# THE MICROSCOPE

#### INTRODUCTION

Instrument that produces enlarged images of small objects, allowing the observer an exceedingly close view of minute structures at a scale convenient for examination and analysis.

The magnifying power of a microscope is an expression of the number of times the object being examined appears to be enlarged and is a dimensionless ratio.

- Total magnification = Objective magnification X ocular magnification.
- It is usually expressed in the form  $10\times$ .
- The resolution of a microscope is a measure of the smallest detail of the object that can be observed.
- Resolution is expressed in linear units, usually <u>micrometres</u> (μm).

### Types of microscope

### 1. Optical Microscopes

- The most common type of microscope.
- These microscopes rely on lenses and light to illuminate a specimen for optimal image-gathering.
- They can be used for viewing living cells, insects, clinical blood and tissue assessment

### 2. Compound Microscopes

• A compound microscope uses a lens close to the object being viewed to collect light called the <u>objective</u> lens.

• They are most often used to view objects at a cellular level and can reach magnifications up to 1000x.

### 3. Electron Microscopes

This type of microscope sends accelerated electrons across or through a specimen to render a digital image.

Used to see detailed structure at the cellular and macromolecular levels.

### 4. Scanning Electron Microscopes (SEM)

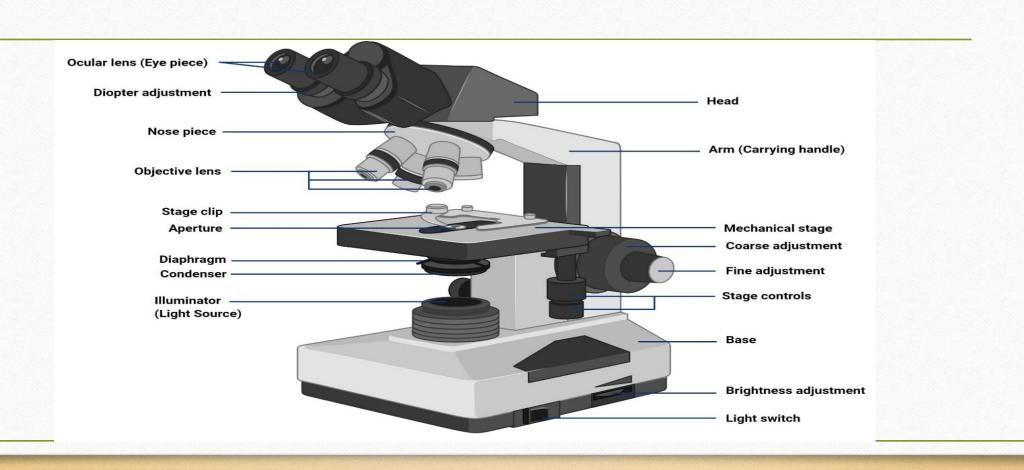
- SEM microscopes scan the surface of a specimen in a rectangular pattern to provide information about topography and composition.
- ESEM also has a variety of applications. Industries including microelectronics, semiconductors, medical devices and food processing, all use scanning electron microscopy as a way to examine the surface composition of components and products.

### 5. Transmission Electron Microscopes (TEM)

> TEM must pass electrons through a thin specimen to receive information.

This increased resolution allows us to study ultrastucture of organelles, viruses and macromolecules. Specially prepared materials samples may also be viewed in the TEM

## Parts of the microscope



- Eyepiece Lens: the lens at the top that you look through. They are usually 10X or 15X power.
- Tube: Connects the eyepiece to the objective lenses
- **Arm**: Supports the tube and connects it to the base
- Base: The bottom of the microscope, used for support
- Illuminator: A steady light source used in place of a mirror.
- Stage: The flat platform where you place your slides. Stage clips hold the slides in place. If your microscope has a mechanical stage, you will be able to move the slide around by turning two knobs. One moves it left and right, the other moves it up and down.

- Revolving Nosepiece or Turret: This is the part that holds two or more objective lenses and can be rotated to easily change power.
- Objective Lenses: Usually you will find 3 or 4 objective lenses on a microscope. They almost always consist of 4X, 10X, 40X and 100X powers. When coupled with a 10X (most common) eyepiece lens, we get total magnifications of 40X (4X times 10X), 100X, 400X and 1000X. To have good resolution at 1000X, you will need a relatively sophisticated microscope with an Abbe condenser.
- Condenser Lens: The purpose of the condenser lens is to focus the light onto the specimen. Condenser lenses are most useful at the highest powers (400X and above).

### How to Use a Microscope



