**Research question:**

**What is the effect of changing the percentage of sucrose solution on the mass (g) of potatoes cut in cylinders measured by how much mass is lost or gained to the potato after leaving the cylinders in different solutions for 24 hours?**

**Background information:**





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 concentration of the sucrose solution increases the final mass of the potato will decrease. Since the concentration of the sucrose is fixed and will not change unless a person is willing to change it. Also, as you increase the concentration of sugar solution the final mass will decrease. Since the water moves from hypotonic to hypertonic solutions. To add, when the sucrose solution increases it means that it becomes more hypertonic so the potato is hypotonic. Therefore, water will move outside the potato which will decrease the mass (from hypotonic to hypertonic

**Variables :**

**The independent variable :**

Changing the concentration of 100 cm3 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 | 15 | 2.5 |
| 5g | 15 | 5 |
| 10g | 15 | 10 |
| 12.5g | 15 | 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:**

The dependent variable is the final mass since it depends and relies on the concentration of sucrose. All results may vary depending on the amount of sucrose. The final mass may vary depending on the amount of sucrose solution that the potato was placed in.

**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?**  |
| Concentration of sucrose solution | Although the concentrations vary, each concentration will give us different results. We will keep this controlled by changing the amount of sugar of each concentration by measuring the sucrose on a balance and keeping the amounts of water the same. | If not controlled, experiment won’t be accurate and won’t give us the results expected. |
| Mass of potatoes | All potatoes will be cut equally and balanced to have the same weight. (g) | If not controlled, the experiment won’t be accurate or show clear differences or similarities. |
| Time of experiment | Time will be recorded with a digital clock. | If not controlled, results won’t be fair since the other potatoes might have more or less time and also it won’t give accurate results. |
| Amount of solution | Each potato will be placed in a separate test tube with 15cm3 of water. | If not controlled, results won’t be accurate or show correct results. |
| Temperature of solutions | Temperature will be recorded with a thermometer and will be placed in the same place. | If not kept at the same temperature, results may vary since water can evaporate or condense. |
| Day/Night time | All potatoes will be left in day/night time at the same time so the temperature is the same and it doesn’t risk exposure to extra sun. | If not kept at the same times of day results will vary since the temperature surrounding it can risk the experiment. |

Table 2: description of the controlled variables

**Materials:**

Fill in the materials needed for the experiment

INCLUDE THE – Quantity, volume and UNCERTAINTY

Marker for labelling.

Sucrose solutions (2.5,5,10,12.5) (100cm3)

Water bath set at 35c

Cork borer qith a diameter of 0.6

Potato (cut into 6 pieces with a diameter of 0.6)

Digital balance

 6 beakers

6 test tubes

Paper towels

Digital clock

**Procedure:**

Procedure:

1. Clear the working area and place a large white tile.

2. Take out at least 10 potatoes that look most similar to each other. The color and the

approximate size should help in deciding that.

3. Use a 0.6 cm diameter borer to form the potato chips. Try to use as few potatoes as possible

to produce 30 potato chips.

4. To ensure that the chips are of same diameter throughout, insert the borer quickly in a

potato while keeping it straight so that one end of the borer comes out of the other side.

Put the chips on the white tile.

5. Now that all the 30 chips are on the white tile, use a scalpel to peel off any remaining skin

on the potatoes. Do this process one by one until all the chips are clean.

Caution: Scalpels are very sharp; use them carefully.

6. Separate the longer chips from the shorter ones. Using a 15 cm ruler, check if any of the long

ones are longer than 6 cm to be evenly cut in half. This will save time.

7. Use the scalpel to cut all the chips to be accurately 3 cm long using the same ruler each time.

8. Once all the chips are 3 cm long, weigh their mass one by one by using a balance.

9. Make sure they are all within 0.1 g difference of each other.

10. Record this data in the “Initial Mass” section of the table.

11. Take out the tray containing beakers of pre-prepared sucrose solutions- concentrations 0.0

mol dm

-3

(distilled water), 0.2 mol dm

-3

, 0.4 mol dm

-3

, 0.6 mol dm

-3

, 0.8 mol dm

-3

 and 1.00

mol dm

-3

.

12. To ensure that the volume of the solutions is 200 cm

3

, use a measuring cylinder. This has to

be repeated twice because the measuring cylinder is 100 cm

3

 (hence double the

uncertainty). The lower meniscus should touch the 100 cm

3

mark.

13. With the help of someone else, ensure that you immerse 5 potato chips in each of the

beakers and start the stopwatch at the same time. The 5 potato chips represent trials of

each concentration.

14. Once the stopwatch is running, name the tray containing all the beakers. The experiment

can be left unmonitored in the lab for 4 hours.

15. When the time nears 4 hours, difference in the size of potato chips is noticeable, however

to have quantitative evidence, potato chips must be weighed.

16. After exactly 4 hours, remove the potato chips from the solutions using a spatula carefully,

ensuring none of the potato chips break or get squashed.

17. Try to blot all 30 potato chips using a paper towel equally and weigh them once again.

18. Record the mass of each in the “Final Mass” section of the table.

19. All the lab work is completed for this experiment. Clear the area and clean the apparatus if

required.

Procedure:

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2. Take out at least 10 potatoes that look most similar to each other. The color and the

approximate size should help in deciding that.

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, 0.4 mol dm

-3

, 0.6 mol dm

-3

, 0.8 mol dm

-3

 and 1.00

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ensuring none of the potato chips break or get squashed.

17. Try to blot all 30 potato chips using a paper towel equally and weigh them once again.

18. Record the mass of each in the “Final Mass” section of the table.

19. All the lab work is completed for this experiment. Clear the area and clean the apparatus if

required.

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 35oC
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



**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%** | **Final mass was more than the initial mass. Since the water moved into the potato.** Water moved from a region of high-water concentration to an area with low water concentrion. |
| 5% | Final mass was more than initial mass. Since the water moved into the potato. Water moved from a region of high-water concentration to an area with low water concentrion. |
| 10% | Final mass was less than the initial mass. Since the water moved out of the potato. Water moved from a region of high-water concentration to an area with low water concentrion. |
| 12.5% | Final mass was less than the initial mass. Since the water moved out the potato. Water moved from a region of high-water concentration to an area with low water concentrion. |
|  |  |

Table ( …..,) …………………………………………………………………..

**Raw data :**

**Quantitative :**

|  |  |  |
| --- | --- | --- |
| **Concentration of sucrose solution %** | **Initial mass g (± 0.01)** | **Final mass g (± 0.01)** |
|  |  |  |
| **2.5** | **2.32** | **2.64** |
| **5** | **2.33** | **2.39** |
| **10** | **2.32** | **2.21** |
| **12.5** | **2.32** | **2.10** |

Table (…….) ………………………………………….

 **Processed data :**

|  |  |  |
| --- | --- | --- |
| **Concentration of sucrose solution %** | **Change in mass g** | **Percentage change %** |
|  |  |  |
| **2.5** | **0.32** | **13.79%** |
| **5** | **0.06** | **2.58%** |
| **10** | **-0.11** | **-4.74%** |
| **12.5** | **-0.22** | **-9.48%** |

Table (……..) ………………………………………