

IN. I-2: Are the Sizes of Potato Pieces Affected by Different Concentrations of Sugar Water?

What happens to the sizes of potato cores that are put in three different water concentrations (with 0, 10, and 20 percent sugar) for 24 hours? Will they shrink, swell, or stay the same? How can you answer this question? Investigating will give you some information (data) on which you can base your answers. The data needed for this problem are these: What sizes are the potato cores initially? What sizes are they on the following day after soaking in different water concentrations?

This investigation will give you a chance to solve a problem using a scientific approach. It will also give you a chance to use some scientific measuring instruments. Most scientists use instruments that measure things in the metric system, for example, in centimeters and grams rather than inches and pounds. (See **Appendix 1-A**, page 683.)

The following materials and procedures will help you collect some information which you can use to answer the question asked in the investigation title. In some of the later investigations you can decide for yourself what materials you will need and what procedures you can use to solve the problems.

MATERIALS

White potato, razor blade, metric ruler, balance, labels, paper towels, cork borer (5 to 10 mm diameter), graduated cylinder, dissecting needle, aluminum foil or plastic wrap, large test tubes or

small beakers, 10% sugar solution (90% water), 20% sugar solution (80% water), distilled water (100% water).

BRIEF PROCEDURE

Cut three cores from a potato, using a cork borer. Measure the length, width, volume, and weight of each core. These are the original sizes. Place the cores in three different concentrations of sugar-water (0, 10, and 20 percent sugar). After 24 hours, measure the length, width, volume, and weight of each core again to see if any sizes have changed.

DETAILED PROCEDURE

1. Using a cork borer, cut three cores from a potato. Trim each core so that its length will be at least 30 mm. Figure 1-A-1 shows the relationship of millimeters to centimeters. Make all cores as nearly the same length as possible. Keep these cores separated and identify them as core A, core B, and core C.

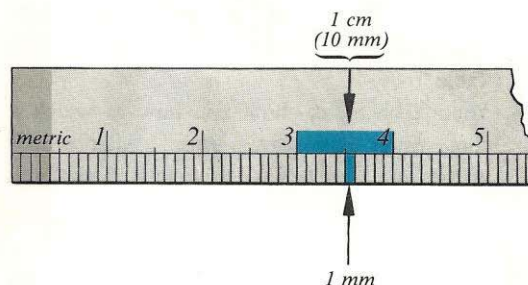


Figure 1-A-1 Metric ruler divided into centimeters and millimeters.

PRECAUTIONS:

1. Do NOT place potato directly on the tabletop or the balance. Measure and cut in petri dish. Weigh in cupcake paper.
2. Accuracy is ESSENTIAL. Weigh each core 3 times and record average.

	core A (100% water)			core B (90% water)			core C (80% water)		
measurements	1st day	2nd day	gain or loss (+ or -)	1st day	2nd day	difference (+ or -)	1st day	2nd day	difference (+ or -)
length (mm)									
diameter (mm)									
volume (ml)									
weight (g)									

Table 1-A-1 Potato core data chart.

2. Measure the length and diameter of each core to the nearest millimeter and record on your data table.
3. Carefully following the directions for proper use of the balance, weigh each core to the nearest hundredth of a gram. (Weigh 3 times - record the average on your data table.)
4. Measure the volume of each core by the following method: Pour water into the graduated cylinder until it is about half full. Hold the cylinder at eye level and read the line on the level with the lower part of the curved surface of the water (called the **meniscus**). See Fig. 1-A-2. Record this exact amount on a piece of scratch paper.

Now, holding the core by the needle end of your probe, sink it under the water. Record the new water level on your scratch paper. Subtract the original volume from the new volume (with the potato) to find the volume of the potato in milliliters. Record this volume on your data table.

5. Place each core in a different test tube and label each tube A, B, or C according to the core identification. Pour distilled water (100% water) into tube A until about $\frac{1}{4}$ " above the top of core A. Pour 10% sugar solution (90% water) into tube B to cover core B in the same way. Pour 20% sugar (80% water) into tube C to cover core C.

6. Cover the test tubes with foil and leave them for 24 hours.

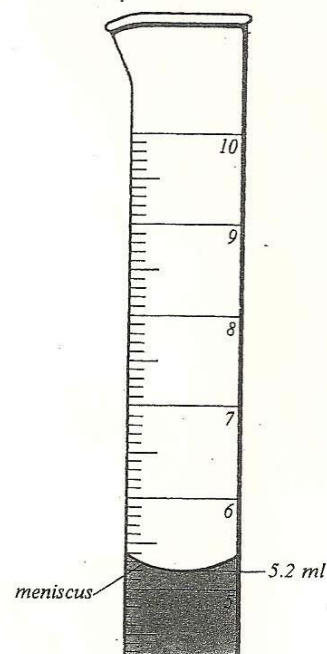


Figure 1-A-2 Read water volume from the bottom of the meniscus.

7. After 24 hours repeat all of the measurements. Record the new measurements and calculate the amount gained or lost.
8. Pay attention to any other changes in the cores – note their appearance, texture and feel compared to yesterday.