

INTRODUCTION TO THE COMPOUND LIGHT MICROSCOPE

INTRODUCTION

One of the biologist's most important laboratory tools is the *compound light microscope* (Greek: micron = small and scopos = aim) which consists of two converging lens systems: the objective and the eyepiece. It is an instrument that is used to magnify objects that are too small to be seen with the unaided eye.

STUDENT OBJECTIVES

1. Learn proper handling of the compound microscope.
2. Know and label the names and functions of the parts of the microscope.
3. Prepare a slide.
4. Acquire skills in using low and high-power magnification.
5. Estimate sizes of specimens.

PRE-LAB QUESTION

1. Explain the difference between magnification and resolution. Which is more important?
2. Explain the function(s) of each of the following parts of the compound light microscope:
 - a. Ocular lens
 - b. Nosepiece
 - c. Wide angle objective lens
 - d. Low power objective lens
 - e. High power objective lens
 - f. Diaphragm
 - g. Coarse adjustment knob
 - h. Fine adjustment knob.

MATERIALS

Microscope, glass slide, cover slips, lens paper, slide with a small clear metric ruler, letter "e."

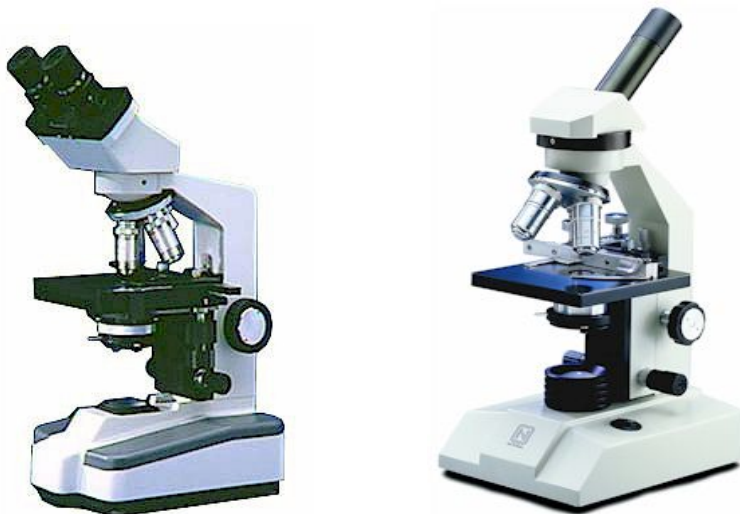
PROCEDURE

Last lab you received a "LAB BENCH NUMBER." This number corresponds to your seat at your lab bench. It is also the number on your microscope and other materials that you will use during the term. You are responsible for items with this number. Get the microscope with your number.

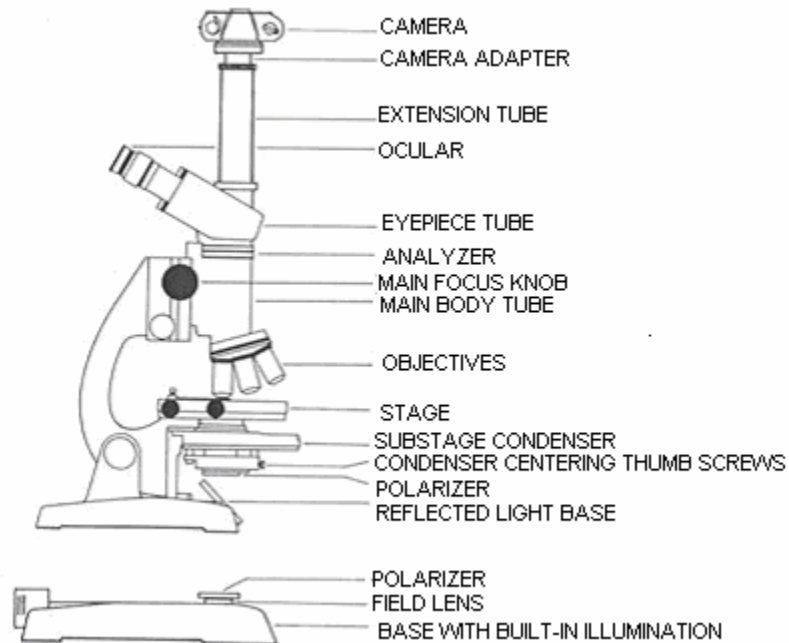
I. Parts of the Microscope

1. As your teacher reviews the parts of the microscope and their uses, you should label the microscope.

The following are common compound microscopes in the Biology Department:



You can find the names of the parts of the microscope from the diagram below:



2. The following rules for the proper use of the microscope should be remembered:
 - a. Always use two hands when carrying a microscope. One hand should be grasping the arm of the microscope while the other hand should be under the base. Always keep the base parallel to the floor.
 - b. Place the microscope on the desk with the arm away from you.
 - c. **ONLY use lens paper** to clean the lenses and the mirror before use.

II. Using the microscope

1. Setting up the microscope.
 - a. Revolve the low-power objective until it is centered over the hold in the stage.
 - b. Lower the low-power objective until it is 1 cm from the stage.
 - c. Turn on the light (some microscopes may have a concave mirror) and open the diaphragm to produce a bright circle of light. This circle is your field of vision (FOV).
 - d. After you have prepared the material to be viewed you will continue with the following.
2. Focusing the microscope.
 - a. Place the slide on the carrier on the stage between the prong and the spring clip so that it nestles against the edge of the carrier. **DO NOT** put the slide under the metal carrier. Adjust the carrier so that the slide is centered over the hold.
 - b. Remember the low-power objective is in place.
 - c. To focus, always start with the coarse adjustment. Focus by moving the stage slowly down. If you have moved the focus a long way and nothing has appeared, you may have to move the stage slowly up until it is a little less than 1 cm from the objective. Move the stage down again until you find the material on your slide.
 - d. For high power, swivel the high-power objective into place carefully. Focus using the **FINE ADJUSTMENT ONLY**.
 - e. When finished, swivel the nosepiece into the "neutral" position (no objective is in place) and remove the slide from the stage.

III. The letter “e”

1. Preparation and examination of the LOWER CASE letter “e” slide.
 - a. Prepare slide for observation by placing a piece of letter “e” on a slide (the rectangular piece of glass) in an upright position. Cover it slowly with a coverslip (the small plastic square).
 - b. Place the slide over the hole on the stage. Keep the “e” in the upright position.
 - c. Follow the instructions in procedure II for focusing low-power objective.
2. Observation of the letter “e”
 - a. Observe the letter “e” under the 4X, 10 X, and 40X objectives separately.
 - b. Under the low-power objective, note the orientation of your letter “e”. Move the slide gently to the right and note the direction in which the letter moves. Move the slide away from you and note the direction in which the letter moves.
 - c. Turn to High Power (40X). Use **FINE ADJUSTMENT ONLY** to sharpen the image. Note the appearance of the image.
 - d. On your answer paper, draw a circle about 5 cm in diameter to represent the circle of light (field of vision) that you observe in the microscope. Try to draw a suggestion of the threadlike texture of the letter “e” that you observe. **DRAW** what you see and note the appearance of the letter and threads of paper.

IV. Measurement of the size of the field.

1. Switch the nosepiece into the neutral position.
2. Remove the slide.
3. Place a piece of clear metric ruler on the stage. Carefully switch to the low-power objective. Focus with the coarse adjustment knob. Position the ruler’s bottom edge along the diameter. **ESTIMATE** the size, in micrometers (μm), of the field of vision and record your answer on the answer page.
4. Magnification has an **INVERSE** relationship to the diameter of the field of vision. If the high-power magnification is approximately 4 times that of the low power, what would be the size of the FOV in proportion to the low-power objective? Determine the actual size, in micrometers (μm), of the high-power field of vision for your answer page.
5. Diagram the ruler under the microscope for each objective requested by your teacher.