

Chapter 7 Study Guide

Study Tip

Divide the class into small groups, and have each group generate a list of questions about the Vocabulary terms and the Key Concepts for each of the four sections. When groups have completed their lists, have groups exchange lists of questions. Each group should end up with a list of questions for each section from four different groups. Ask the students in each group to collaborate in answering the questions they received from other groups.

Thinking Visually

Typically, a student's concept map will label the first level Movement Into and Out of a Cell. The next level should include Diffusion and Active Transport. A line from Diffusion should connect to Osmosis and Facilitated Diffusion. Lines from Active Transport should connect to Endocytosis and Exocytosis. Lines from Endocytosis should connect to Phagocytosis and Pinocytosis.

Chapter 7 Assessment

Reviewing Content

- | | | |
|------|------|-------|
| 1. d | 5. c | 9. d |
| 2. b | 6. a | 10. a |
| 3. b | 7. d | |
| 4. b | 8. c | |

Understanding Concepts

11. Robert Hooke observed cork slices and named cells. Matthias Schleiden concluded that all plants are made of cells. Theodor Schwann concluded that all animals are made of cells. Rudolf Virchow concluded that all cells come from preexisting cells.

12. Both have two characteristics in common: they are surrounded by a cell membrane, and they contain DNA. Prokaryotes are generally smaller and simpler, and they lack a nucleus. Eukaryotic cells generally contain dozens of structures and internal membranes, including a nucleus that contains their genetic material.

Chapter 7 Study Guide

7-1 Life Is Cellular

Key Concepts

- The cell theory states that all living things are composed of cells, cells are the basic units of structure and function in living things, and new cells are produced from existing cells.
- Prokaryotic cells have genetic material that is not contained in a nucleus. Eukaryotic cells contain a nucleus in which their genetic material is separated from the rest of the cell.

Vocabulary

cell, p. 170 • cell theory, p. 170
nucleus, p. 173 • eukaryote, p. 173
prokaryote, p. 173

7-2 Eukaryotic Cell Structure

Key Concepts

- The nucleus contains nearly all the cell's DNA and the coded instructions for making proteins and other important molecules.
- Proteins are assembled on ribosomes.
- One type of endoplasmic reticulum makes membranes and secretory proteins. The other type of ER makes lipids and helps to detoxify, or remove harmful substances.
- The Golgi apparatus modifies, sorts, and packages proteins and other materials from the endoplasmic reticulum for storage or secretion outside the cell.
- Mitochondria convert the chemical energy stored in food into compounds that are more convenient for the cell to use.
- Chloroplasts capture the energy from sunlight and convert it into chemical energy.
- The cytoskeleton is a network of protein filaments that helps the cell to maintain its shape. The cytoskeleton is also involved in movement of materials within and outside the cell.

Vocabulary

organelle, p. 174 • cytoplasm, p. 174
nuclear envelope, p. 176
chromatin, p. 176 • chromosome, p. 176
nucleolus, p. 176 • ribosome, p. 177
endoplasmic reticulum, p. 177
Golgi apparatus, p. 178
lysosome, p. 179 • vacuole, p. 179
mitochondrion, p. 179 • chloroplast, p. 180
cytoskeleton, p. 181 • centriole, p. 181

7-3 Cell Boundaries

Key Concepts

- All cells have a cell membrane. The cell membrane regulates what enters and leaves the cell and also provides protection and support. Some cells also have cell walls. Cell walls provide additional support and protection.
- Diffusion causes many substances to move across a cell membrane but does not require the cell to use energy.
- Osmosis is the diffusion of water through a selectively permeable membrane.

Vocabulary

cell membrane, p. 182 • cell wall, p. 182
lipid bilayer, p. 182 • concentration, p. 183
diffusion, p. 184 • equilibrium, p. 184
osmosis, p. 185 • isotonic, p. 185
hypertonic, p. 185 • hypotonic, p. 185
facilitated diffusion, p. 187
active transport, p. 188
endocytosis, p. 189 • phagocytosis, p. 189
pinocytosis, p. 189 • exocytosis, p. 189

7-4 The Diversity of Cellular Life

Key Concepts

- Cells in multicellular organisms develop in different ways to perform particular functions within the organism.
- The levels of organization in a multicellular organism are individual cells, tissues, organs, and organ systems.

Vocabulary

cell specialization, p. 190
tissue, p. 192
organ, p. 193
organ system, p. 193

Thinking Visually

Use the information in this chapter to create a concept map about the ways substances can move into and out of cells. Use the following terms in your concept map: *diffusion, osmosis, facilitated diffusion, active transport, phagocytosis, endocytosis, pinocytosis, exocytosis*.



CHAPTER RESOURCES

Print:

- **Teaching Resources**, Chapter Vocabulary Review, Graphic Organizer
- **Chapter Tests: Levels A and B**, Chapter 7 Test

Technology:

- **Computer Test Bank**, Chapter 7 Test
- **iText**, Chapter 7 Assessment

Chapter 7 Assessment

Reviewing Content

Choose the letter that best answers the question or completes the statement.

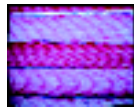
- In many cells, the structure that controls the cell's activities is the
 - cell membrane.
 - organelle.
 - nucleolus.
 - nucleus.
- Despite differences in size and shape, all cells have cytoplasm and a
 - cell wall.
 - cell membrane.
 - mitochondrion.
 - nucleus.
- If a cell of an organism contains a nucleus, the organism is a(an)
 - plant.
 - eukaryote.
 - animal.
 - prokaryote.
- Distinct threadlike structures containing genetic information are called
 - ribosomes.
 - chromosomes.
 - nuclei.
 - mitochondria.
- Which organelle converts the chemical energy in food into a form that cells can use?
 - nucleolus
 - chromosome
 - mitochondrion
 - chloroplast
- Cell membranes are constructed mainly of
 - lipid bilayers.
 - protein pumps.
 - carbohydrate gates.
 - free-moving proteins.
- The movement of water molecules across a selectively permeable membrane is known as
 - exocytosis.
 - phagocytosis.
 - endocytosis.
 - osmosis.
- A substance that moves across a cell membrane without using the cell's energy tends to move
 - away from the area of equilibrium.
 - away from the area where it is less concentrated.
 - away from the area where it is more concentrated.
 - toward the area where it is more concentrated.
- Which cell helps in gas exchange in plants?



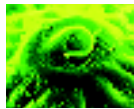
a.



c.



b.



d.

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- A tissue is composed of a group of
 - similar cells.
 - related organelles.
 - organ systems.
 - related organs.

Understanding Concepts

- Make a table to summarize the contributions made to the cell theory by Robert Hooke, Matthias Schleiden, Theodor Schwann, and Rudolf Virchow.
- How are prokaryotic and eukaryotic cells alike? How do they differ?
- Draw a cell nucleus. Label and give the function of the following structures: chromatin, nucleolus, and nuclear envelope.
- What is the function of a ribosome?
- What process takes place in the rough endoplasmic reticulum?
- Describe the role of the Golgi apparatus.
- Other than the nucleus, which two organelles contain their own DNA? What explanation has Lynn Margulis proposed to account for the presence of DNA in these organelles?
- Name and describe the two types of structures that make up the cytoskeleton.
- Briefly describe the structure of a cell membrane. How does the cell membrane affect the contents of a cell?
- What is meant by the concentration of a solution? Give a specific example of concentration involving volume and mass.
- Describe the process of diffusion. Name and describe the condition that exists when the diffusion of a particular substance is complete.
- What is the relationship between osmosis and diffusion? By definition, what's the only substance that carries out osmosis?
- Using the example of a cell in a sugar solution, explain what is meant by an isotonic solution.
- Name and describe the cell structure that helps prevent damage to certain cells when they are subjected to high osmotic pressure.
- Use an example to describe the relationship among cells, tissues, organs, and organ systems.



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(Continued from page 196)

- chromatin—granular material within nucleus consists of DNA bound to protein; nucleolus—small dense region where the assembly of ribosomes begins; nuclear envelope—a double membrane layer containing many pores that allow materials to move into and out of the nucleus.
- Ribosomes produce proteins.
- Rough ER makes membranes and secretory proteins.
- The Golgi apparatus contains enzymes that attach carbohydrates and lipids to proteins.
- Mitochondria and chloroplasts contain their own DNA. Lynn Margulis has suggested that mitochondria and chloroplasts are descendants of ancient prokaryotes.
- Students should describe microfilaments and microtubules.
- The core of the cell membrane is made up of a lipid bilayer. Protein molecules run through this layer. The proteins form channels and pumps that enable materials to move across the cell membrane.
- The concentration of a solution is the mass of solute in a given volume of solution, or mass/volume. For example, if you dissolved 12 grams of salt in 3 liters of water, the concentration of the solution would be 12 g / 3 L, or 4 grams per liter.
- In diffusion, particles tend to move from an area where they are more concentrated to an area where they are less concentrated. When diffusion is complete, the system has reached equilibrium.
- Osmosis is the diffusion of water through a selectively permeable membrane. Only water can move by osmosis.
- An isotonic solution would have the same concentration of solute on both sides of a membrane. The result of placing cells in an isotonic sugar solution would be that the cells would neither shrink nor swell.



HOMEWORK GUIDE

| Section: | Questions: |
|-------------|-------------------------------|
| Section 7-1 | 1-3, 11, 12 |
| Section 7-2 | 4, 5, 13-18, 29, 32, 35 |
| Section 7-3 | 6-8, 19-24, 26-28, 30, 33, 34 |
| Section 7-4 | 9, 10, 25, 31 |

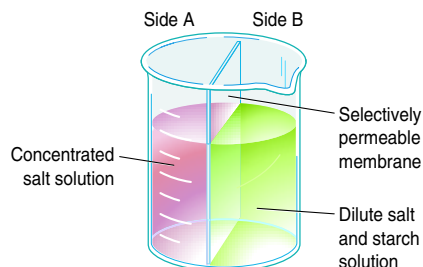
24. Cell walls prevent damage by preventing cells from expanding.
25. Muscle cells make up smooth muscle tissue, which is part of the stomach, an organ. The stomach is part of the digestive system.

Critical Thinking

26. The diffusing salt particles (that is, the sodium ions and chloride ions that make up salt) and water molecules will eventually reach equilibrium without a change in the fluid on either side.
27. Solution A is more concentrated because there are 3 grams of salt per liter compared to the 2 grams per liter in Solution B.
28. The blood cells would swell and probably burst.
29. Because muscle cells are responsible for movement, they require more energy than skin cells. Therefore, skin cells contain fewer mitochondria.
30. Most students will develop an experiment in which the rate of diffusion of food coloring is observed by dropping equal amounts of food coloring into each beaker. Make sure that students identify the control (water at room temperature).
31. Ribosomes are responsible for making proteins. Because enzymes are proteins, the ribosomes would be present in the pancreas.
32. Students should demonstrate an understanding of the functions of different parts of the cell.
33. In diffusion, particles tend to move from an area where they are more concentrated to an area where they are less concentrated. As waste chemicals build up in a cell, they become more concentrated inside the cell than outside. As a result, diffusion occurs from inside to outside, and the level of waste chemicals within the cell drops.
34. Answers may vary. Students should define both diffusion and active transport, and they should emphasize that active transport requires energy, whereas diffusion does not. A typical response might mention the excretion of wastes as an example of diffusion and the phagocytosis of large particles to ingest food as an example of active transport.

Critical Thinking

26. **Predicting** The beaker in the diagram has a selectively permeable membrane separating two solutions. Assume that the water molecules and salt can pass freely through the membrane. When equilibrium is reached, will the fluid levels be the same as they are now? Explain your answer.



27. **Calculating** Which salt solution is more concentrated, solution A, which contains 18 g of salt in 6 L of water, or solution B, which contains 24 g of salt in 12 L of water? Explain.
28. **Predicting** What would happen to a sample of your red blood cells if they were placed into a hypotonic solution? Explain your prediction.
29. **Inferring** Would you expect skin cells to contain more or fewer mitochondria than muscle cells? Explain your answer.
30. **Designing Experiments** You are given vegetable coloring and three beakers. The first beaker contains water at room temperature, the second beaker contains ice water, and the third beaker contains hot water. Design an experiment to determine the effects of temperature on the rate of diffusion. Be sure to state your hypothesis and to include a control.
31. **Inferring** The pancreas, an organ present in certain animals, produces enzymes used elsewhere in the animals' digestive systems. Which type of cell structure(s) might produce those enzymes? Explain your answer.
32. **Using Analogies** Compare a cell to a factory, as in the chapter, or to something else, such as a school. (For example, a cell has a nucleus, and a school has a principal.) Use that analogy to describe the function of different parts of the cell.

35. Carbohydrates are found in the mitochondria, where they are converted into high-energy compounds. Lipids are found in the cell membrane, made up of the lipid bilayer. Proteins are found in ribosomes, where they are manufactured. Nucleic acids are found in the cells' chromosomes, where genetic information is stored.

33. **Applying Concepts** As waste chemicals build up in a cell, homeostasis is threatened. State how diffusion helps cells maintain homeostasis.
34. **Comparing and Contrasting** Diffusion and active transport are processes that are important to the maintenance of homeostasis in organisms. Compare the two processes, including examples that describe how they are important to living organisms.
35. **Connecting Concepts** In Chapter 2, you learned about four categories of carbon compounds called the "molecules of life." Explain where some of those compounds are found in a typical cell.

Writing in Science

Different beverages have different concentrations of solutes. Some beverages have low solute concentrations and can be a source of water for body cells. Other beverages have high solute concentrations and can actually dehydrate your body cells. Should companies that market these high-solute beverages say that these drinks quench your thirst?

Performance-Based Assessment

Prepare to Debate One day, unicellular organisms got tired of being referred to as simple organisms by the multicellular organisms. They felt that they should be recognized as complex individuals, and challenged the multicellular organisms to a debate. As a unicellular organism, what arguments would you use to defend your position?

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