Date:

# Biology Lab Activities: Prokaryotic and Eukaryotic Cells

Last updated: 04/22/25

# **Background Questions**

Read through the Overview of Cells article on the Visible Body Biology Learn Site.

Based on what you've learned in class, in your textbook, from the Biology Learn Site article, and from using Visible Body, answer the following questions about cells.

- 1. What are cells?
- 2. What are the main functions of cells?
- 3. Complete the following sentences about the two main types of cells: prokaryotic and eukaryotic cells.
  - a. \_\_\_\_\_ cells include bacteria and archaea.
  - b. \_\_\_\_\_ cells are found in animals, plants, fungi, and protists.
  - c. Prokaryotes are made up of \_\_\_\_\_\_, whereas eukaryotes are made up of \_\_\_\_\_\_.

Date:

## Lab 1: Prokaryotic Cell Structure and Functions

#### > Activity 1: Label a bacterial cell

- 1. Launch the view
  - Launch Visible Body.
  - Browse or use the search function to view the Bacterial Cell model.
- 2. Label the image below
  - Explore the 3D model of the bacterial cell to find the structures you need to label.
  - Fill in the blanks to label the structures from the list below.

<u>Word list:</u>	
Capsule	Pilus
Cell wall	Plasma membrane
Fimbria	Plasmid
Flagellum	Ribosome
Nucleoid	



Date:

## Lab 1: Prokaryotic Cell Structure and Functions

## > Activity 2: Explore the functions of bacterial cell structures

Refer to your labeled bacterial cell from Activity 1 and the content in Visible Body. Based on what you've learned about bacterial cells, match each of the following bacterial cell structures with its description.

#### Structures:

- a. Flagella
- b. Cell wall
- c. Fimbriae
- d. Capsule
- e. Plasma membrane
- f. Ribosomes
- g. Nucleoid
- h. Pili
- i. Plasmid

#### Descriptions:

- \_\_\_\_ A membrane that encloses the cell's cytoplasm
- \_\_\_\_\_ Short projections that allow the cell to transfer DNA to other cells
- \_\_\_\_ A rigid, chemically complex structure that protects the cell and maintains its shape
- \_\_\_\_ A small, circular DNA molecule
- \_\_\_\_\_ A coating that attaches the cell to surfaces or other cells
- \_\_\_\_ A region that contains most of the cell's DNA
- \_\_\_\_ Long projections that move the cell through its liquid surroundings
- \_\_\_\_\_ Short projections that attach the cell to substrate or other cells
- \_\_\_\_ Structures in the cell that synthesize proteins

Date:

## Lab 2: Eukaryotic Cell Structure and Functions

## > Activity 1: Label an animal cell

- 1. Launch the view
  - Launch Visible Body.
  - Browse or use the search function to view the Animal Cell model.
- 2. Label the image below
  - Explore the 3D model of the animal cell to find the structures you need to label.
  - Fill in the blanks to label the structures from the list below.

In the first animal cell image, label the following structures:

Golgi apparatus	
Plasma membrane	
Ribosomes	
Rough endoplasmic reticulum	
Smooth endoplasmic reticulum	
Vesicle (lysosome or peroxisome)	



In the second animal cell image, label the following structures:Centrioles \_\_\_\_Mitochondria \_\_\_\_Centrosome \_\_\_\_Nuclear envelope \_\_\_\_Chromosomes \_\_\_\_Nucleolus \_\_\_\_Cytoskeleton \_\_\_\_Nucleus \_\_\_\_



Date:

## Lab 2: Eukaryotic Cell Structure and Functions

#### > Activity 2: Label a plant cell

- 1. Launch the view
  - Launch Visible Body.
  - Browse or use the search function to view the Plant Cell model.
- 2. Label the image below
  - Explore the 3D model of the plant cell to find the structures you need to label.
  - Fill in the blanks to label the structures from the list below.

In the first plant cell image, label the following structures:

Cell wall	
Cytoskeleton	
Golgi body	
Plasma membrane	
Plasmodesma	
Rough endoplasmic reticulum	
Smooth endoplasmic reticulum	
Vesicle (lysosome, peroxisome)	



In the second plant cell image, label the following structures:

Central vacuole	
Chloroplast	
Chromosome	
Mitochondrion	
Nucleus	
Nuclear envelope	
Ribosomes*	
Nucleolus	

(\*Hint: In mitochondria)



Date:

# Lab 2: Eukaryotic Cell Structure and Functions

## > Activity 3: Compare animal and plant cells

Refer to your labeled animal and plant cells from Activities 1 and 2 as well as the models in Visible Body to help you answer the following questions comparing animal and plant cells.

1. As you labeled the animal and plant cells, you probably noticed that they share many of the same structures, and they each have some unique structures. In the following table, list the two unique structures of animal cells and the four unique structures of plant cells.

Animal Cells	Plant Cells
1.	1.
2.	2.
	3.
	4.

- 2. The cytoskeleton of animal cells includes three types of proteins, and the cytoskeleton of plant cells includes two types of proteins.
  - a. They both include \_\_\_\_\_\_ and \_\_\_\_\_
  - b. What type of protein is only included in animal cells?

3. In this lab, you've identified the shared and unique structures that make up animal and plant cells. These structures carry out the many essential functions of animal and plant cells. In the table below, list the shared and unique animal and plant cell structures involved in each of the four essential functions listed in the first column of the table.

Essential	Shared Animal &	Unique Plant Cell
Functions	Plant Cell Structures	Structures
DNA Storage & Replication	1. 2.	1.

Protein Synthesis	1. 2. 3. 4.	
Energy Processing	1.	1.
Support & Movement	1. 2.	1. 2.

Need some help filling out the table above? Here are some hints:

- Animal and plant cells share two structures that play a role in DNA storage and replication.
- Plant cells have one unique structure that plays a role in DNA storage and replication.
- Animal and plant cells share four structures that play a role in protein synthesis.
- Animal and plant cells share one structure that plays a role in energy processing.
- Plant cells have one unique structure that plays a role in energy processing.
- Animal and plant cells have two shared structures that support and move the cell.
- Plant cells have two unique structures that support the cell.
- 4. Which animal and plant cell organelles are responsible for digestion, detoxification, and the breakdown of large molecules?

Date:

# Lab 3: Compare Prokaryotic and Eukaryotic Cells

Refer to your labeled bacterial, animal, and plant cells from Labs 1 and 2, as well as the 3D bacterial, animal, and plant cells in Visible Body, to help you answer the following questions comparing prokaryotic and eukaryotic cells. You can also use the <u>Prokaryotes vs. Eukaryotes article</u> on the Biology Learn Site to help you.

- As you explored in Lab 2, animal and plant cells are two types of eukaryotic cells that have many structures in common and a few unique structures. When you compare your labeled bacterial (prokaryotic) cell from Lab 1 with your labeled animal and plant cells from Lab 2, you'll see that there are a few structures that all three types of cells share. Complete the following sentences about the shared structures of prokaryotic and eukaryotic cells.
  - a. All prokaryotic and eukaryotic cells are bound by a \_\_\_\_\_\_.
  - b. The interior of all prokaryotic and eukaryotic cells consists of \_\_\_\_\_\_\_\_ filled with \_\_\_\_\_\_ and suspended cellular components.
  - c. Prokaryotic and eukaryotic cells both have \_\_\_\_\_\_, which contain DNA, and \_\_\_\_\_\_, which are involved in creating proteins.
- 2. As you compare your labeled bacterial, animal, and plant cells from Labs 1 and 2, you'll notice that bacterial cells have some unique structures that set them apart from animal and plant cells. Answer the following questions about the unique bacterial cell structures and how they compare to animal and plant cell structures.
  - a. In animal and plant cells, the \_\_\_\_\_\_ contains the chromosomal DNA; whereas in bacterial cells, the \_\_\_\_\_ contains the chromosomal DNA.
  - b. How would you describe the differences between the DNA of prokaryotic and eukaryotic cells?
  - c. \_\_\_\_\_\_ are small, circular DNA molecules that can replicate themselves, and they are not part of the cell's chromosomal DNA. They are most often found in \_\_\_\_\_\_ cells.

- d. What support structure is shared by plant and bacterial cells?
- e. What three structures support and move bacterial cells, but *not* animal and plant cells?
- f. Which structure supports and moves bacterial cells and also moves some types of animal and plant cells?

3. In these labs, in class, in your textbook, and from using Visible Body, you've learned a lot about the structure and functions of bacterial, animal, and plant cells. Based on what you've learned, explain in 1–3 sentences why there are so many structurally diverse types of cells.

4. Based on what you've learned about cell structure, how do you think modern medicine takes advantage of the differences in cell types to treat bacterial diseases in humans and animals?