Lab instrumentation

Microscope lecture 1

A microscope is an optical instrument that uses a lens or a combination of lenses to produce highly magnified images of small specimens or objects when they are too small to be seen by the naked (unaided) eye.

A light source is used (either by mirrors or lamps) to make it easier to see the subject matter.

Historical overview

There is no one person who invented the microscope as several different inventors experimented with theories and ideas and developed different parts of the concept as they evolved to what is today's microscopes, however, a **Dutchman, Anton van Leeuwenhoek**, **is considered the father of microscopes because of the advances he made in microscope design and use.**

In the early 1930's the first electron beam microscopes were developed which were a breakthrough in technology as they increased the magnification from about 1000x or so up to 250,000x or more. These microscopes use electrons rather than light to examine objects.

Parts of a Microscope:-

Eyepiece (Ocular): The eyepiece consists of a series of lenses mounted in a tube at the upper end of the microscope. Its basic function is to look at the focused, magnified image projected by the **objective lens** and magnify that image a second time before the eye looks at the image of the specimen. The eyepieces are usually **10x** but also come in 5x, 12.5x, 15x, and 20x. **The "x" refers to the amount of magnification (power) that this lens adds as a multiplier to the magnification of the**

objective. They are inscribed with the magnification and its field number (which is the diameter in millimeters of the diaphragm opening (aperture) of the eyepiece.

Head (Body)

The head is the upper part of the microscope that connects the eyepiece to the nosepiece or turret

Nosepiece (Turret or Revolving Nosepiece)

The nosepiece is a rotating turret located above the stage on compound microscopes that can hold multiple objective lenses of various magnifications**.**

Objective Lenses: The objectives are the lens system closest to the specimen Most compound microscopes have three or four (occasionally five) objectives usually of 4x, 10x, 40x, and **100x (oil immersion)** which revolve on a nosepiece (turret) to give different magnifying powers. The 4x, 10x, and 40x are called "dry" objectives which means they operate with air between the objective and the specimen. The 100x is called a "wet" objective which means it operates with immersion oil between the lens and the specimen.

The objective lenses are the most **important components** of microscopes. **Their basic function is to gather the light passing through the specimen and then to present the image up into the body of the microscope.** Most quality microscopes **use glass** for the objectives, stay away **from plastic** objectives lenses as the quality level is quite inferior.

Stage

The platform beneath the objectives on which the slide or object to be observed is placed is called a stage. It has a smooth, flat surface . On most compound microscopes, the stage moves up and down and the nosepiece

is stationary but on some microscopes just the reverse takes place. The stage has an opening for passing light.

Condenser Lens (Sub-stage Condenser)

A glass lens or lens system located within or below the stage on compound microscopes. **Its basic function is to gather the light coming in from the light source and to concentrate that light into a light cone onto the specimen.** High power objective lenses have very tiny diameters and require concentrated light to work properly.

Diaphragm

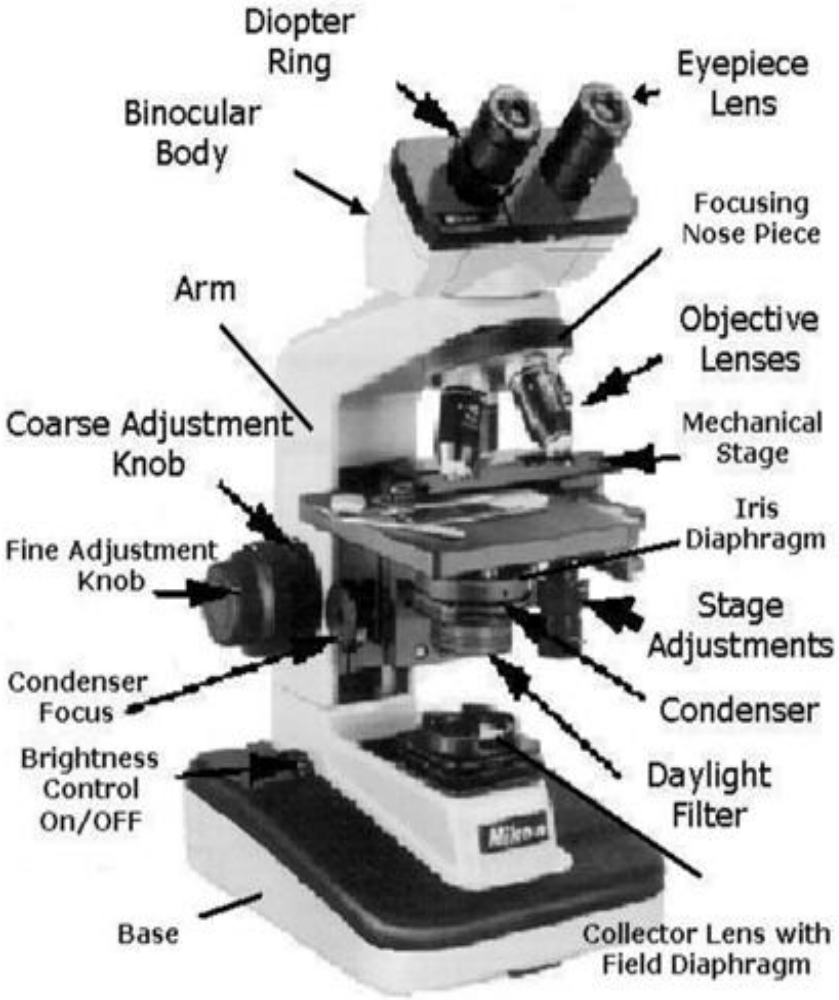
The diaphragm is also called the sub-stage diaphragm or aperture diaphragm. The diaphragm is normally located under the stage of a microscope and it adjusts the amount of light passing into the slide or specimen.

Illumination Systems (Light Source)

Since specimens rarely generate their own light, illumination is necessary. Illumination is the application of light onto an object or specimen in a microscope. The illuminator is the source of light which illuminates the object or specimen to be observed. Illumination of the object or specimen should be bright, free of glare, and evenly dispersed in the field of view.

Focus Systems

A focus control allows you to adjust the focus of the microscope. Every microscope includes a focusing control (knob) for **quick (coarse**) focusing of the image. More expensive compound microscope models include a **coarse** (quick) and **fine** focusing control.


Diopter Ring
Eyepiece Lens
Binocular Body
Focusing Nose Piece
Arm
Objective Lenses
Coarse Adjustment Knob
Mechanical Stage
Iris Diaphragm
Fine Adjustment Knob
Stage Adjustments
Condenser Focus
Condenser
Brightness Control On/OFF
Daylight Filter
Base
Collector Lens with Field Diaphragm