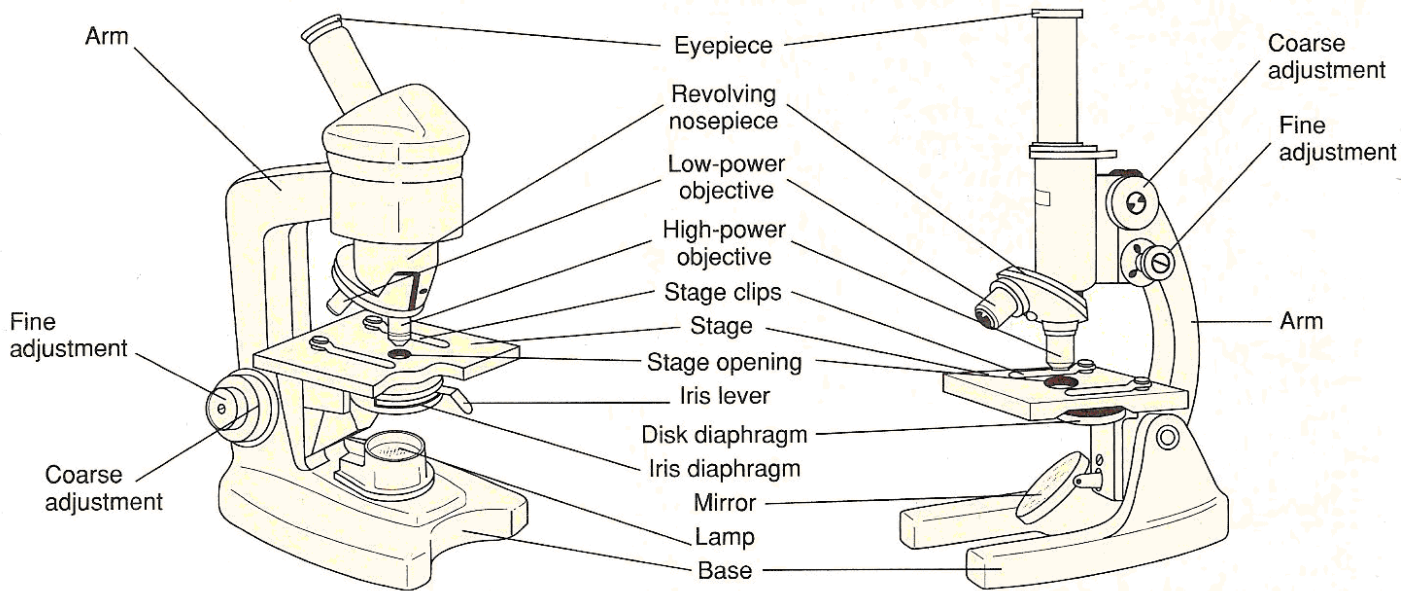


**Microscope Lab - Using the Microscope and Slide Preparation**

"**Micro**" refers to tiny, "**scope**" refers to view or look at. Microscopes are used to make more detailed observations and measurements of objects too small for the naked eye. The compound light microscope is the most common instrument used in education today. It is an instrument containing two lenses, which magnifies, and a variety of knobs to resolve the picture. It is a rather simple piece of equipment to understand and use.

**Define:** *Resolve-*



**Prelab:** Complete the following questions and matching section.

Microscope structure		Function
__1)	Diaphragm	a) Brings objects into rapid but coarse focus
__2)	Mirror or lamp	b) Regulates the amount of light entering the scope
__3)	Eyepiece	c) Is attached to the nose piece and contains a lens
__4)	Objectives	d) Holds the glass slide and specimen in place
__5)	Revolving nosepiece	e) Source of light directed into the microscope
__6)	Coarse adjustment	f) Turns to change from one objective to another
__7)	Fine adjustment	g) Brings object slowly into fine focus
__8)	Stage	h) Contains a lens capable of 10x magnification
__9)	Stage clips	i) Holds the objectives above the stage
__10)	Arm	j) Platform to support the slide
__11)	Base	k) Supports the whole microscope

12. Why should a glass slide and a coverslip be held by their edges?

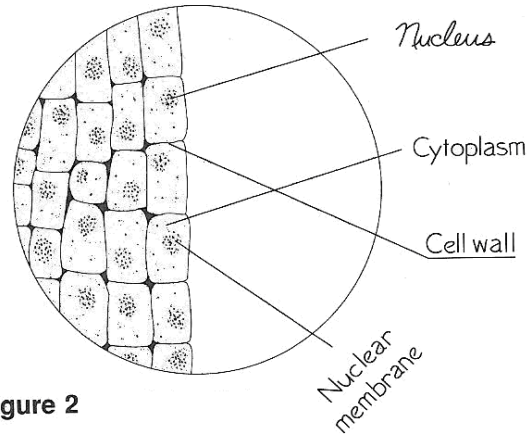
13. Explain why a specimen to be viewed under the microscope must be thin.

**Microscope drawings:**

- Use pencil - you can erase and shade areas.
- Use only white printer paper
- Use a Petri dish for an outline.
- Specimens should be drawn to scale.
- Labeled with name and magnification.
- All labels should be written on the outside of the circle.

14. Based on the guidelines above and your sense of good work, list three things that make the diagram (Fig. 2) an acceptable drawing and three things that would make the drawing better.

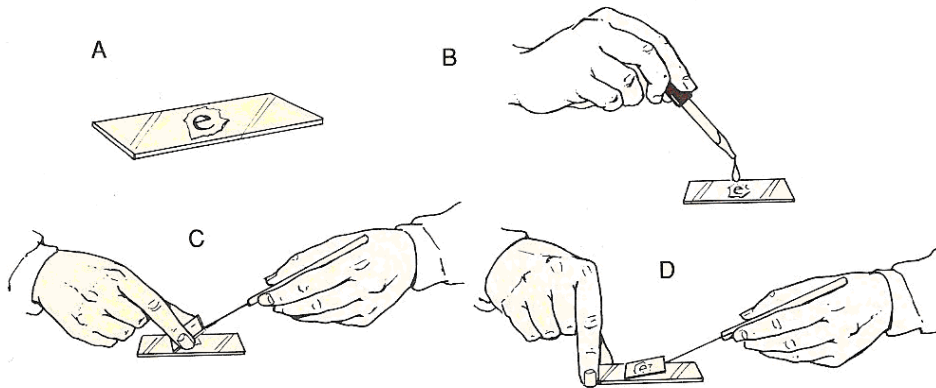
**Onion Cells**  
Magnification 400x



**Figure 2**

**Part 1: Wet mount of Letter “e”**

- A** Cut out the letter “e” and place it on the slide face up.
- B** Add a drop of water to the slide.
- C-D** Place the cover slip over the “e” and water at a 45-degree angle. Lower slowly with a pencil to keep air bubbles out.



1. Place the slide on the stage and view in **low power**. Center the “e” in your field of view. **Draw what you see.** Move the slide to the left, what happens? Move the slide to the right, what happens? Up? Down?
2. View the specimen in **high power**. Use the fine adjustment **only** to focus (this keeps from breaking or scratching glass slides and objectives). **Draw what you see.**
3. Examine a piece of color print from the newspaper, notice how it is printed as compared to what we see.

**Part 2: Calculating Magnification** Fill in the magnification of each objective and the eyepiece of your microscope. To determine the total magnification, multiply the magnification of eyepiece by the objective lens.

Eyepiece lens magnification x objective lens magnification = Total Magnification			
Objective	Eyepiece magnification	Objective magnification	Total magnification
Low power			
Medium			
High power			

**Part 3: Measuring with microscopes**

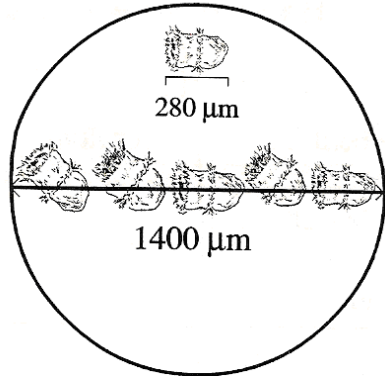
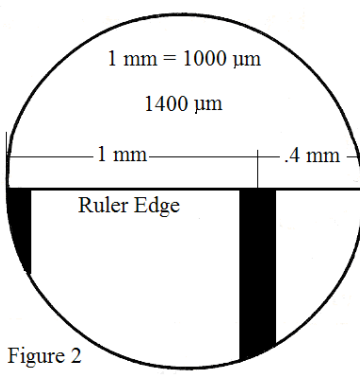
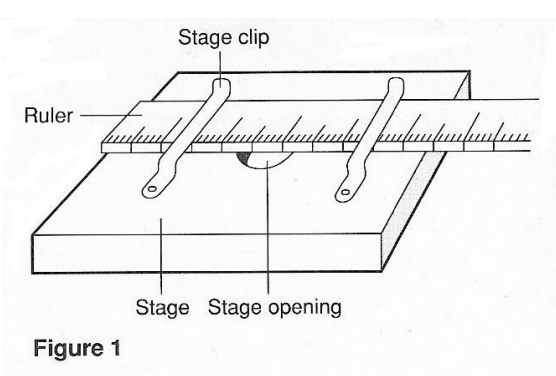
Any object observed under a microscope can be described in the word small, but precisely how small is critical information to many scientists. A millimeter, 1/1,000 of a meter is typically used to measure small objects, but is far too large a unit for microscopic objects. Rather, scientists use the unit of a micrometer 1,000 times smaller than the millimeter. The Greek letter  $\mu$  is used to symbolize **micro**, 1/1,000,000 of a meter.

1. Using the 10x objective, place a clear plastic ruler on the stage and focus on the mm marks.
2. Visually determine how many mm fit across the diameter of your field of view.
3. Then estimate how many objects can fit across the field of view.
4. Use the following formula to calculate the size of the object.
5. To calculate how many  $\mu\text{m}$  fit across the high power field of vision; record the high power field of vision of your microscope in  $\mu\text{m}$  on your data sheet and use the high power equation.

**Method: Low Power**       $\frac{\mu\text{m in field of view}}{\text{number of objects across field}} = \text{size of object}$

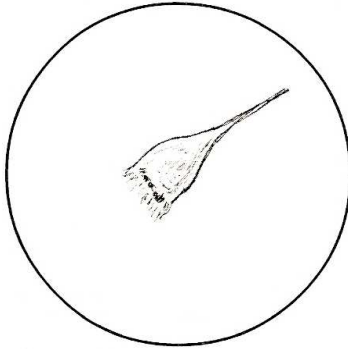
**Method: High Power**       $\frac{\text{Low power magnification}}{\text{High power magnification}} \times \mu\text{m across low power field}$

**Example:** using the diagram below, the size of the organism has been determined to be 280  $\mu\text{m}$ .

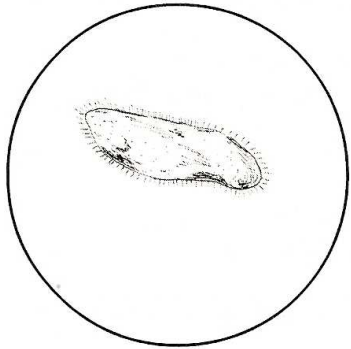


Field of view =  $\sim 1.4\text{mm} = 1,400\mu\text{m}$       Size of object =  $\frac{1400\mu\text{m}}{5 \text{ objects}} = 280\mu\text{m}$

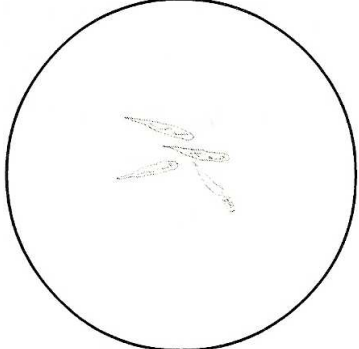
**Calculate** the size of the following organisms based on the field of view given below.



a. Field of Vision = 1400  $\mu\text{m}$   
Size = \_\_\_\_\_  $\mu\text{m}$



b. Field of Vision = 350  $\mu\text{m}$   
Size = \_\_\_\_\_  $\mu\text{m}$



c. Field of Vision = 350  $\mu\text{m}$   
Size = \_\_\_\_\_  $\mu\text{m}$

#### Part 4 - Robert Hooke's Cells

In 1665 Robert Hooke was the first to look at cells and other materials. In fact, he was the person who first called them cells. You will repeat Hooke's experiment using cork.

1. Use a razor blade to cut thin sections of the cork. Prepare a wetmount of the cork.
2. Draw what you observe under the highest magnification you can get. Label the cell wall.
3. Rinse and dry the slide

**Questions** - On a separate paper answer the questions in complete sentences. Label questions well

1. What did Robert Hooke call the small units in the cork that can be seen under high power? Why?
2. Do these units appear filled or empty? Explain.
3. Does a plant or an animal produce cork? What evidence from the cell structure do you have?

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**Please us the following clean up check list:**

1. Clean and return your slide and cover slip
  2. Place the low power objective in the lowest position
  3. Raise the stage and wrap the chord around the base
  4. Replace the dust cover and return to the microscope storage area
  5. Clean and wipe down your work area
- 

**Conclusion Questions:** use complete sentences!

1. What are the advantages of using a microscope? When would a microscope not be useful?
2. In a minimum of three steps using complete sentences, describe how to make a proper wet mount of the letter e in your own words.
3. Images observed under the light microscope are reversed and inverted. Suppose you were observing an organism through the microscope and noticed that it moved toward the bottom of the slide and then it moved to the right. What does this tell you about the actual movement of the organism.
4. Describe the changes in the field of view and the amount of available light when going from low to high power using the compound microscope.
5. A microscope has a 20 X ocular (eyepiece) and two objectives of 10 X and 43 X respectively: Calculate the low power magnification and high power magnification of this microscope. Show your formula and all work.
6. The purpose of a microscope is to make more detailed observations. What have you learned about color in newspaper print that you would not have known with the naked eye?

**Inquiry Extension:**

Design a lab to measure the size of a plant cell.