

GRADE 6: LESSON PLAN 1

ANATOMY: HOW DOES THE CARDIOVASCULAR SYSTEM WORK?

Goals

- Students will understand the basic anatomy and functions of the cardiovascular system.
- Students will understand the function of the blood within the circulatory system.
- Students will identify parts of the cardiovascular system according to the levels of organization

Instructional objectives

Students will be able to

1. Describe the basic functions of the heart and circulatory system that make up the cardiovascular system.
2. Describe the anatomy and function of the blood.
3. Trace the path of a blood cell through the cardiovascular system.
4. Discuss how to keep the cardiovascular system healthy.

Background information

The Cardiovascular (CV) System

Your heart and circulatory system make up the cardiovascular system. The walls of the heart are a special muscle known as cardiac muscle. The conduction system causes that cardiac muscle to beat, pumping blood to the organs, tissues, and cells of your body.

The one-way circulatory system carries blood to all parts of your body. Blood delivers oxygen and nutrients to every cell and removes carbon dioxide and waste products. Blood is carried from your heart to the rest of your body and back again through a complex network of vessels (arteries and veins). Arteries carry oxygen-rich blood away from your heart and veins carry oxygen-poor blood back to your heart. (In pulmonary circulation, though, the roles are reversed. It is the pulmonary artery that brings oxygen-poor blood into your lungs and the pulmonary vein that brings oxygen-rich blood back to your heart.) Twenty major arteries branch into smaller vessels called arterioles. Arterioles further branch into capillaries. Most capillaries are thinner than a hair, so tiny that only one blood cell can move through them at a time. Once the capillaries deliver oxygen and nutrients and pick up carbon dioxide and other waste, they move the blood back through wider vessels called venules. The venules join to form veins, which deliver the blood back to your heart, and sends the blood to the lungs to pick up oxygen.

The Blood

Blood is actually a tissue made of about 80% liquid. Plasma is the yellowish liquid in the blood that carries the blood cells. Plasma is mostly water, but it also contains proteins, salts, sugar (glucose), and other substances. Proteins in plasma carry important nutrients to the body's cells and strengthen the body's immune system so it can fight off infection. The solids in the blood are cells. Each of the three main types of blood cells circulates within the plasma:

- Platelets (also called thrombocytes) help the blood to clot (thicken and stop flowing).
- Red blood cells (also called erythrocytes) carry oxygen and are the most plentiful.
- White blood cells (also called leukocytes) ward off infection. When the body is fighting infection, it makes them in ever-increasing numbers (an important part of the immune system at work). Still, most healthy adults have about 700 times as many red blood cells as white ones.

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Blood carries oxygen from the lungs and nutrients from the digestive tract to the body's cells. It also carries away carbon dioxide and all of the waste products that the body does not need. (The kidneys filter and clean the blood.) Blood also

- Helps keep your body at the right temperature
- Carries hormones to the body's cells
- Sends antibodies to fight infection
- Contains clotting factors to help the blood to clot and the body's tissues to heal

Materials

1. Illustration: The City Map (Activity 6–A)
2. Illustrations: Heart Anatomy
(for review: PDFs from *Look: Heart Anatomy*)
3. Illustrations: The Circulatory System
(PDFs from *Look: Circulatory System*)
4. Illustration: The Blood
(PDF from *Look: Circulatory System*)
5. Worksheet: “The Body Map” (Activity 6–B)
6. Worksheet: “The Blood Cells” (Activity 6–C)
7. Worksheet: “Why I Don’t Smoke” Extension
(Activity 6–D)
8. Optional: Classroom computer with Internet access
 - Project Heart, Look, Circulatory System, *Blood Vessels of the Heart: Coronary Arteries (Flash)*
 - Project Heart, Listen, Heartbeats

Introduction

Place illustrations of *The City Map* and *The Circulatory System* at the front of the room. If you have Internet access, display *The Circulatory System* found under the *Look* tab of the Project Heart website. Begin your discussion by asking students if they have ever helped their family or friends use a road map to travel in and out of the city. Referring to *The City Map* illustration, explain that all traffic moves in and out of the city by way of the roadways, and that many of those roadways are one-way streets. Vehicles travel into town to pick up fuel and groceries (nutrients), and take them home to use. Explain to students downtown is often called the “heart of the city” because it is the center of activity.

Discussion points

- How do people travel?
- Is every roadway the same size?
- Why do people need to travel into town?

- What fuel or nutrients do people need to pick up?

Lesson procedures/activities

1. Begin the lesson by comparing the city map to the circulatory system. Blood cells (like vehicles) travel one-way paths called veins (roadways) to the heart and lungs, where they drop off waste (like recycling), and pick up oxygen and nutrients (like fuel and food). When the nutrient- and oxygen-rich blood travels back out to the cells (home), it goes by way of another set of one-way paths called arteries (roadways). To help students relate to the concept, point out that the state department of transportation calls major city streets arteries. Ask students for some other examples of heart-related terms used to refer to something other than the cardiovascular system.

Explain that the cardiovascular system is made up of the heart and the circulatory system. If necessary, review the basic anatomy of the heart and circulatory system. Refer back to *The City Map* illustration, explain the heart's role as traffic director in the pick up and delivery system.

2. Ask students to compare the anatomy and function of veins and arteries by having them discuss the role of each in the circulatory system. As independent practice, have students write and illustrate a 1-page report reviewing both types of blood vessels. (Students should discover that arteries are stronger, have thicker walls, and do not have valves like veins do.)
3. Discuss the anatomy of the blood and the role it plays in the body. The blood moves through the cardiovascular system delivering fuel and nutrients to, and removing waste from, every cell in the body. As independent practice, have students complete the worksheet “The Body Map” (Activity 6–B).

Review 3 types of blood cells (red, white, and platelets) and discuss each cell's role in the health of the body. Refer to the illustration, *The Blood* (PDF in Project Heart, Look, Circulatory System). Ask students to complete the worksheet “The Blood Cells” (Activity 6-C).

Review the levels of organization: cell—tissue—muscle—organ—organ system—organism—population. Use the

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heart as your organ. This will be a good review of the cardiovascular system and help students understand the levels of organization in the body and in their community. The concept of circulation is repeated at every level from cell to solar system.

Guided Practice

Break the students into groups and assign each group a specific type of blood cell. Ask them to research the following questions:

- a) What is the function of this specific type of cell?
- b) How many of this specific cell type are in the body?
- c) What is the relative size of this specific blood cell type?
- d) How is this specific blood cell type different from others?
- e) How long does this specific type of blood cell live?

Ask the groups to draw the blood cell and list all its characteristics and functions. Guide students in thinking about the cell as it relates to keeping a body healthy (specifically the heart). Posters can be used to present materials to the class. If the classroom has a mini-computer lab, students may want to develop PowerPoint presentations, using materials they find online at the Project Heart website. Be sure to check out the “Look” section for resources and the “Suggested Links” page for additional research sites.

Adaptations

Students who have difficulty with writing may have

their assignments adapted by allowing them to verbalize, demonstrate, or illustrate their responses.

Extensions

1. Provide a list of terms from this lesson plan. Ask students to make their own crossword puzzles by defining the terms and using the definitions as clues. Remind students to design the puzzle layout so that each term crosses at least 2 other terms.
2. Ask students to research how smoking affects the heart and blood vessels. Point out that smoking increases the risk of heart and peripheral vascular disease (PVD). Nicotine and other chemicals in cigarettes narrow the blood vessels, can create irregularities in the timing of heartbeats, and can lead to a buildup of fatty plaque that clogs the arteries. (Plaque is a buildup of substances such as cholesterol and calcium on the blood vessel walls. Plaque eventually causes the inside of the artery to narrow, making it difficult for blood to flow through.) In addition, smoking interferes with the blood cell’s ability to deliver oxygen to the heart and other organs. All these effects cause the heart to work too hard. Using the worksheet “Why I Don’t Smoke” (Activity 6–D) as a basis, ask students to create posters addressing the risks of smoking. Share the posters with other students and other classrooms. This is an excellent opportunity for you to correlate cardiovascular system anatomy with health issues in the school community and beyond.

Assessment

You may use observations of students during class activities and responses for written activities to determine their understanding of the lesson objectives.

Objective	Demonstrated lesson objective	Partially demonstrated lesson objective	Did not demonstrate understanding of the objective
Describe the basic function of the circulatory system.	X		
Describe the basic function of the cardiovascular system.		X	
Describe the anatomy and function of the blood.		X	
Trace the path of a blood cell through the cardiovascular system.			X
Discuss how to keep the cardiovascular system healthy.	X		

GRADE 6: LESSON PLAN 2

NUTRITION: HOW DO I CHOOSE THE RIGHT FOODS?

Goal

Students will understand the importance of the right food choices in maintaining a healthy body.

Instructional Objectives

Students will be able to

1. Differentiate between healthy and unhealthy eating habits.
2. Explain the importance of a long-term healthy eating plan.
3. Choose healthy foods.

Background Information

Teaching students how to make heart-healthy lifestyle choices should include information about how proper nutrition is balanced with exercise. Specific components include choosing healthy foods, consuming appropriate portion sizes, understanding calorie requirements, determining a healthy weight, and establishing healthy eating habits to carry into adulthood. Students should understand that the decisions they make now affect their future health and well-being.

Before the new MyPlate system was developed, experts' opinions differed on how to design a balanced diet. The old food guide pyramid was inadequate, based on the "one-size fits all" approach to healthy eating and neglecting the exercise factor. MyPyramid (2005) addressed dietary needs based on age, gender, and level of activity. The new MyPlate system (2011) helps people better understand portion size by using a place setting to represent five food groups: grains, vegetables, fruits, dairy, and protein. MyPlate takes into account the variety of foods that are in each group, portion sizes, recommended quantity, and health benefits.

The body needs energy to function and food provides that energy. Too much food (calories in) and not enough exercise (expended energy or calories out) can contribute to weight gain and eventually to an unhealthy heart. Each food has a specific amount of energy to give to the body, measured in calories. Each person needs a different number of calories to function, depending on factors like age, body composition, and level of activity. Counting calories may first appear to be old fashioned, but it is the best way to demonstrate the basic principle of balancing energy in with energy out. For example, the average adult must expend (burn off) 3500 calories worth of energy to lose a single pound of body weight.

There are several ways to determine proper body size, but one commonly used method is body mass index (BMI), a formula to assess body weight in relation to height. The BMI gives a measure of body composition and has been shown to be an effective predictor of body fat.

Materials

- 24-hour food diary recorded before studying the lesson.
- Internet connection in the classroom and/or for individual students.
- Materials and programs accessed through or downloaded from MyPlate website.
Example: <http://www.cnpp.usda.gov/Publications/MyPlate/GraphicsSlick.pdf>.

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Preliminary Preparation

A day or two before beginning this lesson, ask students to record a 24-hour food diary: pick a weekday and list every item of food or beverage consumed (with approximate serving size) during a 24-hour period. Do not give any nutrition advice when making the preliminary assignment; you need actual nutritional trends (eating habits) from the students. Have those diaries available in class when you begin this lesson.

Lesson Introduction

In previous lessons, we introduced the idea of the importance of nutrition for athletes. Good nutrition, exercise, and proper conditioning helps them function at their optimum level. Begin your lesson discussion by asking students if it is more important for an athlete to be in good condition, eat right, and exercise than it is for students. Lead them to understand that the decisions they are currently making regarding their eating and activity habits will influence their lives as adults. A balanced diet with lots of fruits and vegetables is a very important aspect of developing good habits into adulthood.

Direct the discussion to the body's energy needs. The body needs energy to function; food provides that energy. Too much food (energy) and not enough exercise (expended energy) can contribute to weight gain and eventually to an unhealthy heart. Each food has a specific amount of energy to give to the body; this energy is measured in calories. (Calorie – a unit of energy-producing potential.)

Every individual needs a different number of calories to function. Counting calories is one of the best ways to determine if you are keeping the right balance between calories in and calories out, a balance that is important to maintaining a healthy weight. (Excess calories can be stored in your body as fat cells and your body must expend (burn off) 3500 calories (energy) to lose a pound of body weight.)

Using an internet connection, refer to the Body Mass Index calculator located at: http://www.texasheart.org/HIC/Topics/HSmart/bmi_calculator.cfm. Allow students to calculate their BMI to give them insight into their height/weight proportion. (This may be a subject that needs to be

handled with caution and sensitivity; use your judgment before assigning the task to your students. Allow them to keep their results private if they wish.)

Compare the energy needs of individuals with different activity levels: the computer programmer who sits for hours at a time intensely thinking while doing his job or the expert mountain climber who guides expedition tours. Consider also the climate the individual works or lives in. The computer programmer is probably sedentary, working in an air-conditioned office. The mountain climber, on the other hand, is very active, working outside in a changing climate; perhaps beginning her climb in a warm climate and ascending to the icy cold, snow-covered mountaintop. Who uses more energy? What are the calorie needs for each of them? Would they eat different foods?

Refer to the website, www.choosemyplate.gov. Review each of the food groups: grains, vegetables, fruits, dairy, and protein.

Ask students to locate the MyPlate Daily Food Planner and determine their daily nutritional requirements. A new page will open with the particular requirements for that profile. Under the "View, Print, and Learn More" section in the right column, students can print their results, along with a meal tracking worksheet.

Ask students to experiment by changing the amounts of activity on the MyPlate Daily Food Planner to determine how increased activity relates to nutritional requirements. (For example, if they exercise more each day can they eat more?) Ask them to retain all of their printed information for the independent assignments.

Guided Practice

Most 6th grade students choose their own meals when ordering from the cafeteria, snack bar, or fast-food menu. Divide students into small groups to address the question of what to order when they are at the snack bar or fast-food restaurant. If Internet access is available, students can go to the website for a fast-food restaurant chain such as McDonalds, Burger King, KFC, or Subway and look for nutritional information. (Alternatively, most chains provide printed information about their food.) Using one

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of the websites, find the nutritional value for a chosen meal. A fun way to do this is to look for the “add to my sack”, “build a meal”, or “add to my tray” area. Record or print off the nutritional components of the meal. Then make different choices (healthier ones) and compare the nutritional values to the first menu. This is a great way to learn how to order in a fast-food restaurant without over-spending on calories, sodium, and fat.

Independent Practice

Using their personal plans from the MyPlate site, ask students to design their own 24-hour eating plan, consisting of breakfast, lunch, snacks, and dinner for a weekday. Encourage them to choose foods they like to eat and don't forget to include beverages. Ask students to compare that plan to the 24-hour food diary they recorded before beginning this lesson. Discuss the findings with the class.

Have students develop a healthy eating plan for 1 week (so it includes a weekend) by following the recommended guidelines established in their MyPlate personal plan. Encourage students to make it a family project with everyone following their own personal plans for a week. Have them develop and sign a healthy lifestyle contract with a parent or guardian. At the end of the week, ask students to discuss the results of the healthy eating plan. Some sample questions to ask: What did you have the

most success with? What was the most challenging or disappointing and how can you overcome that? How can you make healthy eating a lifestyle choice? Who and what can help motivate you?

Extension

As an extension to the nutrition lesson, have students create a poster about a food unique to their family or culture, a food that may be unfamiliar to other students. The poster should illustrate the food, give its nutritional values (calories by serving size, vitamins, minerals, protein, carbohydrates, fats, sodium, etc.), how it is prepared, and any other facts about the food that would encourage other students to try it. Have a poster day so students can share the information with classmates. (The Suggested Links section of Project Heart lists websites that contain nutritional information about foods; one example is USDA National Nutrient Database, www.nal.usda.gov/fnic/foodcomp/search/.)

Adaptation

Students who have difficulty writing or drawing may have their assignments adapted by allowing them to verbalize their responses with other students during guided and independent practice.

Assessment

Objective	Met objective	Partially met objective	Did not meet objective
Differentiate between healthy and unhealthy eating habits.			
Explain the importance of a long-term healthy eating plan.			
Choose healthy foods.			

GRADE 6: LESSON PLAN 3

EXERCISE: WHAT KINDS OF ACTIVITIES ARE BEST?

Goals

Students will understand the benefits from involvement in daily physical activity and the factors that affect physical performance.

Instructional Objectives

Students will be able to

1. Describe selected long-term benefits of regular physical activity.
2. Classify activities as being aerobic or anaerobic.
3. Describe the effects of aerobic exercise on the heart and overall health.

Background Information

When you exercise, muscles contract because nerves send electrical signals to the muscles. The contracting muscles use increased amounts of oxygen and nutrients (such as glucose) and release increased amounts of waste (such as carbon dioxide). This activity results in an increased demand for blood flow to the muscles. People who regularly participate in exercise benefit from that increased circulation. Active people have a healthier heart and lungs, stronger muscles and bones, a leaner body, think more clearly, have better self-esteem, and maintain a more positive outlook on life.

Aerobic exercise, also known as cardiovascular exercise, uses the large muscles, makes your heart beat faster, and makes you breathe hard. It can be continued for long periods of time because the body is able to keep up with the oxygen demands of the activity. This type of exercise drives your body to use oxygen more efficiently and delivers maximum benefits to your cardiovascular system (heart and blood vessels) and pulmonary system (lungs), therefore improving exercise endurance. This type of exercise is very important for keeping your heart healthy and can be done by everyone without special training. Examples include: walking, jogging, biking, swimming, dancing, rollerskating or rollerblading, or jumping rope.

Anaerobic exercise is one that is done quickly for short periods of time. This kind of exercise is done at the maximum level (for example, running at top speed), with rapid deep breathing making speaking difficult. The body cannot keep up with the oxygen demands of the activity so it can only sustain short bursts. Anaerobic activity improves muscle and joint strength, improves agility, and increases muscle tone. Examples include engaging in team sports such as football, basketball, baseball, soccer, volleyball; individual sports such as tennis or track and field; and fitness activities such as strength training or weight lifting.

A balance of both kinds of exercise provides maximum benefits for heart health and overall physical fitness throughout life. Many activities incorporate elements of both aerobic and anaerobic exercise.

Introduction

This lesson is about teaching students the life-long benefits of exercising to improve their cardiovascular system, overall strength, agility, and wellbeing.

Procedures

1. Begin the lesson with a review of what happens in the body when we exercise. Define the terms aerobic and anaerobic as they pertain to exercise. Ask students to provide

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examples of aerobic and anaerobic exercise. During the discussion make a list of every exercise or activity they mention. Then divide the list into two categories: activities considered primarily aerobic and activities considered primarily anaerobic. Reinforce the differences between the two and clarify how some activities can have elements of both.

2. To help students quickly understand the difference, show a video of soccer players during a game. Ask students to determine when the players are performing aerobic exercise and when they are performing anaerobic exercise.
3. Discuss the principles of aerobic (cardiovascular) exercise. Explain what happens in the muscle during aerobic exercise. The muscle has a source of oxygen during aerobic exercise; the heart and lungs are able to keep up with the muscle's requirements. During a 60-minute walk, 40% of the muscle's energy comes from carbohydrates. Since protein and fat require oxygen for combustion, and aerobic exercise does not limit oxygen, 55% of the energy burned comes from fat, and 3-5% comes from protein. This is why people who want to lose weight and strengthen their cardiovascular systems walk or jog instead of sprint. Remind students that cardiovascular health is dependent on consistency: they must consistently eat a well-balanced diet, and consistently participate in physical activities to stay healthy and physically fit.
4. Discuss the principles of anaerobic exercise. Explain what happens in the muscle during anaerobic exercise. The muscle does not have a constant source of oxygen because the heart and lungs are not able to keep up with the requirements. During a sprint, 70% of the energy comes from glycogen (carbohydrate), 15% from fat, and 5-8% from protein. Glycogen is a type of carbohydrate stored in muscle cells and in the liver that provides quick energy to the muscles during extreme exercise. The body stores 1600–1700 calories of carbohydrates (glycogen). When stores run low they must be replaced or the person might "hit the wall," which is a term used when the muscles completely run out of glycogen and another fuel (usually carbohydrates) must be burned for energy. Trained long-distance runners can usually run for about 20 miles before hitting the wall and running out of glycogen stores.

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EXERCISE: WHAT KINDS OF ACTIVITIES ARE BEST?

Group activity

Divide students into research groups. Ask them to choose an activity from the list and research the following questions as they pertain to their choice of activity:

- a. Is it anaerobic or aerobic? Why?
- b. Which muscle groups does the exercise employ?
- c. What do you need to perform the exercise?
- d. What benefit does it provide for the body and, in particular, for the heart?

Students may prepare a live demonstration, a PowerPoint presentation, a slide show, or a video. The presentation should incorporate pictures or videos of children performing the exercise they've chosen, along with the research findings. Give students a guideline for how long the presentation should be, then plan class time during which each group can share their results with the class.

Independent practice

I. Define the following terms and then design a crossword puzzle using all of the terms.

- | | | |
|--------------|-------------------|--------------|
| 1. muscle | 6. cardiovascular | 11. fat |
| 2. exercise | 7. glucose | 12. water |
| 3. aerobic | 8. glycogen | 13. energy |
| 4. anaerobic | 9. carbohydrate | 14. calories |
| 5. heart | 10. protein | 15. oxygen |

II. Ask students to research and report on the following topics:

1. List and discuss 4 health benefits of aerobic exercise.
2. List and discuss 4 health benefits of anaerobic exercise.
3. What aerobic exercises can both young people and adults do together?
4. Why is aerobic exercise beneficial throughout life?

Adaptations

For those students who are physically challenged and can't walk, plan to have a parent volunteer or classroom aide available to assist with alternative exercises.

Extension

For those students motivated to learn more, ask them to write a report and present their findings to the class on one or both of the following questions (or questions they choose):

- Does the heart get tired during exercise?
- Can the heart run out of fuel or oxygen during exercise?

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EXERCISE: WHAT KINDS OF ACTIVITIES ARE BEST?

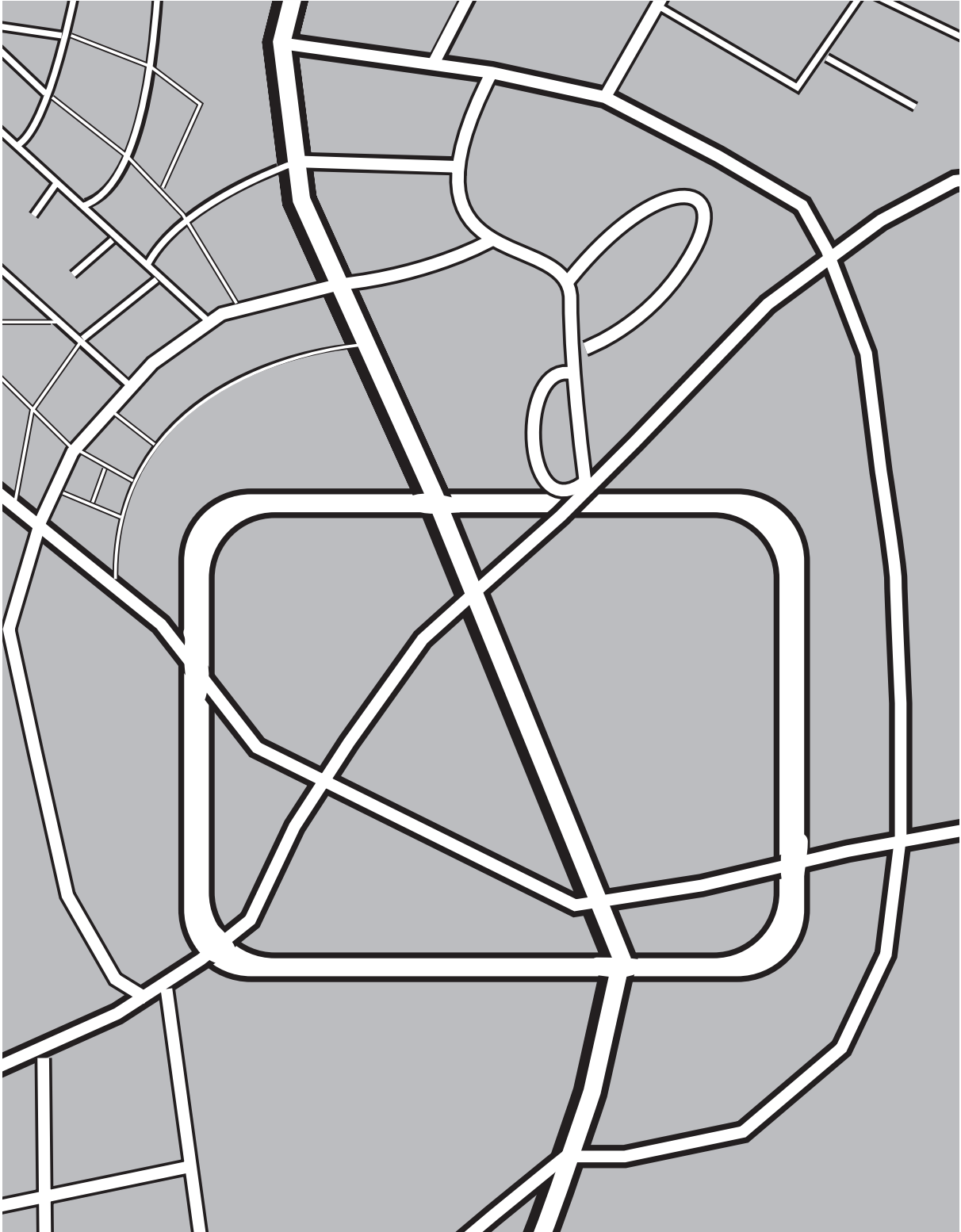
Assessment

Objective	Demonstrated lesson objective	Partially demonstrated lesson objective	Did not demonstrate lesson objective
Describe selected long-term benefits of regular physical activity.			
Classify activities as being aerobic or anaerobic.			
Describe the effects of aerobic exercise on the heart and overall health.			

GRADE 6: LESSON PLAN ACTIVITY MASTERS

- 6–A Illustration: “The City Map”
- 6–B Worksheet: “The Body Map”
- 6–C Worksheet: “The Blood Cells”
- 6–D Worksheet: “Why I Don’t Smoke” Extension

ANATOMY THE CITY MAP



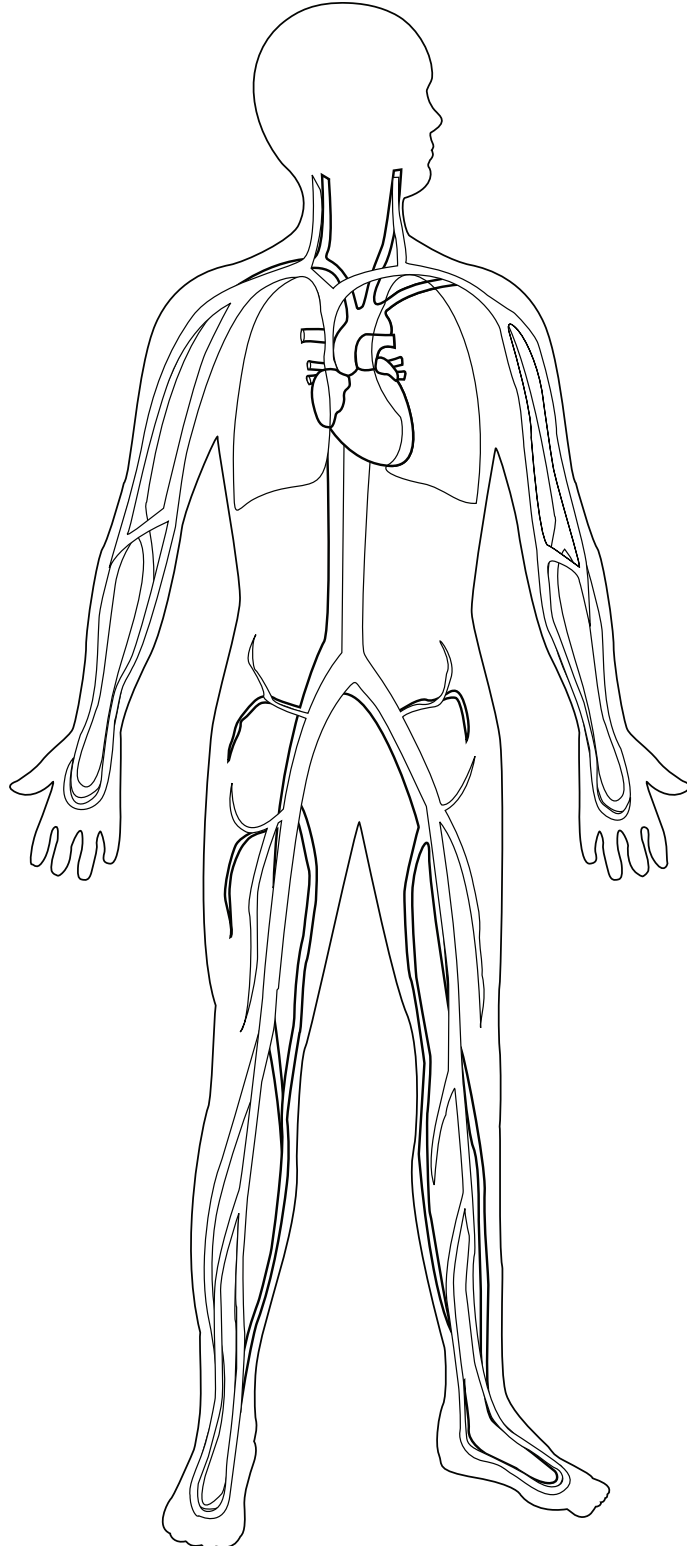
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Label the heart, lungs,
veins, and arteries.
Color the oxygenated
blood red and the
oxygen-poor blood blue.

ANATOMY

THE BODY MAP

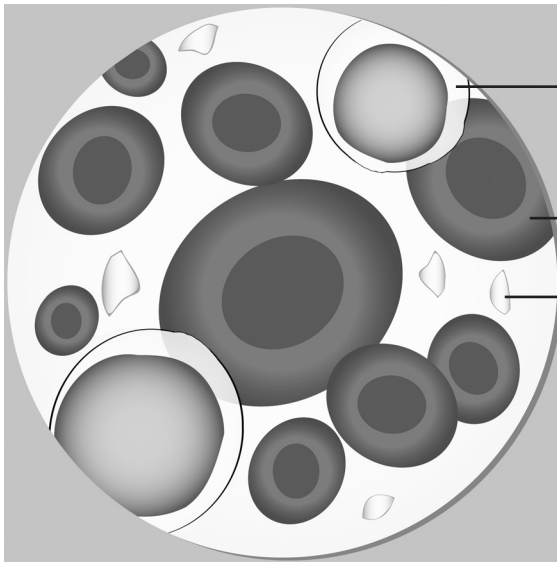


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Activities for the Classroom

Label the three types of blood cells and list their functions.

ANATOMY

THE BLOOD CELLS



Label

List the function of each type of blood cell.

Red blood cell

White blood cell

Platelet

Project Heart

Activities for the Classroom

Draw a poster to display for other students; focus on one way smoking affects the heart and blood vessels.

ANATOMY

WHY I DON'T SMOKE