# Working With A Microscope To View Tissues - KEY

- In microscopy, most measurements are given in micrometers (um) rather than in millimeters (mm). “Micro” means one-millionth, while “Milli” means one-thousandth; there are one million micrometers in a meter, and one thousand millimeters in a meter. This means that there are 1000 um in 1mm. Try the following conversions:

**a) 3000 um = 3 mm**

**b) 10 um = 0.01 mm**

**c) 1.0 mm = 1000 um**

**d) 0.03 mm = 30 um**

**e) 2.5mm = 2500 um**

**f) 0.75 mm = 750 um**

**g) 250 um =0.25 mm**

**h) 2200 um = 2.2 mm**

**- The Compound Microscopes magnify an image by using both an ocular (top) lens in focus with one of three or four objective (bottom) lenses. To figure out the total power of magnification, you simply multiply the power of the ocular lens by the power of the selected objective lens. Fill in the table below to indicate that you know the power of magnification of each lens combination.**

|  |  |  |  |
| --- | --- | --- | --- |
| POWER | **OCULAR**  **LENS** | **OBJECTIVE LENS** | **TOTAL MAGNIFICATION** |
| **Low Power** | 10 X | 4X | **40 X** |
| **Medium Power** | **10 X** | 10X | **100 X** |
| **High Power** | **10 X** | **40 X** | 400 X |

**- In order to estimate the actual size of a specimen or object that you are viewing, you must know how wide your field of view is for each power. We then compare the size of what is being observed to the size of that field of view (the circle of light you see when looking through the scope). In other words you must first know the how big the field of view (FOV) is for each power. This can be determined by using a micro-metric slide to try to measure the diameter of your field of view. (As demonstrated)**

|  |  |  |  |
| --- | --- | --- | --- |
| Power | **Total Magnification** | **Field of View**  **(mm)** | **Field of View**  **(um)** |
| **Low Power** | **40 X** | **4. 4** | **4400** |
| **Medium Power** | **100 X** | **1.8** | **1800** |
| **High Power** | **400 X** | **0.44** | **440** |

**- The next step is to estimate the actual size of the specimen. This is done by comparing the size of the specimen you see, with what the size of the FOV is. For example, if it looks like 5 specimens could fit across the diameter of your field of view, and you know the given field of view You would estimate the length of the specimen by dividing your field of view by the number of specimens that would fit across the diameter.**

**Sample Calculation : Assume that a certain FOV = 3000 um and that you estimate that you could fit 4 specimens across the FOV diameter; then the length of that specimen will be approximately 3000 um ÷ 4 = 750 um; so the specimen’s length is 750 um.**

**- Use the diagrams below and the stated FOV’s to estimate the length of each specimen. Show your calculation beside each.**

**A) Calculation :**

**FOV = 1800 um**

**Approximate Size = \_\_\_\_\_\_\_\_\_\_\_\_ um**

**Work : Approximately 5 fit across. FOV / # fit across**

**1800 um = 360 um**

**5**

**B)**

** Calculation :**

**FOV = 4500 um**

**Approximate Size = \_\_\_\_\_\_\_\_\_\_\_\_ um**

**Work : Approximately 2.5 fit across.**

**FOV / # fit across**

**4500 um = 1800 um**

**2.5**

**Drawing Magnification – How big is your drawing compared to how big the specimen is in real life.**

**Calculation : Drawing Size 🡪 \_\_\_\_\_ X**

**Estimated Size**

**Procedures for viewing tissues:**

1. - Observe following slides at the highest power possible and make a sketch of what you see in the circles on the next page. Your sketch should be the same size as what you see through the scope. So if 20 cells can fit across the FOV, then you draw 20 cells across your circle.

A) SIMPLE SQUAMOUS   
B) BONE   
C) ADIPOSE   
D) SIMPLE CUBOIDAL

E) CILIATED COLUMNAR

F) CARTILAGE

G) AREOLAR

H) STRIATED (SKELETAL) MUSCLE

2. After making your sketches for each tissue, it is important to specify how much larger the size of your sketch is to how big the actual tissue cells are in real life (without being magnified). This comparison is called your Drawing Magnification. To calculate your drawing Magnification you need to know two things:

A) How big did you draw each cell on paper. = Drawing Size

B) What is the estimated size of each cell before being magnified. = Estimated Size

For example:

If I draw some cells on paper and measure how big I drew them and I measure that they are all about 0.8 cm = 8 mm.

Then I have to estimate their actual size. I do this by dividing my FOV by the number of cells that could fit across the diameter of the FOV.  
Let’s say that the FOV is 500 um and 10 cells will fit across, then each cell must be 50 um long.

At this point I have my approx. size and my drawing size; before I put them into the Drawing Magnification Equation I need to put them both into the same units.

Either both into micrometers or both into millimeters:  
  
 D.M. = 8,000 um – 50 um = 160 X

Therefore my drawing is 160 X larger on paper than the actual specimen was.

\*\* Give the drawing size for one of your slides viewed and sketched on medium power and one of your slides viewed and sketched on high power.

Tissue Drawings

A. B.

Tissue name: Simple Squamous Tissue name : BONE (Osteon)  
Tissue category: Tissue category :   
Location in body: Location in body:

Power of Mag = 400 X Power of Mag. = 100 X

Drawing Mag : \_\_\_\_\_\_\_ Drawing Mag = \_\_\_\_\_\_\_\_

C. D.

Tissue name: ADIPOSE Tissue name : SIMPLE CUBOIDAL  
Tissue category: Tissue category :   
Location in body: Location in body:

Power of Mag = 400X Power of Mag. =400 X

E. F.

Tissue name: CILIATED COLUMNAR Tissue name : CARTILAGE  
Tissue category: Tissue category :   
Location in body: Location In body:

Power of Mag = 400 X Power of Mag. = 400X

G. H.

Tissue name: AREOLAR Tissue name : STRIATED MUSCLE (LS)  
Tissue category: Tissue category :   
Location in body: In body: Attached to

Power of Mag = 400 X Power of Mag. = 400 X