 Name _____

Lab 01 - Using the Microscope

OBJECTIVES:

- To learn how to use and care for the compound microscope.
- To learn the names and functions of the parts of the microscope.
- To observe some interesting organisms.

We humans are highly visual creatures, obtaining much of our information about the world around us by using our eyes. To understand many things we need to *visualize* them: we must *see* them. Not surprisingly, then, some of the most useful tools in biology, and indeed in science in general, are those that allow us to visualize objects, processes, and phenomena. This is one of the main advantages of the powerful computers of today, because their power allows us to visualize things, and thus explore them, as never before possible. But even that technology cannot replace one of the most fundamental tools of biology, the **microscope**. With the microscope we can see things that are otherwise too small for us to see, and therefore study them.

There are many different kinds of microscopes. The microscope we will be using is the **compound light microscope**. In this lab we explore how to use and care for this most basic of biological tools.

GENERAL DIRECTIONS

1. Work individually. Everyone will turn in their own lab worksheet.
2. Obtain a microscope from the microscope cabinets & print your name on the microscope assignment sheet next to the microscope number that you selected.
3. Follow the instructions in the lab to familiarize yourself with how to use the microscope. Use the diagram of the microscope at the end of this lab to help you identify parts of the microscope.
4. At the end of the lab, be sure that:
   - the scope is turned off.
   - all slides are removed and returned to their proper container in the correct orientation.
   - the stage is wiped clean.
   - the scope is set with the lowest power objective (scanning objective) in place.
   - the stage is lowered (objectives raised) as much as possible.
   - the cord is properly wrapped.
   - the scope is returned to the proper location in the microscope cabinet.

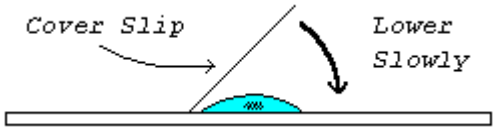
PROCEDURES

Part 1: Getting to know your tool.

Place the microscope on the table in front of you. Make sure it is close enough so that you can comfortably look through it from a seated position.

> *Note: never move the body of the microscope while in use – if your lab mate needs to look at the specimen, change seats, do not scoot the microscope over or you will lose your focus.*

Plug in the microscope and turn in on. You should see light coming from the bottom of the microscope. Turn the light intensity control knob to "4" ("5" tends to be too bright). Use the diagram at the end of the lab to help you identify parts of the microscope.



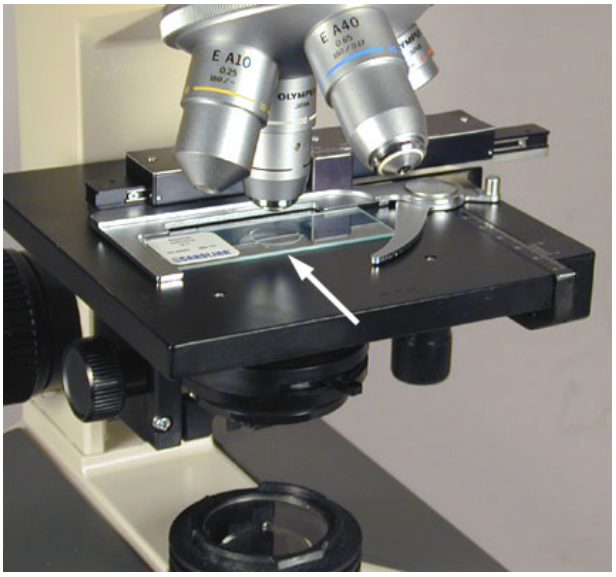
Prepare a wet mount slide with the letter "e" on it. To make your wet mount, obtain a clean glass slide, and one of the smaller, thin cover slips. Place the "e" in the center of your slide. Using a dropper, place a drop of water on top of the "e". Carefully lower one edge of the cover slip down, making contact with the edge of your drop. Then gently lower the cover slip down across your sample. (This will help prevent bubbles!)

Place the slide on the *stage*, in the *specimen holder*.

Locate the *X-axis knob* and *Y-axis knob*.
While looking at the slide on the stage (don't look into the eyepieces yet), turn the *X-axis knob* and examine what happens.

Now do the same with the *Y-axis knob*.

Note: If your slide does not move when you are turning the *X-axis knob* and *Y-axis knob*, then your slide is not placed in the *specimen holder* correctly (see picture).



To determine at what magnification you are observing your specimen (the **total magnification**) you will need to know the magnification of the eyepieces and the magnification of the objective lens. Locate your *eyepieces*. Their power or magnification is fixed at 10 times, which is written as 10x. Next find your *objective lenses*. Look at the number printed on the lens (it will be E A __). This number is the **magnification of the objective lens**, e.g., the lowest powered objective (sometimes called the **scanning objective**) has a magnification of 4 times (4x).

For **total magnification** multiply the power (magnification) of the eyepiece by the power of the objective lens, e.g., the total magnification while using the scanning objective is 40x (10x times 4x). Always include the total magnification in any sketches of specimens you make. You must include the "x" as part of the total magnification (e.g., 40x, 100x).

Locate the magnification of each of the objective lenses, list it in the table below, and then calculate total magnification for each objective lens.

Magnification of objective lens	**Total magnification**

Focusing
Always start with the scanning objective in place and the stage in its lowest position. Locate your *course focus knob* and *fine focus knob*. While looking at the stage (not through the eyepieces), move the course focus knob and watch what happens to the stage. Do the same with the fine focus knob. Return the stage to its lowest position before you continue.

Now look into the eyepieces with both eyes and raise the stage using the course focus knob. Raise the stage until it can't go any higher. While raising the stage, you should see the specimen come into focus and then go out of focus as you raise the stage all the way. Now lower the stage until the specimen is in focus. If you can't see the specimen (in this case the "e"), you will need to use the X- and Y-axis knobs to center the specimen.

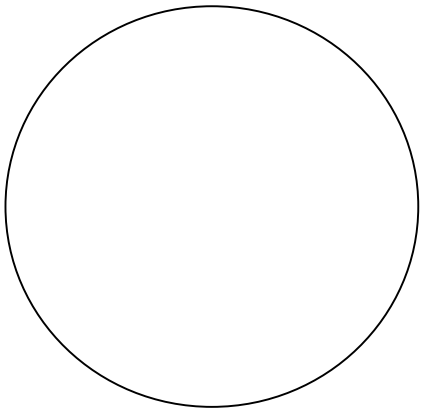
Now switch to using the fine focus knob. Turn the fine focus knob until the specimen is as clear as possible.

At this point you will want to adjust the width of the eyepieces to fit your eyes. Look through the eyepieces; if you see two circles, then the width of the eyepieces (interpupillar distance) is not correct for you. Slowly move the eyepieces closer together or further apart until you see the specimen in just one circle.

To adjust for differences between your eyes you will need to use the *diopter adjustment ring*. Close your left eye and use the fine focus knob until the specimen is clear. Then open your left eye and close your right eye. Turn the diopter adjustment ring until the image is in focus for your left eye. You will need to make these adjustments every time you start using your microscope.

Your "e" should now be centered and in focus under the scanning objective (4x objective).
Make a sketch of what you see in the circle.

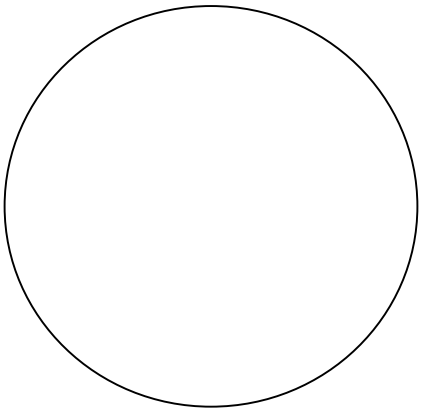
What is the total magnification?



To view the specimen under higher magnification, turn the objective lenses until the next highest objective lens (10x objective) is in place. **Using the fine focus knob only**, bring the specimen into focus. **Do not use the course focus knob** with any lens except the scanning objective –you will end up driving the lens against the slide and causing damage! Once the specimen is focused, use the X- and Y-axis knobs to center the specimen.

Your "e" should now be centered and in focus under the 10x objective.
Make a sketch of what you see in the circle.

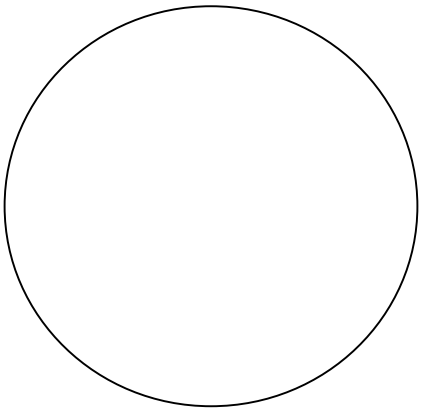
What is the total magnification?



To increase magnification again, turn the objective lenses until the next highest objective lens (40x objective, sometimes called the "high dry" lens) is in place. **Using the fine focus knob only**, bring the specimen into focus. **Do not use the course focus knob**! Once the specimen is focused, use the X- and

Y-axis knobs to center the specimen. You may need to adjust the *aperture iris diaphragm knob* to increase or decrease the amount of light coming through.

Your "e" should now be centered and in focus under the 40x objective.
Make a sketch of what you see in the circle.



What is the total magnification?

The 40x lens is the highest objective we will use in this class. The last objective (100x) can only be brought into focus using oil, a procedure we will not be using.

Clean-up:

- Put cover slip in broken glass jar.
- Put "e" in the garbage.
- Rinse slide, wipe dry with a tissue and return to the slide box. Please take care to make sure the slides are placed in the correct box and properly aligned!

Part 2: "Threads" slide

1. Obtain a "threads" slide from its box.
    - Observe under the 10x objective giving you 100x total magnification. Remember that you must start focusing using the scanning (4x) objective, and then move to the next higher objective lens.

    Are all three threads simultaneously in focus?

    - How would focusing in and out help you to determine the three-dimensional structure of a specimen? What order are the threads in?

        Top _____
        Middle _____
        Bottom _____

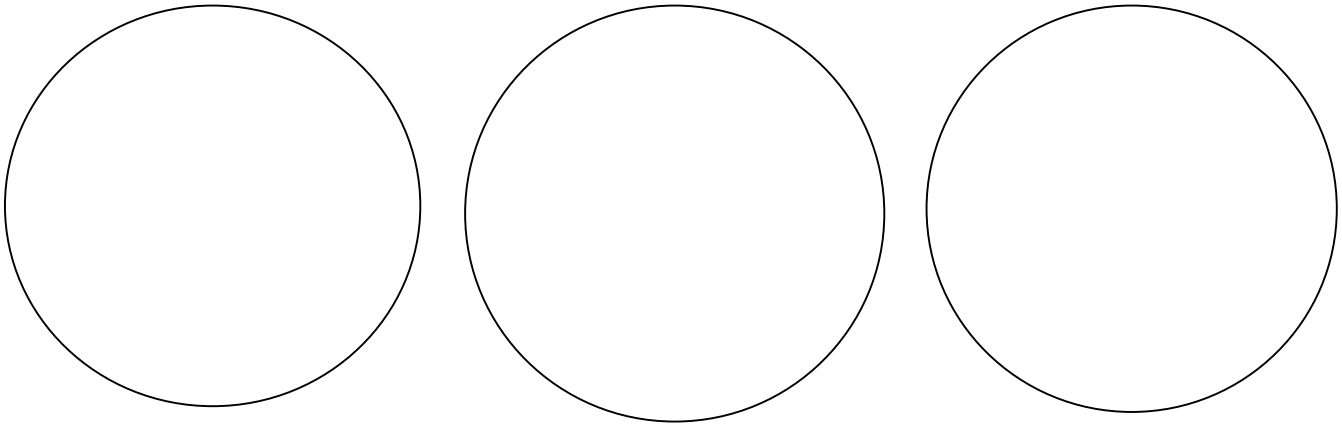
Clean-up:

- Return the "threads" slide to its box. Please take care to make sure the slides are placed in the correct box and properly aligned!

Part 3: Pond water sample

1. Now let's take a look at what sorts of organisms are hanging around in simple pond water. To do this, you'll need to prepare a wet mount. Obtain a clean glass slide and a cover slip. Using a dropper, place a drop of pond water in the center of your slide. (Keep in mind that many of the organisms will be near the bottom of the pond water sample.) Often these little creatures are swimming rapidly through the water, so in order for us to view them, we need to slow them down. Place a drop of methyl cellulose on top of your pond water. This viscous (syrupy) solution makes it difficult for them to swim quickly. Carefully lower one edge of the cover slip down, making contact with the edge of your drop. Then gently lower the cover slip down across your sample.

2. Take a few minutes to scan the slide, sketching <u>three different organisms</u> you see. Always include the ***total*** magnification you used when making your observations and label any structures in your drawing that you are able to identify. Be sure to include any colors, or other descriptive labels that may be helpful.



Total magnification: _____ _____ _____

Question: What type of organisms do you think you've found? What criteria have you used to decide this? Try identifying your organism(s) in a field guide.

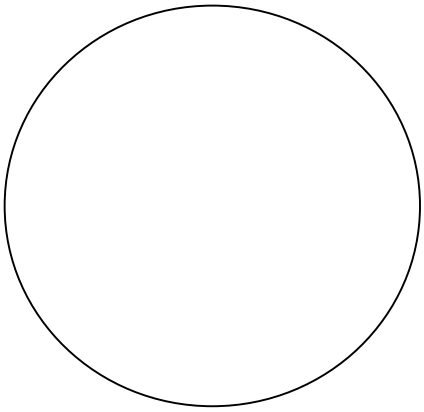
<u>Clean-up:</u>

- Put cover slip in broken glass jar
- Rinse slide, wipe dry with a tissue and return to the slide box. Please take care to make sure the slides are placed in the correct box and properly aligned!

Part 4: Observation practice

After your instructor has demonstrated techniques for drawing slides, select a slide from the samples and make a drawing here, using the 10x or 40x objective lens.

What is the total magnification you used?



CLEAN-UP OF COMPOUND MICROSCOPE

When finished, clean up the compound microscope and prepare it to be put back in the cabinet, as instructed on the 1st page of this lab:

- the scope is turned off.
- all slides are removed and returned to their proper container in the correct orientation.
- the stage is wiped clean.
- the scope is set with the lowest power objective (scanning objective) in place.
- the stage is lowered (objectives raised) as much as possible.
- the cord is properly wrapped.
- the scope is returned to the proper location in the microscope cabinet.

Have the instructor come and take a look at your microscope to be sure you have correctly prepared it to be put away. If it is correctly prepared, the instructor will put his/her initials here:

_____

After the instructor has checked your microscope, you may put the microscope away. Please return the microscope to its correct location by matching the numbers on the scope and in the cabinet.

The Olympus CX30/CX31 Biological Microscope