chapter 1 Cell Structure and Function

lesson 2 The Cell

Grade Seven Science Content Standard. 1.b. Students know the characteristics that distinguish plant cells from animal cells, including chloroplasts and cell walls. **Also covers:** 1.a, 1.c, 1.d, 2.e.

MAIN Idea

Cells have structures with specific functions.

What You'll Learn

- the differences between an animal cell and a plant cell
- the differences between a prokaryotic cell and a eukaryotic cell

Before You Read

What do you know about cells? List a few facts on the lines below. Then read the section to learn about the structures found in the cells.

_____

_____

Mark the Text

Identify Details Highlight each question head. Then use another color to highlight the answer to that question.

Read to Learn

Cell Shape and Movement

The cells of plants and animals have many sizes. They also come in a variety of shapes. Sometimes a cell's shape is related to its function. For example, a human red blood cell is shaped to allow it to move through tiny blood vessels. In plants, some cells are hollow. The hollow cells form a tube to carry water and dissolved substances to all parts of the plant.

What is a cell membrane?

Every cell is enclosed by a flexible cover called the **cell membrane**. The cell membrane is made of one or more layers of linked molecules. It protects a cell by preventing dangerous substances from entering. It allows water, food, and waste products to enter or leave the cell, but does not allow other substances to do so.

Reading Check

1. **Describe** two ways that a cell wall is different from a cell membrane.

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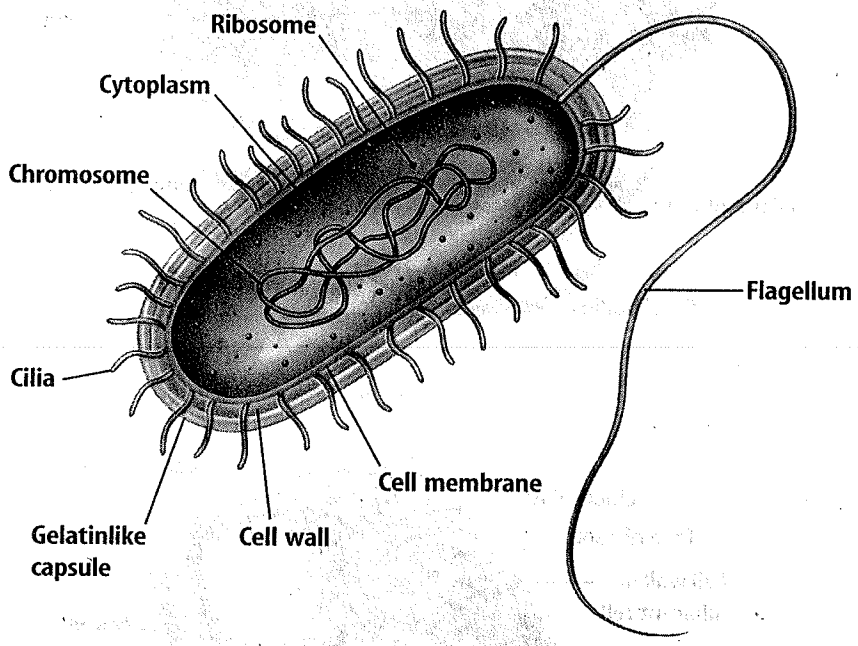
What is the function of a cell wall?

The cells of plants, fungi, and some bacteria have a cell wall. The **cell wall** is a rigid substance that surrounds the cell outside of its cell membrane. The rigid cell wall allows plants and fungi to grow upward against the force of gravity, by maintaining the cell's shape and protecting the cell. Substances can pass freely through a cell wall, unlike a cell membrane. ☑

What appendages do cells have?

Animals run and fly using appendages such as legs and wings. Some cells have appendages too, as shown in the figure below. A flagellum (fluh JEH lum) (plural, flagella) is an appendage that looks like a tail. Some single-celled organisms have one or more flagella. They use the flagellum to move, much like a fish flaps its tail to move through water. Sperm is an example of a cell with one flagellum.

Cilia (SIH lee uh) (singular, cilium) are another type of appendage. Some single-celled organisms are covered with many cilia. Cilia are short appendages that look like hair. The cilia of some single-celled organisms work together to move the organism. Cilia are also on the surface of some cells that do not move. In this case, the cilia help fluids move across the cell's surface.



What are cytoplasm and the cytoskeleton?

The inside of a cell contains a thick fluid made mostly of water called the **cytoplasm** (SI tuh plaz um). Everything inside a cell is suspended in the cytoplasm.

Each cell also has a cytoskeleton. The **cytoskeleton** is a network of fibers that helps the cell maintain or change its shape. It plays a role in muscle contraction, cell division, and cell movement. The cytoskeleton helps the cell maintain its shape. Both cilia and flagella are able to move because they contain fibers of the cytoskeleton.

Picture This

2. Highlight the flagellum in one color and cilia in another color.

Think it Over

3. Decide Which cell structure is made up mostly of a fluid?

a. cytoplasm

b. cytoskeleton

Cell Organelles

Cells must process energy, store materials, and complete many other tasks. Some cells have structures in the cytoplasm called **organelles** (or guh NELZ) that do these jobs. The organelles found in plant and animal cells are shown below. Each type of organelle has its own special function.

Other types of cells do not have organelles. Bacteria, which are single-celled organisms, do not have organelles.

Picture This

4. Name two organelles that are found only in a plant cell.

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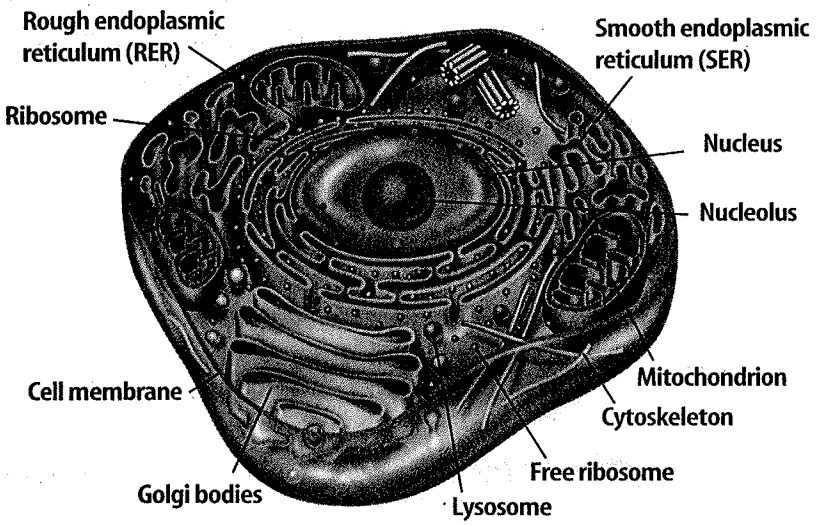
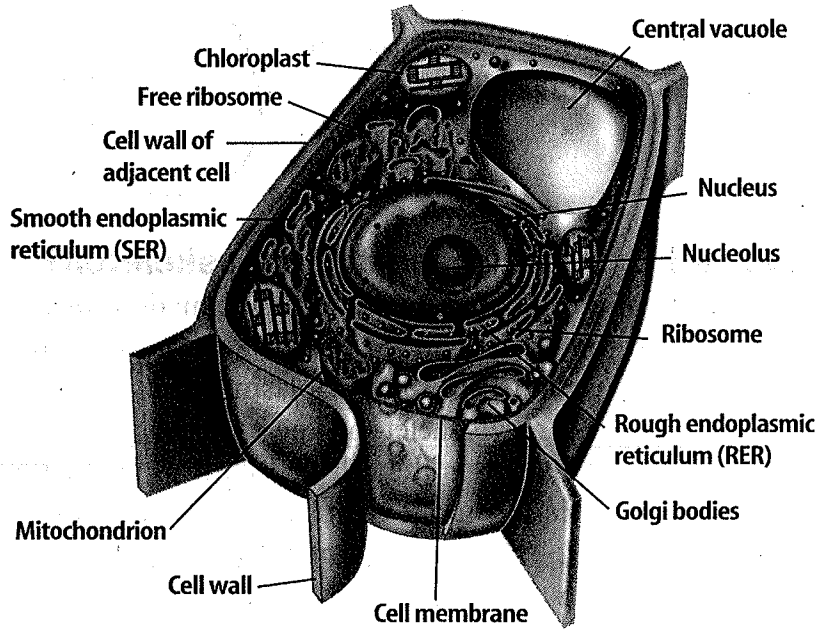
_____

Animal Cell



Plant Cell



What is the nucleus?

The **nucleus** (new KLEE us) is a large organelle found in many cells. It is surrounded by a membrane. Substances can pass into and out of the nucleus through small holes, or pores, in the membrane. The nucleus also contains an organelle called the nucleolus (new KLEE uh luhs). The nucleolus makes structures that make proteins.

The nucleus (plural nuclei) is the control center of a cell because it contains genetic material called DNA. The DNA has information on making all of the molecules in the cell. The long chains of DNA are coiled into structures called **chromosomes** (KROH muh sohmz). Chromosomes have proteins that help the DNA coil. A human cell has 23 pairs of chromosomes. A sheep cell has 27 pairs of chromosomes. Each type of organism has a particular number of pairs of chromosomes in each of its cells. ☑

Where are protein and lipids manufactured?

A cell makes many kinds of molecules to perform its jobs. Protein molecules are built within small structures called **ribosomes** (RI buh sohmz). Ribosomes do not have membranes. They are made in the nucleolus and move into the cytoplasm through the membrane of the nucleus.

Ribosomes can attach to an organelle called the endoplasmic reticulum (en duh PLAZ mihk • rih TIHK yuh lum). The endoplasmic reticulum (ER) is a folded membrane that connects to the nucleus. Rough ER makes and modifies proteins. Smooth ER is important for making lipids and helping cells get rid of chemicals and poisons.

How do cells process energy?

Most plants and some single-celled organisms can make their own food. The food is made in membrane-bound organelles called chloroplasts. A **chloroplast** (KLOR uh plast) uses light energy to make food. It uses light energy, water, and carbon dioxide to make a type of sugar.

All animals must get their food from outside sources. An organelle called **mitochondrion** (mi tuh KAHN dree uhn) (plural, mitochondria) changes the energy from food molecules into a form of energy that cells can use. Mitochondria are surrounded by cell membranes. They are sometimes called the power plants of a cell. Cells that require a lot of energy, such as muscle cells, have many mitochondria. Cells that require less energy, such as skin cells, have fewer mitochondria.

Reading Check

5. Summarize the importance of the nucleus to the cell.

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Academic Vocabulary

source (SORS) (noun) cause; point of origin

Which is the job of the Golgi apparatus?

The Golgi (GAWL jee) apparatus is an organelle that makes, sorts, and ships molecules. It also modifies, stores, and directs the movement of molecules made in the ER. Some cells contain large numbers of Golgi apparatus because they make substances that are needed in other parts of an organism.

When the Golgi apparatus needs to transport a molecule, it puts that molecule into a vesicle. A vesicle is made of membranes and carries molecules throughout the cytoplasm. Vesicles also carry substances that are released from the cell to the cell membrane.

Vacuoles (VAK yuh wohlz) are storage organelles. Small vacuoles contain food molecules, water, or waste products from the cell. An animal cell contains a vacuole called the lysosome (LI suh sohm). A lysosome stores digestive enzymes. A plant cell has a large vacuole called the central vacuole. See the table below for information on the function of various cell structures.

Picture This

6. Identify Circle the cell functions that have to do with movement.

Cell Structure		
Cell Structure	**Function**	**Cell Type**
Cell membrane	regulates movement of substances into and out of a cell	all cells
Cell wall	provides shape, protection, and support	plants, fungi, and some bacteria
Flagellum and cilium	movement	some single-celled organisms; flagellum—some sperm; cilium—some animal cells
Cytoskeleton	cell shape and movement	all cells
Nucleus	controls cell functions	most cells except bacterial cells
Ribosome	site of protein production	all cells
Endoplasmic reticulum (ER)	smooth—makes lipids and gets rid of chemicals and poisons rough—makes and modifies proteins	most cells except bacterial cells
Mitochondrion	releases energy	most cells except bacterial cells
Chloroplast	makes food	most plant cells
Golgi apparatus	modifies, stores, and directs the movement of molecules made by ER	most cells except bacterial cells
Vesicle	transports substances	most cells except bacterial cells
Lysosome	stores digestive enzymes	most animal cells
Central vacuole	stores water and plant substances	plant cells

Cell Types

A cell without a nucleus and other organelles is classified as a **prokaryotic** (proh kayr ee AH tihk) **cell**. A cell with a nucleus and other organelles is classified as a **eukaryotic** (yew kayr ee AH tihk) **cell**.

What is another name for prokaryotes?

Prokaryotic cells are always single-celled organisms. These organisms are called prokaryotes (proh KAYR ee ohts). Many prokaryotes have cell walls and flagella.

Prokaryotes are also known as bacteria. Bacteria are a diverse group of organisms. They live in many different environments.

What are eukaryotic cells?

Eukaryotic cells are larger than prokaryotic cells. They also contain different structures. Protists, fungi, plants, and animals are made of one or more eukaryotic cells. Therefore, these organisms are called eukaryotes (yew KAYR ee ohts). Many scientists suggest that eukaryotic cells may have evolved when one prokaryotic cell became part of another prokaryotic cell.

What have you learned about the cell?

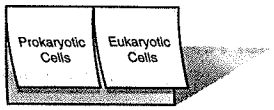
The parts of a cell work together to help the cell survive. The cell membrane controls what enters and exits a cell. The cell wall and cytoskeleton determine the shape of a cell. Most cell organelles are membrane-bound. Chromosomes in a cell's nucleus contain genetic information.

Two cell types are prokaryotic and eukaryotic, as shown below. Prokaryotic cells do not contain any membrane-bound organelles. Eukaryotic cells have a nucleus and other membrane-bound organelles.

FOLDABLES™

B Sketch and Describe

Make a two-tab Foldable. Sketch and label prokaryotic and eukaryotic cells on the front tabs, record what you learn about each, and use what you learn to describe similarities and differences.



Picture This

7. Identify Circle the features that are the same in both types of cells.