

SKILL: MAKING COMPARISONS

Cells and Spacesuits

What do a space suit and a unicellular organism have in common? Both have to support life. And both can support life in difficult environments. What are some of the similarities—and differences—between the cell body of a unicellular organism and a space suit that supports an astronaut in outer space?

Some Features of Spacesuits

FEATURE	FUNCTION
Strong outer material...	...protects the astronaut from space particles.
A special jet-propelled backpack...	...helps the astronaut move in the weightlessness of space.
Tanks of compressed air...	...provide oxygen for the astronaut to breathe.

Some Features of Cells

FEATURE	FUNCTION
Tail-like flagella on the outside of some cells...	...help cells move.
An outer membrane...	...keeps harmful particles out.
Tiny openings in a cell's membrane...	...let oxygen move into the cell.

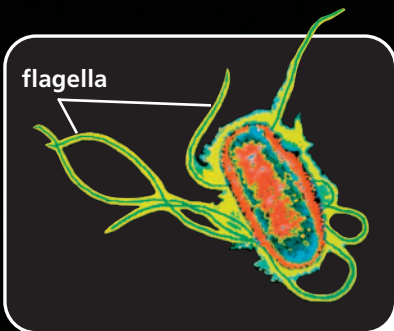
Make Comparisons

On Your Own Match each cell feature with a similar spacesuit feature. What characteristics do the cell and spacesuit have in common? What is one key difference?

As a Group Use your comparisons to make a Venn diagram.



CHALLENGE An analogy uses a familiar thing to help explain or describe something new. Come up with your own analogies to describe the cell or some of its organelles.



This cell has flagella, which help it move.

1 Chapter Review

the **BIG** idea

All living things are made up of cells.



CONTENT REVIEW
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KEY CONCEPTS SUMMARY

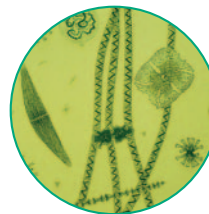
1 The cell is the basic unit of living things.

All living things are made up of one or more cells. **Organisms** share the following characteristics:



Multicellular organisms include this frog and these water-lily plants.

- organization
- ability to grow and develop
- ability to respond
- ability to reproduce



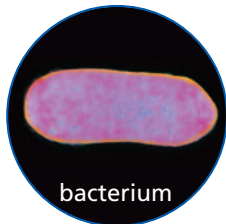
Many unicellular organisms live in pond water.

VOCABULARY

unicellular p. 11
multicellular p. 11
microscope p. 12
bacteria p. 14

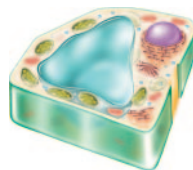
2 Microscopes allow us to see inside the cell.

A **prokaryotic cell** is relatively simple in structure, with no nucleus or other organelles. A **eukaryotic cell** is more complex, with many different organelles inside it.

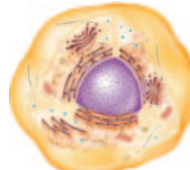


bacterium

A bacterium consists of a single prokaryotic cell.



plant cell



animal cell

Plants and animals are made up of many eukaryotic cells.

VOCABULARY

cell membrane p. 20
cytoplasm p. 20
nucleus p. 20
eukaryotic cell p. 20
prokaryotic cell p. 20
organelle p. 20
cell wall p. 21
chloroplast p. 23
mitochondria p. 23

3 Different cells perform various functions.

- The single cell of a unicellular organism does all that is necessary for the organism to survive.
- A multicellular organism is a community of **specialized** cells.
- Scientific models make it easier to understand cells.

The tarsier has many levels of organization in its body.



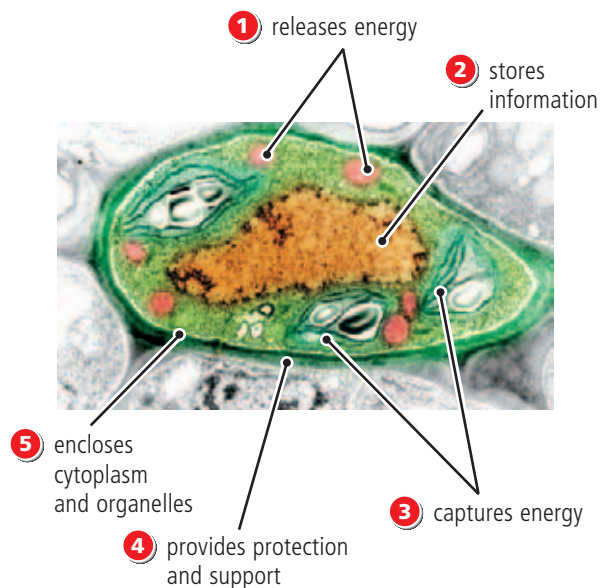
tarsier

VOCABULARY

specialization p. 28
tissue p. 29
organ p. 30

Reviewing Vocabulary

1–5. Use a vocabulary term to identify each numbered part of this plant cell.



In one or two sentences, describe how the terms in each of the following pairs are related. Underline each term in your answer.

- unicellular, multicellular
- cell, organelle
- prokaryotic cell, eukaryotic cell
- tissue, organ

Reviewing Key Concepts

Multiple Choice Choose the letter of the best answer.

- Which statement about cells is part of the cell theory?
 - Cells are found in most living things.
 - Cells with cell walls do not have cell membranes.
 - All cells capture energy from sunlight.
 - Cells come only from other living cells.

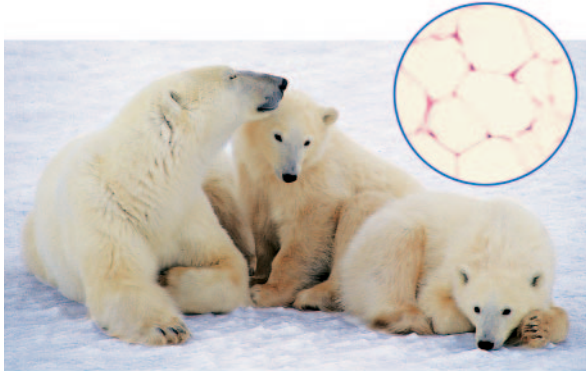
- What structure does a plant cell have that is not found in an animal cell and that allows a plant cell to capture energy from the Sun?
 - cell wall
 - chloroplast
 - mitochondrion
 - central vacuole
- Which technology was important to the development of the cell theory?
 - computer
 - scientific model
 - microscope
 - refrigeration
- Organisms can be divided into domains on the basis of the characteristics of their cells. What are these domains?
 - Archaea, Bacteria, and Eukarya
 - prokaryotes and eukaryotes
 - plants, animals, and bacteria
 - unicellular and multicellular
- A complex multicellular organism has different levels of organization. What is the order of these levels?
 - cell membrane, cytoplasm, nucleus
 - tissues, organs, organ systems
 - tissues, organs, specialized cells
 - cell membrane, organelles, nucleus
- What is the function of the genetic material in a cell?
 - provides transport of materials from the nucleus to the cell membrane
 - breaks down materials brought into the cell
 - provides information a cell needs to function and grow
 - controls what comes into a cell and what goes out

Short Answer Write a short answer to each question.

- What are four characteristics common to all living things?
- What are three needs common to all living things?

Thinking Critically

Questions 18–20 refer to polar bears and their cells as examples of animals and animal cells.



- 18. PREDICT** Some polar bears go through long periods of sleep during the cold winter months. In what two ways might their fat cells help the bears survive during these periods?
- 19. PROVIDE EXAMPLES** Animals do not get energy directly from the Sun as plants do. Give one or two examples of body systems in a polar bear that help it obtain and process food.
- 20. COMPARE AND CONTRAST** Consider the fat cells in a polar bear and compare them with the single body cell of a bacterium. How are the cells alike, and how are they different?
- 21. CONNECT** The cell theory applies to all organisms, including you. State the three parts of the cell theory and describe briefly how they relate to you.
- 22. ANALYZE** Louis Pasteur designed the swan-necked flask to use in his experiments. In one experiment, he used two sealed flasks of nutrient broth. One flask he heated; the other he left untouched. Bacteria grew in the untouched flask. Nothing grew in the flask that had been heated, or sterilized. How did this experiment provide evidence against the theory of spontaneous generation?

Both ends of flasks are sealed.



- 23. PREDICT** What would happen if the neck of the sterilized swan-necked flask were broken?
- 24. IDENTIFY CAUSE** Why does pasteurized milk eventually spoil?
- 25. COMPARE AND CONTRAST** A plant cell has a number of structures and organelles that an animal cell does not. Copy the table below and place a check in the appropriate box of each row. The first two are done for you.

	Animal Cell	Plant Cell
Cell wall		✓
Cell membrane	✓	✓
Cytoplasm		
Nucleus		
Central vacuole		
Chloroplast		
Mitochondrion		

the BIG idea

- 26. CLASSIFY** Look again at the photograph on pages 6–7. Can you identify any of the structures shown? Can you identify the type of microscope used to make the photograph? How do you know?
- 27. CONNECT** What are three ways that an understanding of cells has changed the way people live? **Hint:** Think about Pasteur and his work.

UNIT PROJECTS

If you are doing a unit project, make a folder for your project. Include in your folder a list of the resources you will need, the date on which the project is due, and a schedule to track your progress. Begin gathering data.

The Euglena Puzzle

Read the following description of euglenas and how scientists classify them. Then answer the questions below.

Plants and animals are typically multicellular organisms. For a long time, scientists tried to classify any unicellular organism that had a nucleus as either a single-celled plant or a single-celled animal. One group of unicellular organisms, *Euglenas*, was particularly difficult to classify. These tiny organisms can be found living in most ponds. What is puzzling about *Euglenas* is that they have characteristics of both plants and animals.

Some scientists argued that *Euglenas* are more like plants because many of them have chloroplasts. Chloroplasts are cellular structures that enable both plants and *Euglenas* to capture energy from the Sun. Other scientists argued that *Euglenas* are more like animals because they can take in food particles from the water. *Euglenas* also have flagella, tail-like structures that enable them to swim. The *Euglena* even has an eyespot for sensing light.

1. What cellular structures enable plants and *Euglenas* to capture energy from the Sun?
 - a. flagella
 - b. chloroplasts
 - c. nuclei
 - d. eyespots

2. What cellular structures are common to plants, animals, and *Euglenas*?
 - a. flagella
 - b. chloroplasts
 - c. nuclei
 - d. eyespots
3. In what way are *Euglenas* different from both plants and animals?
 - a. They have no nuclei.
 - b. They are unicellular.
 - c. They live in ponds.
 - d. They get energy from food.
4. What does an eyespot do?
 - a. senses light
 - b. captures food
 - c. provides energy
 - d. senses movement
5. Having flagella makes *Euglenas* similar to animals because it allows *Euglenas* to do what?
 - a. eat food
 - b. get energy
 - c. sense light
 - d. move about

Extended Response

Answer the following questions in detail. Include some of the terms in the word box. In your answers, underline each term you use.

6. A jar of water containing *Euglenas* is placed in a sunny window. After a while, a noticeable cloud forms in the water, near where the light shines into the water. Over the course of the day, the position of the Sun changes. As it does, the cloud keeps moving toward the light. On the basis of your reading, what do you think is happening and why?

sunlight	energy	food
eyespot	flagellum	move

7. Suppose there is a small pond near your school. The pond is surrounded by many tall trees that tend to block sunlight around the edges of the pond. In this situation, explain why it is an advantage for *Euglenas* to have the characteristics they do. Which of these characteristics do you associate with plants? with animals?