



MICROSCOPE CALCULATIONS

Magnifying Power

The microscope is one of the most useful tools in a biology laboratory. In a high school lab, the most common microscope used is the compound light microscope (LM). A compound microscope has two sets of lenses. The lens you look through is called the ocular or eyepiece. The lens near the specimen being examined is called the objective.

The objective lens is one of three or four lenses located on a rotating turret above the stage, and they vary in magnifying power. The lowest power is called the low power objective (LP), and the highest power is the high power objective (HP). You can determine the magnifying power of the combination of the two lenses by multiplying the magnifying power of the ocular by the magnifying power of the objective that you are using.

$$\text{Magnification} = \text{ocular} \times \text{objective}$$

For example, if the magnifying power of the ocular is 10X and the magnifying power of an objective is 4X, the magnifying power of that lens combination is 40X.

Questions:

1) What is the primary difference between a low-power objective and a high-power objective?

2) What is the total magnification of a microscope with a 15X ocular and a 40X objective?

Field of View

The field of view is the maximum area visible through the lenses of a microscope, and it is represented by a diameter. To determine the diameter of your field of view, place a transparent metric ruler under the low power (LP) objective of a microscope. Focus the microscope on the scale of the ruler, and measure the diameter of the field of vision in millimeters. Record this number, you will need it later. _____

The higher the power of magnification, the smaller the field of view. The diameter of the field of view under high power must be calculated using the following equation.

$$\text{Diameter HP} = (\text{Diameter LP} \times \text{Magnification of LP}) / \text{Magnification of HP}$$

Example:

You determine that your field of view is 2.5 mm in diameter using a 4X objective. What will the field of view be with the high-power objective knowing the high-power objective is 40X?

Question:

- 1) A student determines that the field of view with a 4X objective is 2.1 mm in diameter. What is the diameter of the field of view with the same ocular and a 40X objective?