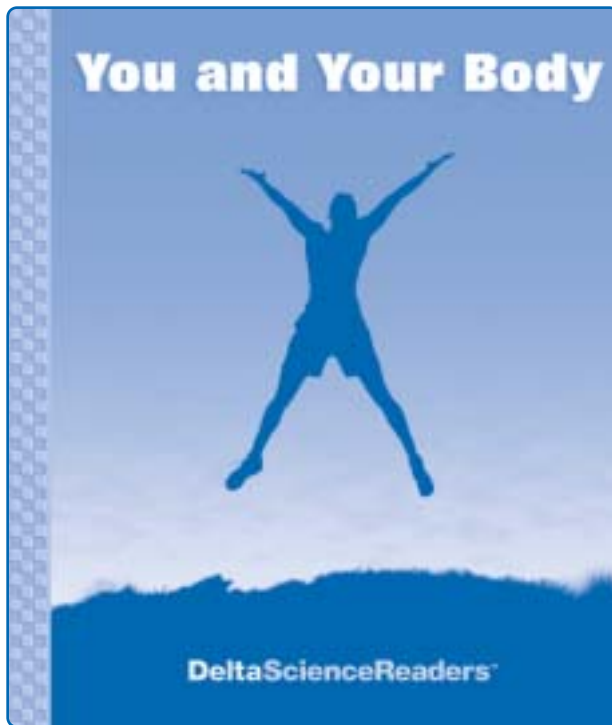


You and Your Body



Delta Science Readers are nonfiction student books that provide science background and support the experiences of hands-on activities. Every **Delta Science Reader** has three main sections: *Think About . . .*, *People in Science*, and *Did You Know?*

Be sure to preview the reader Overview Chart on page 4, the reader itself, and the teaching suggestions on the following pages. This information will help you determine how to plan your schedule for reader selections and activity sessions.

Reading for information is a key literacy skill. Use the following ideas as appropriate for your teaching style and the needs of your students. The After Reading section includes an assessment and writing link.

OVERVIEW

In the Delta Science Reader *You and Your Body*, students read about how cells—the body’s building blocks—make up tissues, organs, and organ systems. Then students explore some of the body’s main systems—skeletal, muscular, circulatory, respiratory, digestive, and nervous. The book also touches briefly on the endocrine, immune, reproductive, and excretory systems. Biographies of two medical pioneers, Dr. Charles Drew and Dr. Elizabeth Blackwell, are included. The book concludes with a look at how reflexes work.

Students will

- ▶ discover facts about the human body
- ▶ learn about the systems that keep the body working
- ▶ discuss the function of a table of contents, headings, and a glossary
- ▶ interpret diagrams to answer questions
- ▶ complete a KWL chart
- ▶ organize information in a variety of ways

READING IN THE CONTENT AREA SKILLS

- Identify main ideas and details about body systems
- Compare and contrast elements of different body systems
- Describe the sequence of events in the process of digestion
- Demonstrate critical thinking
- Interpret graphic devices
- Summarize

NONFICTION TEXT ELEMENTS

You and Your Body includes a table of contents, headings, photographs, captions, diagrams, boldfaced terms, biographical sketches, and a glossary.

CONTENT VOCABULARY

The following terms are introduced in context and defined in the glossary: *alveoli, antibody, antigen, aorta, artery, blood, blood vessel, capillary, cardiac muscle, cartilage, cell, cell division, cell membrane, circulatory system, cytoplasm, diaphragm, digestive system, endocrine system, endoskeleton, excretory system, exoskeleton, extensor, flexor, gland, hormone, immune system, joint, ligament, lung, marrow, motor nerve, muscle, muscular system, nervous system, neuron, nucleus, organ, organ system, pathogen, reaction time, receptor, reflex, reproductive system, respiration, respiratory system, sensory nerves, skeletal muscle, skeletal system, smooth muscle, spinal cord, tendon, tissue, trachea, vein, ventricle, villi.*

BEFORE READING

Build Background

Access students' prior knowledge of the human body by displaying and discussing the cover. Ask, *What do your muscles do? What muscles do you think this person is using to jump?* Read the title aloud, and invite students to share what they know about the topic from their personal experiences and hands-on explorations in science.

To stimulate discussion, ask questions such as these: *What is a skeleton? Why do you think we need a skeleton? What other body systems help keep us alive?*

Begin a class KWL chart by recording facts students know about the human body in the K column. You may wish to copy the KWL chart and ask students to maintain their own charts as they read.

K What I Know	W What I Want to Know	L What I Learned	+ What I Want to Explore Further

Preview the Book

Take a few minutes to have students look through the book. Explain the steps involved in previewing nonfiction: think about the title, read the table of contents, read the headings, read boldfaced words, and examine any photographs, illustrations, charts, and graphics.

Call attention to the various nonfiction text elements and explain how they can help students understand and organize what they read. Point out that the table of contents lists all the main headings in the book and their

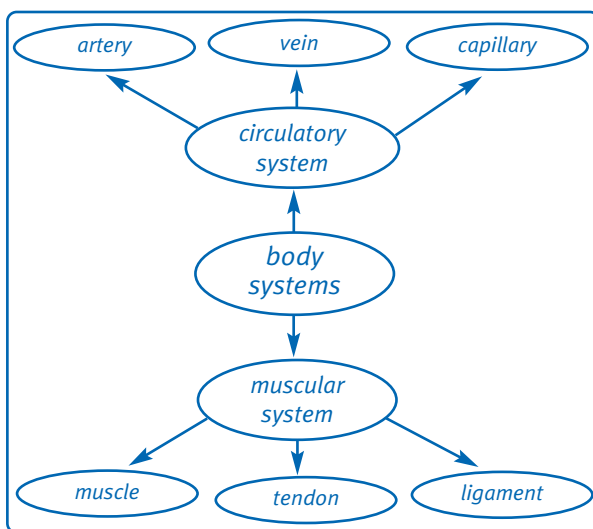
page numbers. Ask, *How do the headings help you know what you will learn about?* Point to some of the photographs and ask questions such as, *What does this picture show you? How do you think it will help you understand the text?* Explain that the words in boldface type are important words related to the human body. Remind students that these words are defined in the glossary. Choose one word and have students find its definition in the glossary.

Following the preview, ask, *What questions do you have about the human body that you would like this book to answer?* Record students' responses in the W column of the KWL chart. Explain that they will add to the chart as they are reading and complete it when they finish reading.

Preview the Vocabulary

You may wish to preview some of the vocabulary words before reading, rather than waiting to introduce them in the context of the book. Possibilities include creating a word wall, vocabulary cards, sentence strips, or a concept web.

For example, many of the words can be grouped according to the body system of which they are a part. Develop a word web like the one that follows.



Set a Purpose

Discuss with students what they might expect to find out from the book, based on their preview. Encourage them to use the questions on the KWL chart to set an overall purpose for reading.

GUIDE THE READING

Preview the book yourself to determine the amount of guidance you will need to give for each section. Depending on your schedule and the needs of your class, you may wish to consider the following options:

- **Whole Group Reading** Read the book aloud with a group or the whole class. Encourage students to ask questions and make comments. Pause as necessary to clarify and assess understanding.
- **Shared Reading** Have students form pairs or small groups and read the book together. Ask students to pause after each text section. Clarify as needed and discuss any questions that arise or have been answered.
- **Independent Reading** Some students may be ready to read independently. Have them rejoin the class for discussion of the book. Check understanding by asking students to explain in their own words what they have read.

Tips for Reading

- If you spread out the reading over several days, begin each session by reviewing the previous day's reading and previewing what will be read in the upcoming session.
- Begin each text section by reading or having a volunteer read aloud the heading. Discuss what students expect to learn, based on the heading. Have students examine any illustrations or graphics and read accompanying captions and labels.

- Help students locate context clues to the meanings of words in boldface type. Remind them that these words are defined in the glossary. Provide help with words that may be difficult to pronounce.
- As appropriate, model reading strategies students may find helpful for nonfiction: adjust reading rate, ask questions, paraphrase, reread, visualize.

Think About . . . (pages 2–11)

Pages 2–3 *Body Building Blocks*

- Have students read page 2 and examine the diagram of an animal cell. Ask, *What is the body made up of?* (cells) Ask students to summarize the main idea. (Cells are the smallest unit of life. All animal cells have the same basic parts: a central nucleus that controls the cell’s work, cytoplasm and cell parts that carry out different tasks, and a cell membrane to protect the cell parts. Cells reproduce by dividing.)
- Have students study the diagram and then read the text on page 3. To assess understanding, have students summarize the parts of an organ system beginning with the cell. (Cells grouped together form tissue, tissues make up organs, and groups of organs work together in an organ system.)
- Ask, *How does the diagram help you understand how cells make up parts of the human body?* (It shows what the text describes.) *In the diagram, what does the term organ system refer to?* (groups of organs that work together; the organ shown is the heart, and the organ system is the circulatory system)
- Tell students that the body has been called the “human machine.” Ask, *How is the body like a machine?* (It is made of different parts, each of which does a job. All the parts work together to keep the body alive. When one part is not working, other parts may be affected.)

- If necessary, provide help with the pronunciation of *nucleus* (NOO-klee-uhs), *cytoplasm* (SITE-oh-plaz-uhm), *mitochondria* (mite-oh-KAHN-dree-uh), and *vacuole* (VAK-yoo-ohl).

Page 4 *What Are the Body’s Main Systems? Skeletal System*

- Have students read page 4 to explore the skeletal system. Ask, *What are the three main purposes of the skeletal system?* (to support the body, protect the organs, and provide places for muscles to attach) *How are humans different from such animals as insects and spiders?* (Humans’ skeletons are on the inside of the body; insects and spiders have skeletons on the outside of their bodies.)
- Discuss the function of the joints in the body. (Joints are the places where bones connect. They allow the skeleton to move. Our bodies have different types of movable joints and some joints that do not move.) Direct students’ attention to the photograph and ask, *Why do you think the body has several different types of movable joints?* (The joints allow us to do different, specialized tasks. For example, the joints in our hands and fingers allow us to grab and pick up small objects.)

Explain that the body has six types of movable joints.

- Hinge (elbow, knee)
- Pivot (in the neck; we use this joint when we make a “no” gesture)
- Ball-and-Socket (shoulder, hip)
- Gliding (between small bones in the wrist)
- Saddle (base of thumb is the only joint of this kind)
- Condylod (between the bones in the palm and the bones in the fingers)

- You may wish to begin a class table of Body System Facts with information about the skeletal system. This can be an ongoing activity as students read about the different body systems. Point out that a table is a good way to organize information. It makes facts easier to read and compare.
- If necessary, provide help with the pronunciation of *endoskeleton* (en-doh-SKEL-uht-n), *exoskeleton* (ek-soh-SKEL-uht-n), and *cartilage* (KAHRT-l-ij).

Page 5 *Muscular System*

- Have students read the text about the muscular system. Ask, *What are the three kinds of muscle tissue?* (cardiac, smooth, and skeletal)
- Guide students to compare and contrast elements of this system. Ask, for example, *How are tendons and ligaments different?* (Tendons attach skeletal muscles to the bones. Ligaments hold bones together.) *What is the difference between a flexor muscle and an extensor muscle?* (A flexor muscle causes a body part to bend when it contracts; an extensor muscle causes a body part to straighten out when it contracts.)
- Have students discuss the diagram and review the names of skeletal muscles. Which names are they familiar with? Which names are new to them?
- Ask students whether they have ever experienced a leg muscle cramp. Ask them to describe their experience and tell what they think happens when a muscle cramps. Explain that a cramp is a sudden and unwanted contraction of a muscle. Normally, only a limited number of muscle fibers contract at the same time. In a cramp, many of the muscle's fibers are contracting, which creates a strong pull called a spasm.

- Discuss the following:

involuntary muscle A muscle that is not under conscious control. Involuntary muscles contract automatically when triggered by signals from the nervous system or by chemicals such as hormones. Cardiac (heart) muscle and the muscles of the internal organs are examples.

voluntary muscle A muscle that is under conscious control. The body's skeletal muscles are voluntary muscles.

- If necessary, provide help with the pronunciation of *muscular* (MUHS-kyoo-luhr), *cardiac* (KAHR-dee-ak), *tendon* (TEN-duhn), *ligament* (LIG-uh-muhnt), *flexor* (FLEKS-uhr), *extensor* (ek-STENS-uhr), and, from the diagram, *gastrocnemius* (gas-trok-NEEM-i-uhs).

Pages 6–7 *Circulatory System*

- Have students read page 6 and study the diagram and labels. Assess understanding by having students summarize the similarities and differences of the functions of arteries, veins, and capillaries. (All three are blood vessels and carry blood. Arteries carry blood away from the heart; veins carry it toward the heart; and capillaries bring nutrients and oxygen to the body's cells and carry away carbon dioxide and other wastes.)
- Before students read page 7, ask them what they know about the way blood flows through the heart. Then have them read the text and go over the diagram and captions together. Ask a volunteer to suggest a title for the diagram. (Answers will vary.) Ask, *What new or interesting things did you learn from this page?* (Responses will vary.)

You may wish to share with students that this system is called *double circulation*, because blood flows through the heart twice—out to and back from the lungs and then out to and back from the body—in a figure-eight pattern. Mammals and birds have double circulation. Some animals, such as fish, have single circulation, in which blood circulates in a single loop from the heart, to the gills, around the body, and back to the heart.

- If necessary, provide help with the pronunciation of *artery* (AHR-tuh-ree), *vein* (VAYN), *capillary* (KAP-uh-ler-ee), *aorta* (ay-OR-tuh), *atrium* (AY-tree-uhm), and *ventricle* (VEN-trik-uhl).

Further Facts

- Some animals have more than one heart. An earthworm has five pairs of hearts!
- In humans, a normal adult heart rate is about 60-80 beats per minute. An elephant's heart rate is only 20-30 beats per minute. The heart rate of a hummingbird is more than 1,000 beats per minute!
- The human heart pumps blood through more than 100,000 km (62,140 miles) of blood vessels (if they were laid end to end). Blood cells complete the journey from heart to body and back again in less than a minute.
- The left ventricle is larger than the right ventricle because it has to pump blood around the entire body. The right ventricle pumps blood only to the lungs.

Page 8 Respiratory System

- Have students read the text about the respiratory system on page 8 and study the diagrams and labels. Explore causes and effects by asking, *What happens when you inhale, or breathe in?* (You take in oxygen.) *What effect does exhaling, or breathing out, have?* (We get rid of carbon dioxide.)

- Discuss with students how the respiratory system and the circulatory system work together. Ask, *What happens in the alveoli?* (Oxygen from the lungs enters the blood stream.) *Where does the blood go after it picks up oxygen in the lungs?* (The oxygen-rich blood goes back to the heart, where it gets pumped out to the body's cells.)
- Explain that *alveoli* is the plural of *alveolus*. Write both words. Tell students that many science words come from ancient Latin and Greek, and their plural forms are different from the plurals of English words. *Alveolus* comes from a Latin word that means “cavity” or “hollow.”
- If necessary, provide help with the pronunciation of *trachea* (TRAY-kee-uh), *alveoli* (al-VEE-uh-lie), and *diaphragm* (DIE-uh-fram).

Page 9 Digestive System

- Have students read the text about the digestive system and examine the diagram and labels.
- Assess understanding by having students describe the sequence of events in the process of digestion:
 1. First, we chew food, breaking it into smaller pieces. Our saliva starts chemical digestion by changing starches into sugars.
 2. Next, food passes through the esophagus into the stomach, where digestive juices mix with it.
 3. Next, chemical digestion continues in the small intestine, where digested food molecules pass through capillaries into the blood stream.
 4. Finally, water and undigested food pass into the large intestine, where water is absorbed into the blood stream and solid wastes move out of the body.

- If necessary, provide help with the pronunciation of *villi* (VIL-ie) and, from the diagram, *esophagus* (i-SAHF-uh-guhs) and *salivary* (SAL-uh-vahr-ee).

Page 10 *Nervous System*

- Have students read the first paragraph on page 10 and identify the main idea. (The nervous system is the body's communication system.) Ask, *What details support this main idea?* (This system collects information from inside and outside the body. Nerve pathways carry signals to the brain. The brain figures out what the signals mean and directs the body's response.)
- Have students finish reading the text and study the diagram and labels. Assess understanding by having students summarize the information about the nervous system. (Receptors take in information and send it to the brain along sensory nerves. Signals from the brain or spinal cord travel along motor nerves to the muscles.)
- If necessary, provide help with the pronunciation of *neuron* (NUR-ahn), and *olfactory* (ohl-FAK-tuh-ree).

Page 11 *Other Body Systems*

- Have students read the text about other body systems and study the diagram of the immune system.
- Have students look at the photograph and read the caption. Ask, *In what way is the skin part of the immune system?* (It is a protective covering that helps keep pathogens out of the body.)
- Assess understanding by having students summarize the function of each of the body systems described. (The endocrine system helps direct the body's activities. The immune system defends the body against disease-causing organisms. The reproductive system produces new individuals. The excretory system removes waste materials from the body.)

- If necessary, provide help with the pronunciation of *endocrine* (EN-duh-krin), *immune* (i-MYOON), *pathogen* (PATH-uh-juhn), *antigen* (AN-ti-juhn), *antibody* (AN-tie-bahd-ee), and *excretory* (EK-skre-tohr-ee).

People in Science (pages 12–13)

Page 12 *Charles Drew, M.D.*

- Before they read, ask students what they know about blood banks and the blood that is given to people who need it because of injury, surgery, or other conditions. Encourage them to share information. Then have them read to find out about a physician and surgeon who made an important contribution to medicine through his research on blood.
- Assess understanding by asking, *What was the problem with stored whole blood?* (It stayed fresh for only a week.) *What solution to this problem did Dr. Drew develop?* (He studied how plasma could be used instead of whole blood and he developed a way to preserve plasma for long periods of time.)

Page 13 *Elizabeth Blackwell, M.D.*

- Ask students whether they or other family members have been treated by women medical professionals such as doctors, dentists, nurse practitioners, nurses, or technologists. Explain that at one time, women were discouraged from going into medical professions. Then have students read about pioneering physician Dr. Elizabeth Blackwell, the first woman to graduate from a U.S. medical school.
- Ask, *What obstacles did Dr. Blackwell have to overcome in order to become a doctor?* (Answers may include the idea that women were not expected to work in fields such as medicine, rejection by medical schools, negative reaction from some male colleagues, unwillingness of some patients to be treated by a doctor who was a woman.)

- Encourage students to speculate about what personal qualities led Elizabeth Blackwell to continue trying to overcome the obstacles she encountered. (She was determined and persistent.) *What qualities do you think helped her become successful?* (She was intelligent—finished first in her class in medical school—and refused to accept defeat.)

Further Facts

Milestones in the Study of the Body

- Galen (129–c.199) was a Greek physician whose dissections of animals enabled him to show that different muscles are controlled at different levels of the spinal cord. He also showed that arteries carry blood (not air), described the heart’s valves, and identified the differences between arteries and veins.
- William Harvey (1578–1657) was an English physician who showed that blood circulates throughout the whole body and discovered the role played by the heart.
- Marcello Malpighi (1628–1694) was an Italian physiologist who discovered that capillaries join small veins to small arteries. He also identified red blood cells and showed that these cells give blood its color.
- Marie François Xavier Bichat (1771–1802) was a French anatomist and physiologist. He was the first person to use the term *tissue*, and he identified 21 different kinds of tissue in the human body.
- Francis Harry Compton Crick (1916–), a British biophysicist, and James Dewey Watson (1928–), an American biochemist, are co-discoverers of the structure of DNA. They shared the 1962 Nobel Prize in physiology or medicine with British biophysicist Maurice Hugh Frederick Wilkins for their work.

- Rosalind Elsie Franklin (1920–1958) was a British physical chemist whose research led to the discovery of the structure of DNA. She died before the Nobel Prize for the discovery was awarded to Crick, Watson, and Wilkins, Franklin’s colleague.

Did You Know? (page 14)

How a Reflex Works

- Drop a book on the floor suddenly, or make another unexpected noise. Encourage students to share their responses. Explain that when the noise startled them and they jumped or responded in another way, this was a reflex—an automatic reaction.
- Have students read to discover how a reflex works. Ask, *What is reaction time?* (The delay between the time receptors pick up information and the moment your body responds.) *What causes the delay between the signal and the response?* (The message has to travel to the brain, and the brain has to direct your body to respond. *How does a reflex help protect you?* (It makes the response automatic, so your body doesn’t have to wait for the brain to signal it to respond.)

Other examples of body reflexes are sneezing, blinking, and coughing.

AFTER READING

Summarize

Have students summarize the book by completing the KWL chart they began before reading. Help them write in the L column the answers to the questions they wrote in the W column. Then ask volunteers to summarize the information in each section, referring to the book if necessary.

Discuss with students how using the KWL strategy helped them understand and appreciate the book. Encourage them to

share any other reading strategies that helped them understand what they read.

Direct attention to the fourth column in the chart and ask, *What questions do you still have about the human body? What would you like to explore further?* Record students' responses. Then ask, *Where do you think you might be able to find this information?* (Students might mention an encyclopedia, science books, and the Internet.) Encourage students to conduct further research.

Review/Assess

Use the questions that follow as the basis for a discussion of the book or for a written or oral assessment.

1. Draw a diagram of an animal cell. Label each part. Then write a caption that explains what each part of a cell is and what it does. (Student diagrams should show the cell nucleus, cytoplasm, and cell membrane. Explanations should mention that the cell nucleus controls the work of the cell; the cytoplasm holds cell parts, each of which performs a different task, such as handling wastes or storing water; the cell membrane protects all the cell parts.)
2. What are six main body systems and what is the main function of each system? Make a two-column chart. In the first column, list each body system. In the second column, list each system's main function.

Body System	Function
skeletal system	supports the body, protects the organs, provides places for muscles to attach
muscular system	moves the body and its parts
circulatory system	transports food and oxygen to every part of the body and carries away carbon dioxide and wastes
respiratory system	handles the body's air supply
digestive system	breaks down food into smaller parts the body can use
nervous system	collects information, sends signals to the brain, and delivers the brain's response to the body

Writing Link/Critical Thinking

Present the following as a writing assignment.

All the body's systems must work together to keep the body healthy and working. Think about what each system contributes to the health of all the other systems. Choose one of the main systems. If this system were to become unhealthy, how might it affect the other systems? (Accept reasonable responses.)

Science Journals: You may wish to have students keep the writing activities related to the reader in their science journals.

References and Resources

For trade book suggestions and Internet sites, see the References and Resources section of this teacher's guide.