

## **INVESTIGATING OSMOSIS**

### **PLANNING**

This experiment is about how osmosis works in a potato. I am going to do this by using different solution water and pouring the water in a tube and see what effects it's going to have on the potato.

### **Hypotheses**

I think some of the potato will expand and lose weight and some potato will gain weight.

### **Predict**

I predict that the potato with less concentration of salt will gain weight and the potato with high concentration will lose it weight.

### **Conclusion**

I am going to carry out this experiment using potato and different solution of salt water and also a control test. In which I will use tap water to see the difference in between.

## **EXPERIMENT**

### **Introduction**

Osmosis is defined as the net movement of water or any other solutions molecules from a region in which they are highly concentrated to a region in which they are less concentrated. This movement must take place across a partially permeable membrane such as a cell wall, which lets smaller molecules such as water through but does not allow bigger molecules to pass through. It is measured in the change of mass of the partially permeable membrane.

As we know, sucrose molecules can not pass through a cell wall, but it does affect osmosis in potato cells, because if there is a high concentration of sucrose in a solution then there will be a low concentration of water molecules. So in order for the solution to become dilute the water molecules in the potato cell which have a higher concentration than the solution, move to the less concentrated solution of water molecules. This decreases the mass of the potato chip because it has lost water molecules. But if there is a low concentration of sucrose in the solution then there will

be a high concentration of water molecules. So the high concentration of water molecules moves to the lower concentration of water molecules in the potato cell causing the potato chip to increase in mass.

I have chosen to investigate and study what the effect of Osmosis can have upon the mass of a potato chip, using different concentrations of solution. I am going to find this out by cutting the potato into different sizes and putting it in different solutions.

I am going to find this out by cutting the potato and weighing the potato before and after the solutions. Then I will leave the solution for an hour and after that I will check the difference and plot a scatter and bar graph showing the difference in volume.

### Aim

To find if the water with low concentration of water has gain weight and see if the water with high concentration has lose weight by osmosis.

### Apparatus

- A piece of potato
- 4 Test tubes
- Different water solutions
- Scalpel
- Knife
- Sticky paper for labelling
- A ruler for measuring
- Weighing machine

### Risk assessment

Apparatus	Hazards	Precautions
Knife and scalpel	Low risk	Use it carefully because it could cut your skin easily.

### Method

Take a potato and cut it into four small peaces

Cut the potato into four different sizes using a scalpel and a measuring tape.

Then weigh the potato mass using a weighing machine and write the results

After measuring put the potatoes into four different tubes

Pour different solution of water in each of the tubes

Leave the solution for 2 hours

Pour the water out leaving the potato in the tube

Then take the potato out and dry it using a paper towel

Weigh the potato again and record the results

Then plot a bar graph using your results

#### Results/ table

	0	<u>0.25</u>	<u>0.5</u>	<u>1</u>	
Weight 1					
Weight 2					
Difference					

#### Conclusion/ Evaluation

My results show that the potato chip with less salt concentration has gained mass. As I increased the concentration then the chip gained mass. This is because the Cell in more dilute solution gains water and swells against the cell wall; it becomes turgid. Cell in more concentrated solution loses water and shrinks; it becomes flaccid. It is clear that the gain in length was a lot less than the loss of length because potato cells are surrounded by a cell wall and so when the cells take in water the cell wall restricts how far the cell membrane can expand, without the cell wall, the cell will take in the water until it reaches its limit. To make the experiment fair I measured the potato accurately before cutting. I also carried out a control test in which I

used tap water to see what happens. I saw that the potato swelled up because water entered the cells by osmosis. I weighed the potato before putting the solutions in.

Improvements I could have been made through the measuring of the length of the potato chip as I found this very hard, I could have used a ruler along with a microscope to see exactly that I was cutting on the mm mark rather than a couple of mm away. A more defined measuring cylinder could have been used too. I could have used a bigger cylinder with spacings easier to measure to. I could have included more observations as they only really said what the pieces felt like, not what they looked like which would have been easier to compare. My test could have being unfair because when I cleaned the potato I might have lost its skin due it and might have squashed it a little when I was drying it. I could have measured the potato cells after the experiment to see if the salt water is affecting the size of the potato.

## **Conclusion**

Osmosis is defined as the net movement of water or any other solutions molecules from a region in which they are highly concentrated to a region in which they are less concentrated. This movement must take place across a partially permeable membrane such as a cell wall, which lets smaller molecules such as water through but does not allow bigger molecules to pass through. It is measured in the change of mass of the partially permeable membrane.

As we know, sucrose molecules can not pass through a cell wall, but it does affect osmosis in potato cells, because if there is a high concentration of sucrose in a solution then there will be a low concentration of water molecules. So in order for the solution to become dilute the water molecules in the potato cell which have a higher concentration than the solution, move to the less concentrated solution of water molecules. This decreases the mass of the potato chip because it has lost water molecules. But if there is a low concentration of sucrose in the solution then there will be a high concentration of water molecules. So the high concentration of water molecules moves to the lower concentration of water molecules in the potato cell causing the potato chip to increase in mass. For instance in my results I put a potato chip weighing 3 grams into a sucrose solution of 0 molecule per  $\text{dm}^3$  concentration, so it had a high water molecule concentration and a low sucrose concentration. After leaving it over night I took the potato chip out and weighed it, the end mass was 5.4 grams so it

had increased in mass considerably. On another result I put a potato chip weighing 2.6 grams into a sucrose solution of 1 molecule per  $\text{dm}^3$ . So it had a high concentration of sucrose and a low concentration of water. The end mass was 1.6 grams so it lost water molecules causing the mass to reduce.

There is a relationship in the results obtained all results from the sucrose concentration of 0 to 0.4, the potato chips mass increases and concentrations of 0.6 to 1, the potato mass decreases.

The graph gives the line of best fit for the percentage change in mass of the potato chips over the course of the experiment. The graph is a curve that slopes downwards and does not go through the origin. Because the line is not straight and does not pass through the origin, it means that the percentage gain and loss in mass and concentration are not the same. However, there is a pattern on my graph, and this is, as the concentration of the sucrose increases, the percentage change in mass decreases. The gradient does change in my graph. It gets less steep as the X axis gets bigger. This is because the potato chip is becoming as flaccid as it possibly can, and so the change in mass of each molar concentration is becoming closer and closer together. From the line of best fit that has been added in, it can be seen that all of my points were very close to creating a perfectly smooth curve. This shows that my results are fairly reliable. My graph fits in with my prediction.

In my original prediction I said that the lower the concentration of the sugar solution, the larger the mass of the potato will increase because the cell wall of the potato chip will allow the smaller molecules such as the water molecules to pass through but won't allow bigger molecules to pass through such as the sugar molecules. So if there is a high concentration of sucrose in the solution then there will be less water molecules to diffuse into the potato chip, so more water molecules are needed to dilute the solution, therefore the potato chip will decrease in mass because the water molecules have passed from a higher concentration of water molecules to the lower concentration of water molecules. Therefore a potato chip put into a higher concentration of water than sugar in the solution will increase in mass, but a chip put into a solution which has a higher sugar solution than water solution will decrease in mass. My prediction was correct because in my results the sucrose concentrations of 0 to 0.4, the potato chips mass increased and the concentrations of 0.6 to 1, the potato mass decreased.