

Osmosis in potato essay sample



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Defining problem and selection variables

Purpose: The purpose of the experiment is to show how varying the concentration of salt solution affects osmosis in a potato piece.

Background:

* Osmosis: Diffusion of water molecules across a membrane from high concentration to low concentration. (Biology, Sixth edition - Campbell, Reece)

* Hypotonic: higher concentration of solute than in the cytoplasm - water flows out of the cell

* Hypertonic: lower concentration of solute than in the cytoplasm - water flows into the cell

* Distilled water: pure H₂O

Table not necessary for this purpose

Hypothesis: If I increase the concentration of salt then the amount of water moving in or out the potato will change and increase or decrease its mass.

Prediction: According to the hypothesis my prediction is that the potato mass will decrease with increase of salt solution and increase in distilled water.

Explanation: If we put the piece of potato in distilled water molecules pass from high concentration (the water itself) to low concentration (in the potato piece).

The water moves towards higher concentrations of solution (from high concentration of water to low concentration of water). That means that if the water outside the cell is saltier (has lower concentration of water) than the water inside, water will move from the inside of the cells to the outside. Therefore, the piece in higher concentrations of water will have a larger mass than the piece in salt concentrations.

Selecting Variables

Independent Variables: Concentration of the solution

Dependent Variable: Mass of potato

Controls: I can control the volume of solution, the temperature of the solution and atmosphere, the time potato pieces are in the solution for, the size of potato pieces, the length of time in which the pieces are in the solution.

The mass of the potato is a variable I will measure through the experiment.

Controlling variables

Materials: a large potato

Cork borer

3 small beakers

Distilled water (H₂O)

Salt (sodium chloride)

Ruler

Timer

Graduated cylinder

Pencil

Chipper

Weight scale

Designing method

With graduated cylinder I fill each of the beakers with 40 ml of distilled water and place them on a table. Label each beaker. First is distilled water, second is 2g salt solution and the third is 4g salt solution.

I add 2 g of salt into the second beaker and stir and 4 g of salt into the third beaker and stir.

I cut out off the same potato from the middle of the potato three slices with the cork borer.

I make sure with the ruler that all pieces have the same length - 25mm, if not I trim them with a chipper I also have to make sure all pieces weight the same - 5g.

I put one piece of potato in each beaker.

I leave the potato in each solution for 30 minutes the total, but at 15 minutes I remeasure the length of potato pieces to see if any change has happened and also weight them.

I write down the data measured after 15 minutes in each solution and after 30 minutes in the solution.

I follow normal safety procedure during this lab.

Error reduction

- clean the scale before placing the pot
- take all potato pieces out at the same time

Method of Collection

Procedure is proper and goes in order I stated above.

Presentation of data:

Weight of potato pieces

Distilled water

Solution of 2g of salt

Solution of 4g of salt

0 minute

5g

5g

5g

15 minute

5. 15g

4. 9g

4. 8g

30 minutes

5. 29g

4. 79g

4. 65g

Length of potato pieces

Length before

Length after 30 minutes

Distilled water

25mm

25mm

Water with 2g of salt

25mm

24mm

Water with 4g of salt

25mm

22mm

How variables are controlled: I make sure that except for the concentration other variables stay constant

Measurement problems: Inaccuracy of weight scale (0.01), potato piece I took from the last beaker stayed in the solution longer.

Reducing of errors: Instead of doing the experiment at the same time with three different solutions, I should have done each solution after another.

Qualitative observations:

- * there is no smell,
- * the potato sinks to the bottom
- * no salt can be seen at the bottom
- * the potato skin seems to be more soft

Quantitative observation - tables above

Conclusion and Evaluations

Hypothesis: If I increase the concentration of salt then the amount of water moving in or out the potato will change and increase or decrease its mass.

Conclusion: In my investigation, this particular diffusion was the diffusion of water from an area of high concentration (inside the potato chip) to an area of low concentration (into the volume of salt water in the beaker). The partially permeable membrane in this is the cell membrane around each cell. Using my scientific knowledge I predicted this. I can see from my results that the mass of potato decreased because the water moved out in all the salt solutions and the other way around (the water moved into the cell, where the mass increased) with distilled water. As we can see there were some errors probably caused by different sizes of cells, which we cannot reduced.

%ERROR - the percentage error will be based on the uncertainty and actual values obtained

Evaluating

Weaknesses: I took only two different sets of data, at 15 minutes and at 30 minutes; if I did couple more times I could see the results better.

Limitations: The time for this lab and the amount of tools was limited and slowed the process down.

Improving

Ways of improvement

* Calculating the mass change in the potato piece, by measuring both length and width.

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* Calculating a value - weight

* doing it more times so that it is more accurate

Related to weakness/limitations

To fill in the gaps in my data I could have taken different results, i. e. 1g, 3g, 5g of salt. This way I could have found more accurate results. Also to make my experiment better I could have repeated it more times, and possibly have worked with someone else, as I was working on my own.