

# 2-1 What is a microscope?

## INVESTIGATE



### Making a Simple Microscope HANDS-ON ACTIVITY

1. Dip the hole in a key into a glass of water. Make sure that a drop of water stays in the hole.
2. Look through the drop of water to read the small print in a book.
3. Move the key up and down very slowly. What happens?

**THINK ABOUT IT:** How did the drop of water change the way the text appears?



### Objective

Describe microscopes and their parts.

### Key Terms

**microscope:** tool that makes things look larger than they really are

**lens:** piece of curved glass or other clear material that causes light rays to come together or spread apart as they pass through

**Microscopes** One of the most important tools used to study living things is the **microscope**. *Micro-* means "very small." *Scope* means "to look at." A microscope is a tool used to make things look larger than they really are.

1 ► **DEFINE:** What is a microscope?

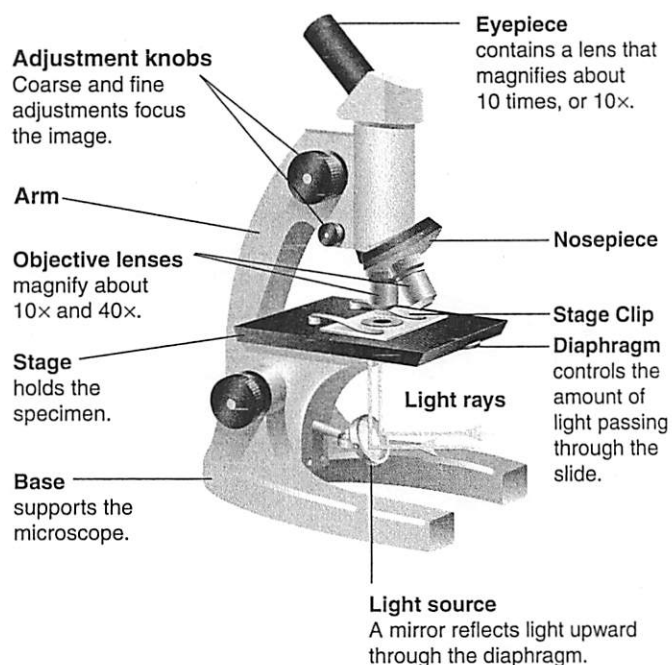
**Lenses** A lens is a piece of curved glass or other clear material. Some lenses have one curved surface and one flat surface. Others have two curved surfaces. A lens brings light rays together or spreads them apart. Light that passes through a lens is bent. The bending of the light rays causes the object to look either larger or smaller. To make an object look larger than it is, you can magnify it by using a lens.



▲ **Figure 2-2** This lens has magnified an ant's image.

2 ► **INFER:** Why might you magnify an object?

**Parts of a Microscope** All microscopes have the same basic parts. Look at Figure 2-3 to learn about each part of a microscope.



▲ **Figure 2-3** A compound light microscope

A microscope's parts are fragile. You need to take care of your microscope. Use only lens paper to clean the lenses and specimen slides. Be careful not to break a slide when you focus using the coarse adjustment. To carry a microscope properly, use one hand to hold the arm and one hand under the base.

3 ► **DESCRIBE:** How do you carry a microscope properly?

**Types of Light Microscopes** Have you ever used a magnifying glass? If you have, you have used a simple microscope. A simple microscope has only one lens. A compound microscope has two or more lenses. Using two lenses makes things look even larger than using one lens.

The first compound microscope was developed in 1590 by two Dutch eyeglass makers, Hans and Zacharias Janssen. Since then, many scientists have made and used microscopes. Much of what is known about living things would not have been discovered without the microscope.

The microscopes you use in the classroom are compound light microscopes. Light microscopes have one or more lenses in them. These microscopes use light and lenses to magnify things.

- 4 **DESCRIBE:** How many lenses does a compound microscope have?

### ✓ CHECKING CONCEPTS

1. What is a lens?
2. What causes an object to look larger or smaller than it actually is?
3. Where on a microscope do you place the object you want to view?



## Science and Technology

### ELECTRON MICROSCOPES

Most cells can be seen using a light microscope. However, with a power of  $1,000\times$  or more the images get fuzzy. An electron microscope can be used to clearly see the smaller structures inside a cell. Electron microscopes use electrons to form images of objects. An electron microscope can magnify objects up to 300,000 times their normal size.

One kind of electron microscope is the transmission electron microscope, or TEM. A TEM sends beams of electrons through the object that is being viewed. The image that you see is two-dimensional. The TEM is used to study cell parts.

Another type of electron microscope is the scanning electron microscope, or SEM. The SEM sends a beam of electrons over the surface of an object to produce realistic, three-dimensional images. However, only the surface can be viewed. Small organisms such as insects or single-celled organisms are often studied using SEM images.

**Thinking Critically** When might you want to use an SEM instead of a TEM?

4. What is the difference between a simple microscope and a compound microscope?



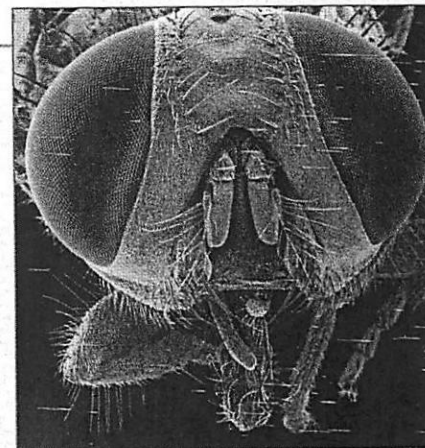
### THINKING CRITICALLY

5. **INFER:** Which of your senses is helped by using a microscope?
6. **EXPLAIN:** How would changing the objective lenses affect what is seen through the microscope?
7. **ANALYZE:** Why do you think it is more important to get a clear, less magnified image than a fuzzy image that is greatly magnified?

### BUILDING MATH SKILLS

**Calculating** To find the total magnification power of a microscope, you multiply the number found on the eyepiece lens by the number found on the objective lens. Find the magnification for the following microscopes.

| Eyepiece       | Objective   |
|----------------|-------------|
| 8. $3\times$   | $40\times$  |
| 9. $5\times$   | $10\times$  |
| 10. $10\times$ | $100\times$ |



▲ Figure 2-4 SEM image of fly head