

Lesson 2 Cells

Scan Lesson 2. Read the lesson titles and bold words. Look at the pictures. Identify three facts you discovered about cells. Record your facts in your Science Journal.

Main Idea

What are cells?

I found this on page _____.

What are cells made of?

I found this on page _____.

Types of Cells

I found this on page _____.

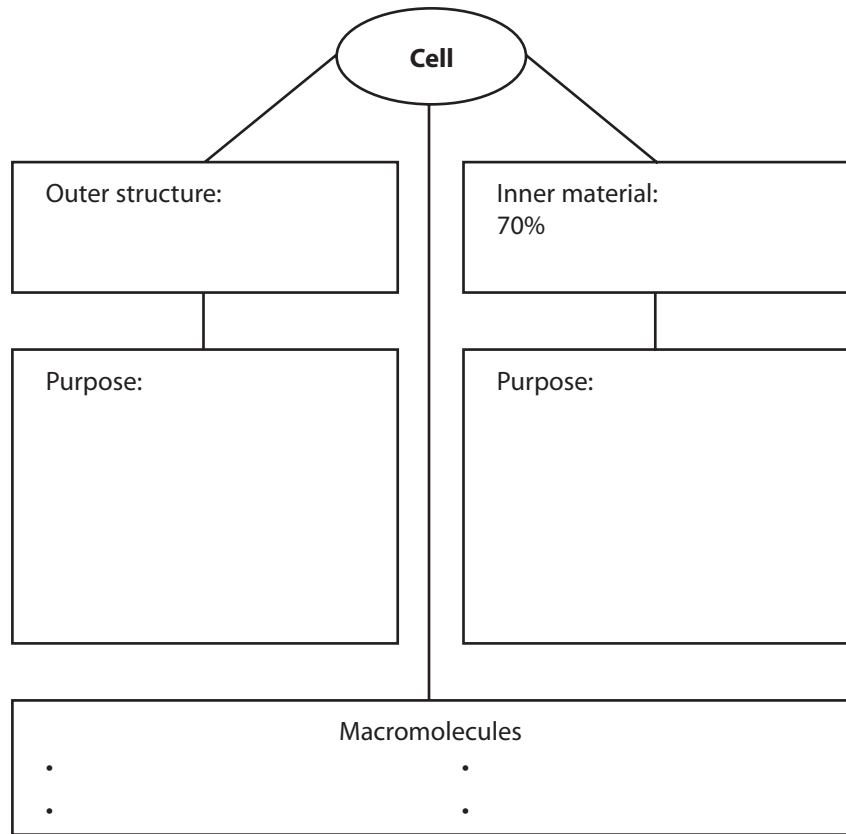
Details

Contrast the numbers of cells that make up organisms.

Most Organisms: _____

Humans: _____

 **Characterize** the makeup of cells.



Describe types of cells.

Prokaryotic cells	Eukaryotic cells

Life's Classification and Structure

Cells

..... Before You Read

What do you think? Read the three statements below and decide whether you agree or disagree with them. Place an A in the Before column if you agree with the statement or a D if you disagree. After you've read this lesson, reread the statements to see if you have changed your mind.		
Before	Statement	After
	4. <i>Cell wall</i> is a term used to describe the cell membrane.	
	5. Prokaryotic cells contain a nucleus.	
	6. Plants use chloroplasts to process energy.	

..... Read to Learn

What are cells?

What is one thing all living organisms have in common? All organisms have one or more cells. Cells are the basic units of organisms. Most organisms have only one cell. Some organisms have many cells. Humans have about 100 trillion cells! Most cells are so small that they can be seen only with a microscope. Microscopes are used to view details of small objects or things that are too small to be seen by the unaided eye.

Scientists first used microscopes to look at cells more than 300 years ago. Cells can be different shapes and sizes. Nerve cells are long and slender. Many female reproductive cells, or eggs, are large and round. ✓

What are cells made of?

Recall that all cells are made of four macromolecules—nucleic acids, lipids, proteins, and carbohydrates. Cells also have many other characteristics. For example, all cells are surrounded by an outer structure called a cell membrane. The cell membrane keeps substances such as macromolecules inside the cell. It also helps protect cells by keeping harmful substances from entering. About 70 percent of the inside of a cell is water. Because many of the substances inside a cell are dissolved in water, they move easily within the cell. ✓

Key Concepts

- What is a cell made of?
- How do the parts of a cell enable it to survive?

Mark the Text

Identify the Main Ideas

Write a phrase beside each paragraph that summarizes the main point of the paragraph. Use the phrases to review the lesson.

Reading Check

1. Explain Why is a microscope needed to view most cells?

Key Concept Check

2. Relate What is a cell made of?

Types of Cells

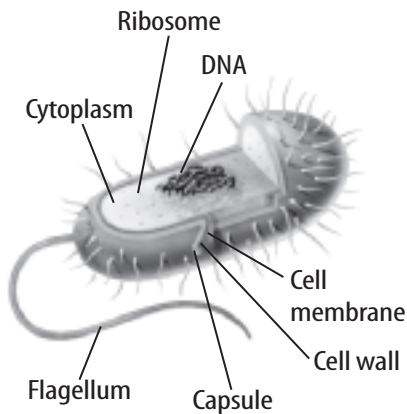
There are two main types of cells, as shown in the figure below. Structures in the two types of cells are organized differently. **Prokaryotic** (pro kayr ee AH tihk) **cells** *do not have a nucleus or other membrane-bound organelles*. Organelles are structures in cells that carry out specific functions. The few organelles in prokaryotic cells are not surrounded by membranes. Organisms with prokaryotic cells are called prokaryotes. Most prokaryotes are unicellular organisms, such as bacteria.

Reading Check

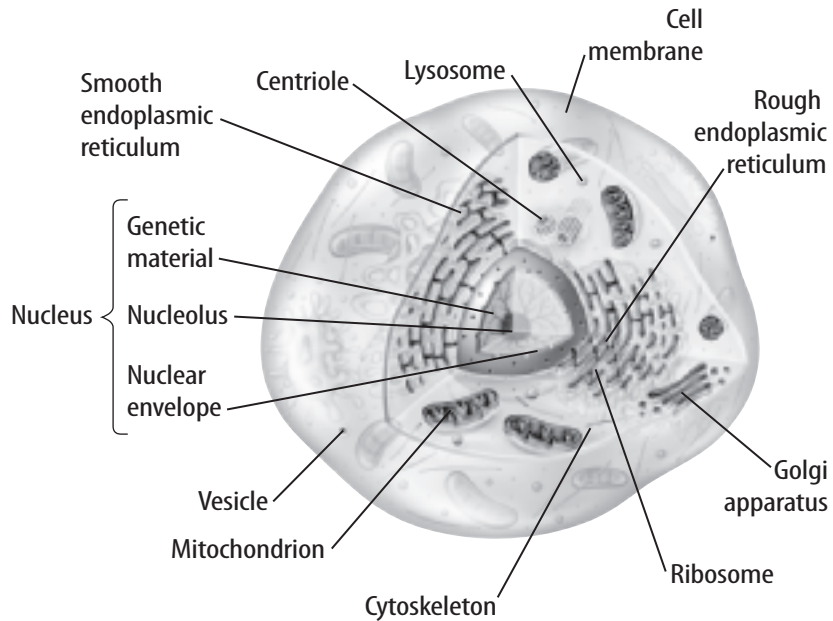
3. State What are the two main types of cells?

Eukaryotic (yew ker ee AH tihk) **cells** *have a nucleus and other membrane-bound organelles*. Most multicellular organisms and some unicellular organisms are eukaryotes. The eukaryotic cell shown in the figure below contains many structures that are not in a prokaryotic cell. In eukaryotes, membranes surround most of the organelles, including the nucleus. ✓

Prokaryotic and Eukaryotic Cells



Prokaryotic Cell



Eukaryotic Cell

Visual Check

4. Compare What structures are in both prokaryotic and eukaryotic cells?

The Outside of a Cell

As you have just read, the cell membrane surrounds a cell. Much like a fence surrounds a school, the cell membrane helps keep substances inside a cell separate from the substances outside a cell. A more rigid layer, called a cell wall, also surrounds some cells.

Cell Membrane

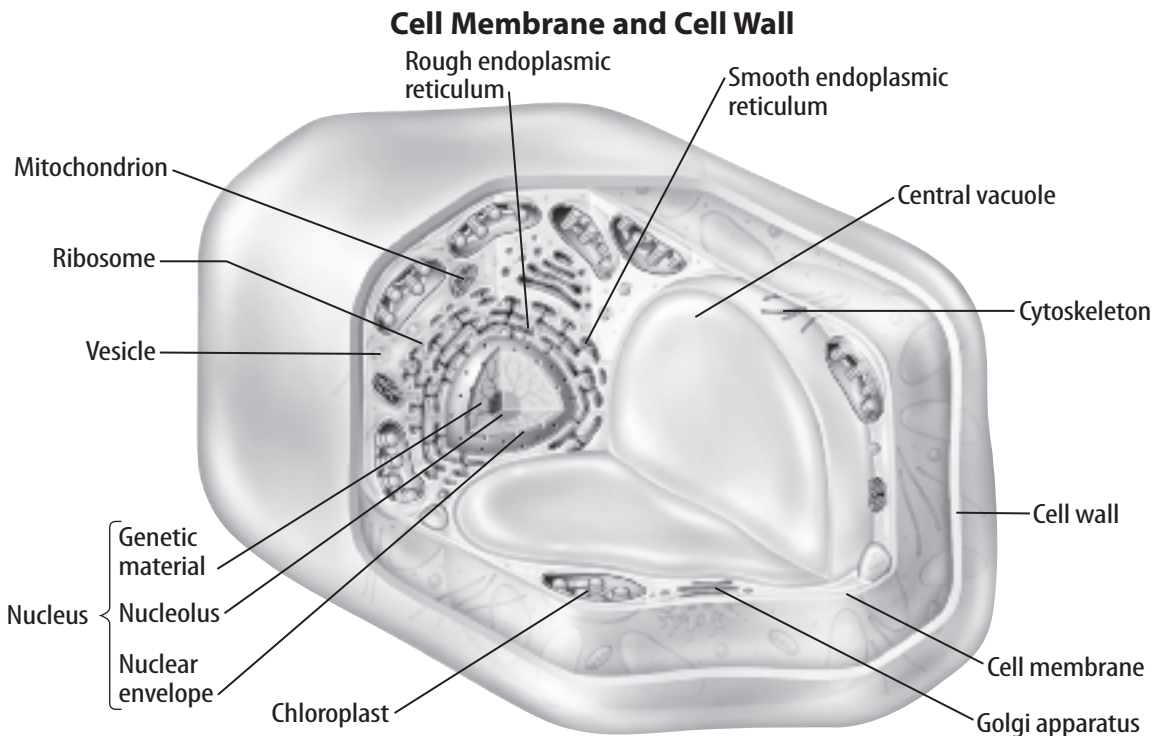
The cell membrane is made of lipids and proteins. Recall that lipids and proteins are macromolecules that help cells function. Lipids in the cell membrane protect the inside of a cell from the external environment. Proteins in the cell membrane transport substances between a cell's environment and the inside of the cell. Proteins in the cell membrane also communicate with other cells and organisms and sense changes in the cell's environment. ✓

Cell Wall

In addition to a cell membrane, some cells have a cell wall, as shown in the figure below. The cell wall is a strong, rigid layer outside the cell membrane. Cells in plants, fungi, and many types of bacteria have cell walls. They provide structure and help protect the cell from the outside environment. Most cell walls are made from different types of carbohydrates.

✓ Reading Check

5. Summarize the major components of cell membranes.



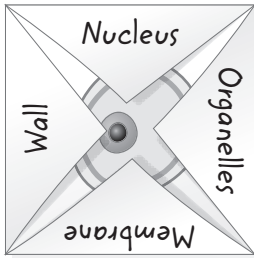
The Inside of a Cell

Recall that the inside of a cell is mainly water. Many substances used for communication, energy, and growth dissolve in water. This makes it easier for the substances to move around inside a cell. Water also gives cells their shapes and helps keep the structures inside a cell organized. The organelles inside a cell perform specific functions. They control cell activities, provide energy, transport materials, and store materials.

✓ Visual Check

6. Locate Is the cell wall found inside or outside the cell membrane?

Make an envelope book and use the inside to illustrate a cell. Use the tabs to label and describe the cellular structures.



Reading Check

7. Identify What type of macromolecule is DNA?

Reading Check

8. Name What energy molecule is made in a mitochondrion?

Cytoplasm

The liquid part of a cell inside the cell membrane is called the **cytoplasm**. It contains water, macromolecules, and other substances. In eukaryotic cells, the organelles are located in the cytoplasm. Proteins in the cytoplasm provide structure and help organelles and other substances move around.

Controlling Cell Activities

Genetic material, called DNA, stores the information that controls all of a cell's activities. DNA is a type of macromolecule called a nucleic acid. The DNA transfers its information to another nucleic acid called RNA. RNA gives cells instructions about which proteins need to be made.

In prokaryotic cells, DNA is in the cytoplasm. In eukaryotic cells, DNA is stored in an organelle called the nucleus. A membrane, called the nuclear membrane, surrounds the nucleus. Tiny holes in the nuclear membrane let certain substances move between the nucleus and the cytoplasm.

Energy for the Cell

You read in Lesson 1 that all living things use energy. Proteins in the cytoplasm process energy in prokaryotes. Eukaryotes have special organelles called chloroplasts and mitochondria (mi tuh KAHN dree uh; singular, mitochondrion) that process energy.

Mitochondria Most eukaryotes contain hundreds of mitochondria. **Mitochondria** are organelles that break down food and release energy. Molecules called ATP—adenosine triphosphate (uh DEN uh seen • tri FAHS fayt)—store this energy. ATP provides a cell with energy to perform many functions, such as making proteins, storing information, and communicating with other cells.

Chloroplasts Energy also can be processed in organelles called chloroplasts. Plants and many other autotrophs have chloroplasts and mitochondria. Animal cells do not have chloroplasts. Chloroplasts capture light energy and convert it into chemical energy in a process called photosynthesis. Chloroplasts contain many structures that capture light energy. Like the reactions that occur in mitochondria, ATP molecules are produced during photosynthesis. However, photosynthesis also produces carbohydrates such as glucose that also are used to store energy.

Protein Production

You just read that cells use protein for many functions. These proteins are made on the surface of ribosomes that are in the cytoplasm of prokaryotic and eukaryotic cells. In eukaryotic cells, some ribosomes are attached to an organelle called the endoplasmic reticulum (en duh PLAZ mihk • rih TIHK yuh lum). Endoplasmic reticulum is made of folded membranes. The proteins can be processed and can move inside the cell through the endoplasmic reticulum. ✓

Cell Storage

What happens to the molecules that are made in a cell? An organelle called the Golgi (GAWL jee) apparatus packages proteins into tiny organelles called vesicles. Vesicles transport proteins around a cell. Organelles called vacuoles store other molecules. A vacuole is usually the largest organelle in a plant cell. In plant cells, vacuoles also store water and provide support. In contrast to the vacuoles in all plant cells, only some animal and bacterial cells contain vacuoles. The vacuoles in animal and bacterial cells are smaller than the ones in plant cells. ✓

✓ Reading Check

9. Express Where are ribosomes found in eukaryotic cells?

✓ Key Concept Check

10. Describe How do the parts of a cell enable it to survive?

..... After You Read

Mini Glossary

cytoplasm: the liquid part of a cell inside the cell membrane

eukaryotic (yew ker ee AH tihk) cell: a cell that has a nucleus and other membrane-bound organelles

mitochondrion (mi tuh KAHN dree un): an organelle that breaks down food and releases energy

prokaryotic (pro kayr ee AH tihk) cell: a cell that does not have a nucleus or other membrane-bound organelles

1. Review the terms and their definitions in the Mini Glossary. Write a sentence discussing what is found in cytoplasm.

2. Identify the organelle that performs each function described in the table and write its letter in the left column.

- a. chloroplast
- b. cell wall

- c. Golgi apparatus
- d. nucleus

- e. vacuole
- f. vesicle

Organelle	Function
	stores DNA in eukaryotic cells
	transports proteins around a cell
	stores water and provides support in plants
	processes energy in plant cells
	packages proteins in vesicles
	protects the cell from the outside environment

3. Explain how DNA and RNA work together.

What do you think **NOW?**

Reread the statements at the beginning of the lesson. Fill in the After column with an A if you agree with the statement or a D if you disagree. Did you change your mind?



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Lesson 2 | Cells (continued)

Main Idea

I found this on page _____.


The Outside of a Cell

I found this on page _____.

The Inside of a Cell


I found this on page _____.

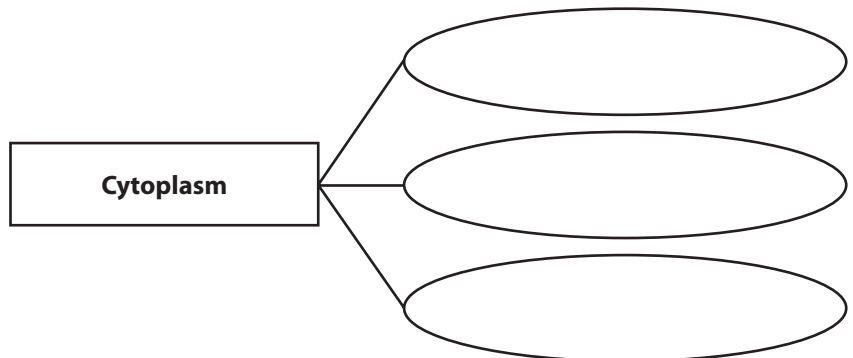
Details

 **Model** a prokaryotic cell. Draw and label the cell, using different colors for different structures. Circle the names of at least two structures that are also present in eukaryotic cells.

Contrast a cell membrane with a cell wall.

Cell Membrane	Cell Wall

 **Characterize** the contents of the cytoplasm in cells of eukaryotic organisms.



Lesson 2 | Cells (continued)

Main Idea

I found this on page _____.

I found this on page _____.

I found this on page _____.

Details



Distinguish the nucleic acid DNA from RNA.

DNA	RNA



Compare and contrast the functions and locations of a mitochondrion and a chloroplast.

Mitochondrion	Both	Chloroplast



Describe the roles of different cell structures.

Structure	Role
Ribosomes	
Endoplasmic reticulum	
Golgi apparatus	
Vesicles	
Vacuoles	



Analyze It Generalize how prokaryotic and eukaryotic cells relate to unicellular and multicellular organisms.
