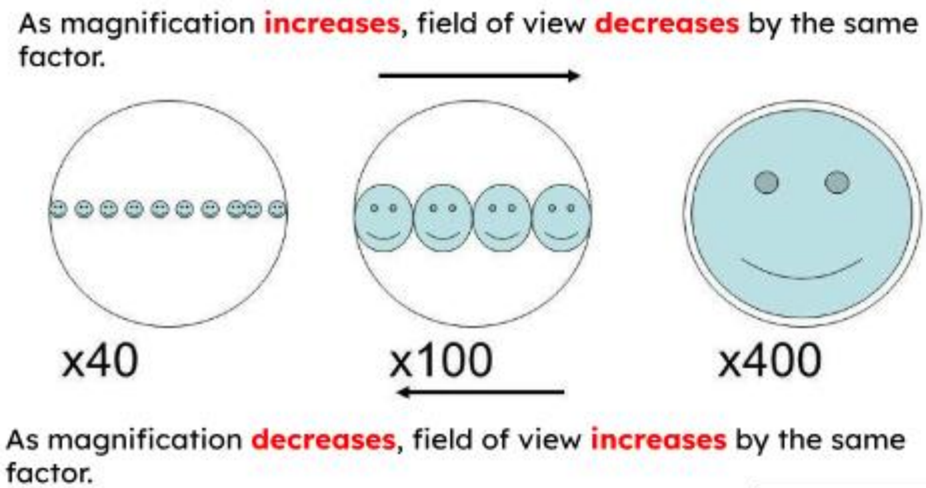
SBI3U Name: ______________________

Determining the Field of View, Size of Specimen & Magnification

Field of View (FOV): the area you observe when you look through the microscope.
Field diameter (FD): the diameter of the field of view

- Often FOV and FD are used interchangeably.

NOTE – As the magnification increases, the field diameter decreases proportionally.



1mm = 1000µm

Name of Lens	**Objective Magnification (X)**	**Ocular Magnification (X)**	***Total Magnification (X)**	**Field Diameter**	
				mm	**µm**
Low Power					
Medium Power					
High Power					
	***Total Mag** = Objective Mag x Ocular Mag				

Determining the Field of View (Field Diameter):

1. Put the low-power objective lens in place. Place a transparent ruler on the stage. Position the millimetre marks of the ruler immediately below the objective lens.
2. Use the coarse-adjustment knob to focus the marks of the ruler.
3. Move the ruler so that one of the millimetre marks is just at the edge of the FOV. Note the diameter of the FOV, in millimetres, under the low-power objective lens. Then convert to micrometres (µm)
4. Rotate to the medium-power objective lens. Repeat steps 2 & 3 to measure the FD for this field. Make sure to convert to micrometres (µm)
5. Most high power objective lenses provide a field of view that is less than 1 mm in diameter, so it cannot be measured with a ruler. You must use the formula below.

➔ **Calculating the Field of View for High-Power Lens**
Calculate the ratio of the magnification of the high-power objective lens to the magnification of the low-power objective lens

$$\textbf{Ratio} = \frac{\text{Magnification of high-power lens (X)}}{\text{Magnification of low-power lens (X)}}$$

Then use the ratio to determine the diameter of the field under high power magnification

$$\textbf{FOV (high power)} = \frac{\text{FOV low power } (\mu m)}{\text{Ratio}}$$

Estimating Size of Specimen

1. Choose the magnification that gives you the **clearest image**
2. **Note the FOV/FD** associated with that magnification
3. Estimate the **number of times** the specimen could fit across the field
4. Estimate the size of the specimen using the formula:

$$\text{Estimated size of specimen} = \frac{\text{Width of field of view (micrometres)}}{\text{Number of specimens that fit across the field}}$$

$$\text{* Actual size} = \frac{\text{field diameter (micrometres)}}{\text{\# of cells / specimens}}$$

Drawing Magnification

The biological drawing magnification tells you how the size of the illustration compares with the actual size of the object.

$$\text{Drawing Magnification} = \frac{\text{Measured size of drawing } \textit{(width or length?)} \text{ (mm)}}{\text{Estimated size of specimen } \textit{(width or length?)} \text{ (mm)}}$$

Practice Calculations

1. Convert the following measurements:
   a) 789.35 μm = ___________ mm
   b) 0.645 cm = ___________ μm
   c) 51.23 mm = ___________ μm
   d) 3.78 μm = ____________ cm

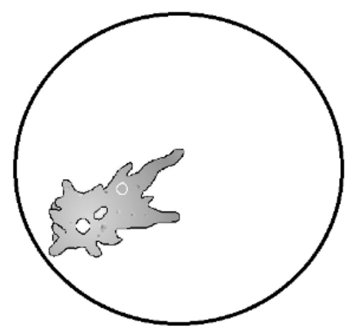
2. Ben observed an *amoeba* under the 40X objective lens and noted that it took up 1/4 of the field of view. Calculate the actual size of the cell (in μm).

3. Ava examined a sample of pond water and found several protists in the water. She observed that 5 *Paramecium caudatum* cells could fit across the field diameter (FD) on high power. She followed the instructions and completed a formal drawing of one *P. caudatum* cell. The drawing measured 10.3 cm in length.

    a) Calculate the estimated length of one *P. caudatum* cell (in μm)

    b) Calculate the drawn magnification of the formal drawing.

4. A student observes an *Amoeba proteus* using high power magnification. The following diagram shows her observations:



    a) Calculate the length of the Amoeba proteus in μm.

    b) The student then draws a diagram of the *amoeba* in her lab book. She uses a ruler to measure the length of her drawing, and determines that the drawing is 8.2 cm long. Calculate the drawn magnification of her *amoeba* drawing.