

## Lesson C3–1

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# Exploring Cells

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**Unit C.** Basic Principles of Agricultural/Horticultural Science

**Problem Area 3.** Understanding Cells, Genetics, and Reproduction

**Lesson 1.** Exploring Cells

### **New Mexico Content Standard:**

**Pathway Strand:** Natural Resources and Environmental Systems

**Standard:** VII: Apply scientific principles to environmental services.

**Benchmark:** VII-E: Perform common microbiology procedures to examine cell types and conduct tests.

**Performance Standard:** 1. Identify groups of microorganisms. 2. Analyze factors affecting microbial growth. 3. Explain microbial growth. 4. Describe roles of microorganisms in the environment.

**Student Learning Objectives.** Instruction in this lesson should result in students achieving the following objectives:

1. Describe the cell's role as the structural unit.
2. Identify the various components of animal and plant cells and explain their functions.

**List of Resources.** The following resources may be useful in teaching this lesson:

**Recommended Resources.** One of the following resources should be selected to accompany the lesson:

Lee, Jasper S. and Diana L. Turner. *AgriScience*, Third Edition. Danville, Illinois: Interstate Publishers, Inc., 2003. (Textbook and Activity Manual, Chapter 5)

**Other Resources.** The following resources will be useful to students and teachers:

Baker, MeeCee and Robert E. Mikesell. *Animal Science Biology & Technology*. Danville, Illinois: Interstate Publishers, Inc., 1996. (Textbook, Chapter 1)

Biondo, Ronald J. and Jasper S. Lee. *Introduction to Plant and Soil Science and Technology*, Second Edition. Danville, Illinois: Interstate Publishers, Inc., 2003. (Textbook and Activity Manual, Chapter 5)

Black, Jacquelyn G., *Microbiology Principles and Applications*. Upper Saddle River, New Jersey: Prentice Hall, Inc., 1996.

Fox, Stuart Ira, *Human Physiology*. Dubuque, Iowa: Wm. C. Brown Publishers, 1996.

Lee, Jasper S., et al. *Introduction to Livestock and Companion Animals*, Second Edition. Danville, Illinois: Interstate Publishers, Inc., 2000. (Textbook, Chapter 8)

Mader, Sylvia S., *Biology*. Dubuque, Iowa: Wm. C. Brown Publishers, 1993. (Textbook, Chapter 5)

## List of Equipment, Tools, Supplies, and Facilities

Writing surface  
Overhead projector  
Transparencies from attached masters

**Terms.** The following terms are presented in this lesson (shown in bold italics):

Adenosine triphosphate (ATP)  
Biogenesis  
Cells  
Cell membrane  
Cell wall  
Cellular respiration  
Cellulose  
Chlorophyll  
Chloroplasts  
Chromosomes  
Cytoplasm

Endoplasmic reticulum  
Eukaryotic cells  
Golgi apparatus  
Lipids  
Lysosomes  
Mitochondria  
Multicellular  
Nucleus  
Prokaryotic cells  
Rough endoplasmic reticulum  
Smooth endoplasmic reticulum  
Unicellular  
Vacuole

**Interest Approach.** Use an interest approach that will prepare the students for the lesson. Teachers often develop approaches for their unique class and student situations. A possible approach is included here:

*Discuss the materials used to build homes (lumber, brick, nails, etc.) Talk with them about how and when these items are put together properly, great structures can be built, but individually they cannot accomplish much. Compare cells to these building materials. Cells are the building blocks of organisms. When cells are linked together to form an organism, they can accomplish much more than the individual cell could ever do.*

## Summary of Content and Teaching Strategies

**Objective I:** Describe the cell's role as the structural unit.

**Anticipated Problem:** What is the cell's roll in an organism?

- I. **Cells** are the basic units of life. They can be divided into two categories based on structural components. They are prokaryotic and eukaryotic cells. **Prokaryotic cells** are cells that lack a nucleus. While **eukaryotic cells** are cells that contain a distinct cell nucleus.
  - A. The cell is considered the building block of living organisms. Organisms are grouped by number of cells.
    1. **Unicellular** organisms are organisms that have only one cell.
    2. **Multicellular** organisms are organisms that are composed of many cells.
  - B. **Biogenesis** means that life comes from life. Nonliving things cannot produce life. When reproducing, life produces life that is similar to itself.

*There are many techniques that can be used to assist students in mastering this material. Students need text material to aid in understanding the cell's role as the basic unit of life. Chapter 5 in AgriScience is rec-*

ommended. Use TM: C3–1A and activities “Identifying the Parts of the Microscope” and “Learning to Make a Wet-mount Slide” found in Chapter 5 in the AgriScience Activity Manual.

**Objective 2:** Identify the various components of animal and plant cells and explain their functions.

**Anticipated Problem:** What are the parts of a cell and their functions?

II. Cells of all organisms have the same basic cell make-up, or cell structure. Differences do occur however between the cells of plants and animals.

A. Animal cells contain:

1. The **cell membrane** is the outside wall of the cell, which is made of a thin layer of lipids or fat. The functions of the cell membrane are to:
  - a. Separate the cell contents from the external environment.
  - b. Allow raw materials (carbohydrates & proteins) to enter the cell.
  - c. Allow newly made proteins and waste to exit the cell.
2. **Nucleus** is the “brain” of the cell. The nucleus controls all of the cell’s activity. It is surrounded by the nuclear membrane, which functions similarly as the cell membrane. The nucleus also contains **chromosomes**, which are small strands of genetic material.
3. **Cytoplasm** is a jelly-like substance between the cell membrane and the nuclear membrane. It contains several specialized structures called **organelles**. There are several organelles within a cell. Some of them are:
  - a. **Endoplasmic reticulum** is a network of membranes that connect the cell membrane to the nucleus. There are two sections of the endoplasmic reticulum. Each section has its own function. They are:
    - (1) **Smooth endoplasmic reticulum** is the site for the production of **lipids** (fats) and hormones.
    - (2) **Rough endoplasmic reticulum** produces the proteins for the cell.
  - b. **Mitochondria** are small, egg-shaped organelles which manufacture **adenosine triphosphate (ATP)**. ATP is used as an energy source for the cell. It converts food into energy through **cellular respiration**.
  - c. **Lysosomes** are round organelles, which cause the digestion of proteins through the release of enzymes. These are made by the Golgi apparatus.
  - d. **Golgi apparatus** consists of flattened membrane sacs that receive substances transported from the endoplasmic reticulum. It also stores the substances and alters their chemical structure.

B. Plants cells contain:

1. Cytoplasm is a jelly-like substance between the cell membrane and the nuclear membrane. It contains several specialized structures called organelles. There are several organelles within a cell. Some of them are:

- a. Nucleus is the “brain” of the cell. The nucleus controls all of the cell’s activity. It is surrounded by the nuclear membrane, which functions similarly as the cell membrane. The nucleus also contains chromosomes, which are small strands of genetic material.
- b. The **vacuole** is a large sac bound by a membrane. It may occupy up to 90% of the cell. The vacuole contains water, stored foods, salts, pigments, and wastes.
- c. Mitochondria are small, egg-shaped organelles which manufacture adenosine triphosphate (ATP). ATP is used as an energy source for the cell. It converts food into energy through cellular respiration.
- d. **Chloroplasts** contain green pigments called **chlorophyll** that trap light energy for photosynthesis. Chlorophyll is produced in cells exposed to light and are abundant in leaves.
- e. Endoplasmic reticulum is a network of membranes that connect the cell membrane to the nucleus. There are two sections of the endoplasmic reticulum. Each section has its own function. They are:
  - (1) Smooth endoplasmic reticulum is the site for the production of lipids (fats) and hormones.
  - (2) Rough endoplasmic reticulum produces the proteins for the cell
- f. Golgi Apparatus consists of flattened membrane sacs that receive substances transported from the endoplasmic reticulum. It also stores the substances and alters their chemical structure.
- g. **Cell wall** is made of multiple layers of cellulose. **Cellulose** is a complex sugar molecule. The cell wall thickens and becomes rigid, once cell stops growing.

*A variety of techniques can be used to assist students in learning this material. Students need text material to help understand the components of a cell and the functions of those components. Chapter 5 in AgriScience is recommended. Use TM: C3–1B and TM: C3–1C to highlight the different components of the cells. Also incorporate the lab exercise “Identifying Cell Structures” found in Chapter 5 in the AgriScience Activity Manual.*

**Review/Summary.** Use the student learning objectives to summarize the lesson. Have students explain the content associated with each objective. Student responses can be used in determining which objectives need to be reviewed or taught from a different angle. Questions at end of chapters in the textbook may also be used in the review/summary.

**Application.** Application can involve one or more of the following student activities:

Identify the Parts of the Microscope and Cell, Learning to Make a Wet-mount Slide, and Identifying Cell Structures found in Chapter 5 in the *AgriScience Activity Manual*.

## **Answers to Sample Test:**

### **Part One: Matching**

1=h, 2=a, 3=b, 4=c, 5=e, 6=f, 7=d, 8=g

### **Part Two: Completion**

1. cytoplasm
2. nucleus
3. biogenesis
4. organelles

### **Part Three: Short Answer**

1. Plant cells have thick, rigid cell walls. Animal cells have thinner cell membranes.

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# Test

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## Lesson C3–1: Exploring Cells

### Part One: Matching

*Instructions.* Match the term with the correct response. Write the letter of the term by the definition.

- |                  |                          |                    |
|------------------|--------------------------|--------------------|
| a. cell          | d. endoplasmic reticulum | g. golgi apparatus |
| b. cell membrane | e. mitochondria          | h. chloroplasts    |
| c. cytoplasm     | f. lysosomes             |                    |

- \_\_\_\_\_ 1. Contain green pigment, called chlorophyll, which aids in photosynthesis.
- \_\_\_\_\_ 2. Basic unit of life.
- \_\_\_\_\_ 3. Outside wall of the cell.
- \_\_\_\_\_ 4. Jelly-like substance in cells.
- \_\_\_\_\_ 5. Manufactures ATP.
- \_\_\_\_\_ 6. Digests proteins through the release of enzymes.
- \_\_\_\_\_ 7. Network of membranes that connect the cell membrane to the nucleus.
- \_\_\_\_\_ 8. Stores substances and alters their chemical structure.

### Part Two: Completion

*Instructions.* Provide the word or words to complete the following statements.

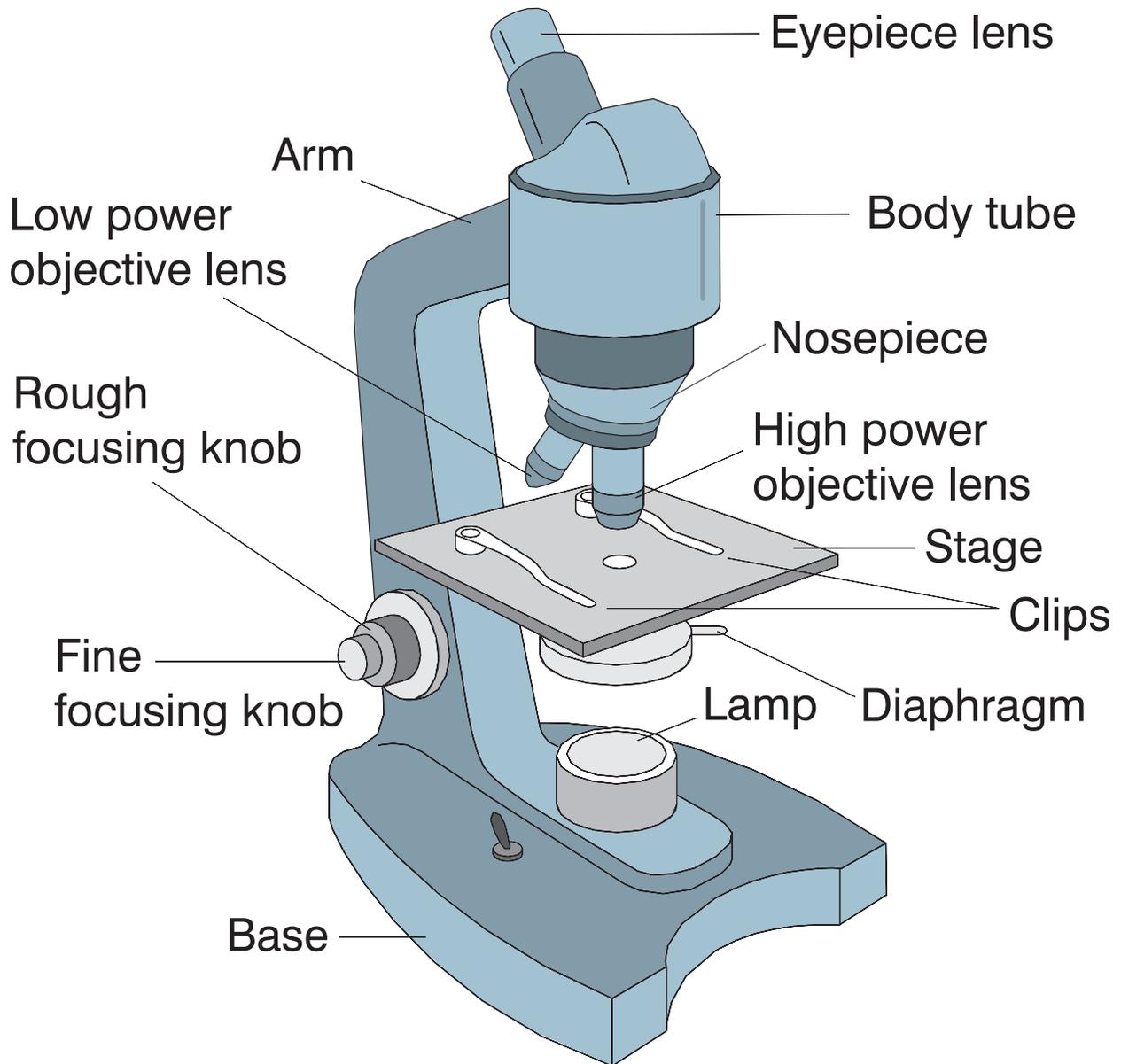
1. The \_\_\_\_\_ is the semifluid substance between the cell membrane and the nuclear membrane.
2. The \_\_\_\_\_ controls cell activity.
3. \_\_\_\_\_ means that life comes from life.
4. The tiny “organs” found within cells that perform specific functions are called \_\_\_\_\_.

### Part Three: Short Answer

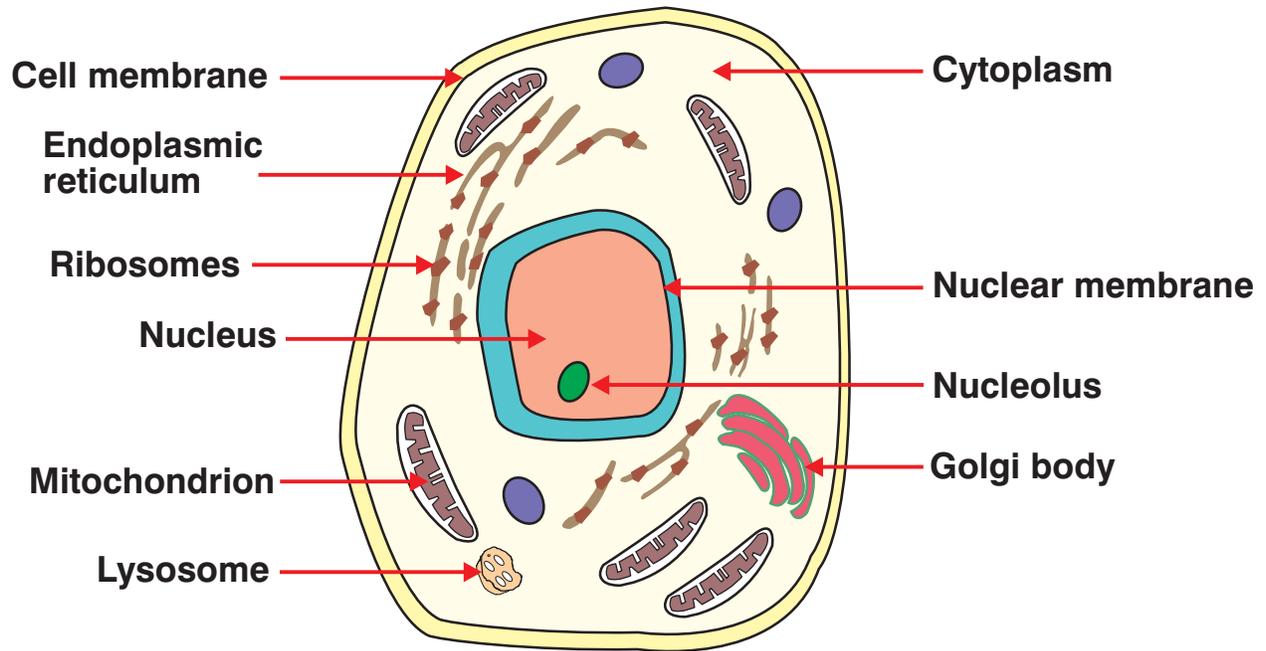
*Instructions.* Provide information to answer the following questions.

1. Explain the structural differences between plant and animal cells.

# Parts of a Microscope



# Animal Cell



# Plant Cell

