

Microscope Worksheet:

Calculating Magnification. Converting Measurements, Estimating cell size, Calculating Field of View & Magnification Problems

1. Calculate total magnification: Ocular x Objective

Ocular	Objective	Total Magnification
10X	4X	40X
15X	10X	150X
5X	12X	60X
10X	10X	100X
10X	40X	400X

2. What are the possible magnifications of a microscope with an ocular marked 10X and objectives marked 5X, 15X, 30X and 60X?

50X, 150X, 300X, 600X

3. Convert the following measurements:

- a. 9.2 mm = 9200 μm
- b. 5900 μm = 5.9 mm
- c. 0.083 mm = 83 μm
- d. 61000 μm = 61 mm

4. Estimating cell size: Divide the field of view by the number of cells that occupy the diameter.

- a. The field of view is 2500 μm . If a cell takes up 1/5 of the field of view, how long is the cell?

Estimated size = $2500\mu\text{m}/5 \text{ cells} = 500\mu\text{m}$

- b. A student counts 50 cells across the diameter of the field of view, and there are 70 rows of cells. If the diameter of the field of view is 3500 μm . what is the length and width of the cells?

Length = $3500\mu\text{m}/50 = 70\mu\text{m}$

5. Calculate the field of view (Field Diameter):

- a. Low power: 4X = 4500 μm = 4.5 mm
- b. Medium power: 10X = 1800 μm = 1.8 mm
- c. High Power: 40X = 450 μm = 0.45 mm

6. Calculate Magnification/Field Diameter

- a. A microscope has a low power magnification of 50X with a field diameter of 7mm. Determine the field diameter of medium power if the magnification is 150X. Write the answer in both mm and μm .

$$7\text{mm} = 7000\mu\text{m}$$

$$\frac{\text{L.P. Mag}}{\text{M.P. Mag}} \times \text{L.P. Field of View}$$

$$\frac{50}{150} \times 7000\mu\text{m}$$

$$\frac{1}{3} \times 7000\mu\text{m}$$

$$2300\mu\text{m}$$

- b. A specimen is $40\mu\text{m}$ in length. The specimen can fit across the field of view 10 times under high power with a magnification of 450X. Determine the magnification of medium power if the medium power field diameter is 1.5mm.

$$\begin{aligned} \text{Field Diameter} &= 40\mu\text{m} \times 10 \\ &= 400\mu\text{m} = 0.4\text{mm} \end{aligned}$$

$$\frac{\text{Med Power Mag}}{\text{High. Power Mag}} = \frac{\text{High Field Diameter}}{\text{Med Field Diameter}}$$

$$\frac{?}{450\text{X}} = \frac{0.4\text{mm}}{1.5\text{mm}}$$

$$? = \frac{(0.4\text{mm}) \times (450\text{X})}{1.5\text{mm}}$$

$$? = 120\text{X}$$