

LIFE SCIENCES 11

MICROSCOPES

Four Types

1. Dissecting Microscope

- 2-4x magnification
- used for a more detailed study of a surface, or to cut, probe or observe a specimen

2. Compound Microscope

- up to 2000x magnification with oil immersions lens
- used to observe semi-transparent microorganisms
- may observe bacteria

3. Transmission Electron Microscope (1931)

- more than 50 million times magnification
- uses a beam of electrons passed through an ultra-thin specimen
- resolution of 0.2 nm

4. Scanning Electron Microscope

- 1-2 million times magnification
- make highly detailed 3-D image of the surface of an organism or cell
- resolution of 0.1 nm

Definitions

a. Field of View

- the amount of area seen when looking through the eyepiece of a microscope

b. Depth of Field

- the thickness amount of an object that can be kept in focus at one time

c. Magnification

- factor by which the apparent size of an object has increased

d. Resolution / Resolving Power

- the ability to distinguish between separate objects that are close together

Magnification Calculations

1. Magnification

- how many times larger does the image appear due to the power of the magnifying lenses
- calculated by multiplying the power of the ocular lens and the power of the objective lens

$$\begin{aligned}\text{Magnification} &= \text{ocular lens} \times \text{objective lens} \\ \text{Mag} &= \text{ocular} \times \text{objective}\end{aligned}$$

2. Actual Size

- how big the specimen really is
- calculated by estimating the percentage of the diameter of the field of view the specimen covers and multiply by the actual diameter of the field of view

$$\begin{aligned}\text{Actual Size} &= \% \text{ field of view covered} \times \text{diameter of field of view} \\ \text{AS} &= \% \text{ fov} \times \text{fov}\end{aligned}$$

3. Drawing Magnification

- how many times larger the drawing or picture is compared to the specimen's actual size
- calculated by dividing the drawing size by the actual size of the specimen as measured in the same units

$$\text{Drawing Magnification} = \frac{\text{Drawing Size}}{\text{Actual Size}}$$

$$\text{DM} = \frac{\text{DS}}{\text{AS}}$$