

Chapter 7**Cell Structure and Function****Section 7-1 Life Is Cellular (pages 169–172)**

This section explains what the cell theory is. It also describes the characteristics of two categories of cells, prokaryotes and eukaryotes.

Introduction (page 169)

1. What is the structure that makes up every living thing? The cell

The Cell Theory (pages 169–170)

2. What was Anton van Leeuwenhoek the first to see in the 1600s? He was the first person to see tiny living organisms in a drop of water.
3. What did a thin slice of cork seem like to Robert Hooke when he observed it through a microscope? The cork seemed to be made of tiny chambers.
4. What did the German botanist Matthias Schleiden conclude? He concluded that all plants are made of cells.
5. What did the German scientist Theodor Schwann conclude? He concluded that animals were also made of cells.
6. How did Rudolph Virchow summarize his years of work? He stated that where a cell exists, there must have been a preexisting cell.
7. What are the three concepts that make up the cell theory?
- All living things are composed of cells.
 - Cells are the basic units of structure and function in living things.
 - New cells are produced from existing cells.

Basic Cell Structures (page 171)

8. Complete the table about structures that are common to most cells.

COMMON CELL STRUCTURES

Structure	Description
Cell membrane	<u>A thin, flexible barrier around the cell</u>
Cell wall	<u>A strong layer around the cell membrane in many cells</u>
Nucleus	<u>A large structure that contains the cell's genetic material and controls the cell's activities</u>
Cytoplasm	<u>The material inside a cell, not including the nucleus</u>

Chapter 7, Cell Structure and Function *(continued)***Prokaryotes and Eukaryotes** (page 172)

9. Complete the table about the two categories of cells.

TWO CATEGORIES OF CELLS

Category	Definition	Examples
Prokaryotes	Organisms whose cells lack nuclei	Bacteria, including <i>Escherichia coli</i> and <i>Staphylococcus aureus</i>
Eukaryotes	Organisms whose cells contain nuclei	Plants, animals, fungi, many microorganisms

10. Circle the letter of each sentence that is true about prokaryotes.

- ☒ a. They grow and reproduce.
- ☐ b. Many are large, multicellular organisms.
- ☐ c. They are more complex than cells of eukaryotes.
- ☒ d. They have cell membranes and cytoplasm.

11. What is an organelle? It is a specialized structure in eukaryotic cells that performs an important cellular function.12. Are all eukaryotes large, multicellular organisms? No, some live solitary lives as single-celled organisms.**Section 7–2 Cell Structures** (pages 173–183)*This section describes the functions of the major cell structures.***Cell Wall** (pages 173–174)

1. In what organisms are cell walls found? They are found in plants, algae, fungi, and almost all prokaryotes.
2. Is the following sentence true or false? The cell wall lies inside the cell membrane. false
3. What is the main function of the cell wall? It provides support and protection for the cell.
4. What are plant cell walls mostly made of? They are made mostly of cellulose.
5. Is the following sentence true or false? Some cell structures are specific to either plant or animal cells. true

Nucleus (pages 175–176)

6. What is the function of the nucleus? It controls most cell processes and contains hereditary material.
7. What important molecules does the nucleus contain? It contains deoxyribonucleic acid, or DNA.
8. The granular material visible within the nucleus is called chromatin.
9. What does chromatin consist of? It consists of DNA bound to protein.
10. What are chromosomes? They are distinct, threadlike structures formed of condensed chromatin that contain genetic information that is passed from one generation of cells to the next.
11. Most nuclei contain a small, dense region known as the nucleolus.
12. What occurs in the nucleolus? This is where the assembly of proteins begins.
13. What is the nuclear envelope? It is a double-membrane layer that surrounds the nucleus.

Cytoskeleton (page 176)

14. What is the cytoskeleton? It is a network of protein filaments that helps the cell to maintain its shape.
15. Complete the table about structures that make up the cytoskeleton.

STRUCTURES OF THE CYTOSKELETON

Structure	Description	Functions
Microtubules	Hollow tubes of protein about 25 nanometers in diameter	Maintain cell shape, serve as “tracks” for organelles, form centrioles in cell division
Microfilaments	Long, thin fibers	Supports the cell, moves organelles within the cell

Organelles in the Cytoplasm (pages 177–180)

16. What is the difference between rough ER and smooth ER? Ribosomes stud the surface of rough ER. There are no ribosomes on smooth ER.
17. Circle the letter of each sentence that is true about lysosomes.
 - a. They contain enzymes that help synthesize lipids.
 - b.** They break down organelles that have outlived their usefulness.
 - c. They produce proteins that are modified by the ER.
 - d.** They contain enzymes that break down lipids, carbohydrates, and proteins.

Chapter 7, Cell Structure and Function *(continued)*

Match the organelle with its description

Organelle	Description
<u>f</u> 18. Ribosome	a. Uses energy from sunlight to make energy-rich food
<u>d</u> 19. Endoplasmic reticulum	b. Stack of membranes in which enzymes attach carbohydrates and lipids to proteins
<u>b</u> 20. Golgi apparatus	c. Uses energy from food to make high-energy compounds
<u>g</u> 21. Lysosome	d. An internal membrane system in which components of cell membrane and some proteins are constructed
<u>e</u> 22. Vacuole	e. Saclike structure that stores materials
<u>a</u> 23. Chloroplast	f. Small particle of RNA and protein that produces protein following instructions from nucleus
<u>c</u> 24. Mitochondrion	g. Filled with enzymes used to break down food into particles that can be used

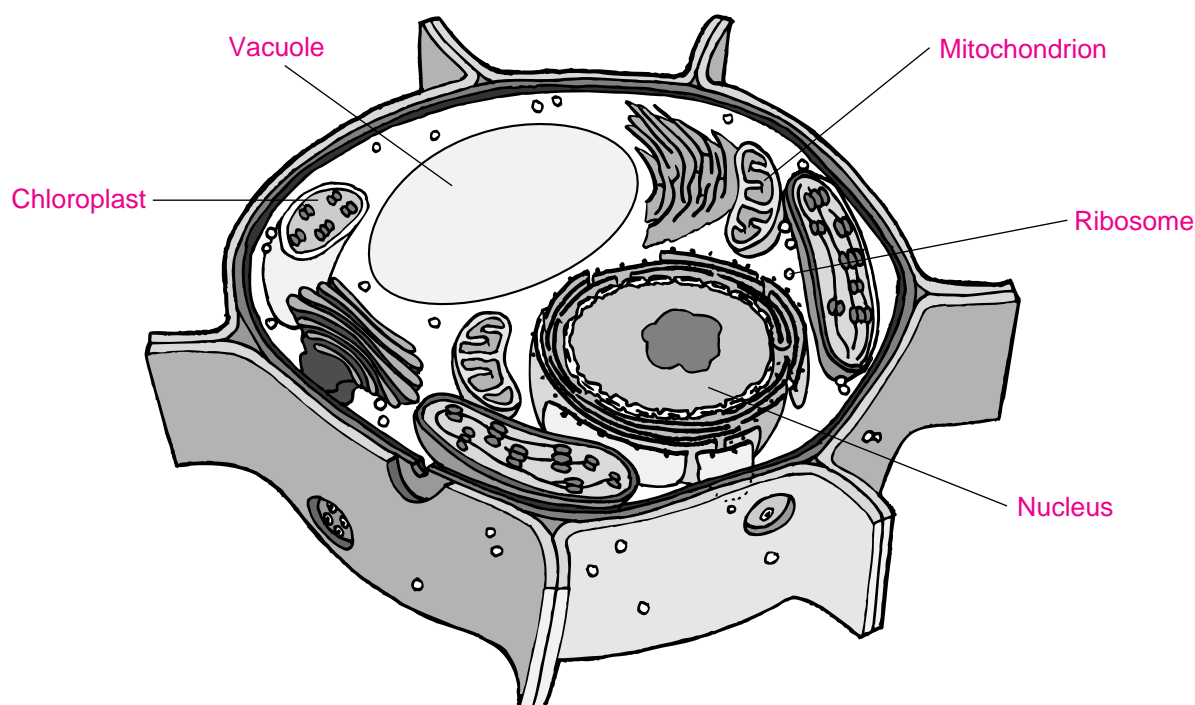
25. The process that occurs in chloroplasts is called

photosynthesis.

26. Is the following sentence true or false? Both chloroplasts and mitochondria are enclosed by two envelope membranes.

true

27. Label the structures on the illustration of the plant cell.



Organelle DNA (page 181)

28. Chloroplasts and mitochondria contain their own genetic information in the form of DNA.
29. Biologist Lynn Margulis has suggested that mitochondria and chloroplasts are descendants of what kind of organisms? They are descendants of ancient prokaryotes.

The Cell as a Factory (page 182)

Match the cell structure with the part of a factory it is like.

Cell Structure	Factory Part
<u>d</u> 30. Cytoskeleton	a. Oil-burning furnaces
<u>f</u> 31. Nucleus	b. Customization shop
<u>e</u> 32. Ribosome	c. Solar power plants
<u>b</u> 33. Golgi apparatus	d. Steel beams and columns
<u>c</u> 34. Chloroplasts	e. Factory machines
<u>a</u> 35. Mitochondria	f. Main office

Comparing Cells (page 183)

36. Circle the letter of each structure that animal cells contain.
a. chloroplasts **b.** lysosomes **c.** cytoskeleton **d.** ER
37. Circle the letter of each structure that plant cells contain.
a. cell wall **b.** ER c. lysosomes **d.** chloroplast

Reading Skill Practice

A flowchart can help you remember the order in which events occur. On a separate sheet of paper, create a flowchart that describes the steps by which proteins are made in the cell. You will find that the steps of this process are explained in the subsections *Nucleus* and *Organelles in the Cytoplasm*. For more information about flowcharts, see Organizing Information in Appendix A in your textbook.

Students' flowcharts should include RNA moving out of the nucleus, the production of proteins in ribosomes, modification in rough ER, proteins move into the Golgi apparatus, they are sent on to their final destinations.

Section 7–3 Movement Through the Membrane (pages 184–189)

This section describes the main functions of the cell membrane. It also explains what happens during diffusion and explains what osmosis is.

Cell Membrane (page 184)

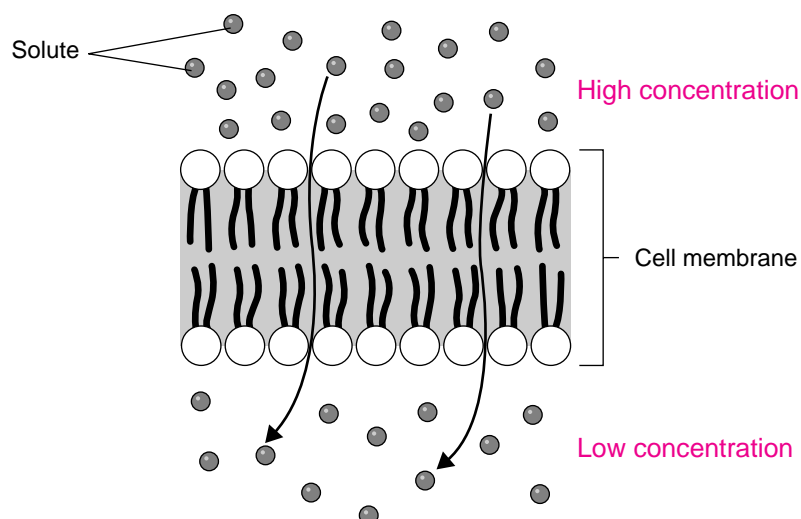
1. What are the functions of the cell membrane? It regulates what enters and leaves the cell and also provides protection and support.
2. The core of nearly all cell membranes is a double-layered sheet called a(an) lipid bilayer.

Chapter 7, Cell Structure and Function *(continued)*

3. What is the difference in the function of the proteins and the carbohydrates attached to a cell membrane? Some of the proteins form channels and pumps that help move materials across the membrane. Many of the carbohydrates act like chemical identification cards.

Diffusion (page 185)

4. The cytoplasm of a cell is a solution of many different substances in water.
5. What is the concentration of a solution? It is the mass of the solute in a given volume of solution, or mass/volume.
6. What is diffusion? It is the process by which molecules tend to move from an area where they are more concentrated to an area where they are less concentrated.
7. The molecules of solute in the illustration are moving through the cell membrane from top to bottom. Indicate with labels which side of the membrane has a high concentration of solute and which has a low concentration.



Osmosis (pages 186–187)

8. What does it mean that biological membranes are selectively permeable? Some substances can pass across them and others cannot.
9. What is osmosis? It is the diffusion of water through a selectively permeable membrane.
10. Is the following sentence true or false? Water tends to diffuse from a region where it is less concentrated to a region where it is highly concentrated. false
11. When will water stop moving across a membrane? It will move across the membrane until equilibrium is reached.

Match the situation to the description

Situation	Description
<u> b </u> 12. Two solutions are isotonic.	a. The solution is above strength in solute.
<u> a </u> 13. A solution is hypertonic.	b. The solutions are the same strength.
<u> c </u> 14. A solution is hypotonic.	c. The solution is below strength in solute.

15. On which side of a selectively permeable membrane does osmosis exert a pressure? It exerts a pressure on the hypertonic side.
16. What is the function of a contractile vacuole in some single-celled organisms? By contracting rhythmically, the contractile vacuole pumps excess water out of the cell.

Facilitated Diffusion (page 188)

17. What happens during the process of facilitated diffusion? Molecules such as glucose that cannot cross the cell membrane's lipid bilayer directly move through protein channels instead.
18. What kinds of substances do the protein channels allow to cross membranes? The substances include ions, sugars, and salts.
19. Is the following sentence true or false? Facilitated diffusion does not require the cell to use energy. true

Active Transport (page 189)

20. The energy-requiring process that moves molecules and ions across a cell membrane against a concentration difference is called active transport.
21. Is the following sentence true or false? Active transport does not require transport proteins during the process. false
22. Complete the table about types of active transport.

TYPES OF ACTIVE TRANSPORT

Type	Description
Endocytosis	Process of taking materials into the cell by means of infoldings of the cell membrane
Phagocytosis	Process of taking large particles into the cell by endocytosis
Exocytosis	The removal of large amounts of material from the cell

23. During endocytosis, what happens to the pocket in the cell membrane when it breaks loose from the membrane? It forms a vacuole within the cytoplasm.

Chapter 7, Cell Structure and Function (continued)**Section 7–4 The Diversity of Cellular Life** (pages 190–193)

This section explains what cell specialization is. It also describes the four levels of organization in multicellular organisms.

Unicellular Organisms (page 190)

1. A single-celled organism is also called a(an) unicellular organism.
2. Circle the letter of each sentence that is true about unicellular organisms.
 - a. Some types of algae are single-celled.
 - b. They include prokaryotes and eukaryotes.
 - c. Some even live within the human body.
 - d. They can grow but cannot reproduce.
3. What are colonial organisms? They are organisms that live in groups of individuals of the same species that are attached to one another but have few specialized structures.

Multicellular Organisms (page 191)

4. What is cell specialization in a multicellular organism? It is the characteristic of having separate roles for each type of cell.
5. Circle the letter of each sentence that is true about cell specialization.
 - a. Specialized cells perform particular functions within the organism.
 - b. Only unicellular organisms have specialized cells.
 - c. The human body contains scores of different cell types.
 - d. Some cells are specialized to react to the environment.

Levels of Organization (pages 192–193)

6. What are four levels of organization in a multicellular organism?
 - a. Individual cells
 - b. Tissues
 - c. Organs
 - d. Organ systems
7. What is a tissue? It is a group of cells that perform similar functions.
8. What are the four main types of tissue in multicellular organisms?
 - a. Muscle
 - b. Epithelial
 - c. Nervous
 - d. Connective
9. What is the function of epithelial tissues? They cover or line body surfaces.
10. Circle the letter of each type of connective tissue.
 - a. blood
 - b. skin
 - c. bone
 - d. lymph

11. Groups of tissues that work together to perform a specific function are called a(an) organ.
12. What kinds of tissues can be found within a muscle in your body? They include muscle tissue, nervous tissue, and connective tissue.
13. What is an organ system? It is a group of organs that work together to perform a specific task.

WordWise

Use the clues below to identify vocabulary terms from Chapter 7. Write the terms on the lines, putting one letter in each blank. When you finish, the words enclosed in the diagonal will reveal an important term related to cell structure and function.

Clues

1. An organelle that uses the energy from sunlight to make energy-rich food molecules
2. A specialized structure in eukaryotic cells that performs an important cellular function
3. A saclike structure in which cells store materials
4. A network of protein filaments that helps the cell maintain its shape
5. Cells that have a nucleus
6. The organelle that uses energy from food to make high-energy compounds
7. A theory that states that all living things are composed of cells
8. The diffusion of water through a selectively permeable membrane
9. The process of taking materials into the cell by means of infoldings of the cell membrane
10. A group of cells that perform similar functions

Vocabulary Terms

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|-----|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | c | h | l | o | r | o | p | l | a | s | t | | | | | | | | |
| 2. | | | | | | | o | r | g | a | n | e | l | l | e | | | | |
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| 4. | | | | c | y | t | o | s | k | e | l | e | t | o | n | | | | |
| 5. | | | | | | | e | u | k | a | r | y | o | t | e | | | | |
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