Microscopy

1- Microscope:

> Definition:

A microscope is an instrument that can be used to observe small objects, even cells which can't be seen from the naked eye.

> Type of Microscope:

Two types of microscope

- I- light Microscope
- II- Electron Microscope

I- Light Microscope:

- a. That uses visible light to detect and magnify very small objects and enlarge them.
- b. Magnification power: light microscope has 500x to 1500x magnification power
- c. **Resolution**: it has low resolving power 0.25um to 3um.
- d. We can see individual cell or large sub- cellular structure (nuclei)



II- Electron Microscope:

a. uses a beam of electrons and their wave-like characteristics to magnify an object's image

b. Magnification power: it has 100,000x magnification power

B1: Cell Biology

c. **Resolution**: it has high resolution power 0.001um. Almost 250 times more than light microscope.

d. We can see internal structure of cell like internal structure of mitochondria.



III: How to check magnification power

By using this formula we can check the magnification

Magnification = image Size/ real size



Q: A cheek cell is viewed under microscope with

the magnification of 40x. The image of the cell is 2.4mm. Calculate its

real width

Solution:

Using the formula

B1: Cell Biology

ASM tuition Academy

Magnification = image Size/ real size. Real size = image size/ magnification Real size = 2.4mm/ 40 0.06mm

2- Difference between light microscope and electron microscope

S. No	Characteristics	Light Microscope	Electron Microscope
1.	Magnification	2,000x	Up to 10,000,000x
2.	Resolution	200 nm	0.5 nm
3.	Image produced by	Visible light rays	Electron beam
4.	Image focused by	Glass objective lens	Electromagnetic objective lenses
5.	Image viewed through	Glass ocular lens	Fluorescent screen
6.	Specimen placed on	Glass slide	Copper mesh
7.	Organisms may be	Live	Always dead
8.	Specimen requires special stain or treatment	Not always	yes
9.	Colored Image produced	Yes	No i.e. Black and white

10.	Vacuum	Not used	Operates under a high vacuum
11.	Handle	Simple to use	Users require technical skills
12.	Cost and maintenance	Cheap to buy and has low maintenance costs	Very expensive to buy and maintain
13.	Image type	2D	3D



3- Parts of light microscope and their functions

(1) Eyepiece: the lens at the top that you look through, usually 10x or 15x power.

② Nosepiece:Nosepiece holds the objective lenses and is sometimes called a revolving turret

③ **Objective** lense: captured light emitted or reflected by the specimen.most common objective lenses have power of 4X, 10X and 40X.

④ Stage:The stage is where the specimen is placed. This place is for observation.

Stage Clips : Stage clips are the supports that hold the slides in place on the stage.

(6) Diaphragm (sometimes called the Iris): The diaphragm controls the amount of light passing through the slide

⑦ Coarse focus :Coarse focus moves the stage to provide general focus on the specimen. When bringing a specimen into focus, the course dial is the first one used.

B1: Cell Biology ASM tuition Academy

(8) Fine focus: Fine focus moves the stage in smaller increments to provide a clear view of the specimen. When bringing a specimen into focus, the fine focus dial is the second one used.

Base: The base is the main support of the microscope. The bottom, where all the other parts of the microscope stand.

4- How to prepared a slide.

- To view the specimen under the microscope, first prepare the microscopic slide (may be glass or plastic slide)
- > There are some steps which we follow to view the specimen
 - () Add a drop of water on the clean slide

2 Cut the onion into 2 pieces, peel off the Epidermis tissue using Tweezer as shown in fig:1

- ③ Place a piece of it in a drop of water on a clean side.
- ④ With a dropper, add a drop of iodine solution onto it.

iodine solution is a stain to colour the specimen under the microscope

- (5) Gently cover with a cover slip.
- 6 Use a piece of filter paper to remove excess liquid from the slide.
- ⑦ Place the slide on the microscope and observe. Fig: 3







Diagrammatically presentation of onion slide preparation and observation

Figure: 2

How to observe onion cell using Light Microscope

- 1. Place the slide on stage and clip it.
- 2. Select the lowest objective lens with lowest magnification
- 3. look down from eyepiece and use coarse adjustment knob to move the stage downward until the image is roughly in focus.
- 4. Adjust the Fine adjustment knob for clear image
- 5. Use High power objective lens if needed for greater magnification
- 6. See and observe the image as shown in Figure: 3

B1: Cell Biology



Figure: 3