

Lab Section: _____ **Name:** _____

Pre-lab Homework Lab 4: The Cell

After reading over the lab and the cell chapter in your textbook, answer these questions to be turned in at the beginning of the lab!

1. Define “**organelle**”:

Two examples of organelles:		
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2. There are two major differences between **prokaryotic cells** and **eukaryotic cells** (cell size and the amount of internal compartmentalization). How do these differ between the two cell types?

Cell type	Prokaryotic cells	Eukaryotic cells
Size		
Internal compartmentalization		

Of the 6 kingdoms of organisms (Animals, Archaeobacteria, Bacteria, Fungi, Plants, Protists):

3. Name the 2 kingdoms that have organisms composed of prokaryotic cells?
4. Name the 4 kingdoms that have organisms composed of eukaryotic cells?
5. How do plant cells differ from animal cells? Review the animal and plant cells figures and tables from your textbook (or google how plant cells differ from animal cells).
In the table below, indicate which organelles or cellular structures are found only in the animal kingdom and which are found only in the plant kingdom. i.e. how are they distinct?

Kingdom	Distinctive Organelle(s) or Cellular Structure(s)
Animalia: Distinctive parts they have (list at least 2)	
Plantae: Distinctive parts they have (list at least 3)	

Note: If you want to get a “jump” on this lab, complete the tables on pages 4 and 5 before coming to lab.

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Name: _____ Date/Lab time: _____

Lab 4: The Cell

LAB SYNOPSIS:

- We will watch a video on cells and their organelles.
- Using your textbook, in-class models, micrographs and or microscope slides, you and your group will model the structure of a cell using Play-Doh.
- Given the function of cell/tissue types, hypothesize as to why cells have the shapes they have.

OBJECTIVES: After successfully completing this lab, a student will be able to:

- Describe the generalized structure of eukaryotic cells.
- Describe the function of the components of a generalized eukaryotic cell.
- Differentiate between animal-like and plant-like cells.

Exercise 1: Inside Cells: Cells and Their Organelles

Video: *Inside Cells: Cells and Their Organelles*. Runtime 30 min.

Cells are referred to as the “basic units of life”. All living things are composed of one or more cells. You started out life as a single cell resulting from the fusion of your dad’s sperm cell with your mom’s egg. This cell divided many times to form the ~20 trillion cells of your body.



Prokaryotic cells
are tiny

There are two basic cell types found in living organisms (prokaryotic or eukaryotic).

Prokaryotic cells are relatively small and simple. They found in members of the domains Bacteria and Archaea. When we look inside these cells, we do not see smaller membrane-bound structures.

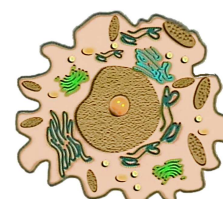
Eukaryotic cells are found in members of the domain Eukarya. What are the 4 Kingdoms found in this Domain?

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Note: The Monera Kingdom, mentioned in the video, is now separated into two Kingdoms (Archaeobacteria and Eubacteria)

Eukaryotic cells are composed of smaller membrane bound structures called **organelles**. Each organelle has a specific function for the cell. The video will focus on two cell types: (plant-like cells and animal-like cells). These types share most of the organelles but there are a few differences between them.

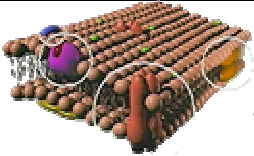
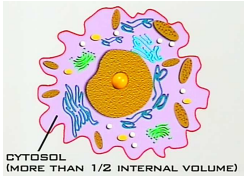
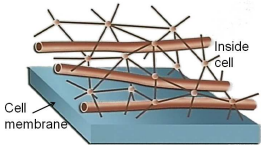
Within the domain Eukarya, the Kingdom Animalia has animal-like cells. Which other kingdom has animal-like cells? (hint- this eukaryotic kingdom contains the protozoans.)

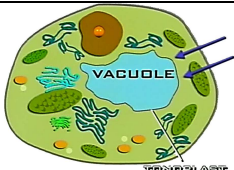


Eukaryotic cell

Within the domain Eukarya, the kingdom Plantae has plant-like cells. Which other kingdom has plant-like cells? (hint- this eukaryotic kingdom contains the algae.)

Below is a list of organelles found in eukaryotic cells. Complete the table by drawing a sketch of the organelle (make it good enough that you can tell the organelles apart!) and stating its function. Also note whether this organelle is found in plant-like cells, animal-like cells, or both.

ORGANELLE OR CELL STRUCTURE	SKETCH	FUNCTION	PLANT OR ANIMAL CELL (OR BOTH)?
cell wall			
plasma membrane/cell membrane			
nucleus with nuclear pores		Contains chromosomes which carry DNA, site of DNA transcription	
nucleolus			
cytoplasm = organelles and cytosol		Synthesis of proteins and lipids. Made up of organelles and (cytosol- the fluid portion of the cytoplasm)	
<u>cytoskeleton</u> : microtubules microfilaments			
mitochondria with inner and outer membrane			
chloroplast with inner and outer membrane			

ORGANELLE OR CELL STRUCTURE	SKETCH	FUNCTION	PLANT OR ANIMAL CELL (OR BOTH)?
rough endoplasmic reticulum			
ribosome			
smooth endoplasmic reticulum		Formation and transport of lipids and steroid hormones. Protects from harmful drugs	
golgi apparatus (body)			
lysosome			
Large central vacuole			

The following were not discussed in the video. Use your textbook (or other sources found in lab) to complete the following table:

CELL STRUCTURE	SKETCH	FUNCTION	PLANT OR ANIMAL CELL (OR BOTH)?
cilia			
flagellum			
centriole			

Exercise 2: Modeling Cells and Their Organelles Using Play-Doh

Work as a whole group or in pairs. Half the class will be assigned to build an animal cell; the other will build a plant cell. Circle the one assigned.

Who all is in your cell design team? _____

1. Find a light micrograph (a picture taken with a light microscope) for your assigned cell.

What species of organism are you modeling? _____

Which organelles or cell structures can you see?

Which organelles or cell structures can you not see?

Were you surprised by the number of structures you could see in this picture? Why or why not?

Most organelles are so small that you cannot see them in a light micrograph. A light microscope can magnify about 1000 times. A transmission electron microscope (TEM) can magnify more than 100,000 times.

2. Find a TEM photo for your assigned cell type. Note how many more organelles can be seen.

To make your cell model, use both the light and TEM photos. You will create your model on the tray provided and use play-doh to make the organelles. Make your cells nice and big. Be sure that each organelle you add to your cell looks different from the other organelles (they should not all look like little round blobs). Review pages 4&5, lab models and your text book as to what these organelles look like.



Your final cell model should have at least: cell membrane, nucleus, nucleolus, mitochondria, ER (rough and smooth) and a Golgi body. Plus any additional features of plant cells or of animal cells

Once you have completed this part of the model, have your instructor check it. Be sure that you can explain to your instructor which organelles you have included and what they do! Structure/Function!

INSTRUCTOR INITIALS: _____

You now have a complete model of either an animal-like cell or a plant-like cell. Find a group that has completed a model of the type of cell you did not do (if you did an animal-like cell, find a group that did a plant-like cell, or vice versa).

Who are the people in this group?

Compare your models. Whichever group created an animal-like cell should point out the organelles unique to animal-like cells. Whichever group created a plant-like cell should point out the organelles unique to plant-like cells.

Which organelle(s)/structure(s) are found only in the plant-like cell? _____

Which organelle(s)/structure(s) are found only in the animal-like cell? _____

Exercise 3: The Structure and Function of Cells

Introduction (Cell structure/function):

The structure of cells is key to their function. Both plants and animals are multicellular organisms. They have many cell types that play different function within the body. Some organisms are unicellular (single celled). These single celled organisms have to accomplish all life functions, from finding and obtaining nutrients, growth and reproduction.

Procedure: Using either the microscope or micrographs (photos taken from a microscope), you will draw and label cells of organisms. You will explore how the structure of these cells relate to their function. Drawings and details are to be recorded on the last page of this lab manual.

Ask your instructor which of the two exercise they want you to do (3A and/or 3B)

Exercise 3A: The Structure and Function of Cells (from micrographs- photos taken from a microscope)

Look over the provide micrographs (photos were taken using a compound light microscope). Note the cell types from animals and plants and the description of their function in the body. Complete drawings on the next pages.

Exercise 3B: The Structure and Function of Cells (from the compound microscope)

Introduction: (The compound light microscope) :

The compound light microscope is a tool used by biologists to extend the range of vision. Ordinarily, human eyes cannot see objects smaller than 0.1 mm in diameter, but the light microscope allows viewing of objects as small as 0.2 micrometers (1 micrometers = 10^{-3} mm).

Microscopes are expensive, and easily damaged. Please take care when using the microscopes. Your instructor will setup a number of microscopes (prepared slides of animal cells, plant cells and living organisms from the pond water). Please do not change the instructor's set-ups!

Unfortunately, this is the only lab where the microscope is used in bio101. So, we will keep its structure/function basic.

Lens

The compound light microscope is "compound" because it uses two lens for magnification, the **eyepiece lens** magnification and the **objective lens** magnification. Their magnification is printed on the lens. To determine total magnification you multiply the magnification of the two.

For example: if the magnification of the eyepieces is 10X and the objective lens magnification you are using is 40X what would the total magnification be?

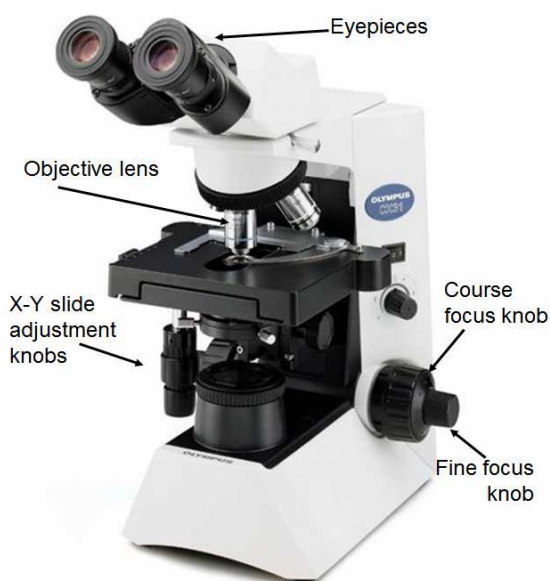
Your instructor has set-up the microscopes at the appropriate total magnification. Do not change the magnification!

Focusing knobs

The focusing knobs raise and lower the microscope stage (holding the microscope slide). Your instructor has already focused the sample for you. However if the sample is no longer in focus use only the **fine focus knob**. Using the **course focus** can result in the objective lens smashing into the microscope slide.

X-Y adjustment knobs

The two perpendicular knobs on the backside of the stage move the microscope slide forwards/backwards and left/right. These knobs help you explore the field of view. Feel free to explore.



Procedure: fill-out the following as you explore the microscopic world:

Sample #1

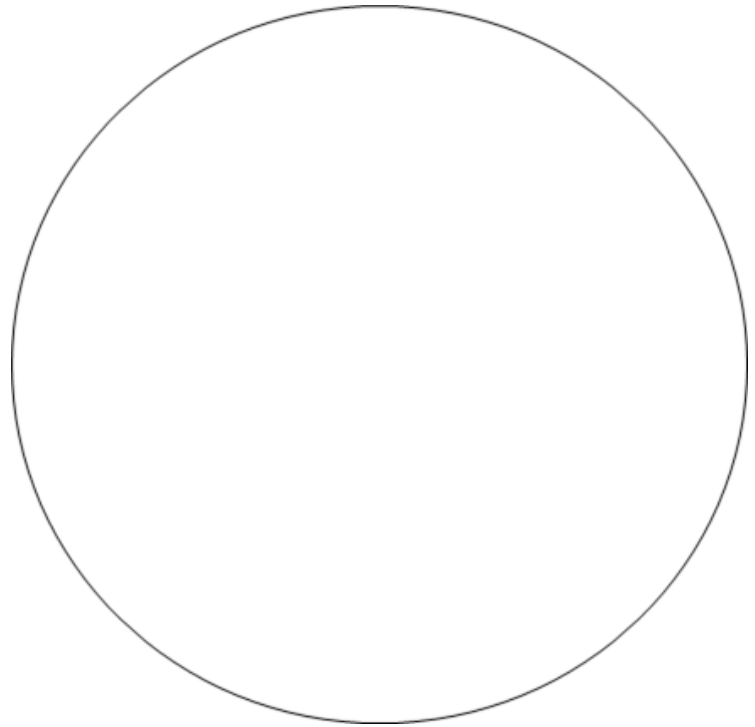
Drawings: though multicellular, try to focus on the details of one cell but draw surrounding cell outlines as well. Clarify your figure. Label at least 2 obvious cellular structures (cell wall, plasma membrane, various organelles, etc.) or 2 tissue structures.

Name or source of specimen:

Which Kingdom does it belong to:

Total Magnification Used:

Based on its function: Why do you think this cell has this shape?



Sample #2

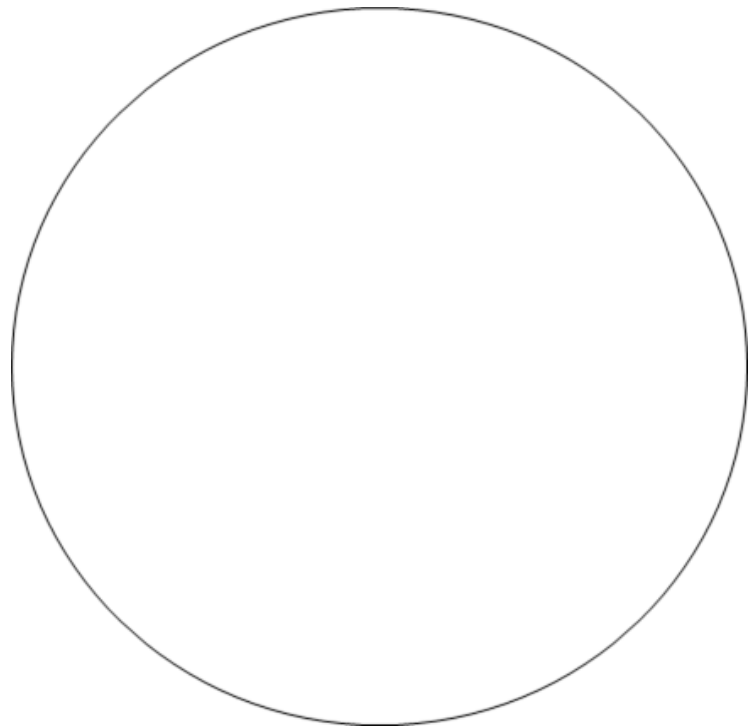
Drawings: though multicellular, try to focus on the details of one cell but draw surrounding cell outlines as well. Clarify your figure. Label at least 2 obvious cellular structures (cell wall, plasma membrane, various organelles, etc.) or 2 tissue structures.

Name or source of specimen:

Which Kingdom does it belong to:

Total Magnification Used:

Based on its function: Why do you think this cell has this shape?



Sample #3

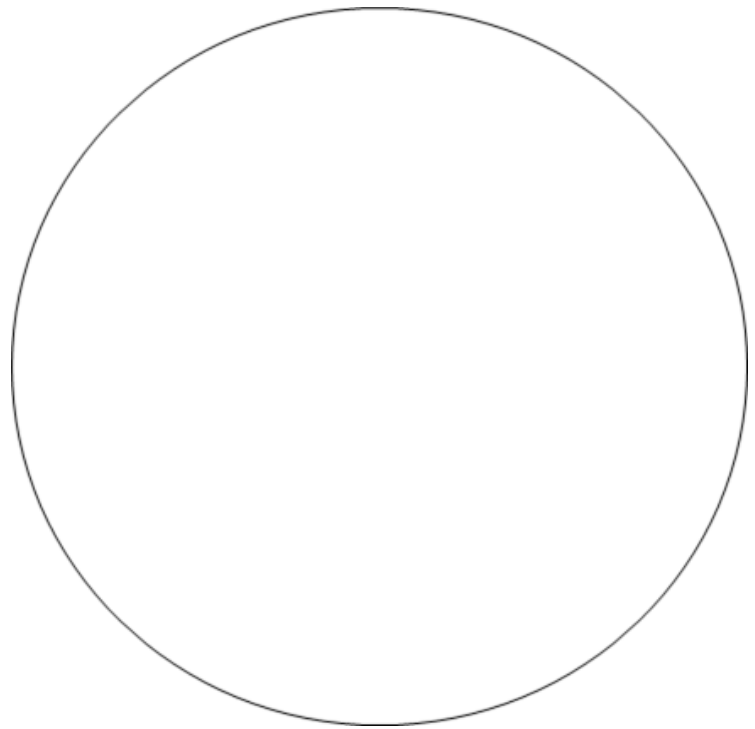
Drawings: though multicellular, try to focus on the details of one cell but draw surrounding cell outlines as well. Clarify your figure. Label at least 2 obvious cellular structures (cell wall, plasma membrane, various organelles, etc.) or 2 tissue structures.

Name or source of specimen:

Which Kingdom does it belong to:

Total Magnification Used:

Based on its function: Why do you think this cell has this shape?



Sample #4

Drawings: though multicellular, try to focus on the details of one cell but draw surrounding cell outlines as well. Clarify your figure. Label at least 2 obvious cellular structures (cell wall, plasma membrane, various organelles, etc.) or 2 tissue structures.

Name or source of specimen:

Which Kingdom does it belong to:

Total Magnification Used:

Based on its function: Why do you think this cell has this shape?

