**A View of the Cell**

**Chapter 7**

*In your textbook, read about the history of the cell theory.*

For each statement in Column A, write the letter of the matching item in Column B.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The first scientist to describe living cells as seen through a simple microscope</td>
<td>a. Schleiden</td>
</tr>
<tr>
<td>2. Uses two or more glass lenses to magnify either living cells or prepared slides</td>
<td>b. compound light microscope</td>
</tr>
<tr>
<td>3. A scientist who observed that cork was composed of tiny, hollow boxes that he called cells</td>
<td>c. electron microscope</td>
</tr>
<tr>
<td>4. A scientist who concluded that all plants are composed of cells</td>
<td>d. Schwann</td>
</tr>
<tr>
<td>5. A scientist who concluded that all animals are composed of cells</td>
<td>e. Hooke</td>
</tr>
<tr>
<td>6. The microscope that allowed scientists to view molecules</td>
<td>f. van Leeuwenhoek</td>
</tr>
</tbody>
</table>

*In your textbook, read about the two basic cell types.*

Complete the table by checking the correct column for each statement.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Prokaryotes</th>
<th>Eukaryotes</th>
</tr>
</thead>
<tbody>
<tr>
<td>7. Organisms that have cells lacking internal membrane-bound structures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Do not have a nucleus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Are either single-celled or made up of many cells</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Generally are single-celled organisms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Organisms that have cells containing organelles</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
In your textbook, read about maintaining a balance.

Use each of the terms below just once to complete the passage.

- glucose
- plasma membrane
- homeostasis
- organism
- balance
- selective permeability

Living cells maintain a **(1) _______** by controlling materials that enter and leave. Without this ability, the cell cannot maintain **(2) _______** and will die. The cell must regulate internal concentrations of water, **(3) _______**, and other nutrients and must eliminate waste products. Homeostasis in a cell is maintained by the **(4) _______**, which allows only certain particles to pass through and keeps other particles out. This property of a membrane is known as **(5) _______**. It allows different cells to carry on different activities within the same **(6) _______**.

In your textbook, read about the structure of the plasma membrane.

For each statement below, write **true** or **false**.

- **7.** The structure and properties of the cell wall allow it to be selective and maintain homeostasis.
- **8.** The plasma membrane is a bilayer of lipid molecules with protein molecules embedded in it.
- **9.** A phospholipid molecule has a nonpolar, water-insoluble head attached to a long polar, soluble tail.
- **10.** The fluid mosaic model describes the plasma membrane as a structure that is liquid and very rigid.
- **11.** Eukaryotic plasma membranes can contain cholesterol, which tends to make the membrane more stable.
- **12.** Transport proteins span the cell membrane, allowing the selectively permeable membrane to regulate which molecules enter and leave a cell.
- **13.** Proteins at the inner surface of the plasma membrane attach the membrane to the cell’s support structure, making the cell rigid.
In your textbook, read about cellular boundaries; nucleus and cell control; assembly, transport, and storage in the cell; and energy transformers.

Complete the table by writing the name of the cell part beside its structure/function. A cell part may be used more than once.

<table>
<thead>
<tr>
<th>Structure/Function</th>
<th>Cell Part</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. A membrane-bound, fluid-filled sac</td>
<td></td>
</tr>
<tr>
<td>2. Closely stacked, flattened membrane sacs</td>
<td></td>
</tr>
<tr>
<td>3. The sites of protein synthesis</td>
<td></td>
</tr>
<tr>
<td>4. A folded membrane that forms a network of interconnected compartments in the cytoplasm</td>
<td></td>
</tr>
<tr>
<td>5. The clear fluid inside the cell</td>
<td></td>
</tr>
<tr>
<td>6. Organelle that manages cell functions in eukaryotic cell</td>
<td></td>
</tr>
<tr>
<td>7. Contains chlorophyll, a green pigment that traps energy from sunlight and gives plants their green color</td>
<td></td>
</tr>
<tr>
<td>8. Digest excess or worn-out cell parts, food particles, and invading viruses or bacteria</td>
<td></td>
</tr>
<tr>
<td>9. Small bumps located on the endoplasmic reticulum</td>
<td></td>
</tr>
<tr>
<td>10. Provides temporary storage of food, enzymes, and waste products</td>
<td></td>
</tr>
<tr>
<td>11. Firm, protective structure that gives the cell its shape in plants, fungi, most bacteria, and some protists</td>
<td></td>
</tr>
<tr>
<td>12. Produce a usable form of energy for the cell</td>
<td></td>
</tr>
<tr>
<td>13. Modifies proteins chemically, then repackages them</td>
<td></td>
</tr>
<tr>
<td>14. Contains inner membranes arranged in stacks of membranous sacs called grana</td>
<td></td>
</tr>
<tr>
<td>15. Plant organelles that store starches or lipids or that contain pigments</td>
<td></td>
</tr>
</tbody>
</table>
In your textbook, read about structures for support and locomotion.

Determine if the statement is true. If it is not, rewrite the italicized part to make it true.

16. Cells have a support structure within the *cytoplasm* called the cytoskeleton.

17. The *exoskeleton* is composed of thin, fibrous elements that form a framework for the cell.

18. *Microtubules* of the cytoskeleton are thin, hollow cylinders made of protein.

19. Cilia and flagella are cell surface structures that are adapted for *respiration*.

20. *Flagella* are short, numerous, hairlike projections from the plasma membrane.

21. Flagella are longer and *more* numerous than cilia.

22. In *multicellular* organisms, cilia and flagella are the major means of locomotion.

23. In *prokaryotic* cells, both cilia and flagella are composed of microtubules.

Write titles for each of the generalized diagrams and then label the parts. Use these choices: plant cell, animal cell, plasma membrane, chloroplast, lysosome, large vacuole, cell wall.

24. ________________

25. ________________

26. ________________

27. ________________

28. ________________

29. ________________

30. ________________
En tu libro de texto, lee sobre la historia de la teoría celular.

Anota la letra de la columna B que corresponde a cada enunciado de la columna A.

<table>
<thead>
<tr>
<th>Columna A</th>
<th>Columna B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. El primer científico que describió las células, vistas a través de un microscopio simple</td>
<td>a. Schleiden</td>
</tr>
<tr>
<td>2. Usa dos lentes para aumentar el tamaño de las imágenes de células vivas o de laminillas preparadas</td>
<td>b. microscopio óptico compuesto</td>
</tr>
<tr>
<td>3. Científico que observó que el corcho estaba formado por celdillas vacías que denominó células</td>
<td>c. microscopio electrónico</td>
</tr>
<tr>
<td>4. Científico que concluyó que todas las plantas estaban formadas por células</td>
<td>d. Schwann</td>
</tr>
<tr>
<td>5. Científico que concluyó que todos los animales estaban formados por células</td>
<td>e. Hooke</td>
</tr>
<tr>
<td>6. Microscopio que permitió a los científicos observar moléculas</td>
<td>f. van Leeuwenhoek</td>
</tr>
</tbody>
</table>

En tu libro de texto, lee sobre los dos tipos básicos de células.

Completa la tabla indicando la columna correspondiente a cada enunciado.

<table>
<thead>
<tr>
<th>Enunciado</th>
<th>Procariontas</th>
<th>Eucariontas</th>
</tr>
</thead>
<tbody>
<tr>
<td>7. Organismos formados por células que carecen de estructuras membranosas internas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. No tienen núcleo</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Están formados por una o muchas células</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. En general son organismos unicelulares</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Organismos formados por células que tienen organelos</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
En tu libro de texto, lee sobre cómo mantiene la célula el equilibrio.

Usa cada término una sola vez para completar el párrafo.

glucosa  membrana plasmática  homeostasis  organismo  equilibrio  permeabilidad selectiva

Las células vivas mantienen un (1) _________ controlando los materiales que entran y salen de ella. Si carecieran de esta capacidad, las células no podrían mantener su (2) _________ y morirían. La célula debe regular la concentración interna de agua, (3) _________ y otros nutrientes y debe también eliminar sus desechos. La (4) _________ mantiene la homeostasis de la célula, lo cual permite que sólo ciertas partículas entren a la célula y evita que otras salgan. Esta propiedad de la célula se conoce como (5) _________ y ayuda a que diferentes células cumplan diferentes funciones dentro de un mismo (6) _________.

En tu libro de texto, lee sobre la estructura de la membrana plasmática.

Indica si cada enunciado es verdadero o falso.

7. La estructura y las propiedades de la pared celular le permiten ser selectiva y mantener la homeostasis.

8. La membrana plasmática es una capa doble de moléculas de lípidos con proteínas incrustadas.

9. La molécula de un fosfolípido tiene una cabeza no polar, insoluble en agua, unida al extremo o cola que es polar y soluble.

10. El modelo del mosaico fluido describe la membrana plasmática como una estructura líquida y muy rígida.

11. La membrana plasmática de las células eucariotas puede contener colesterol, lo que ayuda a una mayor estabilidad en las membranas.

12. Las proteínas de transporte atraviesan la membrana celular y le confieren permeabilidad selectiva que regula las moléculas que entran y salen de la célula.

13. Las proteínas de la superficie interna de la membrana plasmática unen la membrana a la estructura de soporte de la célula, haciendo que la célula sea rígida.
En tu libro de texto, lee sobre los límites de la célula; el núcleo y el control celular; el ensamblaje, el transporte y el almacenamiento en la célula y los transformadores de energía.

Completa la tabla escribiendo el nombre de la parte de la célula que corresponde a cada descripción en la primera columna. Se puede usar cada parte más de una vez.

<table>
<thead>
<tr>
<th>Estructura/Función</th>
<th>Parte de la célula</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Saco membranoso lleno de fluido</td>
<td></td>
</tr>
<tr>
<td>2. Sacos membranosos planos y semejantes a monedas apiladas</td>
<td></td>
</tr>
<tr>
<td>3. Sitio donde ocurre la síntesis de proteínas</td>
<td></td>
</tr>
<tr>
<td>4. Membrana plegada que forma dentro del citoplasma una red de compartimentos interconectados</td>
<td></td>
</tr>
<tr>
<td>5. Fluido claro dentro de la célula</td>
<td></td>
</tr>
<tr>
<td>6. Organelo que controla las funciones de las células eucariotas</td>
<td></td>
</tr>
<tr>
<td>7. Contiene clorofila, un pigmento verde que atrapa la energía de la luz solar y que proporciona a las plantas su color verde</td>
<td></td>
</tr>
<tr>
<td>8. Digeiere las partes gastadas o sobrantes de una célula, las partículas alimenticias y los virus o bacterias</td>
<td></td>
</tr>
<tr>
<td>9. Pequeños gránulos localizados en el retículo endoplásmico</td>
<td></td>
</tr>
<tr>
<td>10. Sirve como almacén temporal de alimentos, enzimas y desechos</td>
<td></td>
</tr>
<tr>
<td>11. Estructura protectora firme que da forma a las células de plantas, hongos, la mayoría de las bacterias y algunos protistas</td>
<td></td>
</tr>
<tr>
<td>12. Produce una forma de energía que la célula puede usar</td>
<td></td>
</tr>
<tr>
<td>13. Modifica químicamente las proteínas y las envuelve o empaca</td>
<td></td>
</tr>
<tr>
<td>14. Contiene membranas internas que forman una estructura con forma de sacos planos apilados llamados grana</td>
<td></td>
</tr>
<tr>
<td>15. Organelos de la planta que almacenan almidones o lípidos, o que contienen pigmentos</td>
<td></td>
</tr>
</tbody>
</table>
En tu libro de texto, lee acerca de las estructuras de sostén y locomoción.

Si el enunciado es verdadero, escribe verdadero; de lo contrario, modifica la sección en itálicas para hacer verdadero el enunciado.

16. Las células poseen una estructura de soporte dentro del citoplasma llamada citoesqueleto.

17. El exoesqueleto está compuesto de elementos fibrosos y delgados que dan forma a la célula.

18. Los microtúbulos del citoesqueleto son cilindros delgados y huecos compuestos de proteína.

19. Los cílios y los flagelos son estructuras de la superficie de la célula adaptadas para la respiración celular.

20. Los flagelos son proyecciones cortas y numerosas de la membrana plasmática.

21. Los flagelos son más largos y más numerosos que los cílios.

22. En los organismos multicelulares, los cílios y los flagelos son los principales medios de locomoción.

23. Los cílios y flagelos de las células procariotas están compuestos de microtúbulos.

Identifica el tipo de célula representado por cada diagrama y rotula las partes. Usa estos términos: célula vegetal, célula animal, membrana plasmática, cloroplasto, vacuola pequeña, vacuola grande y pared celular.

24. ____________________ 25. ____________________

26. ____________________ 27. ____________________

28. ____________________ 29. ____________________

30. ____________________
Recycling in the Cell

Complete the concept map on recycling in a cell. Use these words or phrases one or more times: lysosomes, food particles, a membrane, bacteria and viruses, cell proteins, tail, vacuoles, worn-out cell parts, digesting it, digestive enzymes.

1. [Blank]
   - fuse with
     2. [Blank]
       - into which they dispense
         6. [Blank]
   - break down
     3. [Blank]
   - contain
     4. [Blank]
   - do not harm
     5. [Blank]
     8. [Blank]
   - because they are surrounded by
     9. [Blank]
   - used to digest
     7. [Blank]
     10. [Blank]
     11. [Blank]
In the past, biologists looked for clues to aging and human disease by studying organs, tissues, and cultures of cells. With more powerful microscopes and more sophisticated means of chemical analysis, biologists can focus on smaller elements of living things: the organelles within individual cells. Use your knowledge of cell organelles and their functions to answer the following questions about some of the current research that links cell organelles with certain conditions of aging and disease.

1. Scientists studied DNA molecules taken from mitochondria in the cells of older people. These mitochondrial DNA molecules differed from the mitochondrial DNA taken from the cells of younger people.
   a. What is the function of mitochondria in a healthy cell?
   b. In view of this cellular function, why does it make sense that mitochondria might be different in the cells of older people?

2. There are more mitochondria in cells that need a lot of energy, such as heart muscle cells. Some researchers have begun to study mitochondrial DNA in the heart cells of different age groups. What do you think researchers discovered in the mitochondrial DNA taken from the heart cells of older adults?

3. Researchers have found mutated mitochondrial DNA in people suffering from Kearns-Sayre syndrome. The syndrome causes paralysis of the eye muscles, difficulty in walking, and heart problems. What is the connection between the symptoms of Kearns-Sayre syndrome and the role of mitochondria in cell function?

4. Some researchers now believe that Alzheimer’s disease is caused by the release of destructive enzymes into the cytoplasm of nerve cells. The enzymes are thought to be released by organelles whose membranes ruptured as they were trying to digest harmful proteins. Which organelles do you think are responsible for the release of these destructive enzymes? Why?

5. In the liver cells of a person who died from alcoholism, an extremely dense network of smooth endoplasmic reticulum was found. Why do you think this was so? Hint: Smooth ER has enzymes that break down harmful substances, or toxins, in the liver.
The images have been made by three different types of microscopes. How do the images differ?

What kinds of information might scientists gather with each type of microscope?
Movement of Materials

Use with Chapter 7, Section 7.2

1. What is happening to the starch and the sugar?
2. What does this tell you about the membrane covering the test tube?
What do plants and animals need to stay alive?

Name some ways plant and animal cells would be similar. Name some differences. Why do you think that?
Basic Concepts

Plasma Membrane

Use with Chapter 7, Section 7.2

- Polar head
- Phosphate group
- Glycerol backbone
- Fatty acids
- Phospholipid molecule
- Cholesterol
- Membrane protein
- Membrane protein
- Cytoplasm
- Filaments of cytoskeleton
1. Describe the phospholipid in the upper left part of the transparency.

2. Which end of a phospholipid is attracted to water?

3. How are phospholipids oriented in the plasma membrane?

4. What is the function of membrane proteins?

5. Why is the model of a membrane shown in the transparency referred to as the fluid mosaic model?

6. How would the membrane shown in the transparency behave if its fatty acid tails consisted mostly of unsaturated fatty acids?

7. What is the function of the cholesterol molecules shown in the transparency?
The Cell

Typical Animal Cell

- Microfilaments
- Cytoplasm
- Chromatin
- Nucleolus
- Nuclear membrane
- Nucleus
- Microtubules
- Central vacuole
- Lysosome
- Plasma membrane
- Mitochondria
- Endoplasmic reticulum with ribosomes
- Golgi apparatus
- Cell wall
- Nuclear membrane
- Nucleolus
- Chromatin
- Nucleus
- Chloroplast
- Microfilaments
- Microtubules
- Cytoplasm

Typical Plant Cell

- Cell wall
- Nuclear membrane
- Nucleolus
- Chromatin
- Nucleus
- Chloroplast
- Microfilaments
- Microtubules
- Cytoplasm
1. Which cell parts are common to both plant and animal cells?

2. Which organelle aids in digestion of worn-out cell parts?

3. Which organelle is found in plant cells but not in animal cells?

4. What is the function of the central vacuole in plant cells?

5. What would be the likely function of a plant cell that contains many chloroplasts?

6. Which plant cells might not contain any chloroplasts?

7. Which organelles are produced within the nucleolus?

8. Why would a cell that moves by means of cilia or flagella require a relatively large number of mitochondria?
The Optical Microscope

Use with Chapter 7, Section 7.1

- **Eyepieces**
  - Contain magnifying lenses to look through

- **Light source**
  - Allows light to reflect upward through the diaphragm, the specimen, and the lenses

- **Diaphragm**
  - Regulates the amount of light that passes through the specimen

- **Stage**
  - Supports the microscope slide

- **Stage clips**
  - Holds the microscope slide in place

- **Coarse adjustment**
  - Focuses the image under low power

- **Fine adjustment**
  - Sharpens the image under high and low magnification

- **Low-power objective**
  - Contains the lens with low power magnification

- **R revolving nosepiece**
  - Holds and turns the objectives into viewing position

- **High-power objectives**
  - Contain lenses with greater powers of magnification

- **Arm**
1. What is the function of the diaphragm?

2. If you want to change the objective lens through which you are viewing a specimen, what must you do?

3. What knob is turned to focus an image under low power?

4. What is the purpose of having a light source on a microscope?

5. Explain the significance of the term *compound* in describing a modern light microscope.

6. Identify the parts of the microscope that are used for supporting the specimen and holding it in place.

7. If the magnifying power of an eyepiece is 10× and that of an objective is 45×, by how much is a specimen magnified through this combination of lenses?

8. What is the fundamental difference between a compound microscope and the simple microscope that van Leeuwenhoek used in the 1600s to describe living cells?

9. What major advantage does a transmission electron microscope have over a compound light microscope? What is its major disadvantage?
Eukaryotic Cell Structure and Organelles

Animal Cell

- Nucleus
- Mitochondrion
- Ribosomes
- Endoplasmic reticulum
- Golgi apparatus
- Plasma membrane
- Cytoskeleton (Microtubule and Microfilaments)
In the space provided, describe the function of each cell structure:

<table>
<thead>
<tr>
<th>Cell Structure</th>
<th>Cell Structure Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Nucleus</td>
<td></td>
</tr>
<tr>
<td>2. Plasma membrane</td>
<td></td>
</tr>
<tr>
<td>3. Endoplasmic reticulum</td>
<td></td>
</tr>
<tr>
<td>4. Mitochondrion</td>
<td></td>
</tr>
<tr>
<td>5. Golgi apparatus</td>
<td></td>
</tr>
<tr>
<td>6. Cytoskeleton</td>
<td></td>
</tr>
</tbody>
</table>
A View of the Cell

Chapter 7

Reviewing Vocabulary

Write the word or phrase that best completes the statement.

1. A structure outside the plasma membrane in some cells is the __________________________.
2. The functions of a eukaryotic cell are managed by the __________________________.
3. In a cell, the tangles of long strands of DNA form the __________________________.
4. The folded system of membranes that forms a network of interconnected compartments inside the cell is called the __________________________.
5. The pigment that gives plants their green color is __________________________.
6. The network of tiny rods and filaments that forms a framework for the cell is called the __________________________.
7. In plants, the structures that transform light energy into chemical energy are called __________________________.

In the space at the left, write the term in parentheses that makes each statement correct.

8. (Phospholipids, Transport proteins) make up the selectively permeable membrane that controls which molecules enter and leave the cell.

9. Short projections used for oarlike locomotion are (cilia, flagella).

10. In a cell, the breakdown of molecules in order to release energy occurs in the (mitochondria, Golgi apparatus).

11. An organism with a cell that lacks a true nucleus is a(n) (prokaryote, eukaryote).

12. The movement of materials into and out of the cells is controlled by the (cytoplasm, plasma membrane).

13. The small, membrane-bound structures inside a cell are (chromatin, organelles).

14. In a cell, the sites of protein synthesis are the (ribosomes, nucleolus).

15. Cell structures that contain digestive enzymes are (plastids, lysosomes).
Understanding Concepts (Part A)

In the space at the left, write the letter of the word or phrase that best completes the statement.

1. Cell walls of multicellular plants are composed mainly of
   a. cellulose.  b. chitin.  c. pectin.  d. vacuoles.

2. The term least closely related to the others is
   a. cytoskeleton.  b. microfilament.  c. microtubule.  d. cell juncture.

3. In a chloroplast, the stacks of membranous sacs are called
   a. stroma.  b. grana.  c. plastids.  d. thylakoid membrane.

4. The structure most responsible for maintaining cell homeostasis is the
   a. cytoplasm.  b. mitochondrion.  c. cell wall.  d. plasma membrane.

5. If a cell contains a nucleus, it must be a(n)
   a. plant cell.  b. eukaryotic cell.  c. animal cell.  d. prokaryotic cell.

6. One advantage of electron microscopes over light microscopes is their
   a. size.  b. higher magnification.  c. two-dimensional image.  d. use of live specimens.

7. When a cell is ready to reproduce, its DNA is packed into
   a. chromosomes.  b. chromatin.  c. nucleoli.  d. nucleoids.

8. The scientist who first described living cells as seen through a simple microscope was

9. Each of the following is a main idea of the cell theory except
   a. all organisms are composed of cells.  b. the cell is the basic unit of organization of organisms.  c. all cells are similar in structure and function.  d. all cells come from preexisting cells.

10. A plasma membrane is made up of a(n)
    a. cholesterol layer.  b. enzyme bilayer.  c. phospholipid bilayer.  d. protein layer.
Understanding Concepts (Part B)

The diagram below of a bacterium shows a light area with no surrounding membrane in the center of the cell. This area contains a single large DNA molecule. Use the diagram to answer questions 1 and 2.

1. Identify the structures labeled A, B, C, and D.

2. Based on the diagram, would scientists classify this cell as a prokaryote or a eukaryote? Explain.

Answer the following questions.

3. In plants, cells that transport water against the force of gravity are found to contain many more mitochondria than do some other plant cells. What is the reason for this?

4. Why did it take almost 200 years after Hooke discovered cells for the cell theory to be developed?