INTRODUCTION TO THE USE OF THE MICROSCOPE

Biologists use microscopes to enable them to study cells, the basic units of structure and function of all living things, because most cells are extremely small and cannot be studied in detail without technological assistance. Many types of microscopes have been developed to suit the varied needs of biological researchers.

We will be working with two different types of microscopes. One is a ***monocular*** (or ***binocular) compound*** microscope, which is used to view slides; the other is a ***dissecting*** microscope, which is used to view whole specimens and pond water samples. The compound microscope we will use is said to be ***parfocal***, which means that when you switch from the low power to the next-power lens the object will be kept in focus.

PART I: PARTS OF THE MICROSCOPE AND THEIR FUNCTIONS	
Ocular with pointer	
Body Tube	
Arm	
Coarse Adjustment	
Fine Adjustment	
Nosepiece	
Objective lenses	
Low Power	
Medium Power	
High (High Dry) Power	
Oil Immersion	
Inclination Joint	
Stage	
Stage Clips or Mechanical Stage	
Condenser	
Diaphragm	
Base	

PART II: HOW TO COMPUTE MAGNIFICATION

Multiply the power of the ocular lens (usually ocular lenses are 10x) times the power of the particular objective lens you happen to be using at that time. The power of each lens is printer on its outer surface: a number such as 4 or 10 followed by an *X*, meaning *the magnification of 4 x 10 = 40, or 10 x 10 = 100*.

PART III: HOW TO CARRY, STORE AND USE A COMPOUND MICROSCOPE

- When you store a microscope make certain that the ***low-power lens*** is in position above the opening at the center of the stage, the electrical cord is securely wrapped around the base of the microscope (not too tight – the cord will fray), the microscope arm is upright and not inclined and the body tube is adjusted to its lowest position.

- When you carry a microscope, make certain that you keep one hand under the ***base*** and the other on the ***arm*** of the microscope and hold the microscope close to your body.

- When you are ready to use a microscope place the microscope securely on the table (not too close to the edge) and plug it in, check to make certain that the light is working, make sure that the ***low-power lens*** is in position over the opening in the ***stage*** and clean the ***ocular*** and ***objective lenses*** with lens paper.

- Check the amount of light in the field of vision and adjust the ***diaphragm*** to increase or decrease the amount of light as needed, clean a slide with lens paper and then hold the slide up to the light to get an approximate location of the object you will be looking for.

- Place the slide under the ***stage clips*** (or mechanical stage clips) and use the ***coarse adjustment*** knob to locate the object you wish to study. Once you have located the object you wish to study and have it in approximate focus, use the fine adjustment knob to bring it into fine focus and then you can switch to another power.

CAUTION! **DO NOT** move the body tube or stage when changing from a low power to a high power lens. In other words, **DO NOT** use the coarse adjustment knob unless the low power lens is in position for use.

PART IV: PRACTICE WITH PREPARED SLIDES OF *e* AND COLORED THREADS

- Letter *e*:

(1) View the orientation of the letter *e* slide with your naked eye before you place it on the microscope stage. Observe its size, location and orientation.
(2) Study the characteristics of the letter *e* under low power, then medium power and finally high power. Note your observations.

- Colored Threads:

(1) Follow the same procedure with this slide that you used for the letter *e*.
(2) Attempt to focus where the threads cross over one another. Note your observations.

PART V: HOW TO PREPARE A TEMPORARY (WET-MOUNT) SLIDE

(1) Place a drop or two of water and/or staining solution on the center of a clean, dry microscope slide.
(2) Place the object to be examined into the drop(s) of water, take a cover slip and position the slip at the outer edge of the drop(s) of water.
(3) Position the cover slip so it creates an angle of 45' over the drop(s) of water then slowly lower the cover slip onto the water.
(4) Examine the object beginning with the low power lens in position and working upward in magnification until you reach high dry power. Diagram the organism(s) in the space provided below.

PART VI: USING THE OIL-IMMERSION LENS

(1) Get the object to be studied focused under high power as per the directions in part #3.

(2) Turn the high power lens up to the right away from the surface of the slide but do not allow the next lens to go into position over the slide.

(3) Use the space that was created between the lenses over the slide to add several drops of immersion oil to the surface of the slide, making certain that the oil is placed over the area to be examined.

(4) Return the high power lens to its position over the object.

CAUTION! When you are finished with your immersion oil examination remember to clean the objective oil-immersion lens with alcohol and lens paper.

Clean the microscope slide with kimwipes and if further cleaning is needed use soap and water, not alcohol.

PART VII: PRACTICE WITH THE DISSECTING MICROSCOPE

(1) Observe the finger bowl of pond water set up on one of the dissecting microscopes located on the back counter of our lab room.

(2) Notice that you can observe the organisms in a different way than with a regular compound microscope: you can watch them move freely in water and observe their entire body structure. With the regular microscope they can be crushed by the cover slip and are in such a tiny amount of water that the water heats very quickly (from the heat of the light bulb), causing the organisms to die more rapidly.

(3) Dissecting microscopes, therefore, are not just used for observations during dissection. They are also used to observe living things that can be kept alive during and after the observations. For example, you could observe the gill movements of a live fish without killing the fish. You could not, however, study high magnification details of the gills. That is what the other type of compound microscope is for!