

Using a Compound Microscope

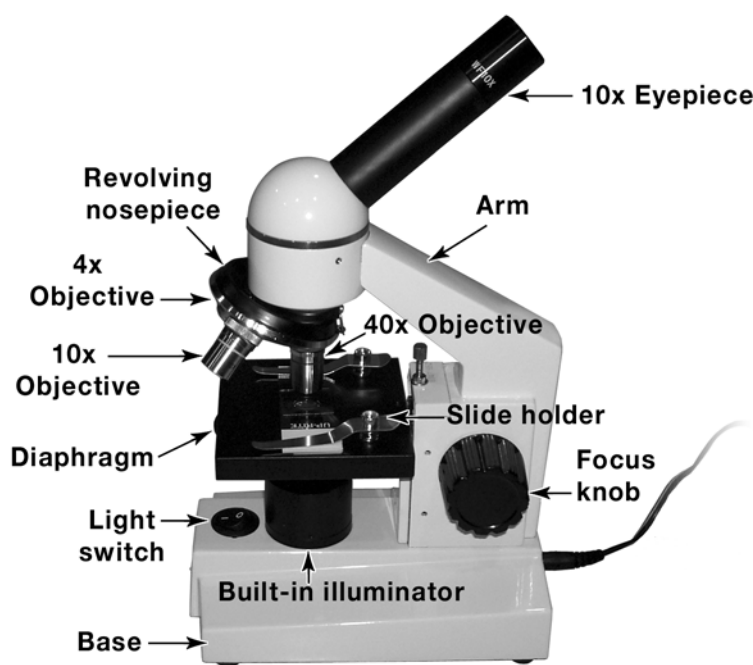
How do you use a compound microscope to see objects?

Have you ever used a magnifying glass? Objects under the magnifying glass look larger than real life. A compound microscope is like a magnifying glass that uses more than one lens to magnify small objects. In this investigation you will become familiar with the parts of the compound microscope. Then you will examine a specimen with microscope and practice using different levels of magnification.

Materials

- Compound microscope
- Power supply
- Clean glass slides
- Permanent markers
- Prepared specimens on glass slides
- Lens paper

1 Identifying the parts of the microscope



Look at the picture above. Each of the parts of the microscope is labeled. The major parts of the microscope are the light source, the specimen stage, the eye piece, and the objective lenses. You will find a description of the microscope parts at the end of this write up.

2 Care of the microscope

Microscopes are expensive pieces of equipment containing glass parts that can break or scratch easily. Never touch the glass with your fingers.

1. Always carry the microscope with two hands. Hold the arm of the microscope with one hand and support the base with the other hand. Never turn the microscope upside down or the eyepiece could fall out.
2. Place the microscope on a level surface.
3. Check to make sure the battery operated built-in illuminator is working. The microscope comes with a battery charger that can be plugged into an electrical outlet, if needed.
4. Without removing them, inspect the objectives, eyepiece, and illuminator for dust. If necessary, wipe the glass surfaces with lens paper. Store the microscope with a dust cover to keep it clean.
5. When you are finished using the microscope, switch to the lowest power objective (4x), lower the stage, switch off the power, cover the microscope with a dust cover, and return the microscope to its storage area.

3 Setting up the microscope

The microscope allows you to look in the eyepiece and see an image of the object on the stage. There are some differences between the image and the object. By following these directions, you will see how the image is different from the object.

1. With your teacher's permission write a small letter "e" on a glass slide with a permanent marker.
2. Turn on the built-in illuminator.
3. Place the slide on the stage with the letter "e" facing you. Secure the slide under the slide holders.
4. Lower the stage until it is about half way between the built-in illuminator and the objective.
5. Move the revolving nosepiece slowly until the 4x objective is clicked into place and directly above the object.
6. Look into the eyepiece. Adjust the focus knob until the image appears in focus.
7. Carefully move the slide until the image is centered. Focus again if necessary. What do notice about the direction of the letter "e"?
8. What happens to the image when you move the slide to the right? To the left? Forward? Backward? Specimens appear reversed when you look at them under the microscope because a mirror is used inside the microscope to direct the light rays to the eyepiece.

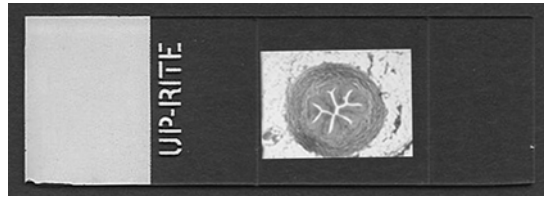


4 Adjusting the microscope

The microscope is adjustable so you can look at different types of samples. The following directions explain the adjustments you can make to get the best images possible.

1. Use the focus knob to move the stage up and down to see your specimen more clearly. The stage should be lowered when you are putting a slide on or off the stage.
2. Change the objective you are using by rotating the revolving nosepiece until a new objective clicks into place directly above the slide. An objective with a larger number increases the size of the image. Each objective has its magnifying power stamped on it.
 - a. Find the 4x, the 10x, and the 40x objectives.
 - b. Always start with the 4x objective directly above the slide when looking at a sample for the first time. View the sample through the eyepiece and bring it into focus.
 - c. Center the object by moving the slide with your hand before changing the objective.
 - d. Objectives are said to be parfocal if you can change from one objective to another without having to refocus the image very much. See if your image appears in focus when you switch to the 10x objective.
 - e. Using a 10x objective and a 10x eyepiece the object appears one hundred times larger than its actual size. This number is called the total magnification. To solve for the total magnification, multiply the number on the objective times the number on the eyepiece. Solve for the total magnification for a 4x objective and a 10x eyepiece. Repeat the calculation using the 40x objective and the 10x eyepiece.
 - f. After increasing the magnification, you will notice two things about the image. The image may appear darker, and the field of view becomes smaller. Objects near the edge of the image may disappear when you switch to a higher magnification. If your specimen is no longer visible, center the image at low magnification before switching to a higher magnification. These two effects are the normal result of switching to a higher magnification.
 - g. Rotate the nosepiece slowly to move the 40x objective in place. Watch the microscope from the side while you do this. The 40x objective is very close to the stage when it is used correctly. The 40x objective is spring-loaded and retractable to prevent damage to the objective and slide in most cases. View your specimen through the eyepiece and adjust the focus if necessary.
 - h. At higher magnification the amount of light entering the objective decreases. To increase the amount of light passing through the specimen, rotate the diaphragm under the stage. Select one of six different size holes to control the amount of light passing through.

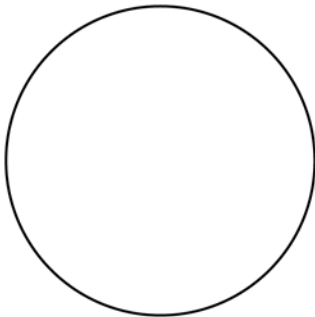
5 Examining specimens under a microscope



Your teacher will provide you with prepared specimens on slides. In some cases, a stain has been used to allow you to see the specimen better. Follow the steps below to set up the microscope and record your observations.

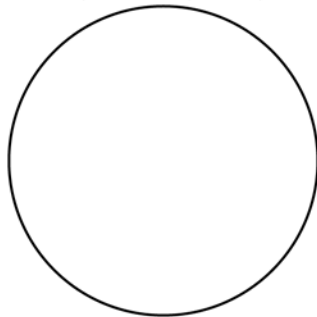
1. Lower the stage until it is about half way between the built-in illuminator and the objective.
2. Turn on the built-in illuminator.
3. Place the slide on the stage and secure it with the slide holders.
4. Move the revolving nosepiece slowly until the 4x objective clicks into place and is directly above the object.
5. Look into the eyepiece. Bring the slide into focus using the focus knob.
6. Make a detailed sketch of what you see in the space below. Record your specimen name and your observations
7. Use the 10x objective and repeat steps 5 and 6.
8. Use the 40x objective and repeat steps 5 and 6.

Specimen: _____
(Low power)



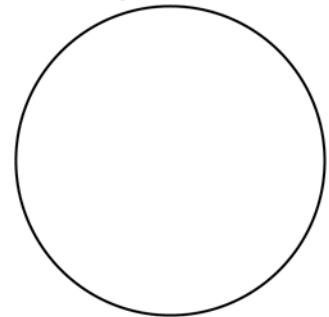
Observations:

Specimen: _____
(Medium power)



Observations:

Specimen: _____
(Highpower)



Observations:



6 Glossary of microscope parts

- **10x Eyepiece:** One (monocular) or two (binocular) lenses that you look through to see the image
- **Built-in pointer:** A pointer inside the eyepiece to help you center your image
- **Arm:** Supports the upper half of the microscope
- **4x Objective:** Low power scanning objective
- **10x Objective:** Medium power objective
- **40x Objective:** High power objective
- **Revolving nosepiece:** Can be rotated to change objectives
- **Stage:** The platform for holding the slide
- **Focus knob:** The knob that adjusts the height of the stage
- **Specimen:** Sample to be observed on the slide
- **Slide:** Glass support for specimens
- **Cover slip:** Glass cover for specimens
- **Light switch:** Switch to turn on built-in illuminator
- **Built-in illuminator:** Light source required to view specimens
- **Base:** Supports entire microscope
- **Power cord:** For recharging batteries to illuminator
- **Slide holder:** Clips to hold slide to stage
- **Diaphragm:** Adjusts amount of light entering specimen