



Body Organization



How Is Your Body Organized?

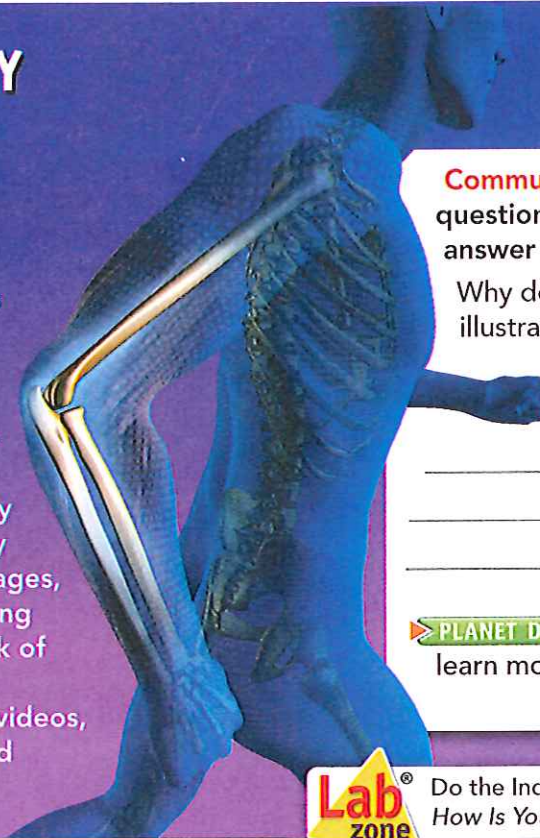
7.3.6, 7.3.7, 7.NS.8, 7.NS.11



my planet Diary

Medical Illustrator

Who made the colorful drawings of human body structures in this book? The drawings are the work of specialized artists called medical illustrators. These artists use their drawing skills and knowledge of human biology to make detailed images of body structures. Many artists draw images, such as the one on this page, using 3-D computer graphics. The work of medical illustrators appears in textbooks, journals, magazines, videos, computer learning programs, and many other places.



CAREER

Communicate Answer the question below. Then discuss your answer with a partner.

Why do you think medical illustrations are important to the study of human biology?

PLANET DIARY Go to Planet Diary to learn more about body organization.



Do the Inquiry Warm-Up
How Is Your Body Organized?



Academic Standards for Science

7.3.6 Explain that after fertilization, a small cluster of cells divides to form the basic tissues of an embryo which further develops into all the specialized tissues and organs within a multicellular organism.

7.3.7 Describe how various organs and tissues serve the needs of cells for nutrient and oxygen delivery and waste removal.

7.NS.8 Analyze data.

7.NS.11 Communicate findings using models.

How Is Your Body Organized?

The bell rings—lunchtime! You hurry to the cafeteria, fill your tray, and pay the cashier. You look around the cafeteria for your friends. Then you walk to the table, sit down, and begin to eat.


Think about how many parts of your body were involved in the simple act of getting and eating your lunch. Every minute of the day, whether you are eating, studying, walking, or even sleeping, your body is busily at work. Each part of the body has a specific job to do. And all these different parts usually work together so smoothly that you don't even notice them.

Vocabulary

- differentiation
- muscle tissue
- nervous tissue
- connective tissue
- epithelial tissue

Skills

-  Reading: Identify the Main Idea
-  Inquiry: Make Models

Levels of Organization The smooth functioning of your body is due partly to how the body is organized.  **The levels of organization in the human body consist of cells, tissues, organs, and organ systems.** The smallest unit of organization is a cell. The next largest unit is a tissue, then an organ. Finally, an organ system is the largest unit of organization in an organism.

Cells A cell is the basic unit of structure and function in a living thing. Complex organisms are made up of many cells in the same way that your school is made up of many rooms. The human body contains about 100 trillion tiny cells. Most cells cannot be seen without a microscope.

Structures and Functions Almost all cells in the human body have the same basic structures, such as a nucleus, a cell membrane, and cytoplasm. Each of these structures has a specific job that keeps the cell functioning properly.

Cells carry on the processes that keep organisms alive. Inside cells, for example, molecules from digested food undergo changes that release energy that the cells can use. Cells also grow, reproduce, and get rid of the waste products that result from these activities.

Differentiation As you learned in the previous lesson, when a cell divides by mitosis, it produces two daughter cells with identical sets of chromosomes. So how do cells in multicellular organisms such as humans become different from one another? They do this through a process called differentiation. In differentiation, cells change in structure and become capable of carrying out specialized functions.

As **Figure 1** shows, after fertilization, cell division occurs rapidly in an embryo. When cells differentiate, they become organized. At first, cells of the same type group into tissues. Groups of tissues combine to form organs that carry out specific functions, such as the stomach or small intestines. Finally, different organs that work together form an organ system, such as your digestive system. And to think that all of this comes from one original cell!

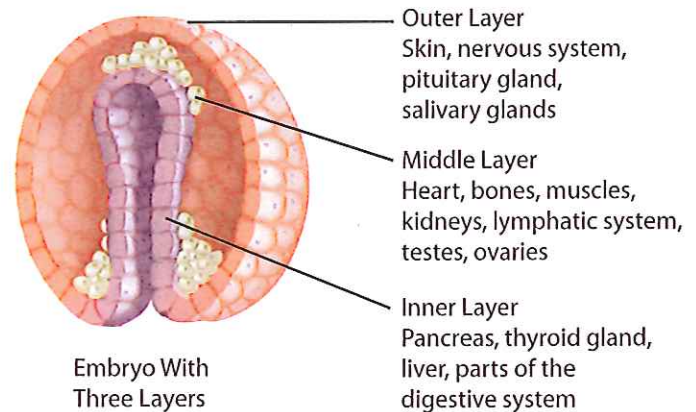


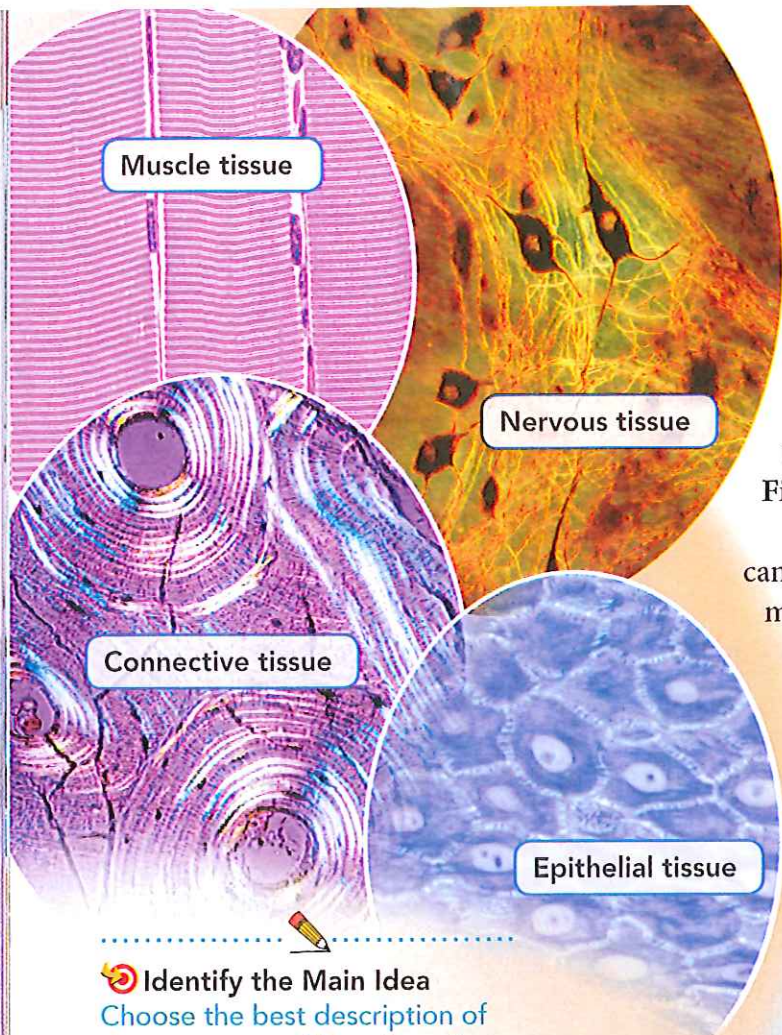
FIGURE 1

Cell Differentiation

During the first week after fertilization, a human embryo forms from a hollow ball with three layers. Some of the structures that form from each layer are listed.

 **Interpret Diagrams** Which layer gives rise to the skeletal system?

7.NS.8, 7.NS.11



Muscle tissue

Nervous tissue

Connective tissue

Epithelial tissue

Identify the Main Idea

Choose the best description of the structure and function of a tissue.

- A group of different cells that have the same function
- A group of similar cells that have different functions
- A group of similar cells that have the same function

Tissues The next largest unit of organization in your body is a tissue. A tissue is a group of similar cells that perform the same function. Your body contains several types of tissue. Four of these are muscle tissue, nervous tissue, connective tissue, and epithelial tissue. You can see examples in Figure 2 at left.

Like the muscle cells that form it, **muscle tissue** can contract, or shorten. By doing so, muscle tissue makes parts of your body move. While muscle tissue carries out movement, **nervous tissue** directs and controls the process. Nervous tissue carries electrical messages back and forth between the brain and other parts of the body. Another type of tissue, **connective tissue**, provides support for your body and connects all its parts. Bone tissue and fat tissue are examples of connective tissue.

Epithelial tissue (ep uh THEE lee ul) covers the surfaces of your body, inside and out. Some epithelial tissue, such as your skin, protects the delicate structures that lie beneath it. The lining of your digestive system consists of epithelial tissue that allows you to digest and absorb the nutrients in your food.

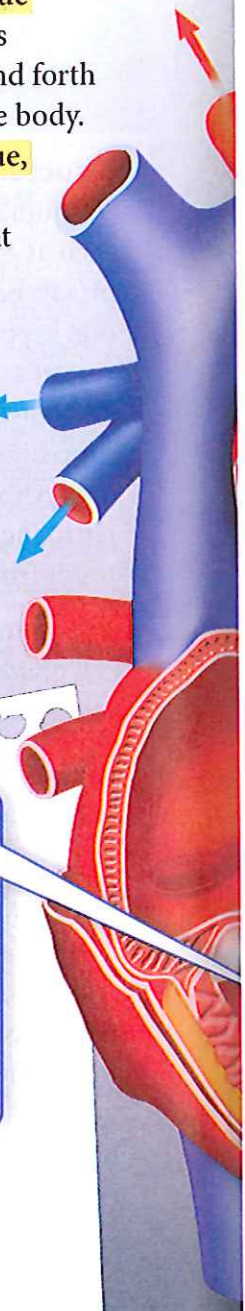


FIGURE 2

The Heart

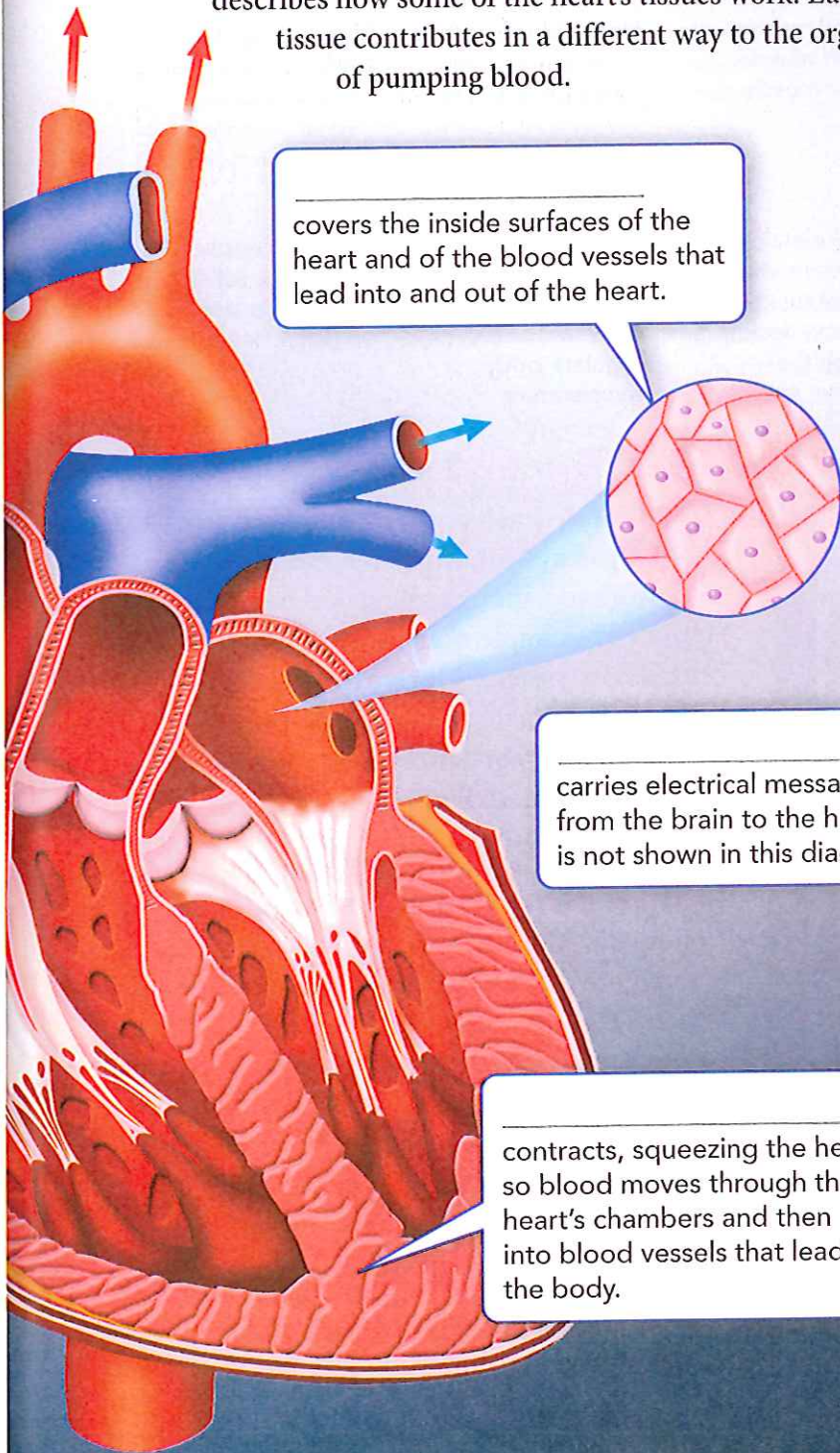
The heart, like your other organs, is made of different kinds of tissues that have different functions.

Answer the following questions.

1. **Relate Text and Visuals** In each box, fill in the kind of tissue that matches the function described.
2. **CHALLENGE** Pick one type of tissue shown and describe how the heart would be affected if the tissue did not function properly.

provides strength and flexible support for muscle tissue and other structures inside and outside the heart.

Organs Your stomach, heart, brain, and lungs are all organs. An organ is a structure that is made up of different kinds of tissue. Like a tissue, an organ performs a specific job. The job of an organ, however, is usually more complex than that of a tissue. For example, the heart pumps blood through your body over and over again. The heart contains muscle, connective, and epithelial tissues. In addition, nervous tissue connects to the heart and helps control heart function. **Figure 2** shows a diagram of a human heart and describes how some of the heart's tissues work. Each type of tissue contributes in a different way to the organ's job of pumping blood.



_____ covers the inside surfaces of the heart and of the blood vessels that lead into and out of the heart.

_____ carries electrical messages from the brain to the heart but is not shown in this diagram.

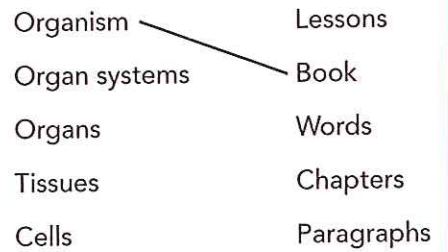
_____ contracts, squeezing the heart so blood moves through the heart's chambers and then into blood vessels that lead to the body.

apply it!

Books are a nonliving model of levels of organization. Find out how a book is organized.

STEP 1 Observe Examine this book to see how its chapters, lessons, and other parts are related.

STEP 2 Make Models Next, compare levels of organization in this book to those in the human body. Draw lines to show which part of this book best models a level in the body.



STEP 3 Make Models Where in the book model do you think this Apply It fits? What level of organization in the body does the Apply It represent?

7.NS.11





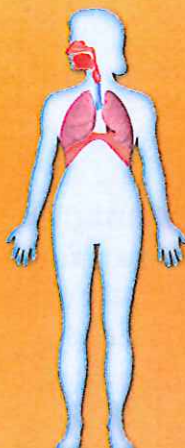
BODY SYSTEM					
STRUCTURES	Skeletal System Bones, cartilage, ligaments, tendons	Integumentary System Skin, hair, nails, sweat glands, oil glands	Muscular System Skeletal muscle, smooth muscle, cardiac muscle	Circulatory System Heart, blood vessels	Respiratory System Nose, pharynx, larynx, trachea, bronchi, lungs
FUNCTIONS	Supports body; protects internal organs; allows movement; stores minerals; produces blood cells	Guards against infection and injury; helps regulate body temperature	With skeletal system, produces movement; helps circulate blood and move food through the digestive system	Transports oxygen, nutrients, and wastes; fights infection; helps regulate body temperature	Brings in oxygen needed by cells; removes carbon dioxide from body

FIGURE 3

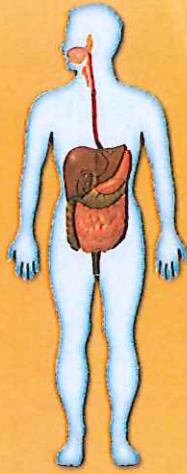
INTERACTIVE ART Body Systems

Apply Concepts Describe the levels of organization in a complex system. Write about a sports team, a supermarket, a digital audio player, or an orchestra. Or choose your own example.

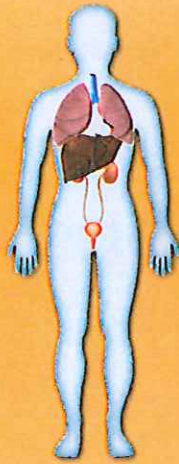
Systems Each organ in your body is part of an organ system, which is a group of organs that work together, carrying out major functions. For example, your heart is part of your circulatory system, which carries oxygen and other materials throughout your body. The circulatory system also includes blood vessels and blood. **Figure 3** shows most of the organ systems in the human body.

Organisms Starting with cells, the levels of organization in an organism become more and more complex. A tissue is more complex than a cell, an organ is more complex than a tissue, and so on. You, as an organism, are the next level of organization. And all organisms are part of levels of organization within the environment.

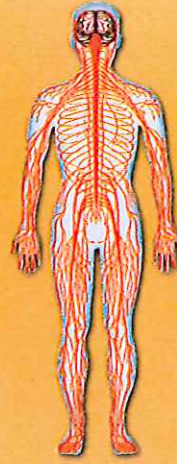
BODY SYSTEM



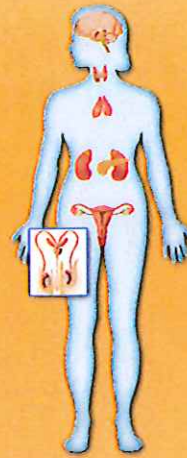
Digestive System



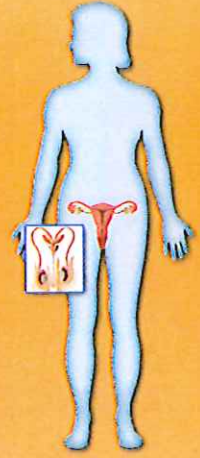
Excretory System



Nervous System



Endocrine System



Reproductive System

STRUCTURES

Mouth, esophagus, stomach, small intestine, liver, pancreas, large intestine, rectum

Skin, lungs, liver, kidneys, urinary bladder, urethra

Brain, spinal cord, nerves

Glands, such as the thyroid, pancreas, adrenals, ovaries, testes, and others

In males: testes, ducts, urethra, penis; in females: ovaries, ducts, uterus, vagina

FUNCTIONS

Breaks down food; absorbs nutrients; removes food wastes

Removes waste products from the body

Controls body's responses to changes in inside and outside environments

Controls growth, development, and energy processes; helps maintain homeostasis

Produces and delivers sex cells; in females, nurtures and protects developing embryo



Do the Quick Lab *Observing Cells and Tissues.*

Assess Your Understanding

1a. **Review** How are cells, tissues, and organs related?

7.3.6, 7.3.7

b. **Infer** What systems of the body are involved in preparing and eating a sandwich?

7.3.7

c. **Make Judgments** How does learning about body systems help you make informed decisions about your health?

7.3.7

got it?

I get it! Now I know that the body's levels of organization, from least complex to most complex, are _____

I need extra help with _____

Go to **my science COACH** online for help with this subject.

7.3.7