

Chapter 1 The Science of Biology

Exploration

Using a Compound Microscope

In this investigation, you will use a compound light microscope to determine the positions and sizes of objects. Before you begin, read the safety rules described in Appendix B. Then, read Appendix D to learn how to use a microscope.

Problem

What kinds of information can a compound microscope provide?

Materials

- compound microscope
- microscope slide
- newspaper or other small-print text
- scissors
- dropper pipette
- coverslips
- prepared slide of crossed fibers
- transparent 15-cm plastic ruler
- prepared slide of root or stem
- prepared slide of bacteria

Skills Observing, Measuring, Calculating

Procedure  

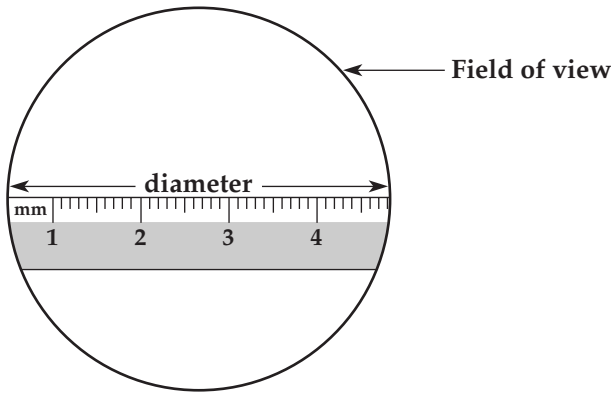
1. Use scissors to cut out a square of printed text approximately 1 cm wide. Place the paper square on a microscope slide. **CAUTION:** *Be careful when handling sharp instruments.*
2. Use a dropper pipette to place a drop of water on the paper square. Add a coverslip. Place the slide on the stage of a compound microscope. Use the stage clips to hold the slide in place.
3. Use the low-power objective to bring the letters on the paper square into focus. Slowly move the slide in different directions along the stage. On the lines below, record how the image changes. **CAUTION:** *Handle the microscope carefully.*

Observation: _____

4. Observe a prepared slide of crossed fibers through the low-power objective. Use the fine adjustment to focus up and down through the area where the fibers cross. On the lines below, record the order of the fibers, from top to bottom.

Observation: _____

5. Observe a transparent ruler through the low-power objective. Use the ruler to measure in millimeters the diameter of your field of view as precisely as you can. Record this distance and the magnification of the low-power objective.



6. Calculate and record the diameter of the field of view through the other objectives. For example, if a 4× objective has a field of 2 mm (2000 micrometers), then a 10× objective will have a field of $(4 \div 10) \times 2 \text{ mm} = 0.8 \text{ mm}$ (800 micrometers).

Data Table	
Objective Size	Diameter of Field of View

7. Examine a prepared slide of a plant stem or root at low and high powers. The small round shapes you see are cells. Use the field diameters you calculated in step 6 to estimate and record the size of a typical plant cell. For example, if 4 cells fit across an 800-micrometer field, then each cell is 200 micrometers long.

Observation: _____

8. Repeat step 7 with a prepared slide of bacteria.

Observation: _____

Analyze and Conclude

1. **Applying Concepts** What are the advantages of using the high-power objective? What are the disadvantages?

2. **Inferring** Some plant diseases are caused by bacteria. Could a bacterium injure a plant by surrounding a plant cell and consuming it? By entering a plant cell? Explain your answer.

3. **Drawing Conclusions** In what ways did the microscope alter the image in step 3? How did moving the slide affect the image?

4. **Drawing Conclusions** In what order were the fibers arranged on the slide you observed in step 4?
