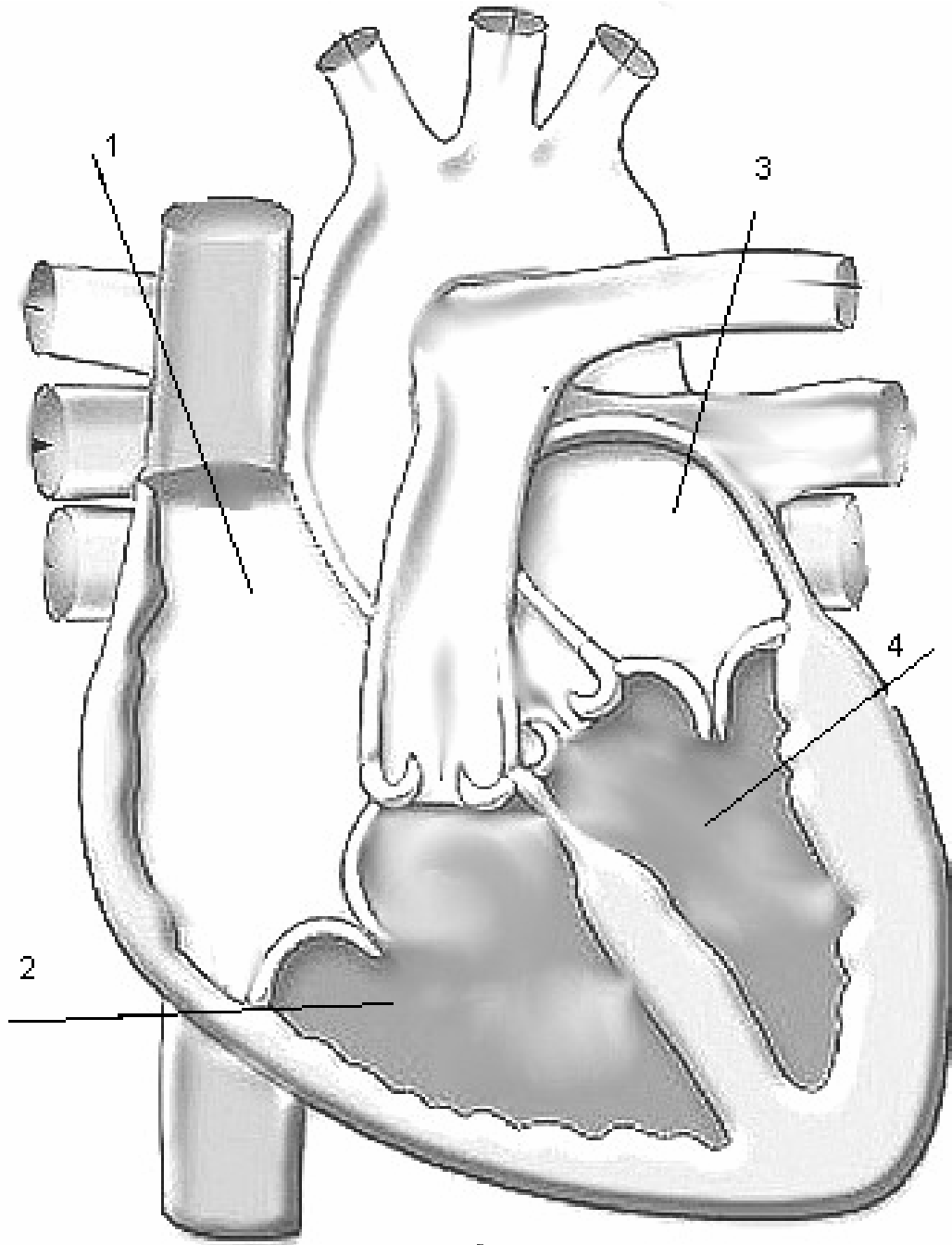
- N. Appendix N: Restaurant Menu Worksheet
- O. Appendix O: Restaurant Menu rubric
- P. Appendix P: Circulatory System Summative Evaluation (six pages)
- Q. Appendix Q: Circulatory System Summative Evaluation answer key (six pages)

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Appendix A

The Heart



*(this picture was adapted from <http://www.tmc.edu/thi/anatomy2.html>)*

## Appendix B

# Human Body Corporation Worksheet

As a body organ, you are an employee of the Human Body Corporation. Due to recent cost increases, the Human Body has to fire workers. You need to write a letter to the Human Body Corporation defending your position in the company. In your letter, you need to describe to the corporation the following characteristics of your organ and explain why you are important to the Human Body Corporation.

1. Tell the name of your organ and where you are located in the body.
2. Identify what system of the body you work with.
3. Describe how you work with this system.
4. List the parts of your organ or describe what your organ looks like inside.
5. Describe your main function as an organ.
6. Tell the corporation how you perform your main function.
7. Tell the corporation why you are important and what could happen if they fire you.

*(this activity was adapted from The Human Body Corporation at <http://www.lessonplanspage.com/TheHumanBodyCorporation.htm>)*

Appendix C

## Human Body Corporation Letter Checklist

	<b>Yes</b>	<b>No</b>
<b>Named organ and told where it was located</b>		
<b>Identified the body system the organ works with</b>		
<b>Described how the organ works with this system</b>		
<b>Listed the parts of the organ.</b>		
<b>Described the main function as an organ</b>		
<b>Told corporation how they performed the functions of the organ</b>		
<b>Told corporation why they are important</b>		
<b>Wrote letter in correct format</b>		
<b>Signed their name</b>		
<b>Wrote letter neatly</b>		

## Appendix D

# Blood Vocabulary Sheet

**Red blood cells:** cells in the blood that carry oxygen and give the blood its color

**White blood cells:** cells in the blood that fight germs and illnesses

**Plasma:** yellowish liquid in the blood that delivers nutrients from your food to the rest of your body

**Hemoglobin:** a protein in red blood cells that contains iron and combines with oxygen

**Platelets:** small pieces of cells that float in the blood and cause blood to clot at a cut in the skin

**Antibody:** chemical produced by white blood cells which helps kill organisms that cause diseases and illnesses

## Appendix E

# Blood Model Worksheet

1. Follow the teacher's directions to create your model of a drop of blood. Answer the following questions based on your model.
2. What does each of the following represent in the model of a drop of blood?  
Red hots \_\_\_\_\_  
Corn syrup \_\_\_\_\_  
White jelly bean \_\_\_\_\_  
Sprinkles \_\_\_\_\_
3. Why do you think you need more red blood cells than white blood cells?
4. What do the platelets do to help your body?
5. What do you think it would mean if you had a lot more white blood cells than usual in your blood?

*(this activity was adapted from Blood, an activity at <http://student.biology.arizona.edu/sciconn/blood/teachernotes.html>)*

## Blood Model Worksheet Answer Key

1. Follow the teacher's directions to create your model of a drop of blood. Answer the following questions based on your model.
2. What does each of the following represent in the model of a drop of blood?  
Red dots red blood cells  
Corn syrup plasma  
White jelly bean white blood cells  
Sprinkles platelets
3. Why do you think you need more red blood cells than white blood cells?  
**Red blood cells carry oxygen, which your body needs all the time, while white blood cells only help your body when you are sick.**
4. What do the platelets do to help your body?  
**Platelets help your blood clot when you cut your skin. Without them, you would never stop bleeding.**
5. What do you think it would mean if you had a lot more white blood cells than usual in your blood?  
**It would mean that you are sick.**

Appendix G

## Blood Vessel Worksheet

1. Which blood vessel do you think the blood passes through the quickest? Why?
2. Write down the times that the sugar takes to pass through the "blood vessels".  
Artery\_\_\_\_\_   
Vein\_\_\_\_\_   
Capillary\_\_\_\_\_
3. Which blood vessel had the quickest time for the sugar to pass through? Why?
4. Which blood vessel had the slowest time for the sugar to pass through? Why?
5. Why do you think vessels with the slowest time allow the blood more time to move through them?

Appendix H

## Blood Vessel Worksheet Answer Key

1. Which blood vessel do you think the blood passes through the quickest? Why?  
**Artery, because it carries more blood so it needs to move quickly**
  
2. Write down the times that the sugar takes to pass through the "blood vessels".  
Artery\_\_\_\_\_   
Vein\_\_\_\_\_   
Capillary\_\_\_\_\_
  
3. Which blood vessel had the quickest time for the sugar to pass through? Why?  
**Artery, because it was larger and had more room for the sugar to pass.**
  
4. Which blood vessel had the slowest time for the sugar to pass through? Why?  
**Capillaries, because the straw is small and thin**
  
5. Why do you think vessels with the slowest time allow the blood more time to move through them?  
**Capillaries need time for nutrients to filter out, and for wastes to filter in to be carried away**

## Appendix I

### Heart Rate Worksheet

1. Which place in your body are you taking your pulse from?
2. Fill out the chart below as your teacher directs you.

Action	Heart Rate
Sitting	
After marching for one minute	
After resting for one minute	
After running in place for one minute	
After resting for one minute	
After walking around the room for one minute	

3. How did your pulse change when you exercised?
4. Did your pulse change after resting for one minute after exercising? How?
5. Why would your heart have to beat faster when you exercise?

Appendix J

## Heart Rate Worksheet Answer Key

1. Which place in your body are you taking your pulse from?  
**Student will either have written down "neck" or "wrist"**
2. Fill out the chart below as your teacher directs you.  
**Answers will vary depending on student.**

Action	Heart Rate
Sitting	
After marching for one minute	
After resting for one minute	
After running in place for one minute	
After resting for one minute	
After walking around the room for one minute	

3. How did your pulse change when you exercised?  
**It sped up after exercising.**
4. Did your pulse change after resting for one minute after exercising? How?  
**Yes, it slowed down after resting.**
5. Why would your heart have to beat faster when you exercise?  
**When you exercise, you need more oxygen, so your heart beats faster to provide your body with oxygen.**

Appendix K

**Story Writing: Platelet Story**

Student Name: \_\_\_\_\_

<b>CATEGORY</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>
<b>Accuracy of Facts</b>	All facts presented in the story are accurate.	Almost all facts presented in the story are accurate.	Most facts presented in the story are accurate (at least 70%).	There are several factual errors in the story.
<b>Neatness</b>	The final draft of the story is readable, clean, neat and attractive. It is free of erasures and crossed-out words. It looks like the author took great pride in it.	The final draft of the story is readable, neat and attractive. It may have one or two erasures, but they are not distracting. It looks like the author took some pride in it.	The final draft of the story is readable and some of the pages are attractive. It looks like parts of it might have been done in a hurry.	The final draft is not neat or attractive. It looks like the student just wanted to get it done and didn't care what it looked like.
<b>Illustrations</b>	Original illustrations are detailed, attractive, creative and relate to the text on the page.	Original illustrations are somewhat detailed, attractive, and relate to the text on the page.	Original illustrations relate to the text on the page.	Illustrations are not present OR they are not original.
<b>Creativity</b>	The story contains many creative details and/or descriptions that contribute to the reader's enjoyment. The author has really used his imagination.	The story contains a few creative details and/or descriptions that contribute to the reader's enjoyment. The author has used his imagination.	The story contains a few creative details and/or descriptions, but they distract from the story. The author has tried to use his imagination.	There is little evidence of creativity in the story. The author does not seem to have used much imagination.

Total score \_\_\_\_\_/16

## Appendix L

# Drawing Rubric

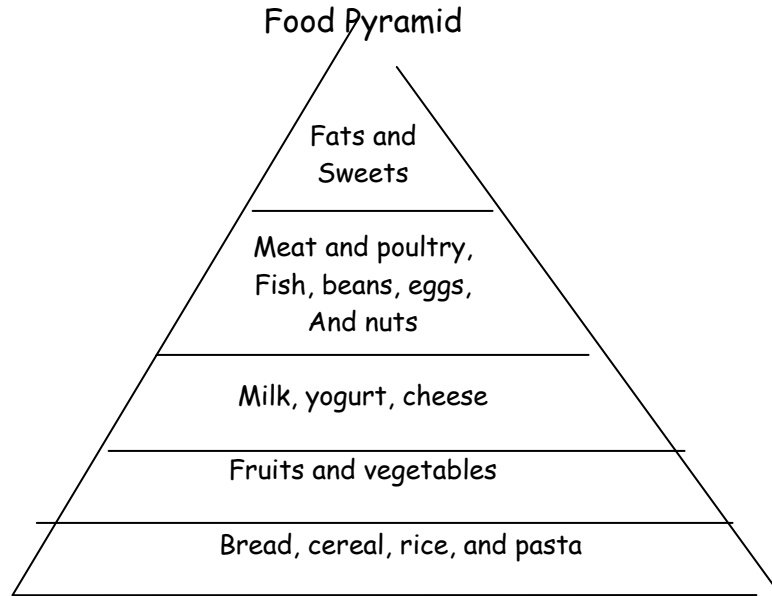
Student Name: \_\_\_\_\_

CATEGORY	4	3	2	1
<b>Labels</b>	Every item that needs to be identified has a label. It is clear which label goes with which structure.	Almost all items (90%) that need to be identified have labels. It is clear which label goes with which structure.	Most items (75-89%) that need to be identified have labels. It is clear which label goes with which structure.	Less than 75% of the items that need to be identified have labels OR it is not clear which label goes with item.
<b>Drawing - details</b>	All assigned details have been added. The details are clear and easy to identify.	Almost all assigned details (at least two) have been added. The details are clear and easy to identify.	Almost all assigned details (at least 1) have been added. A few details are difficult to identify.	None of the details are present OR most details are difficult to identify.
<b>Spelling</b>	All words are spelled correctly in the title, labels and caption/description.	All common words are spelled correctly in the title, labels and description. One-two scientific words may be misspelled.	75% of the words are spelled correctly in the title, labels, and description.	Fewer than 80% of the words are spelled correctly in the title, labels, and description.

Total \_\_\_\_\_/12

## Appendix M

# Healthy Heart Handout



### Low-Fat Foods

apples	apple juice
bananas	cherries
hot cocoa with skim milk	
egg whites	grapefruit
melons	skim milk
oatmeal	orange juice
pears	peaches
rice	raisins
wheat cereal	

### Healthy Heart Tips

1. Get plenty of exercise.
2. Eat a balanced diet.
3. Limit fat in your diet.
4. Eat foods high in iron.
5. Keep your heart drug free.

**Foods high in Iron:** beef, pork, chicken, turkey, fish, dried fruit, cereal

**Foods high in Vitamin C:** oranges, grapefruit, strawberries, broccoli, cauliflower

*(this activity was adapted from the Academy Handbook Fourth Grade, "Circulatory System, Lesson 27)*

## Appendix N

# Restaurant Menu

1. What is the name of your restaurant?
2. Make a list of foods that your restaurant will serve:
3. Put together some simple meals that are healthy, such as cereal and fruit combos. List at least three choices.
4. Now, on a white sheet of paper, create a menu for your restaurant with meal choices and side dishes. Add prices to each meal. List at least three meal choices and three side dishes or extras. Use color and pictures.

*(this activity was adapted from the Academy Handbook Fourth Grade, "Circulatory System, Lesson 27)*

Appendix O

**Restaurant Menu Rubric**

Student Name: \_\_\_\_\_

<b>CATEGORY</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>
<b>Content - Accuracy</b>	All foods in the brochure are healthy.	99-90% of the foods in the brochure are healthy.	89-80% of the foods in the brochure are healthy.	Fewer than 80% of the foods in the brochure are healthy.
<b>Attractiveness and Organization</b>	The menu has exceptionally attractive formatting and well-organized information.	The menu has attractive formatting and well-organized information.	The menu has well-organized information.	The menu's formatting and organization of material are confusing to the reader.
<b>Graphics/ Pictures</b>	Graphics go well with the text and there is a good mix of text and graphics.	Graphics go well with the text, but there are so many that they distract from the text.	Graphics go well with the text, but there are too few and the brochure seems "text-heavy".	Graphics do not go with the accompanying text or appear to be randomly chosen.
<b>Poster</b>	Restaurant poster is neat, states the name of the restaurant and location, and has good use of color.	Restaurant poster is neat, and states the name of the restaurant and location and has moderate use of color.	Restaurant poster is fairly neat, and states the name of the restaurant OR the location, and uses color.	Restaurant poster is messy, only states either the name of restaurant or location, and does not use color well.

**Total \_\_\_\_\_/16**

## Circulatory System Summative Evaluation

Name \_\_\_\_\_ Date \_\_\_\_\_

**Section I. Knowledge (each question worth one point, with a total of 10 points.)**

Use the words in the list below to fill in the blanks. Make sure each sentence is capitalized.

atrium                      ventricle                      red blood cell                      white blood cell  
hemoglobin                      platelet                      artery                      vein  
capillary                      pulse

1. The \_\_\_\_\_ is the measurable movement in a vein or artery caused by pressure from a heart beat.
2. When blood is carried away from the heart, it travels through a/an \_\_\_\_\_.
3. This chamber of the heart, called the \_\_\_\_\_, is in the lower part of the heart, and pumps blood to the lungs or around the body.
4. This protein in red blood cells, called \_\_\_\_\_ contains iron and combines with oxygen.
5. The upper chamber of the heart, which receives blood from the body or lungs, is the \_\_\_\_\_.
6. \_\_\_\_\_ help the blood to clot.
7. The \_\_\_\_\_ are cells in the blood that carry oxygen and give the blood its color.

Appendix P, page 2

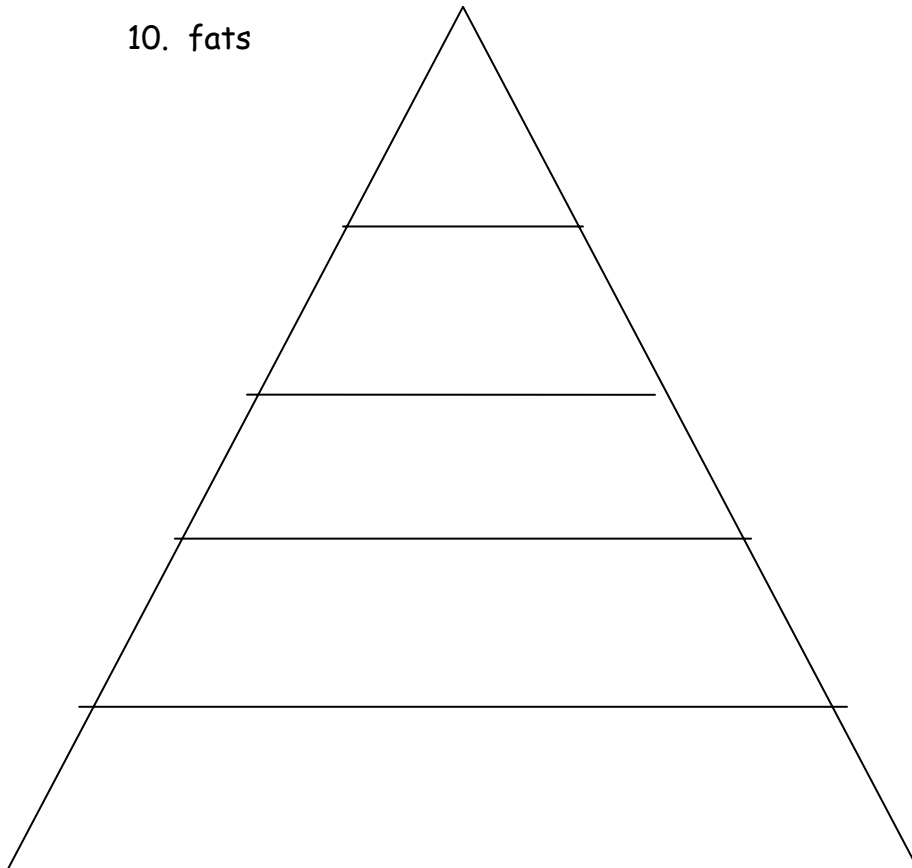
- 8. The smallest blood vessel is the \_\_\_\_\_.
- 9. A \_\_\_\_\_ carries blood to the heart.
- 10. The cells in the body that help fight germs and illnesses are the \_\_\_\_\_.

**Section II. Comprehension (each food is worth one point, with a total of 10 points.)**

**On the pyramid below, classify each type of food given by placing it in the correct level in the pyramid. You can have more than one food in each level.**

**Types of food:**

- 1. bread                      2. milk                      3. eggs                      4. cereal
- 5. sweets                      6. cheese                      7. vegetables                      8. fruit
- 9. fish                      10. fats



Appendix P, page 3

**Section III. Application (each question worth 2 points, with a total of 4 points)**

**0= blank or totally wrong    1= partially right    2= completely right**

1. Predict what would happen, and what it would mean, if your body had many more white blood cells than it needed.

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2. Explain what can happen if plaque builds up on the inside of an artery.

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**Section IV. Analysis (each question worth 2 points, with a total of 8 points)**

**0= blank or totally wrong    1= partially right    2= completely right**

1. Compare arteries, veins, and capillaries. Discuss size and use.

**Appendix P, page 4**

2. Draw an outline of the human body, and draw and label where the heart, liver, and spleen are located.

3. Identify three ways to have a healthy heart.

4. Separate the following foods into the chart below as either healthy or unhealthy.

strawberries      milk      cake      caffeine      tomato  
eggs      candy      chicken

Healthy	Unhealthy



**Section VI. Evaluation (worth 8 points)**

**Pretend you are a platelet. You are living inside a blood vessel. Suddenly, someplace on the body gets cut. Use your knowledge of platelets to describe what your role would be, and how you would do it. Be creative, and write in paragraph form. Explain what you would do, and if you would do it alone or need help.**

**2 points for how the platelet would get to the cut**

**2 points for where the cut is found**

**2 points for how the platelet helps**

**2 points for correct paragraph form and grammar, punctuation, spelling**

## Circulatory System Summative Evaluation Answer Key

Name \_\_\_\_\_ Date \_\_\_\_\_

**Section I. Knowledge (each question worth one point, with a total of 10 points.)**

Use the words in the list below to fill in the blanks. Make sure each sentence is capitalized.

atrium                      ventricle                      red blood cell                      white blood cell  
hemoglobin                      platelet                      artery                      vein  
capillary                      pulse

1. The pulse is the measurable movement in a vein or artery caused by pressure from a heart beat.
2. When blood is carried away from the heart, it travels through a/an artery.
3. This chamber of the heart, called the ventricle, is in the lower part of the heart, and pumps blood to the lungs or around the body.
4. This protein in red blood cells, called hemoglobin contains iron and combines with oxygen.
5. The upper chamber of the heart, which receives blood from the body or lungs, is the atrium.
6. Platelets help the blood to clot.
7. The red blood cells are cells in the blood that carry oxygen and give the blood its color.

Appendix Q, page 2

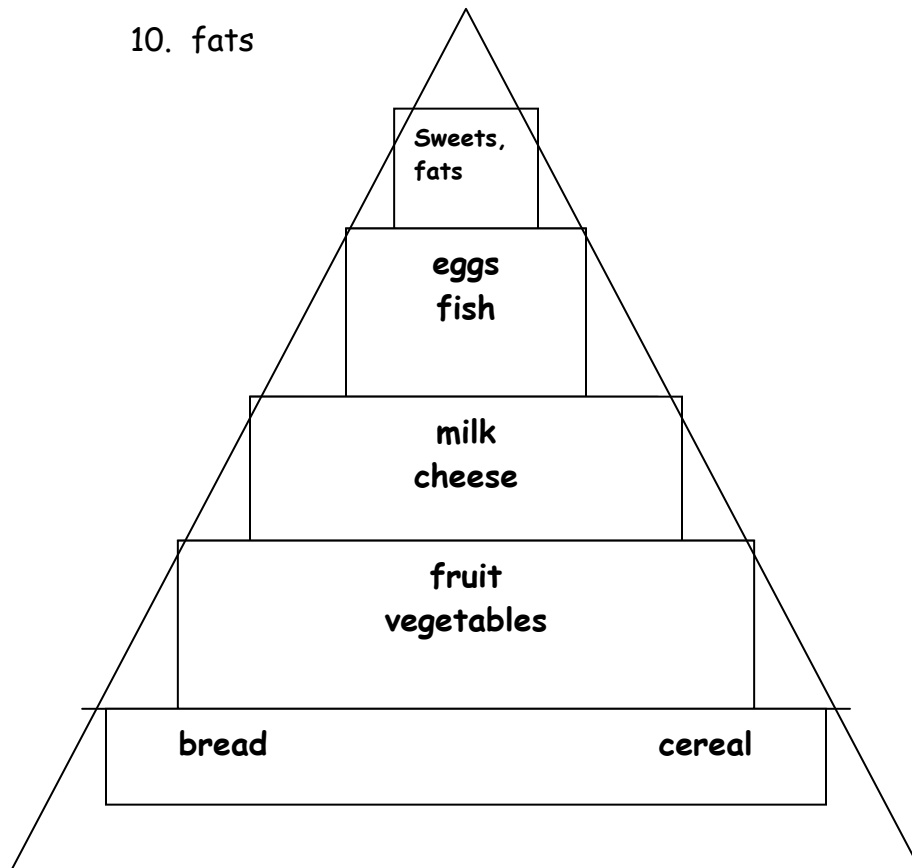
- 8. The smallest blood vessels is the capillary.
- 9. A vein carries blood to the heart.
- 10. The cells in the body that help fight germs and illnesses are the white blood cells.

**Section II. Comprehension (each food is worth one point, with a total of 10 points.)**

On the pyramid below, classify each type of food given by placing it in the correct level in the pyramid. You can have more than one food in each level.

**Types of food:**

- 1. bread
- 2. milk
- 3. eggs
- 4. cereal
- 5. sweets
- 6. cheese
- 7. vegetables
- 8. fruit
- 9. fish
- 10. fats



Appendix Q, page 3

**Section III. Application (each question worth 2 points, with a total of 4 points)**

**0= blank or totally wrong    1= partially right    2= completely right**

1. Predict what would happen, and what it would mean, if your body had many more white blood cells than it needed.

**If your body had more white blood cells, then it would be fighting an infection. You would feel sick. Your white blood cells would be producing antibodies, and you would get better.**

2. Explain what can happen if plaque builds up on the inside of an artery.

**If plaque builds up, then it can clog the artery. It can cause pressure to build up and cause a heart attack. The heart will stop beating and stop getting oxygen. It could also cause the artery to burst, causing a stroke.**

**Section IV. Analysis (each question worth 2 points, with a total of 8 points)**

**0= blank or totally wrong    1= partially right    2= completely right**

1. Compare arteries, veins, and capillaries. Discuss size and use.

**Arteries are the largest blood vessel. They carry the most blood, and they carry it away from the heart. Veins are the next largest. They carry blood to the heart from the lungs or body. Capillaries are the smallest blood vessel. They are very thin, and allow nutrients and oxygen to be transferred through their walls.**

Appendix Q, page 4

2. Draw an outline of the human body, and draw and label where the heart, liver, and spleen are located.

Drawings will vary, but the heart should be located under the left shoulder, a little off center. The liver should be located on the right side of the body, under the ribcage, and on top of where the stomach would be. The spleen is on the left side, and would be behind where the stomach would be.

3. Identify three ways to have a healthy heart.

Eat a variety of foods from the food pyramid. Exercise, and eat foods high in iron and Vitamin C.

4. Separate the following foods into the chart below as either healthy or unhealthy.

strawberries      milk      cake      caffeine      tomato  
eggs      candy      chicken

Healthy	Unhealthy
Strawberries	Cake
Milk	Caffeine
Tomato	Candy
Eggs	
Chicken	

**Section V. Synthesis (worth five points)**

Think about the experiment we did in class, in which we used paper towel rolls, a rolled up piece of paper, and a straw to represent blood vessels. Choose three objects to represent the three types of blood vessels. (You may use the paper towel roll, paper, and straw, or you may choose three different objects.) Explain which object represents which blood vessel (artery, vein, capillary), and tell why it represents that blood vessel.

1 point for object for artery

1 point for object for vein

1 point for object for capillary

2 points for correctly explaining how they represent that blood vessel

Arteries should be the largest (paper towel roll) because they carry more blood. The paper towel roll is the largest in diameter.

Veins should be in between arteries and capillaries (rolled-up paper). They carry more blood than capillaries, but less than arteries. They rolled up paper is only one inch in diameter.

Capillaries are the smallest (straw), because they can only carry one blood cell in diameter. The straw is the smallest in diameter.

**Section VI. Evaluation (worth 8 points)**

Pretend you are a platelet. You are living inside a blood vessel. Suddenly, someplace on the body gets cut. Use your knowledge of platelets to describe what your role would be, and how you would do it. Be creative, and write in paragraph form. Explain what you would do, and if you would do it alone or need help.

2 points for how the platelet would get to the cut

2 points for where the cut is found

2 points for how the platelet helps

2 points for correct paragraph form and grammar, punctuation, spelling

**Sample Answer:**

**I was in my blood vessel, when suddenly I heard a shout. There was a cut in the skin in the knee, and blood was escaping! I jumped in the blood flow in my vein, traveling through the veins and capillaries to get to the knee. When I got there, there were hundreds of other platelets joining hands to form a bond to stop the bleeding. We all produced fibrin, a thread-like substance and joined together. After a few minutes, the bleeding slowed down. We patched the cut with our fibrin, then traveled back to our homes.**