CHAPTER 8

LESSON 1

Life Is Cellular

READING TOOL **Main Idea and Details** As you read your textbook, identify the main ideas along with details or evidence that supports the main ideas. Use the lesson headings to organize the main ideas and details. One example is entered for you. Record your work in the table.

Heading	Main Idea	Details/Evidence
The Discovery of the Cell		
Early Microscopes	The invention of the microscope led to the discovery of cells.	Microscopes show that cork consists of cells and that there are organisms present in pond water.
The Cell Theory		
Exploring the Cell		
Light Microscopes		
Electron Microscopes		
• Transmission Electron Microscopes		
• Scanning Electron Microscopes		
Prokaryotes and Eukaryotes		
Prokaryotes		
Eukaryotes		

Lesson Summary

As you read, circle the answers to each Key Question. Underline any words you do not understand.

BUILD Vocabulary

cell basic unit of all forms of life

cell theory fundamental concept of biology that states that all living things are composed of cells; that cells are the basic units of structure and function in living things; and that new cells are produced from existing cells

cell membrane thin, flexible barrier that surrounds all cells; regulates what enters and leaves the cell

nucleus in cells, structure that contains the cell's genetic material in the form of DNA

eukaryote organism whose cells contain a nucleus

prokaryote unicellular organism that lacks a nucleus

Root Words *Karyo* comes from the Greek *karyon*, meaning "nut" or "kernel." It is used in words that refer to the nucleus. *Pro-* is a prefix that means "before," so prokaryotes have been around since before the nucleus appeared in living organisms.

What structure distinguishes eukaryotes from prokaryotes?

_____

The Discovery of the Cell

KEY QUESTION *What are the main points of the cell theory?*

The smallest living unit of any organism is a cell. Cells were unknown until the microscope was invented.

Early Microscopes Eyeglass makers in the late 1500s discovered that using several lenses in combination could magnify objects. They used their lenses to build the first microscopes. In 1665, Robert Hooke used a microscope to look at a slice of cork from a plant. The cork appeared to be made of many tiny empty chambers that Hooke called "cells." Around the same time Anton van Leeuwenhoek used a microscope to look at pond water. With the microscope, he saw many tiny living organisms in the water.

The Cell Theory In 1838, Matthias Schleiden stated that all plants are made of **cells**. In 1855, Theodor Schwann stated that all animals are made of cells. In 1885 Rudolf Virchow stated that new cells are produced only from the division of existing cells. These discoveries are summarized in the **cell theory**.
The cell theory includes three main ideas:

- All living things are made up of cells.
- Cells are the basic units of structure and function in living things.
- New cells are produced from existing cells.

Exploring the Cell

KEY QUESTION *How do microscopes work?*

Modern biologists still use microscopes to study the cell. Microscopes work by using beams of light or beams of electrons to produce magnified images.

Light Microscopes You may be familiar with the compound light microscope. A light microscope uses light passing through a specimen and two lenses to form an image. The first lens, called the objective lens, is just above the specimen. The second lens, called the ocular lens, magnifies the image further. Due to the nature of light, light microscopes clearly magnify an object only about 1000 times. Chemical stains or dyes are used to help make parts of cells visible. Some dyes are fluorescent, meaning they give off light of a particular color.

Electron Microscopes Electron microscopes use beams of electrons instead of light. A light microscope can view something as small as 1 millionth of a meter. An electron microscope can view something as small as 1 billionth of a meter, such as viruses or a DNA molecule.

Samples viewed on an electron microscope must be placed in a vacuum. Therefore, an electron microscope can only be used to examine nonliving samples. Images are black and white, but computers are used to add "false color" to structures.

Transmission Electron Microscopes Beams of electrons must pass through the sample, so samples of cells and tissues must be sliced extremely thin. Images appear flat and two-dimensional.

Scanning Electron Microscopes A beam of electrons scans the surface of a specimen, so samples do not have to be cut into thin slices. Images appear three-dimensional.

READING TOOL

Compare and Contrast

Transmission and scanning electron microscopy are both tools to examine biological structures. Each creates a very different type of image. ☑ **How do the final images of transmission and scanning electron microscopy differ?**

Prokaryotes and Eukaryotes

KEY QUESTION *How do prokaryotic and eukaryotic cells differ?*

Most cells range from 5 to 50 micrometers in diameter. All cells are surrounded by a thin flexible barrier called the **cell membrane** (also called the plasma membrane). Cells fall into two categories, depending on whether they contain a nucleus. The **nucleus** (plural: nuclei) is a large membrane-enclosed structure that contains genetic material in the form of DNA. **Eukaryotes** (yoo KAR ee ohts) are cells that have nuclei. **Prokaryotes** (pro KAR ee ohts) are cells that do not have nuclei.

Prokaryotes

Prokaryotic cells do not enclose their genetic material within a nucleus. They are generally smaller and simpler than eukaryotic cells. Bacteria are prokaryotes. Prokaryotes carry out all of the activities associated with living things. Prokaryotes were the first photosynthetic organisms on Earth.

Eukaryotes

In eukaryotic cells, the nucleus separates the genetic material from the rest of the cell. Most eukaryotic cells contain many structures and internal membranes. Some eukaryotes are unicellular organisms called protists. Others form multicellular organisms—plants, animals, and fungi. In multicellular organisms, cells are specialized and usually work together to perform specific tasks.

Visual Reading Tool: Prokaryotes and Eukaryotes

Read the section on prokaryotes and eukaryotes to identify the similarities and differences of each cell type. Use a green pencil to circle similarities, a blue pencil to circle prokaryotic cell characteristics, and a red pencil to circle eukaryotic cell characteristics. Then complete the table below.

	Prokaryotic Cell	Eukaryotic Cell
Cell membrane		yes
Nucleus		
Cell size	smaller	
Complexity		
Example of organism with this cell type		

LESSON 2

Cell Structure

READING TOOL **Connect to Visuals** As you read, use the figures and diagrams to help you identify and describe each part of the cell, and what the function that part performs. Complete the graphic organizer.

Cellular Structure	Form and Function
Nucleus	
Ribosomes	
Endoplasmic reticulum	
Golgi apparatus	
Vacuoles	
Lysosomes	
Cytoskeleton	
Chloroplasts	
Mitochondria	
Cell wall	
Cell membrane	

Lesson Summary

Cell Organization

KEY QUESTION *What is the role of the cell nucleus?*

Eukaryotic cells can be divided into the nucleus and the cytoplasm. The **cytoplasm** is the part of the cell outside the nucleus. The interior of a prokaryotic cell, which lacks a nucleus, is also called the cytoplasm. Eukaryotic cells also have many specialized structures that are called **organelles**, which means "little organs."

Comparing the Cell to a Factory A eukaryotic cell functions much like a factory. The different organelles of a cell are like specialized machines and assembly lines. Organelles follow instructions and create biological molecules, like the people and machines in a factory create different products.

The Nucleus The nucleus is the control center of the cell. The nucleus contains nearly all of the DNA in the cell and, with it, the coded instructions for making proteins and other important molecules. In prokaryotic cells, there is no nucleus, and the DNA is found in the cytoplasm.

The nucleus is surrounded by the nuclear envelope, which is composed of two membranes. The nuclear envelope has thousands of nuclear pores, which allow material such as proteins and other molecules to move in and out of the nucleus. The genetic material in the nucleus is found in chromosomes. Most nuclei also contain a nucleolus, which is a region of the nucleus where ribosome assembly begins.

Organelles That Build Proteins

KEY QUESTION *What organelles help make and transport proteins and other macromolecules?*

Much of the cell is devoted to producing proteins, which are responsible for the synthesis of other macromolecules such as lipids and carbohydrates.

Ribosomes Proteins are assembled on ribosomes. **Ribosomes** are small particles of RNA and protein found throughout the cytoplasm in eukaryotes and prokaryotes. Ribosomes produce proteins by following instructions that come from DNA.

As you read, circle the answers to each Key Question. Underline any words you do not understand.

BUILD Vocabulary

cytoplasm fluid portion of the cell outside the nucleus

organelle specialized structure that performs important cellular functions within a eukaryotic cell

ribosome cell organelle consisting of RNA and protein found throughout the cytoplasm in a cell; the site of protein synthesis

Related Words The English word *organ* comes from the Latin word "organon," meaning tool or instrument. ☑ **Using this information, explain how an organ and organelles are related.**

BUILD Vocabulary

endoplasmic reticulum internal membrane system found in eukaryotic cells; place where lipid components of the cell membrane are assembled

Golgi apparatus organelle in cells that modifies, sorts, and packages proteins and other materials from the endoplasmic reticulum for storage in the cell or release outside the cell

vacuole cell organelle that stores materials such as water, salts, proteins, and carbohydrates

lysosome cell organelle that breaks down lipids, carbohydrates, and proteins into small molecules that can used by the rest of the cell

cytoskeleton network of protein filaments in a eukaryotic cell that gives the cell its shape and internal organization and is involved in movement

Chloroplast cell organelle that converts energy from sunlight into chemical energy through the process of photosynthesis

mitochondrion cell organelle that converts the chemical energy stored in food into compounds that are more convenient for the cell to use

cell wall strong, supporting layer around the cell membrane in most prokaryotes and some eukaryotes

Related Words *Plasm* is a root that appears in many biological terms related to cells and living things. It comes from a Greek word that means "something molded."

☑ **What two vocabulary terms in this lesson have *plasm* as a root?**

_____

_____

Endoplasmic Reticulum Eukaryotic cells contain an internal membrane system called the **endoplasmic reticulum** (en doh PLAZ mik reh TIK yoo lum), or ER. The portion of the ER involved in making proteins is called the rough ER, due to the ribosomes on its surface. Proteins made on the rough ER include those that will be released, or secreted, from the cell; many membrane proteins; and proteins destined for other specialized locations within the cell. Other proteins are made on ribosomes that are not attached to membranes.

The other part of the ER is called the smooth ER because ribosomes are not found on its surface. The smooth ER produces lipids and is involved in the detoxification of drugs and the synthesis of carbohydrates.

Golgi Apparatus In eukaryotic cells, proteins produced in the rough ER move into the **Golgi apparatus**, which appears as a stack of flattened membranes. The proteins are bundled into tiny membrane-enclosed structures called vesicles that bud from the ER and carry the proteins to the Golgi apparatus. The Golgi apparatus modifies, sorts, and packages proteins and other materials from the endoplasmic reticulum for storage in the cell or release from the cell.

Organelles That Store, Clean Up, and Support

KEY QUESTION *What are the functions of vacuoles, lysosomes, and the cytoskeleton?*

Vacuoles, vesicles, lysosomes, and the cytoskeleton represent the cellular factory's storage space, cleanup crew, and support structures.

Vacuoles and Vesicles Many cells contain **vacuoles**, which are large, saclike, membrane-enclosed structures. Vacuoles store materials like water, salts, proteins, and carbohydrates. Many plant cells have a single, large central vacuole. The pressure of the liquid in the central vacuole helps plants to support structures such as leaves and stems. In addition to vacuoles, most eukaryotic cells contain smaller membrane-enclosed structures called vesicles. Vesicles store and move materials between organelles, as well as to and from the cell surface.

Lysosomes **Lysosomes** break down lipids, proteins, and carbohydrates into small molecules that can be used by the cell. Lysosomes also break down and remove organelles and other things in the cell that are no longer needed. Lysosomes are found in animal cells and in some plant cells.

The Cytoskeleton Eukaryotic cells have a network of protein filaments called the **cytoskeleton**. The cytoskeleton helps to transport materials within the cell. The cytoskeleton helps the cell maintain its shape and is involved in movement.

Microfilaments Microfilaments are threadlike structures made from a protein called actin. They form a tough, flexible framework that supports the cell. Microfilaments also help cells move.

Microtubules Microtubules are hollow structures made from proteins called tubulins. In some cells they maintain cell shape. They are important in cell division, forming a structure called the mitotic spindle that separates chromosomes. Organelles called centrioles are also made from tubulins. Centrioles help to organize cell division in animal cells, but are not found in plant cells. Microtubules also help to build projections from the cell surface such as cilia (singular: *cilium*) and flagella (singular: *flagellum*) that allow cells to swim through liquid.

READING TOOL

Academic Words

network A network is a system of connected things. In a previous chapter you learned about food webs, which are another type of network.

☑ **Based upon what you know about networks, explain why computers are more useful when they are connected to the internet.**

Organelles That Capture and Release Energy

KEY QUESTION *What are the functions of chloroplasts and mitochondria?*

Chloroplasts Plants and some other organisms contain chloroplasts (KLAWR uh plasts). **Chloroplasts** capture the energy from sunlight and convert it into chemical energy stored in food during photosynthesis. Chloroplasts are surrounded by two membranes and contain large stacks of additional membranes that contain the green pigment chlorophyll.

Mitochondria Nearly all eukaryotic cells, including plants, contain mitochondria (myt oh KAHN dree uh; singular *mitochondrion*). **Mitochondria** convert the chemical energy stored in food molecules into compounds that are more convenient for the cell to use. As with chloroplasts, mitochondria are surrounded by two membranes. The inner membrane is folded up inside the mitochondrion. All or nearly all of our mitochondria are inherited from our mothers.

Chloroplasts and mitochondria contain some of their own genetic information in the form of small DNA molecules. These organelles probably originated from prokaryotic cells that became part of eukaryotic cells in a mutualistic relationship. Genetic changes in human mitochondria can affect human health.

Cellular Boundaries

KEY QUESTION *What is the function of the cell membrane?*

Cell Walls The **cell wall** lies outside the cell membrane and supports, shapes, and protects the cell. Most prokaryotes and some eukaryotes, including plants and fungi, have cell walls. Animal cells do not have cell walls. Cell walls allow water, oxygen, carbon dioxide, and other substances to pass through. Cell walls provide much of the strength plants need to stand.

BUILD Vocabulary

lipid bilayer flexible double-layered sheet that makes up the cell membrane and forms a barrier between the cell and its surroundings

selectively permeable property of biological membranes that allows some substances to pass across it while others cannot; also called semipermeable membrane

Prefixes The prefix *bi-* means "two." A bicycle has two wheels, and a lipid bilayer has two layers, or sheets, of lipids. ☑ **The cell membrane is a lipid bilayer, but a cell has only one cell membrane. Which organelles in this lesson have a double membrane?**

_____

_____

_____

Cell Membranes

All cells have cell membranes. Cell membranes are made up of a double-layered sheet called a **lipid bilayer**. The cell membrane regulates what enters and leaves the cell and also protects and supports the cell.

The Properties of Lipids

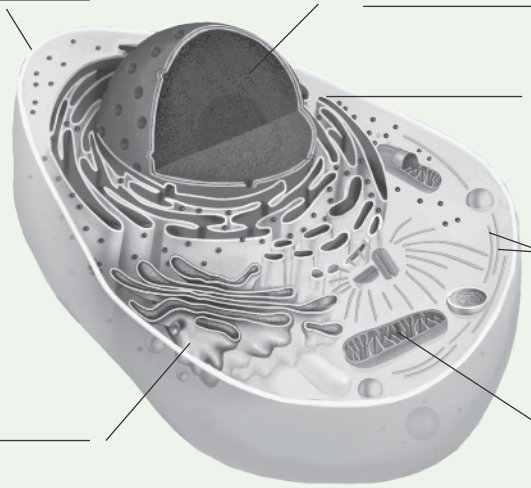
Lipids have oily fatty chains that are attached to chemical groups that interact with water. The fatty acid portions of the lipid are hydrophobic (hy druh FOH bik), or "water hating," while the other end is hydrophilic (hy druh FIL ik), or "water loving." When the lipids are in water, their hydrophobic "tails" cluster together while the hydrophilic "heads" are attracted to water. This results in a lipid bilayer, with the fatty acid tails forming the interior of the membrane. Many substances can cross cell membranes, but some substances are too large or too strongly charged to cross the lipid bilayer. Cell membranes are **selectively permeable** (or semipermeable), meaning that some substances can cross the membrane and others cannot.

The Fluid Mosaic Model

Proteins are embedded in the lipid bilayer of most cell membranes. Carbohydrate molecules are attached to many of these proteins. The proteins in the lipid bilayer can move around, "floating" among the lipids. Scientists describe the cell membrane as a "fluid mosaic." A mosaic is a type of art made up of different materials, just as the membrane is made up of different kinds of molecules. Some of these proteins form channels and pumps that move substances across the cell membrane. Some proteins attach to the cytoskeleton, enabling cells to use their membranes to move or change shape. Many of the carbohydrate molecules help cells to identify each other.

Visual Reading Tool: Eukaryotic Cell Structure

Write the name of the numbered structures.

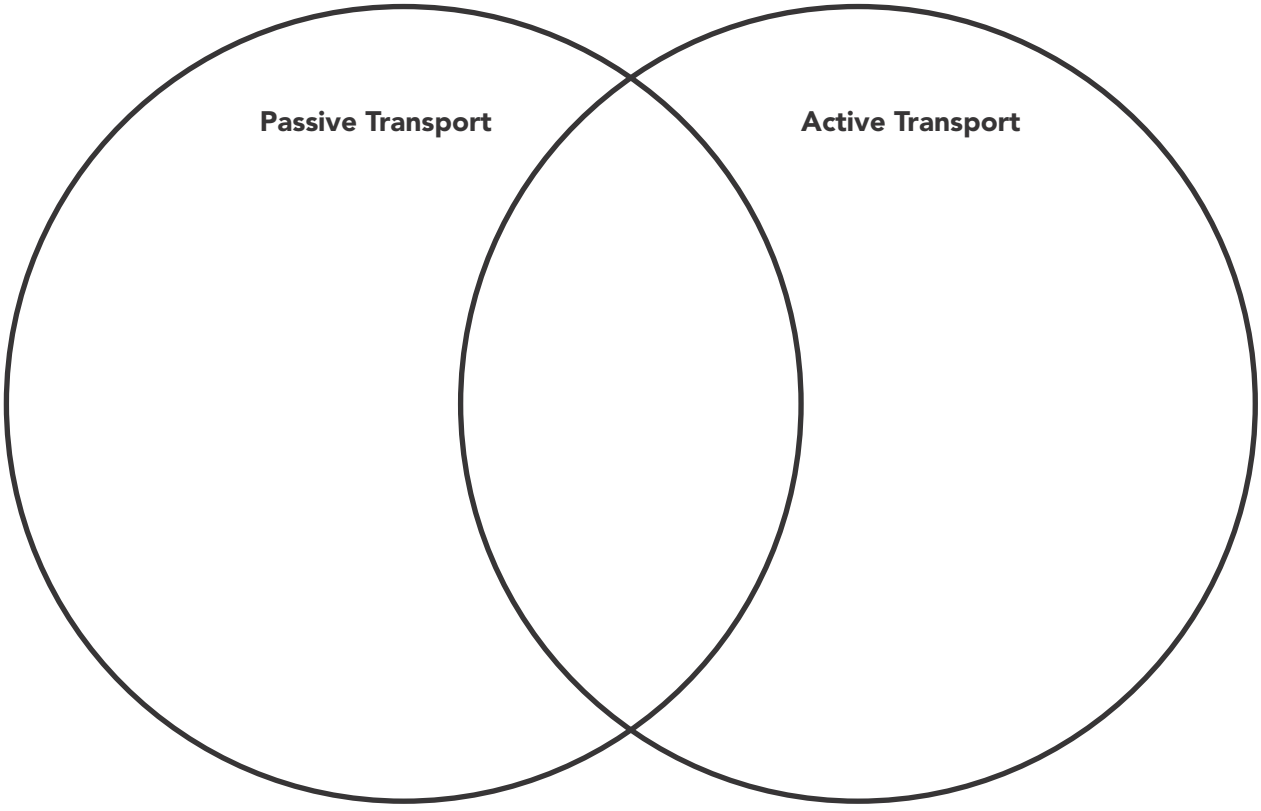


CHAPTER 8

LESSON 3

Cell Transport

READING TOOL **Compare and Contrast** As you read, compare and contrast passive and active transport. Complete the Venn Diagram by filling in the similarities where the two circles overlap, and their differences on either side. Be sure to also include the types of passive transport and active transport.



Lesson Summary

Passive Transport

KEY QUESTION *How does passive transport work?*

Living cells must stay in **homeostasis**, which is a state of relatively constant internal physical and chemical conditions. One way that cells maintain homeostasis is by controlling the movement of molecules across the cell membrane.

As you read, circle the answers to each Key Question. Underline any words you do not understand.

BUILD Vocabulary

homeostasis relatively constant internal physical and chemical conditions that organisms maintain

READING TOOL

Academic Words

passive *Passive* has multiple meanings. It can mean inactive, and it can also mean that something is unpowered, with no force behind it. ☑ ***Passive transport*** **does not mean that a particle is inactive or not moving. It means that the particle can move without requiring what?**

_____

BUILD Vocabulary

diffusion process by which particles tend to move from an area where they are more concentrated to an area where they are less concentrated

facilitated diffusion process of diffusion in which molecules pass across the membrane through protein channels in the cell membrane

aquaporin water channel protein in a cell membrane

osmosis diffusion of water through a selectively permeable membrane

isotonic when the concentration of two solutions is the same

hypertonic when comparing two solutions, the solution with the greater concentration of solutes

hypotonic when comparing two solutions, the solution with the lesser concentration of solutes

osmotic pressure pressure that must be applied to prevent osmotic movement across a selectively permeable membrane

Prefixes *Iso-* means "equal." You may have encountered this prefix in the term *isosceles triangle* in a math class. An isosceles triangle has two equal sides. ☑ **What quantity is equal between two solutions that are isotonic?**

_____

_____

Diffusion

In any solution, solute particles constantly move and collide with each other. The particles tend to move from an area where they are more concentrated to an area where they are less concentrated. This process is called **diffusion** (dih FYOO zhun). Diffusion is why many substances move across the cell membrane. For a substance that can cross the cell membrane, it will move to the side of the membrane where it is less concentrated. Equilibrium is reached when the concentration of the substance is the same on both sides of the membrane. Molecules will continue to move across the membrane, but the concentration will stay the same on both sides. Diffusion depends on molecular movements that do not require the cell to use energy. The movement of molecules across the cell membrane without using cellular energy is called passive transport.

Facilitated Diffusion

Molecules that move across the cell membrane most easily are small and uncharged. Such molecules can dissolve in the membrane's lipid bilayer. But charged ions and many large molecules such as the sugar glucose can also cross the cell membrane. This is because proteins in the cell membrane act as carriers or channels for these molecules. In **facilitated diffusion**, molecules that cannot diffuse through the membrane pass through protein channels. Facilitated diffusion does not require any cellular energy. There are hundreds of different proteins that allow specific substances to cross cell membranes.

Osmosis: An Example of Facilitated Diffusion

Water molecules cannot diffuse through the cell membrane because the interior of the membrane is hydrophobic. Water enters cells by facilitated diffusion. Many cells contain proteins called **aquaporins** (ak wuh PAW rinz) that allow water to pass through them. **Osmosis** is the diffusion of water through a selectively permeable membrane, such as the cell membrane.

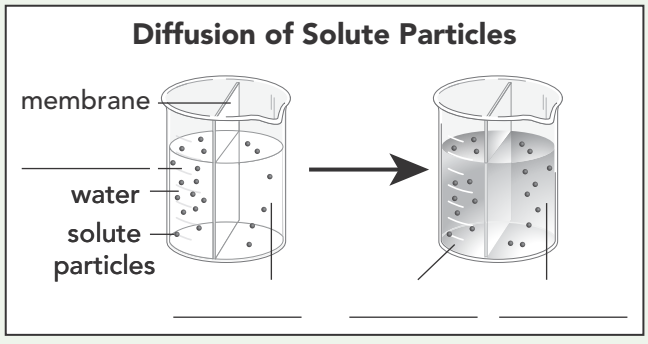
How Osmosis Works Think about two solutions of sugar in water separated by a membrane that is permeable to water, but not sugar. One solution has a higher concentration of sugar, which means there is a lower concentration of water. Water moves both ways across the membrane, but more water molecules will move from the side with more water and less sugar to the side with less water and more sugar until equilibrium is reached. Equilibrium is when the water and sugar concentrations are the same in both solutions. At equilibrium, the solutions are **isotonic**, meaning "same strength." Before equilibrium was reached, the solution with more sugar was **hypertonic**, or "above strength," and the solution with less sugar was **hypotonic**, or "below strength." The terms *isotonic, hypertonic,* and *hypotonic* refer the "strength," or concentration, of the sugar solute, not the water.

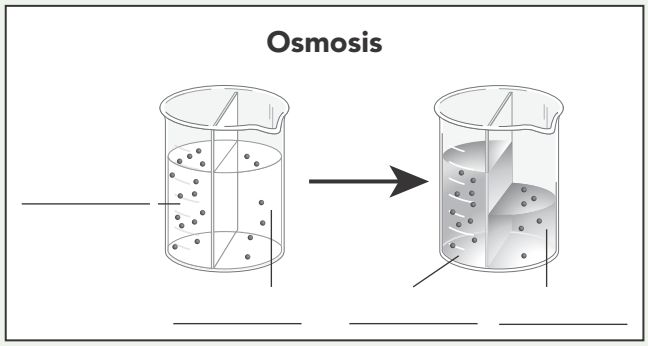
Osmotic Pressure The net movement of water into or out of a cell produces a force called **osmotic pressure**. Because cells contain salts, sugars, proteins and other dissolved molecules; they are almost always hypertonic to fresh water. As a result, water tends to move into a cell, increasing the osmotic pressure inside the cell and causing it to swell. This could cause the cell to burst. Most cells in large organisms are bathed in blood or other isotonic fluids, not water, so they are not in danger of bursting.

Visual Reading Tool: Passive Transport

Diffusion is the movement of particles from an area of high concentration to an area of low concentration. Osmosis is the diffusion of water through a selectively permeable membrane. Study the beakers at the right. The arrows between beakers tell you what process is occurring.

1. In the beakers on the right, draw the result of the described process. Draw changes in water levels. Draw changes in the number of solute particles. Remember to draw on both sides of the membrane.
2. Label each of the solutions on each side of the membrane as either hypertonic, hypotonic, or isotonic.





Active Transport

As you read, circle the answers to each Key Question. Underline any words you do not understand.

READING TOOL

Cause and Effect Small molecules have the ability to move across the cell membrane by dissolving through the lipid bilayer. This is called diffusion and it happens without any energy input.

Why do some molecules need help moving across a cell membrane in the form of energy?

KEY QUESTION *How does active transport work?*

Sometimes cells transport materials against a concentration gradient, from an area of low concentration to an area of higher concentration. The movement of materials against a concentration difference is known as active transport, and it requires energy. The active transport of small molecules or ions across a cell membrane is usually carried out by membrane proteins called protein pumps. Larger molecules can be actively transported by processes known as endocytosis and exocytosis.

Molecular Transport

Many cells use protein pumps and cellular energy to move ions such as calcium, potassium, and sodium across membranes. This allows cells to store substances in a particular location even when diffusion would tend to move these substances in the opposite direction.

Bulk Transport

Large molecules and even clumps of material can be moved across the cell membrane by bulk transport.

Endocytosis Endocytosis (en doh sy TOH sis) is the process of bringing material into a cell by means of parts of the membrane folding in, or forming pockets. The resulting pocket breaks away from the cytoplasmic side of the cell membrane, forming a vesicle or vacuole in the cytoplasm. Large molecules, clumps of food, and even whole cells can be taken up in this way.

Phagocytosis (fag oh sy TOH sis) is a kind of endocytosis in which extensions of the cell surround a particle and package it within a food vacuole. White blood cells use phagocytosis to destroy damaged or foreign cells. Amoebas use this method to take in food. Phagocytosis requires a lot of cellular energy.

Many cells take up liquid from the environment in a similar process called pinocytosis (py nuh sy TOH sis). Tiny pockets form along the cell membrane, fill with liquid, and pinch off to form vacuoles.

Exocytosis Cells can also release material using the process of exocytosis (ek soh sy TOH sis). In exocytosis, the membrane of a vesicle or vacuole fuses with the cell membrane, forcing the contents of the vacuole out of the cell. Cells remove water by means of a contractile vacuole and exocytosis.

CHAPTER 8

LESSON 4

Homeostasis and Cells

READING TOOL **Make Connections** As you read the text, fill in the chart below to show how each idea is related to one another.

Specialized Cells

- Definition: _____
- Example: _____

Tissues

- Definition: _____
- Example: _____

Organs

- Definition: _____
- Example: _____

Organ System

- Definition: _____
- Example: _____

Lesson Summary

As you read, circle the answers to each Key Question. Underline any words you do not understand.

BUILD Vocabulary

tissue group of similar cells that perform a particular function

organ group of tissues that work together to perform closely related functions

organ system group of organs that work together to perform a specific function

receptor on or in a cell, a specific protein that receives chemical signals from molecular messengers, such as hormones

Word Origins The English word *receive* is based upon the Latin word *recipere* which means "to take back." **What do receptors in cells receive from other cells?**

_____

_____

The Cell as an Organism

KEY QUESTION *How do single-celled organisms maintain homeostasis?*

Unicellular organisms, like all living things, must maintain homeostasis, or relatively constant internal physical and chemical conditions. To maintain homeostasis, unicellular organisms grow, respond to the environment, transform energy, and reproduce. Unicellular organisms include prokaryotes, such as bacteria. Many eukaryotes, such as amoebas, many algae, and yeasts, live as single cells.

Multicellular Life

KEY QUESTION *How do the cells of a multicellular organism work together to maintain homeostasis?*

The cells of humans and other multicellular organisms do not live on their own. They are interdependent. The cells of multicellular organisms are specialized for specific tasks and communicate with one another to maintain homeostasis.

Cell Specialization

We each began life as a single cell. That cell grew and divided and gave rise to many other cells that became specialized to perform different roles. Each specialized cell in a multicellular organism contributes to homeostasis in the organism.

Levels of Organization

In a multicellular organism, specialized cells are organized into tissues. Tissues are organized into organs, which are organized into organ systems. A **tissue** is a group of similar cells that perform a particular function. Different tissues may work together to form an **organ**. For example, the brain is an organ made of nerve and fat tissue and blood vessels. A group of organs that work together to perform a function is called an **organ system**. The brain, spinal cord, and nerves in the body work together as the nervous system.

Cellular Communication

Cells in a large organism communicate using chemical signals. These signals can speed up or slow down the function of cells that receive them, or can cause the cell to change what it is doing. Some cells form connections or cellular junctions to neighboring cells. Some junctions hold cells together. Others allow molecules to carry chemical signals between cells. In order for cells to respond to a chemical signal, the cell must have a **receptor** that the chemical signal can bind to. Receptors can be on the cell membrane or inside the cytoplasm. In many animals, nerve cells carry messages from one part of the body to another.

8 Chapter Review

Review Vocabulary

Choose the letter of the best answer.

1. Proteins that will be released from the cell are assembled at the

- ☐ A. central vacuole.
- ☐ B. mitochondria.
- ☐ C. rough endoplasmic reticulum.

2. The diffusion of water through a selectively permeable membrane is called

- ☐ A. homeostasis.
- ☐ B. pinocytosis.
- ☐ C. osmosis.

Match the vocabulary term to its definition.

3. _____	A cell that has DNA but no nucleus.	a. receptor
4. _____	A complex of protein and RNA that assembles proteins.	b. prokaryote
5. _____	A protein on or in a cell that binds a chemical signal.	c. ribosome

Review Key Questions

Provide evidence and details to support your answers.

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

7. Plants and animals are both made up of eukaryotic cells. Does this mean they have the same kinds of organelles? Why or why not?

8. A cell makes and secretes a certain protein. Explain where it is made, how it is secreted from the cell, and what kind of transport is used.

9. Why do prokaryotes not have cell specialization?