**The 3rd Lab.**

## Estimation the dimensions of cells and organelles

The tiny size of the most cells is assumed the existence of appropriate measures to be able to be measured because of their importance in the process of cellular description and study. The methods used in the measurement process is different in terms of accuracy and requirements. The most important method is the methods that used ocular micrometer:

This is the most accurate method to use where it is measure the length of the cell or its , in this method the dimensions of the cell or one of its parts measured and this performed by measure the distant that are occupied by the cells from ocular micrometer gradations , when knowledge the value of each gradations.

They are able to measure real length of examined bodies. For application this process, it usually used slides that are consist of two basic parts:

1- **Ocular micrometer:** It is an ocular lens that consist of small scales in form of coordinates, the horizontal lines are divided into 10 small division, in this way, the horizontal axis are divided into 100 unknown scales because it is depending on the magnification power that used (The greater magnification power the smaller value of scales and vice versa). Determination the value of each scales of ocular micrometer requires using another way which is:
2- **Stage micrometer**: It is a slid consist of line with known length (1mm), this line divided into 10 large divisions and the value of each division is (0.1mm =100 micron) then divided into 10 others small divisions, thus, the value of each small division is ( 0.01mm=10 micron).

To calculate the value of one scale of ocular micrometer we follow the following steps :

1- Put the stage micrometer in its place on the stage of the microscope.
2- Put the ocular micrometer in its place instead of the eyepiece of the microscope.
3- We match the scales of the tow micrometers from each other, by put the beginning line of ocular micrometer with the beginning line of stage micrometer.
4- Look for the matching line in the tow micrometers, then we calculate the number of scales in stage micrometer and the corresponding scales in ocular micrometer.
5- Since the value of each scales of stage micrometer are known (equal to 10 micron) therefore, we can measure the value of ocular micrometer scale of the following law (calibration law):
**Scale value of ocular micrometer = number of stage micrometer scales X 10 / number of ocular micrometer scales.**

**6-** The value of scales in ocular micrometer depending on the magnification power that are used, therefore it must measure the value of scales with each magnification power used.
**7-** After determination the value of the ocular micrometer scale it is now possible to use the ocular micrometer only and put a slid of the microorganism to be measured.

We can use ocular micrometer only for measuring the real length of the bodies or cells by measuring the number of ocular micrometer scales that are occupied by the cell and multiplying by the value of one scales of ocular micrometer.

Dimensions of objects are measured by appropriate units, for cells, their parts and components, it is measured by micron and its parts. To illustrate the

units used in cellular measurements, we should mention the following 1 cm=10 mm, 1mm=1000 µm , 1nm=10 Angstrom

The value of **one Scale** varies depending on the objective lens used, as shown below:

| The objective lens used | The value of a single scale of ocular micrometer |
|---|---|
| **4x** | **43µm** |
| **1ox** | **17µm** |
| **40x** | **4.3µm** |
| **100x** | **1.7µm** |

**The real length = number of small scales in ocular micrometer X the value of one scale**

**Example:**

- **find the real length of *Paramecium* if you know the number of scales is 46 at objective lens 40X?**