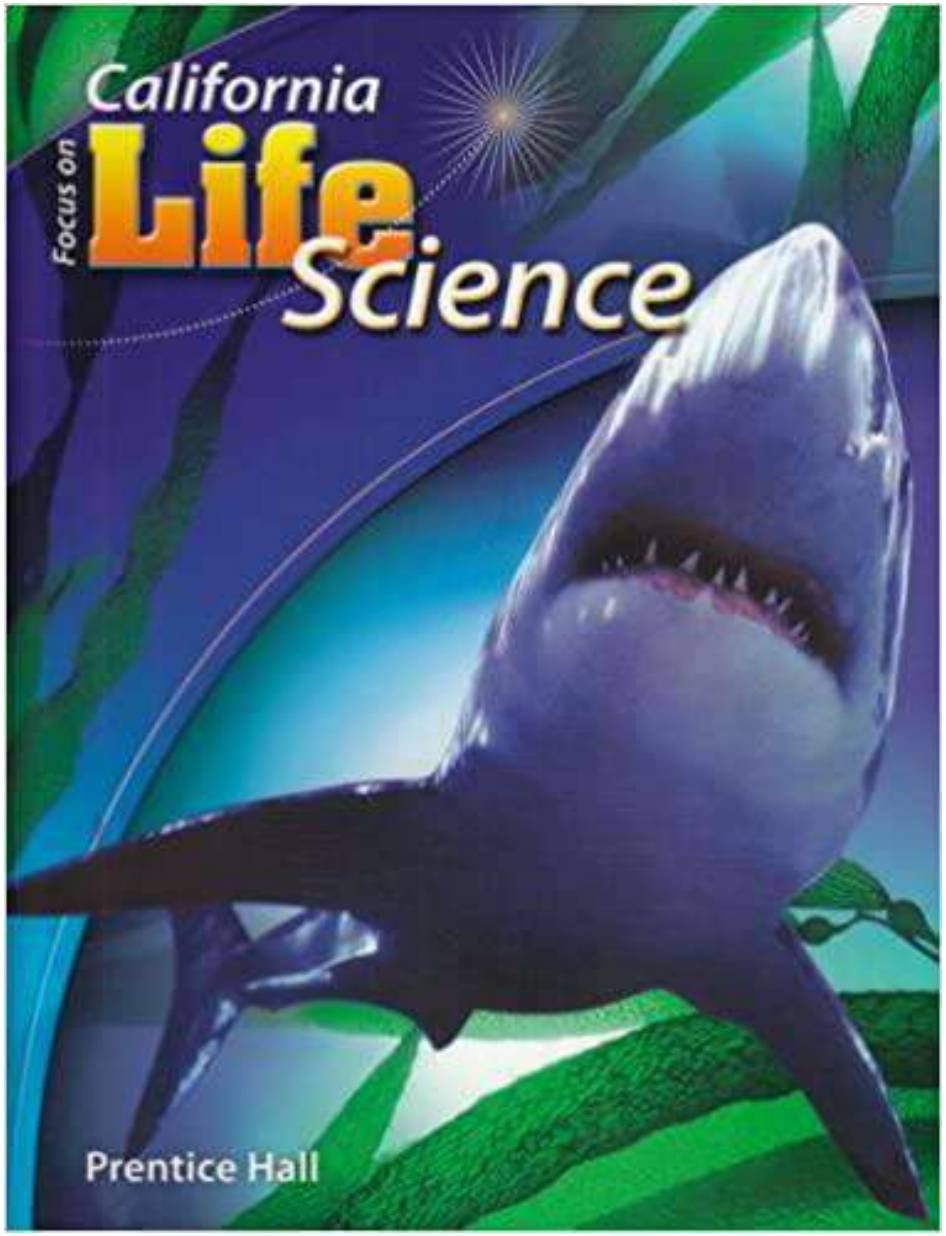


Read pages 88 to 95

Answer the questions from page 95 #1-4

They are on the packet #5

Section 2

Looking Inside Cells

Standards Focus

7.1.b Students know the characteristics that distinguish plant cells from animal cells, including chloroplasts and cell walls.

7.1.c Students know that the nucleus is the repository for genetic information in plant and animal cells.

What role do the cell wall and cell membrane play in the cell?

What is the role of the nucleus in the cell?

What organelles are found in the cytoplasm and what are their functions?

How do cells differ?

Key Terms

- organelle
- cell wall
- cytoskeleton
- cell membrane
- nucleus
- cytoplasm
- mitochondria
- endoplasmic reticulum
- ribosome
- Golgi body
- chloroplast
- vacuole
- lysosome

Lab zone Standards Warm-Up

How Large Are Cells?

1. Look at the organism in the photo. The organism is an amoeba (uh MEE buh), a large single-celled organism. This type of amoeba is about 1 mm long.
2. Multiply your height in meters by 1,000 to get your height in millimeters. How many amoebas would you have to stack end to end to equal your height?
3. Many of the cells in your body are about 0.01 mm long—one hundredth the size of an amoeba. How many body cells would you have to stack end-to-end to equal your height?

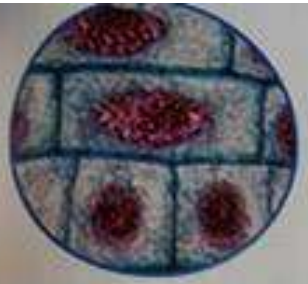
Think It Over

Inferring Look at a metric ruler to see how small 1 mm is. Now imagine a distance one one-hundredth as long, or 0.01 mm. Why can't you see your body's cells without a microscope?

Nasturtiums brighten up many gardens with green leaves and colorful flowers. How do nasturtiums carry out all the functions necessary to stay alive? To answer this question, you will take an imaginary journey into the cell of a nasturtium leaf. You will observe some of the structures found in plant cells. You will also learn some differences between plant and animal cells.

As you will discover on your journey, there are even smaller structures inside a cell, called organelles. **Organelles** carry out specific functions within the cell. Just as your stomach, lungs, and heart have different functions in your body, each organelle has a different function within the cell. Now, hop aboard your imaginary ship and sail into a typical plant cell. As you travel through the plant cell, refer to Figure 6. And be sure to note the differences between plant and animal cells.

Nasturtiums ▶



◀ Onion root cells

▼ Paramecium

Enter the Cell

Your ship doesn't have an easy time getting inside the plant cell. It has to pass through the cell wall and the cell membrane.

Cell Wall The **cell wall** is a rigid layer of nonliving material that surrounds the cells of plants and some other organisms.

A cell wall helps to protect and support the cell. In plants, the cell wall is made mostly of a strong material called cellulose. Although the cell wall is tough, many materials, including water and oxygen, can pass through easily.

Unlike plant cells, the cells of animals and many single-celled organisms do not have cell walls. Instead, a protein "framework" inside the cell called a **cytoskeleton** gives the cells their shape.

Cell Membrane After passing through the cell wall, the next barrier you must cross is the **cell membrane.** All cells have cell membranes. The cell membrane forms the outside boundary that separates the cell from its environment. In cells with cell walls, the cell membrane is located just inside the cell wall. In other cells, the cell membrane forms the outside boundary that separates the cell from its environment.

The cell membrane controls what substances come into and out of a cell. Everything the cell needs, from food to oxygen, enters the cell through the cell membrane. For a cell to survive, the cell membrane must allow these materials to pass in and out. Harmful waste products leave the cell through the cell membrane. The cell membrane also prevents harmful materials from entering the cell. In a sense, the cell membrane is like a window screen. The screen allows air to enter and leave a room, but it keeps insects out. Fortunately, on this trip, your ship can slip through.

Reading Checkpoint Do animal cells contain cell walls?

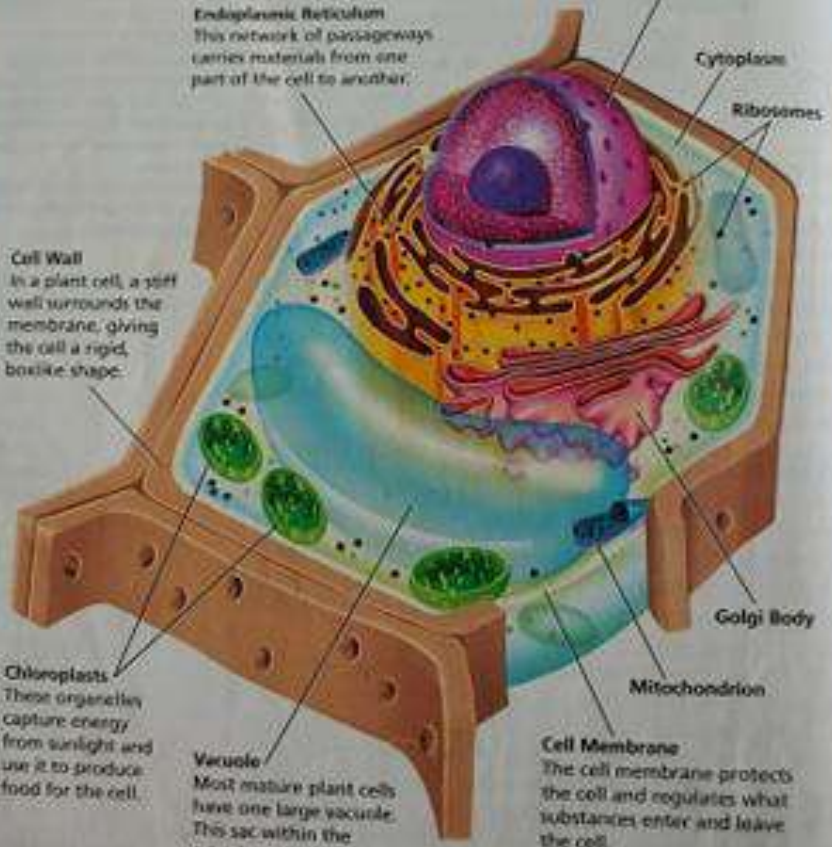
Figure 5
Cell Wall and Cell Membrane
The onion root cells have both a cell wall and a cell membrane. The single-celled paramecium has only a cell membrane, but it is dense and tough.
Interpreting Photographs What shape do the cell walls give to the onion root cells?

Video Field Trip
Discovery Channel School
Cell Structure and Function

FIGURE 6

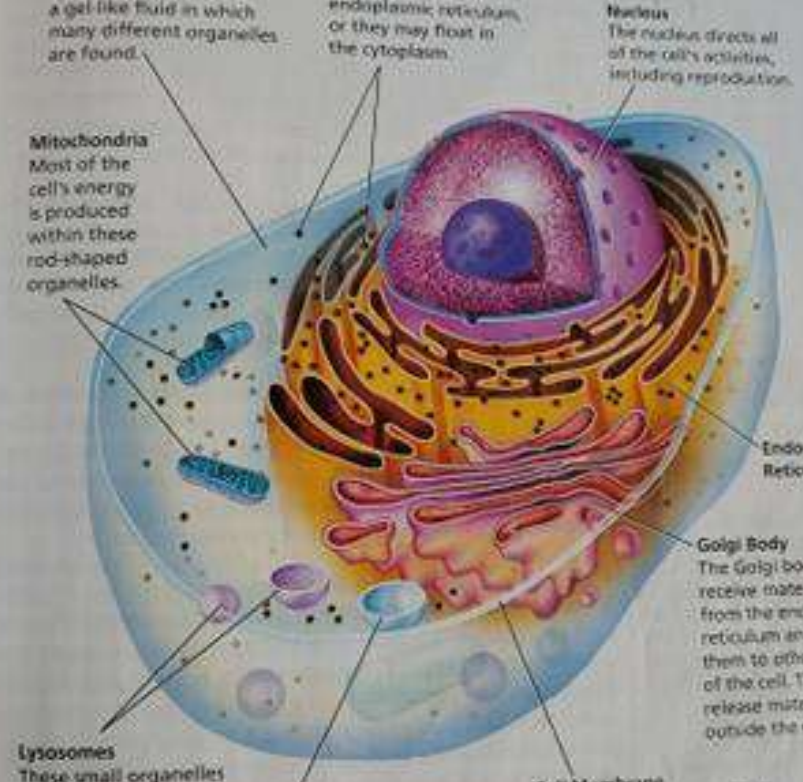
Plant and Animal Cells

These illustrations show typical structures found in plant and animal cells. *Comparing and Contrasting* Identify one structure found in plant cells but not animal cells.



Plant Cell

Go Online
active art
For: Plant and Animal Cells activity
Visit: PHSchool.com
Web Code: cep-3072



Animal Cell

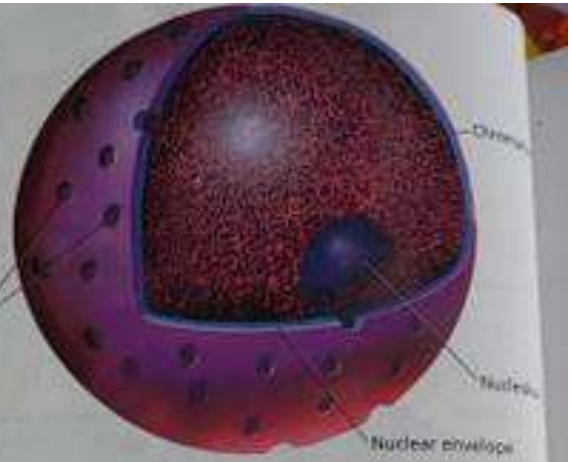


Figure 7
The Nucleus
The photo (left) and diagram (right) both show the nucleus, which is the cell's control center. The chromatin in the nucleus contains instructions for carrying out the cell's activities.

Sail on to the Nucleus

As you sail inside the cell, a large, oval structure comes [into] view. This structure, called the **nucleus** (NOO klee us), [acts] as the control center of the cell. **The nucleus is the cell's control center, directing all of the cell's activities.**

Nuclear Envelope Notice in Figure 7 that the nucleus [is] surrounded by a membrane called the nuclear envelope. Just [as] a mailing envelope protects the letter inside it, the nuclear envelope protects the nucleus. Materials pass in and out of the nucleus through pores in the nuclear envelope. So aim for the pore just ahead and carefully glide into the nucleus.

Chromatin You might wonder how the nucleus "knows" how to direct the cell. The answer lies in those thin strands floating directly ahead in the nucleus. These strands, called chromatin, contain genetic material, the instructions for directing the cell's functions. For example, the instructions in the chromatin ensure that leaf cells grow and divide to form more leaf cells. You can think of the nucleus as a repository for genetic information in cells. A repository is a storage area.

Nucleolus As you prepare to leave the nucleus, you spot a small object floating by. This structure, a nucleolus, is where ribosomes are made. Ribosomes are the organelles where proteins are produced. Proteins are important chemicals in cells.

Reading Checkpoint **Where in the nucleus is genetic material found?**

Lab Zone Try This Activity

Gelatin Cell

Make your own model of a cell.

1. Dissolve a packet of colorless gelatin in warm water. Pour the gelatin into a rectangular pan (for a plant cell) or a round pan (for an animal cell).
2. Choose different materials that resemble each of the cell structures found in the cell you are modeling. Insert these materials into the gelatin before it begins to solidify.

Making Models On a sheet of paper, develop a key that identifies each cell structure in your model. Describe the function of each structure.

Figure 8
Mitochondrion
The mitochondria release most of the cell's energy. *Inferring* *In what types of cells would you expect to find a lot of mitochondria?*

Organelles in the Cytoplasm

As you leave the nucleus, you find yourself in the **cytoplasm**, the region between the cell membrane and the nucleus. Your ship floats in a clear, thick, gel-like fluid. The fluid in the cytoplasm is constantly moving, so your ship does not need to propel itself. **In the cytoplasm are many organelles, including mitochondria, endoplasmic reticulum, ribosomes, Golgi bodies, chloroplasts, vacuoles, and lysosomes. Each of these organelles has specific functions in the cell.**

Mitochondria Suddenly, rod-shaped structures loom ahead. These organelles are **mitochondria** (my tuh KAHN dree uh) (singular *mitochondrion*). Mitochondria are known as the "powerhouses" of the cell because they convert energy in food molecules to energy the cell can use to carry out its functions. Figure 8 shows a mitochondrion up close.

Endoplasmic Reticulum As you sail farther into the cytoplasm, you find yourself in a maze of passageways called the **endoplasmic reticulum** (en duh PLAZ mik rih TIK yuh lum). The endoplasmic reticulum's passageways help form proteins and other materials. They also carry material throughout the cell.

Figure 9
Endoplasmic Reticulum
The endoplasmic reticulum is similar to the system of hallways in a building. Proteins and other materials move throughout the cell by way of the endoplasmic reticulum. The spots on this organelle are ribosomes, which produce proteins.

Ribosomes Attached to some surfaces of the endoplasmic reticulum are small, grainlike bodies called **ribosomes**. Other ribosomes float in the cytoplasm. Ribosomes function as factories to produce proteins. Some newly made proteins are released through the wall of the endoplasmic reticulum. From the interior of the endoplasmic reticulum, the proteins will be transported to the Golgi bodies.

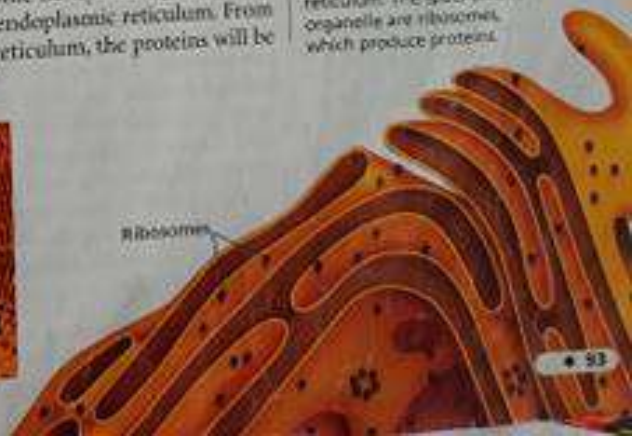


Figure 10
A Golgi Body
Golgi bodies are organelles that transport materials.

Golgi Bodies As you leave the endoplasmic reticulum, you see the structure shown in Figure 10. It looks like flattened sacs and tubes. This structure, called a **Golgi body**, can be thought of as the cell's mail room. Golgi bodies receive proteins and other newly formed materials from the endoplasmic reticulum. They then package and distribute materials to other parts of the cell. Golgi bodies also release materials outside the cell.

Chloroplasts Have you noticed the many large green structures floating in the cytoplasm? Only the cells of plants and some other organisms have these green organelles called **chloroplasts** (KLAWR uh plasts). Chloroplasts capture energy from sunlight and use it to produce food. Chloroplasts make leaves green.

Vacuoles Steer past the chloroplasts and head for that large, water-filled sac, called a **vacuole** (VAK yoo ohl), floating in the cytoplasm. Vacuoles are the storage areas of cells. Most plant cells have one large, central vacuole. Vacuoles store food and other materials needed by the cell. Vacuoles can also store waste products. Animal cells do not have central vacuoles. However, some animal cells have smaller storage organelles.

Lysosomes Your journey through the cell is almost over. Before you leave, take another look around you. If you carefully swing your ship around the vacuole, you may be lucky enough to see a lysosome. **Lysosomes** (LY suh sohmz) are small, round structures containing chemicals that break down certain materials in the cell. Some chemicals break down large food particles into smaller ones. Lysosomes also break down old cell parts and release the substances so they can be used again. In this sense, you can think of lysosomes as the cell's cleanup crew.

Reading Checkpoint **What organelle captures the energy of sunlight and uses it to make food for the cell?**

Lab zone Try This Activity

Comparing Cells

Observe the characteristics of plant and animal cells.

1. Obtain a prepared slide of plant cells from your teacher. Examine these cells under the low-power and high-power lenses of a microscope.
2. Draw a picture of what you see.
3. Repeat Steps 1 and 2 with a prepared slide of animal cells.

Observing How are plant and animal cells alike? How are they different?

Cell Diversity

You just had a tour of a typical leaf cell. But actually, there's a lot of variety in cells—both within individual organisms and across different organisms. **The variety of structure in cells reflects differences in cell function.**

Cells come in many shapes. Look at the nerve cell and red blood cells in Figure 11. Notice the long, fingerlike extensions of the nerve cell. These extensions help transmit information from one part of your body to another. Red blood cells carry oxygen throughout your body. Their flattened shape enables them to fit through tiny blood vessels.

Some cells contain certain organelles but not others. For example, not all plant cells have chloroplasts. Since root cells grow underground away from sunlight, they have no need for chloroplasts. Cells may also have more of a particular kind of organelle. For example, cells that actively produce proteins, such as liver cells, contain many ribosomes. Each human liver cell has millions of ribosomes.

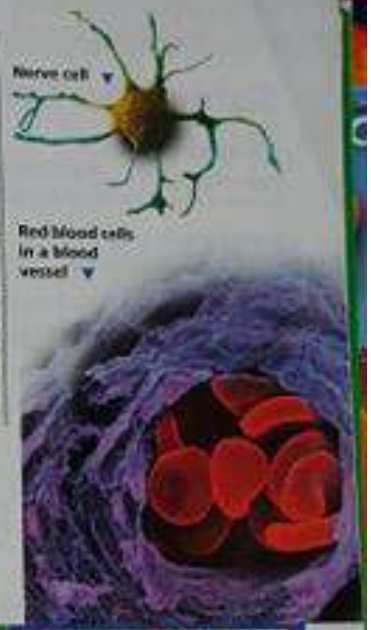


Figure 11 Specialized Cells
Nerve cells carry information throughout the human body. Red blood cells carry oxygen. **Developing Hypotheses** *How do the shapes of these cells help them function?*

Section 2 Assessment

S 7.1 b, 7.7.c, E-LA: Reading 7.1.2, Writing 7.2.0

Vocabulary Skill **Prefixes** The Key Term *endoplasmic reticulum* begins with the prefix *endo-*, which means "in" or "within." Within what part of a cell is the endoplasmic reticulum located?

Reviewing Key Concepts

1. a. **Comparing and Contrasting** Compare the functions of the cell wall and the cell membrane in plant and animal cells.
   b. **Inferring** How does cellulose help with the function of the cell wall?
2. a. **Identifying** What is the key function of the nucleus?
   b. **Describing** Which structure inside the nucleus is involved in this function?
   c. **Predicting** Suppose a dye for staining cells stains the region where ribosomes are made. What would you expect to see inside the stained cell's nucleus?
3. a. **Identifying** Identify the functions of ribosomes and Golgi bodies.
   b. **Describing** Describe the characteristics of the endoplasmic reticulum.
   c. **Applying Concepts** How are the functions of ribosomes, Golgi bodies, and the endoplasmic reticulum related?
4. a. **Listing** What are two ways cells can differ?
   b. **Applying Concepts** Which organelles might you expect to see in large quantities in cells that actively release proteins outside the cell?

Writing in Science

Writing a Description Write a paragraph describing a typical animal cell. Your paragraph should include all the structures generally found in animal cells and a brief explanation of the functions of those structures.