A Closer Look at the Microscope

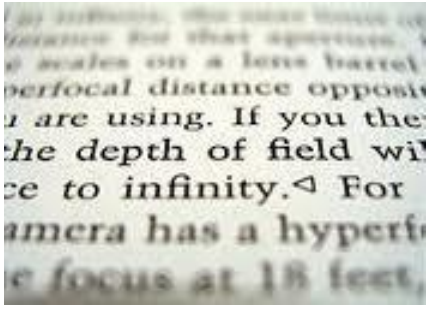
1. Total Magnification and Measuring Field of View

TOTAL MAGNIFICATION = OBJECTIVE MAGNIFICATION x EYEPIECE MAGNIFICATION

1 mm = 1000 μm
Diameter of Field = How much of the slide you can see

	Drawing of Objective Lens	Magnification of Objective Lens	Magnification of Ocular Lens	Total Magnification	Diameter of Field (mm and μm)
Low					
Medium					
High					
Oil					

Depth of Field = distance in front or behind the specimen which appears to be in focus.



2. Calculating Actual Size of a Specimen

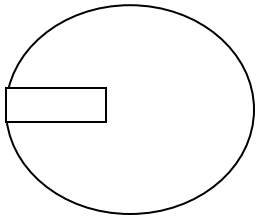
- How much of the field of view does my specimen take up?

Formula:

$$\text{ACTUAL SIZE (AS)} = \frac{\text{DIAMETER OF FIELD (μm)}}{\text{\# OF TIMES OBJECT CROSSES FIELD}}$$

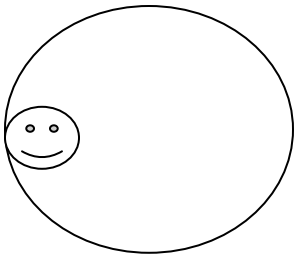
- Always measure in micrometres
- Always use the longest dimensions of the object

Example 1: On **low** power the diameter of the field of view is 4mm or 4000 μm. If I'm on low power and my specimen takes up half of the field of view (OBJECT WOULD CROSS FIELD TWICE) then the object I'm looking at must be 2000 μm in length.



$$\text{Actual size} = \frac{4000\ \mu m}{2} = 2000\ \mu m$$

Example 2: Find the actual size of the specimen below given the magnification.



400x magnification

3. Calculating Drawing Magnification

How much bigger is your drawing than the actual specimen?

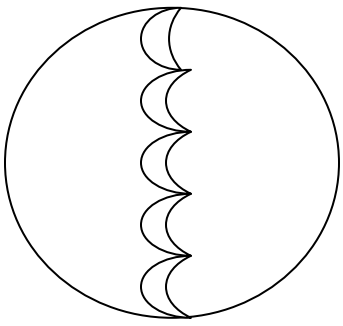
Formula:

Drawing Magnification (DM) = DRAWING SIZE (mm) / ACTUAL SIZE (mm)

Example 1: You draw a cell 10 mm in diameter but you calculated the actual size to be 1 mm. Your drawing is 10 x as big as the actual specimen.

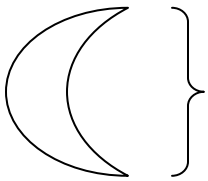
$$\text{Drawing magnification} = \frac{10\ mm}{1\ mm} = 10x$$

Example 2: **You saw** (in the microscope): **You drew:**



40 x

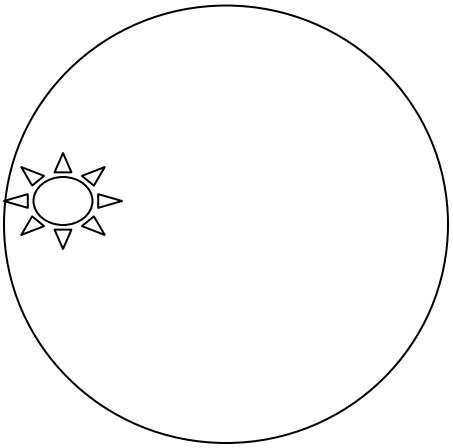
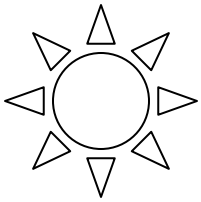
$$AS = \frac{4000\ \mu m}{5} = 800\ \mu m = 0.8\ mm$$



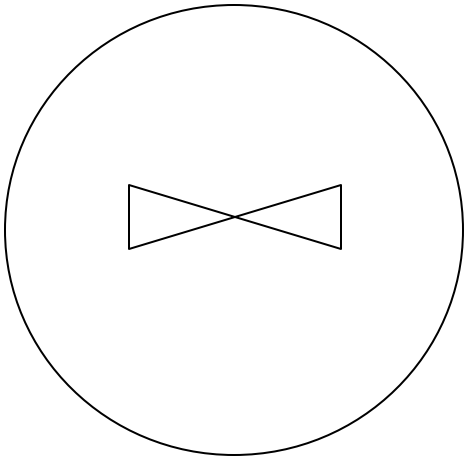
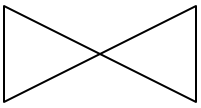
$$DM = \frac{\text{Drawing Size}}{\text{Actual Size}} = \frac{16\ mm}{0.8\ mm} = 20\ x$$

Actual Size and Drawing Magnification Practice

You will need a ruler (transparent), your diameter of fields, and your formulas. Calculate the actual size and the drawing magnification for each of the following specimens.

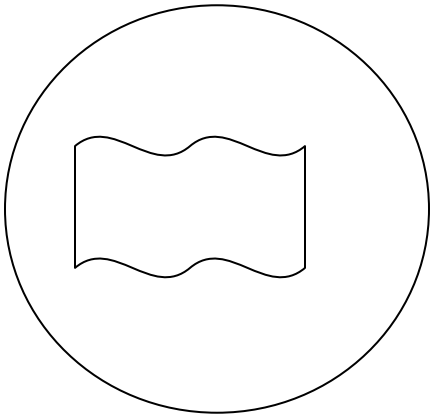
You saw	You drew
	

Medium Power

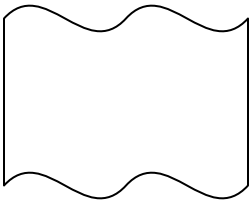
	

Low Power

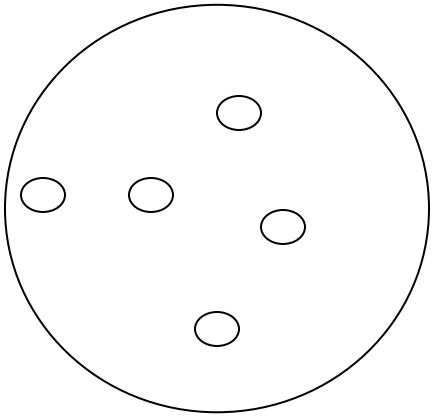
You saw

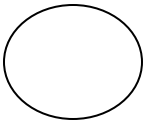


You drew

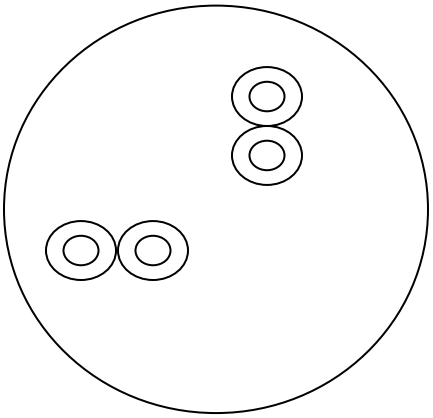


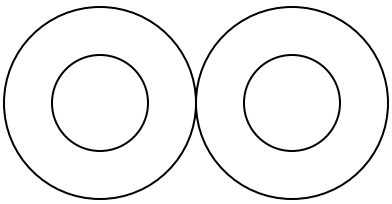
High Power





Oil Power





Low Power