**Production of a dilution series of a solute to produce a calibration curve with which to identify the water potential of plant tissue**

**Learning objectives**

* To develop practical skills c, h, j, l and begin to demonstrate competencies 2a, 2c and 5a
* To calculate percentage change in mass of potato chips
* To draw a graph showing how changing concentration of sucrose affects percentage change in mass of potato chips.
* To use the graph to determine the water potential of potato tuber cells

You are provided with the following:

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| --- | --- |
| * large potato tuber | * potato chip cutter |
| * 1 mol dm–3 sucrose solution | * distilled water |
| * boiling tube rack | * six boiling tubes, |
| * marker pen | * thermometer |
| * 10 cm3 graduated syringes | * White tile |
| * scalpel | * ruler |
| * paper towels | * timer |
| * digital balance | * forceps. |

**You should read these instructions carefully before you start work.**

**Preparing the dilution series**

1. Label six boiling tubes 0, 0.2, 0.4, 0.6, 0.8 and 1.0 mol dm–3 sucrose.
2. Use the 1.0 mol dm–3 sucrose solution and water to make up 20 cm3 of sucrose solution of each of the following concentrations:

0.2 mol dm–3

0.4 mol dm–3

0.6 mol dm–3

0.8 mol dm–3

1.0 mol dm–3

Complete **Table 1** to show the volumes of 1.0 mol dm–3 sucrose solution and water that you used to make up each concentration.

**Table 1**

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| --- | --- | --- | --- | --- | --- | --- |
| Concentration of sucrose solution /  mol dm–3 | **0** | **0.2** | **0.4** | **0.6** | **0.8** | **1.0** |
| Volume of  1.0 mol dm–3 sucrose solution / cm3 | **0** |  |  |  |  | **20** |
| Volume of water / cm3 | **20** |  |  |  |  | **0** |
| Total volume | **20** | **20** | **20** | **20** | **20** | **20** |

1. Stand the boiling tubes containing the sucrose solutions in a water bath set at 30 °C. Use a thermometer to check the temperatures in all tubes reaches 30 °C.
2. Using the chipper, cut six chips from your potato tuber. Make sure you remove any peel on the potatoes. Use a ruler, scalpel and tile to cut all of the chips to the same length. Blot the potato chips dry with a paper towel, ie roll each chip until it no longer wets the paper towel and dab each end until dry. **Do not squeeze the chips***.* Put each potato chip onto a clean square of paper towel which you have numbered in the same way as the boiling tubes.
3. Weigh each potato chip. Record these initial masses in a suitable table.
4. At the water bath, set the stop clock to zero. Quickly transfer each potato chip from its square of paper towel to its own boiling tube with the same number.
5. After precisely 20 minutes, remove the chips from the boiling tubes. Blot the chips dry, as before. Then reweigh them. Record these final masses in your table.
6. Calculate the change in mass and then calculate the percentage change in mass.
7. Plot a graph of your processed data and use this to determine the concentration of sucrose which has the same water potential as the potato tuber cells.

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| Competencies demonstrated | |
| 2. Applies investigative approaches and methods when using instruments and equipment | a. Correctly uses appropriate instrumentation, apparatus and materials (including ICT) to carry out investigative activities, experimental techniques and procedures with minimal assistance or prompting.  c. Identifies and controls significant quantitative variables where applicable, and plans approaches to take account of variables that cannot readily be controlled. |
| 5. Researches, references and reports | a. Uses appropriate software and/or tools to process data, carry out research and report findings. |
|  | Apparatus and techniques |
| AT c | use laboratory glassware apparatus for a variety of experimental techniques to include serial dilutions |
| AT h | safely and ethically use organisms to measure:   * plant or animal responses   physiological functions |
| AT j | safely use instruments for dissection of an animal organ, or plant organ |
| ATl | use ICT such as computer modelling, or data logger to collect data, or use software to process data |

**Risk Assessment**

Care should be taken with use of chippers and scalpel. Cut away from your body onto the white tile.