
بسم الله الرحمن الرحيم

Foundation Module
Skill Lab /Physiology Practical
First Year MBBS Batch 51
Introduction To Microscope

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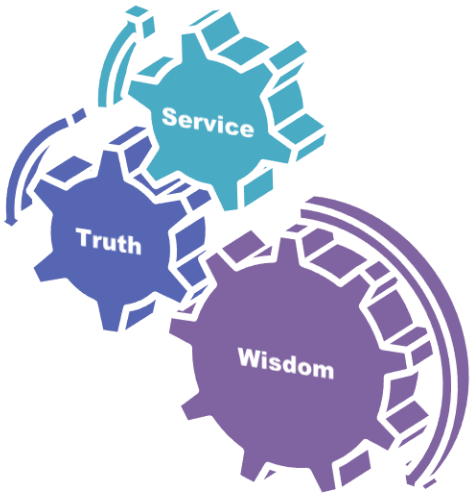
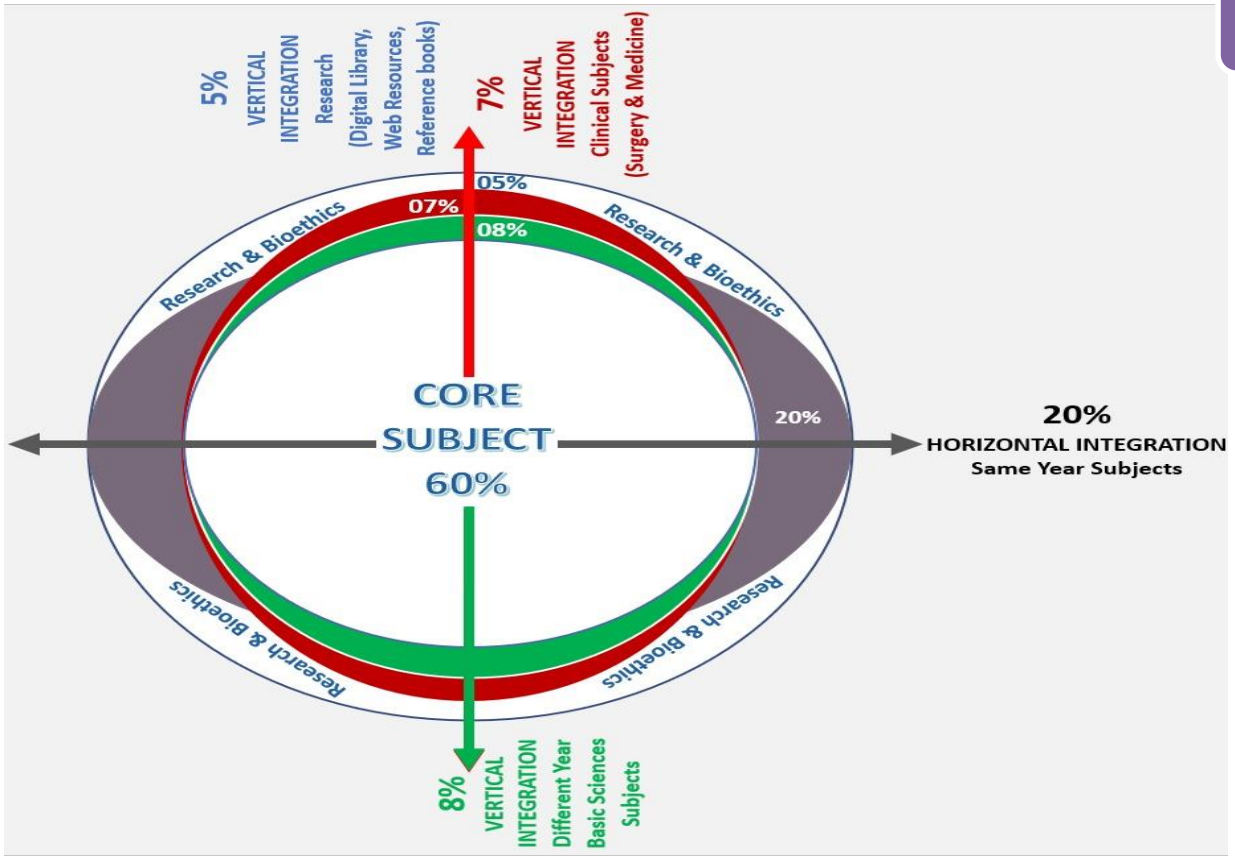
Motto



Vision; The Dream/Tomorrow

- To impart evidence based research oriented medical education
- To provide best possible patient care
- To inculcate the values of mutual respect and ethical practice of medicine

Professor Umar Model of Integrated Lecture



60% CORE SUBJECT

20% HORIZONTAL INTEGRATION
Physiology
biochemistry

8% VERTICAL INTEGRATION
Pathology
pharmacology

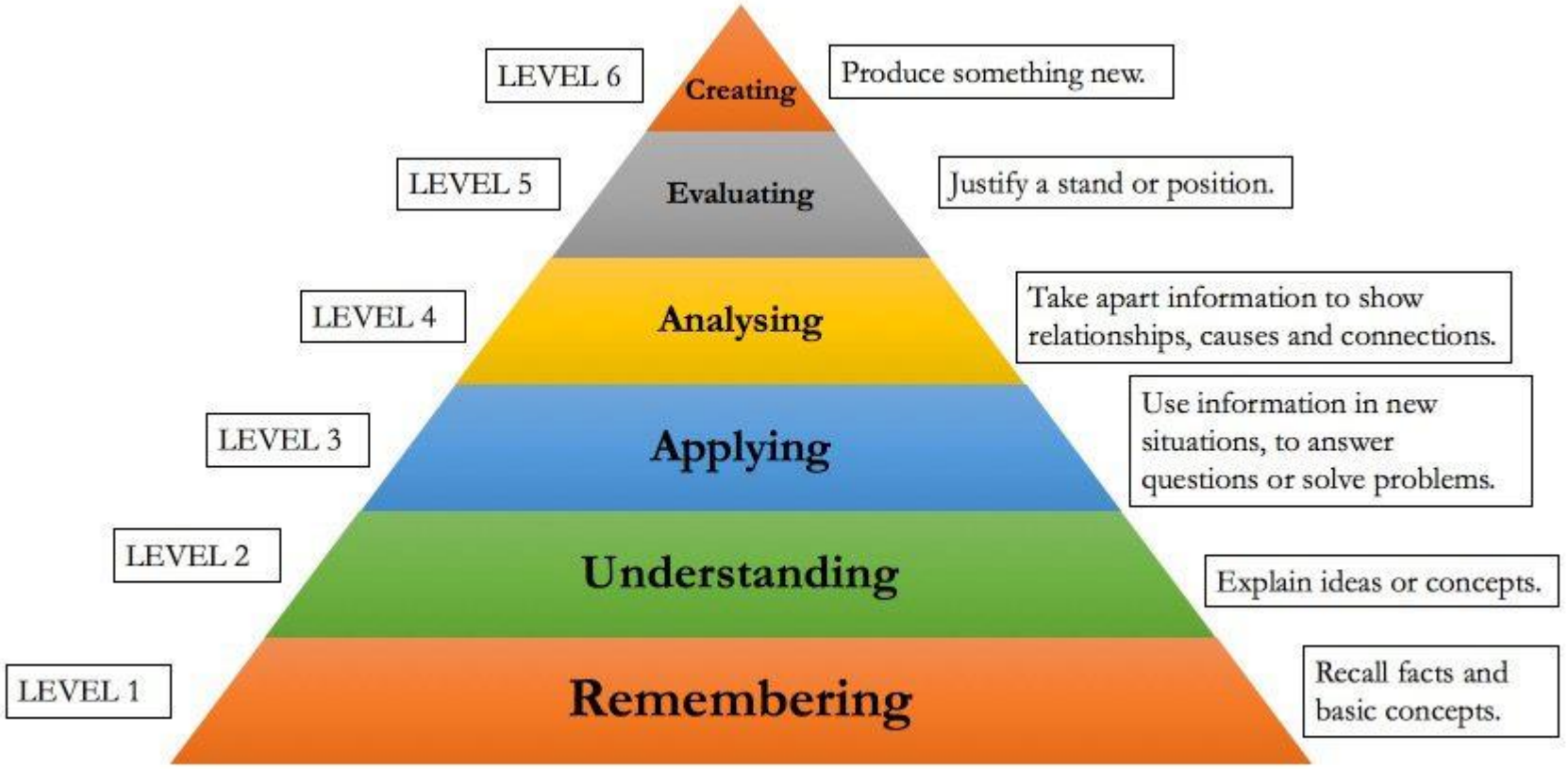
7% VERTICAL INTEGRATION
Clinical integration

5% VERTICAL INTEGRATION
Research, professionalism
Ethics
Digital library

Bloom's Taxonomy : Domains Of Learning

Sr. #	Domain of learning	Abbreviation	Levels of the domain	Meaning
1	cognition	C	C1	Recall / Remembering
2			C2	Understanding
3			C3	Applying / Problem solving
4	Psychomotor	P	P1	Imitation / copying
5			P2	Manipulation / Follows instructions
6			P3	Precision / Can perform accurately
7	Attitude	A	A1	Receiving / Learning
8			A2	Respond / Starts responding to the learned attitude
9			A3	Valuing / starts behaving according to the learned attitude

Bloom's Taxonomy Of The Cognitive Domain



LEARNING OBJECTIVES

Sr. #	Learning Objective	Domain of Learning
1	To define Microscope.	C1
2	To perform step by step the Microscopy procedure.	P3
3	To understand the types of Microscopes	C2
4	To enlist different parts of Microscope.	C1
5	To understand uses of Microscope.	C2
6	To differentiate between Resolution & Magnification.	C2

Core Concept

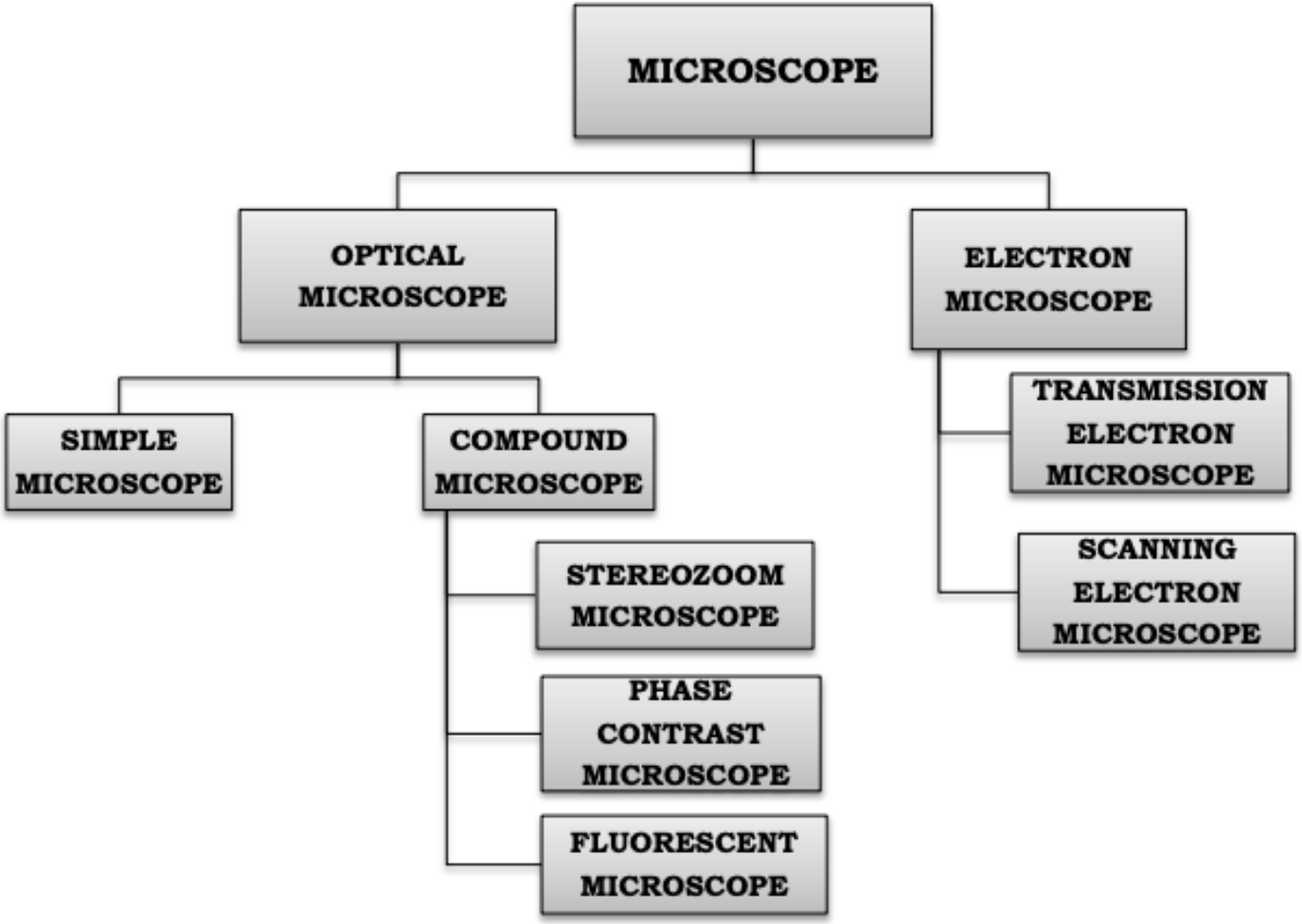
Core Concept

Introduction:-

- A microscope is a scientific instrument that makes things that are too small into big so that they can be examined correctly.
- The use of microscope is to view objects and areas of objects that cannot be seen with the naked eyes. They do this by magnification and resolution. Magnification means how many times the object is enlarged within the viewing lens.
- Resolution means how detailed the object appears when viewed.
- The micro organisms are so small for visualization of microorganisms microscope is used. It magnifies the size of an apparent image of an object.

Core Concept

Introduction:-



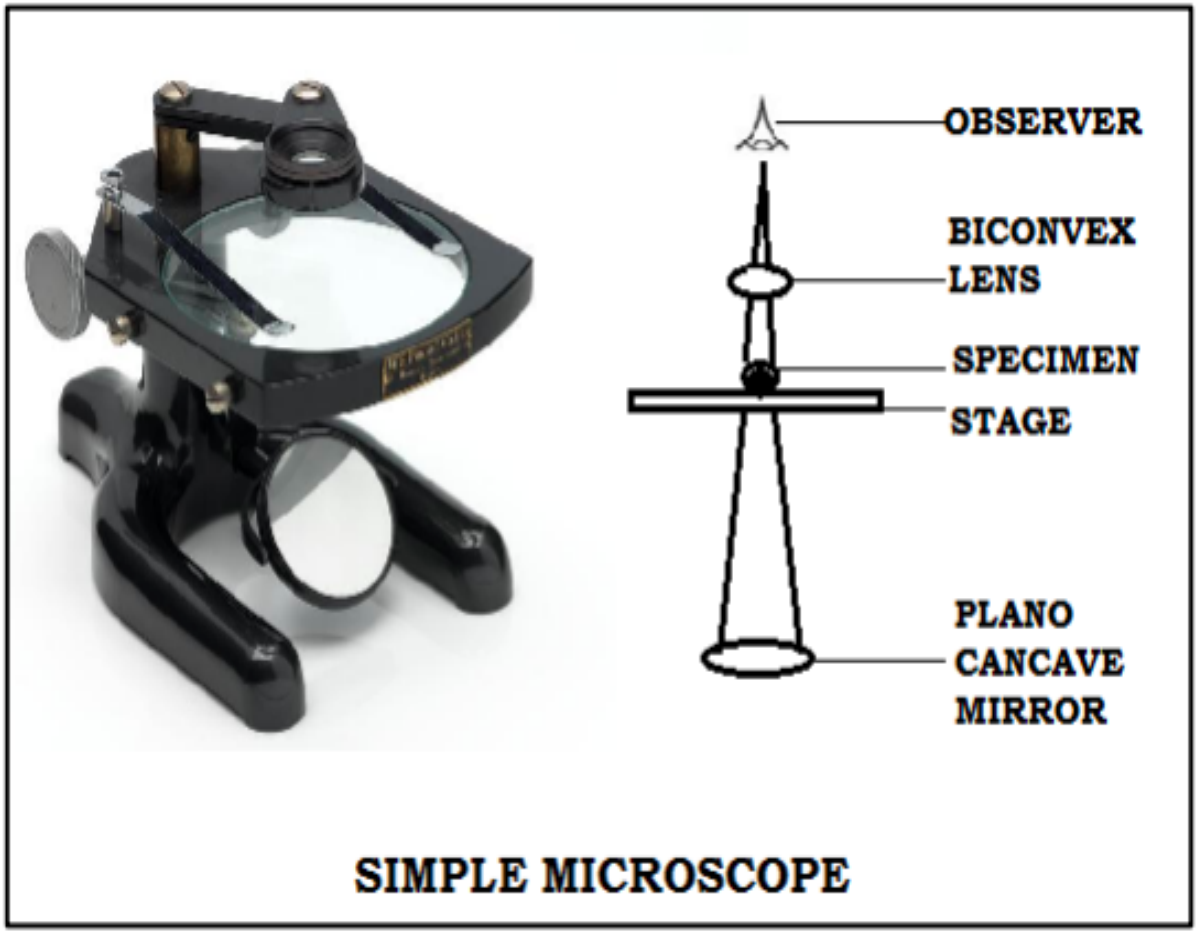
Core Concept

Simple Microscope

A simple microscope is used to obtain small magnifications. It is usually used for study of microscopic algae, fungi and biological specimen.

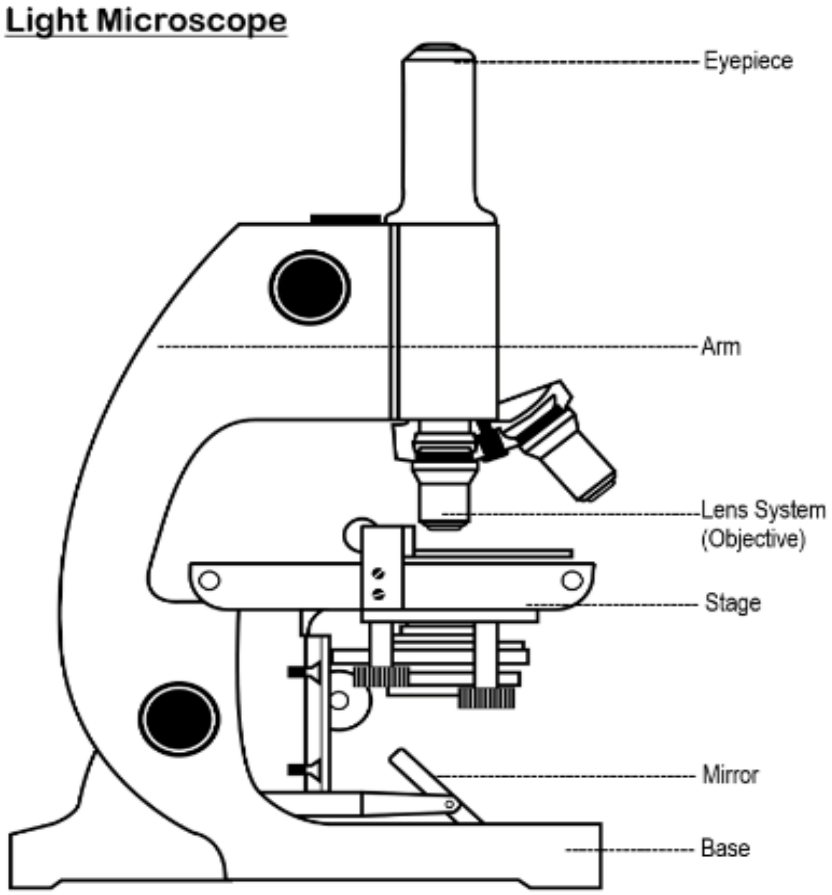
Principal:

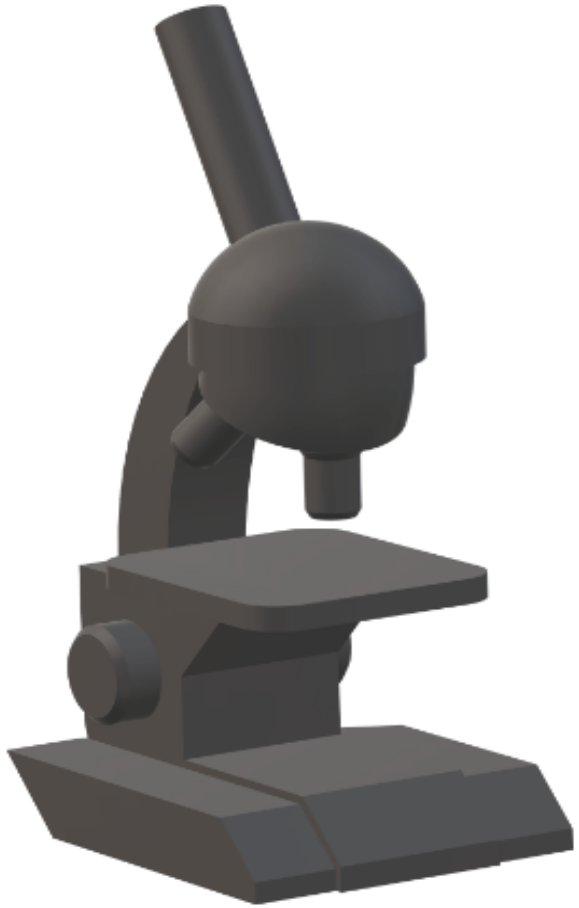
Light from a light source (mirror) passes through a thin transparent object. A biconvex lens magnifies the size of the object to get an enlarged virtual image. The image is viewed from the other side.



Parts of Microscope:-

Simple Microscope





Parts of Microscope

The part of simple microscope are of two categories: Mechanical parts and optical parts.

1.Mechanical parts: These parts support the optical parts and help in their adjustment for focusing the object.

They include metal stand and stage.

Metal stand: It has heavy base plate and a vertical rod fitted to it, which provide support and stability to other parts of the microscope.

Stage: It is a rectangular metal plate fitted to the vertical rod . It has a central hole for light to pass from below. Slide with specimen to be observed is kept on the stage, in such a way that, the specimen remain just on the central hole.

Parts of Microscope

2. Optical Parts: These parts are involved in passing the light through the object (specimen) and magnifying its size. They includes mirror and lens.

a) **Mirror:** A Plano convex mirror is fitted below the stage to the vertical rod by means of a frame. It focused the surrounding light on the object to be observed.

b) **Lens:** The biconvex lens is fitted above the stage, to the vertical rod by means of frame. It magnifies the size of the object and the enlarged virtual image formed is observed by keeping the eye above it. For proper focusing the lens can be moved up and down by the frame.

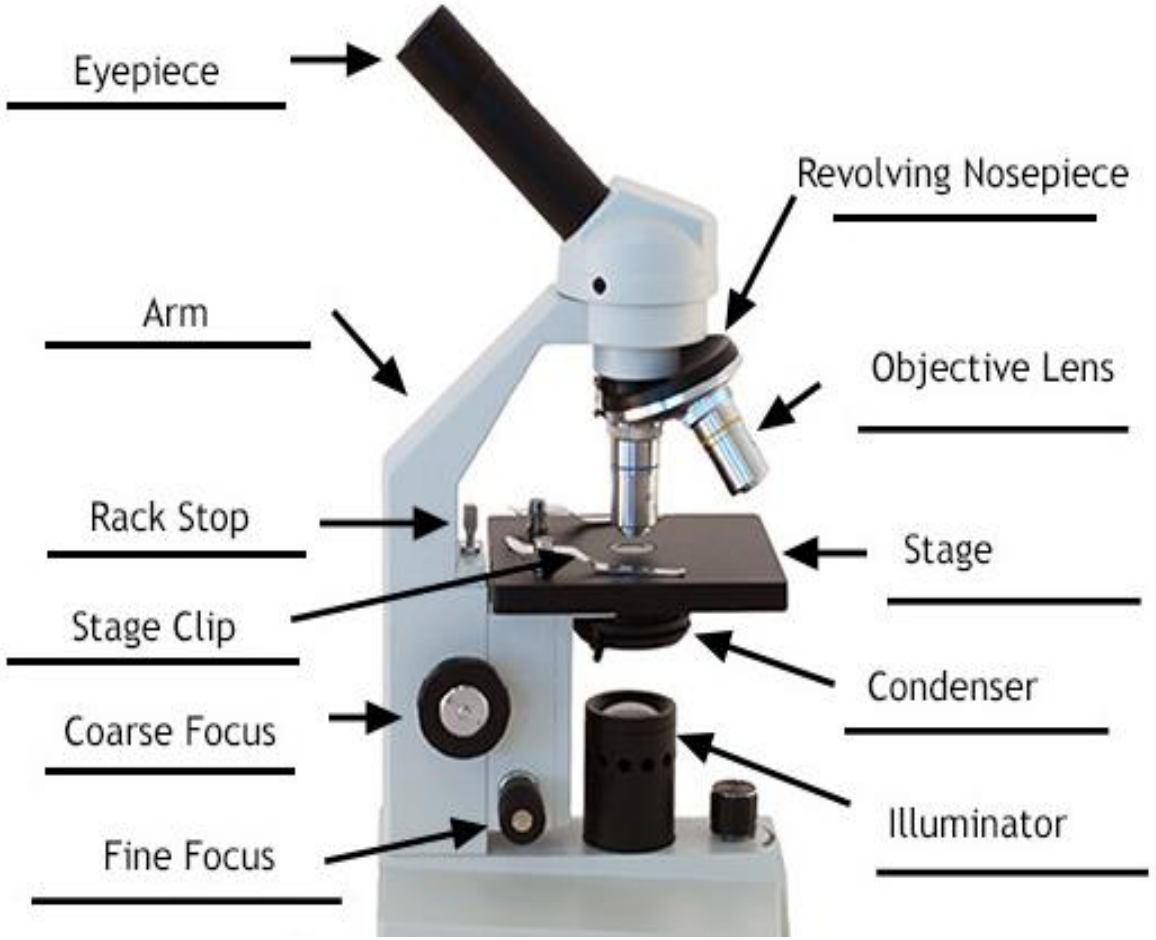
Core Concept

Compound Microscope

A compound microscope is an optical instrument consisting of two convex lenses of short focal lengths which is used for observing the highly magnified images of tiny object.

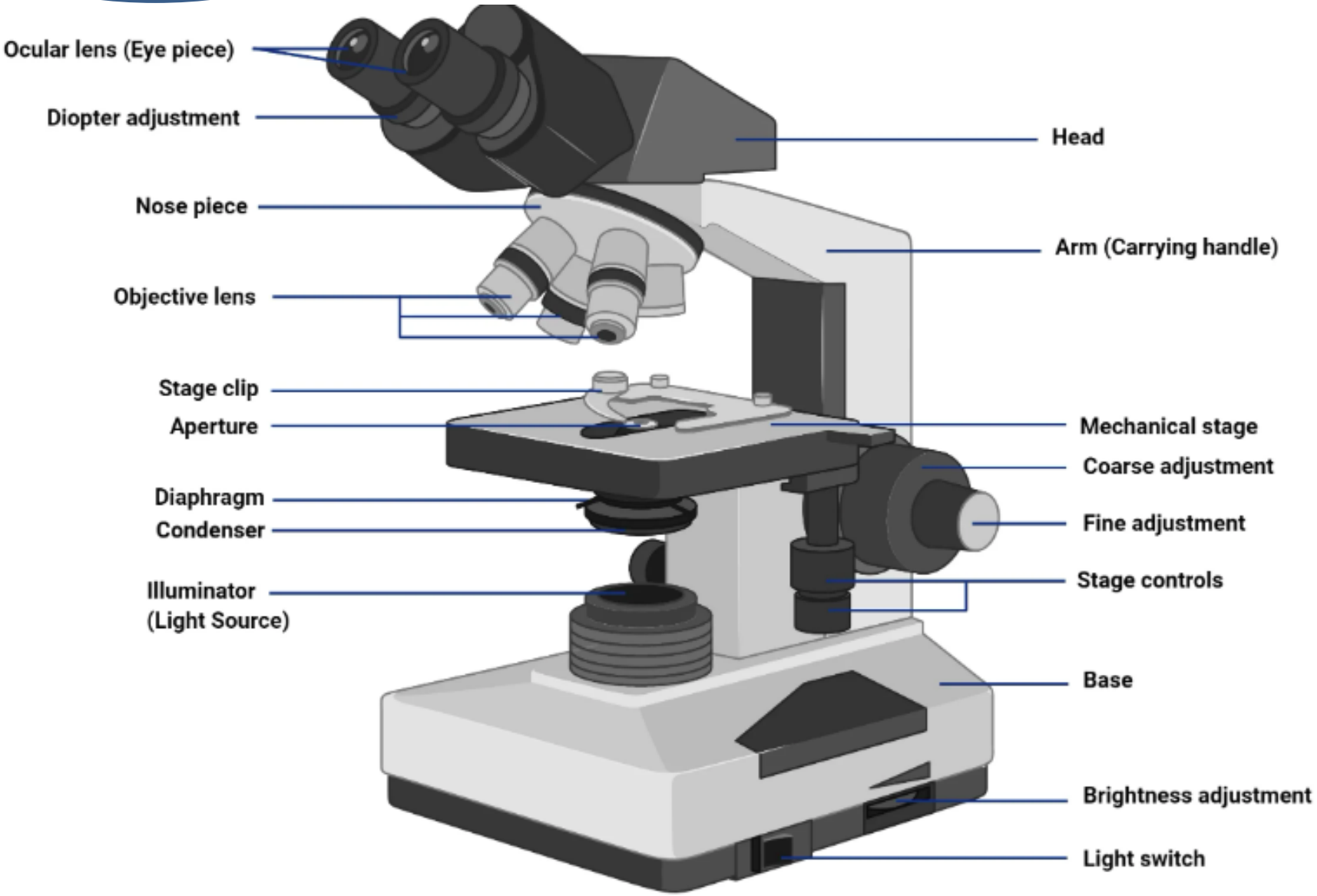
Principal:

The compound microscope works on the principle that when a tiny object to be magnified is placed just beyond the focus of its objective lens, a virtual, inverted and highly magnified image of the object is formed at the least distance of distinct vision from the eye held close to the eyepiece.



Core Concept

Parts of Microscope



Parts of Microscope

The part of compound microscope are of two categories: Mechanical parts and optical parts.

1. Mechanical Parts: It includes base or foot, pillar, arm, inclination joint, stage, clips, diaphragm, body tube, nose piece, coarse adjustment knob and fine adjustment knob.

i) **Foot or base:** It is the basal, horse shoe shaped structure. It provides support to all remaining parts of the microscope.

ii) **Pillar:** A small strong vertical projection developing from the foot or base is called pillar.

iii) **Arm:** It is curved and strong structure used for handling the entire instrument.

iv) **Inclination Joint:** A joint at which the arm is attached to the pillar of the microscope is called inclination joint. It is used for tilting the microscope.

Parts of Microscope

1. Mechanical Parts: It includes base or foot, pillar, arm, inclination joint, stage, clips, diaphragm, body tube, nose piece, coarse adjustment knob and fine adjustment knob.

v) Stage: It is a flat rectangular plate attached to the lower end of the arm. Slide or object is placed on the stage and studied. A hole is present in the center of the stage. Light rays passed through this hole.

vi) Clips: Two clips are attached on the upper part of the stage. These are used for holding the slide in position.

vii) Diaphragm: It is attached beneath the stage. It regulates the intensity or amount of light entering into the microscope.

viii) Condenser: It is the lens situated beneath the stage. It controls the size of the light beam. It gathers light from the mirror and directs it to objective lens. Condenser may be lowered or raised by a knob present on the side beneath the stage.

Parts of Microscope

1. Mechanical Parts: It includes base or foot, pillar, arm, inclination joint, stage, clips, diaphragm, body tube, nose piece, coarse adjustment knob and fine adjustment knob.

ix) Body Tube: It the tubular, hollow part attached to the upper part of the arm of microscope. It can be moved up and down with the help of adjustment knobs.

x) Nose piece: It is circular and revolving metallic part attached to the lower end of the body tube. It has three holes in which objective lenses can be fitted.

xi) Coarse adjustment knob: It is a large sized knob used to move the body tube up and down for bringing the object into focus.

xii) Fine adjustment knob: It is the small sized knob. It is used for fine and sharp focusing of the object. Exact focusing is done by this knob.

Parts of Microscope

2. Optical parts:

These includes eyepiece lens, objective lenses and mirror.

i. **Eyepiece or ocular:** It is lens fitted at the top of the body tube. It is always marked with a number (5X, 10X, 15X) on its rim. This number shows its magnification power. Magnified images of the object are seen with the eyepiece.

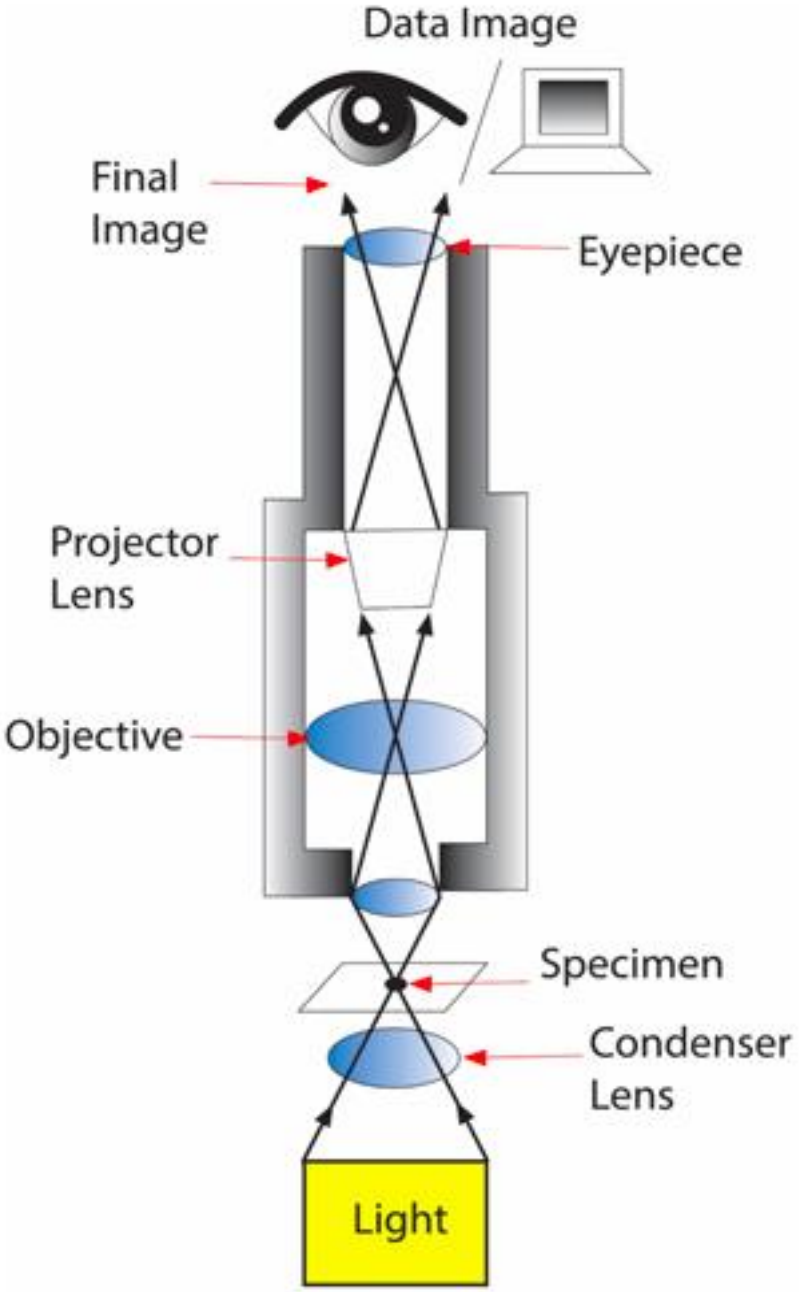
ii. **Objective Lenses:** Three objective lenses are attached to the revolving nose piece at the bottom of the body tube. These are low power objective (10X), high power objective (45X) and oil immersion objective (100X).

iii. **Mirror:** It is either attached to lower end of the arm or to the pillar. It contains the plane mirror on one side and a concave mirror on the other side. Mirror is used to reflect the light rays into the microscope.

Parts of Microscope:-

2. Optical parts:

These includes eyepiece lens, objective lenses and mirror.



Core Concept

Precautions

- Always keep the microscope in vertical direction.
- Don’t make the use of direct sunlight.
- Don’t keep the microscope near the edge of the table.
- The object to be examined should be mounted in mounting medium and should be covered with cover slip before observation.
- Don’t use excess mounting medium.
- Always keep the microscope clean, dust free and covered.
- Concave mirror is used while using low power lens whereas plane mirror is used while using high power or oil immersion lens. To obtain maximum and even illumination the mirror must be adjusted accordingly.
- After placing the slide over the stage the low power lens is to be brought down using coarse adjustment knob. Bend by the side of the tube and bring your eyes at the level of slide while bringing it down. Never bring down the objective with coarse adjustment knob while looking through the eye-piece of the microscope. Bring it down to the extent that it is just near to the slide but not touching it.

Precautions

- Slowly the objective is to be raised while looking through the eye-piece of the microscope using coarse adjustment knob till the object is seen. The image of the object is made clear using the fine adjustment knob. 10) To use high power lens, the objective is to be raised again. Change the lens and then bring it down looking from the side. The objective is again raised while looking through the eye-piece till the object is seen.
- Remove the eye-piece for a while and adjust the position of condenser to get better results.
- Adjust the iris-diaphragm.
- After adjusting the condenser and iris, replace the eye-piece and observe again. The object will be very clear.
- While using oil immersion lens, a drop of cedarwood oil is placed on the slide. Cedarwood oil is preferred to other oils because its refractive index is nearer to that of glass.
- Never unscrew any part of microscope. Do not clean any lens of the microscope with alcohol as the cementing material for the fixation of lens is soluble in alcohol.

Vertical integration

Clinical Uses Of Microscope:-

1. To conduct cytological screening for blood disorders and other diseases to study microorganisms, this allows scientists to develop the vaccines. Being able to identify the infecting agent is the basis for effective treatment.
2. To map the fine details of the spatial distribution of macromolecules within cells.
3. To measure the biochemical events in the living tissues.
4. To interpret the function of proteins within cells by labeling the proteins with a tag.
5. To review chromosomal structure particularly in chromosome abnormalities by staining techniques.
6. To examine forensic evidence.
7. To study the failures in immune function and molecular studies to obtain digital imaging for storing images and in obtaining second opinions or returning results to remote locations.
8. To monitor the health of a particular ecosystem.
9. To diagnose and get symptoms details in the veterinary clinic.

Biomedical Ethics

Codes of Ethics for Laboratory

Testing laboratories have an obligation to adhere to high ethical standards in order to provide with the accurate and reliable test results needed to meet the requirements and reduce uncertainty in results.

- Always wear white coat in lab
- Handle the glassware gently
- Wait for your turn while working in groups
- Use gloves while handling chemicals
- Do not waste reagents or other lab supplies

Brain Storming

Question & Answer

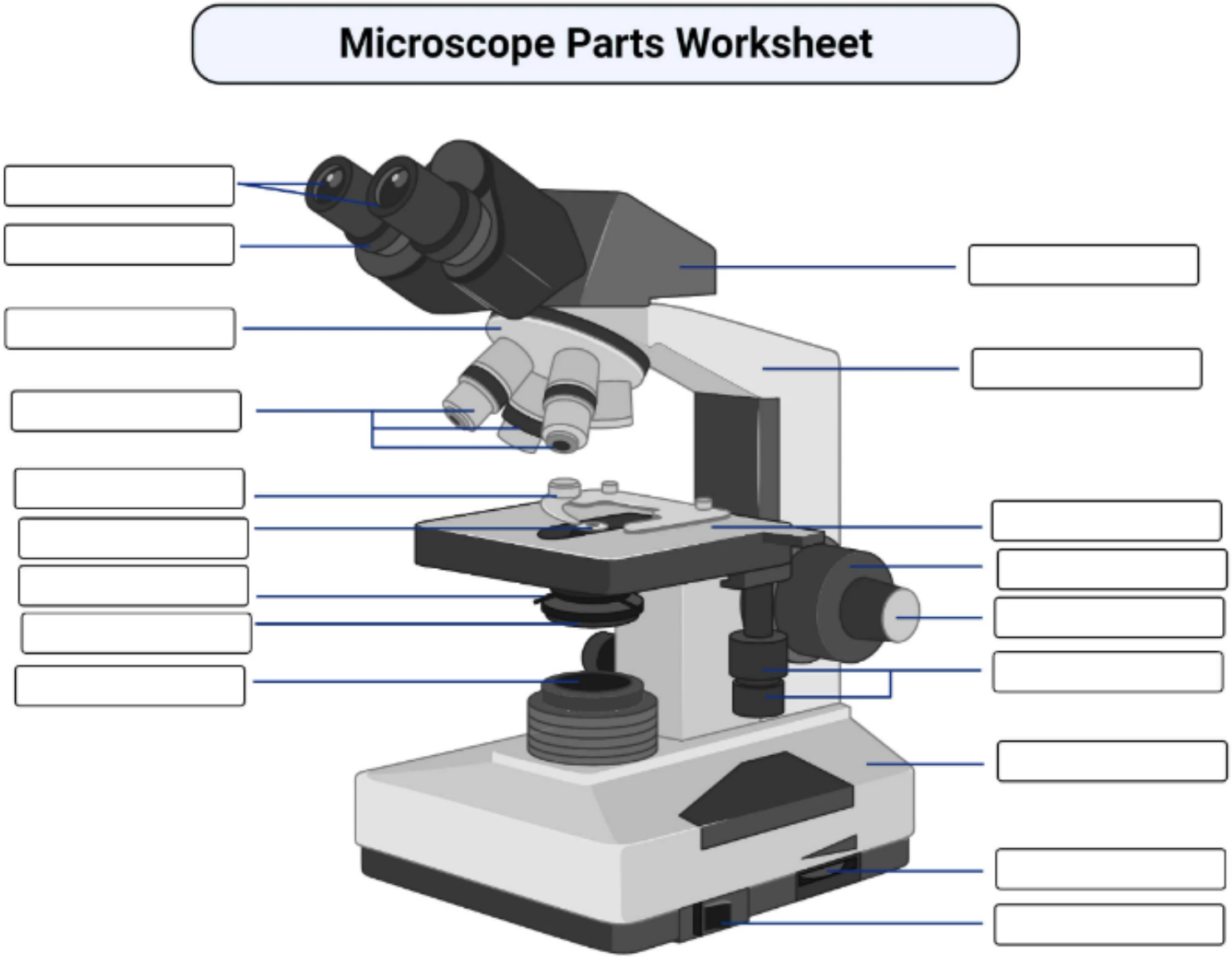
Question Related to Microscopy

Question 1 : State why the lower power magnification is used first while examining a specimen under microscope?

Answer:

Lower power magnification is used first when examining a specimen under a microscope because it offers a larger field of view, making it easier to locate and navigate the specimen. Additionally, lower magnification provides a greater depth of field, ensuring more of the specimen is in focus at once. This initial step allows for an overall understanding of the specimen's structure and organization before zooming in for more detailed observations at higher magnifications.

Question 2 : Label the parts of the diagram given below:



Answer : Label the parts of the diagram given below:

PARTS

1. Eyepiece
2. Objective Lenses
3. Stage Holder Clamp
4. Mechanical Stage
5. Abbe Condenser
6. Abbe Adjustment Knob
7. Illuminator
8. Base
9. Diopter
10. Binocular Head
11. Head Locking Screw
12. Nosepiece
13. Arm
14. Coaxial Focus Knob
15. Iris Diaphragm
16. Limit Stop Lock
17. Stage Control Knobs
18. Illuminator Adjustment Wheel
19. Power Switch

Suggested Research Article

Related Research Article

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7822289/

PLoS One. 2021; 16(1): e0245795.
Published online 2021 Jan 22. doi: 10.1371/journal.pone.0245795
PMCID: PMC7822289
PMID: 33481885

A comparative study on the use of microscopy in pharmacology and cell biology research

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[redacted]

Abstract

Go to:

Microscopy is the main technique to visualize and study the structure and function of cells. The impact of optical and electron microscopy techniques is enormous in all fields of biomedical research. It is possible that different research areas rely on microscopy in diverse ways. Here, we analyzed comparatively the use of microscopy in pharmacology and cell biology, among other biomedical sciences fields. We collected data from articles published in several major journals in these fields. We analyzed the frequency of use of different optical and electron microscopy techniques: bright field, phase contrast, differential interference contrast, polarization, conventional fluorescence, confocal, live cell imaging, super resolution, transmission and scanning electron microscopy, and cryoelectron microscopy. Our analysis showed that the use of

Summary Of Research Article

we could see several similar parameters between BJP and FP and between JBC and JCS. Interestingly, several parameters that we analyzed in JPP and CEL do not behave in a similar way to pharmacology and cell biology journals, respectively. The level of similarity between different journals of the same field should be further investigated.

Our analysis showed that nearly half of the articles from the pharmacology journals did not use any microscopy method, compared to the use of microscopy in almost all (97%) of the articles from the cell biology journals. We hope that our study will provide support for a critical evaluation of the impact of the use of microscopy in the pharmacology field and in biomedical sciences in general.

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REFERENCES

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2. Guyton and Hall text book of medical physiology, 14th edition

3. Human Physiology by Lauralee Sherwood, 9th edition

4. Ganong's Review of Medical Physiology, 26th Edition

Research:-

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Thank You!