Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
Period\_\_\_\_\_\_\_\_\_\_\_

How Microscopes Work – A Lab Evaluation

**Introduction**

    "Micro" refers to **tiny**, "scope" refers to **view or look** at. Microscopes are tools used to enlarge images of small objects so as they can be studied. The compound light microscope is an instrument containing **two lenses**, which magnifies, and a variety of **knobs to resolve (focus)** the picture. Because it uses more than one lens, it is sometimes called the compound microscope in addition to being referred to as being a light microscope.  In this lab, we will learn about the proper use and handling of the microscope.

**Instructional Objectives**

* Explain how to properly handle the microscope
* Determine the total magnification of the microscope.
* Demonstrate the proper procedures used in correctly using the compound light microscope.
* Describe changes in the field of view and available light when going from low to high power using the
compound light microscope
* Explain why objects must be centered in the field of view before going from low to high power using the compound light microscope.
* Explain how to increase the amount of light when going from low to high power using the compound light microscope.
* Explain the proper procedure for focusing under low and high power using the compound light microscope.
* Prepare and use a wet mount.

**Materials**

* Compound microscope
* Glass slides
* Cover slips
* Eye dropper
* Beaker of water
* The letter "e" cut from newsprint
* Scissors
* 3 pieces of colored string (red, white, blue)

**A. Microscope Handling**

1. **Carry the microscope with both hands** --- one on the arm and the other under the base of the microscope.
2. One person from each group will now go over to the microscope storage area and properly **transport one microscope to your working area.**
3. The other person in the group will **pick up a pair of scissors, newsprint, a slide, and a cover slip.**
4. **Remove the dust cover** and store it properly. Plug in the scope. Do not turn it on until told to do so.
5. **Examine the microscope and give the function of each of the parts** listed on the right side of the diagram.

|  |  |
| --- | --- |
| lightmicroscopediagram2 | 1. eyepiece or ocular
2. body tube
3. fine adjustment knob
4. nosepiece
5. high power objective
6. low power objective
7. diaphragm
8. mirror (many   microscopes have a light instead)
9. base
10. coarse adjustment
11. arm
12. stage clip
13. inclination joint

  |

***Names of parts and their functions   (place these on a sheet attached to this report)***

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**\*\*Observation Drawing\*\***

**- I understand that not all of you are artists. But I DO understand you can draw better than kids in elementary school. When drawing observations, it is in your best interest to draw as ACCURATELY AS POSSIBLE AND USE DETAIL! This will help prove to me you are making good observations, and that you can prove your proper use of a microscope**

**B. Determining Total Magnification:**

1. Locate the numbers on the eyepiece and the low power objective and fill in the blanks below.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Eyepiece magnification \_\_\_\_\_\_\_\_\_\_\_\_\_\_** | **(X)** | **Objective magnification \_\_\_\_\_\_\_\_\_\_\_\_\_\_** | **=** | **Total Magnification \_\_\_\_\_\_\_\_\_\_\_\_\_X** |

2.       Do the same for the high power objective.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Eyepiece magnification \_\_\_\_\_\_\_\_\_\_\_\_\_\_** | **(X)** | **Objective magnification \_\_\_\_\_\_\_\_\_\_\_\_\_\_** | **=** | **Total Magnification \_\_\_\_\_\_\_\_\_\_\_\_\_X** |

3. Write out the **rule for determining total magnification of a compound microscope.**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# C. Observing the Letter “e”

 **PROCEDURE**

1. Cut out the letter “e” and place it on the slide face up.

2. Add a drop of water to the slide.

3. Place the cover slip on top of the “e” and drop of water at a 45-degree angle and lower. Draw what is on the slide in **Figure1**.

4. Place the slide on the stage and view in low power (4x). Center the “e” in your

field of view. Draw what you see in **Figure 2**.

5. Move the slide to the left, what happens? Move the slide to the right, what

happens? Up? Down?

6. View the specimen in high power (10x). Use the fine adjustment **only** to focus.

Draw what you see in **Figure 3**.

**Data**: Part 1- The letter “e”

**Figure 1**: Drawing of the letter “e” on the slide. (half page)

##  Figure 1 Drawing

**Figure 2**: Drawing of the letter “e” in low power (4x). (half page)

**Figure 3**: Drawing of the letter “e” in high power (10x) (half page)

### Figure 2 Drawing Figure 3 Drawing

**ANALYSIS:**

1. How does the letter “e” as seen through the microscope differ from the way an

“e” normally appears?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. When you move the slide to the left, in what direction does the letter “e” appear to

move? When you move it to the right? Up? Down?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. How does the ink appear under the microscope compared to normal view?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

4. Why does a specimen placed under the microscope have to be thin?
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

D. Observing the depth of string in a \* shape

 **PROCEDURE**:

* 1. Obtain a clean blank slide from your instructor
	2. Also obtain 3 different colored strings (red, white, & blue)
	3. Make a “STAR” shape with the 3 pieces of string
	4. Use a **cover slip** to cover the string while under the microscope to ensure that the pieces stay in place while observing
	5. Notice that you get a view of the depth of the string placed on top of one another.

**ANALYSIS**:

1. How does the light from below (diaphragm) help with your observations of layers of an object?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

E. Observing Prepared Slides (human bone & organisms)

 **PROCEDURE**

* + 1. Obtain a prepared slide of human bone from your instructor.
		2. Make sure to obtain clear focus on LOW POWER.
		3. Record and draw your observations in the figures (4 – 7) provided for each of the human bone slides & organism of your instructors choice.

 **Figure 4 Human Bone (4x) Figure 5 Human Bone (10x)**

 **Figure 6 (4x) Figure 7(10x)**

**NAME OF ORGANISM OBSERVED**:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**ANALYSIS**:

1. What did you notice that was the same when observing the letter “e” compared to the bone & organisms?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. What happened when you changed the magnification from low to high power when observing these types of cells? Use details when describing your observations.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. What are some parts of the cell that you can observe on high power?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

F. Starting “wet mounts” and observing cheek cells

 **PROCEDURE**:

* 1. Obtain a clean blank slide from your instructor. If slides have been previously used, they will be in an anti-bacterial cleaning solution. They will need to be rinsed off and dried before being used.
	2. Also acquire a cover slip to cover your cheek specimen.
	3. One lab group member will have to use a toothpick to scrape their cheek. Scrape some skin from the inside of your cheek and smear it on to the middle of the microscope slide. Your instructor will demonstrate.
	4. Once you have your cells on the slide, place 1 DROP of water on to the slide.
	5. Place the cover slip on the slide to protect the specimen. MAKE SURE THERE ARE **NO BUBBLES** IN YOUR COVER SLIP. Your instructor will demonstrate.

**\*\*When staining cells, make sure that your are VERY careful with your dye. It WILL stain your clothes!!!!**

* 1. Place 2 – 3 drops of ***methylene blue*** to one side of the cover slip. Use a piece of paper towel on the OTHER SIDE to suck the dye into the cover slip. Make sure that the dye does not make it out the other side, otherwise you will start sucking dye out of the cover slip.
	2. Record your observations in the figures (8 and 9) below and answer the questions that follow

 **Figure 8 (4x) Figure 9 (10x)**

**ANALYSIS**

1. What do YOU think is the purpose of mounting materials in water, not on a dry slide?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. What is the purpose of using the dye when observing animal cells?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. What parts of the cheek cell can you see when the objective is on low power? What about high power?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_