Research question:

What is the effect of the concentration of sucrose solution on the final mass of the potato slices measured by?

Background information: Potato cylinders immersed in

Osmosis is the passive movement of water molecules from a region of high water concentration to a region of lower water concentration (lower solute concentration to higher solute concentration), across a partially permeable membrane.[1] The plasma membrane is selectively permeable, and it controls the movement of substances in and out of cells, but water is able to move freely in and out of the cell, allowing osmosis to occur.[2] Potato cells have selectively permeable membranes and therefore can be used to show the process of osmosis.

As plant cells generally have a higher solute concentration than their surroundings (lower water concentration), when immersed in H_20, the potato strips will be surrounded by a region of high water concentration since water has a solute concentration of 0.[3] This would mean that the distilled water is hypotonic whereby it has a higher concentration of water than the potato cells, causing water to flow from the area of higher water concentration (water solution) to the area of lower water concentration (potato cell).

Osmosis is also responsible for the ability of plant roots to draw water from the soil. Roots are adapted for this because of the numerous root hair cells; they increase the surface area to volume ratio, making the absorption highly effective. Animal cells also use osmosis to transport water in and out, but the consequences in this case are different due to the absence of cell walls.

strong sucrose solutions will lose mass/length as water moves from a high concentration area (inside the potato cells) to a low concentration area (outside the potato

cells). The sucrose concentration that causes no change in mass/length is the potato cell concentration.

- https://www.bbc.co.uk/

Osmotic pressure is essential for support in plants. Entry of water in the cell raises the turgor pressure exerted against the cell wall, making it turgid and enabling it to stand upright. Plant cells are usually in hypotonic environments, where the fluid in the cell is more concentrated than that outside the cell, so water enters in. This is illustrated below.

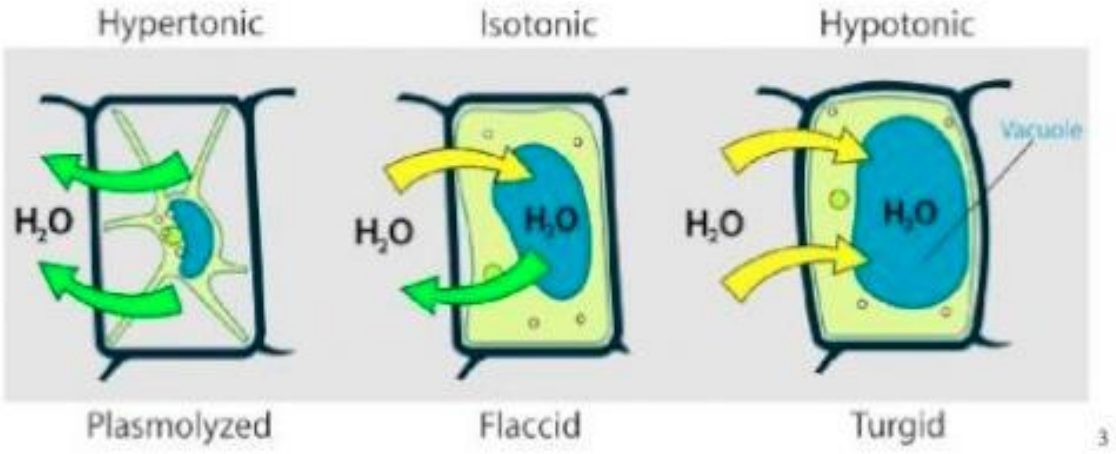

Figure 2: Plant cells in hypertonic, isotonic and hypotonic environments.

Figure 2 also shows that if plant cells are in a hypertonic environment, then all the water will leave the cell, making it plasmolyzed[4]. This causes the cytoplasm to be pinched away from the cell wall, and the cell can no longer function. If plants are in isotonic environment, they are not turgid, but flaccid; they tend to wilt.

In this lab report, we will preparing different concentrations of sucrose solution and we will measure the water uptake or loss by measuring the change in the masses of potatoes using a digital balance after soaking potato cylinders for fixed period of time.

Hypothesis:

If the water in the potato decreases then the mass of the potato will decrease

Variables:

The independent variable: concentration of sucrose solution

Changing the concentration of 100 cm^3 sucrose solution the following concentrations will be prepared as shown in the table below:

Table 1: shows the volumes of water and masses of sucrose that will be used to prepare the different concentrations of sucrose solutions

Mass of Sucrose g ( )	Volume of water cm3 ( )	Concentration of sucrose solution (%)
2.5g	100cm3	2.5%
5g	100cm3	5%
7.5g	100cm3	7.5%
10g	100cm3	10%
12.5g	100cm3	12.5%

The masses of sucrose will be measured using a digital balance (…….)

- And the volume of water will be measured using a 100 cm3 measuring cylinder (…….)
- The uncertainty of the digital balance and the pipette was measured by dividing the smallest increment by 2

Dependent variable: Final mass.

Controlled Variable:

Controlled Variable	**How will you keep this controlled? Stating the values and the equipment that you will be using**	**How could it affect your results if not controlled?**
Quantity of sucrose solution	Beaker	It could affect the amount in G of sucrose solution which will make our values in the experiment wrong
The temperature of the water	Thermometer	Dissolve the sucrose faster
The mass of the potato	Digital balance	Affect the results

Table 2: description of the controlled variables

Materials:

Fill in the materials needed for the experiment

INCLUDE THE – Quantity, volume and UNCERTAINTY

Slice of a potato that has been cut into 6 pieces

100cm3 of sucrose solution

Digital balance

Water bath set at 35c

Thermometer

Cork borer with a diameter of 0.6 beaker labelled on 2,5%

Digital clock for timer

Blotting paper

Procedure:

1. Prepare 100 cm3 of sucrose solutions using the information shown in table 1
2. Add each solution into a beaker that is labelled with the corresponding concentration
3. Place all solutions in a thermostatically controlled water bath set at 35°C
4. Using a cork borer with a diameter of 0.6 cut out 6 potato cylinders
5. Using a digital balance (…….) measure the initial masses of each potato cylinder and record these values into a table and label them as initial masses
6. add one cylinder of potato into the beaker labelled 2.5 %
7. repeat step 6 using the other concentrations of sucrose
8. leave all the potatoes soaked for 2 hours monitored using a digital clock
9. after 2 hours remove all the potato cylinder and dry them gently using blotting paper
10. measure the final masses of each potato cylinder and record these values in a table and label them as final masses

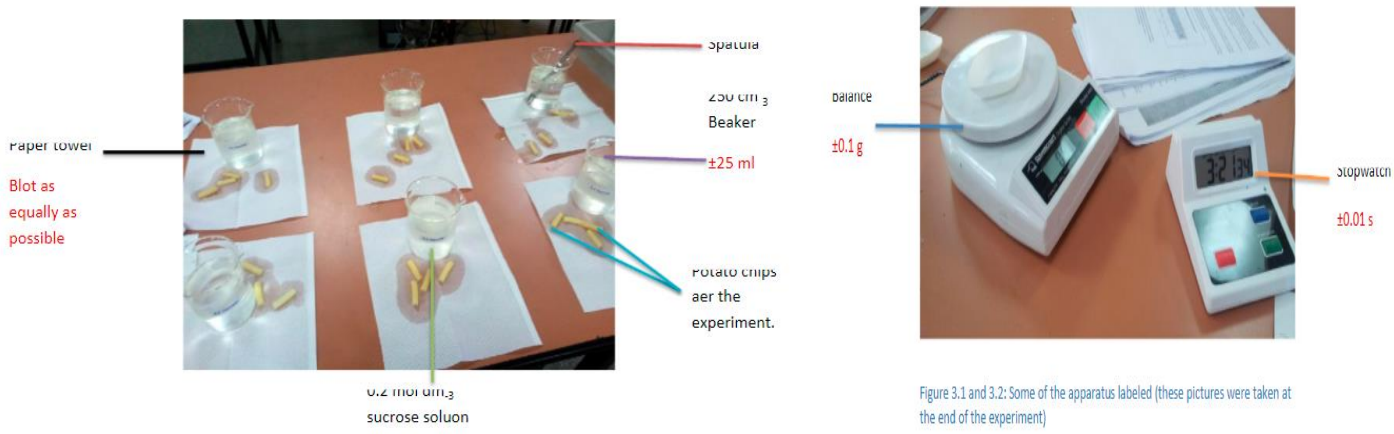

Figure 3.1 and 3.2: Some of the apparatus labeled (these pictures were taken at the end of the experiment)

Safety, ethical and environmental considerations:

Safety: be careful while using scissors to avoid possible cuts in the skin

Ethical: No human or animals subjects are used during the experiment

Environmental: no harmful chemicals that will harm the environment are used, care was taken when selecting the volumes and masses used so as not to overconsume the chemicals

The sucrose solutions were safely disposed into the sink after completing the experiment

Construct a table to write your qualitative and quantitative data.

Qualitative:

Concentration of sucrose solution %	Observation
2.5%	
5%	
7.5%	
10%	
12.5%	

Table (….,) ……

Raw data :

Quantitative :

Concentration of sucrose solution %	Initial mass g (± 0.01)	Final mass g (± 0.01)
2.5%	1.2	1.48
5%	1.21	1.35
7.5%	1.21	1.38
10%	1.23	1.32
12.5%	1.04	1.17

Table (…….) ……

Processed data :

Concentration of sucrose solution %	Change in mass g	Percentage change %
2.5%	0.28g	
5%	0.14g	
7.5%	0.17g	
10%	0.09g	
12.5%	0.13	

Table (.....) .....