Introduction

Many people use microscopes daily. Lab technicians, doctors, and veterinarians use them to diagnose diseases in people and in animals. Even though it’s been around for years, the microscope is still one of the best “windows” into the world of disease.

"Micro" means tiny, "scope" means to view or look at. There are many different types of microscopes. The compound light microscope is the most common instrument used today. It contains two lenses, which magnify, and a variety of knobs to resolve (focus) the picture. It is a rather simple piece of equipment to understand and use. In this lab, we are going to learn the proper use and handling of the microscope.

Objectives

- Demonstrate the proper procedures used in correctly using the compound light microscope.
- Prepare and use a wet mount.
- Determine the total magnification of the microscope.
- Develop a checklist to insure the proper handling of the microscope.
- Understand the importance of microscopes as an important diagnostic tool in many careers.

Materials

- Compound microscope
- Glass slides
- Cover slips
- Eye dropper
- Beaker of water
- The letter "e" (cut from newspaper)
- Scissors
- Methylene blue stain
- Iodine stain
- Prepared slides
- Colored pencils

Drawing Specimens

1. Use pencil - you can erase and shade areas
2. All drawings should include clear and proper labels (and be large enough to view details). Drawings should be labeled with the specimen name and magnification.
3. Labels should be written on the outside of the circle. The circle indicates the viewing field as seen through the eyepiece, specimens should be drawn to scale - ie..if your specimen takes up the whole viewing field, make sure your drawing reflects that.

Procedures

I. Proper Handling of the Microscope

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, a cover slip and a toothpick.
4. Remove the dust cover and store it properly. Plug in the scope. Do not turn it on until told to do so.

II. Microscopes Usage “101”

1. With your scissors cut out the letter "e" from the newsprint.
2. Place it on the glass slide so as to look like (e).
3. Cover it with a clean cover slip. See the figure below:
4. Turn on the microscope and place the slide on the stage; making sure the "e" is facing the normal reading position (see the figure above). Using the course focus and low power, move the body tube down until the "e" can be seen clearly.

5. **Draw what you see** in the circle:

5. Describe the relationship between what you see through the eyepiece and what you see on the stage.

6. Offer an explanation of why this happened.

7. Look through the eyepiece, move the slide to the right. **What direction does the image move?**

8. Now, move it to the lower left side of the stage. **What direction does the image move?**

9. Re-center the slide and change the scope to high power. You will notice the "e" is out of focus. **Do Not** touch the coarse focus knob, instead use the fine focus to resolve the picture. **How does changing the magnification change what you see (once it is in focus)?**

10. Locate the diaphragm under the stage. Move it and tell me what happens to what you see.

### III. Preparing a wet mount slide “101”

1. Throw away the letter e. Get a toothpick.

2. Have one person scrape the inside of their cheek with the toothpick.

2. The other person should put one small drop of water on the slide.

3. Rub the toothpick in the water to allow the check cells to come off onto the slide.

4. Put a cover slip over the mixture.
5. Put a drop of blue dye at the corner of the cover slip and a piece of paper towel at the other side of the cover slip. This will "wick" the blue stain across the slide and stain your cells.

6. Draw what you see using the proper colors and label the cell membrane, nucleus and cytoplasm.

7. Get the prepared epithelial slide from *Canis lupus familiaris* (your pet dog) and *Equus caballus* (horse). Look at them under high power.

How do they compare to your cheek slide?

**IV. Plant Cells**

1. With the forceps, peel off a very thin piece of skin from the inner, concave side on an onion section. (It should look like Plastic Wrap.)
2. Place this small piece of onion skin on the microscope slide and add one or two drops of iodine. If the onion skin is wrinkled or overlapped, use a toothpick to straighten it. Carefully place a cover slip over the onion skin.
3. Place the slide on the stage of the microscope and examine the onion skin under low power. Once you have found the onion cells under low power, switch to the medium power objective. Draw what you see below:

Medium Power

Onion Cell Medium Power
Magnification= ______

Switch to the highest objective and draw what you see and label the cell wall, cytoplasm and nucleus.

Onion Cell High Power
Magnification= ______

Describe what the onion cells looked like. Be descriptive. ______________________________
_____________________________________________________________________________
_____________________________________________________________________________

V. *Elodea* Leaf Slide

1. Obtain a sprig of the aquarium plant known as *Elodea*. Pull off a small leaflet and place the upper surface of the leaf down on a clean microscope slide. Flatten it out with the forceps.
2. Place a cover slip on top of the specimen.
3. Examine the cells under low power first, then look at it under high power. Usually, in these cells, the nucleus is pretty hard to see due to the high number of chloroplasts. After studying the cells, draw what you see in your field of view below and label the cell wall, cytoplasm and chloroplast in ONE OF THESE CELLS!

Draw what you see below using the correct colors.
VI. Determining Total Magnification:

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

<table>
<thead>
<tr>
<th>Eyepiece magnification</th>
<th>Objective magnification</th>
<th>Total Magnification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(X)</td>
<td></td>
</tr>
</tbody>
</table>

2. Do the same for the high power objective.

<table>
<thead>
<tr>
<th>Eyepiece magnification</th>
<th>Objective magnification</th>
<th>Total Magnification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(X)</td>
<td></td>
</tr>
</tbody>
</table>

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

___________________________________________________________________________________________________

4. Remove the slide and rinse it off. Put it back with the other slides. The cover slip can be thrown away along with the toothpick.

VII. What a Veterinarian Might See

Blood

1. Obtain blood smears from the human, dog and horse. Look at each one individually and draw what you see in the correct circle. It is pink so make sure you get it focused on the proper thing. Eventually get it focused under high power. Draw what it looks like, using the correct colors, below.

   Human

   Dog

   Horse

2. How are they the same? ___________________________________________________________________________
3. Do you see any differences? ______ (If yes, explain.)______________________________________________________

4. What is the total magnification of this under high power? ____________________________________________________

5. Make a hypothesis as to what the red circles are that you drew._______________________________________________

**Deer Tick:** Draw a rough sketch of the tick.

1. Why do ticks live on dogs? ___________________________________________________________________________

2. What diseases do ticks carry?__________________________________________________________________________

**Ear Mites:** A local veterinarian prepared this slide. Look at it under low power. What animal do you think these were found in?__________

**Hairs:** Gently pull out one of your hairs. Put it on the slide and put the small cover slip over it. Look at it under the microscope. Get a sample of dog hair and horse hair. Look at them under the microscope. Draw what you see:

1. How are these the same microscopically?_______________________________________________________________

2. How are they different microscopically?_______________________________________________________________