

Picophytoplankton Size Lab Activity

Objective:

There are four objectives in this activity:

1. to learn how to use a micrometer—a specialized slide that allows you to measure the field of view on a microscope,
2. to become familiar with phytoplankton and picophytoplankton,
3. to improve microscope skills, and
4. to utilize math skills.

Materials:

- Microscope
- Stage micrometer (if a stage micrometer is unavailable, a small plastic metric ruler can be used or a variety of micrometers can be printed from the Web at: <http://www.microscopy-uk.org.uk/mag/imgoct02/MicroscopeCalibrationRule.pdf>)
- Slides / Cover slip
- Phytoplankton sample—a natural sample or a mixed assemblage bought from a lab supply company and a culture of picophytoplankton

Procedure:

1. Obtain a micrometer. The size of the scale or the gradations should be indicated on the micrometer (Figure 1).

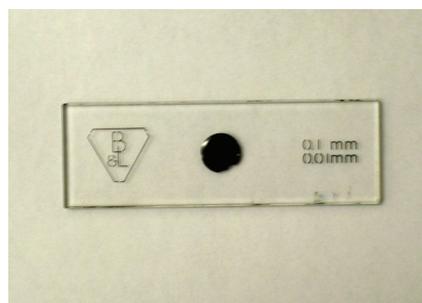


Figure 1: An example micrometer. The scale is inscribed in the round silver disk in the middle.

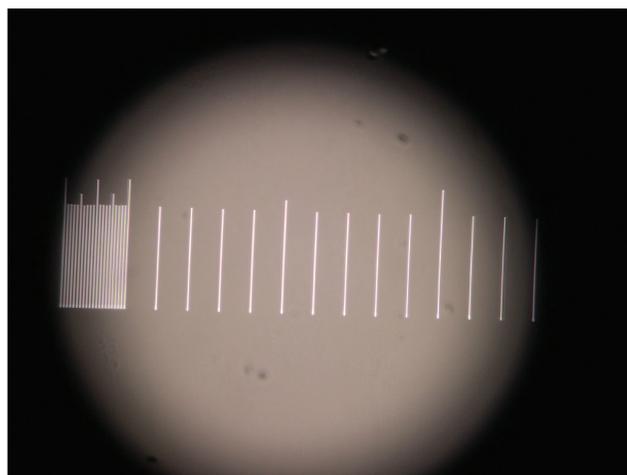


Figure 2: On this microscope, the field of view is 1.51 mm. In this case, the larger gradations are 0.1 mm, and the small gradations on the scale are 0.01 mm.

2. Place the micrometer under the lowest-power objective (likely 4 or 10x) and center the scale below the objective. Bring the scale into focus (Figure 2). What is the size of your field of view using the lowest-power objective? Measure this by determining the number of units on the micrometer visible under this objective.

Magnification of lowest-power objective:

Field of view using lowest-power objective:

3. Repeat the process for higher magnification if additional objectives are available.

Magnification of middle-power objective:

Field of view using middle-power objective:

Magnification of highest-power objective:

Field of view using highest-power objective:

The size of the field of view under higher magnification can also be computed mathematically. For example, if your field of view is 1.51 mm under 10x, then how big would the field of view be under the 40x objective?

$$1.51 \text{ mm} \times 10 = X \text{ mm} \times 40$$

$$(1.51 \text{ mm} \times 10)/40 = X \text{ mm}$$

$$0.38 \text{ mm} = X$$

The field of view under 40x would be 0.38 mm. You will be looking at very small organisms, so it might be helpful to think in terms of micrometers (μm) instead of millimeters (mm).

$$1 \text{ mm} = 1000 \mu\text{m}$$

$$0.38 \text{ mm} = 380 \mu\text{m}$$

4. Make a slide of the phytoplankton assemblage by placing a drop of water on the slide and covering it with the cover slip. Place under the lowest-powered objective on the microscope and focus. Can you see phytoplankton cells? Find two different phytoplankton cells and change to a higher magnification to see them in more detail, if necessary. The size of the cell can be estimated because you know the size of the field of view.

Sketch the two phytoplankton cells below and estimate their size.

Phytoplankton #1: Size



Phytoplankton #2: Size



5. Repeat this process using the second phytoplankton sample. This phytoplankton sample is a type of picophytoplankton. You will likely have to use your highest-power objective to see the picophytoplankton.

Picophytoplankton #1: Size



Picophytoplankton #2: Size



Discussion Questions:

1. How big is a period on this page compared to the large phytoplankton and the picophytoplankton?
2. What differences did you observe between the phytoplankton and the picophytoplankton?
3. What other things might you find in the ocean in these size ranges?
4. What benefits or drawbacks do you think there would be to studying phytoplankton that are so small?
5. The initial discovery of picophytoplankton was greatly facilitated by technologies used in the medical field. Discuss the possible reasons these technologies were first developed for the medical field.