SECTION 1. CELL THEORY
1. first to identify cells and name them
2. observed live cells and observed greater detail
3. concluded that plants are made of cells
4. concluded that animals and, in fact, all living things are made of cells
5. proposed that all cells come from other cells
6. All organisms are made of cells. All existing cells are produced by other living cells. The cell is the most basic unit of life.
7. Answers will vary. Sample answer: Cell theory is one of the great unifying theories of biology. Cell theory helped people understand that life didn’t arise from nonliving sources.

Y diagram:
- Eukaryotic cells—surrounded by a cell membrane; contains cytoplasm; contains a nucleus; contains membrane-bound organelles; tends to be microscopic in size; eukaryotic organisms may be single-celled or multicellular;
- Prokaryotic cells—surrounded by a cell membrane; contains cytoplasm; tends to be microscopic in size; prokaryotic organisms are single-celled;
- Both—surrounded by a cell membrane; contains cytoplasm; tends to be microscopic in size.
8. a jellylike substance that contains dissolved molecular building blocks and, in some types of cells, organelles
9. in the cytoplasm
10. cell theory
11. prokaryotic cells

SECTION 2. CELL ORGANELLES
1. The cytoskeleton supports and shapes the cell, positions and transports organelles, provides strength, assists in cell division, and aids cell movement.
2. The cytoskeleton supports and shapes the cell.
3. The cytoskeleton helps the cell move.
4. stores most of the genetic information of a cell; contains the nucleolus, where ribosomes are assembled
5. endoplasmic reticulum
6. link amino acids together to form proteins
7. processes, sorts, and delivers proteins
8. vesicles
9. supply energy to the cell by converting molecules from food into usable energy
10. stores materials needed by a cell; may help provide support to plant cells
11. contains enzymes that break down damaged and worn-out cell parts; defends a cell from invaders
12. organizes microtubules to form cilia and flagella for cell motion or the movement of fluids past a cell
13. The cell walls are strong and rigid and adhere to each other, which helps to support the entire plant.
14. All cells are surrounded by a cell membrane that is flexible and interacts with the environment. Only certain cells have a cell wall, which is rigid and provides shape and support to cells.
15. They enable plants to convert solar energy into energy-rich molecules that cells can use.
16. endoplasmic reticulum
17. mitochondrion

SECTION 3. CELL MEMBRANE
1. Student should draw and label: phosphate group; glycerol; fatty acid.
2. the charged phosphate and glycerol
3. the fatty acid tails
4. polar
5. outside the cell because of the extracellular fluid and inside the cell because of the cytoplasm
6. The polar heads interact with the watery environments both inside and outside the cell. The nonpolar tails interact with each other inside the membrane.
Study Guide B continued

7. strengthen the cell membrane
8. help materials cross the membrane, part of the cytoskeleton
9. help identify cell types
10. The phospholipids in each layer can move from side to side and slide past each other.
11. Refer to Figure 3.2 for visual answer.
12. receptor
13. ligand
14. intracellular
15. membrane, changes
16. The fluid mosaic model is a description of the arrangement of the molecules that make up a cell membrane. It emphasizes both the fluidity of the membrane and the variety of molecules that make up the membrane.
17. selective permeability

SECTION 4. DIFFUSION AND OSMOSIS
1. the difference in the concentration of a substance from one location to another
2. The molecule diffuses from an area of higher concentration into an area of lower concentration.
3. diffusion
4. osmosis
5. the movement of molecules down a concentration gradient
6. the natural motion of particles
7. energy from the cell
8. lower
9. hypertonic
10. hypotonic
11. It occurs through selective transport proteins, not simply across the membrane.
12. down a concentration gradient
13. concentration gradient
14. Just as a hyper person has a higher level of energy than most people, a hypertonic solution has a higher level of solutes than the solution it is being compared to.
15. The transport protein makes it easier for a molecule that cannot directly cross the cell membrane to enter or exit a cell.

SECTION 5. ACTIVE TRANSPORT, ENDOCYTOSIS, AND EXOCYTOSIS
1. Active transport is the movement of molecules against a concentration gradient, whereas any type of diffusion is the movement of molecules down a concentration gradient.
2. Both involve the movement of molecules through selective membrane proteins.
3. All transport proteins span the membrane, and most change shape when they bind to a target molecule or molecules.
4. Active transport proteins use chemical energy to move a substance against its concentration gradient.
5. Refer to Figure 5.1 for visual answer.
6. ATP
7. vesicles
8. lysosomal enzymes

Y diagram: Endocytosis—uses energy, takes substances into a cell, moves substances in vesicles; Exocytosis—uses energy, releases substances outside a cell, moves substances in vesicles; Both—use energy, move substances in vesicles.
9. phagocytosis
10. Exocytosis is a process that releases substances outside a cell. Endocytosis is a process that takes substances into a cell.
11. active transport
Section 1: Cell Theory

Study Guide B

KEY CONCEPT
Cells are the basic unit of life.

VOCABULARY

<table>
<thead>
<tr>
<th>cell theory</th>
<th>organelle</th>
<th>eukaryotic cell</th>
</tr>
</thead>
<tbody>
<tr>
<td>cytoplasm</td>
<td>prokaryotic cell</td>
<td></td>
</tr>
</tbody>
</table>

MAIN IDEA: Early studies led to the development of the cell theory.

In a phrase, tell what each scientist did to help develop the cell theory.

<table>
<thead>
<tr>
<th>Scientist</th>
<th>Contribution to Cell Theory</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Hooke</td>
<td></td>
</tr>
<tr>
<td>2. Leeuwenhoek</td>
<td></td>
</tr>
<tr>
<td>3. Schleiden</td>
<td></td>
</tr>
<tr>
<td>4. Schwann</td>
<td></td>
</tr>
<tr>
<td>5. Virchow</td>
<td></td>
</tr>
</tbody>
</table>

6. What are the three parts of the cell theory?
   ___________________________________________________________
   ___________________________________________________________
   ___________________________________________________________

7. Give two reasons why the cell theory is important.
   ___________________________________________________________
   ___________________________________________________________
MAIN IDEA: Prokaryotic cells lack a nucleus and most internal structures of eukaryotic cells.

In the top left side of the Y shape below, write the characteristics of eukaryotic cells. In the top right side of the Y shape below, write the characteristics of prokaryotic cells. At the bottom of the Y shape below, write the characteristics that both kinds of cells have in common. Then lightly cross out those characteristics at the top of the Y.

Eukaryotic cells


Prokaryotic cells


Both


Vocabulary Check

8. What is cytoplasm?


9. Where do you find organelles?


10. What statements summarize scientists’ concepts of cells?


11. Which type of cells have no nucleus?
Section 2: Cell Organelles

Study Guide B

KEY CONCEPT
Eukaryotic cells share many similarities.

VOCABULARY

- cytoskeleton
- Golgi apparatus
- lysosome
- nucleus
- vesicle
- centriole
- endoplasmic reticulum
- mitochondrion
- cell wall
- ribosome
- vacuole
- chloroplast

MAIN IDEA: Cells have an internal structure.

1. Look at Figure 2.1 in your textbook. What are the functions of a cytoskeleton?

2. How is a cytoskeleton like your skeleton?

3. How is a cytoskeleton like your muscles?

MAIN IDEA: Several organelles are involved in making and processing proteins.

Write either the function or the name of each organelle. Draw a sketch to help you remember it.

<table>
<thead>
<tr>
<th>Organelle</th>
<th>Function</th>
<th>Sketch</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. nucleus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>helps in the production of proteins and lipids</td>
<td></td>
</tr>
<tr>
<td>6. ribosomes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Golgi apparatus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>carries certain molecules from place to place within a cell</td>
<td></td>
</tr>
</tbody>
</table>
MAIN IDEA: Other organelles have various functions.

Write the function of each organelle. Draw a sketch to help you remember it.

<table>
<thead>
<tr>
<th>Organelle</th>
<th>Function</th>
<th>Sketch</th>
</tr>
</thead>
<tbody>
<tr>
<td>9. mitochondrion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. vacuole</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. lysosome</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. centriole</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

MAIN IDEA: Plant cells have cell walls and chloroplasts.

13. What role do cell walls play in a plant?

_______________________________________________________________

14. What is the difference between a cell wall and a cell membrane?

_______________________________________________________________

15. Why are chloroplasts important?

_______________________________________________________________

Vocabulary Check

16. Which cell part is a maze of folded membranes where proteins and lipids are produced?

_______________________________________________________________

17. Which cell part converts food into energy that is usable by a cell?

_______________________________________________________________
Section 3: Cell Membrane

Study Guide B

KEY CONCEPT
The cell membrane is a barrier that separates a cell from the external environment.

VOCABULARY

<table>
<thead>
<tr>
<th>term</th>
<th>definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>cell membrane</td>
<td>selective permeability</td>
</tr>
<tr>
<td>receptor</td>
<td>phospholipid</td>
</tr>
<tr>
<td>fluid mosaic model</td>
<td></td>
</tr>
</tbody>
</table>

MAIN IDEA: Cell membranes are composed of two phospholipid layers.

1. Draw a phospholipid in the box below. Label the three major parts.

2. Which part of a phospholipid is charged, or polar?

3. Which part of a phospholipid is nonpolar?

4. What type of molecules interact with water, polar or nonpolar?

5. Where does a cell membrane come into contact with water?

6. Why do the phospholipids surrounding the cell form a bilayer?
A cell membrane has other types of molecules embedded in the phospholipid bilayer. List a function of each type of molecule in the table below.

<table>
<thead>
<tr>
<th>Molecule</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>7. Cholesterol</td>
<td></td>
</tr>
<tr>
<td>8. Proteins</td>
<td></td>
</tr>
<tr>
<td>9. Carbohydrates</td>
<td></td>
</tr>
</tbody>
</table>

10. In what way is a membrane fluid?

11. Draw a picture in the box below to represent selective permeability.

```
outside inside
```

**MAIN IDEA:** Chemical signals are transmitted across the cell membrane.

12. A _____________ detects a signal molecule and carries out an action in response.
13. A _____________ is a molecule that acts as a signal when it binds to a receptor.
14. A ligand that can cross the cell membrane can bind to an ________________ receptor.
15. A ligand that cannot cross the cell membrane can send a message to a cell by binding to a ________________ receptor, which then ________________ shape.

**Vocabulary Check**

16. What is the fluid mosaic model?

17. The cell membrane allows some, but not all, molecules to cross. What term describes this property?
Section 4: Diffusion and Osmosis

Study Guide B

KEY CONCEPT
Materials move across membranes because of concentration differences.

VOCABULARY

<table>
<thead>
<tr>
<th>passive transport</th>
<th>osmosis</th>
<th>hypotonic</th>
</tr>
</thead>
<tbody>
<tr>
<td>diffusion</td>
<td>isotonic</td>
<td>facilitated diffusion</td>
</tr>
<tr>
<td>concentration gradient</td>
<td>hypertonic</td>
<td></td>
</tr>
</tbody>
</table>

MAIN IDEA: Diffusion and osmosis are types of passive transport.
1. What is a concentration gradient?

2. What does it mean for a molecule to diffuse down a concentration gradient?

Complete the concept map below about passive transport.

8. The higher the concentration of dissolved particles in a solution, the ______________ the concentration of water molecules in that solution.
Suppose you have three solutions with different concentrations of particles. Relative to the concentration of particles in a cell, one solution is isotonic, one is hypertonic, and one is hypotonic. Use this information to answer the next two questions.

9. Which solution has the highest concentration of particles?

10. Which solution has the highest concentration of water molecules?

**MAIN IDEA:** Some molecules diffuse through transport proteins.

11. How does facilitated diffusion differ from simple diffusion?

12. In facilitated diffusion, do molecules move down a concentration gradient or against a concentration gradient?

**Vocabulary Check**

13. The difference in the concentration of a substance from one location to another is a __________.

14. People with excess energy are described as hyper. How does this relate to the meaning of hypertonic?

15. The word *facilitate* means “to make easier.” How does this meaning apply to facilitated diffusion?
Section 5: Active Transport, Endocytosis, and Exocytosis

Study Guide B

KEY CONCEPT
Cells use energy to transport materials that cannot diffuse across a membrane.

VOCABULARY

<table>
<thead>
<tr>
<th>active transport</th>
<th>phagocytosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>endocytosis</td>
<td>exocytosis</td>
</tr>
</tbody>
</table>

MAIN IDEA: Proteins can transport materials against a concentration gradient.

1. How is active transport different than simple diffusion and facilitated diffusion?

2. How is active transport similar to facilitated diffusion?

3. List two characteristics that almost all transport proteins share.

4. List the key distinguishing feature of active transport proteins.

5. Refer to Figure 5.1 to draw a picture in the box below to represent active transport.

   outside

   inside

6. Most active transport proteins use energy from the breakdown of __________.
MAIN IDEA: Endocytosis and exocytosis transport materials across the membrane in vesicles.

7. A cell may transport a substance in __________ if the substance is too large to cross the membrane.

8. During endocytosis, the vesicle membrane fuses with a lysosome, and the membrane and its contents are broken down by __________.

Complete the Y diagram below to compare and contrast the processes of endocytosis and exocytosis. Under the heading “endocytosis,” list the characteristics of endocytosis. Under the heading “exocytosis,” list the characteristics of exocytosis. At the bottom of the Y, write the characteristics that both processes have in common. Then lightly cross out those characteristics at the top of the Y.

Endocytosis

Exocytosis

Both

Vocabulary Check

9. What term means “cell eating” and describes a type of endocytosis?

_______________________________________________________________

10. The prefix exo- means “out of,” and the prefix endo- means “taking in.” How do these meanings relate to the meaning of exocytosis and endocytosis?

_______________________________________________________________

_______________________________________________________________

11. What process drives molecules across a membrane against a concentration gradient?

_______________________________________________________________