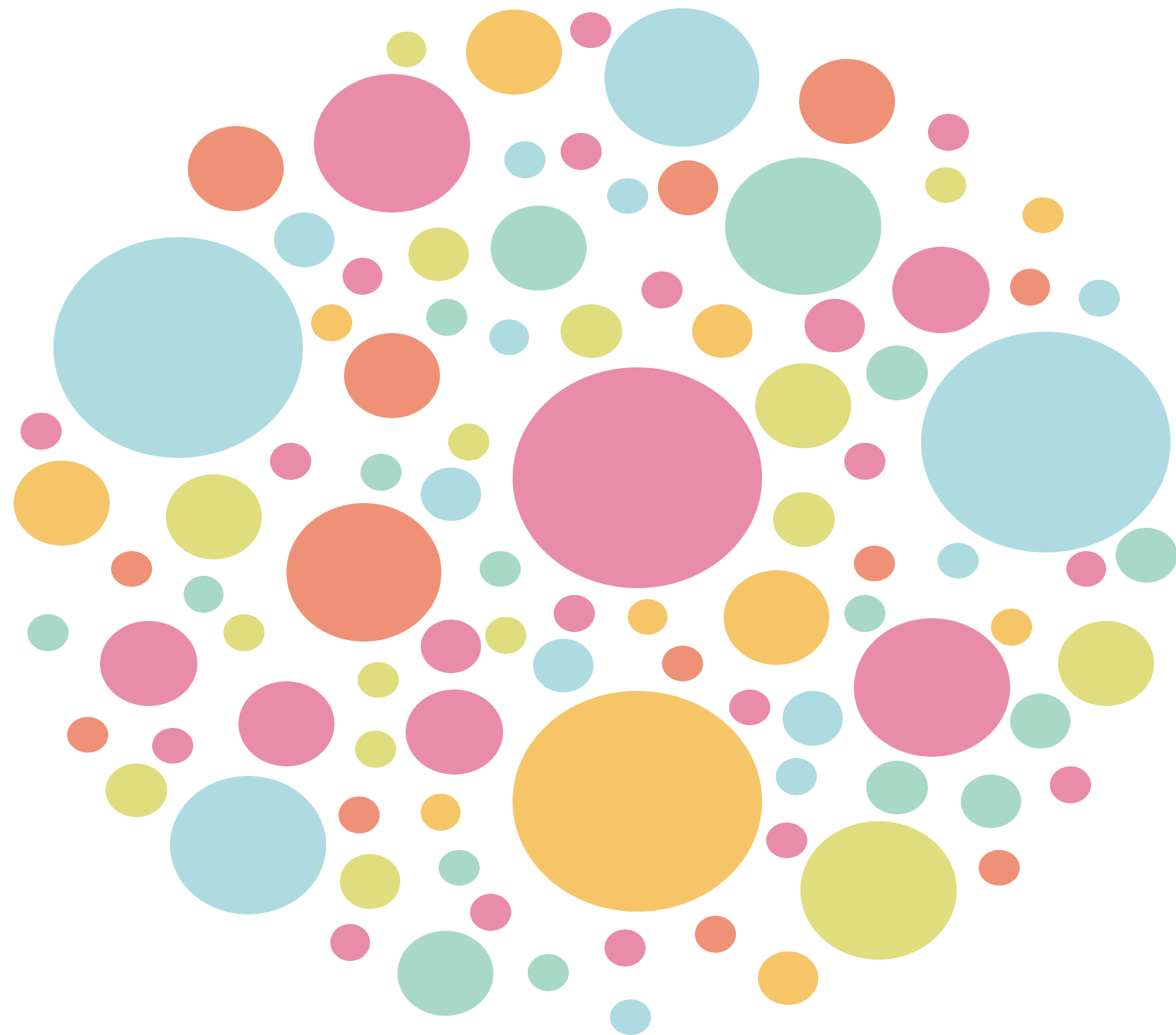


Republic of Iraq
Ministry of Higher Education And Scientific
Research
Al-Zahraa University for Women
College of Pharmacy



Human Biology
First semester/ Lab.1
The Microscope

By:

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The Microscope

Microscopes are essential tools in biology, allowing scientists to observe and study organisms and cells that are too small to be seen with the naked eye.





Microscope Types

1. Light Microscope (Optical Microscope):

- ❖ Principle: Uses visible light and a system of lenses to magnify samples.
- ❖ Types:
 - a) **Compound Microscope:** Features multiple lenses for magnification; ideal for viewing thin sections of specimens. Typically has two or more objective lenses with varying magnifications (e.g., 4x, 10x, 40x, 100x). Uses transmitted light, meaning the light passes through the specimen.
 - b) **Stereo Microscope:** Provides a 3D view of larger specimens, useful for dissections.



Microscope Types

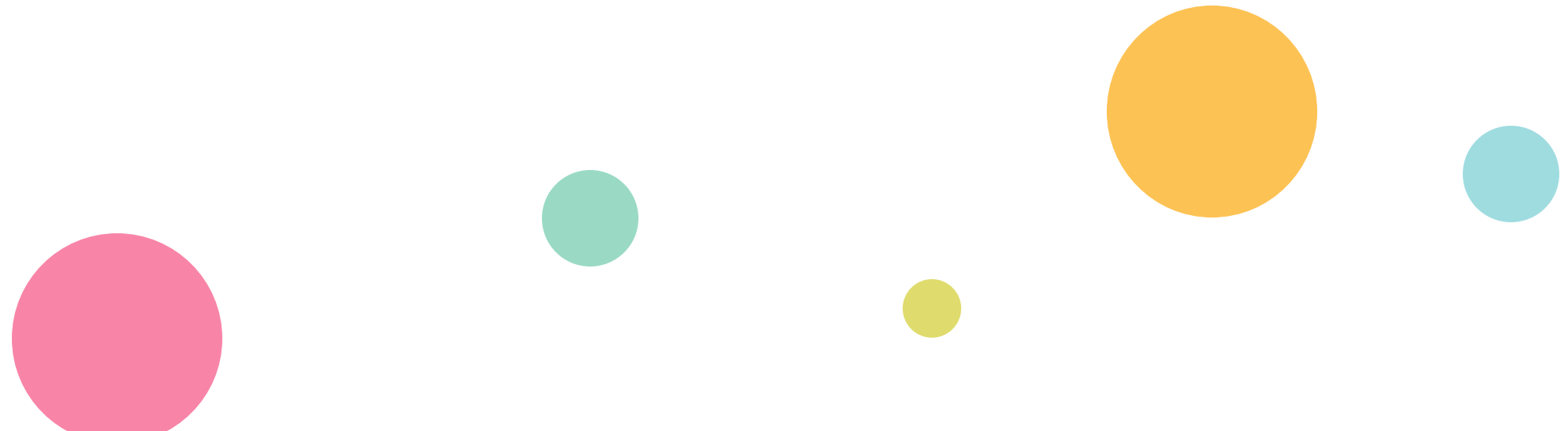
2. Electron Microscope:

- ❖ Principle: Uses beams of electrons for imaging, allowing much higher magnification and resolution than light microscopes.
- ❖ Types:
 - a) **Transmission Electron Microscope (TEM)**: Electrons pass through a thin specimen, providing detailed images of internal structures.
 - b) **Scanning Electron Microscope (SEM)**: Electrons scan the surface of a specimen, creating detailed 3D images of its topography.



Parts of the light microscope

A compound microscope is made up of both structural and optical components. The 3 basic structural components are – the head, arm and base.

1. The body or head comprises the optical parts present in the upper part of the microscope.
 2. The arm connects and supports the base and head of the microscope. Also, it is used to carry the microscope.
 3. Base of the microscope supports the microscope and comprises the illuminator.
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Microscope Types

Stereo microscope



Compound Microscope



Transmission Electron Microscope



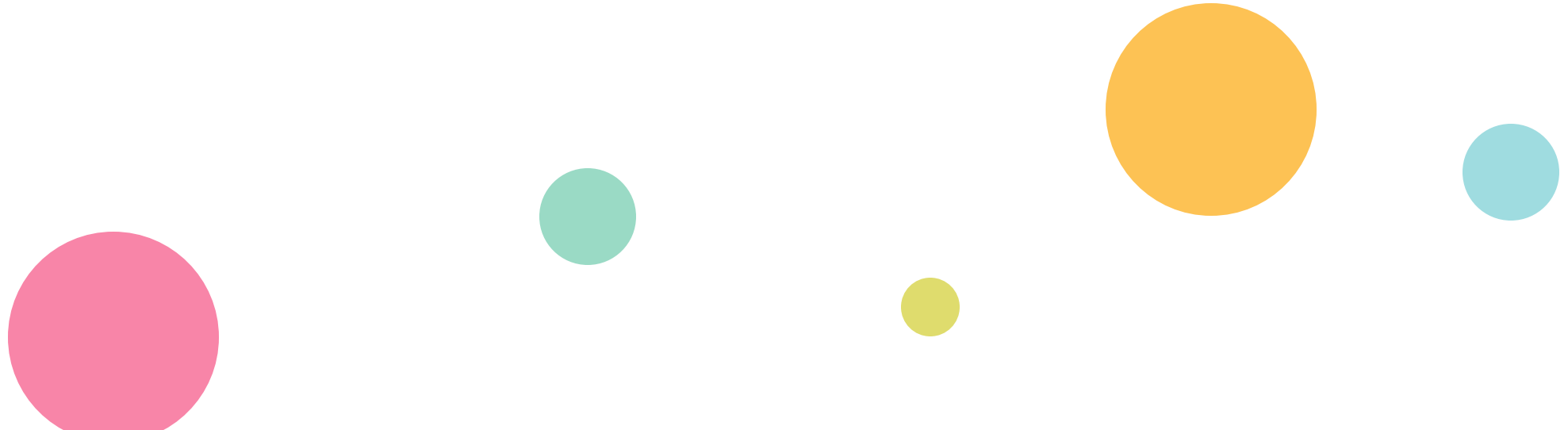
Scanning electron microscope





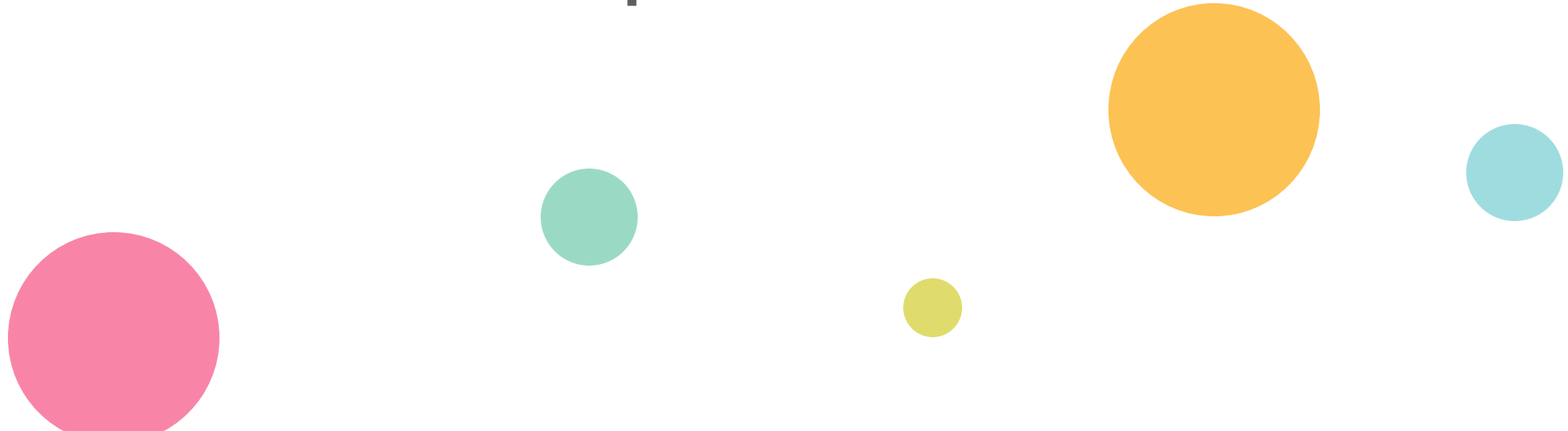
Anatomy of a compound Microscope

The optical part of the microscope includes:

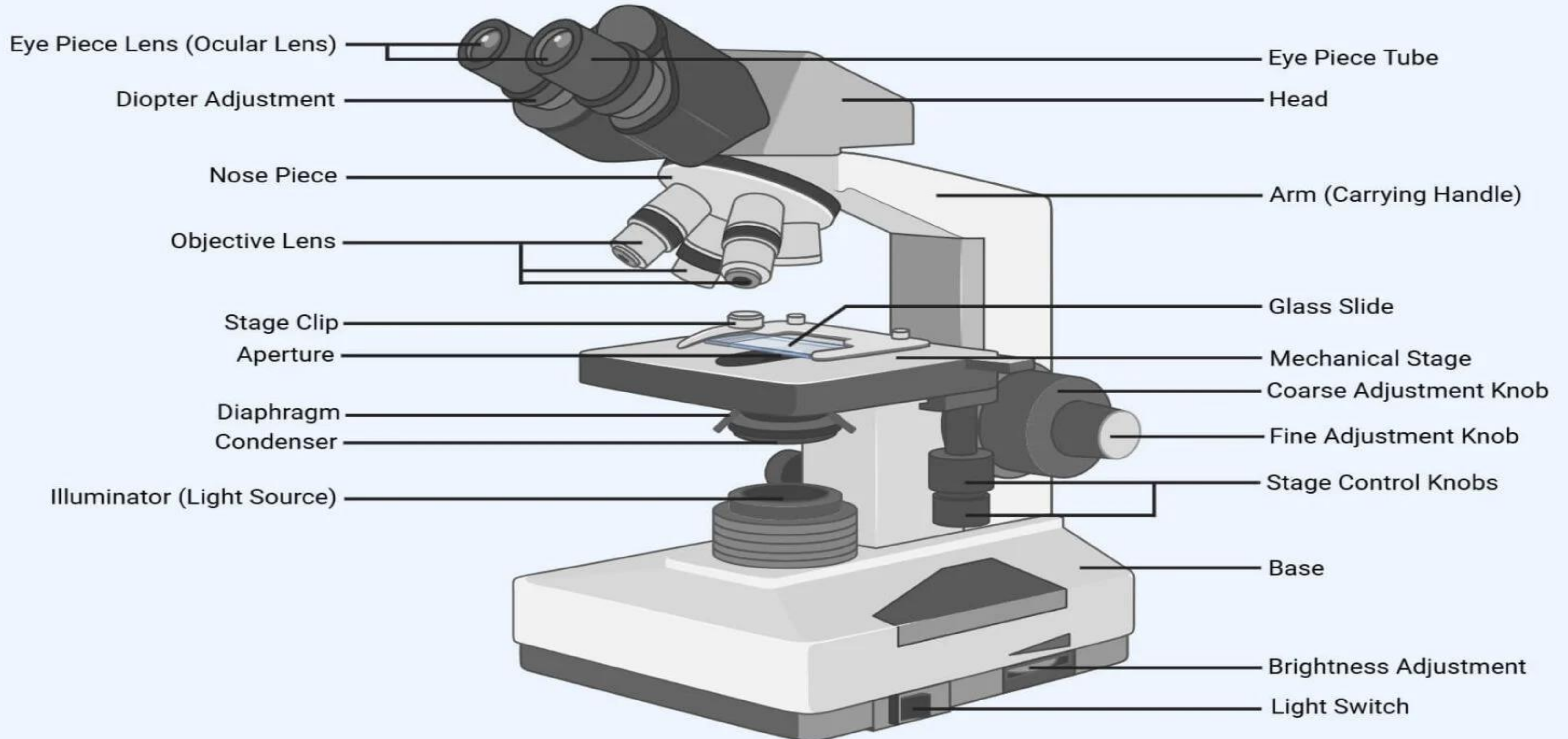
1. **Eyepiece or Ocular** contain the ocular lens at the top of the microscope.
 2. **Eyepiece Tube** holds the eyepieces in place above the objective lens.
 3. **Objective lenses** are the primary optical lenses on a microscope. They range from 4x, 10x, 40x and oil immersion 100x and typically include four lenses on most microscope.
 4. **Nosepiece** holds the objective lenses can be rotated to change magnification.
 5. **Fine & Coarse** adjustment knobs are used to moves the stage slightly to sharpen & focusing the image.
 6. **stage** supports the slide being viewed.
- 



Anatomy of a compound Microscope

7. **The aperture** is a tiny hole in the stage via which the transmitted light enters the stage.
 8. **Illuminator** is the light source for a microscope typically located in the base of the microscope.
 9. **Condenser** is used to collect and focus the light from the illuminator on the specimen is located under the stage.
 10. **Condenser Focus knob** moves the condenser up or down to control the light focus on the specimen.
 11. **Diaphragm** regulates the amount of light that reaches the specimen.
- 

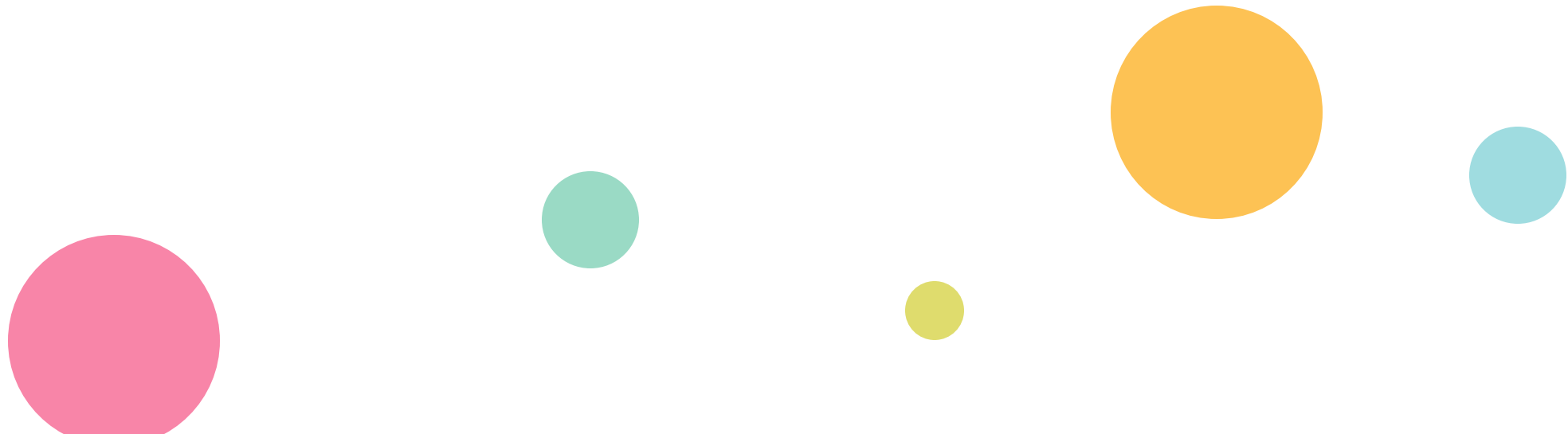
Parts of a Microscope





Applications

Applications in Biology:

- **Cell Biology:** Studying cell structure.
 - **Microbiology:** Identifying and characterizing microorganisms.
 - **Histology:** Examining tissue samples to understand morphology and pathology.
- 



BASIC UNITS FOR MICROSCOPE

1 meter = 1000 millimeter

1 millimeter = 1000 micrometer (μm) = 10^{-6} meter

1 micrometer = 1000 nanometer (nm) = 10^{-9} meter

1 Angstrom (A) = 10^{-10} meter

1 nanometer = 10 Angstrom





MAGNIFICATION AND RESOLUTION

Magnification is the apparent increase in size affected by a convex lens. A compound microscope uses two sets of lenses, with differing focal lengths, to facilitate magnification. The total magnification achieved by the lens array is the product of each individual lens.

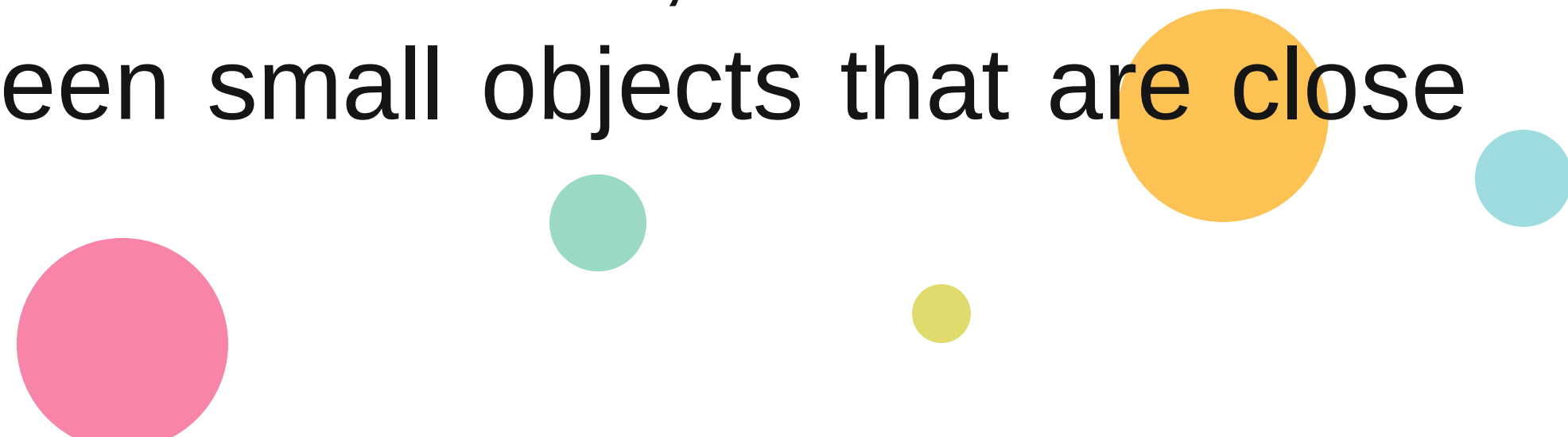
Magnification (total) = magnification (obj. lens) x magnification (ocu. lens)

Example:

Mag (obj) = 40X and Mag (ocular) = 10X

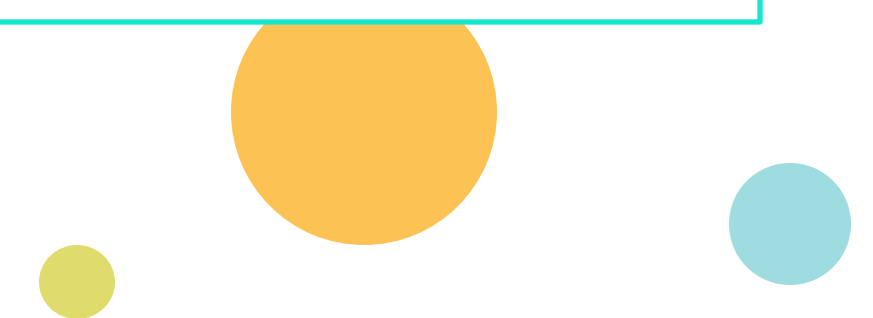
Then Mag (total) = (40X) (10X) = 400X.

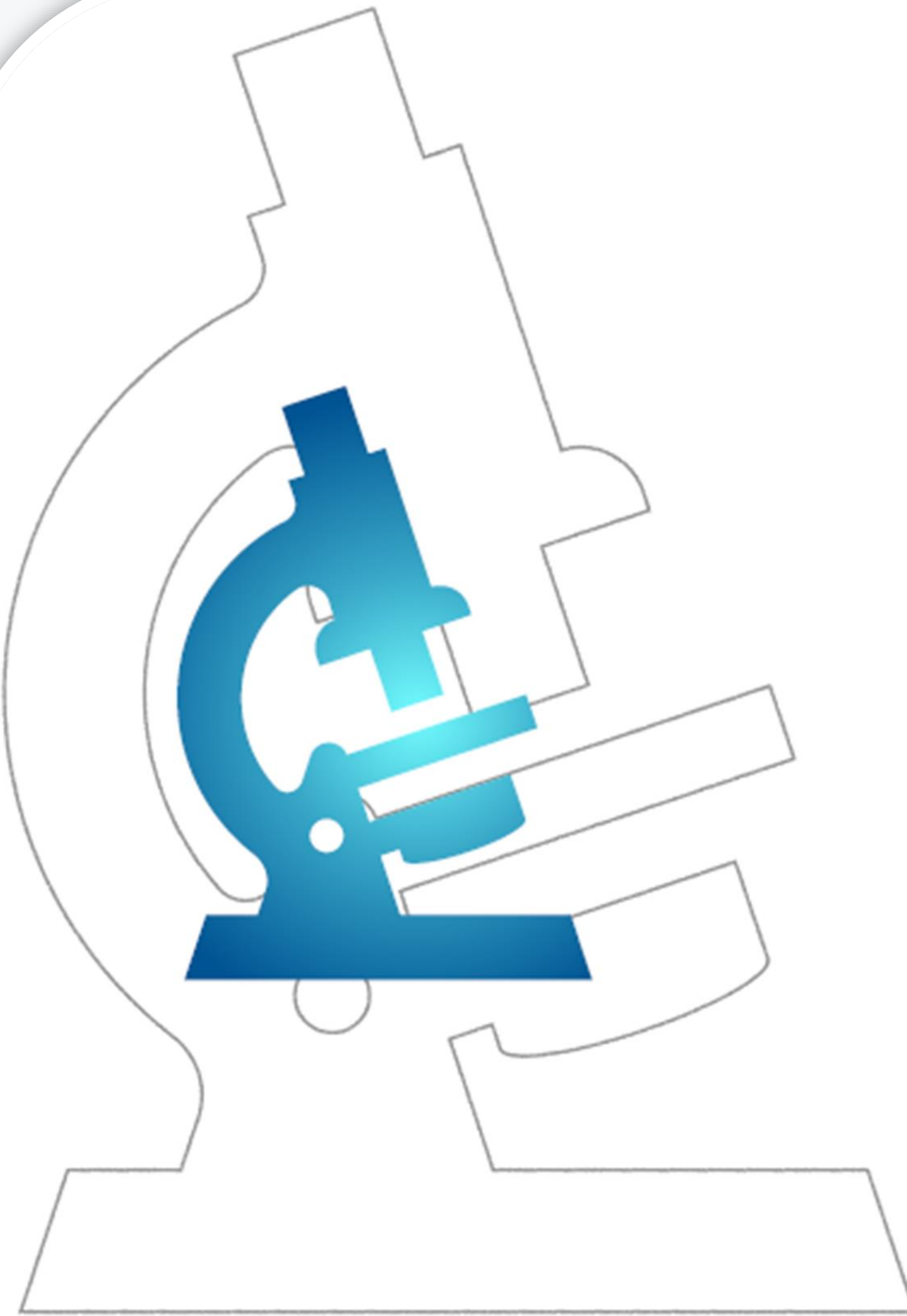
Resolution is the ability to separate points (in other words, to observe fine detail), or the ability of a lens to distinguish between small objects that are close together.





Microscope Care

- ✓ **Always carry with 2 hands.**
 - ✓ **Never touch the lenses with your fingers.**
 - ✓ **Only use lens paper for cleaning.**
- 



QUESTIONS?

The background of the image is white and is decorated with numerous circles of various sizes and colors. The colors include pink, orange, teal, and light green. The circles are scattered across the entire frame, with some being larger and more prominent than others. The text "Thank you" is centered in the middle of the image in a blue, rounded, handwritten-style font.

Thank you