

Lesson 2.5: Microscope Terminology

Magnification – The ratio of the size of the image being viewed compared to the actual size.

You can calculate the magnification of the viewed image simply by multiplying the power of the ocular lens (usually 10X), by the power of the objective lens (4x, 10X or 40X).

Exercise: Calculate the magnification of an object that is viewed with the high power objective lens. $10 \times 40 = 400x$.

Resolution - capability of distinguishing between two separate but adjacent objects.

***Oral:** Objects can often be magnified but sometimes resolution is lost in the process. Q: Have you ever tried to magnify a digital picture many times?*

The field of view - the diameter of the circle of view you can see when looking down a microscope; The higher the magnification, the smaller the field of view.

***Orally:** The field of view is determined by viewing a microscope slide with a tiny ruler (usually only 1 or 2 mm long) printed onto the surface. By moving the ruler so that it lies across the diameter, you can measure the field of view for each magnification on your microscope. Once you know the width of your field of view, you can then make estimates of the size of objects being viewed under the microscope.*

Q: How do I determine the field of view if it is less than one millimeter?

A: Determine the field of view of the low power objective lens first. Let's assume the field of view under low power is 5mm at 40x total magnification. At high power the field of view is unknown, but we know we are using a total of 400x magnification. What I see is $400x/40x = 10x$ larger when we compare high to low power, therefore the field of view is 10x smaller! So under high power, the field of view is only $5mm/10 = 0.5mm$.

Exercises:

Calculate the field of views using the given information:

a) low power objective = 4X

high power objective = 40X

eyepiece lens = 10X

low power field of view (FOV) = 4.4 mm

What is the high power field of view?

b) low power objective = 5X

med power objective = 10X

eyepiece lens = 5X

low power field of view (FOV) = 3.5 mm

What is the medium power field of view?

Q: How do I determine the actual size of an object that I am viewing?

A: Determine what fraction of the field of view it occupies. E.g., if the FOV is 5mm and the object takes up half of the diameter we simply divide the FOV by 2 (i.e., 2.5mm). If the object fits across the diameter 3 times we simply divide the FOV by 3 (i.e., 1.67mm).

Q: When I draw a picture of an object that I'm viewing, how do I determine the total magnification?

A: Simply divide the size of the drawing by the actual size of the object. E.g., If you draw an object that is 50mm and the actual size is 0.5mm, then the total magnification of the drawing is $50\text{mm}/0.5\text{mm} = 100\text{X}$. This magnification factor should appear on the drawing.

<http://www.youtube.com/watch?v=jP9HtcAvGDk>

(video on proper use of a microscope)

Assign: Worksheet – Microscope parts and FOV