AP BIOLOGY NAME_____
CELL UNIT
ACTIVITY #3 DATE_____HOUR_____

# CELL LAB

## OBJECTIVES

After completing this lab you should be able to:

1. Compare and contrast prokaryotic and eukaryotic cells,
2. Prepare wet mount slides of eukaryotic cells,
3. Identify each cell part and state its function, and
4. Distinguish between plant and animal cells.

## INTRODUCTION:

In the 17th century Robert Hooke built a microscope powerful enough to see objects at greater magnification than had previously been possible. Hooke used his microscope to examine a thin piece of cork. While viewing this section of cork, he observed many individual units making up the cork. He published a report in 1655 in which he called these units "cells" because they reminded him of the small cubicles in which monks lived.

Other scientists began to use microscopes to examine many different plants and animals and these scientists often saw structures that reminded them of the cork cells Hooke described. Over the next 150 years, scientists realized that all living things are composed of cells.

With better microscopes, scientists observed that although cells vary in organization, size, and function, all cells have the following structures:

- A **plasma membrane** defining the boundary of the living material,
- A region of **DNA (deoxyribonucleic acid)**, which holds the genetic information, and
- A **cytoplasm** (everything inside the plasma membrane that is not part of the DNA region).

There are two basic types of cells: **eukaryotic**, those with a clearly defined nucleus and membrane-bound organelles, and **prokaryotic**, those without a nucleus and membrane-bound organelles. The Greek word **karyon** means kernel, referring to the nucleus. Thus, **prokaryotic** means "before a nucleus", while **eukaryotic** means true nucleus. The table on the next page compares the characteristics of prokaryotic and eukaryotic cells.

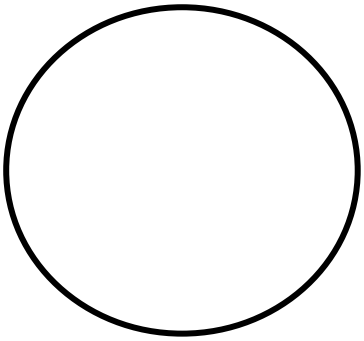
| Characteristics | Prokaryotic Cells | Eukaryotic Cells |
|---|---|---|
| Genetic Material | Located in **nucleoid** (region of cytoplasm not bounded by membrane) Consists of a single DNA molecule | Located in **nucleus** (membrane-bound compartment within the cytoplasm) Made up of DNA molecules and protein. Organized into chromosomes. |
| Cytoplasm | Small ribosomes. Photosynthetic membranes arising from the plasma membrane in some species. | Large ribosomes. Membrane-bound organelles present. Organelles are compartments which perform specific cell functions. |

## PART I: PROKARYOTIC CELLS

1. Observe the microscopic structure of the bacteria on demonstration. You are viewing the bacteria with the oil immersion lens in place.

   What is the total magnification?

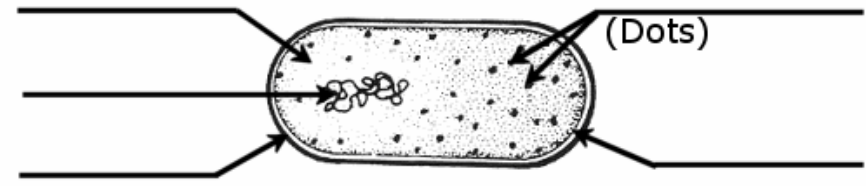
   _____



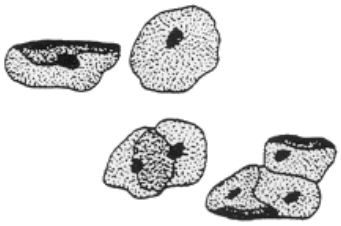
2. Carefully draw that you see in the field of view.

3. Examine the drawing of the bacterium *Escherichia coli* below. The cell has a **cell wall**, a structure different form the wall of plant cells but serving the same primary function. The **plasma membrane** is flat against the cell wall and may be difficult to see. Look for two components in the **cytoplasm**: the small block dots called **ribosomes** give the cytoplasm its granular appearance; the **nucleoid**, a relatively electron-transparent region (appears light) containing fine threads of DNA.

4. Label the structures highlighted structures from #3 on the diagram below.



## Part II: Eukaryotic Cells – Animal Cells

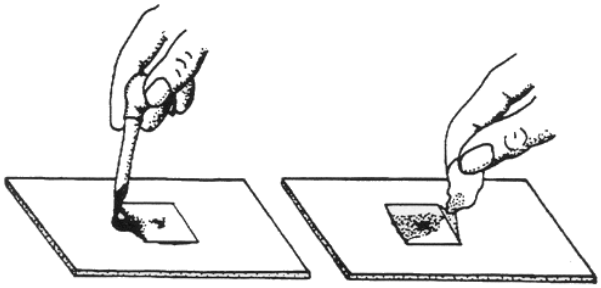


5. Obtain a clean toothpick, slide, coverslip, Barnes bottle of water, and Barnes bottle of methylene blue from the supply area.

6. Use a clean toothpick to gently scrape the inside of your cheek.

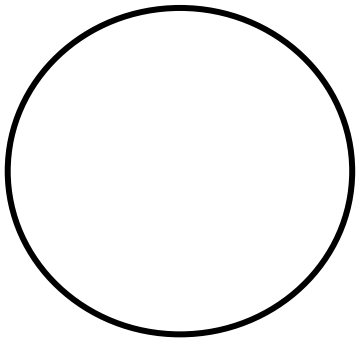
7. Add a drop of water to the slide. Roll the toothpick with your cheek cells in the water drop. Add a coverslip and throw the toothpick in the trash.

8. Methylene blue is a dye that will stain the cell's nucleus darker than the cytoplasm. Stain your sample by drawing a drop of stain under the coverslip by touching a piece of paper towel to the opposite side of the coverslip. DO NOT remove the coverslip.



9. Locate the cheek cells using low power, the switch to high-power. Find the **nucleus**, a round centrally located body within each cell.

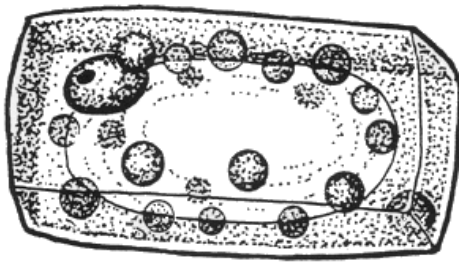
10. Carefully draw several cells as they appear under the microscope. Label the **cytoplasm, nucleus,** and **plasma membrane**. Estimate the size of a typical cell. Record the cell size and magnification used.



Magnification _____

Cell size (μm) _____

11. Wash and dry your slide and coverslip.



## PART III: EUKARYOTIC CELLS – PLANT CELLS

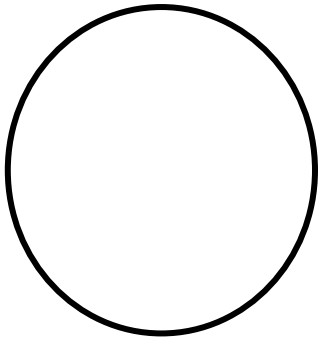
12. Use forceps to remove a young leaf from the growing tip of an *Elodea* plant and prepare a wet mount slide.

13. Examine the leaf structure under low power. They study the detail of several cells under high power.

14. Add a drop of safranin stain to make the cell wall more visible. Add the stain the same way you stained your cheek cells with methylene blue. (Step #8)

15. You will notice many spherical green **chloroplasts** in the cytoplasm. These organelles function in photosynthesis. The **cell wall** is a clear area outside the cytoplasm. The **plasma membrane** is not visible because it is pressed tightly against the cell wall and because it is beyond the resolving power of the light microscope. You may also see **cytoplasmic streaming**. This is evident by the movement of chloroplasts along the cell wall. Microfilaments are responsible for this intracellular movement. Toward the middle of the cell, you will find the large, water filled **central vacuole**. This structure may take up over half of the cell interior. The **nucleus**, within the cytoplasm, appears as a clear or slightly amber-colored body. It is slightly larger than the chloroplasts.

16. Carefully draw and label several *Elodea* cells in the field of view. Indicate where the plasma membrane is located in the cells. Estimate the size of a typical cell. Label the **plasma membrane**, **chloroplasts**, **nucleus**, **cytoplasm**, and **cell wall**.



Magnification _____

Cell size (μm) _____

17. Describe the three-dimensional shape of the *Elodea* cell.

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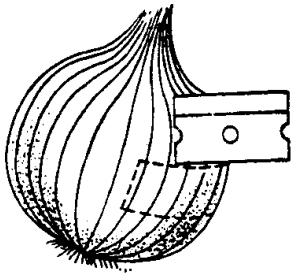
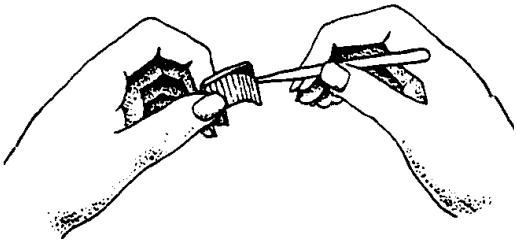
18. Wash and dry your slide and coverslip.

19. Prepare a wet mount of onion epidermal cells using the technique described below.



1. Using a razor blade, carefully cut a section from one bulb scale.

2. Using forceps, grasp the inner epidermis of the scale.



3. Remove this epidermis and prepare a wet mount slide.

20. Observe the wet mount with your microscope under low power then switch to high power.

21. Stain the specimen with iodine using the same technique you used in step #8. The stain will increase the contrast and enable you to better view the nucleus, oil droplets, and cell wall.

22. The nucleus will be a large sphere within the cytoplasm. Examine the nucleus carefully and you will spot several **nucleoli** inside the nucleus. Nucleoli are the areas within the nucleus were RNA (ribonucleic acid) is produced. The rest of the nucleus is largely DNA.

23. Look for **oil droplets** in the form of granular material within the cytoplasm. The droplets are a form of stored food for the cell.

24. What plant cell organelle is present in *Elodea* leaf cells that is absent in onion epidermal cells?

_____

_____

25. What is the observable difference between the *Elodea* cell and the onion epidermal cells?

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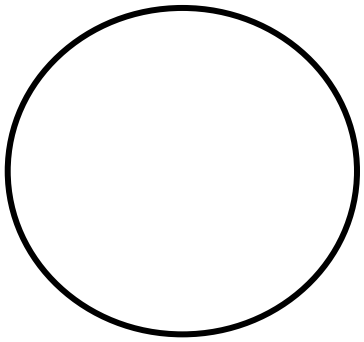
26. Carefully draw several onion epidermal cells. Label the **oil droplets**, **nucleus**, **cell wall**, **cell membrane**, and **cytoplasm.** Estimate the size of a typical cell.



Magnification _____

Cell size (μm) _____

## PART IV: QUESTIONS

27. Determine if each of the following characteristics is true of **P**rokaryotic cells, **E**ukaryotic cells, or **B**oth cell types.

_____ No membrane-bound nucleus

_____ Membrane-bound nucleus

_____ No membrane-bound organelles

_____ Contains membrane-bound organelles

_____ Ribosomes present

_____ Cell membrane present

_____ Chromosomes present

_____ Cytoplasm present

_____ Mitochondria, endoplasmic reticulum, Golgi, and vacuoles present

28. How does the size of the bacteria cell observed compare with the size of the human cheek cells or Elodea cells?

_____

_____

29. Name 4 structures common to all cells.

_____ _____

_____ _____

30. List 3 differences between plant and animal cells.

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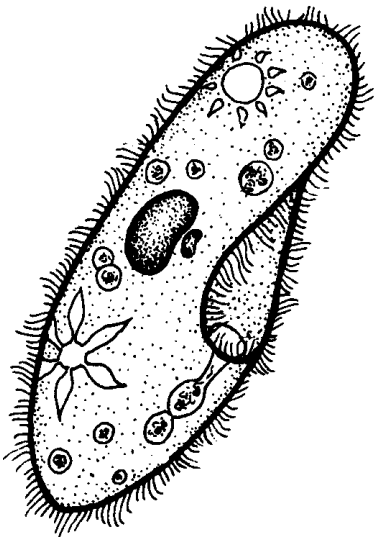
|---|
| |
| |
| |

31. Examine the cell at the right. Is the cell prokaryotic or eukaryotic?



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How do you know?

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