Human biology
Introduction
Lab. 1

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Definition

An optical instrument consisting of a lens or combination of lenses for making enlarged images of minute objects

Types

There are different types of microscopes and each of these has different purposes of use. Some are suitable for biological applications, while others are used in educational institutions. there are such microscope types that are discussed along with their diagram, working principles, and applications. Some of the types of microscopes are:

- **Compound microscope**
- **Electron microscope**
- **Stereomicroscope**

Compound microscope

A **compound microscope** is defined as a type of microscope that has more than one lens. It has a combination of lenses and two optical parts known as an objective lens and an eyepiece or ocular lens.

Electron microscope

Defined as the type of microscope in which the source of illumination is the beam of accelerated electrons. It is a special type of microscope with a high resolution of images as the images can be magnified in nanometers.

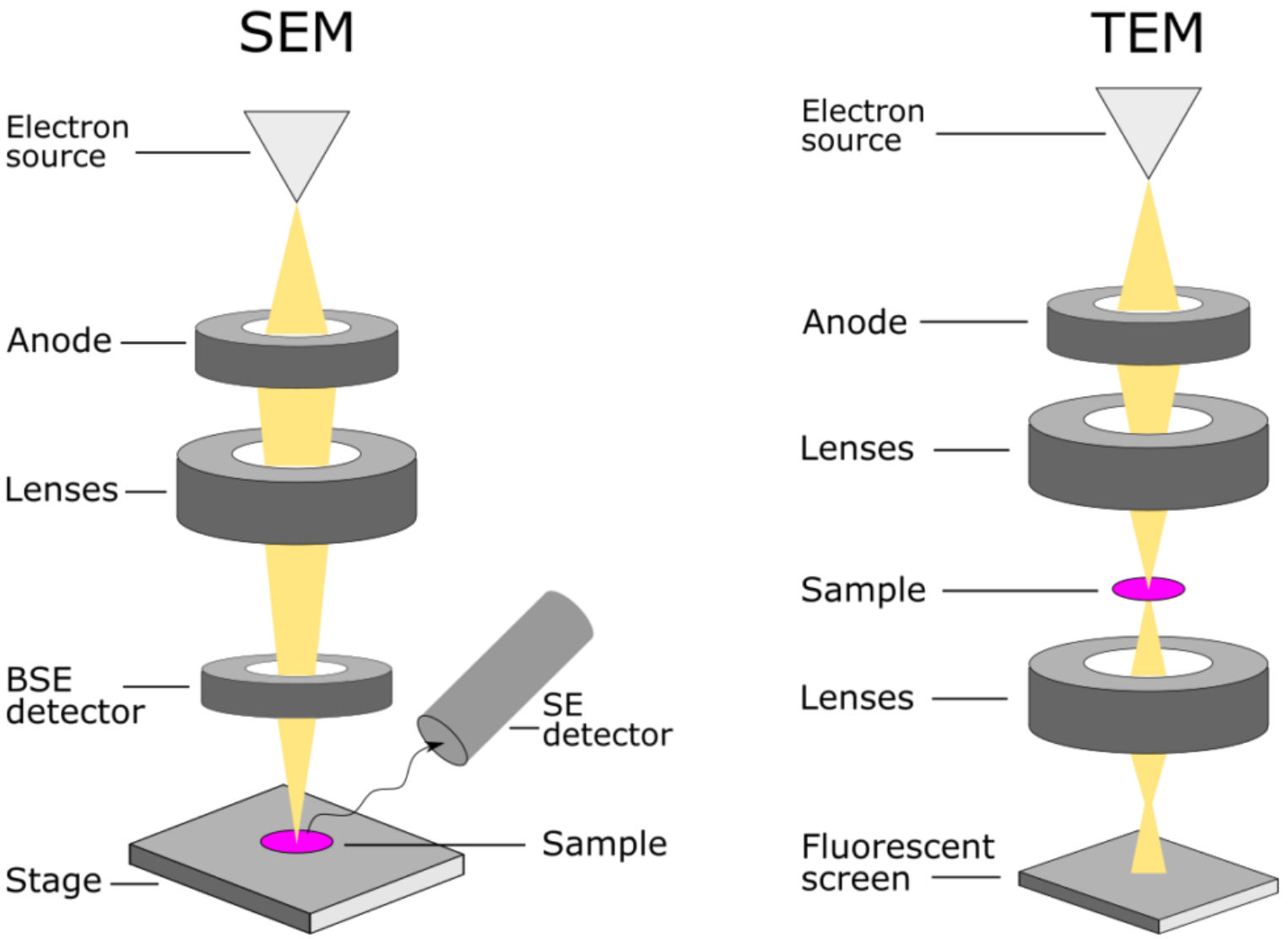
There are **two types** of **electron microscopes**:

- The **transmission electron microscope** (TEM)
- The **scanning electron microscope** (SEM)

Principle of Electron microscope

The metal used in an electron microscope is **tungsten**. A high voltage current is applied which results in the ***excitation of the electrons in the form of a continuous stream*** that is used as a beam of light. The lenses used in the electron microscope are **magnetic coils**.

The images obtained in an electron microscope can be captured as electron micrographs with the help of specialized cameras.


SEM
Electron source
Anode
Lenses
BSE detector
SE detector
Sample
Stage
TEM
Electron source
Anode
Lenses
Sample
Lenses
Fluorescent screen

Stereomicroscope

A stereo microscope is defined as a type of microscope that provides a **three-dimensional view** of a specimen.

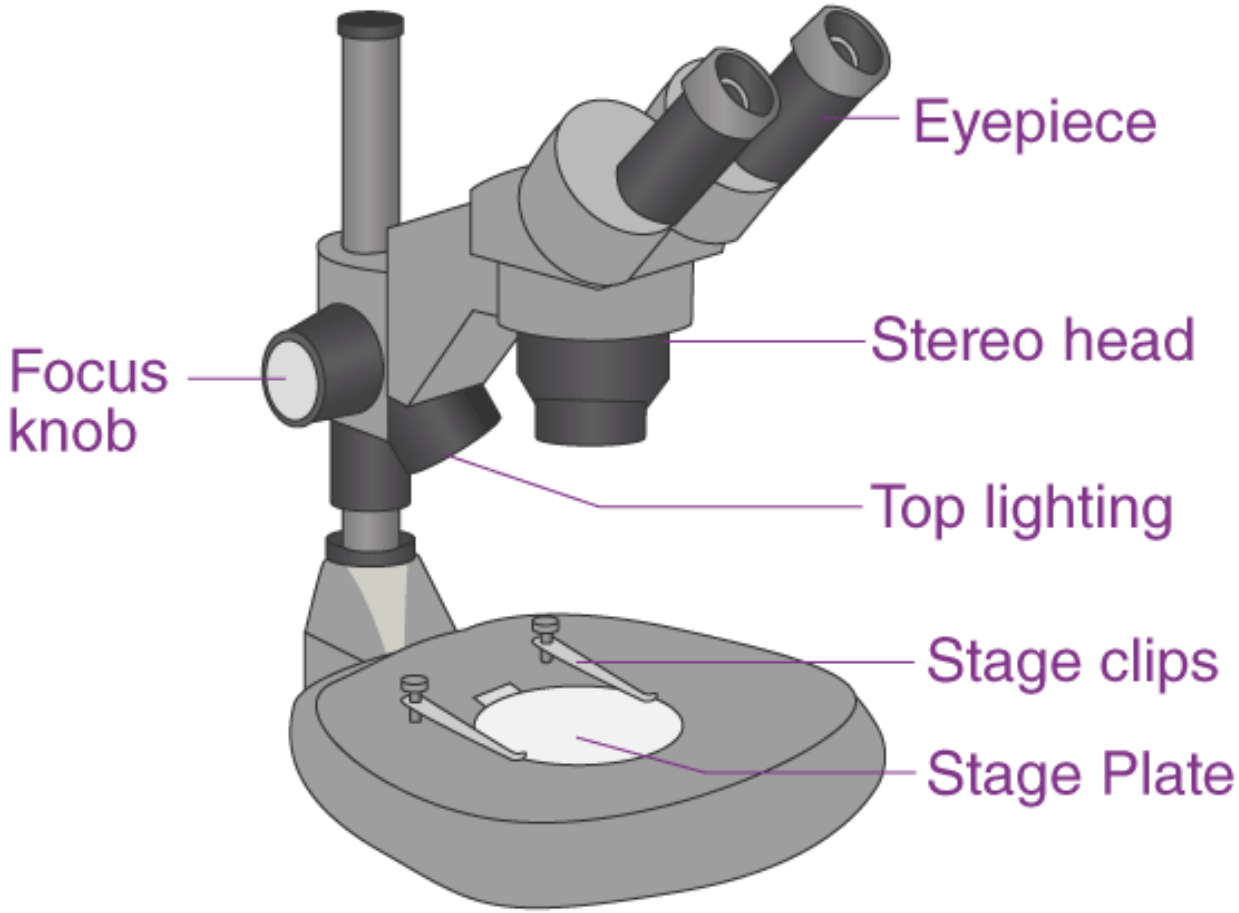
It is also known as a **dissecting microscope**. In a stereo microscope, there are separate objective lenses and eyepiece such that there are two separate optical paths for each eye.

Principle of Stereomicroscope

A **stereomicroscope** works on the reflected light from the sample. The microscope's magnification takes place at low power and hence, it is suitable for magnifying opaque objects.

It is suitable for thick and solid samples because it uses light reflected from the sample.

It finds application in **microsurgery**.

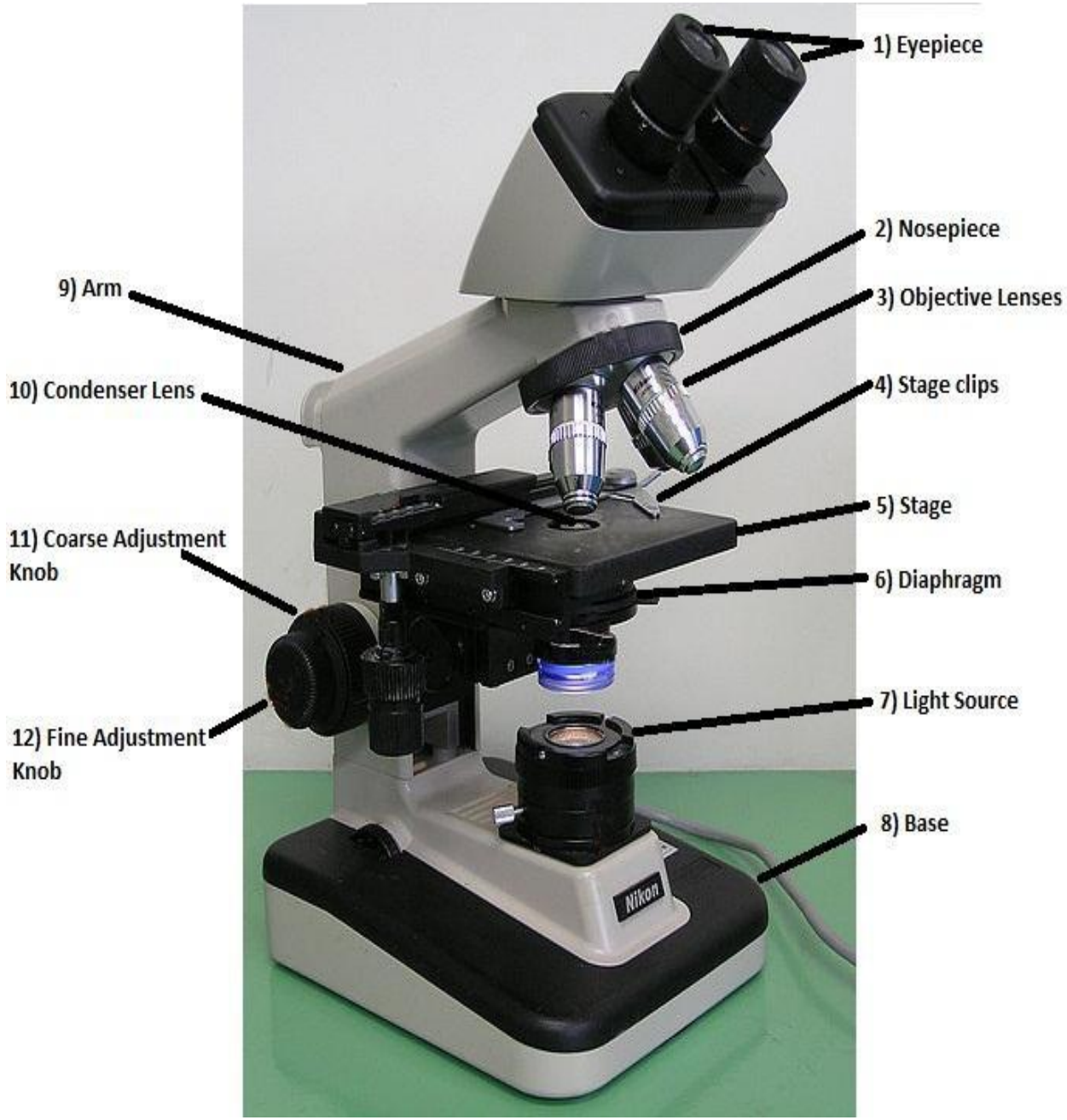


Stereo microscope

Compound microscope

The compound microscope has **four sets** of **parts**:

1. The **stand** or the **support system**
2. The **optics** or the **magnification system**
3. The **mechanical adjustment system**
4. The **illumination system**


1) Eyepiece
2) Nosepiece
3) Objective Lenses
4) Stage clips
5) Stage
6) Diaphragm
7) Light Source
8) Base
9) Arm
10) Condenser Lens
11) Coarse Adjustment Knob
12) Fine Adjustment Knob
Nikon

The main parts of light microscope and their functions

Eyepiece: The part of the microscope you look into. May contains a pointer that can be seen as you look into the eyepiece. May also be called the (ocular)

Nose piece: Part of the microscope to which the objectives are attached. Rotates to allow for the changing of objectives to increase or decrease magnification.

Arm: A part of the microscope that is used to carry the microscope.

Objectives Lenses: Usually, you will find 3 or 4 objective lenses on a microscope. They almost always consist of 4X, 10X, 40X and 100X powers. Oil immersion magnifies 100X.

Diaphragm: regulates the amount of light on the specimen**.** Increases resolving power of the microscope**.**

Stage: Supports the slide being viewed

Slide holder or stage clips: hold the slide in place

Control knobs: Move the slide

Coarse adjustment knob: Moves the stage up and down for focusing.

Fine adjustment knob: Moves the stage slightly to sharpen the image.

Sub stage condenser: concentrates light & directs it through opening in microscope stage.

Light control: Controls the intensity of light**.** Serves as the on/off switch for some microscopes.

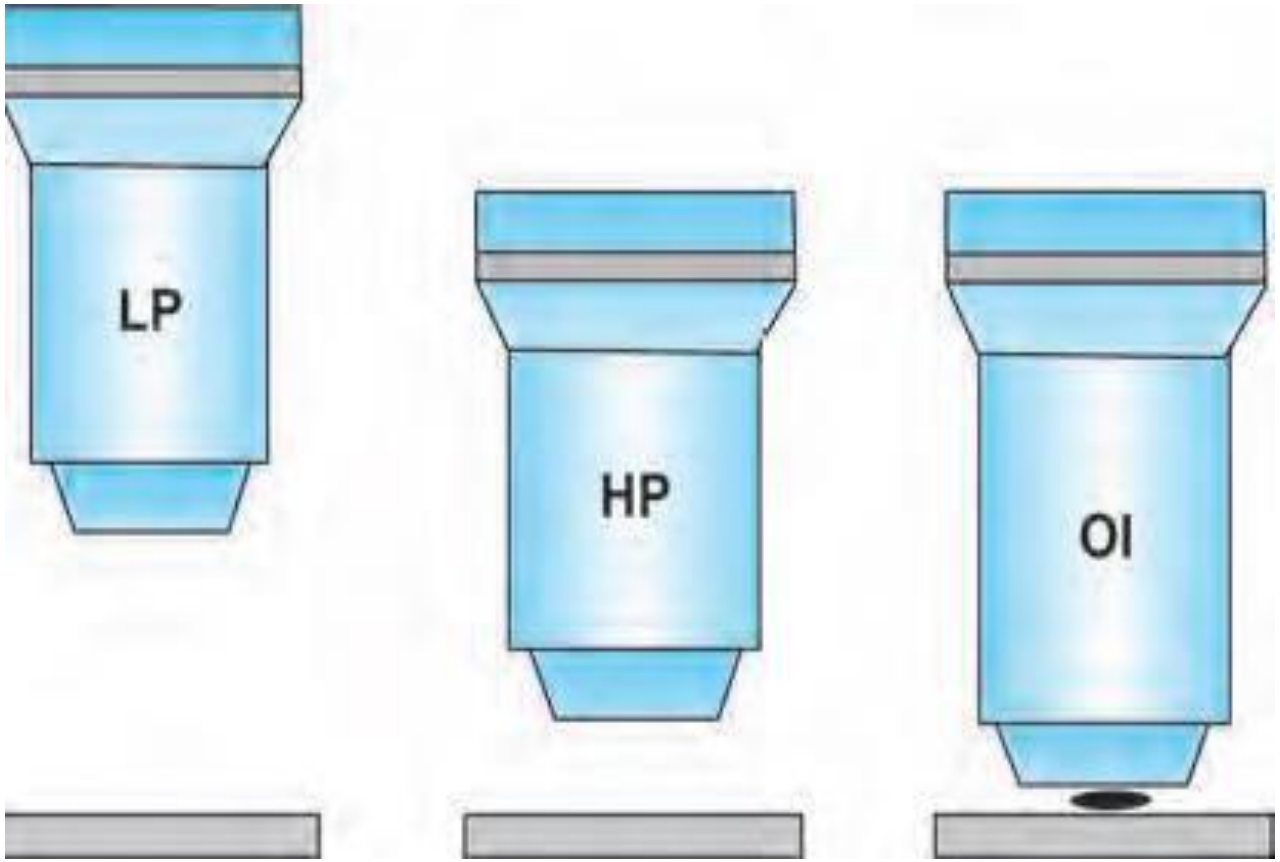
Base: provides support for microscope**.**

Working distance

Is the distance between the objective and the slide under study.

This **distance decreases with increasing magnification**.

It is 8–13 mm in **LP**, 1–3 mm in **HP**, and 0.5–1.5 mm in **OI** lenses, respectively.




THANK
YOU