Measuring Under the Microscope

Introduction:

Although it is interesting and informative to observe specimens under the microscope, it is often difficult to know the actual size of the object being observed. Magnification causes us to lose the idea of actual size. As we cannot hold a ruler up to the object while it is under the microscope, size of the specimen must be measured indirectly, by comparing it to something you already know the size of. In this case, we use the diameter of the microscope field (field of view) as seen through the ocular.

Size under a microscope is measured in micrometers where:

1 mm. = 1000 micrometers (um)

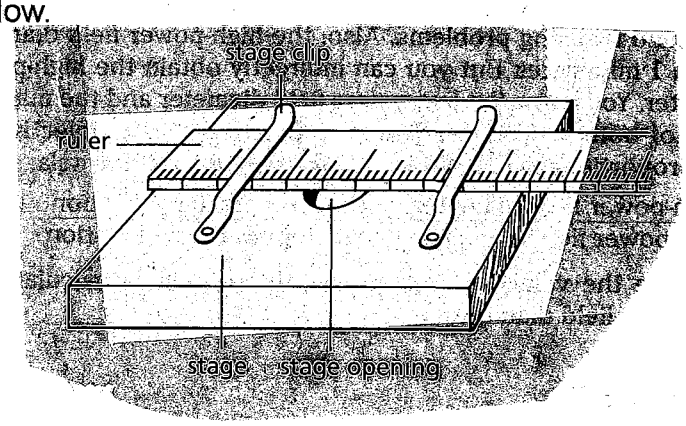
Objectives:

1. Measure the diameter of the low power field.
2. Calculate the diameter of the high power field.
3. Estimate the sizes of objects under the microscope.

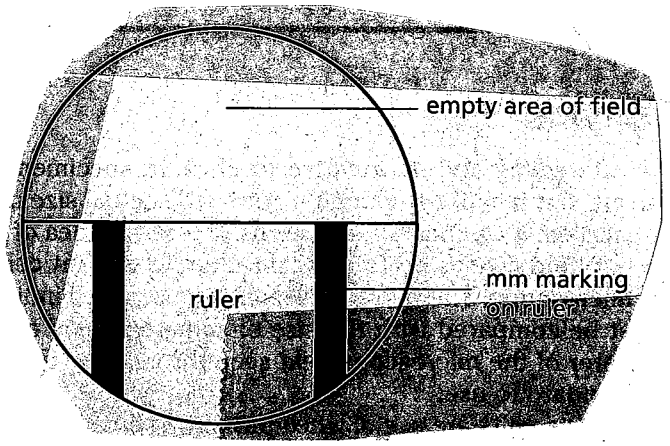
Procedure:

Part I: Determining the Diameter of the Field of View

1. Examine the markings on a transparent metric ruler. Determine which marks indicate millimeter lengths. Place the ruler on the stage so that it covers half of the stage opening as shown below.



2. Using the low power objective, focus on the edge of the ruler. Adjust the position of the ruler so that the view in the low-power field is similar to the diagram below.



3. Once you are in focus, reposition the ruler so that the center of one millimeter marking is at the left side of the field of view. Make sure that the edge of the ruler is exactly across the center of the field.
4. Remember that the distance from the middle of one mark to the middle of the next mark equals 1 millimeter.
5. Record the measurement of the diameter of the low power field of view in millimeters. Convert to micrometers.
6. You cannot measure the diameter of the high power field of view using the method above. Viewing a ruler under high power presents light and focusing problems. Instead, you can perform a mathematical calculation that will determine the high power field of view.

Low power Diameter	X	low power total magnification	=	high power diameter	X	high power total magnification

   a. What is the low power diameter?
   b. What is the lower power total magnification?
   c. What is the high power total magnification?

7. Using the above formula, substitute the appropriate values and solve for high power diameter of the field of view. (Show all work)

Part II Measuring Objects Under the Microscope

1. Obtain a prepared slide and record the name of the specimen that you are going to examine.
2. Place the slide on the stage and focus your microscope on low power.
3. Estimate the number of specimens that would fit across the diameter of the low power field of view. Record this number.
4. Divide the diameter of the field of view (in um) by your estimate in # 3. You have just estimated the length of your specimen. Record this estimate on your lab paper.
5. Now focus on a specimen under high power and estimate the number of specimens that would fit across the high power field of view. Record your estimate
6. Divide your estimate in # 5 into the high power field of view (in um) to determine the length of your specimen.

Conclusions:

1. Describe relationship between magnification and the diameter of the field of view.
2. Compare magnification and the size of the object.
3. If you observed 20 onion cells under low power (10x). How many cells will you observe under high power (50x). Explain your answer.
4. Why do we use the term estimate when we measure objects under a microscope?