

BEFORE YOU READ

After you read this section, you should be able to answer these questions:

- What are the parts of a eukaryotic cell?
- What is the function of each part of a eukaryotic cell?
- How do plant cells differ from animal cells?



California Science Standards

7.1.a, 7.1.b, 7.1.c, 7.1.d

What Are the Parts of a Eukaryotic Cell?

Plant cells and animal cells are two types of eukaryotic cells. A eukaryotic cell has many parts that help it stay alive.

CELL WALL

All plant cells have a cell wall. The **cell wall** is a stiff structure that supports the cell and surrounds the cell membrane. The cell wall of a plant cell is made of a type of sugar called cellulose.

Fungi (singular, *fungus*), such as yeasts and mushrooms, also have cell walls. The cell walls of fungi are made of a sugar called chitin. Prokaryotic cells such as bacteria and archaea also have cell walls. ✓

STUDY TIP

Organize As you read this section, make a chart comparing plant cells and animal cells.

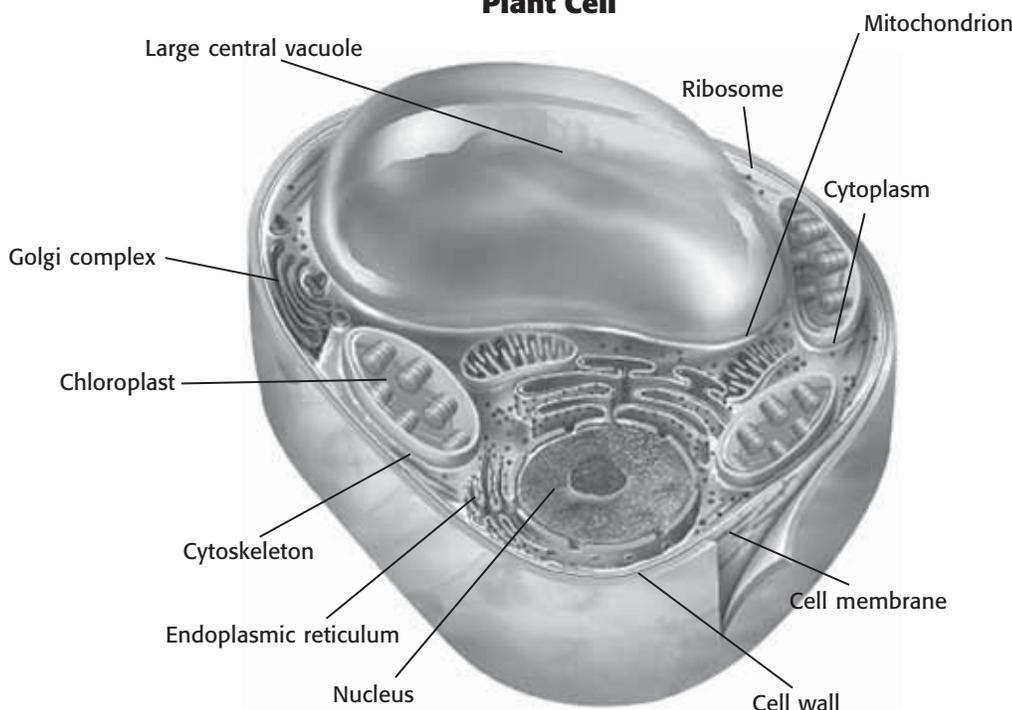
READING CHECK

1. Identify Name two kinds of eukaryotes that have cell walls.

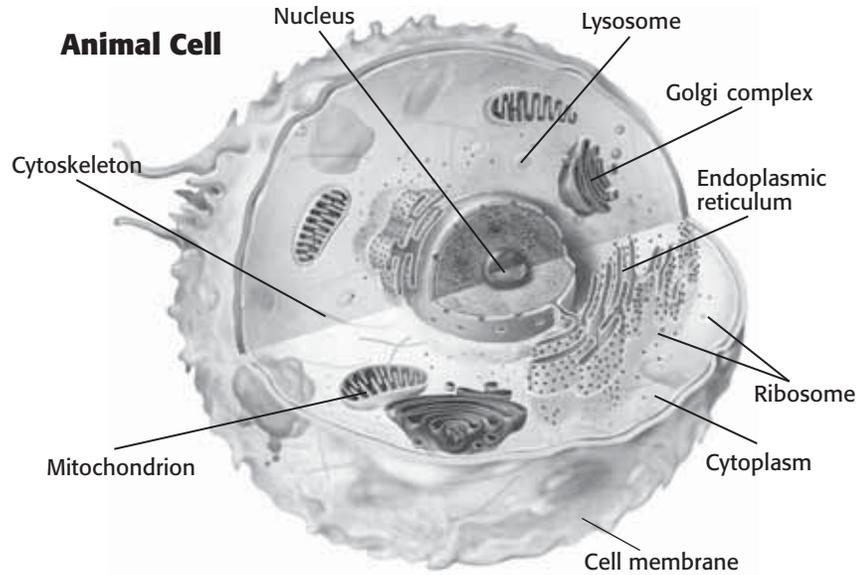
TAKE A LOOK

2. Identify Where is the cell wall located?

Plant Cell



SECTION 2 Eukaryotic Cells *continued*



TAKE A LOOK

3. Compare Compare the pictures of an animal cell and a plant cell. Name three parts that both the plant cell and the animal cell have.

CELL MEMBRANE

Every cell has a cell membrane. The cell membrane surrounds and protects the cell. It separates the cell from the outside environment. In a cell that has a cell wall, the cell membrane is found just inside the cell wall.

The cell membrane is made of many kinds of materials. It contains proteins and lipids, including phospholipids. Proteins are molecules made by cells for a variety of functions. Lipids are compounds that do not dissolve in water. They include fats and cholesterol. Phospholipids are lipids that contain the element phosphorus. ✓

The proteins and lipids in the cell membrane control the movement of materials into and out of the cell. A cell needs materials such as nutrients and water to survive and grow. The proteins in the cell membrane allow nutrients to go in and wastes to go out of the cell. Water can pass through the cell membrane without the help of proteins.

RIBOSOMES

Ribosomes are organelles that make proteins. They are the smallest organelles. A cell can have many ribosomes. Some float freely inside the cell. Others are attached to membranes or to other organelles. Unlike most organelles, ribosomes are not covered by membranes. ✓

READING CHECK

4. List What is the cell membrane made of?

READING CHECK

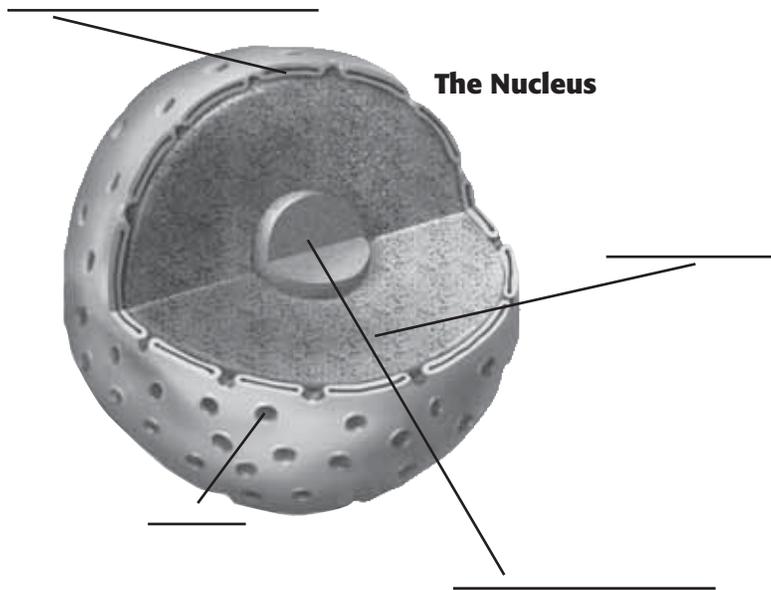
5. Compare How are ribosomes different from other organelles?

SECTION 2 Eukaryotic Cells *continued*

NUCLEUS

The nucleus is a large organelle in a eukaryotic cell. It contains DNA, the cell’s genetic material. DNA has the instructions that tell a cell how to make proteins.

The nucleus is covered by two membranes. Materials pass through pores in the double membrane. In many cells, the nucleus contains a dark area called the *nucleolus*.



TAKE A LOOK

6. Identify Label the diagram of a nucleus with these terms: pore, DNA, nucleolus, double membrane.

ENDOPLASMIC RETICULUM

Many chemical reactions take place in the cell. Many of these reactions happen on or inside the endoplasmic reticulum. The **endoplasmic reticulum** (ER) is a system of membranes with many folds in which proteins, lipids, and other materials are made.

The ER is also part of the cell’s delivery system. Its folds have many tubes and passageways. Materials move through the ER to other parts of the cell.

There are two types of ER: rough and smooth. Smooth ER makes lipids and helps break down materials that can harm the cell. Rough ER has ribosomes attached to it. The ribosomes make proteins. The proteins are then delivered to other parts of the cell by the ER. ✓

READING CHECK

7. Compare What is the difference between smooth ER and rough ER?



Endoplasmic reticulum
This organelle makes lipids, breaks down drugs and other substances, and packages proteins for the Golgi complex.

SECTION 2 Eukaryotic Cells *continued*

MITOCHONDRIA

A **mitochondrion** (plural, *mitochondria*) is an organelle that breaks down sugar to make energy. It is the main power source for a cell.

A mitochondrion is covered by two membranes. Most of a cell's energy is made in the inside membrane. Energy released by mitochondria is stored in a molecule called ATP. The cell uses the ATP to do work. Mitochondria have their own DNA that is different from the cell's DNA. ✓

READING CHECK

8. Explain How do mitochondria differ from other organelles?



Mitochondrion
This organelle breaks down food molecules to make ATP.

CHLOROPLASTS

Plants and algae have chloroplasts in some of their cells. **Chloroplasts** are organelles where photosynthesis takes place. During *photosynthesis*, plants use sunlight, carbon dioxide, and water to make sugar and oxygen. Animal cells do not have chloroplasts.

Chloroplasts are green because they contain green molecules called *chlorophyll*. Chlorophyll traps the energy of sunlight. Mitochondria then use the sugar made in photosynthesis to make ATP.



Chloroplast
This organelle uses the energy from sunlight to make food.

<p>CALIFORNIA STANDARDS CHECK</p>
<p>7.1.d Students know that mitochondria liberate energy for the work that cells do and that chloroplasts capture sunlight</p> <p>Word Help: liberate to release; to set free</p> <p>Word Help: energy the capacity to do work</p> <p>9. Infer Why don't animal cells need chloroplasts?</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>

CYTOSKELETON

The **cytoskeleton** is a web of proteins inside the cell. It acts as both a skeleton and a muscle. The cytoskeleton helps the cell keep its shape. It also helps some cells, such as bacteria, to move.

VESICLES

A **vesicle** is a small sac that surrounds material to be moved. The materials are moved to another part of the cell or out of the cell. Vesicles are made from the membrane of the Golgi complex or from the cell membrane. All eukaryotic cells have vesicles.

SECTION 2 Eukaryotic Cells *continued*

GOLGI COMPLEX

The **Golgi complex** is the organelle that packages and distributes proteins. It is the “post office” of the cell. The Golgi complex looks like the smooth ER.

The ER delivers lipids and proteins to the Golgi complex. The Golgi complex can change the lipids and proteins so that they can do different jobs. The final products are then enclosed in pieces of the Golgi complex’s membrane. This membrane pinches off to make vesicles. The vesicles transport the materials to other parts of the cell or out of the cell. ✓



Golgi Complex
This organelle processes and transports proteins and other materials.

LYSOSOMES

Lysosomes are organelles that are responsible for digestion in a cell. They destroy worn-out or damaged organelles, get rid of wastes, and protect the cell from harmful particles.

Lysosomes are found mainly in animal cells. The cell wraps membrane around a particle and encloses it in a vesicle. Lysosomes bump into the vesicle and pour enzymes into it. The enzymes break down the particle inside the vesicle. This removes old or dangerous materials so they do not build up inside the cell.



Lysosome
This organelle digests food particles, wastes, cell parts, and foreign invaders.

VACUOLES

A vacuole is a vesicle. In plant and fungal cells, some vacuoles act like lysosomes. They contain enzymes that help a cell digest particles. The large central vacuole in a plant cell stores water and other liquids. Large vacuoles full of water help support the cells. Some plants wilt when their vacuoles lose water. ✓

READING CHECK

10. Define What is the function of the Golgi complex?

READING CHECK

11. Identify What types of eukaryotic cells have vacuoles that act like lysosomes?

Section 2 Review

7.1.a, 7.1.b, 7.1.c, 7.1.d 

SECTION VOCABULARY

<p>cell wall rigid structure that surrounds the cell membrane and provides support to the cell</p> <p>chloroplast an organelle found in plant and algae cells where photosynthesis occurs</p> <p>cytoskeleton the cytoplasmic network of protein filaments that plays an essential role in cell movement, shape, and division</p> <p>endoplasmic reticulum a system of membranes that is found in a cell's cytoplasm and that assists in the production, processing, and transport of proteins and in the production of lipids</p>	<p>Golgi complex a cell organelle that helps make and package materials to be transported out of the cell</p> <p>lysosome a cell organelle that contains digestive enzymes</p> <p>mitochondrion in eukaryotic cells, the cell organelle that is surrounded by two membranes and that is the site of cellular respiration</p> <p>ribosome a cell organelle composed of RNA and protein; the site of protein synthesis</p> <p>vesicle a small cavity or sac that contains materials in a eukaryotic cell</p>
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1. Compare Name three parts of a plant cell that are not found in an animal cell.

2. Explain How does a cell get water and nutrients?

3. Predict What would happen to a eukaryotic cell if all its mitochondria were destroyed?

4. Apply Concepts What kind of cell in the human body do you think would have more mitochondria—a muscle cell or a skin cell?

5. List What are two functions of the cytoskeleton?
