

7.1 Life Is Cellular

Lesson Objectives

-  State the cell theory.
-  Describe how the different types of microscopes work.
-  Distinguish between prokaryotes and eukaryotes.

Lesson Summary

The Discovery of the Cell The invention of the microscope in the 1600s enabled researchers to see cells for the first time.

- ▶ **Robert Hooke** named the empty chambers he observed in cork “cells.”
- ▶ **Anton van Leeuwenhoek** was the first to observe living microorganisms.
- ▶ **Cells** are the basic units of life.
- ▶ Discoveries by German scientists **Schleiden**, **Schwann**, **Bown** and **Virchow** led to the development of the **cell theory**, which states:
 - All living things are made of cells.
 - Cells are the basic units of structure and function in living things.
 - New cells are produced from existing cells.
 - All cells are related to the first cells from 3.5 BYA.

Exploring the Cell Scientists use light microscopes and electron microscopes to explore the structure of cells.

- ▶ **Compound light microscopes** have lenses that focus light. They magnify objects by up to 1000 times. Chemical stains and fluorescent dyes make cell structures easier to see.
- ▶ **Electron microscopes** use beams of electrons focused by magnetic fields. They offer much higher resolution than light microscopes. There are two main types of electron microscopes—**transmission and scanning**. Scientists use computers to add color to electron micrographs, which are photos of objects seen through a microscope.

Prokaryotes and Eukaryotes Cells come in an amazing variety of shapes and sizes, but all cells contain DNA. Also, all cells are surrounded by a thin flexible barrier called a **cell membrane**. There are two basic categories of cells based on whether they contain a nucleus. The **nucleus** (plural: nuclei) is a large membrane-enclosed structure that contains DNA.

- ▶ **Eukaryotes** are cells that enclose their DNA in nuclei.
- ▶ **Prokaryotes** are cells that do not enclose their DNA in nuclei.

The Discovery of the Cell

For Questions 1–6, complete each statement by writing the correct word or words.

1. The invention of the microscope made the discovery of cells possible.
2. Robert Hooke used the name cell to refer to the tiny empty chambers he saw when he observed magnified cork.

+20 pts

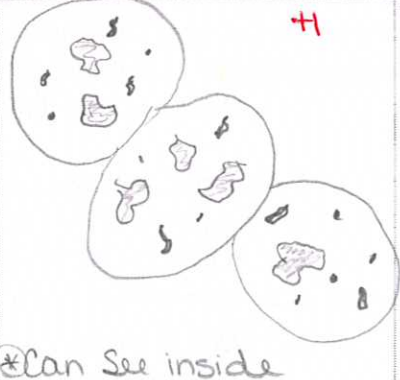
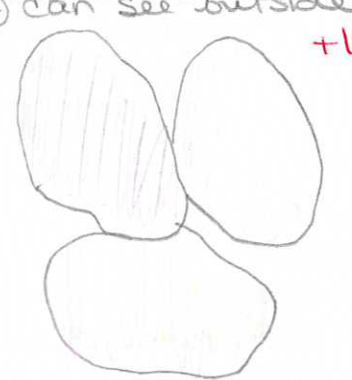
3. German botanist Matthias Schleiden concluded that plants are made of cells.
4. German biologist Theodor Schwann concluded that animals are made of cells.
5. Rudolph Virchow concluded that new cells are produced from other cells.
6. The Cell theory combines the conclusions made by Schleiden, Schwann, and Virchow.

Exploring the Cell

For Questions 7–9, write True if the statement is true. If the statement is false, change the underlined word or words to make the statement true.

- False 7. The size of the image formed by a light microscope is unlimited because light that passes through matter is diffracted. Limited to about 1000x
- True 8. Fluorescent dyes help scientists see the movement of compounds and structures in living cells.
- False 9. Scanning ~~Transmission~~ electron microscopes form a 3-D image of the surface of a specimen.
10. **THINK VISUALLY** In the second row of the table, *draw diagrams* to show how a sample of **three yeast cells** would look in the types of micrographs indicated in the top row of the table. Then, in the third row, **describe** how each image would be formed.

A Comparison of Detail in Basic Types of Micrographs

Light Micrograph (LM 500x)	Transmission Electron Micrograph (TEM 4375x)	Scanning Electron Micrograph (SEM 3750x)
* Can see inside & out, but smaller 	+1 	* Can see outside +1 
A light microscope image is formed by <u>two lenses focusing light</u>.	+1 A transmission electron microscope image is formed by <u>beams of electrons passing through the sample</u>.	+1 A scanning electron microscope image is formed by a <u>beams of electrons scanned over the surface</u>.

+1 for drawing 3 cells

+1 for description

11. To study cells with a light microscope, different types of stains are usually available. Why is it generally more useful to stain eukaryotic cells than prokaryotic cells?

Has to be comp. sentence

Stains work better for eukaryotic cells because they have more internal structures to hold the stain - more to see.

Prokaryotes and Eukaryotes

12. Complete the table about the two categories of cells.

Two Categories of Cells			
Category	Definition	Size range	Examples
Prokaryotic cells	Cells that lack a nucleus	1-5 μm (micrometers)	bacteria
Eukaryotic cells	Cells that have nuclei	10-100 μm (micrometers)	Animals, Plants, Fungus, Protista

+1

+1

13. Which category of cells—prokaryotic or eukaryotic—is your body composed of?

Humans are made of eukaryotic cells.

Apply the Big idea

14. Recall that in science, a theory is a well-tested explanation that unifies a broad range of observations and hypotheses and enables scientists to make accurate predictions about new situations. How does the cell theory demonstrate this definition of theory?

Has to be comp. sentence

By definition a theory is well-tested, covers a broad range of observations and can be used to make predictions.

Cell theory has been well tested since the invention of the microscope, it covers the observations of many scientists' work and it can be used to predict if an unknown object is alive or not by determining characteristics such as can it reproduce.

