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Guided Inquiry • **Skills Lab**

Using a Compound Microscope

Problem

What is the proper way to use a compound microscope and prepare a wet-mount slide? PART OF YOUR EXAM FOR THIS UNIT WILL BE FOR YOU TO PROPERLY DEMONSTRATE THAT YOU CAN USE A MICROSCOPE CORRECTLY.

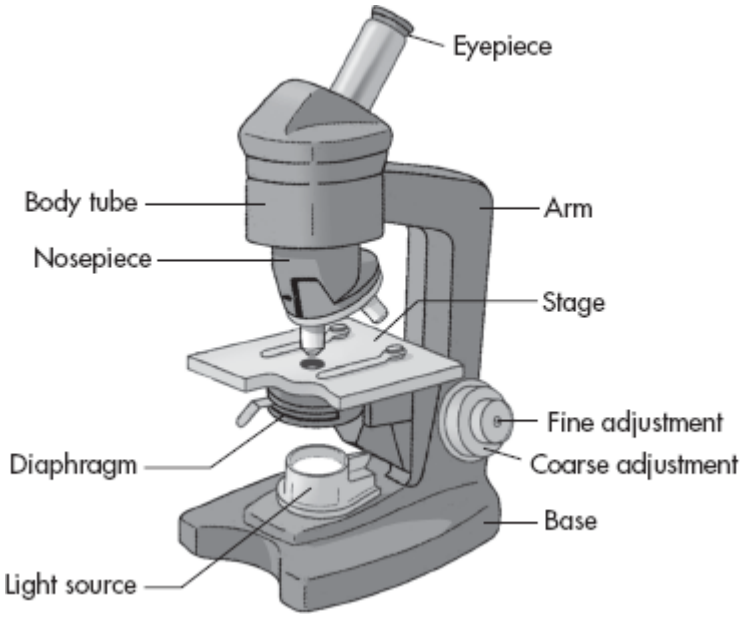
Introduction

A microscope is a device that magnifies objects that are too small to be seen by the eye alone. A compound microscope has three main parts that work together to bring a magnified image to your eye. A light source illuminates the object being observed. A lens on the nosepiece magnifies the image of the object. A lens in the eyepiece further enlarges the image and projects the image into your eye.

Thin glass plates, or slides, are used to observe biological specimens under a microscope. The slides are made in one of two ways. A prepared slide is made by encasing a specimen in glass. This permanent slide can be stored and viewed many times. A wet-mount slide is made by enclosing a drop of liquid containing the specimen between the slide and a thin glass coverslip. This temporary slide is made to last only a short time—usually one laboratory period.

The microscope you will use will be similar to the one shown in Figure 1. A microscope is a precision instrument that requires careful handling. In this lab, you will learn how to use a compound microscope. You will also learn how to prepare a wet-mount slide.

Figure 1 Parts of a microscope



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Skills Focus

Observe, Calculate, Compare and Contrast

Materials

- compound microscope
- lens paper
- prepared slide
- scissors
- newspaper
- microscope slide
- dropper pipette
- coverslip
- dissecting probe

Safety

To avoid damaging a microscope, follow the rules that are stated in this lab. Handle slides gently to avoid breaking them and cutting yourself. Alert your teacher if you break a glass object. To avoid electrical shocks, make sure that cords, plugs, and your hands are dry when using the light source. Use the scissors only as instructed. Do not direct the points of the scissors toward yourself or others.

Pre-Lab Questions

1. **Infer** Why is it important to keep a microscope at least 10 cm from the edge of the table?

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2. **Compare and Contrast** Why are you allowed to use the coarse adjustment when you focus the low-power objective lens but not when you focus the high-power objective lens?

_____

3. **Predict** How will the image of the letter *e* change when you switch from low power to high power?

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Procedure

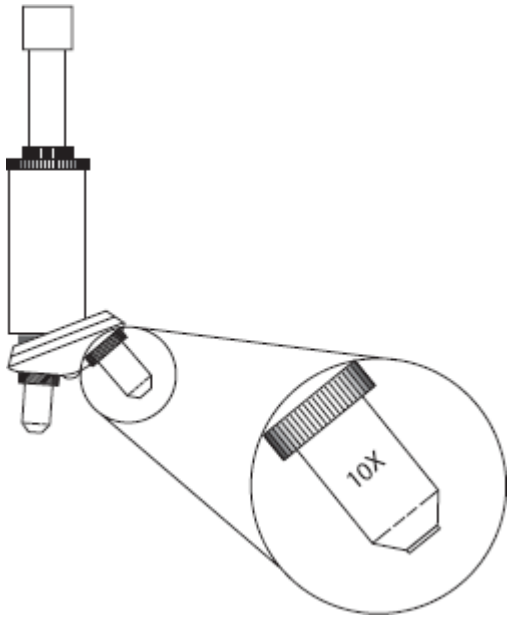
Part A: Practice Using the Microscope

1. Collect a microscope and bring it to your workstation.

RULE 1: Always carry a microscope with both hands. Grasp the arm of the microscope with one hand, and place your other hand under the base. Hold the microscope in an upright position so that the eyepiece cannot fall out. Place the microscope at least 10 cm from the edge of your table or desk with the arm facing you.

2. The magnification for a lens is etched on the side of the objective. In Figure 2, the lens has a 10 × magnification, which means that it will produce an image that is ten times the actual size of the object being viewed. Find the magnification for each objective lens and record this data in the table. Then find and record the magnification for the eyepiece. To find the total magnification under each power, multiply the objective magnification by the eyepiece magnification. Record the results in the table.

Figure 2 Nosepiece with objective lens



Data Table			
Objective	**Objective Magnification**	**Eyepiece Magnification**	**Total Magnification**
Low power			
Medium power			
High power			

3. Before you use a microscope, you should clean the objective lenses and the lens in the eyepiece.

RULE 2: To avoid scratching the lenses, always use lens paper to clean the lenses. Use a new piece of lens paper for each lens because dust picked up from one lens could scratch the next lens. Never touch a lens with your finger. Oils on your skin can attract dust that could scratch the lens.

4. Look at the microscope from the side. The low-power objective should be about 3 cm from the stage. Rotate the nosepiece until you hear the high-power objective click into position. Note that the high-power objective is longer than the low-power objective.

RULE 3: Always view the microscope from the side when you move an objective to avoid damaging the lens or a slide.

5. Rotate the nosepiece until the low-power objective clicks into position. Find the coarse adjustment knob and practice using it to raise and lower the nosepiece.

6. Plug in the cord attached to the light source. Look through the eyepiece. Practice using the diaphragm to adjust the amount of light entering the microscope.

RULE 4: To avoid eyestrain, keep both eyes open while looking through the eyepiece.

7. Center a prepared slide over the opening in the stage. Hold the slide by its edges to avoid leaving fingerprints that could distort the image. Use the stage clips to hold the slide in place. Make sure the low-power objective is still in position. While you look from the side, use the coarse adjustment to move the objective as close to the stage as possible without touching the stage.

8. Use both eyes to look through the eyepiece. Turn the coarse adjustment to move the low-power objective *away* from the stage until the object comes into focus.

RULE 5: To avoid hitting a slide, never move an objective toward the stage while looking through the eyepiece.

9. Use the fine adjustment to bring the object into sharp focus. You may need to adjust the diaphragm to see the object clearly. Draw what you can see under low power in Figure 3 on the next page.

10. While you look from the side, rotate the high-power objective into position. Look through the eyepiece and use the fine adjustment to bring the object into focus. Draw what you can see under high power in Figure 3.

RULE 6: Never use the coarse adjustment when you are using a high-power objective.

11. Move the low-power objective back into position. Remove the slide from the stage.

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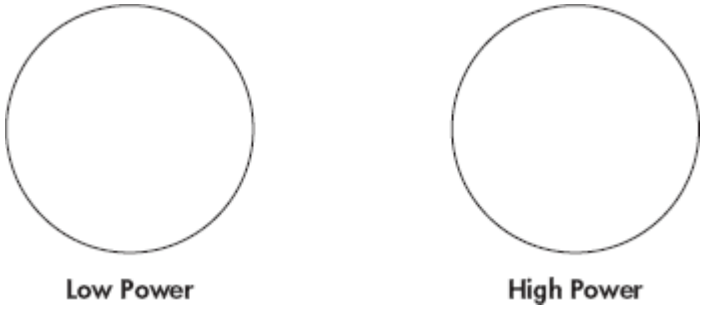
Figure 3 Prepared slide under low power and high power

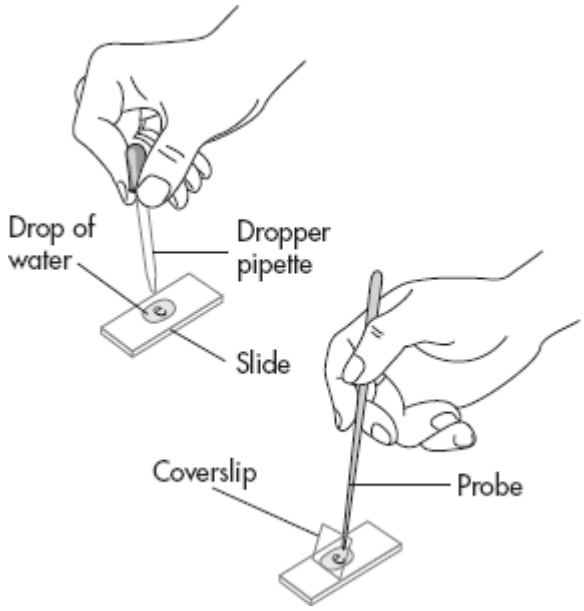


Part B: Prepare a Wet-Mount Slide

12. Look for the smallest lowercase letter e you can find in a newspaper. Cut out the letter and place it on the center of a slide. Use a dropper pipette to place one drop of water on the letter, as shown in Figure 4.

13. Place a coverslip so that one edge touches the side of the drop at a 45º angle, as shown in Figure 4. Use a dissecting probe to slowly lower the coverslip onto the paper. This slow movement should prevent air bubbles from being trapped between the slide and the coverslip, which could distort the image.

Figure 4 How to prepare a wet-mount slide



14. If necessary, use a paper towel to dry the bottom of the slide. Center the slide on the stage with the *e* right side up. Rotate the low-power objective into position and bring the *e* into focus. Draw what you can see under low power in Figure 5.

15. As you look through the eyepiece, move the slide to the left. Notice the way the image of the letter moves. Now move the slide to the right and notice the way the image moves. Move the slide toward the arm and away from the arm and observe how the image of the letter moves.

16. Rotate the high-power objective into position and focus the *e*. Draw what you can see under high power in Figure 5.

Figure 5 Wet-mount slide under low power and high power

17. Take apart the wet mount. Discard the newspaper. Clean the slide and coverslip with soap and water. Carefully dry the slide and coverslip with paper towels and return them to their boxes.

18. Rotate the low-power objective into position and use the coarse adjustment to place it as close to the stage as possible without touching the stage. Carefully pick up the microscope and return it to its storage area.

Analyze and Conclude

1. Apply Concepts The adjective *compound* means "made by the combination of two or more parts." In a compound microscope, which are the parts that are being combined, and why?

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2. **Compare and Contrast** How is the image of an object seen through a high-power objective different from the image seen through a low-power objective?

3. **Observe** How did the position of the *e* appear to change when it was viewed through the microscope?

4. **Draw Conclusions** You observe an ant through the eyepiece of a microscope. The ant moves toward the bottom of the slide and then it moves to the right. What do these observations tell you about the actual movement of the ant?

5. **Form a Hypothesis** Why must scientists cut a thin slice from a biological specimen before they can view it under a microscope?

WHEN YOU HAVE COMPLETED THIS LAB PLEASE LET YOUR INSTRUCTOR KNOW SO THEY CAN VERIFY YOU ARE DONE AND HAVE PROPERLY CLEANED UP YOUR LAB AREA.