Lab:1

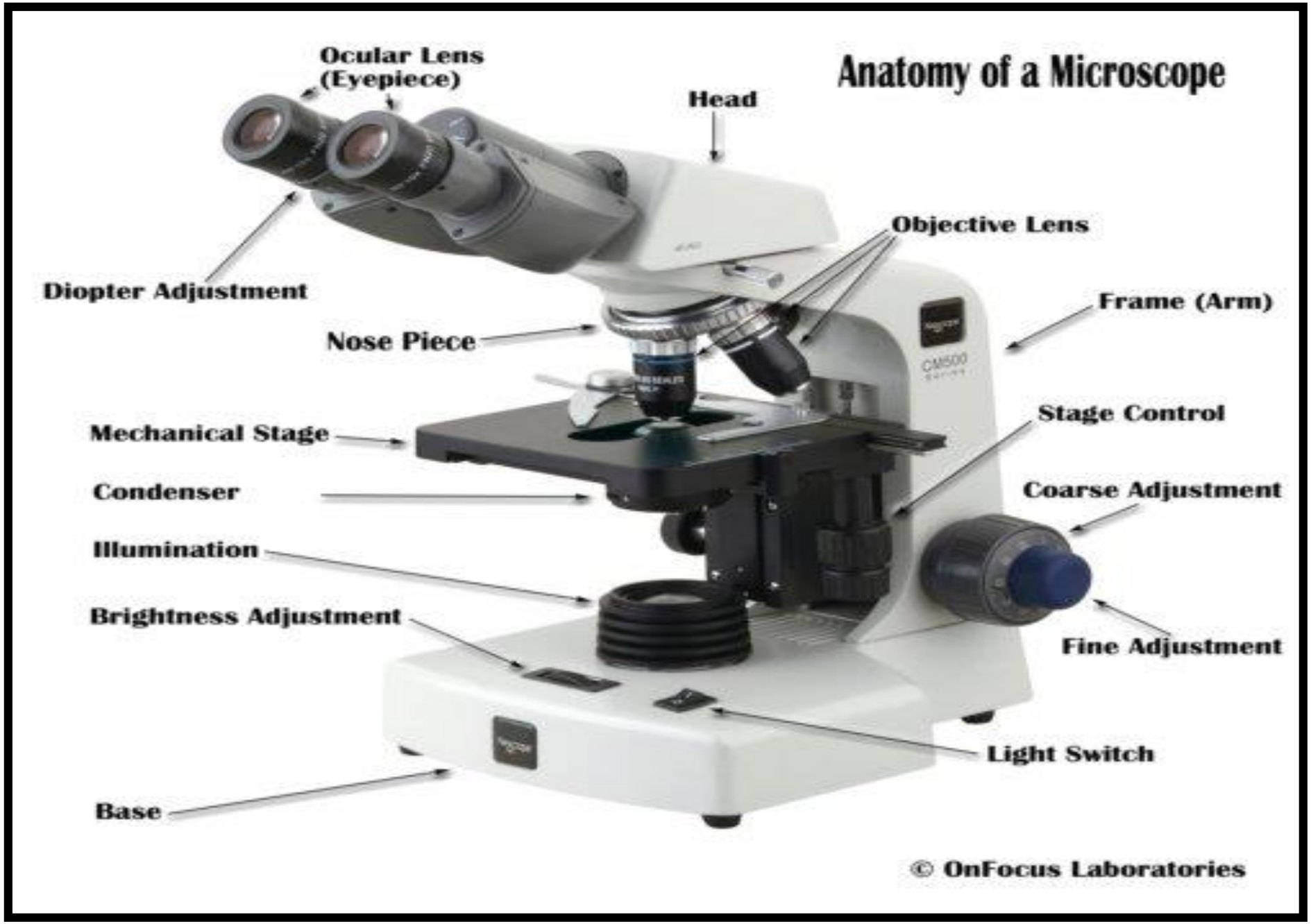
TYPES OF MICROSCOPS

1) Light Microscopes

Light microscope (**LM**) is an instrument that uses visible **light** and magnifying lenses to examine small objects not visible to the naked eye, or in finer detail than the naked eye allows.

working Principle

Light from a mirror is reflected up through the specimen, or object to be viewed, into the powerful objective lens, which produces the first magnification. The image produced by the objective lens is then magnified again by the eyepiece lens, which acts as a simple magnifying glass.


Anatomy of a Microscope
Ocular Lens (Eyepiece)
Head
Diopter Adjustment
Objective Lens
Frame (Arm)
Nose Piece
Mechanical Stage
Stage Control
Condenser
Coarse Adjustment
Illumination
Brightness Adjustment
Fine Adjustment
Light Switch
Base
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Eye piece (1

Diopter Adjustment (2

Body tube (Head) (3

Arm (4

Coarse adjustment (5

Fine adjustment (6

Nosepiece (7

Objective lenses (8

Specimen or slide (9

stage (1

Stage clips (2

Aperture (3

On/off switch (4

Illumination (5

Iris diaphragm (6

Condenser (7

Base (8

The types of Light Microscopes

Some of the major types of light microscopes are as follows:

A. Dark-field Microscope.

B. Phase-Contrast microscope.

C. interference-contrast microscope.

D. Ultraviolet Microscope.

E. Fluorescence microscope.

F. Confocal microscope.

1) Electron microscope

Electron microscope (EM) is a type of microscope that uses **electrons** to create an image of the target. It has much higher magnification or resolving power than a normal light microscope.

working Principle

An electron microscope uses an **'electron beam'** to produce the image of the object and magnification is obtained by 'electromagnetic fields'; unlike light or optical microscopes, in which 'light waves' are used to produce the image and magnification is obtained by a system of 'optical lenses.

Parts of an electron microscope

Electron gun (1

Electron magnetic lenses : (2

Condenser lens -**a**

Objective lens -**b**

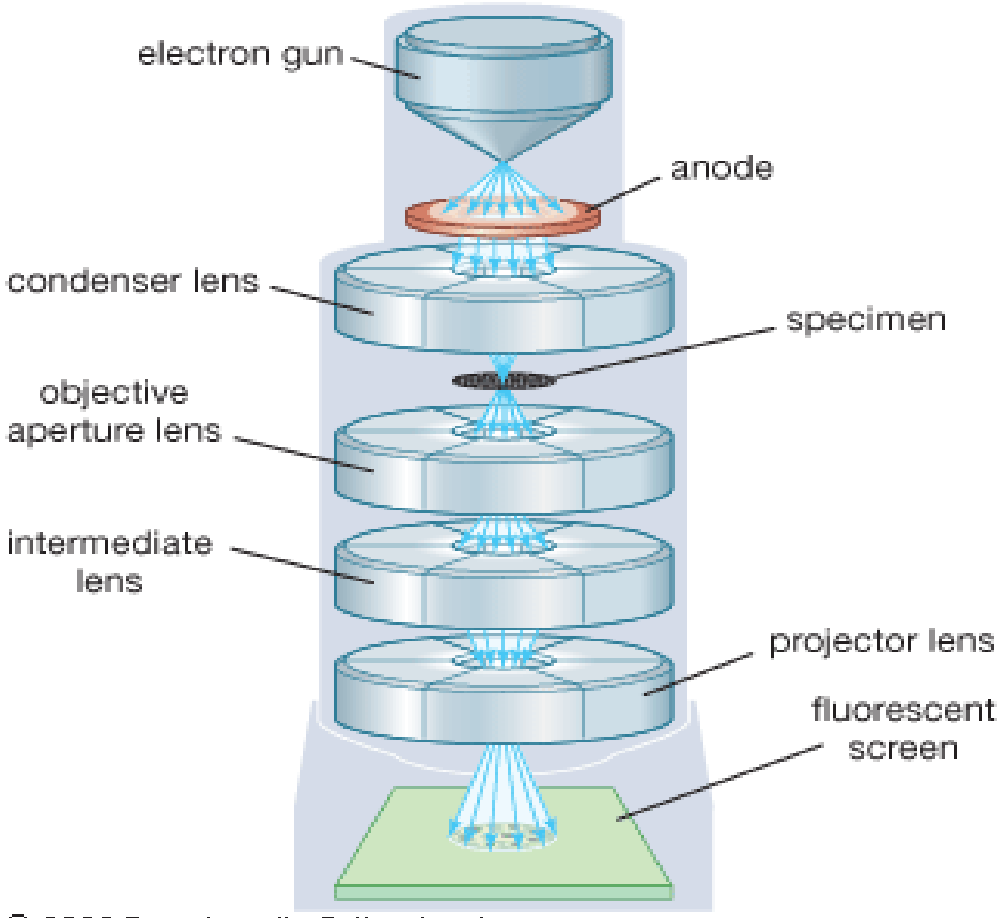
Projector lens -**c**

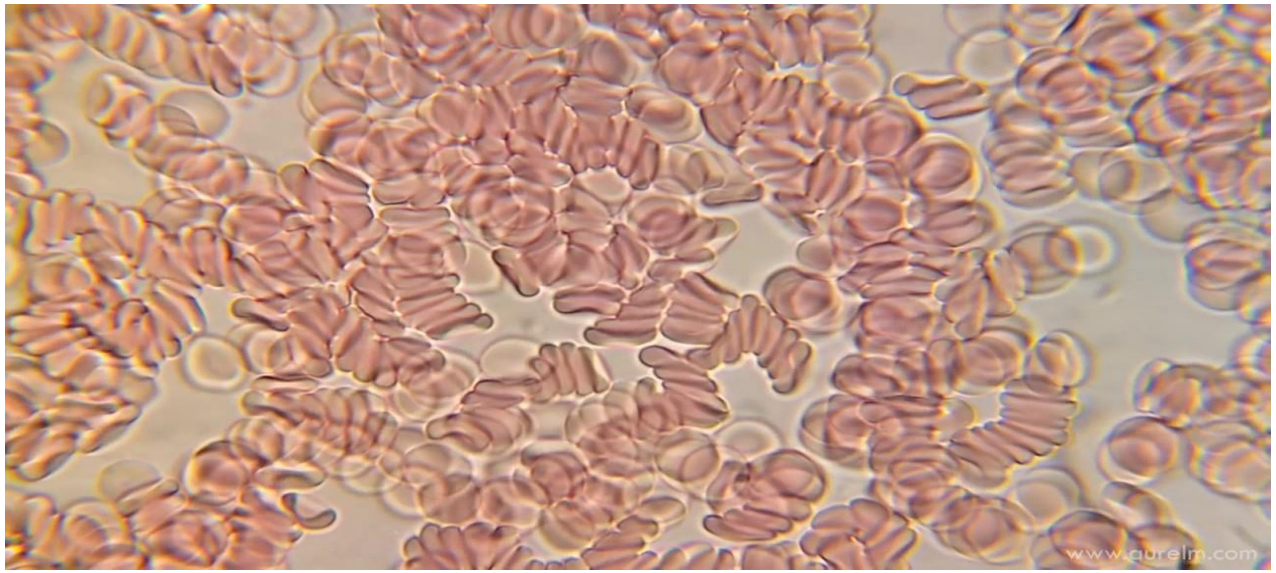
Fluorescent screen (3

Camera (4

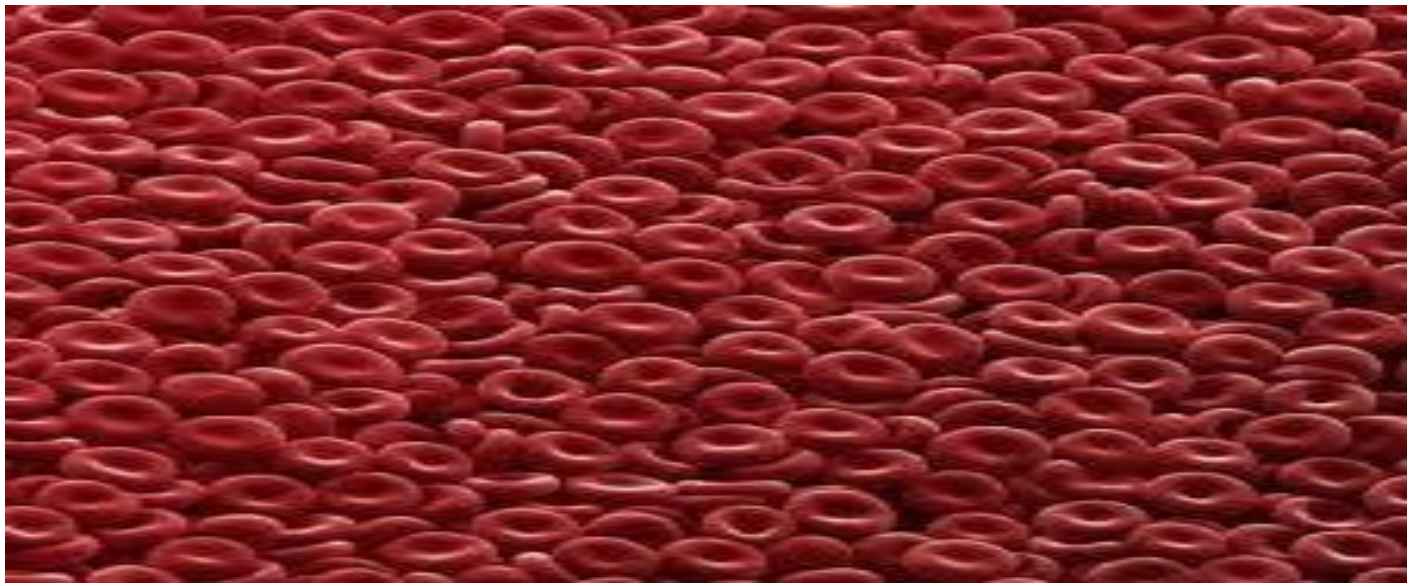
Deflation device (5

Voltage measuring device (6





(Red blood cells in compound light microscope (L.M.))



(Red blood cells in electron microscope (E.M.))

The types of Electron Microscopes

The major types of Electron Microscopes are as follow

A. Transmission electron microscope (TEM).

used to view thin specimens (tissue sections, molecules, etc) through which electrons can pass generating a projection image.

B. Scanning electron microscope (SEM).

scans a focused electron beam over a surface to create an image. The electrons in the beam interact with the sample, producing various signals that can be used to obtain information about the surface topography and composition.

C. Reflection electron microscope (REM).

Is now well established as a technique for the study of the structure of surfaces of crystals.

A- (An image of Bacillus subtilis taken with a transmission electron microscope)

B- (An image of an ant in a scanning electron microscope)

***Why is the light microscope called the compound microscope?**

Compound microscope are so called because they are designed with a compound lens system. The objective lens provides the primary magnification which is compounded (multiplied) by the ocular lens (eyepiece).

***What can you see in a light microscope?**

Using a light microscope, one can view cell walls, vacuoles, cytoplasm, chloroplasts, nucleus and cell membrane. Light microscopes use lenses and light to magnify cell parts. However, they usually can achieve a maximum of 2000x magnification which is not sufficient to see many other tiny organelles.

***How Does a Microscope Work?**

All of the parts of a microscope work together - The light from the illuminator passes through the aperture, through the slide, and through the objective lens, where the image of the specimen is magnified. Then magnified image continues up through the body tube of the microscope to the eyepiece, which further magnifies the image the viewer then sees.

***What are the differences between TEM and SEM?**

1-**SEM** is based on scattered electrons while **TEM** is based on transmitted electrons.

2- **SEM** focuses on the sample's surface and its composition whereas **TEM** provides the details about internal composition.

3-TEM has up to a 50 million magnification level while **SEM** only offers 2 million as a maximum level of magnification.

4-The resolution of **TEM** is 0.5 angstroms while **SEM** has 0.4 nanometers. However, 7-**SEM** images have a **better** depth of field compared to **TEM** produced images