

Integrated Science 2**Redwood High School****Name:** _____**Period:** _____**■ Background**

Ever since the first microscope was used, biologists have been interested in studying the cellular organization of all living things. After hundreds of years of observations by many biologists, the cell theory was developed. The cell theory states that the cell is the structural and functional unit of living things. One of the way cells are classified is by the structures they contain. In plant and animal cells, both similarities and differences exist with respect to structure.

- In this investigation, you will compare the structures of a typical plant cell and a typical animal cell

■ Focus Questions

- How are plant, animal, and bacterial cells alike?
- How are plant, animal, and bacterial cells different?

■ Materials

- Forceps • Micro dropping pipet • Water plant leaf • Water • Microscope • Glass slide
- Coverslip • Toothpicks • Methylene blue stain • Paper towel • Lens paper

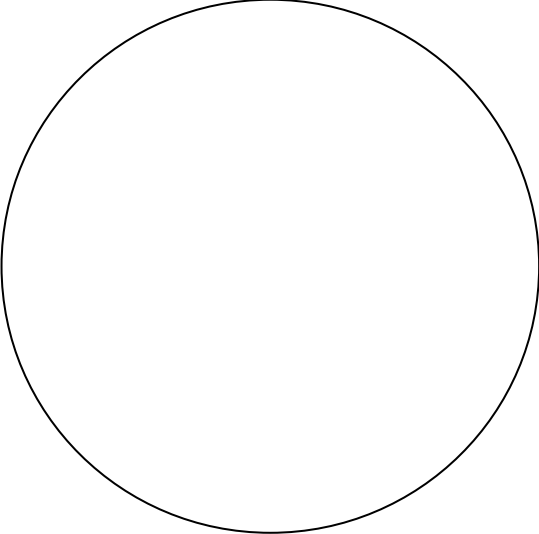
■ Safety

Use caution when handling glass slides as they can break easily and cut you. Always use special caution when working with laboratory chemicals, as they may irritate the skin or cause staining of skin or clothing. Never touch or taste any chemical unless instructed to do so.

■ Procedure**Part A. Examining Plant Cells**

1. Take a microscope from the storage area and place it about 10 cm from the edge of the laboratory table.
2. If instructed to do so, carefully clean the eyepiece and objective lenses with lens paper.
3. Send one member of your lab team to a plant slide making station.
4. Secure a glass slide, a coverslip, and a forceps.
5. Using the forceps, place a drop of water in the center of your clean glass slide.
6. Using the forceps, remove a leaf from the supplied water plant and place the leaf on the drop of water on the slide – **BOTTOM SIDE OF LEAF UP**. Make sure that the leaf is flat. If it is folded, straighten it with the forceps.
7. Carefully place a coverslip over leaf, and press down gently until the leaf is perfectly flat.
8. Place the slide on the stage of the microscope with the leaf directly over the opening in the stage.
9. Using the 4x (low-power) objective lens, locate the leaf under the microscope by turning the coarse adjustment knob until the leaf comes into focus. Center the leaf in the field of view by moving the slide.
10. Switch to the 10x (med-power). Use the fine focus knob to adjust your view.
11. Switch to the 40x (high-power) objective lens. Use the fine focus knob to adjust your view. At this magnification small adjustments of the fine focus knob will allow you to witness the 3-dimensionality of the leaf, as the leaf is composed of many layers of cells. At 400x, your total magnification at high-power you can focus on as many as three different layers of cells, by simply scrolling 'up' or 'down' with the fine focus adjustment.
12. Closely observe the cells of the leaf. Complete Data Table 1.
13. When your lab group has finished using your leaf slide, carefully remove the coverslip, throw away the leaf, rinse and pat-dry both your slide and coverslip – then return your slide and coverslip to where they belong.

■ **Data Table 1.**

Draw three cells in a single row at 400x - label each structure you can see for one of the cells -	Additional Data
	1. Calculate the length of the cell you labeled. – field of view diameter at 400x = 0.40mm 2. Thoroughly describe these plant cells and their pattern within a leaf.

Part B. Examining Bacterial Cells

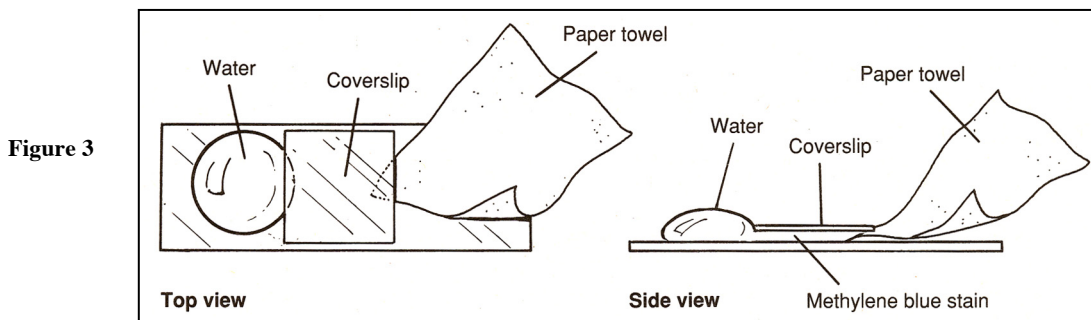
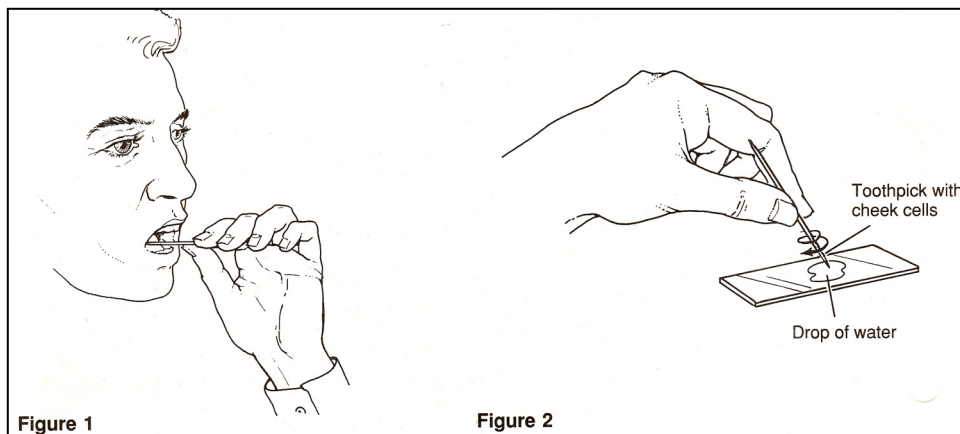
1. A few select fixed bacterial slides are available for you to view. Slides are labeled with the species represented, or source of smear.
2. These slides feature heat-fixed, dead bacteria cells that have been stained to make viewing them easier.
3. You are not expected to see a nucleus. Why? _____
4. To view a slide:
 - a) make sure the slide is free of smudges by holding the slide up to a light – clean any smudges by lightly buffing the slide with lens paper
 - b) place the slide on your stage with the most highly stained region of the slide directly over the opening in the stage
 - c) begin on low-power, proceeding to med-power only after the stained smear is in focus; move onto high-power once the smear is in focus on med-power
5. Once the smear/cells are in focus on high-power, select small region of cells to draw. Label as much of one cell from each slide as you can. Complete Data Table 2 for each slide provided.

■ **Data Table 2.**

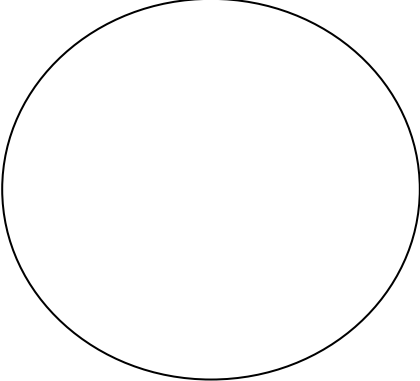
	Slide Name:	Slide Name:	Slide Name:
D r a w i n g			

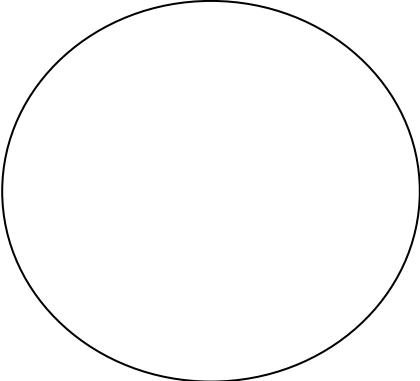
Part C. Examining Animal Cells (human cheek cells)

1. Using a micro dropping pipet, place a very small drop of water in the center of a clean glass slide.
2. Using the end of a toothpick, gently scrape the inside of your cheek. (See Figure 1)
 - **CAUTION:** Do not use excessive force when scraping the inside of your cheek.The end of the toothpick will have many cheek cells stuck to it even though you may see nothing.
3. Stir the water on the slide with the end of the toothpick to mix the cheek cells with the water. (See Figure 2).
 - **DISPOSE** of the toothpick by dropping the toothpick into the beaker marked “Waste”.
4. Put one **small** drop of methylene blue stain on top of the drop of water containing the cheek cells.
 - **CAUTION:** Use care when working with methylene blue to avoid staining hands and clothing.
5. Wait one minute, and then carefully place a coverslip over the stained cheek cells.
6. To remove the stain from under the coverslip and replace it with clear water, place a piece of paper towel at the edge of one side of the coverslip. Then place a very small drop of water at the edge of the coverslip on the opposite side. (See Figure 3). The paper towel will absorb the stained water under the coverslip. As the stain is removed, the clear water next to the coverslip on the opposite side will be drawn under the coverslip. Discard the paper towel after it has absorbed the stained water.
7. Place the slide on the stage of the microscope with the center of the coverslip directly over the opening in the stage.
8. Using the low-power objective lens, locate the region of the slide with a fairly high concentration of cheek cells. **Note:** You may need to reduce the amount of light coming through the slide in order to see the cells more clearly. Adjust the diaphragm as necessary.
9. Switch to the medium power, and then the high-power objective lens.
10. Observe a few cheek cells at 400x. Select two different looking cheek cells. Draw, label, and describe each cell in Data Table 3.
11. Carefully rinse, dry, and return your coverslip and slide.
12. Return your microscope to the storage area.



■ **Data Table 3.**

Draw an enlarged view of one cheek cell - label each structure you can see -	Additional Data
	1. Calculate the length of the cell. – field of view diameter at 400x = 0.40mm 2. Thoroughly describe this animal cell.

Draw an enlarged view of another cheek cell - label each structure you can see -	Additional Data
	1. Calculate the length of the cell. – field of view diameter at 400x = 0.40mm 2. Thoroughly describe this animal cell.

■ **Analysis and Conclusion [type the answers to the following questions for homework]**

1. If you were given a slide containing living cells of an unknown organism, how would you identify the cells as either plant or animal? **note: consider every plant and animal cellular structure and characteristic you were able to see in this lab - be very thorough and include in your answer a full description of every structure, and characteristic, one would expect to be able to use to differentiate between plant and animal cells*
2. Based on your observations in this lab, describe the similarities between plant and animal cells.
3. Why is it an advantage to use a wet-mount preparation instead of a dry-mount preparation in the study of living cells?
4. Describe the ways in which the bacterial cells differed from the eukaryotic cells.
5. Why are stains often used when observing cells under the microscope?
6. Explain why you think a leaf from a terrestrial (living on land) plant was not chosen for the plant cell part of this lab. Rather, a leaf from an aquatic (living under water) plant was chosen.