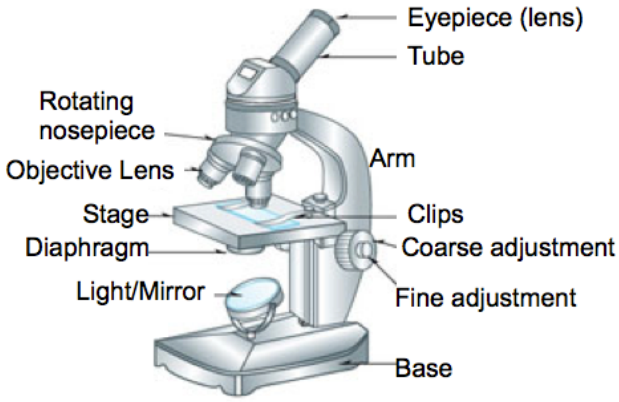
Name:_____ Period: _____

Lab: Viewing Cells

Basic Microscope Procedures	Microscope Parts
1. Turn on light. Open diaphragm to widest hole. 2. Set to low power objective. 3. Place slide on stage. Fasten slide with clips. 4. Focus using coarse adjustment. Use fine only if needed. 5. Set diaphragm to smallest hole with highest resolution. → DRAW, Label, and indicate magnification. 6. Set to medium power. 7. Fine adjustment. 8. Set diaphragm to smallest hole with highest resolution. → DRAW, Label, and indicate magnification. 9. Set to high power. Lens should almost touch the slide. 10. Fine adjustment *only.* 11. Set diaphragm to smallest hole with highest resolution. → DRAW, Label, and indicate magnification	

II. Magnification, and the size of objects that you're looking at.

These microscopes are **compound** microscopes. They magnify both at the eyepiece and the lower objective lenses. The total magnification is the product of these two magnifications. Our eyepiece magnifies 10X. If the low power objective magnifies 4X, then the total magnification is 4 X 10 = 40.

Use what we've just learned to fill in the top row of the table below. Then, figure out the magnification for the medium and high power settings:

	Eyepiece magnification	Objective magnification	Total Magnification
low power			
medium power			
high power			

- If you lay a metric ruler on the stage hole with the microscope set for low power, you'll see that the maximum diameter of what you're viewing is just about 4.5 mm.
- The medium power objective magnifies 2.5 times more than the low power objective. That means that the field of view will be 2.5 times smaller. 4.5/2.5 is 1.8 mm. That's also **1800 micrometers (AKA microns), or 1800 µm**

The high power objective magnifies 10 times more than the low power objective. Therefore, the field of view under high power is 10 times smaller. 4.5/10 is 0.45 mm., or **450 micrometers (450 µm).**

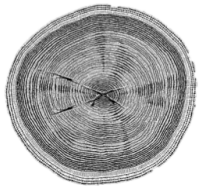
Just to have this data in a handy form, fill in the table below.

	Total Magnification	Diameter of field of view in millimeters	Diameter of field of view in micrometers
low power			
medium power			
high power			

III. The diaphragm

It's counterintuitive, but *you'll see best with the least amount of light.* You can control the amount of light by using the diaphragm, which is below the stage. Always set the diaphragm to the smallest possible hole.

IV. A little geometry: a cross section. circular slice of a carrot or a sausage is a cross section.



cross section of a tree trunk

Cross section of a tomato

IV. Practice: Getting a slide on the stage and focusing it

Obtain a prepared slide of a cross section of a dicot leaf. Maples, oaks, peas, and roses are dicots.
Sketch what you see under medium and high power.

Medium Magnification: ____ X	High Magnification: ____ X

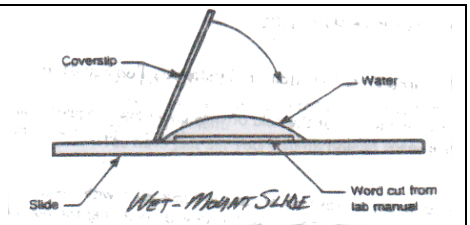
There's a variety of cells that you should be able to see. Try to estimate the size of one of these cells in micrometers.

List your estimate here: _____.

Explain your reasoning: why do you think it's the size that you think it is,

V. Small Newspaper Letter (to learn how to make a wet-mount slide)

1. Place a drop of water on a slide
2. Cut out a small letter from the newspaper. Use any letter except for "s." Place on the drop. Make sure the letter is facing you as it would if you were reading it.
3. Add another drop. Add a cover slip at an angle to avoid air bubbles.
4. Record below: What do you notice about the orientation of the letter under the microscope? How has it changed? (answer below)
5. While looking at the letter, move the slide around. What happens when you move the slide up? To the left. Record your observations. What can you say in general about how things look and move under a microscope. (answer below)



6. Draw/photo under low, medium, and high power. Indicate the magnification and size, indicating units μm).

Letter _____, Magnification____	Letter _____, Magnification____	Letter _____, Magnification____
Size: _____	Size: _____	Size: _____

Observations, responses to questions 4 and 5 (see above)

VI. Elodea (Anacharis)

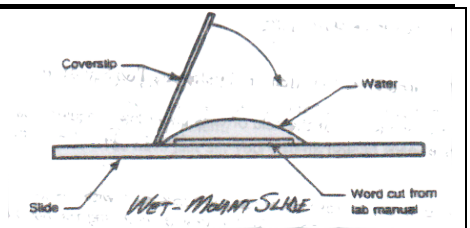
(Elodea is a plant that lives in ponds and lakes. It's frequently used as an aquarium plant)

a. Place a drop or two of water on a slide.

b. Place an entire Elodea leaf on the drop. Each leaf is only a few cells thick.

c. Add a coverslip. As you view (especially under high power), you might have to use the fine adjustment to focus on just one layer of cells. The cells are very regular, with tiny green spherical structures inside, which you might see moving. These structures are **chloroplasts**, the photosynthetic organelles of plant cells.

d. Draw below what you see under high power, or take a photograph. LABEL ALL VISIBLE PARTS (chloroplasts, wall, cytoplasm). Note that you can't see the cell's membrane because it's pressed up against the wall.



6. Draw/photo under low, medium, and high power. Indicate the magnification and size.

Elodea in fresh water High Power Magnification: ____	To see the cell membrane of Elodea, do the following. While viewing elodea, have your partner add a drop or two of salt water to the right edge of the coverslip. As you do this, place a piece of paper towel on the left side of the coverslip. This will remove freshwater and draw in the salt water. You should see the cells change. Draw what you see. Take photos, too, if desired.	Elodea in salt water High Power Magnification: ____

Observations

1. How is the elodea in salt water different from that in fresh water?

2. If you move a microscope slide toward the top of the stage while viewing, what happens to the image that you're looking at?

3. In micrometers, what are the dimensions of a single elodea cell?

VII: Cells from an onion bulb

a. Place a drop or two of iodine or methylene blue on a slide. This will stain the DNA in the nucleus.

b. Peel off a translucent piece of onion.

c. Place this piece of onion tissue (it has to be *very* thin) on the drop.

d. Add another drop of stain.

e. Add a coverslip. The cells are the very regular, brick-like structures. The nucleus is darkly stained in the center. The cell membrane (as in Elodea) is tightly pressed against the cell wall, and can't be seen. The cytoplasm lies between the nucleus and the membrane.

f. Draw a few cells on the right. LABEL ALL VISIBLE PARTS (wall, nucleus, cytoplasm)

Onion cell drawing

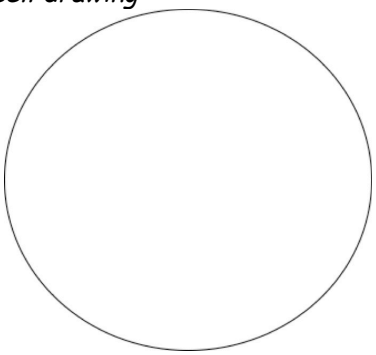
Magnification: _____X

In micrometers, what are the dimensions of a single onion cell: _____ x _____.

VIII. Human Cheek Cells

a. Place a drop or two of iodine on a slide.
b. Gently scrape the inside of your cheek with a toothpick.
c. Put the toothpick in the drop.
d. Add a coverslip.
e. Look for very small blobs on your slide, then zoom in to high power. These blobs are your very small, irregular cells–much smaller than the plant cells that you've just observed. The outer boundary is the cell membrane. The nucleus is darkly stained in the center. Between the nucleus and the cell membrane is the cytoplasm, the metabolically active region of the cell.
e. Draw on the right. LABEL ALL PARTS (membrane, nucleus, cytoplasm).

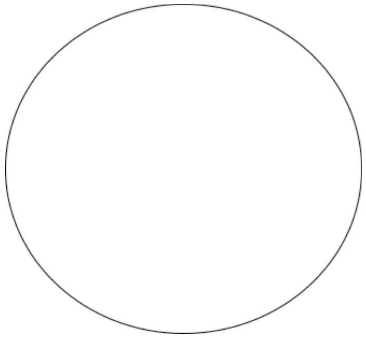
Cheek cell drawing



Magnification: _____X
In micrometers, what is the approximate diameter of a cheek cell. _____

IX: Animal Sperm Cells (prepared slide).

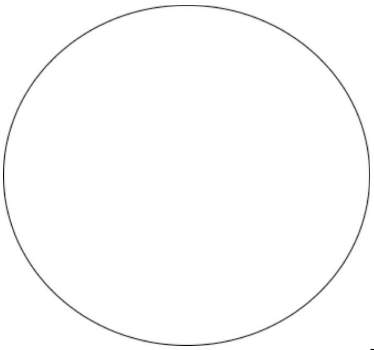
Draw a few cells under high magnification. These cells are much smaller than any cell you've drawn so far. Note the flagellum (the tail).



_____X
Dimensions in micrometers:

X. Coccus (bacterial cells) (prepared slide).

Draw a few cells under high magnification. These are the smallest cells yet

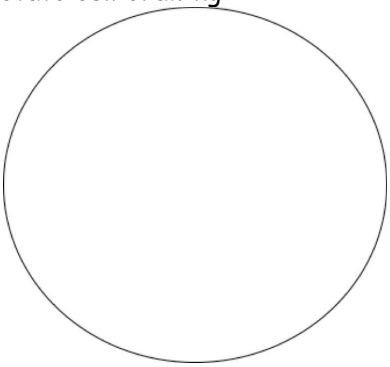


_____X
Dimensions in micrometers:_____

XI. Potato cells

1. Place a drop or two of iodine on a slide.
2. Use a razor to slice the thinnest slice possible.
3. Place the slice on the drop, add another drop, and add a coverslip.
4. The cells have a regular hexagonal shape, and are filled with darkly stained spheres. These spheres are starch plastids, an organelle used for starch storage. Note that these spheres have become purple after being stained with iodine. Put a drop of iodine on your paper. What are these spheres made of?
5. Draw under medium or high power (best view (wall, cytoplasm, starch plastids)

6. Potato cell drawing



_____X

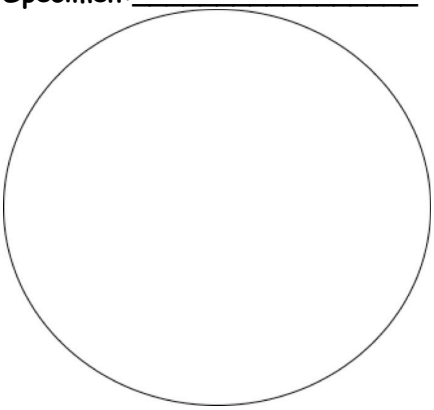
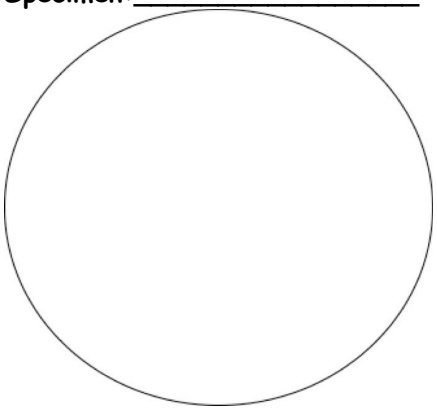
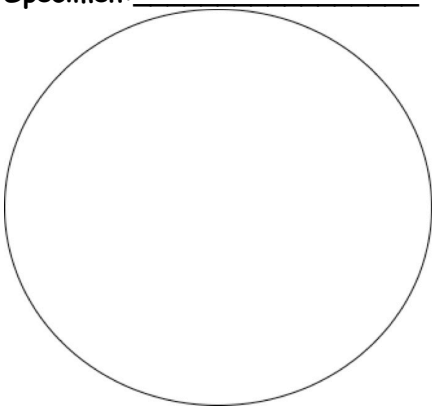
7. Making comparisons. In this lab, you observed plant, animal, and bacterial cells. Using some of the compare and contrast phrases below, write a few sentences comparing these cells.

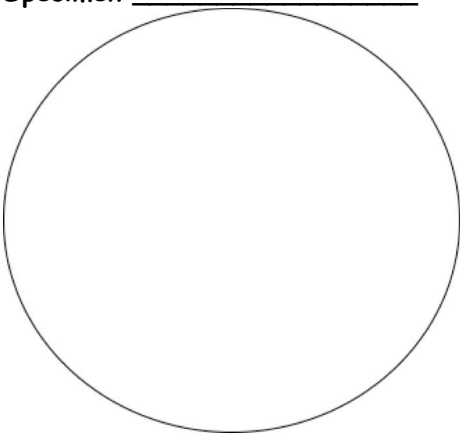
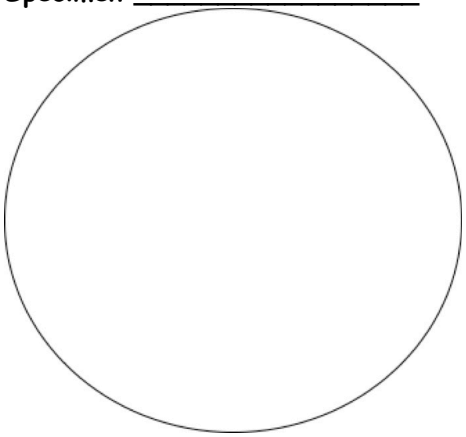
Compare and contrast • *are similar because* • *have in common* • *difference between* • *on the other hand* • *just like* • *in contrast* • *compared to*	

Microscope Lab Extension: Protists (and other amazing critters)

Introduction: Protists are eukaryotes, just like you and me. That means that they have much larger cells than prokaryotes do, with internal organelles, such as chloroplasts or mitochondria (or both). Many are unicellular, but there are a few multicellular forms (like algae).

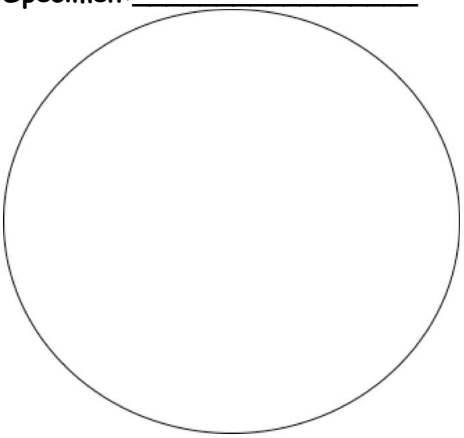
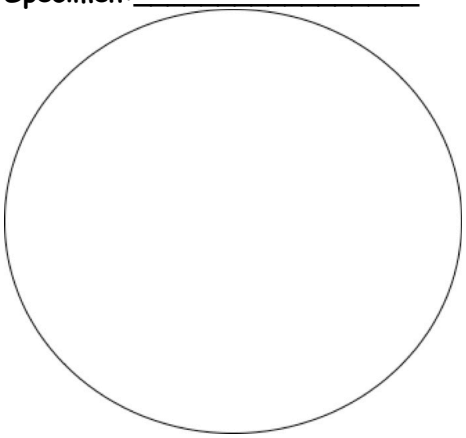
In today's lab, we have a variety of protists for you to look at: Paramecium, amoeba, the colonial volvox, euglena. We also have one microscopic, multicellular animal: Rotifers.

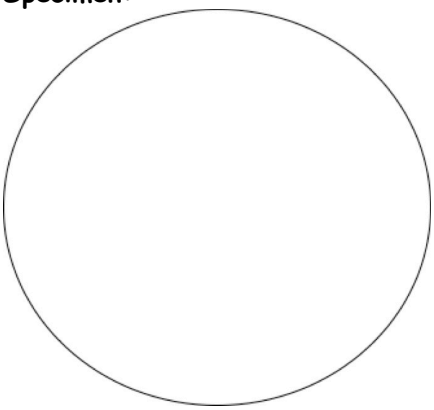
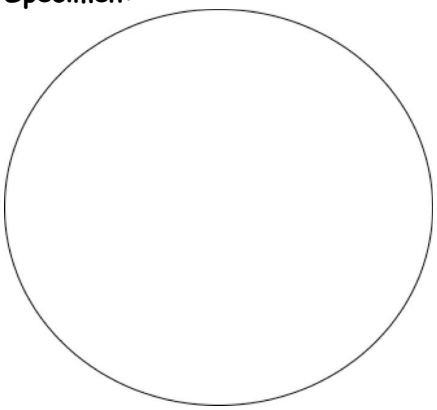
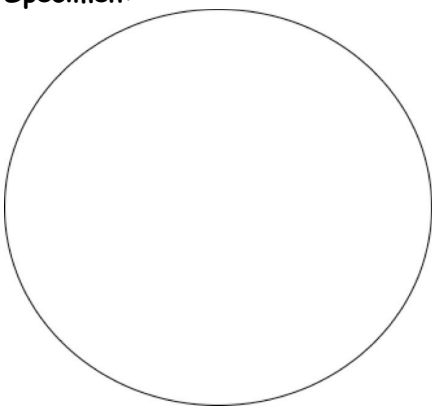
Specimen:_____  **Size: _____** **Observations of behavior:**	**Specimen:_____**  **Size: _____** **Observations of behavior:**	**Specimen:_____**  **Size: _____** **Observations of behavior:**

Specimen:_____  **Size: _____** **Observations of behavior:**	**Specimen:_____**  **Size: _____** **Observations of behavior:**

Freestyle Microscope Viewing

The space below is for you to observe objects that you're interested in. Describe below and draw and/or photograph

Specimen:_____  **Size: _____** **Observations/description**	**Specimen:_____**  **Size: _____** **Observations/description**

Specimen:  **Size: _____** **Observations/description**	**Specimen:**  **Size: _____** **Observations/description**	**Specimen:**  **Size: _____** **Observations/description**