

# SCIENCE

Student Book

► **5th Grade | Unit 1**

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# SCIENCE 501

## CELLS

Introduction | **3**

### **1. The Basic Units of Living Things: A Cell 6**

What is a Cell? | **6**

Viewing Cells | **11**

Self Test 1 | **16**

### **2. The Life and Activity of Cells..... 19**

More Details of Cells | **21**

Plants | **25**

Animals | **29**

Tissue | **38**

Self Test 2 | **42**

### **3. Energy and Growth of Cells..... 45**

Energy | **46**

Cell Reproduction | **50**

Self Test 3 | **54**

LIFEPAC Test | **Pull-out**

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**804 N. 2nd Ave. E.**

**Rock Rapids, IA 51246-1759**

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# CELLS

In the Book of Genesis, we read that God created everything, including all living things. In this LIFEPAK®, you will explore the tiny unit that God made part of all living things. This tiny unit that is part of all living things is called a cell. All living things that God has created contain cells.

Because most cells are so tiny, they can only be seen with the aid of a microscope. Therefore, it was only after microscopes were invented that men and women were able to explore the tiny world of cells. In 1665, an Englishman named Robert Hooke examined a slice of cork under a crude microscope. He noticed that the cork was made up of small chambers that were similar in appearance. He called these small units “cells.” Later, other people discovered more information about cells. They discovered new information about the make-up of cells, the types of cells, and the ways that cells grow and divide. They discovered much about the work and energy processes that take place within cells. Scientists are still making new discoveries today about cells and the fascinating things that happen in them.

In this LIFEPAK, you will also learn much about the make-up, types, and growth of cells. As you explore the fascinating world of cells, think about the wonderful work of God in making such tiny, complex, and orderly units to be part of all living things. Like King David in Psalm 143:5, you can think about the wonderful work of God’s hands in creating such a great variety of cells: “I meditate on all thy works; I muse on the work of thy hands.”

Before beginning your study of cells, write below some things that you have heard or read about cells. \_\_\_\_\_

\_\_\_\_\_

List below some questions that you have about cells. \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## Objectives

**Read these objectives.** The objectives tell you what you will be able to do when you have successfully completed this LIFEPAK. Each section will list according to the numbers below what objectives will be met in that section. When you have finished this LIFEPAK, you should be able to:

1. Give a basic definition of a cell and explain what a cell is.
2. Use a microscope to examine examples of different types of cells.
3. Label the different basic parts of a cell.
4. Identify different types of cells.
5. Explain in more detail the make-up of the cell membrane, cytoplasm, and nucleus.
6. Examine some unique characteristics of plant and animal cells.
7. Examine types of plant and animal tissues.
8. Define what energy is and explain how plants and animals receive and produce energy.
9. Explain how cells reproduce and grow.

# Science 500 Supplies

Many of the things that you will need to perform the experiments in Science 500 can be found around the home. For instance, instead of using test tubes, you may substitute baby-food jars and lids. Instead of a beaker, you may use a mayonnaise jar. Some of the things you will need to successfully perform the experiments you will just need to borrow or buy. There are resources in your area where you may be able to find these materials. Your local school may lend you a microscope or perhaps you can buy an older one from them when they purchase new ones. There may be discount department stores in your area that sell these things for low cost. Ordering science material through the mail or over the Internet is also a possibility. With each complete boxed set of science curriculum, you should receive an order blank from a trusted supplier for science supplies in the sizes and amounts that you will need to successfully perform the experiments.

If you did not receive an order blank, call the Alpha Omega Publications Customer Services Department for more information.

A suggested support item for this course is the 5th Grade Science experiments video, SD0501. The video includes presentations of many of the experiments in this course. Several of the experiments that require special equipment or materials are demonstrated on these videos. They can either be used for answering the questions of the lab report or as a demonstration of the procedure prior to performing the experiment. A notice is included with each experiment in the LIFEPAK where the video is available.

Remember, it is the supervisors' or parents' responsibility to make sure that all students follow proper safety procedures for experiments and lab work. Any questions that you have about chemicals or supplies should be directed to the supplier of those materials. It cannot be assumed that all necessary warnings and precautions are contained in this material.



As a Christian school curriculum publisher, we discuss what is taught and believed regarding the creation and origins of life on our planet from the Christian point of view. It is the responsibility of the family to decide what they desire to be learned by their students in the school and the home, and whether or not the biblical view is what they want to be taught. There are a number of Christian websites on the Internet, however, that may be examined to get further information on the origins of life from a biblical point of view. One of them is the Creation Research Institute website.



# 1. THE BASIC UNITS OF LIVING THINGS: A CELL

## What is a Cell?

**Definition.** A **cell** is the basic unit of all living things. It is the unit of life. Some living things consist of only one cell. They are called **unicellular** (one-celled). Other living things consist of more than one cell. They are called **multicellular** (many-celled). All plants and animals are multicellular. God provided his creation with a great variety of cells! Yet, as you will learn, all cells have some things in common.

## Objectives

**Review these objectives.** When you have completed this section, you should be able to:

1. Give a basic definition of a cell and explain what a cell is.
2. Use a microscope to examine examples of different types of cells.
3. Label the different basic parts of a cell.
4. Identify different types of cells.

## Vocabulary

**Study these new words.** Learning the meanings of these words is a good study habit and will improve your understanding of this LIFE PAC.

**bacteria** (bak tir' ē ə). Simple organisms that consist of one cell. They are a type of prokaryote cells (no nucleus). Bacteria are among the smallest living things.

**cell** (sel). The basic unit of all living things.

**cell membrane** (sel mem' brān). The thin-layer outer structure of each cell that completely surrounds the cell and holds the other contents of the cell within it.

**cell wall** (sel wôl). A non-living chemical produced by the plant's cells. It surrounds the cell outside the cell membrane. It is harder than the cell membrane.

**columnar** (kō lum' năr). Column shaped.

**cytoplasm** (sī' tō plaz' um). The fluid material (mainly water) within the cell membrane that does not include the nucleus.

**elongated** (i lōng' gāt id). A long, stretched-out shape.

**eukaryote** (yū kar' ē ot). The type of cell that contains three basic parts: the cell membrane, the cytoplasm, and the nucleus.

**microscopic** (mī' krə' skop' ik). Very small. A microscope is needed to see something microscopic.

**multicellular** (mul' tī sel' yū lur). Contains more than one cell, usually many cells.

**nucleus** (nü' klē us). The command center that controls the life and activity of the cell. It is located within the cytoplasm of the cell.

**prokaryote** (prō kar' ē ot). The type of cell that contains only two basic parts: the cell membrane and protoplasm. It does not have a nucleus. Bacteria are an example of this cell.

**protoplasm** (pro' tē plaz' əm). The inner fluid material within the cell membrane.

**unicellular** (yü' nə sel' yə lur). One-celled. Living things that have only one cell.

**Note:** All vocabulary words in this LIFEPAK appear in **boldface** print the first time they are used. If you are unsure of the meaning when you are reading, study the definitions given.

**Pronunciation Key:** **h**at, **ā**ge, **cā**re, **fā**r; **l**et, **ē**qual, **tē**rm; **i**t, **ī**ce; **h**ot, **ō**pen, **ō**rder; **o**il; **o**ut; **c**up, **pūt**, **rū**le; **ch**ild; **l**ong; **th**in; / ʒH/ for **th**en; /zh/ for **meas**ure; /u/ or /ə/ represents /a/ in **a**bout, /e/ in **tak**en, /i/ in **pencil**, /o/ in **lemon**, and /u/ in **circus**.



### Write the answers on the lines.

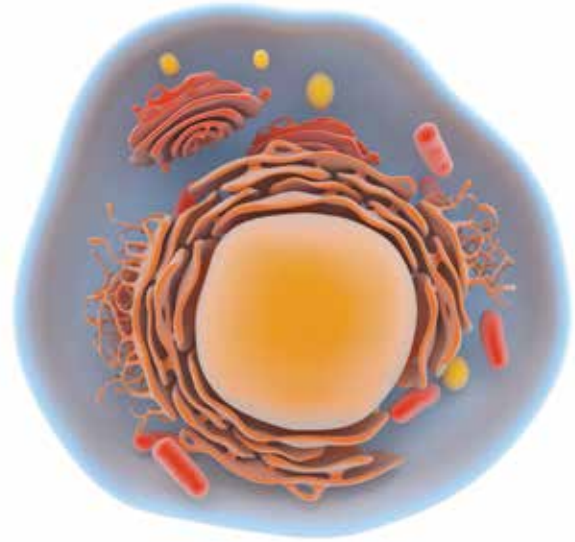
- 1.1 All living things that God has created contain \_\_\_\_\_.
- 1.2 An Englishman named Robert Hooke examined \_\_\_\_\_ under a crude microscope and called the small chambers "cells."
- 1.3 A cell is the \_\_\_\_\_ of all living things.
- 1.4 A one-celled living thing is called \_\_\_\_\_.
- 1.5 A many-celled living thing is called \_\_\_\_\_.



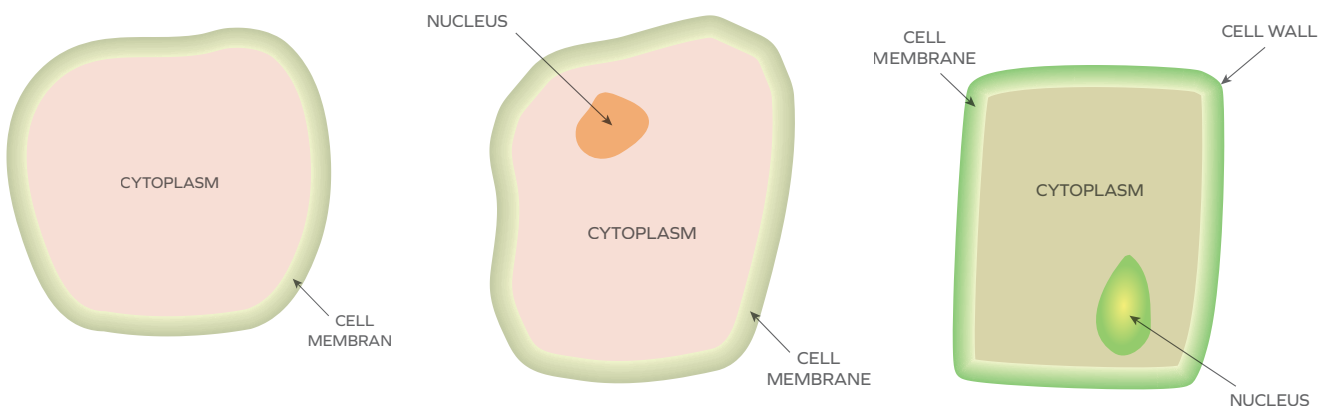
**Basic parts of a cell.** All cells have at least two basic parts: (1) a **cell membrane**, and (2) an inner material called **protoplasm**. This inner material called protoplasm is usually a fluid or jelly-like substance, although in some cells it is harder than jelly. Cells that contain *only* these two parts—an outer membrane and the inner protoplasm—are called **prokaryote** cells. The living things called **bacteria** are examples of these two-part prokaryote cells.

Many other cells contain a third basic part: a **nucleus**. The nucleus is part of the protoplasm of the cell and is located within the cell membrane. It usually looks like a little dark ball or dot within the cell. When a cell contains a nucleus, then we call the part

of the protoplasm outside the nucleus the **cytoplasm**. The cytoplasm is the liquid or jelly-like substance within the cell membrane and outside the nucleus, while the nucleus consists of harder living substances. Therefore, these cells with a nucleus contain three basic parts: (1) an outer membrane, (2) the cytoplasm, and (3) the nucleus. Cells with three basic parts are called **eukaryote** cells. There are many unicellular living things that consist of a single eukaryote cell; that is, they are a three-part cell. *All* the cells in multicellular living things are eukaryote cells. Therefore, all the cells in your body are eukaryote cells. There is a fourth basic part of cells found in plants and fungi. This is called the **cell wall**. The cell wall surrounds the cell membrane. It helps give support to the plant. Animal cells do not contain cell walls.



| Structure of the human cell



| Two-part cell

| Three-part cell

| Plant cell



### Match these items.

- |             |                  |  |
|-------------|------------------|--|
| <b>1.6</b>  | _____ protoplasm | a. contains three basic parts of the cell: cell membrane, cytoplasm, and nucleus |
| <b>1.7</b>  | _____ prokaryote | b. inner fluid material within the cell membrane                                 |
| <b>1.8</b>  | _____ eukaryote  | c. a fourth part of a cell found only in plants                                  |
| <b>1.9</b>  | _____ nucleus    | d. found within the protoplasm and looks a little like a dark ball or spot       |
| <b>1.10</b> | _____ cytoplasm  | e. part of a microscope  |
| <b>1.11</b> | _____ cell wall  | f. contains only two basic parts of the cell: cell membrane and protoplasm       |
|             |                  | g. fluid material within cell membrane and outside the nucleus                   |



### Complete this activity.

- 1.12** Draw a typical three-part cell on a separate sheet of paper and label the three basic parts of a cell.



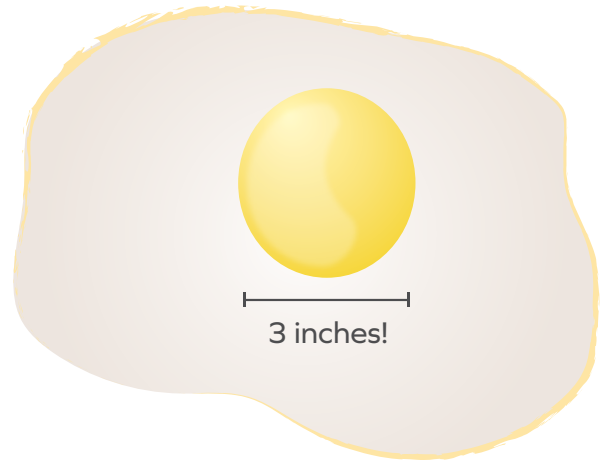
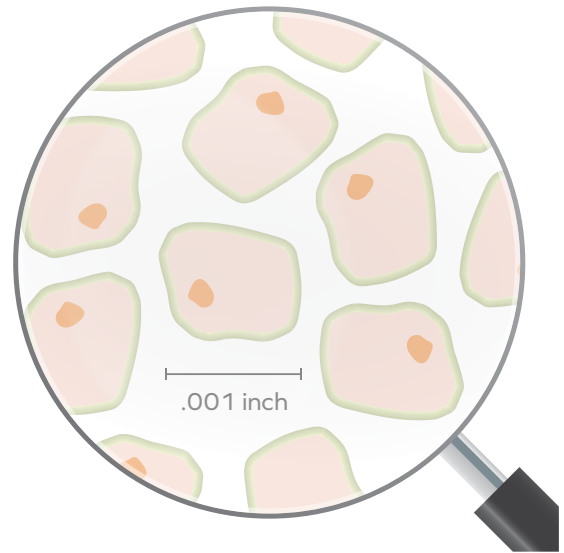
**INTERNET NOTICE:** There are many good resources on the Internet giving information about cells and the life of cells. A lot of these Internet sites have excellent drawings, illustrations, and animations showing the detailed parts of cells. You can use keywords like “cells” and “nucleus” to find out more details on cells. We will cover more details on cells in Section 2 of this LIFE PAC.

**Size.** Almost all cells are **microscopic**. This means that most cells are so tiny that they require a microscope to be seen. In fact, the period at the end of the last sentence would hold about 500 average-sized cells! These average-sized cells would be about 1/1000 of an inch in diameter (0.0025 centimeter).

The human body has more than 10 trillion (10,000,000,000,000) cells!

However, other cells can be larger. The largest cells are the yolks of birds' eggs. The largest cell of all is the yolk of an ostrich egg. It is about 3 inches in diameter (7.6 centimeters), yet it consists of only one cell!

**Shape.** Cells also come in a variety of shapes. There are round cells, oval cells, cubed cells, **columnar** cells, **elongated** cells, and irregular cells. Other cells are shaped like doughnuts or pancakes. There are even cells shaped like hearts and commas and corkscrews! There is no typical cell shape.



## Viewing Cells

The only way to view most cells is to use a microscope. There are different types of microscopes. An *optical microscope* is the one you will normally see and use. It can magnify a cell up to about 2,000 times so that we can easily see the basic parts of the cell. However, some cells are too small to be seen by an optical microscope. For these, an *electron microscope* is needed. An electron microscope can magnify a cell by one million times! These electron microscopes not only allow us to see the smallest of cells, they also allow us to view the tiny subparts of cells. (We will cover some of these subparts of cells in Section 2 of this LIFE PAC.)

It is also helpful to use dyes to view cells. The dyes stain certain parts of the cell—such as the cell membrane and the nucleus—so that they stand out more clearly when we view the cells under a microscope. (You will use iodine as a dye in some of the experiments in this LIFE PAC.)



Optical microscope



| Muscle cells



| Paramecium



| Red blood cell



| Nerve cell



| Diatom



| Leaf pore guard cell



**Answer true or false.**

- 1.13** \_\_\_\_\_ Almost all cells are “microscopic.”
- 1.14** \_\_\_\_\_ The smallest cell is the yolk of an ostrich egg.
- 1.15** \_\_\_\_\_ The human body has more than 10 trillion cells.
- 1.16** \_\_\_\_\_ Cells come in a great variety of shapes.
- 1.17** \_\_\_\_\_ All cells are the same size.



**Answer this question.**

- 1.18** What things help us to view cells? \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

# 501.A SKIN CELLS



View 501  
**SKIN CELLS:**  
Grade 5 Science  
experiments video

**Overview.** You will use an optical microscope to observe some skin cells from the palm of your hand.

## These supplies are needed:

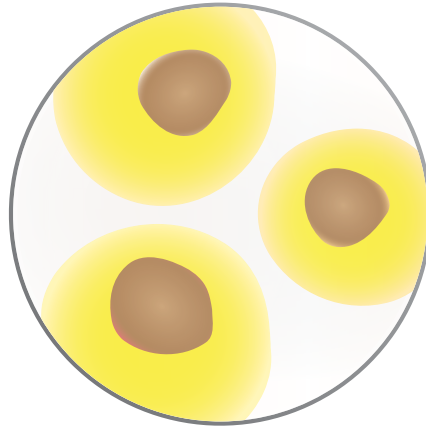
optical microscope  
diluted iodine solution  
slide  
knife or scalpel  
slide cover  
small eyedropper  
or toothpick

**Follows these directions carefully.** Place a check mark in the box as you complete each step in these directions.

- ☐ 1. Have the teacher show you how to use the optical microscope. (If this has already happened, go to step 2.)
- ☐ 2. Ask your teacher to be present. When the teacher is with you, **CAREFULLY** use the edge of the knife or scalpel blade to lightly scrape some skin cells from the palm of your hand. (**NOTE:** You will be able to get a lot of cells from just a little material, so you will not have to do a lot of scraping.)
- ☐ 3. Place the scraped skin cells on the slide.
- ☐ 4. Use the small eyedropper or a toothpick to place a small drop of diluted iodine solution on the skin cells while they are on the slide. (**NOTE:** This will stain parts of the cells and make them easier to view in the microscope.)
- ☐ 5. Cover the stained skin cells with a slide cover.
- ☐ 6. Place the prepared slide of skin cells under the microscope for viewing.

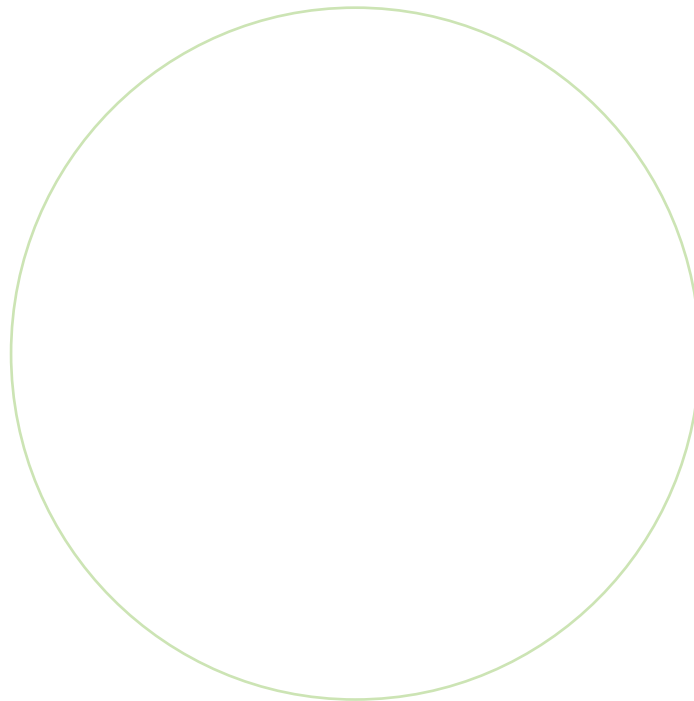
*(continued on the following page)*

- 7.** Adjust the microscope settings until you can see the skin cells clearly. (**NOTE:** If you have trouble adjusting the microscope to view the slide, have your teacher assist you.) The picture below should help you see what to look for. There may be some bubbles of air present along with the skin cells.



**Record your observations.**

- 1.19** Draw the view you have in the microscope in the large circle below. Label the cells (and the basic cell parts, if you can see them) and also label what may be air bubbles.



| Skin Cells

*(continued on the following page)*



**1.20**

Record any other information about this experiment that you found interesting or surprising! \_\_\_\_\_

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**Teacher check:**

Initials \_\_\_\_\_ Date \_\_\_\_\_



**Review the material in this section to prepare for the Self Test.** The Self Test will check your understanding of this section. Any items you miss on this test will show you what areas you will need to restudy in order to prepare for the unit test.

## SELF TEST 1

**Match these items** (each answer, 3 points).

- |              |                    |   |
|--------------|--------------------|---|
| <b>1.01</b>  | _____ cell         | a. inner fluid material within the cell membrane                            |
| <b>1.02</b>  | _____ cytoplasm    | b. Englishman who discovered cells by looking at cork                       |
| <b>1.03</b>  | _____ unicellular  | c. contains only one cell   |
| <b>1.04</b>  | _____ protoplasm   | d. contains three basic parts of the cell: membrane, cytoplasm, and nucleus |
| <b>1.05</b>  | _____ prokaryote   | e. basic unit that is part of all living things                             |
| <b>1.06</b>  | _____ eukaryote    | f. a fourth part of a cell found only in plants                             |
| <b>1.07</b>  | _____ nucleus      | g. found within the protoplasm as a dark ball or spot                       |
| <b>1.08</b>  | _____ Robert Hooke | h. part of a microscope   |
| <b>1.09</b>  | _____ cell wall    | i. contains only two basic parts of the cell: membrane and protoplasm       |
| <b>1.010</b> | _____ God          | j. contains many cells  |
|              |                    | k. fluid material within cell membrane and outside the nucleus              |
|              |                    | l. discovered the shapes of cells   |
|              |                    | m. created all living things  |

**Write the letter of the correct answer on the blank line** (each answer, 3 points).

- 1.011** All living things that God has created contain \_\_\_\_\_.  
 a. the nucleus      b. chloroform      c. cells      d. a cell wall
- 1.012** Scientists are still making new \_\_\_\_\_ today about cells.  
 a. computer programs      b. textbooks  
 c. discoveries      d. names
- 1.013** Living things that contain only one cell are called \_\_\_\_\_.  
 a. bacteria      b. unicellular      c. microbes      d. none of these

- 1.014** Eukaryote cells contain (1) a cell membrane, (2) cytoplasm, and (3) \_\_\_\_\_.  
a. a nucleus      b. prokaryote      c. protoplasm      d. elongated cells
- 1.015** An \_\_\_\_\_ is normally used to view cells and can magnify up to about 2,000 times.  
a. overhead projector      b. iodine solution  
c. electron microscope      d. optical microscope
- 1.016** Some of the shapes of cells include \_\_\_\_\_.  
a. round and oval      b. hearts and corkscrews  
c. cubed and columnar      d. all of these
- 1.017** The largest cell of all is the \_\_\_\_\_.  
a. amoebae      b. yolk of an ostrich egg  
c. elephant foot      d. palm cell

**Write your answer** (each answer, 10 points).

- 1.018** What is a cell? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
- 1.019** Explain why it is helpful to use dyes (such as iodine) to view cells in a microscope.  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Draw a picture below** (5 points) **and label it** (4 points).

**1.020**    What are the four basic parts of a typical plant cell? Label each part.



**Teacher check:**

Score \_\_\_\_\_

Initials \_\_\_\_\_

Date \_\_\_\_\_

