**IN. SS-2: HOW ARE POTATO PIECES AFFTECTED BY DIFFERENT CONCENTRATIONS OF SUGAR AND WATER SOLUTIONS?**

What happens to the sizes of potato cores that are put in three different water concentrations (with 0, 10, 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 are they 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 instrument. Most scientists use instruments that measure things in the metric system, for example, in centimeters and grams rather that inches and pounds.

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 solve the problems.

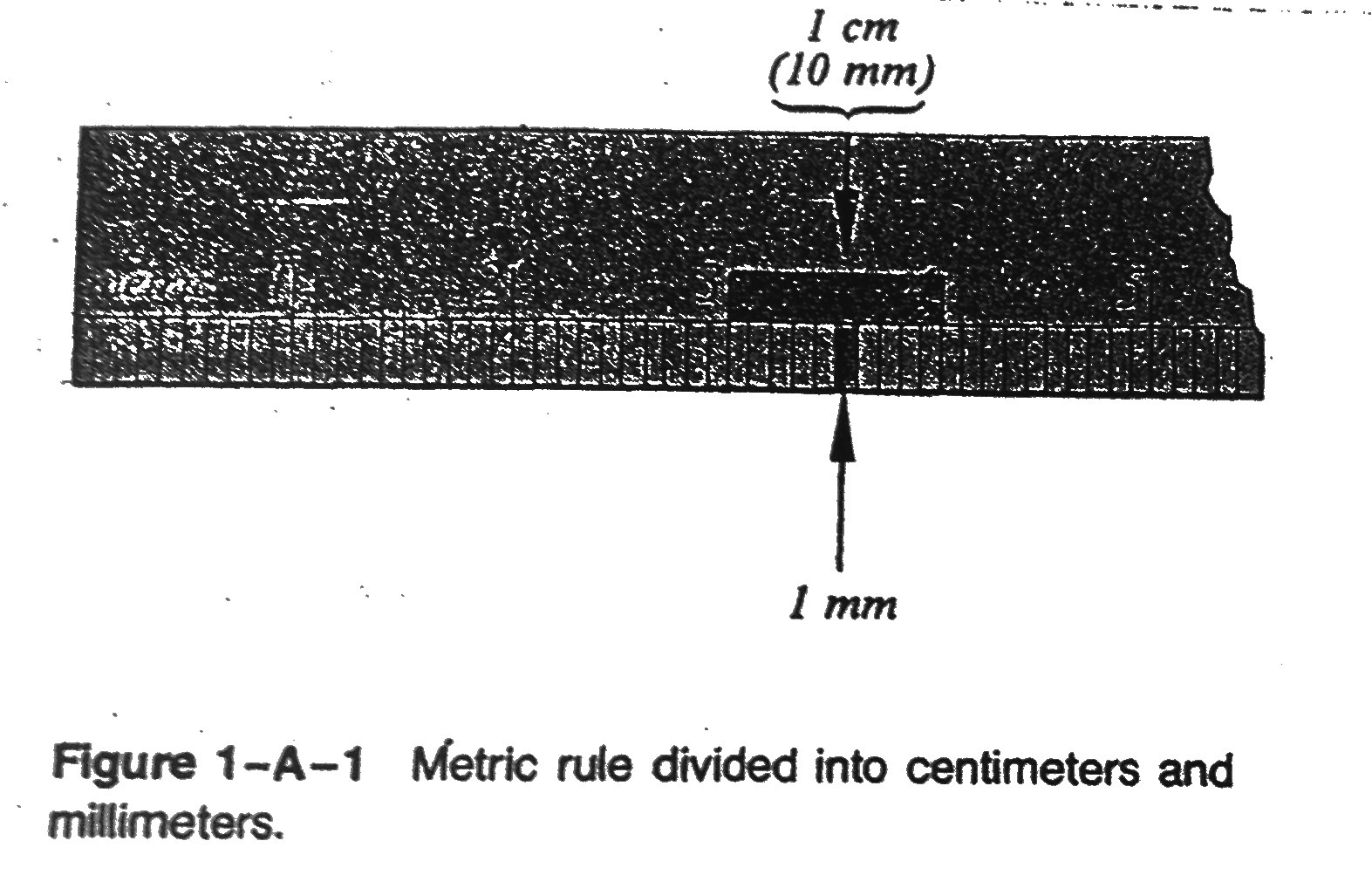
**Materials:** White potato, razor blade, metric ruler, balance, labels, paper towels, cork borer (5 to 10 mm diameter), graduated cylinder, dissecting needle, aluminum foil or plastic wrap, large test tubes or small beakers, 10% sugar solution (90% water) , 20% sugar solution (80% water), distilled water (100% water).

**Precautions**

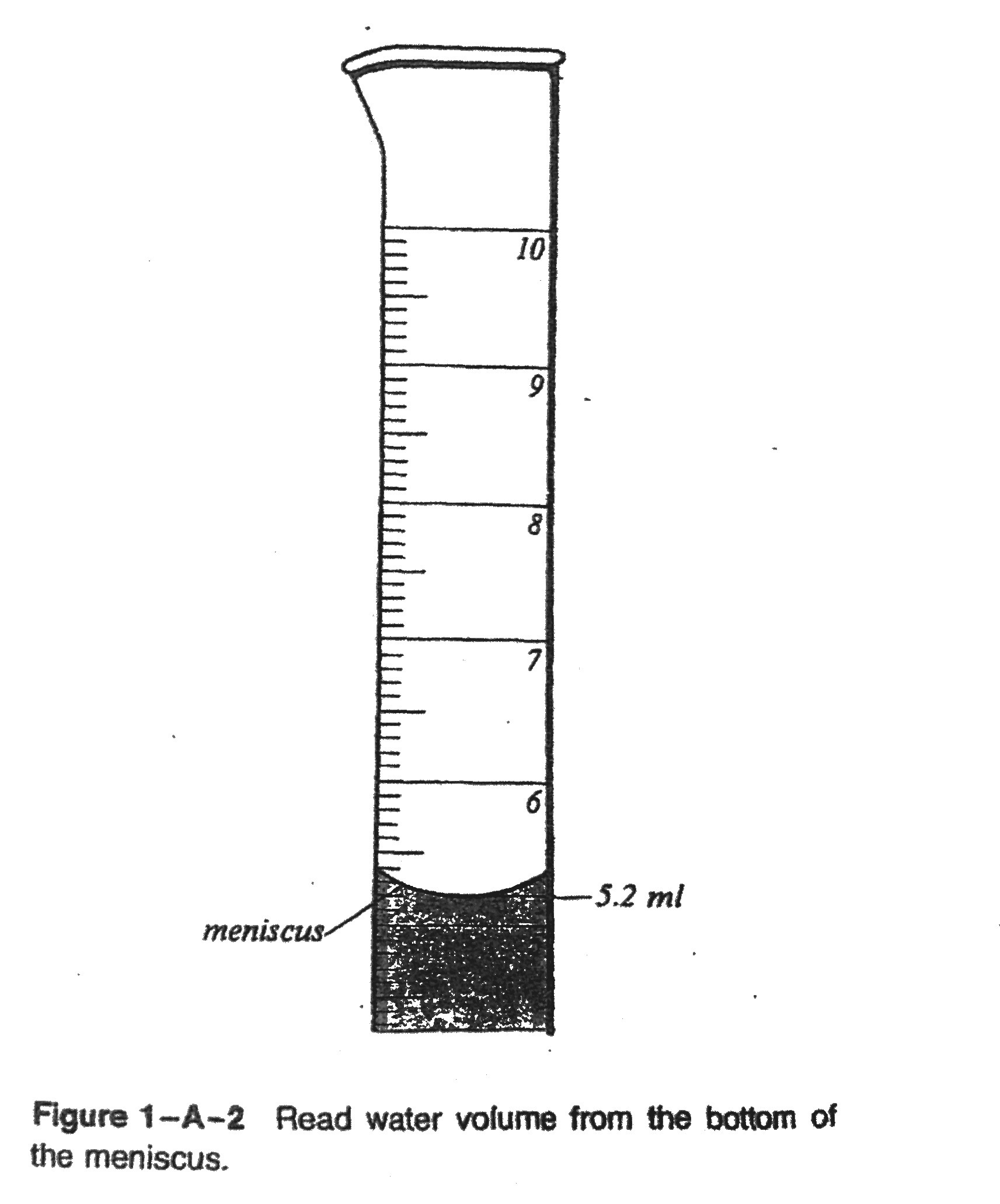
1. Do NOT place potato directly on table or balance. Measure and cut in petri dish. Weigh in cupcake cup.
2. Accuracy is essential. Make all measurements 3 times.

**Procedure**

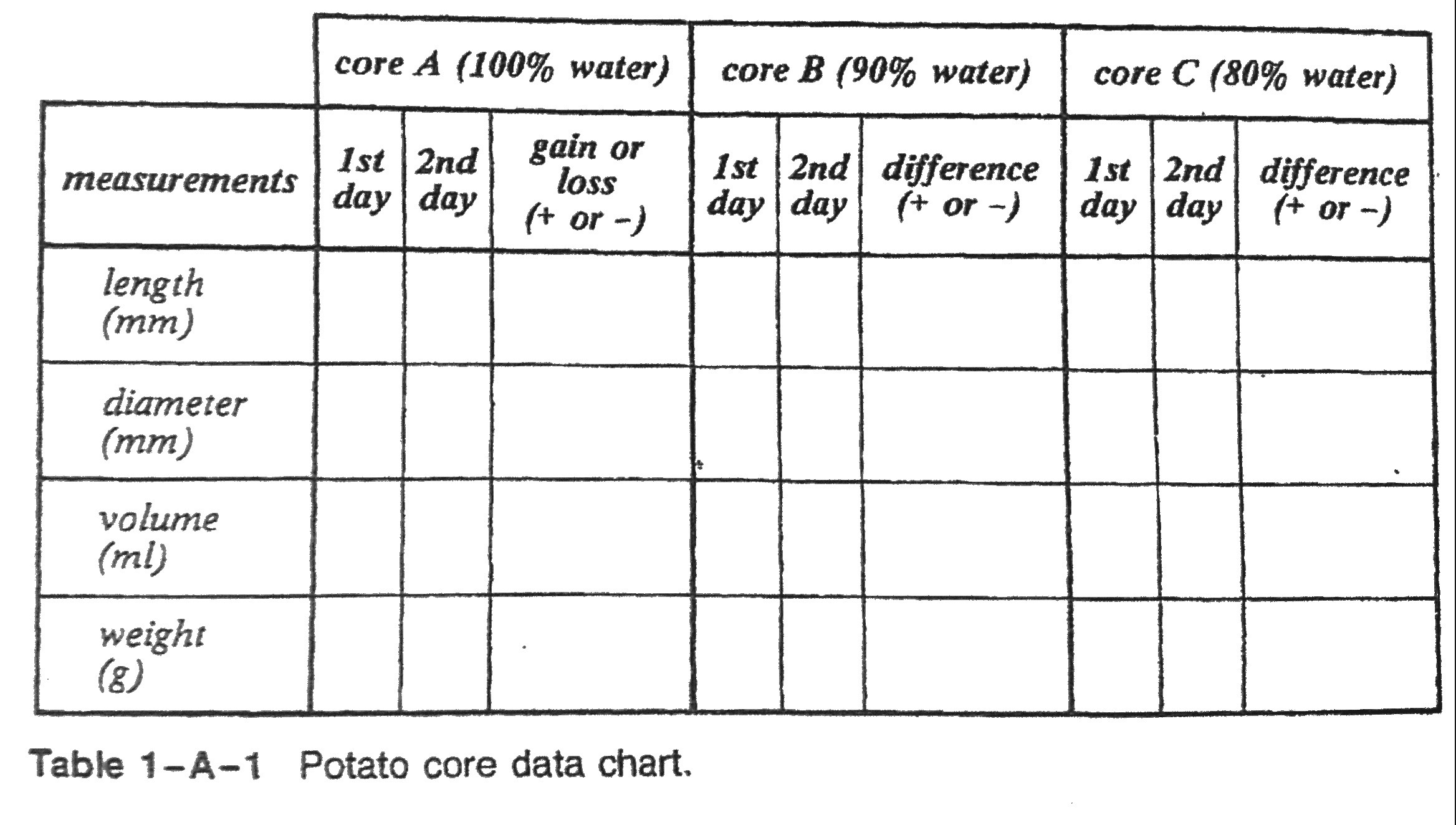
1. Using a core borer, cut three cores from a potato. Trim each core so that its length will be at least 30mm. Figure 1-A-1 shows the relationship of millimeters to centimeters. Make all cores as nearly the same length as possible. Keep these cores separated and identify them as core A, core B, and Core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



1. Measure the length and diameter of each core to the nearest millimeter and record on your data table.
2. 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. **Since the change in weight is most important, do not spend time subtracting the weight of the paper cup. Include that weight for both days.**
3. 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 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.

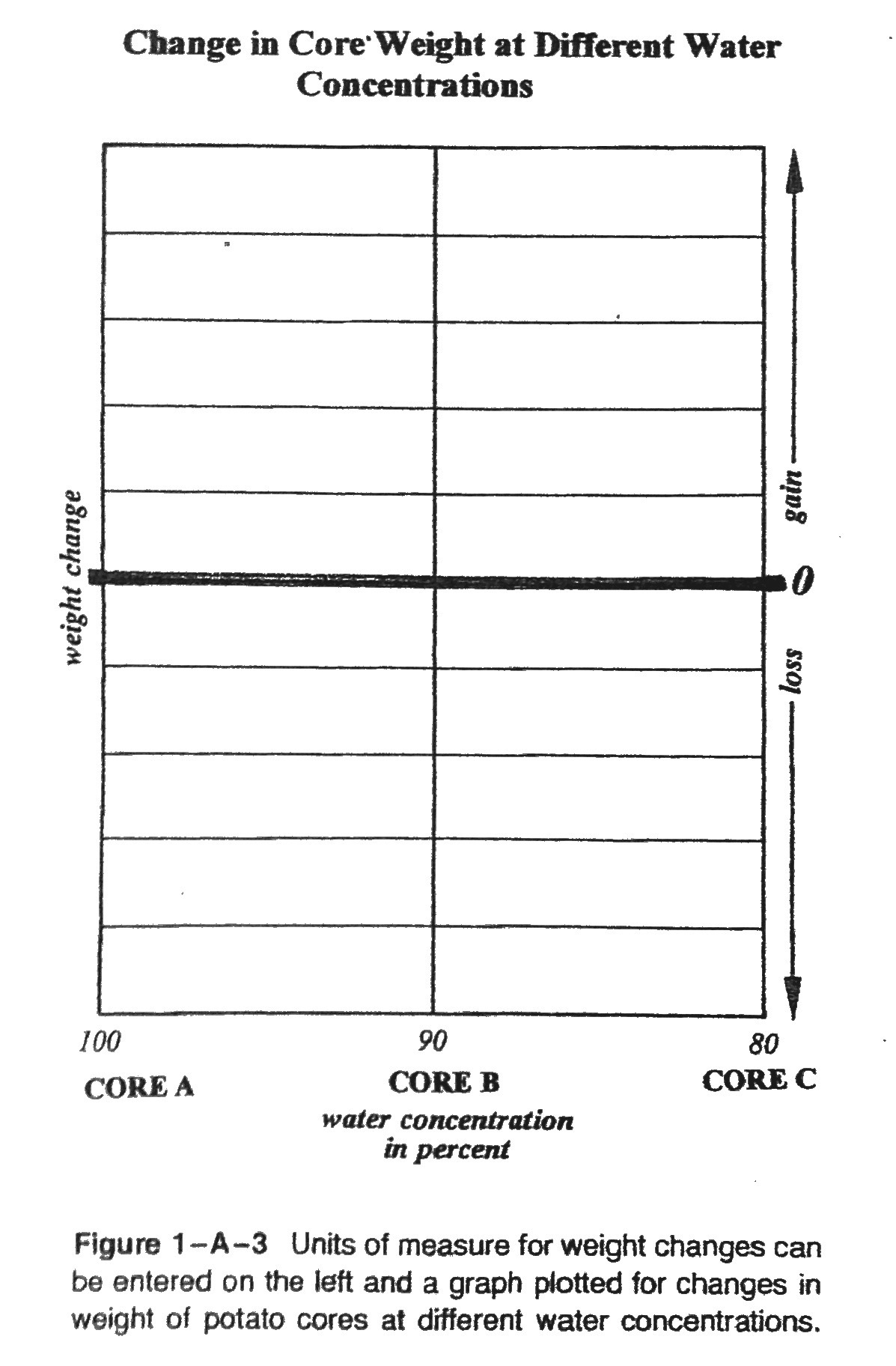


1. Place each core in a different test tube and label each tube A, B, or C according to the core identification. Pour distilled water (100% water) into tube A until about ¼ ” above the top of core A. Pour 10% sugar solution (90% water) into tube B to cover core B in the same way. Pour 20% sugar (80% water) into tube C to cover core C.
2. Cover the test tubes with the screw caps and leave them for 24 hours in your storage locker.
3. After 24 hours repeat all of the measurements. Record the new measurements and calculate the amount gained or lost.
4. Pay attention to any other changer in the cores – note their appearance, texture, and feel compare to yesterday.

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**Results**

Plot on a graph like the one shown in Figure 1-A-3 the change in weight (i.e. gain or loss) of each of the cores. You will need to add units and label the increments on the vertical (i.e. “weight change”) axis.



**Discussion Questions**

1. In addition to the changes in size, weight, and volume you recorded in your data, what other changes did you notice in the appearance and texture or “feel” of Core A? Core B? Core C?
2. Did both the weight and volume of core A change? If so, did both change in the same direction (i.e. both up or down)?
3. Does your graph show a relationship between the concentration of water and the change in potato core weight? If so, what is the relationship?
4. Using your graph, predict the concentration of water at which the potato core would not change weight – in other words, at what concentration would there be “zero change”?
5. Describe an experiment you could do to test the accuracy of your prediction in question 5.
6. Several people measured the length of the same potato core using the same ruler. All were trying to be as careful and accurate as possible yet they came up with the measurements of: 30 mm, 31 mm, 29 mm, and 28 mm.
7. How can you explain this type of variation in measurements made by different people?
8. Assuming you are instructed to record just one number on your data table, what number should you record in this case?