

## The Compound Light Microscope

### Introduction

The compound microscope is an important scientific tool. It enables a person to observe specimens too small to be seen with the unaided eye. There are two lenses that make up this microscope. The objective lens forms an enlarged image of the object (the specimen) while the ocular lens is used to look through and further enlarges the image.

### Objectives

In this lab activity you will:

1. Learn the parts and operation of the compound light microscope.
2. Learn to prepare and observe a wet mount using the compound light microscope.

### Materials

Compound light microscope	Water
Slides	Magazine paper
Cover Slips	Hairs
Lens Paper	Ruler
Paper Towels	Lens Paper
Newspaper	Scissors
Forceps	

### Part I – Getting to know the Compound Microscope

1. Get microscope from the closet and carry it with TWO HANDS! A MICROSCOPE IS AN EXPENSIVE PIECE OF LAB EQUIPMENT, SO HANDLE IT WITH CARE!
2. Identify the parts of the microscope using the diagram on the last page of this lab
3. Your microscope has a built in lamp powered by electricity. Plug the microscope into an outlet by your lab bench.
4. Now locate the diaphragm of the microscope. Adjust it so the most light possible enters the microscope. You can tell how much light enters the microscope by looking through the ocular.
5. Adjust the nosepiece of so your microscope is on the lowest power. This power is known as the scanning objective. Find the number on the side of the objective that is followed by an X. This number indicates how many times an object is magnified by the lens.
  - a. What is the magnifying power of the scanning objective?
  - b. What is the magnifying power of the low power objective?
  - c. What is the magnifying power of the high power objective?
6. Clean the objective and ocular lenses with lens paper.
7. The ocular lens also has a magnifying power.
  - a. Indicate the magnifying power of the ocular lens.
8. The total magnification of the microscope is found by multiplying the magnifying power of the ocular by the magnifying power of the objective.
  - a. Calculate the total magnification of the microscope using scanning power (show all calculations)
  - b. Calculate the total magnification of the microscope using low power.
  - c. Calculate the total magnification of the microscope using high power.
9. Turn the coarse adjustment. Describe what happens to the microscope.
10. Turn the fine adjustment. Describe what happens to the microscope.

## Part II – Wet Mount Preparation

1. Find a small, lower case “e” in regular print section of a newspaper article.
2. Cut the “e” out in a square shape and place the “e” in the middle of a slide. A pair of forceps may be helpful in handling the paper “e”.
3. With an eye dropper, put one drop of water in the paper “e”. Do not touch the eye dropper to the paper!
4. Cover the wet mount with a clean cover slip in the manner shown in the diagram below. **Do NOT** press on the press on the cover slip. A good wet mount is bubble free. If your slide has too many bubbles, take off the cover slip and absorb the excess water with a paper towel.
5. Draw the letter “e” on your paper exactly in the same size and position as it is on your slide.
6. Click the low power objective into place.
7. Check to make sure the bottom of your slide is dry and then place it on the stage of the microscope. **Set the slide on the stage so that the “e” is over the hole in the stage.** Fasten the slide to the stage using the stage clips.
8. Look through the ocular keeping both eyes open. Keeping both eyes open prevents eye strain – it gets easier with practice!
9. Slowly raise the stage by turning the coarse adjustment until the letter “e” comes into focus. Use the fine adjustment to sharpen the focus.
  - a. Draw the letter “e” on your paper (in a field of view) in exactly the same size and position that you see it through the microscope.
  - b. Move the slide to the left. Which way does the image move?
  - c. Move the slide to the right. Which way does the image move?
  - d. Move the slide toward you. Which way does the image move?
  - e. Move the slide away from you. Which way does the image move?
  - f. Observe the wet mount as you rotate the diaphragm. Describe what happens.
10. Re-center and refocus the image. Carefully switch to high power. **DO NOT USE THE COARSE ADJUSTMENT UNDER HIGH POWER. ONLY USE THE FINE ADJUSTMENT.** If you use the coarse adjustment you can crack the lens or the slide. Carefully focus with the fine adjustment.
  - a. Draw the letter “e” exactly as you see it under high power. (Remember to draw the “e” in a field of view).
  - b. Is the field of view larger under high power or low power?
  - c. Compare you’re the brightness of the field under high and low power.

## Part III: Resolving Power

1. Make a wet mount using a 1 cm. square of colored newspaper cartoon or a colored picture from a magazine printed on thin paper. Choose a square of color that does NOT have a black color on it.
  - a. Record the colors you see in your field of view.
2. Carefully switch to high power.
  - a. Record the colors you see in your field of view.
  - b. Describe how these colors are distributed.

**Resolving power** is the ability of a microscope to distinguish between two separate points that are very close together.

3. Prepare a wet mount with two hairs that are different colors. Cross them on the slide then add a drop of water and a cover slip. Center the area where the two hairs cross over the opening on the stage. View the hairs under low power at the point where the two hairs cross.
  - a. Are both hairs in focus under low power?
4. Switch to high power and describe what you see in the field of view.
  - a. Are both hairs in focus under high power? Explain.
5. Clean up your lab space – throw away your cover slip, wash and dry your slide, turn off your microscope, wrap up the cord and put your microscope away. Once your lab space is clean, you may start working on the analysis and conclusion questions.

### **Analysis and Conclusion Questions**

1. Briefly describe the function of each of the following microscope parts:
  - a. ocular
  - b. coarse adjustment
  - c. nosepiece
  - d. stage
  - e. diaphragm
  - f. objectives
  - g. fine adjustment
2. Why should a wet mount have no bubbles?
3. What did the microscope “do” to the letter “e”?
4. Why must you center and focus the object under low power before switching to high power?
5. Why is the fine adjustment only used when focusing a compound light microscope under high power?
6. Why did the color of the magazine look different when you looked at it under the microscope?
7. If you were scanning a slide to find a particular area, which objective would be better to use? Explain.
8. Which factor limits the usefulness of a compound microscope: magnification or resolving power. Please explain your answer.