

## Investigation to find out the effect of osmosis on potatoes.

### Planning

In this investigation I am trying to find out the effect osmosis has on potatoes. Osmosis is the passage of water through a semi-permeable membrane from a high water concentration to a low water concentration through a semi permeable membrane. The equipment we will use is as follows: -

- 6 Boiling Tubes
- 6 Pieces of Potato of a certain weight
- 1 water and 5 molar solutions
- 1 measuring cylinder
- 1 potato borer
- 1 balance/weighing scales.
- 2 Test Tube Racks
- 1 Stopwatch

I will test 6 solutions, 0.2 molar, 0.4 molar, 0.6 molar, 0.8 molar, 1 molar and one that is totally water. The fixed variable will be time, as I will keep the potatoes in the water for 20 minutes each. I will keep the weight of each potato at 2.78g for each test. To ensure reliability and a fair test, I will make sure that the weighing scale is correct to 0.01g. I will also repeat the tests to ensure accurate results. My prediction is that the water solution and the 0.2M solution, with a higher concentration of water, will increase in weight. I also think that the solutions with lower concentrations of water will decrease in weight. I think that the solutions with almost equal concentrations of water will more or less stay the same.

### Prediction

#### 0M

I believe that the potato in this solution will increase in mass because the water surrounding the cell has a higher concentration of water than the water inside. The cell will also become turgid.

#### 0.2M

I believe that the same thing will happen in this test as in the above.

#### 0.4M

I believe that the potato in this solution will more or less stay the same because the water moves across the cell membrane equally.

### 0.6M

I believe that the same thing will happen in this test as in the above.

### 0.8M

I believe that the potato in this solution will decrease in mass because the water surrounding the cell has a lower concentration of water than the water inside. The cell will also become flaccid.

## Observations

We did four tests in all, just to make sure that our results were as accurate and reliable as possible. Our results are below: -

### Tests 1+2

Dilution (M)	Mass of potato at start (g)		Mass of potato at end (g)		Change in mass (g)	
	Test 1	Test 2	Test 1	Test 2	Test 1	Test 2
0M	2.78g	2.78g	2.81g	2.90g	0.03g	0.12g
0.2M	2.78g	2.78g	2.72g	2.70g	-0.06g	-0.08g
0.4M	2.78g	2.78g	2.50g	2.54g	-0.28g	-0.24g
0.6M	2.78g	2.78g	2.43g	2.53g	-0.35g	-0.25g
0.8M	2.78g	2.78g	2.38g	2.38g	-0.4g	-0.4g
1M	2.78g	2.78g	2.34g	2.34g	-0.44g	-0.44g

### Tests 3+4

Dilution (M)	Mass of potato at start (g)		Mass of potato at end (g)		Change in mass (g)	
	Test 3	Test 4	Test 3	Test 4	Test 3	Test 4
0M	2.78g	2.78g	2.80g	2.71g	0.02g	-0.07g
0.2M	2.78g	2.78g	2.72g	2.76g	-0.06g	-0.02g
0.4M	2.78g	2.78g	2.49g	2.56g	-0.29g	-0.22g
0.6M	2.78g	2.78g	2.45g	2.37g	-0.33g	-0.41g
0.8M	2.78g	2.78g	2.43g	2.41g	-0.35g	-0.37g
1M	2.78g	2.78g	2.25g	2.13g	-0.53g	-0.65g

All of the results fit a pattern; they increase slightly for the water solution and then decrease gradually. The final set of results, however, do not fit this pattern.

## Analysis

The change in mass graphs for all four tests have been drawn on separate sheets and can be seen later. The top reading did support my prediction as I predicted that it would increase from the starting weight and it did. I predicted the same for the second reading but this strangely decreased. My prediction for the bottom two readings was also correct as they decreased as predicted. The results for the middle two readings did not support my prediction as I predicted that they would more or less stay the same, but they decreased and the difference was quite large. These results are consistent for the first three tests so I have no idea what must have happened to make the middle readings be different to my prediction. As I said before, the final set of results do not follow the pattern at all. In these results, the top reading decreases, instead of increasing, increases slightly, and then decreases again until 0.8M where it increases slightly and then decreases again. I think that something must have also been wrong whilst we were doing this test. The top reading increases because the water moves from a high concentration to a low concentration of water and the cells have become turgid. This happens because the solution outside the potato cells has a higher concentration of water than the cells, more of the highly concentrated water moves in, and the cells swell up, making it turgid. The potatoes in solutions with higher concentrations of water decreased because the process is opposite to that of the top reading. This will happen because the solution inside the cell has a higher concentration of water than outside and become flaccid because the cells shrink. I also believed that the almost equal concentrations would have more or less stayed the same weight because the concentrations of water are nearly the same and the amount of water going in is almost the same as the amount going out. In this case the cells would be in a state between turgidity and flaccidity called incipient plasmolysis.

## Evaluation

I believe that my results are quite reliable because we did repeat the tests three times after we had done the initial test. I found out that nearly half of my results turned out as I predicted, although many did not. My results were very consistent though, excluding the final set, so my prediction may have been wrong. The likely outcome is that the experiment went wrong. Perhaps the weight or length was very marginally different for those particular potatoes as the weighing scales could have had a problem, the water level might not have been quite the same, or the dilutions may have been slightly wrong. If we were to do the experiment again, I would try very hard to ensure that these problems would not happen again. As I said before, the 0M, 0.8M and 1M solutions supported my prediction, but 0.2M, 0.4M and 0.6M did not. To carry out further research, I could do the same experiment but with different foods or plants to see if that made any difference or I could put a raw egg into a small jar, fill it with vinegar and then see what effect it has on egg shells.