

BIOLOGY
Investigative Skills Assignment
Task Sheet

BIO3T/Q09/task

Finding the water potential of potato tissue

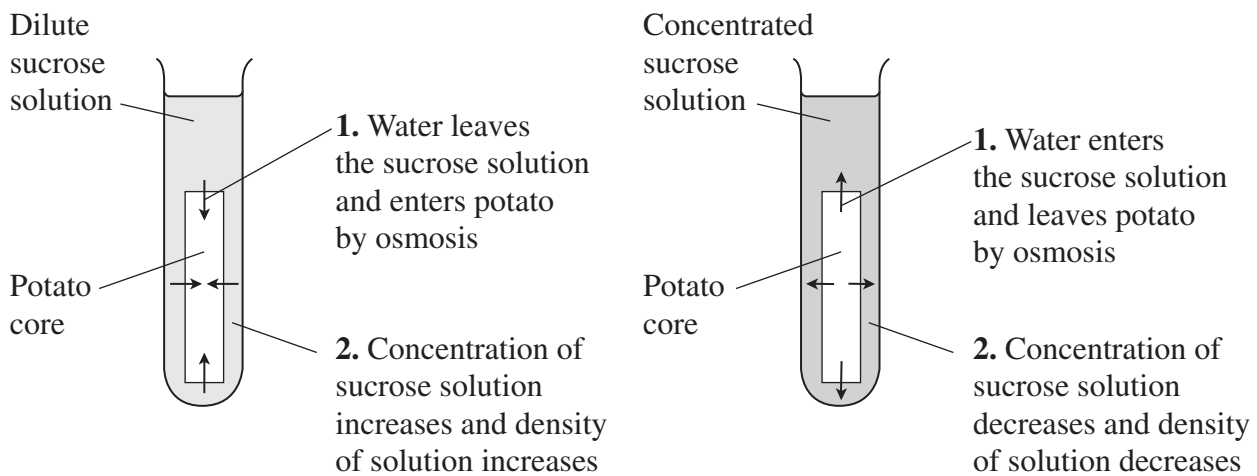
INTRODUCTION

When you put potato tissue in a dilute sucrose solution, water leaves the sucrose solution and enters the tissue by osmosis. Loss of water increases the concentration of the sucrose solution and causes its density to increase.

When you put potato tissue in a concentrated sucrose solution, water enters the sucrose solution from the tissue by osmosis. Gain of water decreases the concentration of the sucrose solution and causes its density to decrease.

This information is summarised in **Figure 1**.

Figure 1



You can tell if water has entered the potato or been lost from the potato by finding out if there has been any change in the density of the surrounding solution.

When there is no change in density of the sucrose solution, there has been no net movement of water into or out of the potato tissue.

You are going to find the sucrose concentration in which there is no net movement of water. You will use this value to determine the water potential of the potato cells.

Outline method

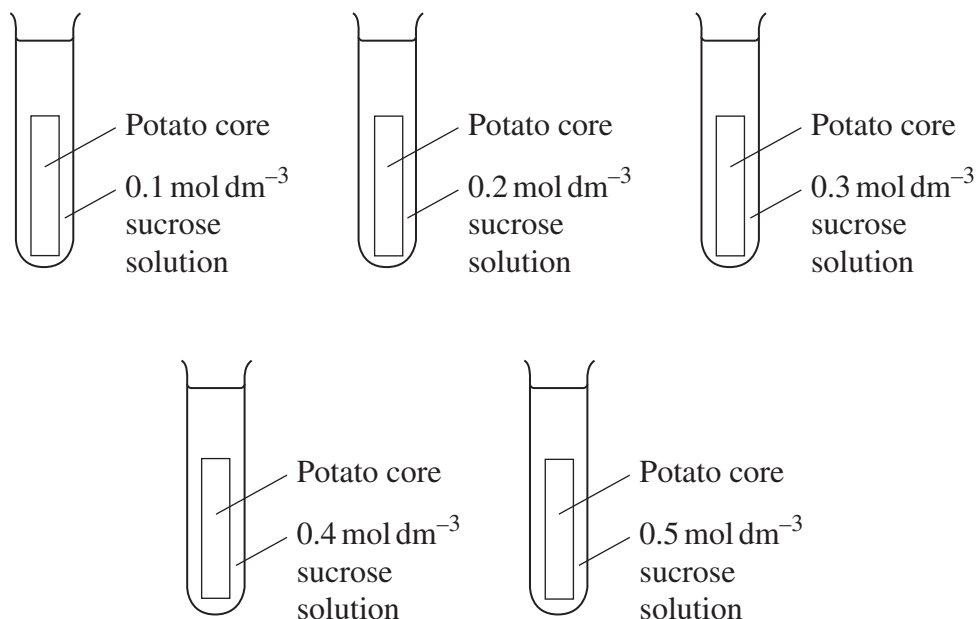
You are provided with

- sucrose solutions of concentration 0.1, 0.2, 0.3, 0.4 and 0.5 mol dm⁻³
- distilled water
- dye solution
- apparatus necessary to cut the potato
- a potato
- a cork borer
- white tile
- test tubes
- Pasteur pipette
- stopwatch
- permanent marker pen
- paper towels
- ruler graduated in mm.

You may ask your teacher for any other apparatus you require.

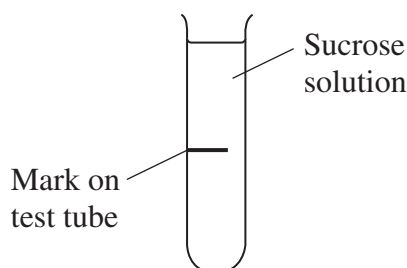
You should read these instructions carefully before you start work. Your teacher will also demonstrate the technique you will be using in steps 8 and 9. You will then be given the opportunity to practise the technique. You may ask your teacher for help if you have any difficulties with the technique.

1. Label one set of five test tubes 0.1, 0.2, 0.3, 0.4 and 0.5. Add 10 cm³ of the appropriate sucrose solution to each test tube.
2. Use the cork borer to obtain 5 potato cores. Remove any skin and cut each one so it is exactly 4 cm long. Keep the cut cores covered with a moist paper towel until you need them.
3. Put one potato core into each of the test tubes. This is shown in **Figure 2**. (The cores should be totally covered by the sucrose solution – ask your teacher for help if this is not the case.)

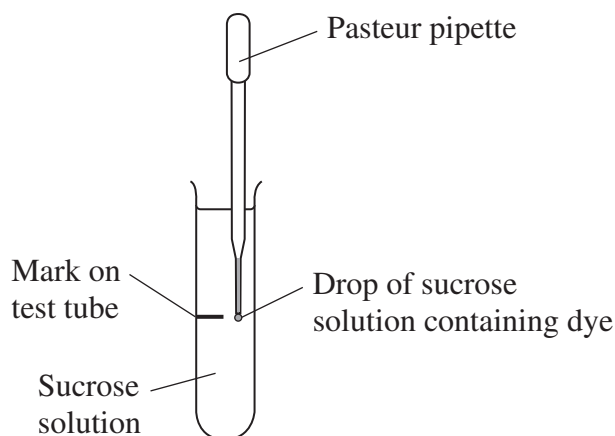


4. While the potato cores are in the solutions, label another set of five test tubes 0.1, 0.2, 0.3, 0.4 and 0.5. Add 10 cm³ of the appropriate sucrose solution to each test tube.
5. Make a mark on each test tube halfway down the depth of the solution. (**Figure 3**)

Figure 3



6. Remove the potato cores from the sucrose solutions after a set period of time. Your teacher will tell you how long to leave them.
7. After removing the potato cores, add a few drops of dye solution to each test tube and mix.
8. Use a Pasteur pipette to remove some of the coloured 0.1 mol dm⁻³ sucrose solution. **Carefully and slowly** release one drop halfway down the test tube containing the clear 0.1 mol dm⁻³ sucrose solution. The test tube should be vertical.



9. Place the ruler behind the test tube. Immediately start the stopwatch, and record the direction and distance moved by the drop of dyed sucrose solution in a time of your choosing. If the drop disperses into the solution record the distance moved as zero.
10. Repeat steps 8 and 9 several times with this solution and record your results.
11. Repeat steps 8 to 10 with the other four pairs of sucrose solutions.

You will need to decide for yourself

- how many repeat readings you will take with each sucrose concentration in step 10.

ISA BIO3T/Q09 Candidate Results Sheet: Stage 1

Finding the water potential of potato tissue

Centre Number

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Candidate number

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Candidate Name

Record your data in a table in the space below. Hand in this sheet at the end of each practical session.

ISA BIO3T/Q09 Candidate Results Sheet: Stage 2

Finding the water potential of potato tissue

Centre Number

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Candidate number

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Candidate Name

Use the space below to calculate the mean rate of rise or fall of the dyed drop.

Use the graph paper to plot a graph of your processed data.

Hand in this sheet at the end of each practical session.

Hand in this sheet at the end of the session.

