Measuring Cells

Investigation

People often marvel at the height of structures or organisms. You might stand at the base of a *Sequoia*, calculate its height, and realize that if it were felled that it would stretch the length of a football field. Biologists also marvel at the minute size of some organisms and cellular structures. To calculate the size of very small objects, a microscope, which allows you to view and measure, is needed.

Preparation

Read Section 5:12 and review Section 2:8 in your text before you begin Investigation 5.

Goals

In this investigation you will
(a) measure the size of several different cells while viewing them through the microscope.
(b) use an SI unit for measuring length—the micrometer.

Materials

microscope
glass slide
Iodine stain
coverslip
Elodea
onion skin
dropper
water
prepared slide of frog blood
prepared slide of *Paramecium*
live Daphnia

Procedure

In the blank to the left of each step, place a check after you have completed that step.

____ 1. Look through the microscope using low power magnification. The circle of light you see is called the field of view. It has a diameter of about 1.35 mm. If you convert millimeters (mm) to micrometers (μm), the diameter of the field of view equals 1350 μm (Figure 5–1).

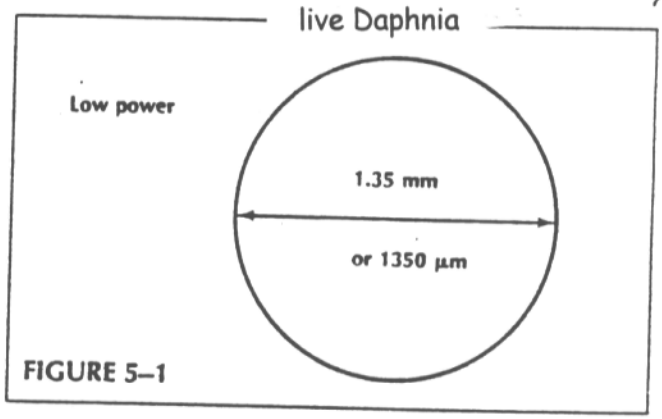


FIGURE 5–1

____ 2. Look through the microscope using high power magnification. The field of view is now about 0.3 mm (300 μm) in diameter (Figure 5–2).

____ 3. Convert the following measurements.

(a) 1.5 mm = _____ μm

(b) 400 μm = _____ mm

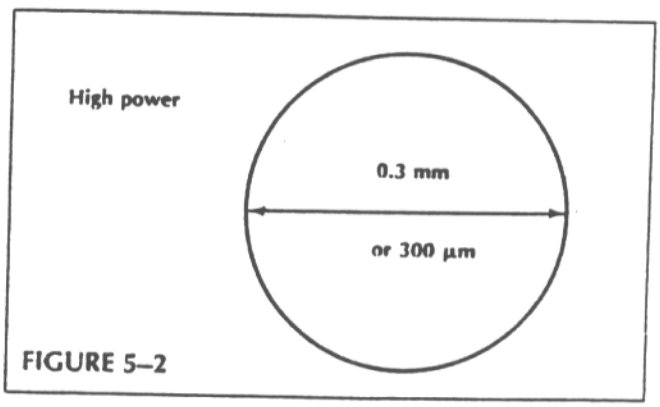


FIGURE 5–2

____ 4. To estimate the size of a cell while looking through the microscope, follow this method.
(a) Locate the cell under low power and then, if desired, under high power.
(b) Draw a circle that represents your field of view. Draw the cell to scale within the circle.
(c) Estimate the number of same-sized cells that could fit side-by-side across the diameter of the circle (shown as dashed outlines in Figure 5–3).
(d) To determine cell size on low power, divide 1350 μm by the total number of cells that would fit across the circle's diameter. The size of the original cell in Figure 5–3 is 385 μm (1350 μm ÷ 3.5).
(e) To determine cell size on high power, divide 300 μm by the total number of cells that would fit across the circle's diameter.

____ 5. Examine the prepared slide of frog red blood cells. Determine if this slide is best viewed under low or high power. Complete the first column of Table 5–1.

Daphnia

___ 6. Examine the prepared slide of *Paramecium*. Determine if this slide is best viewed under low or high power. Complete the second column of Table 5–1.

*If using Daphnia...Use a DEPRESSION slide. Suck up one Daphnia with a pipette. Expel most of the water onto a piece of paper toweling without losing the animal, then deposit the remaining water and animal into the depression.

7. Prepare a wet mount of an *Elodea* leaf and observe it through the microscope. Determine if this slide is best viewed under low or high power. Complete the third column of Table 5–1.

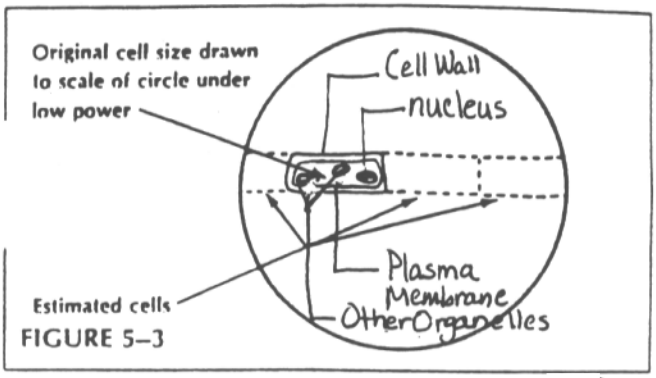


FIGURE 5–3

** Follow the directions for making a WET MOUNT

TABLE 5–1. ESTIMATING CELL SIZE

	FROG RED BLOOD CELLS	PARAMECIUM (or) Daphnia	ELODEA	ONION
Viewing under low power or high power				
Diagram of cell drawn to scale				
Number of cells that fit side-by-side				
Diameter of field of view				
Cell size				

Conclusions

Refer to the investigation results and your text for aid in answering each of the following questions.

1. Convert each of the following cell measurements.

a. 0.25 mm = _____ µm b. 0.06 mm = _____ µm c. 10.7 µm = _____ mm

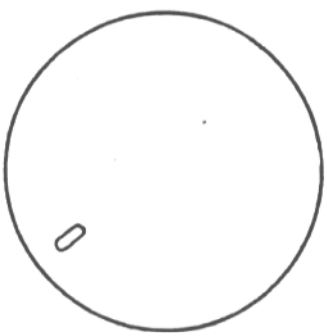
2. A student observed the same cell under low power and then under high power. The number of cells that could fit across the field of view was estimated at 10 on low power and 2.2 on high power. Determine cell size under each power.

3. Determine the cell size in each diagram.

Low power

Cell length:

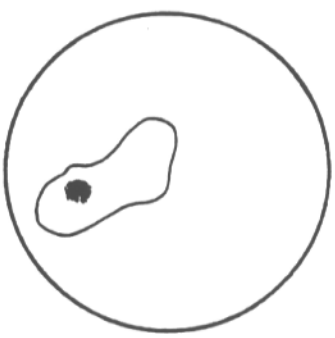
Cell width:



High power

Cell length:

Cell width:



4. (a.) What structures are in the elodea cells that are missing in the onion? (b)Why do you think it was necessary to stain the onion cells specimen? (c) So approximately how many cells in one leaf of the elodea