

Discovering Cells (pages 6–13)

An Overview of Cells (page 7)

Key Concept: Cells are the basic units of structure and function in living things.

- **Cells** make up the structures in all living things. Cells also carry out all of the functions, or jobs, of living things.
- Living things look like they do because of the different ways cells are put together.
- The different things that living things do are all done by cells. For example, digesting food, moving, and growing are all done by cells.
- Cells are so small that they cannot be seen with your eyes alone.

Answer the following questions. Use your textbook and the ideas above.

1. Read each word in the box. In each sentence below, fill in the correct word.

functions	structures	units
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- a. Cells make up the _____ in all living things.
 - b. Cells carry out all the _____ of living things.
2. Is the following sentence true or false? You can see cells with just your eyes alone. _____

Cell Structure and Function

First Observations of Cells (pages 7–9)

Key Concept: The invention of the microscope made it possible for people to discover and learn about cells.

- A **microscope** is a tool that makes small objects look larger.
- Many microscopes work by using curved pieces of glass or plastic to focus light.
- Robert Hooke was an English scientist who was one of the first people to see a cell with a microscope.

Answer the following question. Use your textbook and the ideas above.

3. Circle the letter of what a microscope does.
 - a. makes large objects look smaller
 - b. makes small objects look larger
 - c. makes faraway objects look closer

Development of the Cell Theory

(pages 10–11)

Key Concept: The cell theory states the following: **All living things are composed of cells. Cells are the basic units of structure and function in living things. All cells are produced from other cells.**

- As more and more scientists used microscopes to observe cells, they learned that cells are the building blocks of living things.
- Many different scientists worked together to develop the cell theory. The **cell theory** explains the relationship between cells and living thing.
- The cell theory is true for all living things. Scientists can study cells to learn how living things function and grow.

Cell Structure and Function

Answer the following question. Use your textbook and the ideas on page 5.

4. Circle the letter of each sentence that is true about cells.
- Not all living things are made of cells.
 - The cell theory explains how cells are made.
 - Scientists learn how living things function by studying cells.

Light and Electron Microscopes

(pages 11–13)

Key Concept: The lenses in light microscopes magnify an object by bending the light that passes through them. Electron microscopes use a beam of electrons instead of light to produce a magnified image.

- Microscopes magnify objects. To magnify means to make things look larger than they are.
- Light microscopes have lenses. A lens is a piece of curved glass or plastic. The lens bends light that passes through it. When the light hits your eyes, your eyes see the object larger than it really is.
- Electron microscopes use electrons to make an image. Electrons are very tiny particles. You can see things with an electron microscope that are too small to see with a light microscope.

Answer the following question. Use your textbook and the ideas above.

5. Circle the letter of each type of microscope.
- electron microscope
 - light microscope
 - telescope

Cell Structure and Function

Looking Inside Cells (pages 16–24)

Enter the Cell (page 17)

Key Concept: A plant's cell wall helps to protect and support the cell. The cell membrane controls what substances come into and out of a cell.

- An **organelle** is a structure in the cell that has a specific function.
- The **cell wall** is a stiff layer that protects and supports the cell. Animal cells do not have cell walls.
- The **cell membrane** forms the boundary between the cell and its environment. The cell membrane controls what goes in and out of a cell.

Answer the following questions. Use your textbook and the ideas above.

1. A structure inside a cell that has a specific function is a(an) _____.
2. Read each word in the box. In each sentence below, fill in the correct word or words.

cell membrane	cell wall	organelle
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- a. A stiff layer that protects and supports the cell is the _____.
 - b. The cell boundary that controls what goes in and out of a cell is the _____.
3. Is the following sentence true or false? Animal cells do not have a cell wall. _____

Cell Structure and Function

Sail on to the Nucleus (page 18)

Key Concept: Think of the nucleus as the cell's control center, directing all of the cell's activities.

- The cell **nucleus** (NOO klee us) is the control center of the cell.
- The nucleus is protected by a membrane called the nuclear envelope.
- The nucleus holds the genetic information. The genetic information controls what the cell does.

Answer the following question. Use your textbook and the ideas above.

4. Circle the letter of each sentence that is true about the nucleus.
- a. The nucleus is the control center of the cell.
 - b. The cell membrane protects the nucleus.
 - c. The nucleus holds the genetic information.

Organelles in the Cytoplasm (pages 19–22)

Key Concept: The cytoplasm has many organelles that carry out the life functions of a cell.

- The **cytoplasm** (cy tuh PLAZ um) is the thick, gel-like fluid found between the cell membrane and the nucleus. The cytoplasm has many organelles.
- **Mitochondria** (my tuh KAHN dree uh) are rod-shaped organelles known as the “powerhouses” of the cell. Mitochondria change food to energy.
- **Ribosomes** (RY buh sohm) are very small grainlike structures that make proteins.
- Plant cells have chloroplasts. **Chloroplasts** (KLOR uh plasts) are green organelles that capture the energy from sunlight and use it to make food.

Cell Structure and Function

Answer the following questions. Use your textbook and the ideas on page 8.

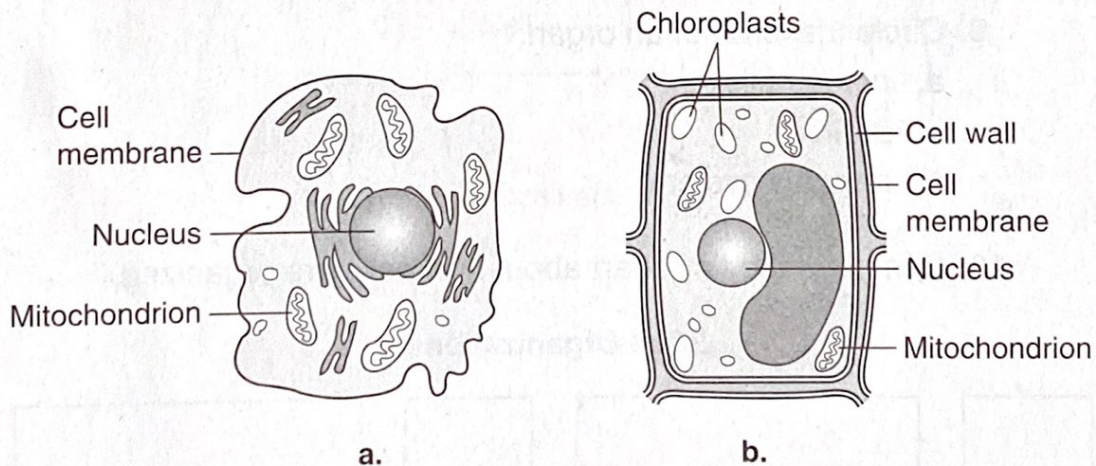
5. Circle the letter of the gel-like fluid found between the cell membrane and the nucleus.

- a. organelle
- b. cytoplasm
- c. nuclear envelope

6. Draw a line from each organelle to its function.

Organelle	Function
mitochondria	a. make proteins
ribosomes	b. capture the energy from sunlight
chloroplasts	c. change food to energy the cell can use

7. The picture shows two different cells. One cell is an animal cell. The other cell is a plant cell. Read the labels for the cell parts. Circle the letter of the plant cell.



Cell Structure and Function

Specialized Cells (page 23)

Key Concept: In many-celled organisms, cells are often organized into tissues, organs, and organ systems.

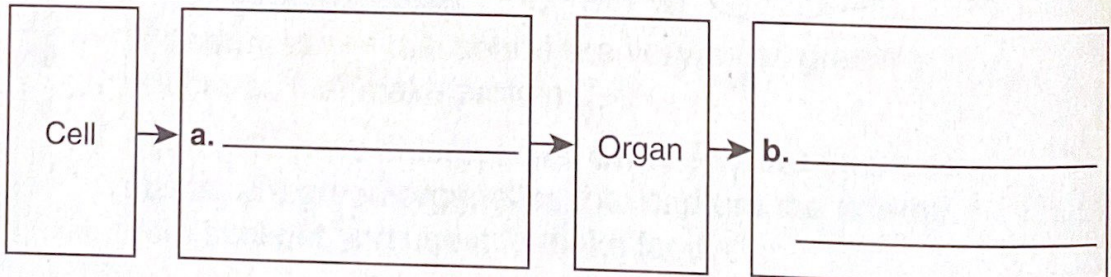
- In a many-celled organism, cells are often very different from each other. These cells have different shapes and different jobs.
- A tissue is a group of cells that work together to do a specific job. For example, nervous tissue is made up of nerve cells.
- A group of different tissues is an organ. Your brain is an organ.
- An organ system is a group of organs working together. Your brain is part of the nervous system.

Answer the following questions. Use your textbook and the ideas above.

8. Is the following sentence true or false? In a many-celled organism, all the cells look the same.

9. Circle the letter of an organ.
a. nerve cells
b. brain
c. nervous system
10. Complete the flowchart about how cells are organized.

Cell Organization



Cell Structure and Function

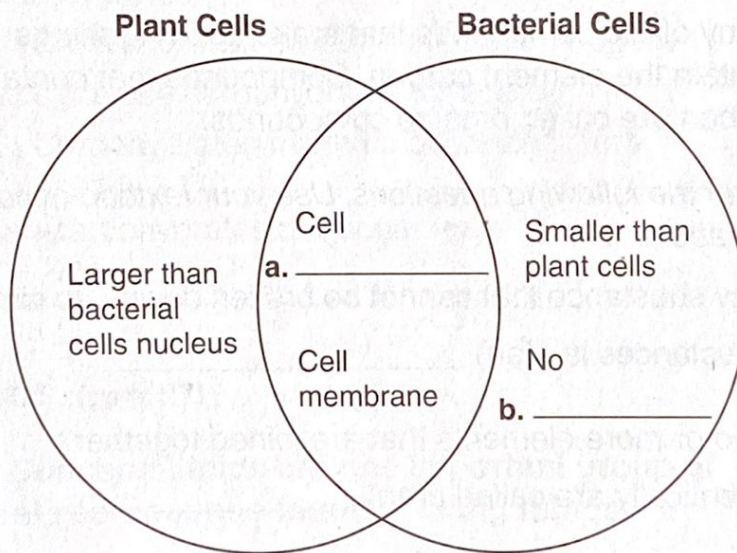
Bacterial Cells (page 24)

Key Concept: While a bacterial cell does have a cell wall and a cell membrane, it does not contain a nucleus. The bacterial cell's genetic material, which looks like a thick, tangled string, is found in the cytoplasm.

- Bacterial cells are smaller than plant or animal cells.
- Bacterial cells have cell walls and a cell membrane.
- Bacterial cells do not have a nucleus. The genetic material is in the cytoplasm.

Answer the following question. Use your textbook and the ideas above.

11. Fill in the Venn diagram to show how plant cells and bacterial cells are alike and different.



Chemical Compounds in Cells (pages 25–30)

Elements and Compounds (pages 25–26)

Key Concept: An element is any substance that cannot be broken down into simpler substances. When two or more elements combine chemically, they form a compound.

- Elements are the basic substances that everything is made of. An **element** cannot be broken down into simpler substances. Oxygen and carbon are two elements.
- A **compound** is made of two or more elements that are joined together in a chemical reaction. Carbon dioxide is a compound made of the elements carbon and oxygen.
- Many of the compounds that make up living things contain the element carbon. Compounds that contain carbon are called organic compounds.

Answer the following questions. Use your textbook and the ideas above.

1. Any substance that cannot be broken down into simpler substances is a(an) _____.
2. Two or more elements that are joined together chemically are called a(an) _____.
3. Is the following sentence true or false? Many of the compounds that make up living things contain the element sulfur. _____

Cell Structure and Function

Carbohydrates (page 27)

Key Concept: One important group of organic compounds found in living things is carbohydrates.

- A **carbohydrate** (kahr boh HY drayt) is a compound made of the elements carbon, hydrogen, and oxygen. Carbohydrates give energy.
- Sugars and starches are carbohydrates. When plants make food, they make sugar. Plants store extra sugar as starch.
- All cells use carbohydrates for energy. Carbohydrates also make up the cell wall and the cell membrane.

Answer the following questions. Use your textbook and the ideas above.

4. Circle the letter of each sentence that is true about carbohydrates.
 - a. Carbohydrates have the element nitrogen.
 - b. Cells use carbohydrates for energy.
 - c. Carbohydrates make up some cell parts.
5. Two carbohydrates are sugar and _____.

Lipids (page 27)

Key Concept: Lipids are one important group of organic compounds found in living things.

- **Lipids** are energy-rich compounds made of carbon, hydrogen, and oxygen. Fats, oils, and waxes are examples of lipids.
- Lipids have more energy than carbohydrates.
- Cells store energy as lipids for later use.
- Cell membranes are made mostly of lipids.

Cell Structure and Function

Answer the following questions. Use your textbook and the ideas on page 13.

6. Is the following sentence true or false? Carbohydrates have more energy than lipids. _____
7. Cell membranes are made mostly of _____.

Proteins (page 28)

Key Concept: Proteins are one important group of organic compounds found in living things.

- **Proteins** are large organic compounds. Meat, eggs, fish, and nuts are foods that are high in protein.
- Proteins are made up of many smaller compounds called **amino acids**. There are 20 different amino acids. Cells combine the amino acids in different ways to form thousands of different proteins.
- Most cell structures are made of proteins.
- Proteins called **enzymes** speed up the chemical reactions that take place in cells. Without enzymes, many chemical reactions would not happen.

Answer the following question. Use your textbook and the ideas above.

8. Draw a line from each term to its meaning.

Term	Meaning
amino acid	a. speeds up chemical reactions
enzyme	b. found in foods such as meat, eggs, and fish
protein	c. makes up proteins

Cell Structure and Function

Nucleic Acids (page 29)

Key Concept: Nucleic acids are one important group of organic compounds found in living things.

- **Nucleic acids** are long organic compounds that instruct cells in carrying out all their functions.
- One kind of nucleic acid is deoxyribonucleic (dee ahk see ry boh noo KLEE ik) acid, or **DNA**. **DNA** is the genetic material that carries information about an organism. DNA is passed from parents to offspring. DNA is in the nucleus of the cell.
- The information in DNA directs the cell's activities.
- Ribonucleic (ry boh noo KLEE ik) acid, or **RNA**, helps make the proteins that a cell needs. RNA is in the cytoplasm and in the nucleus.

Answer the following questions. Use your textbook and the ideas above.

9. Circle the letter of a function of nucleic acids.
 - a. carry information about the cell
 - b. provide energy
 - c. make up cell structures

10. Fill in the table about nucleic acids.

Nucleic Acids		
Type	Role in the Cell	Location in the Cell
DNA	carries information about living things	a. _____
RNA	b. _____ _____	cytoplasm and nucleus

Cell Structure and Function

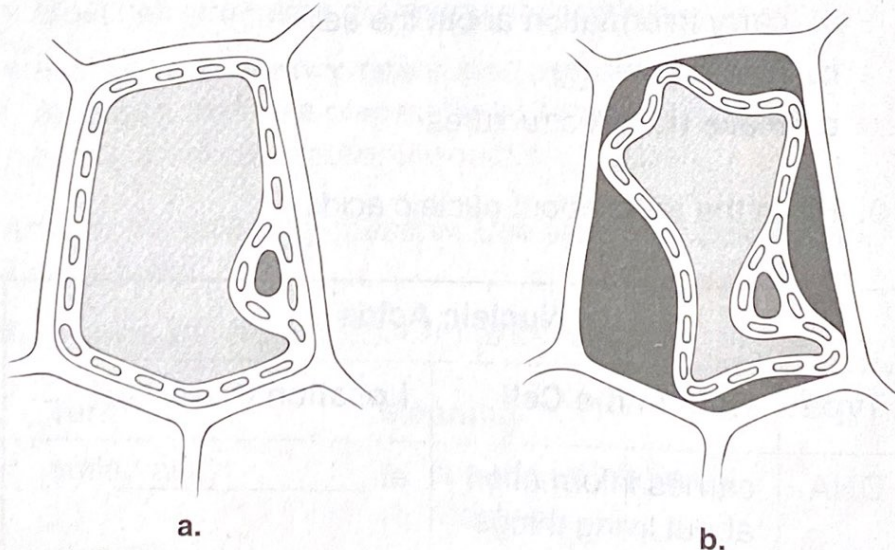
Water and Living Things (page 30)

Key Concept: Most chemical reactions within cells could not take place without water.

- Water makes up about two thirds of your body.
- Most chemical reactions in cells take place in water. Some chemical reactions use water in the reaction itself.
- Water helps cells keep their size and shape.
- Water helps keep the temperature of cells from changing too fast.

Answer the following questions. Use your textbook and the ideas above.

11. Is the following sentence true or false? Most chemical reactions in cells take place without water. _____
12. The picture shows two cells. Circle the letter of the cell that needs more water.



Cell Structure and Function

The Cell in Its Environment

(pages 32–37)

Diffusion (pages 33–34)

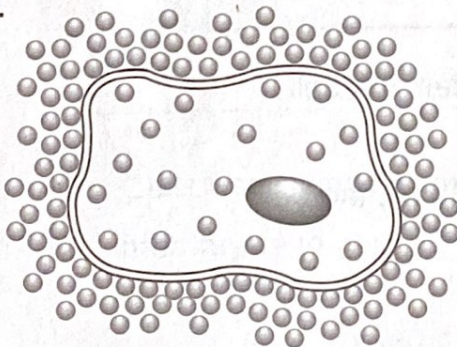
Key Concept: Diffusion is the main method by which small molecules move across the cell membrane.

- The cell membrane lets only some substances pass through it. Oxygen, food, waste products, and water are substances that can pass through the cell membrane.
- **Diffusion** (dih FYOO zhun) is when substances move from an area of high concentration to an area of low concentration. It is like when people spread out from a crowded space to a less crowded space.

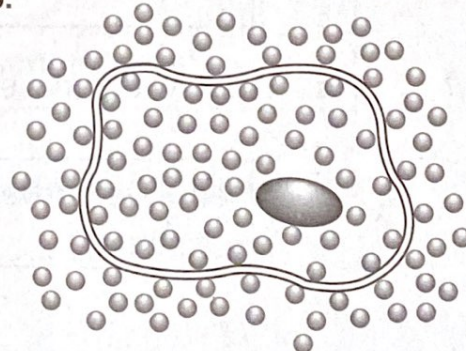
Answer the following questions. Use your textbook and the ideas above.

1. Is the following sentence true or false? In diffusion, substances move from areas of high concentration to areas of low concentration. _____
2. The pictures show particles of a substance spread inside and outside a cell. Circle the letter of the picture that shows how the particles look before diffusion has taken place.

a.



b.



Cell Structure and Function

Osmosis (pages 34–35)

Key Concept: Because cells cannot function properly without adequate water, many cellular processes depend on osmosis.

- **Osmosis** (ahz MOE sis) is the diffusion of water across a cell membrane.
- In osmosis, water moves by diffusion through the cell membrane to an area of low water concentration.
- Water moves out of the cell if there is more water inside the cell than outside the cell. Cells shrink when water moves out.
- Water moves into the cell if there is more water outside the cell. Cells swell, or get larger, when water moves in.

Answer the following questions. Use your textbook and the ideas above.

3. Circle the letter of how water moves in osmosis.
 - a. across a cell membrane
 - b. to areas where there is more water
 - c. downhill
4. Read each word in the box. In each sentence below, fill in the correct word or words.

shrinks	stays the same	swells
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- a. When water moves into a cell, the cell _____.
- b. When water moves out of a cell, the cell _____.

Cell Structure and Function

Active Transport (pages 36–37)

Key Concept: Active transport requires the cell to use its own energy, while passive transport does not.

- In **passive transport**, substances move back and forth through the cell membrane without the use of energy. Diffusion and osmosis are examples of passive transport.
- In **active transport**, cells use energy to move substances through the cell membrane. Cells use active transport to take in substances that are already in higher concentrations inside the cell than outside.
- Calcium, potassium, and sodium are some substances that move in and out of cells by active transport.

Answer the following questions. Use your textbook and the ideas above.

5. Fill in the table below to compare active transport and passive transport in cells.

Cell Transport		
Type	Needs Energy?	Direction Materials Move
Passive	a. _____	to lower concentration
Active	yes	to b. _____ concentration

6. Cells use energy to move substances through the cell membrane in _____ transport.