# LESSON 9 | How can a microscope help us study living things?

All living things are made up of cells. Some organisms, such as bacteria, are made up of only one cell. They are much too small to be seen with the naked eye alone. These organisms are called microorganisms [my-kroh-OWR-guh-nizums].

How can we see and study such tiny organisms or the single cells of a many-celled organism? We can use a **microscope**. A microscope is an instrument that makes objects appear larger. Have you ever used a hand lens? A hand lens is a simple microscope. A simple microscope has only one lens.

A hand lens is easy to use. It is small, and it does not weigh very much. But a hand lens does not magnify objects very much. We cannot see most one-celled organisms with a hand lens.

A compound microscope is much more powerful than a simple microscope. A compound microscope has two sets of lenses. Most school microscopes are compound microscopes.

Most compound microscopes can make objects appear 100 to 400 times larger than they really are. Some microscopes can magnify objects as much as 1000 times. When we talk about a microscope, we usually mean a compound microscope.

Another kind of microscope is the electron microscope. Electron microscopes can magnify objects up to 300,000 times. These microscopes are found in scientific laboratories.

Microscopes have many uses, especially in biology. Doctors often use microscopes. Have you ever seen a microscope in your doctor's office?

## 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.

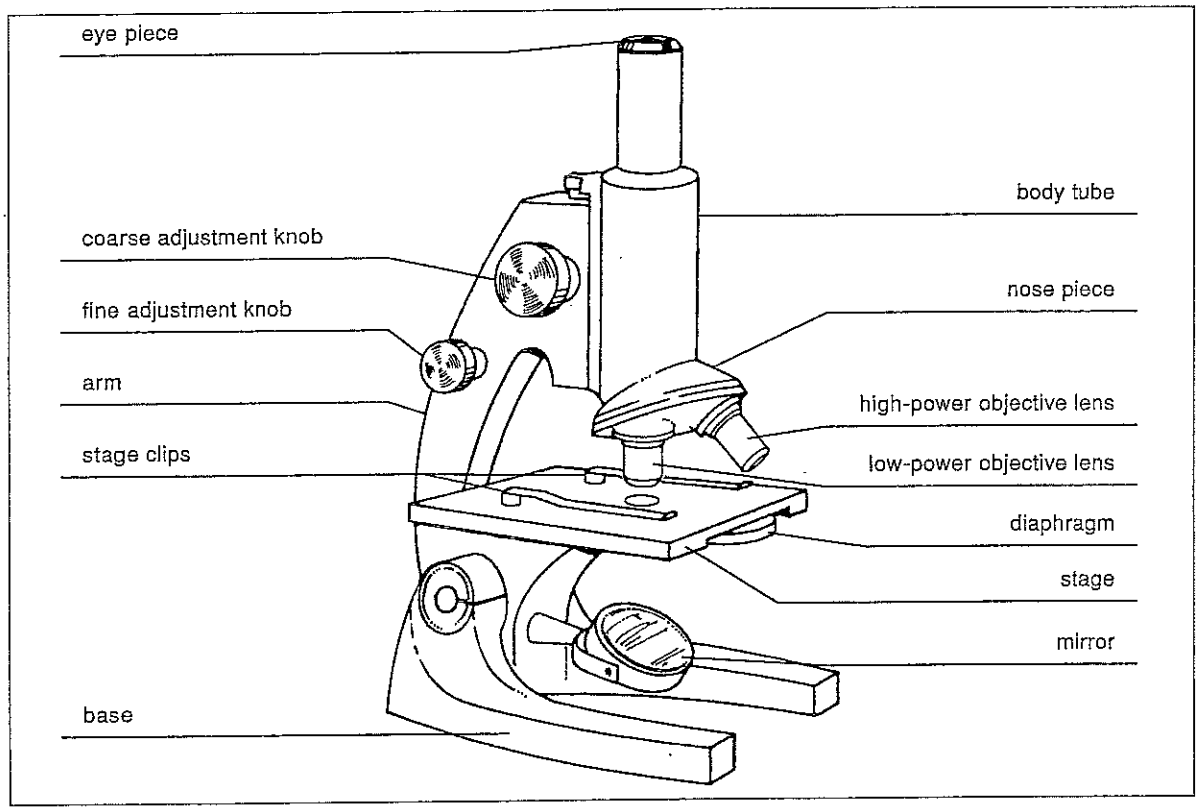


**Figure A**

**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?

   _____

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.

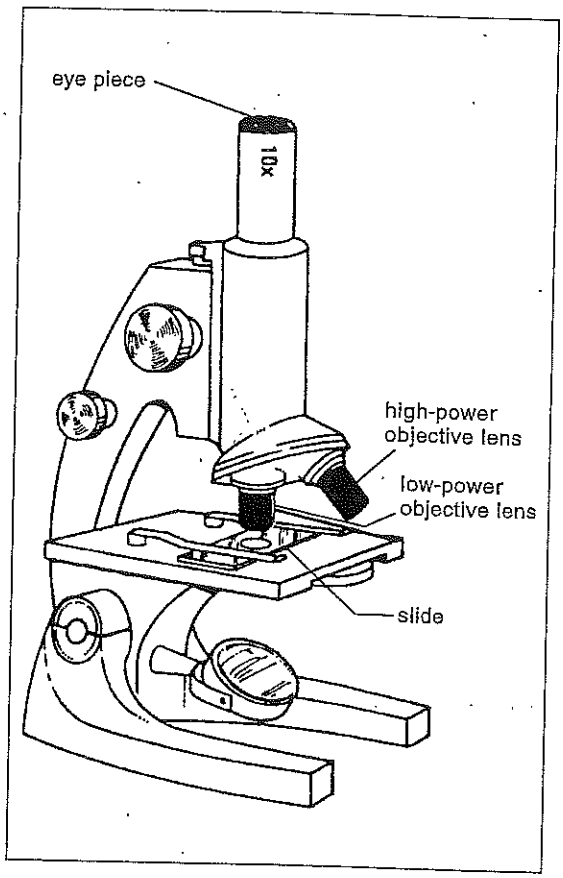


**Figure B**

*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× | |

* Eyepiece Magnification × objective magnification = Total Magnification

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

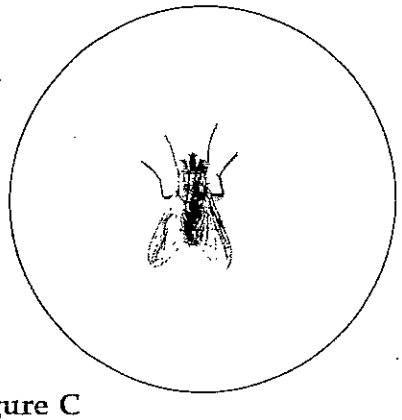

Figure C

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

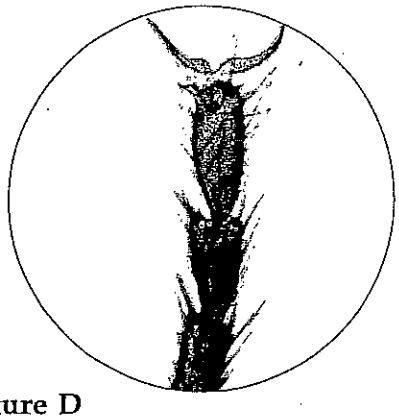

Figure D

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? _____

   _____

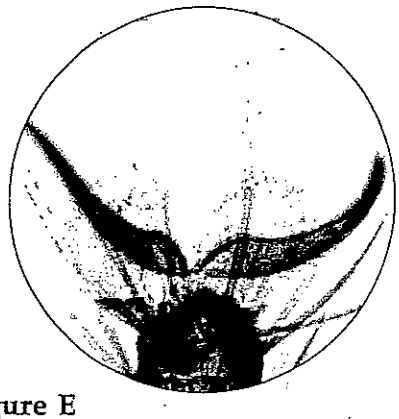

Figure E

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

A microscope is a delicate instrument. Treat it carefully. A microscope should be held with two hands, one holding the arm of the microscope and the other supporting the base. The lenses of a microscope should only be cleaned with special lens paper. Regular tissues scratch the lenses.

*Read about each picture. Then answer the questions next to each picture.*

The student on the left is not holding the microscope the right way.

1. Can you describe the right way to hold a microscope? _____

Figure P

The boy is wondering which tissue to use to clean the microscope lenses.

2. Which one would you use?

_____

3. Why? _____

_____

_____

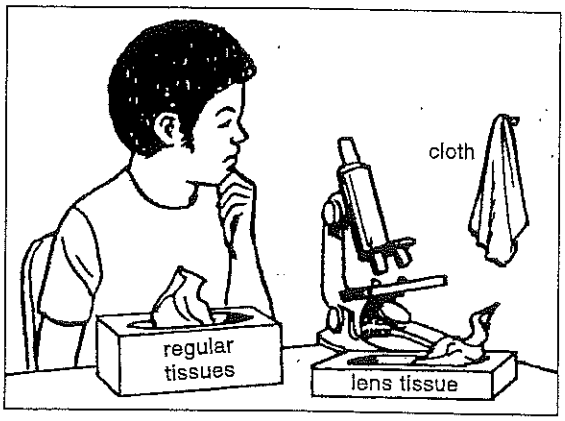


Figure Q

The girl is focusing downward toward the slide.

4. What has happened to the slide?

_____

5. Is this the proper way to focus?

_____

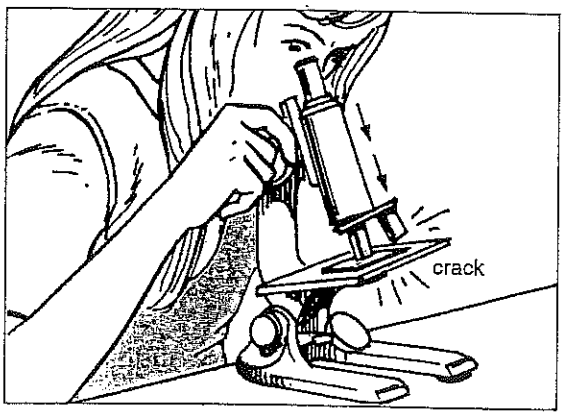


Figure R

6. What is happening to this boy's microscope? _____

_____

7. What should you do to prevent this from happening? _____

_____

_____

_____

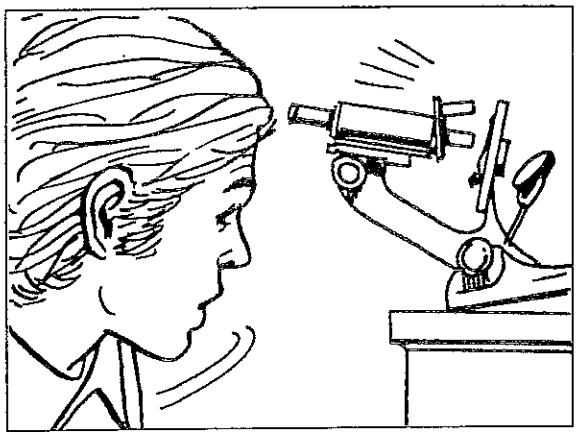

Figure S

## TRUE OR FALSE

*In the space provided, write "true" if the sentence is true. Write "false" if the sentence is false.*

_____ 1. A microscope can have one lens.

_____ 2. A transparent object blocks light.

_____ 3. A compound microscope magnifies more than a simple microscope does.

_____ 4. Light enters the eyepiece first.

_____ 5. A microscope stage must have an opening.

_____ 6. When you carry a microscope, you should hold it by the tube.

_____ 7. A temporary slide cannot be stored.

_____ 8. You should only use lens tissue to clean a microscope lens.

## MATCHING

*Match each term in Column A with its description in Column B. Write the correct letter in the space provided.*

| Column A | Column B |
|---|---|
| _____ 1. simple microscope | a) supports entire microscope |
| _____ 2. base | b) has only one lens |
| _____ 3. compound microscope | c) allows light to pass through |
| _____ 4. eyepiece | d) has more than one lens |
| _____ 5. transparent | e) lens closest to the eye |