



# Looking Inside Cells



 **How Do the Parts of a Cell Work?**

7.3.3, 7.3.4, 7.NS.8

 **How Do Cells Work Together in an Organism?**

7.3.5, 7.3.6, 7.NS.8

## my planet DiARY

### Glowing Globs

Do these cells look as if they're glowing? This photograph shows cells that have been stained with dyes that make cell structures easier to see. Scientists view such treated cells through a fluorescent microscope, which uses strong light to activate the dyes and make them glow. Here, each green area is a cell's nucleus, or control center. The yellow "fibers" form a kind of support structure for the cell.



Do the Inquiry Warm-Up  
How Large Are Cells?

## TECHNOLOGY

**Communicate** Discuss these questions with a partner. Then write your answers below.

1. Why is staining useful when studying cells through a microscope?

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2. If you had a microscope, what kinds of things would you like to look at? Why?

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 **PLANET DIARY** Go to **Planet Diary** to learn more about cell parts.


## Vocabulary

- cell wall • cell membrane • nucleus • organelle
- ribosome • cytoplasm • mitochondria
- endoplasmic reticulum • Golgi apparatus • vacuole
- chloroplast • lysosome • multicellular • unicellular
- tissue • organ • organ system

## Skills

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

# How Do the Parts of a Cell Work?

When you look at a cell through a microscope, you can usually see the outer edge of the cell. Sometimes you can also see smaller structures within the cell.  **Each kind of cell structure has a different function within a cell.** In this lesson, you will read about the structures that plant and animal cells have in common. You will also read about some differences between the cells.

**Cell Wall** The **cell wall** is a rigid layer that surrounds the cells of plants and some other organisms. The cells of animals, in contrast, do not have cell walls. A plant's cell wall helps protect and support the cell. The cell wall is made mostly of a strong material called cellulose. Still, many materials, including water and oxygen, can pass through the cell wall easily.

**Cell Membrane** Think about how a window screen allows air to enter and leave a room but keeps insects out. One of the functions of the cell membrane is something like that of a screen. The **cell membrane** controls which substances pass into and out of a cell. Everything a cell needs, such as food particles, water, and oxygen, enters through the cell membrane. Waste products leave the same way. In addition, the cell membrane prevents harmful materials from entering the cell.

All cells have cell membranes. In plant cells, the cell membrane is just inside the cell wall. In cells without cell walls, the cell membrane forms the border between the cell and its environment.



### Academic Standards for Science

**7.3.3** Explain that although the way cells function is similar in all living organisms, multicellular organisms also have specialized cells whose specialized functions are directly related to their structure.

**7.3.4** Compare and contrast similarities and differences between specialized subcellular components within plant and animal cells, including organelles and cell walls that perform essential functions and give a cell its shape and structure.

**7.NS.8** Analyze data, and use it to identify patterns and make inferences.

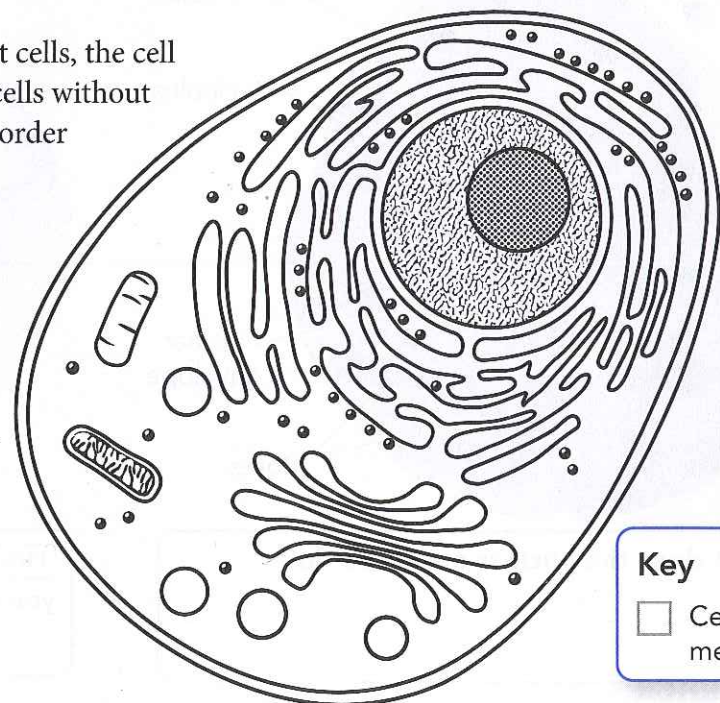



FIGURE 1 .....

### A Typical Animal Cell

You will see this diagram of a cell again in this lesson.

 **Identify** Use a colored pencil to shade the cell membrane and fill in the box in the key.

#### Key

- Cell membrane

FIGURE 2 .....

### Organelles of a Cell

The structures of a cell look as different as their functions.

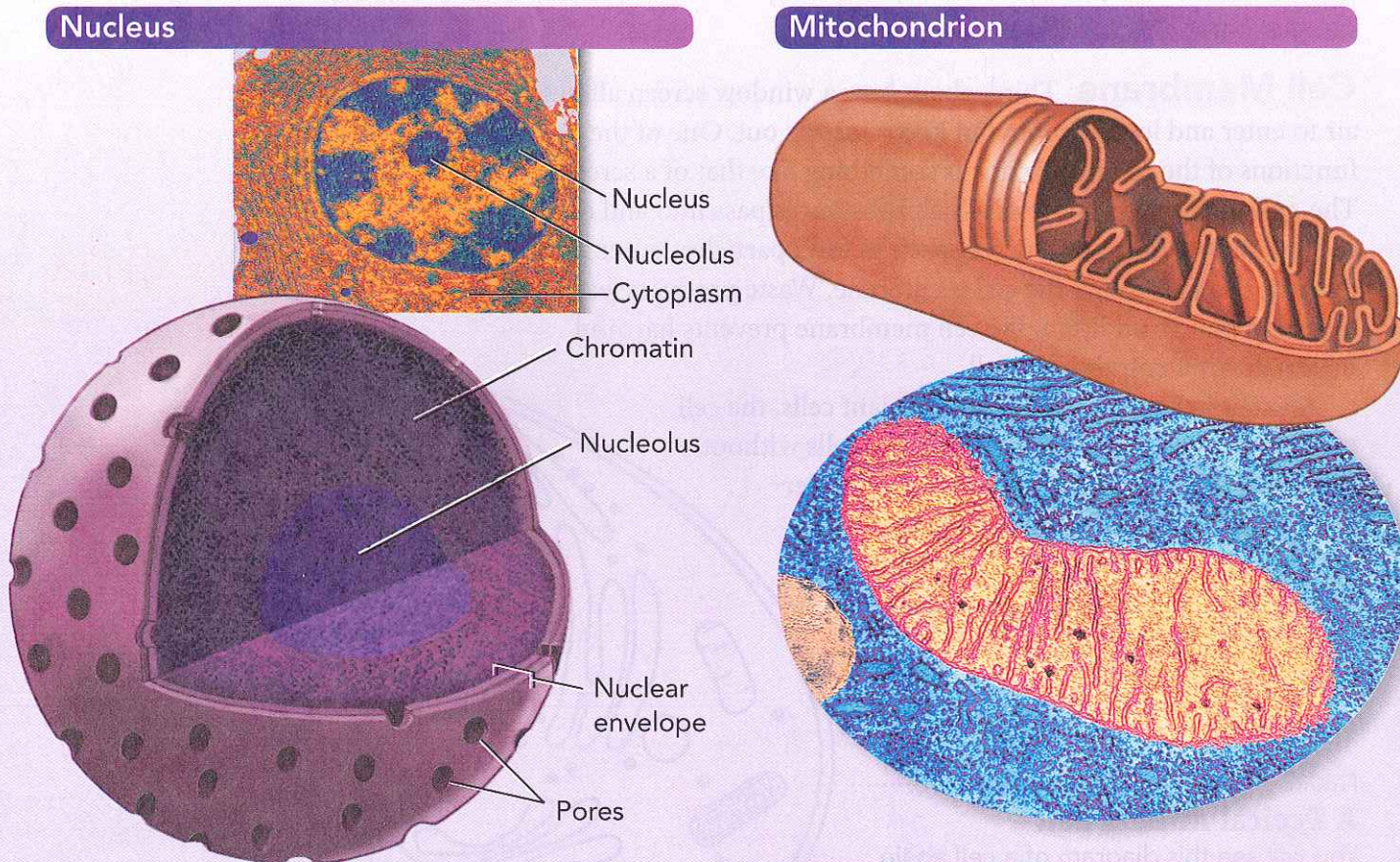
 **Complete each task.**

- 1. Review** Answer the questions in the boxes.
- 2. Relate Text and Visuals**  
In the diagram on the facing page, use different-colored pencils to color each structure and its matching box in the color key. **7.NS.8**

**Nucleus** A cell doesn't have a brain, but it has something that functions in a similar way. A large oval structure called the **nucleus** (NOO klee us) acts as a cell's control center, directing all of the cell's activities. The nucleus is the largest of many tiny cell structures, called **organelles**, that carry out specific functions within a cell. Notice in **Figure 2** that the nucleus is surrounded by a membrane called the nuclear envelope. Materials pass in and out of the nucleus through pores in the nuclear envelope.

**Chromatin** You may wonder how the nucleus "knows" how to direct the cell. Chromatin, thin strands of material that fill the nucleus, contains information for directing a cell's functions. For example, the instructions in the chromatin ensure that leaf cells grow and divide to form more leaf cells.

**Nucleolus** Notice the small, round structure in the nucleus. This structure, the nucleolus, is where ribosomes are made. **Ribosomes** are small grain-shaped organelles that produce proteins. Proteins are important substances in cells.



**What does the nuclear envelope do?**  
\_\_\_\_\_

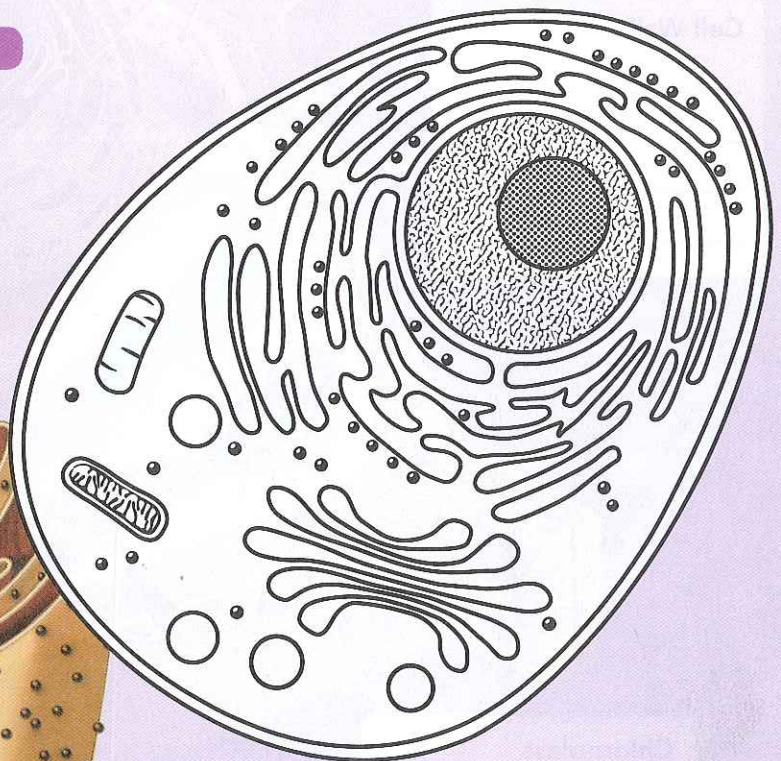
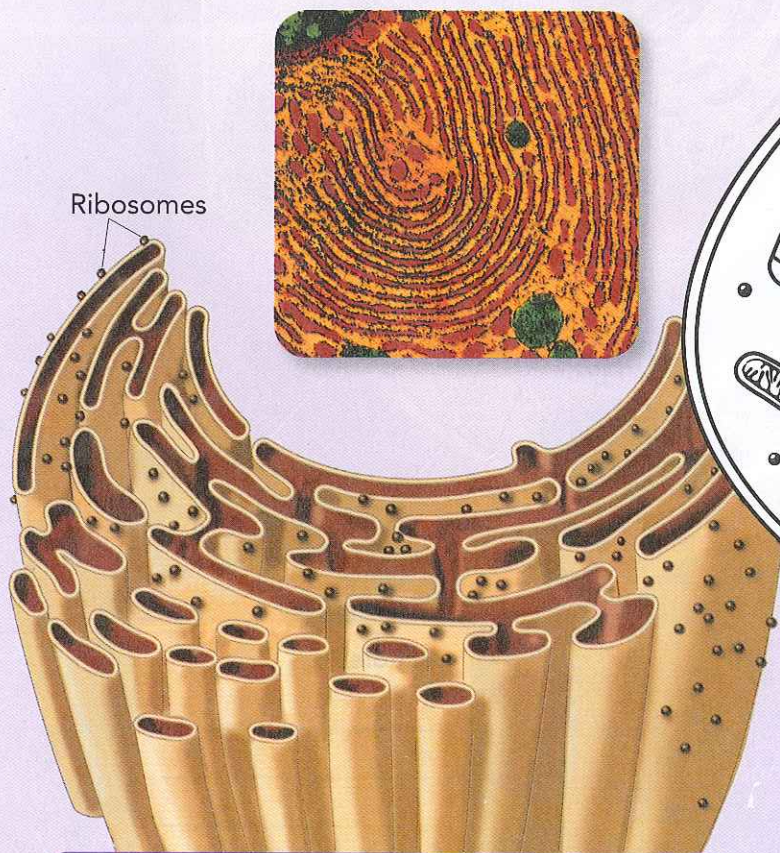
**CHALLENGE** In what types of cells would you expect to find a lot of mitochondria?  
\_\_\_\_\_

**Organelles in the Cytoplasm** Most of a cell consists of a thick, clear, gel-like fluid. The **cytoplasm** fills the region between the cell membrane and the nucleus. The fluid of the cytoplasm moves constantly within a cell, carrying along the nucleus and other organelles that have specific jobs.

**Mitochondria** Floating in the cytoplasm are rod-shaped structures that are nicknamed the “powerhouses” of a cell. Look again at **Figure 2**. **Mitochondria** (myt oh KAHN dree uh; singular *mitochondrion*) convert energy stored in food to energy the cell can use to live and function.


**Endoplasmic Reticulum and Ribosomes** In **Figure 2**, you can see what looks something like a maze of passageways. The **endoplasmic reticulum** (en doh PLAZ mik rih TIK yuh lum), often called the ER, is an organelle with a network of membranes that produces many substances. Ribosomes dot some parts of the ER, while other ribosomes float in the cytoplasm. The ER helps the attached ribosomes make proteins. These newly made proteins and other substances leave the ER and move to another organelle.

**Endoplasmic Reticulum and Ribosomes**



What do ribosomes do?

\_\_\_\_\_

 **Vocabulary Prefixes** The prefix *endo-* is Greek for “within.” If the word part *plasm* refers to the “body” of the cell, what does the prefix *endo-* tell you about the endoplasmic reticulum?

\_\_\_\_\_

\_\_\_\_\_

**Key**

- |                                    |                                       |
|------------------------------------|---------------------------------------|
| <input type="checkbox"/> Nucleus   | <input type="checkbox"/> Mitochondria |
| <input type="checkbox"/> Nucleolus | <input type="checkbox"/> ER           |
| <input type="checkbox"/> Cytoplasm | <input type="checkbox"/> Ribosomes    |



# CELLS IN LIVING THINGS

What are cells made of?

FIGURE 3

**INTERACTIVE ART** These illustrations show typical structures found in plant and animal cells. Other living things share many of these structures, too. **Describe** Describe the function of each structure in the boxes provided.

7.NS.8

**Endoplasmic Reticulum**

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

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**Nucleus**

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Cytoplasm**

**Ribosomes**

**Cell Wall**

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Chloroplast**

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Mitochondrion**

**Golgi Apparatus**

**Cell membrane**

**Vacuole**

\_\_\_\_\_

\_\_\_\_\_

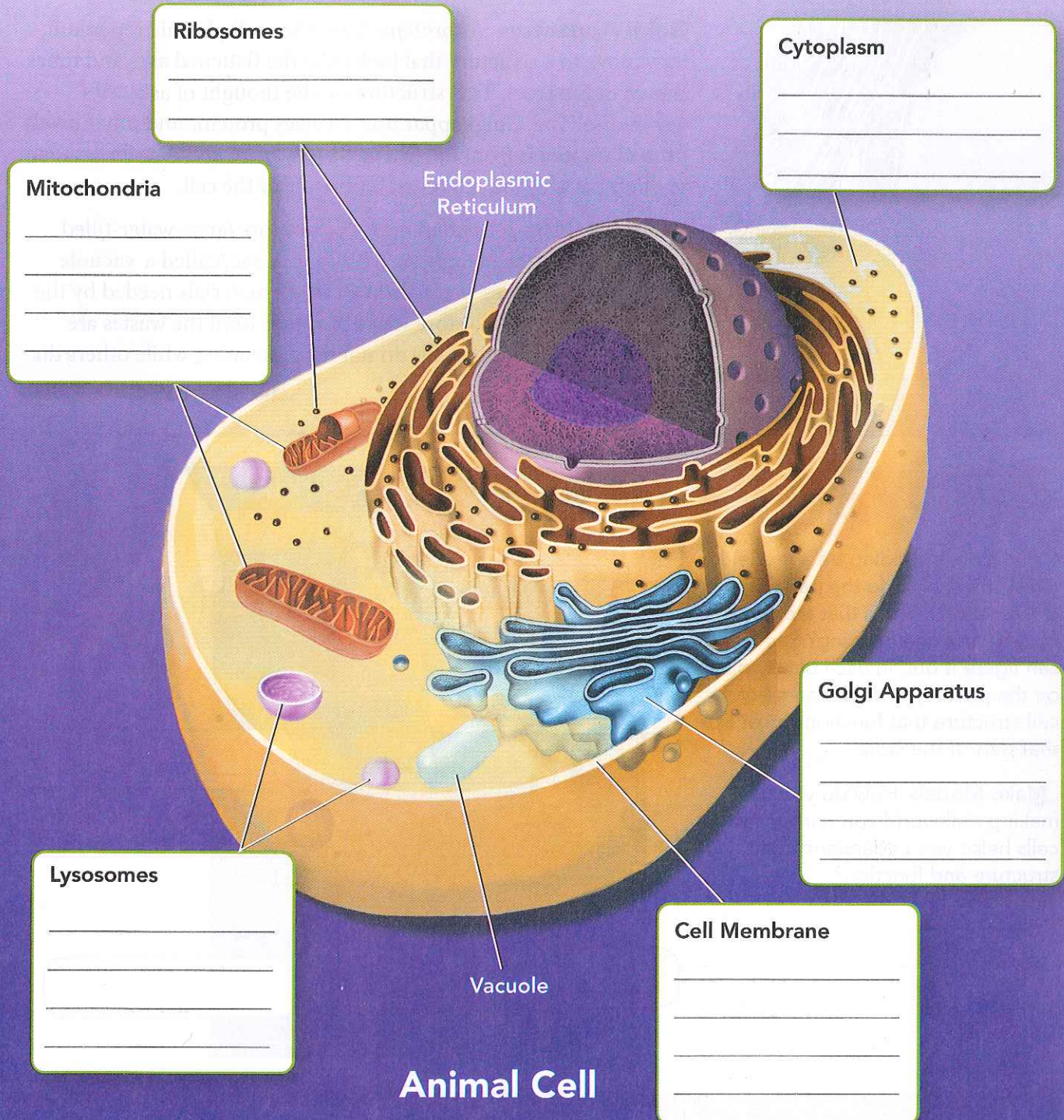
\_\_\_\_\_

\_\_\_\_\_

**Plant Cell**

Check the box for each structure present in plant cells or animal cells.

Structure	Cell wall	Cell membrane	Cytoplasm	Nucleus	Mitochondria	Chloroplasts	Ribosomes	Endoplasmic reticulum	Vacuoles	Golgi apparatus	Lysosomes
Plant cells											
Animal cells											



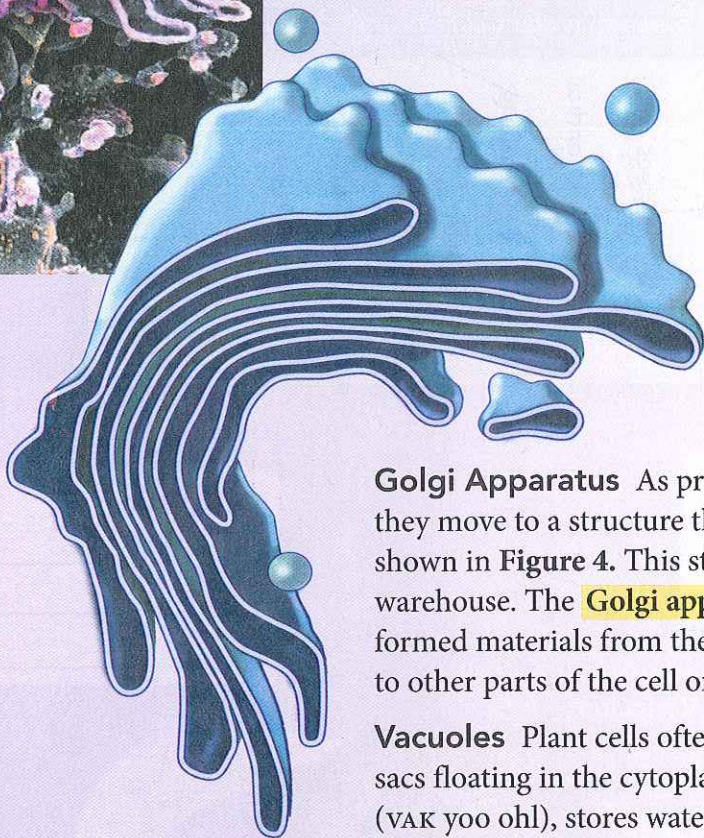
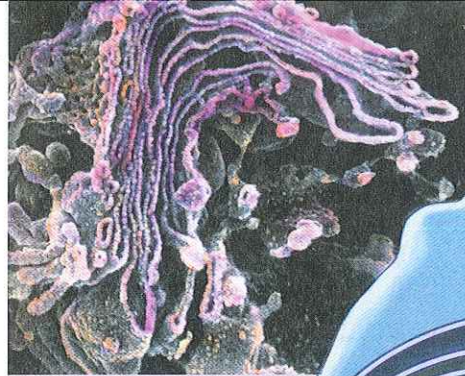


FIGURE 4 .....

### Golgi Apparatus

**Define** The Golgi apparatus is an organelle that \_\_\_\_\_ and \_\_\_\_\_ materials made in the \_\_\_\_\_

**Golgi Apparatus** As proteins leave the endoplasmic reticulum, they move to a structure that looks like the flattened sacs and tubes shown in **Figure 4**. This structure can be thought of as a cell's warehouse. The **Golgi apparatus** receives proteins and other newly formed materials from the ER, packages them, and distributes them to other parts of the cell or to the outside of the cell.

**Vacuoles** Plant cells often have one or more large, water-filled sacs floating in the cytoplasm. This type of sac, called a **vacuole** (VAK yoo ohl), stores water, food, or other materials needed by the cell. Vacuoles can also store waste products until the wastes are removed. Some animal cells do not have vacuoles, while others do.

## apply it!

Can a store's building be a model for a cell? If so, how do the parts of a cell function in ways that are similar to the parts of a building? See if you can figure it out. In each blank space on the picture, write the name of a cell structure that functions most like that part of the store.

**Make Models** How do you think making real-world comparisons with cells helps you understand cell structure and function?

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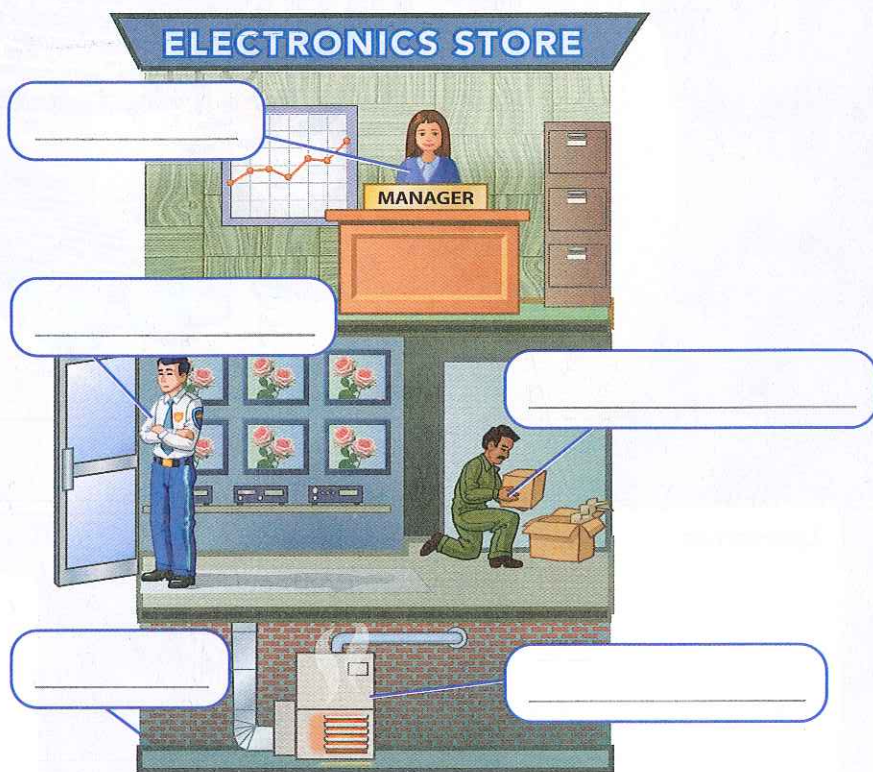
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**Chloroplasts** Recall from **Figure 3** that a typical plant cell contains green structures, called chloroplasts, in the cytoplasm. **Chloroplasts** capture energy from sunlight and change it to a form of energy cells can use in making food. Animal cells don't have chloroplasts, but the cells of plants and some other organisms do. Chloroplasts make leaves green because leaf cells contain many chloroplasts.

**Lysosomes** Look again at the animal cell in **Figure 3**. Notice the saclike organelles, called **lysosomes** (LY suh sohmz), which contain substances that break down large food particles into smaller ones. Lysosomes also break down old cell parts and release the substances so they can be used again. You can think of lysosomes as a cell's recycling centers.

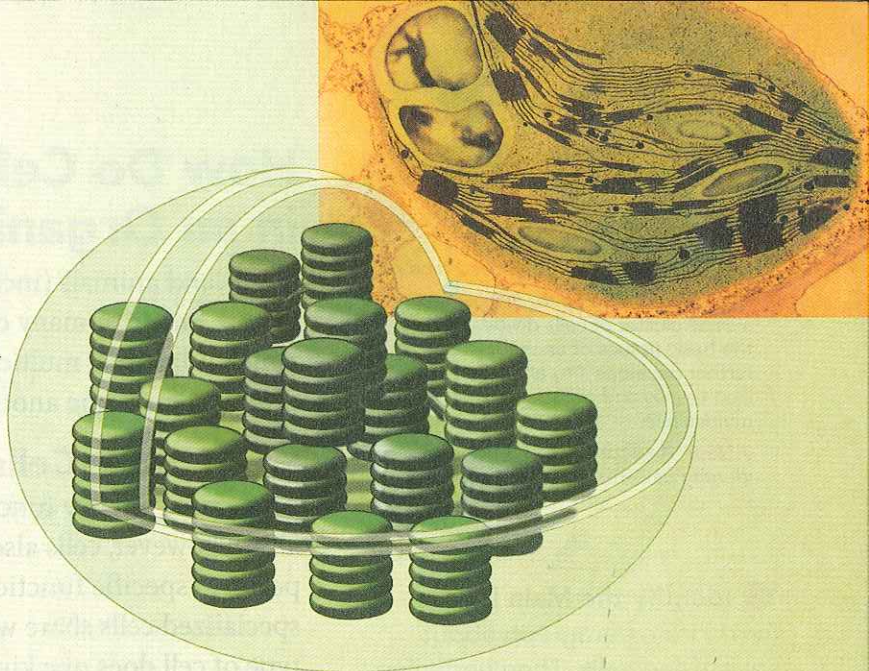



FIGURE 5 .....

**A Chloroplast**

 **Infer** In which part of a plant would you NOT expect to find cells with chloroplasts?

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Do the Quick Lab Gelatin Cell Model.

 **Assess Your Understanding**

**1a. Interpret Tables** Use the table you completed in **Figure 3** to summarize the differences between a plant cell and an animal cell.

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7.3.4

**b. Make Generalizations** How are the functions of the endoplasmic reticulum and the Golgi apparatus related?

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7.3.3

**c. CHALLENGE** A solar panel collects sunlight and converts it to heat or electrical energy. How is a solar panel similar to chloroplasts?

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7.3.3, 7.3.4

**d. ANSWER THE BIG ?** What are cells made of?




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7.3.3, 7.3.4

**got it?** .....

I get it! Now I know that different kinds of organelles in a cell

I need extra help with \_\_\_\_\_

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

7.3.3, 7.3.4





Academic Standards for Science

7.3.5 Explain that all cells in multicellular organisms repeatedly divide to make more cells for growth and repair.

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.NS.8 Analyze data, and use it to identify patterns and make inferences.



Identify the Main Idea

Reread the paragraph about specialized cells. Then underline the phrases or sentences that describe the main ideas about specialized cells.

# How Do Cells Work Together in an Organism?

Plants and animals (including you) are **multicellular**, which means "made of many cells." Single-celled organisms are called **unicellular**. In a multicellular organism, the cells often look quite different from one another. They also perform different functions.

**Specialized Cells** All cells in a multicellular organism must carry out key functions, such as getting oxygen, to remain alive. However, cells also may be specialized. That is, they perform specific functions that benefit the entire organism. These specialized cells share what can be called a "division of labor." One type of cell does one kind of job, while other types of cells do other jobs. For example, red blood cells carry oxygen to other cells that may be busy digesting your food. Just as specialized cells differ in function, they also differ in structure. **Figure 6** shows specialized cells from plants and animals. Each type of cell has a distinct shape. For example, a nerve cell has thin, fingerlike extensions that reach toward other cells. These structures help nerve cells transmit information from one part of your body to another. The nerve cell's shape wouldn't be helpful to a red blood cell.

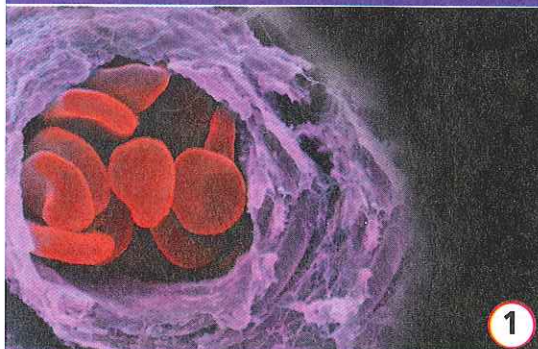

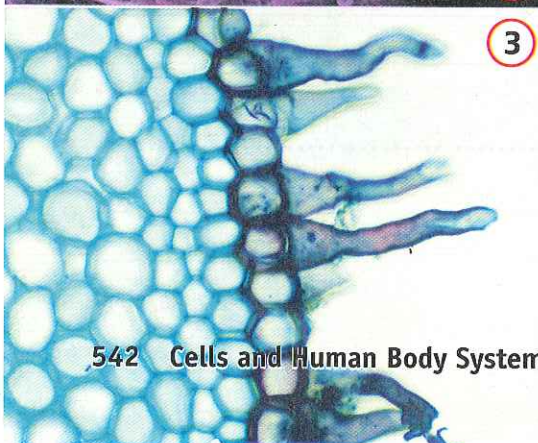
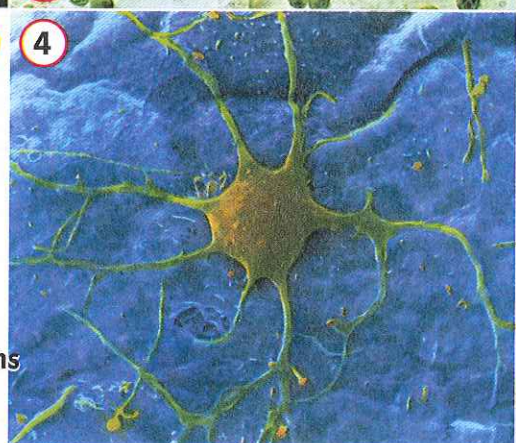
FIGURE 6

INTERACTIVE ART **The Right Cell for the Job**

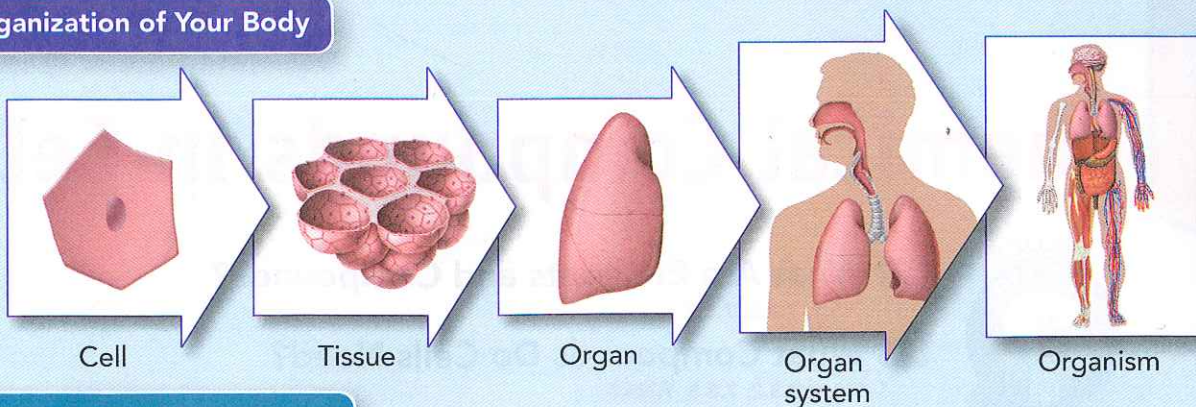
Many cells in plants and animals carry out specialized functions.

**Draw Conclusions** Write the number of each kind of cell in the circle of the matching function.

7.NS.8

Specialized Cells		Function
		<input type="radio"/> Animal cells that can bend and squeeze easily through narrow spaces
		<input type="radio"/> Animal cells that can relay information to other cells
		<input type="radio"/> Plant root cells that can absorb water and minerals from the soil
		<input type="radio"/> Plant cells that can make food

Organization of Your Body



Organization of Your School



**Cells Working Together** A division of labor occurs among specialized cells in an organism. It also occurs at other levels of organization. **In multicellular organisms, cells are organized into tissues, organs, and organ systems.** A **tissue** is a group of similar cells that work together to perform a specific function. For example, your brain is made mostly of nerve tissue, which consists of nerve cells that relay information to other parts of your body. An **organ**, such as your brain, is made of different kinds of tissues that function together. For example, the brain also has blood vessels that carry the blood that supplies oxygen to your brain cells. Your brain is part of your nervous system, which directs body activities and processes. An **organ system** is a group of organs that work together to perform a major function. As **Figure 7** shows, the level of organization in an organism becomes more complex from cell, to tissue, to organ, to organ systems.

FIGURE 7 .....

**Levels of Organization**

Living things are organized in levels of increasing complexity. Many nonliving things, like a school, have levels of organization, too.

**Apply Concepts** On the lines above, write the levels of organization of your school building, from the simplest level, such as your desk, to the most complex.



Do the Quick Lab  
Tissues, Organs, Systems.

**Assess Your Understanding**

**2a. Describe** What does the term *division of labor* mean as it is used in this lesson?

\_\_\_\_\_

\_\_\_\_\_

**b. Infer** Would a tissue or an organ have more kinds of specialized cells? Explain your answer.

\_\_\_\_\_

\_\_\_\_\_

**got it?**

7.3.3

7.3.6

I get it! Now I know that the levels of organization in a multicellular organism include \_\_\_\_\_

I need extra help with \_\_\_\_\_

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

7.3.5, 7.3.6