The microscope

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 microscope magnifies the image of such objects thus making them visible to the human eye. Microscopes are used to observe the shape of bacteria, fungi, parasites and host cells in various stained and unstained preparations.

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. It is usually expressed in the form 10×. 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 micrometres (μm).

Types of microscope

1. Light Microscopes

The most common type of microscope, also referred to as **optical 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, for performing dissections, or for clinical blood and tissue assessment.

2. Compound Microscopes

Compound microscopes have a combination of lenses that enhances both magnifying powers as well as the resolving power. A compound microscope uses a lens close to the object being viewed to collect light (called the objective lens) which focuses a real image of the object inside the microscope They are most often used to view objects at a cellular level and can reach magnifications up to 1000x.

3. Electron Microscopes

An electron microscope doesn't need light to create an image. Instead, this type of microscope sends accelerated electrons across or through a specimen to render a digital image. These microscopes have the highest power and highest resolution available and are used to see detailed structure at the cellular and macromolecular levels. While this may seem like the answer to all things microscopy, electron beams destroy samples. This means you can't use them to view live specimens.

4. Scanning Electron Microscopes (SEM)

Is a type of electron microscope that produces images of a sample by scanning the surface with a focused beam of electrons. The electrons interact with atoms in the sample, producing various signals that contain information about the surface topography and composition of the sample. SEM also has a variety of applications for business. 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)

Unlike the scanning structure of an SEM microscope, a TEM must pass electrons through a thin specimen to receive information, comparable to the way light must pass through a specimen on a compound microscope. Rather than reflecting off the specimen's surface, the TEM's electrons pass back and forth through the microscope's vacuum chamber to build an image. Stronger than an SEM microscope, a TEM produces high magnification power of up to 1-nanometer resolution, or about 500,000x. This increased resolution allows us to study ultrastucture of organelles, viruses and macromolecules. Specially prepared materials samples may also be viewed in the TEM.

NOTE: There (STM), which can create images scanning tunneling microscope environmental scanning electron microscope of atoms, and the (ESEM).

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).

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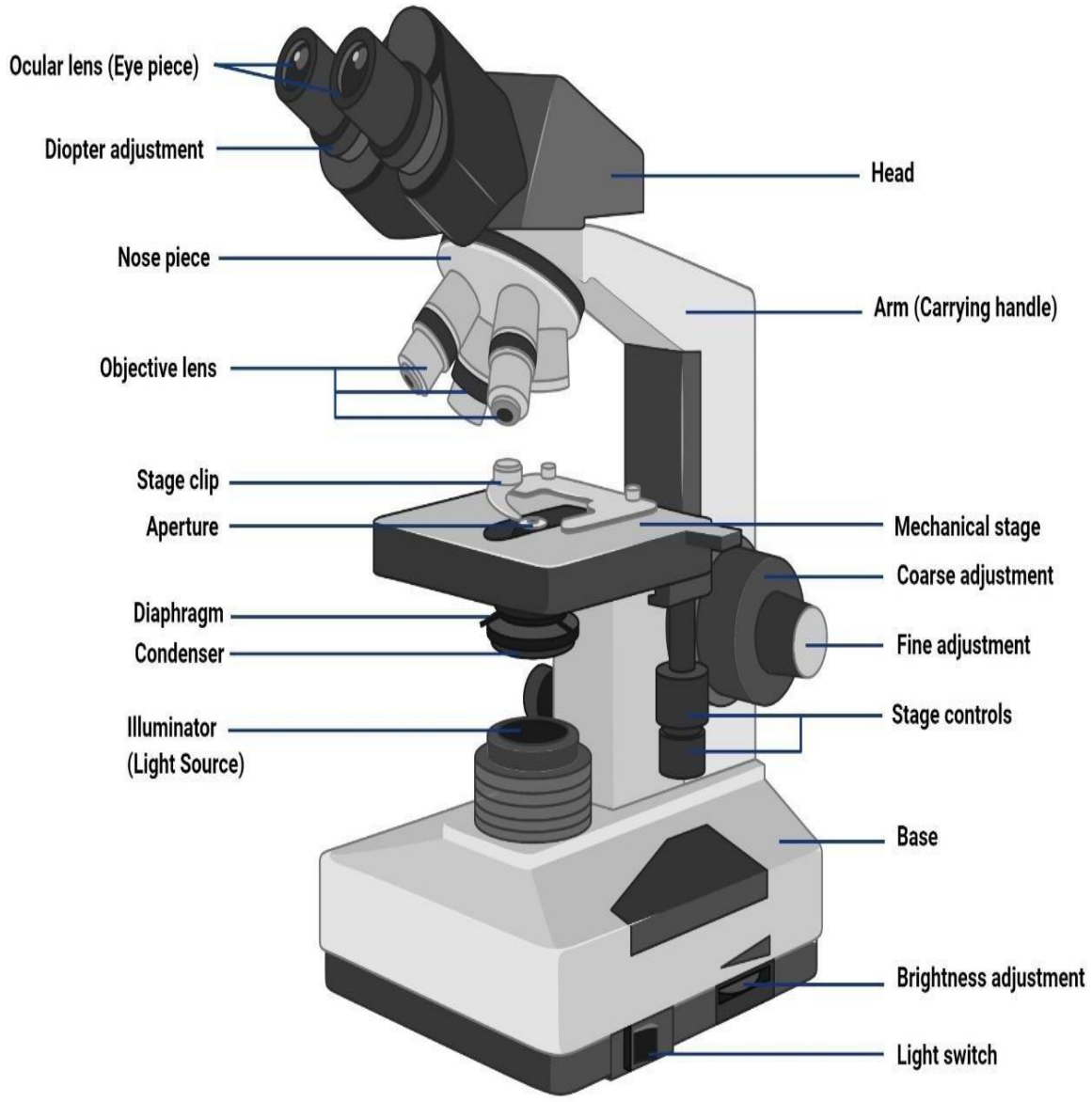

How to Use a Microscope

1. Turn the revolving turret (2) so that the lowest power objective lens (eg. 4x) is clicked into position.
2. Place the microscope slide on the stage (5) and fasten it with the stage clips (8).
3. Look at the objective lens (3) and the stage from the side and turn the focus knob (4) so the stage moves upward. Move it up as far as it will go without letting the objective touch the coverslip.
4. Look through the eyepiece (1) and move the focus knob until the image comes into focus.
5. Adjust the condenser (7) and light intensity for the greatest amount of light.
6. Move the microscope slide around until the sample is in the centre of the field of view (what you see).
7. Use the focus knob (4) to place the sample into focus and readjust the condenser (7) and light intensity for the clearest image (with low power objectives you might need to reduce the light intensity or shut the condenser).
8. When you have a clear image of your sample with the lowest power objective, you can change to the next objective lenses. You might need to readjust the sample into focus and/or readjust the condenser and light intensity. If you cannot focus on your specimen, repeat steps 3 through 5 with the higher power objective lens in place. **Do not let the objective lens touch the slide!**
9. When finished, lower the stage, click the low power lens into position and remove the slide.