

Exercise 1

Aim: To study parts of a compound microscope.

Principle: Magnified and real images of minute objects are obtained using combination of lenses. A compound microscope is a complex assemblage of such lenses enabling highly magnified images of the microscopic living organisms and intricate details of cells and tissues. A monocular mono-objective compound microscope is normally used in a biology laboratory.

Requirement: A compound microscope, silk cloth, lens cleaning fluid and lens cleaning paper.

Procedure

Place the microscope on the working table and remove dust by wiping the body with a silk cloth. Clean the lenses with lens cleaning fluid and lens cleaning paper.

Identify the various parts of the microscope (Fig. 1.1). Draw a diagram of the microscope and label its various parts.

Take a permanent slide preparation or a temporary preparation made by you, keep it on the stage, fix with clips after focusing and view. Learn how the microscope can be tilted or inclined by moving the arm of the microscope. Note, how focussing is done by moving the coarse adjustment and fine adjustment knobs.

Observation

- (i) The microscope has a strong basal foot and a vertical arm joined by an inclination joint. The arm can be tilted to different angles for its convenient usage.
- (ii) The stage of the microscope is round/rectangular/square shaped and is fixed to the arm. In the centre of the stage is a small circular hole covered with glass for passage of light.
- (iii) The stage is provided with two clips or mechanical device to fix and hold the slide firmly in position. The material to be observed is brought into view by moving the slide and then fixed with the help of clips at desired position.
- (iv) A movable (rack and pinion mechanism) or a fixed substage is provided with an iris diaphragm and condenser. The condenser is a system of two or more lenses to receive parallel light rays and to converge these

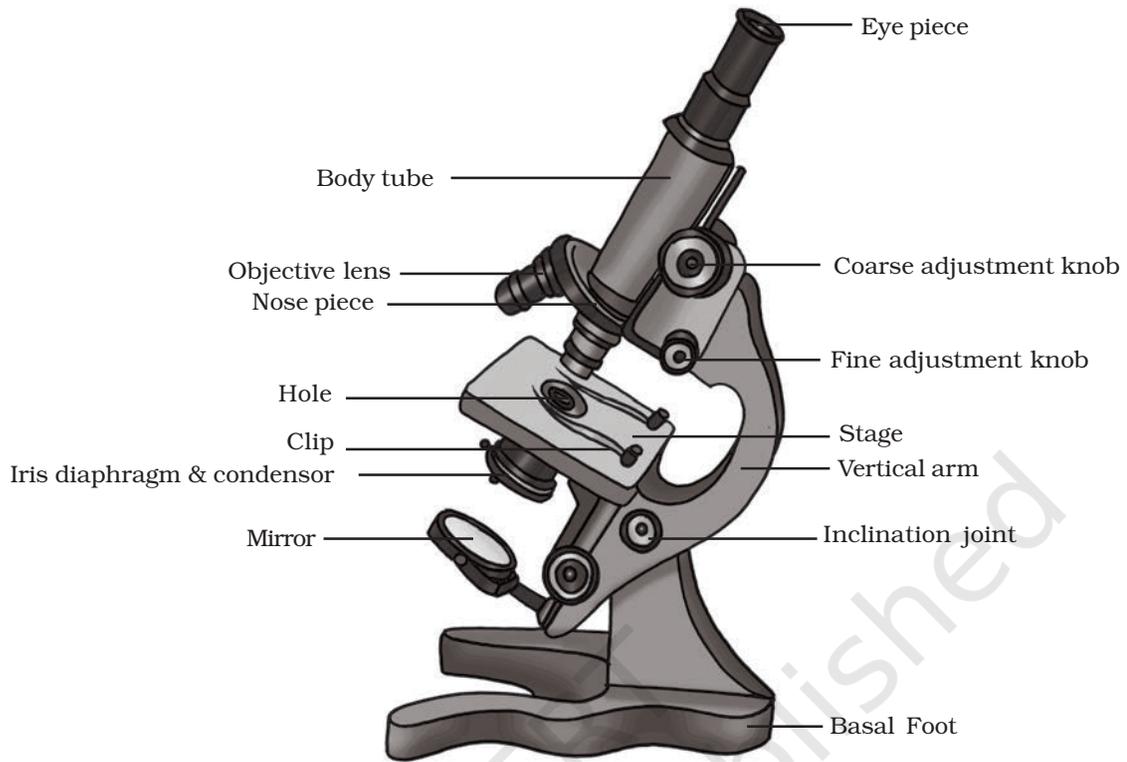


Fig. 1.1 A compound microscope

on to the object through the iris and the hole present in the stage. The diaphragm helps in regulating the aperture size and thereby controls the amount of light that passes through the slide (Fig. 1.2). The needle/pin is used to increase or decrease the aperture size. Some microscopes do not have the condensor.

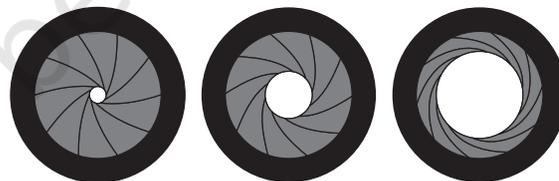


Fig. 1.2 Iris diaphragm showing different aperture sizes

- (v) An adjustable mirror is fitted below the condensor. It has plano- concave surfaces to focus the converging rays of light on the object through iris diaphragm and condensor in order to obtain a brightly illuminated image of the object.
- (vi) The body of the microscope consists of a movable tubular body tube raised on rack and pinion mechanism. The tube has an ocular or eye piece of specific magnification (which can be changed for lower or higher magnification, i.e., 5X, 10X or 15X. Eye piece with pointer are also available. Two objective lenses 10X, 40X or 45X are mounted on a revolving nose piece at the lower end.

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Some microscopes may also have a third objective lens (100X) called oil immersion lens.

The tube with eye and objective lenses can be moved up or down to focus the object sharply with the help of coarse adjustment knob and fine adjustment knob.

The object is first viewed under lower magnification using the coarse adjustment and then under higher magnification by rotating the revolving nose piece on which the objective lenses are mounted. While viewing at higher magnification, only fine adjustment knob is used for fine focus tuning.

Magnification

Magnification by a microscope is a multiple of the X value of the lenses of the eye piece and objective. For example, a 5X eye piece and a 40X objective will magnify the image $5 \times 40 = 200$ times the size of the object. Similarly, when a 10X eye piece and a 40X objective are used, magnifying power would be $10 \times 40 = 400X$. Generally, in a compound microscope, the eye piece lenses are 10X or 15X and the objective lenses are 10X as well as 40X.

Precaution

- (i) Always clean the lenses before and after using the microscope.
- (ii) For cleaning lenses, always use lens cleaning fluid and lens cleaning paper.
- (iii) While observing, the objective lens should be carefully adjusted so as to avoid touching the slide lest it breaks the slide.
- (iv) Always put back the microscope in its case after use.

Questions

1. What is the magnification achieved when a 15X eye piece and a 40X objective are used together ?
2. What would happen if direct sun rays are focused by the mirror into the body tube?
3. What is the difference between a dissecting and a compound microscope?
4. Which of the following parts provides support and supports the weight of a microscope?
(a) Arm (b) Stage (c) Body tube (d) Foot
5. To which part of a microscope is the objectives fitted.
(a) Nose piece (b) Diaphragm (c) Stage (d) Arm
6. Magnification power of a microscope is calculated by
(a) magnifying power of eye piece \times magnifying power of mirror.
(b) magnifying power of eye piece \times magnifying power of objective.
(c) magnifying power of objective \times magnifying power of plane mirror.