



EXPERIMENT NO. 4 (MICROSCOPES)



Asst. Lec. Mohammed Tareq Fakhri

What are Microscopes?

Microscopes are instruments that are used in science laboratories, to visualize very minute objects such as cells, microorganisms, giving a contrasting image, that is magnified. Microscopes are made up of lenses for magnification, each with its own magnification powers. Depending on the type of lens, it will magnify the specimen according to its focal strength.

Their ability to function is because they have been constructed with special components that enable them to achieve high magnification levels. they can view very small specimens and distinguish their structural differences, for example, the view of animal and plant cells, viewing of microscopic bacterial cells.

Microscopes are generally made up of structural parts for holding and supporting the microscope and its components and the optical parts which are used for magnification and viewing of the specimen images. This description defines the parts of a microscope and the functions they perform to enable the visualization of specimens.

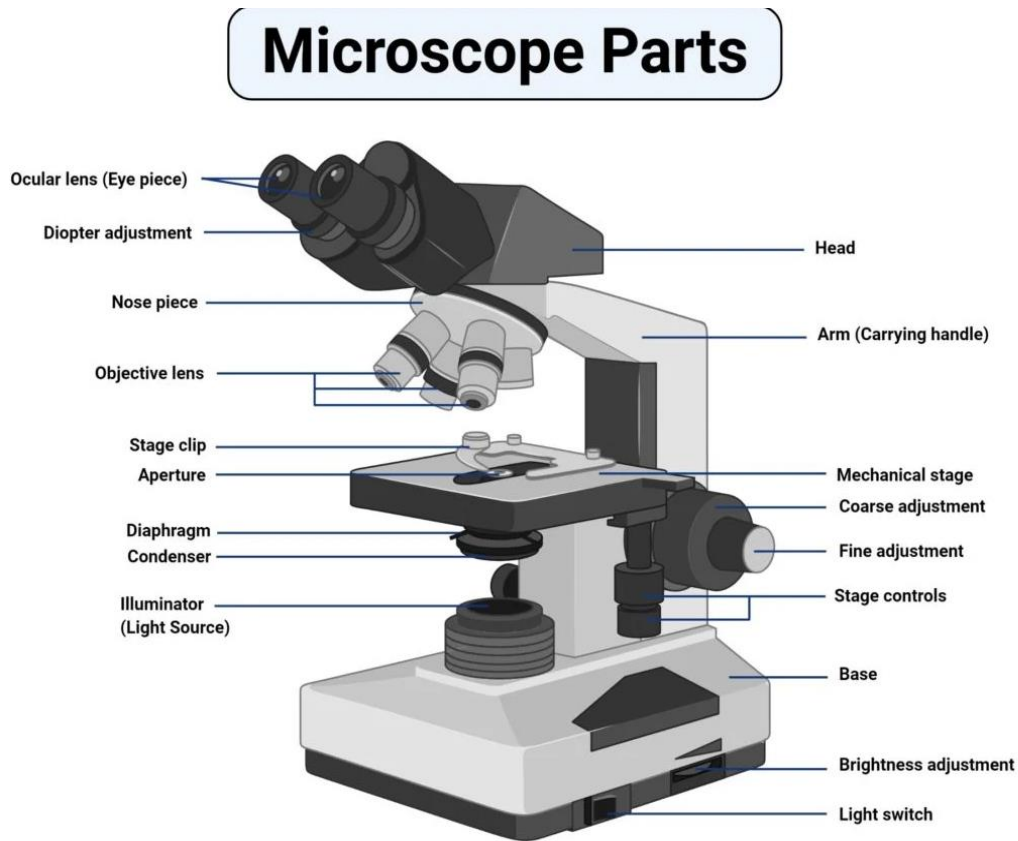


Figure: Diagram of parts of a microscope

There are three structural parts of the microscope i.e. head, base, and arm.

1. **Head** – This is also known as the body, it carries the optical parts in the upper part of the microscope.
2. **Base** – It acts as microscopes support. It also carries microscopic illuminators.
3. **Arms** – This is the part connecting the base and to the head and the eyepiece tube to the base of the microscope. It gives support to the head of the microscope and it is also used when carrying the microscope. Some high-quality microscopes have an articulated arm with more than one joint allowing more movement of the microscopic head for better viewing



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Optical parts of a microscope and their functions

The optical parts of the microscope are used to view, magnify, and produce an image from a specimen placed on a slide. These parts include:

1. **Eyepiece** – also known as the ocular. this is the part used to look through the microscope. Its found at the top of the microscope. Its standard magnification is 10x with an optional eyepiece having magnifications from 5X – 30X.
2. **Eyepiece tube** – it's the eyepiece holder. It carries the eyepiece just above the objective lens. In some microscopes such as the binoculars, the eyepiece tube is flexible and can be rotated for maximum visualization, for variance in distance. For monocular microscopes, they are none flexible.
3. **Objective lenses** – These are the major lenses used for specimen visualization. They have a magnification power of 40x-100X. There are about 1- 4 objective lenses placed on one microscope, in that some are rare facing and others face forward. Each lens has its own magnification power.
4. **Nose piece** – also known as the revolving turret. It holds the objective lenses. It is movable hence it cal revolve the objective lenses depending on the magnification power of the lens.
5. **The Adjustment knobs** – These are knobs that are used to focus the microscope. There are two types of adjustment knobs i.e fine adjustment knobs and coarse adjustment knobs.
6. **Stage** – This is the section on which the specimen is placed for viewing. They have stage clips that hold the specimen slides in place. The most common stage is a mechanical stage, which allows the control of the slides by moving the slides using the mechanical knobs on the stage instead of moving it manually.
7. **Aperture** – This is a hole on the microscope stage, through which the transmitted light from the source reaches the stage.
8. **Microscopic illuminator** – This is the microscopes light source, located at the base. It is used instead of a mirror. it captures light from an external source of a low voltage of about 100v.
9. **Condenser** – These are lenses that are used to collect and focus light from the illuminator into the specimen. They are found under the stage



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next to the diaphragm of the microscope. They play a major role in ensuring clear sharp images are produced with a high magnification of 400X and above. The higher the magnification of the condenser, the more the image clarity. More sophisticated microscopes come with an Abbe condenser that has a high magnification of about 1000X.

10. **Diaphragm** – it's also known as the iris. Its found under the stage of the microscope and its primary role is to control the amount of light that reaches the specimen. It's an adjustable apparatus, hence controlling the light intensity and the size of the beam of light that gets to the specimen. For high-quality microscopes, the diaphragm comes attached with an Abbe condenser, and combined they are able to control the light focus and light intensity that reaches the specimen.
11. **Condenser focus knob** – this is a knob that moves the condenser up or down thus controlling the focus of light on the specimen.
12. **Abbe Condenser** – this is a condenser specially designed on high-quality microscopes, which makes the condenser to be movable and allows very high magnification of above 400X. High-quality microscopes normally have a high numerical aperture than objective lenses.
13. **The rack stop** – It controls how far the stages should go preventing the objective lens from getting too close to the specimen slide which may damage the specimen. It is responsible for preventing the specimen slide from coming too far up and hit the objective lens.

Q. Define a Microscope.

Ans. Microscopes are instruments that are used in science laboratories, to visualize very minute objects such as cells, microorganisms, giving a contrasting image, that is magnified.



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Parts of a Microscope Revision Questions

Q. State functions of a microscope?

Ans. A microscope is usually used for the study of microscopic algae, fungi, and biological specimens.

Q. Differentiate between a condenser and an Abbe condenser?

Ans. Condensers are lenses that are used to collect and focus light from the illuminator into the specimen. They are found under the stage next to the diaphragm of the microscope. They play a major role in ensuring clear sharp images are produced with a high magnification of 400X and above. Abbe condenser is a condenser specially designed on high-quality microscopes, which makes the condenser to be movable and allows very high magnification of above 400X. High-quality microscopes normally have a high numerical aperture than objective lenses.

Q. How does the eyepiece compare to the objective lens?

Ans. The eyepiece, also known as the ocular is the part used to look through the microscope. Its found at the top of the microscope. Its standard magnification is 10x with an optional eyepiece having magnifications from 5X – 30X. Objective Lens are the major lenses used for specimen visualization. They have a magnification power of 40x-100x. There are about 1- 4 objective lenses placed on one microscope, in that some are rare facing and others face forward.

Q. What is a magnification power?

Ans. Magnification of a lens is defined as the ratio of the height of an image to the height of an object. Microscope magnification measures the total enlargement of the image of an object. Magnification power is the product of eyepiece lens power and objective lens power.