1-7 What is a microscope?

Objective ▸ Identify and describe different kinds of microscopes.

TechTerms

- **lens** (LENZ): piece of curved glass that causes light rays to come together or spread apart as they pass through
- **magnify:** to make something look larger than it is
- **microscope** (MIKE-roh-scope): tool that makes things look larger than they really are

Microscopes One of the most important tools used to study living things is the **microscope** (MIKE-roh-scope). "Micro" means very small. "Scope" means to look at. A microscope is a tool used to make things look larger than they really are. There are different kinds of microscopes.

Define: What is a microscope?

Lenses A **lens** (LENZ) is a curved piece of glass. Some lenses have one curved surface and one flat surface. Others have two curved surfaces.

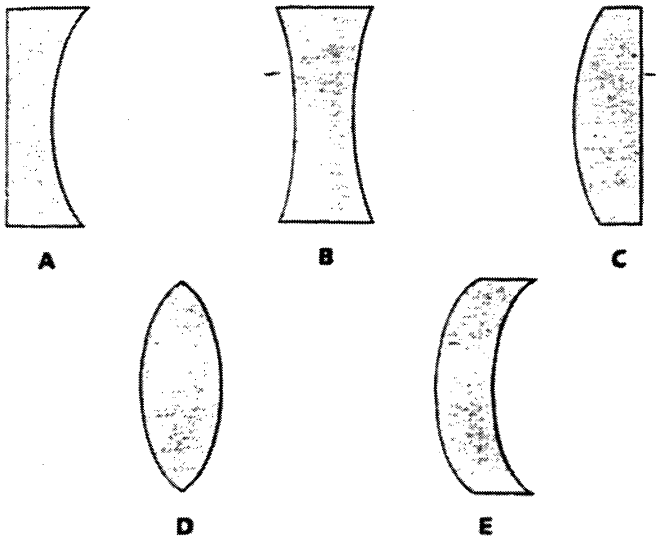
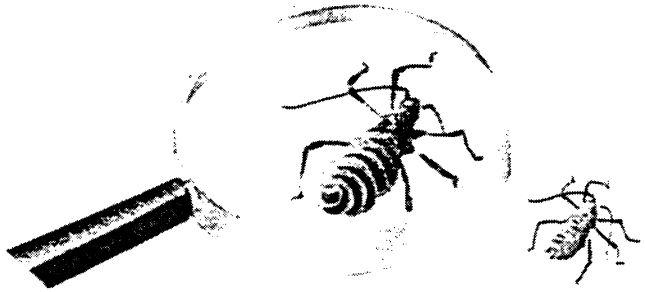


Figure 1 Different Kinds of Lenses

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. If the object looks larger, the lens has **magnified** (MAG-ni-fyd) the object.

Observe: Look at Figure 1. Which lenses have two curved surfaces?



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

Have you ever used a magnifying glass? If you have, you have used a simple microscope. A simple microscope has only one lens. Other microscopes have two or more lenses. A compound microscope has two or more lenses. The two lenses make things larger than does one lens.

Describe: How many lenses does a compound microscope have?

Electron Microscope An electron microscope uses electrons to magnify objects. It does not use light. Electrons are the particles that light up your television screen. A standard microscope can make an object appear 50 to 400 times larger. An electron microscope can magnify objects up to 300,000X their normal size. One type of electron microscope, scans the object and produces a three-dimensional image. Electron microscopes are very useful but they are very expensive.

Identify: What kind of microscope can magnify an object up to 300,000X?

LESSON SUMMARY

- A microscope makes objects appear larger.
- A lens is a curved piece of glass that bends light.
- A magnifying glass is a simple microscope.
- A compound microscope uses two or more lenses to magnify objects.
- An electron microscope uses electrons which magnify objects up to 300,000X.

CHECK *Answer the following.*

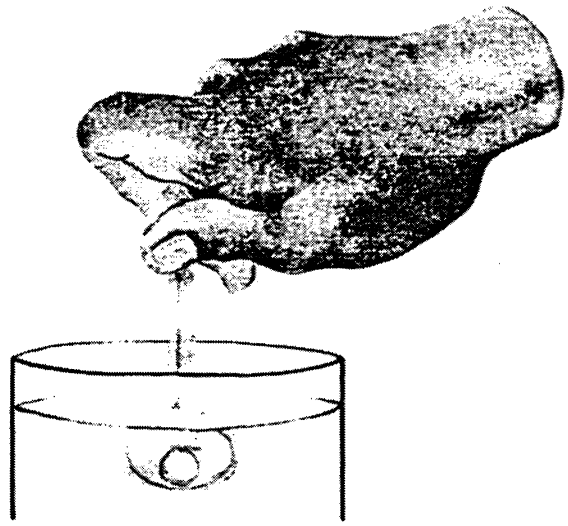
1. What is the difference between a compound microscope and a simple microscope?
2. What is a lens?
3. What kind of microscope can magnify things up to 300,000 X?
4. What household appliance uses electrons?

APPLY *Answer the following.*

5. **Infer:** Why do you think a compound microscope is better than a simple microscope?
6. **Infer:** Which of your senses is aided by using a microscope?

Skill Builder

Making a Simple Microscope Dip the part of a key with a hole into a glass of water. Make sure that a drop of water stays in the hole. Look through the drop of water to read the small print in a book. Move the key up and down very slowly. What happens? Which part of the microscope is the drop of water?



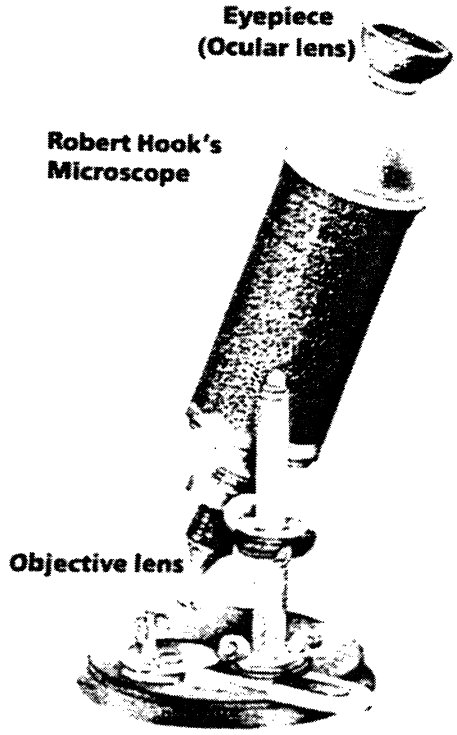
LOOKING BACK IN SCIENCE

DEVELOPMENT OF THE MICROSCOPE

The ancient Greeks used magnifying glasses in the 2nd century BC. They used them as "burning glasses". The ancient Romans made simple microscopes out of rock crystals. Over 3000 years ago, glass balls filled with water were used as magnifying glasses. In 1590, two Dutch eyeglass makers, Hans and Zacharias Janssen developed the first compound microscope. Their microscope had two lenses, one at each end of a tube. The microscope made objects appear larger, but the image was fuzzy and distorted. Poor lenses caused this problem. Robert Hooke, an English scientist made and used a compound microscope in 1665. He looked at thin slices of cork.

About 1670, a Dutch merchant, Anton van Leeuwenhoek made a lens of fine quality. The lens produced a clear image. Leeuwenhoek made more than 500 lenses. They were used as simple microscopes. Some lenses could magnify objects 250X.

In 1931, two German scientists developed the first electron microscope. Today, electron microscopes are used in many science laboratories. Electron microscopes have a major drawback. They cannot be used to look at living things.



WHAT ARE THE PARTS OF A MICROSCOPE?

A compound microscope is shown in Figure A. The parts of the microscope have been labeled. Read the description of each part below the microscope. Then find the part in Figure A.

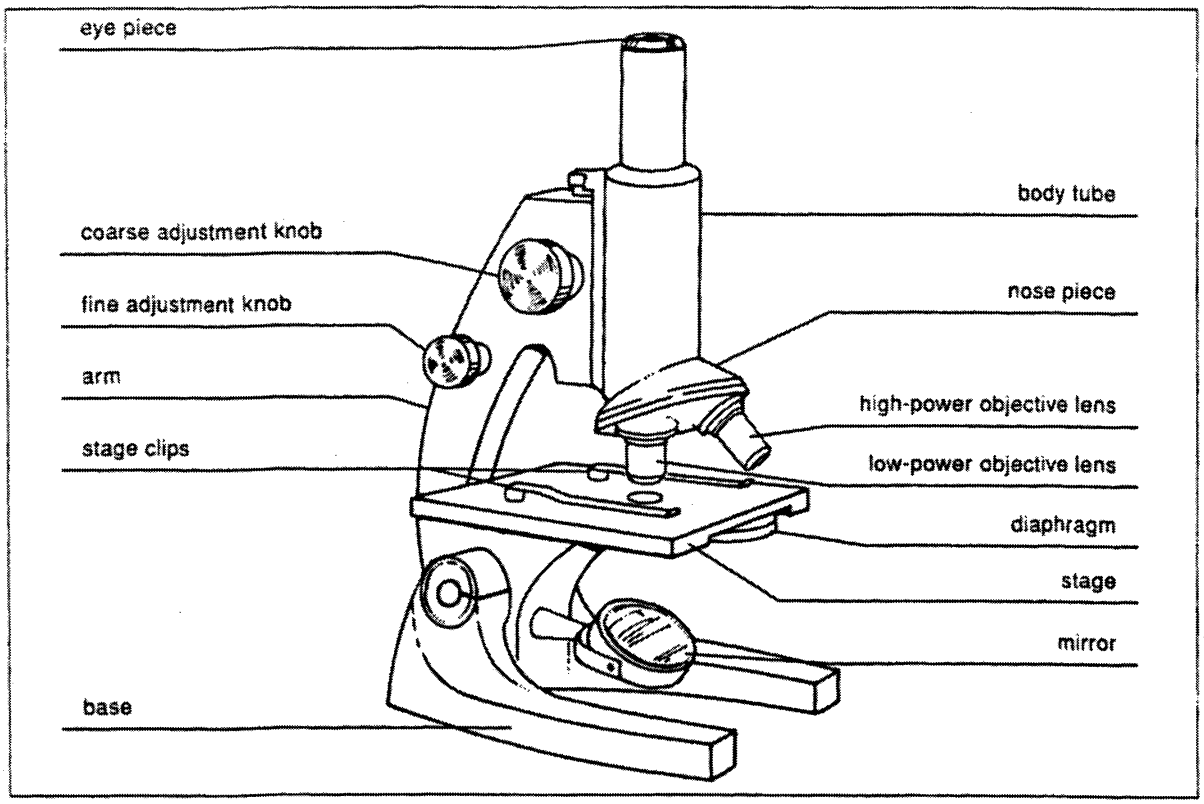


Figure A

Eyepiece or Ocular lens Located at the top of the microscope. Holds the lens closest to the eye.

High-Power Objective Longer of the two lenses close to the slide.

Low-Power Objective Shorter of the two lenses close to the slide.

Body Tube Gives the distance needed between the eyepiece and objective.

Coarse Adjustment Knob Moves the tube up and down.

Fine Adjustment Knob Moves the tube up and down, but only slightly.

Base Holds up the entire microscope.

Arm Supports the body tube.

Nosepiece Holds objective lenses.

Mirror Reflects light into the tube.

Diaphragm Circular disk that adjusts the amount of light entering the stage area.

Stage Platform that supports the slide; allows light to pass through.

Stage Clips Hold the slide in place on the stage.

1. What does the diaphragm do?

   _____

   _____

2. What part of a compound microscope supports the body tube? _____

3. Which objective is longer?

   _____

HOW DOES A MICROSCOPE MAGNIFY?

A microscope makes things look bigger. It does this because light coming from the object passes through lenses. A lens is a piece of glass that has been carefully shaped to bend light. Light that passes from an object through the lens of a microscope is bent so that the object looks larger.

Figure B shows the three lenses of a compound microscope. The top lens is called the eyepiece or the ocular lens. It is the lens closest to the eye. The other two lenses are called objective lenses. The objective lenses are the lenses closest to the object being viewed.

The object being viewed is on a microscope slide.The slide is placed below the objective lenses on the microscope stage.

Different lenses magnify to different powers. The power of magnification is marked by a number with an × next to it. A lens that magnifies ten times is marked 10×.

In this picture, the ocular lens is marked 10× and the objective 10×. This gives a total magnification of 100×. To find the total magnification of a microscope, just multiply the two magnifications.

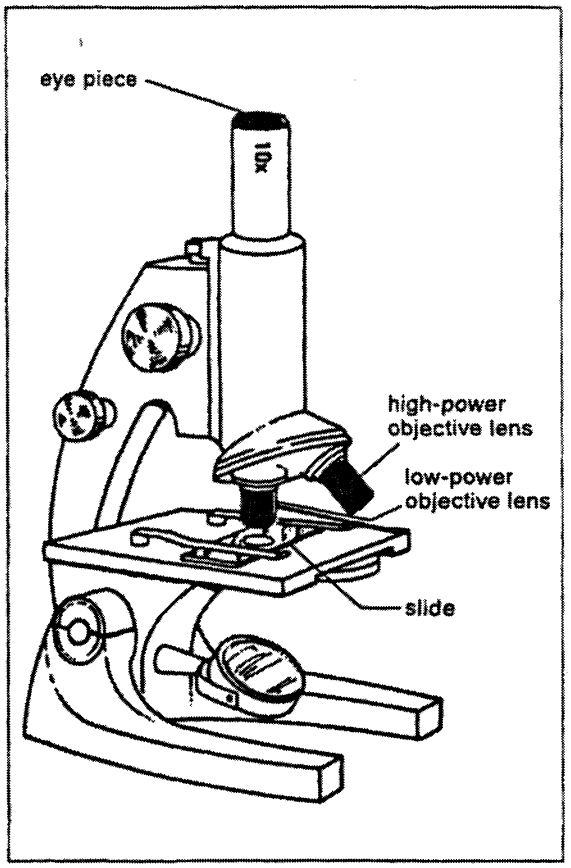


Figure B

Complete the table below by finding the total magnification for each pair of lenses. For example, the first pair has a total magnification of 100× (10 × 10 = 100).

Eyepiece	Objective lens	Magnification
10×	10×	100×
10×	40×	
10×	44×	
5×	10×	
5×	40×	
20×	10×	
20×	40×	

DISCOVERING MICROSCOPE FEATURES

Look at each picture. Then answer the questions next to the pictures.

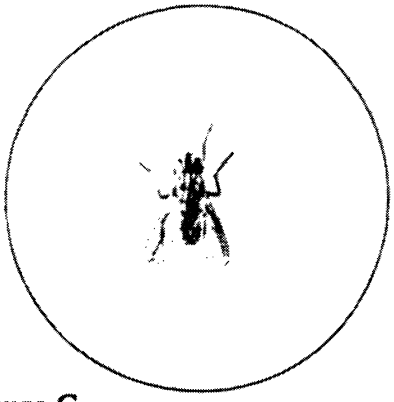


Figure C

This is a picture of a common house fly. It has been magnified about two times.

1. Can you see much of the fly's detail?

   _____
   yes, no

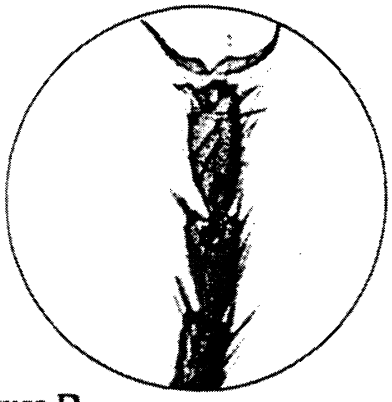


Figure D

This is what a part of a fly looks like through a microscope. It is magnified 100 times.

2. You now see _____ of the fly,
   more, less
   but you see _____ detail.
   more, less

3. What part of the fly do you think this picture shows? _____

   _____

Figure E

This is the same part of the fly. This time it is magnified 400 times.

4. Compared to 100×, you now see

   _____ of the fly. However,
   more, less
   you see _____ detail.
   more, less

CONCLUSIONS

1. The higher the magnification of a microscope, the _____ of a specimen you see.
   more, less

2. The higher the magnification of a microscope, the _____ detail you see.
   more, less

let's Review!