

The effect of osmosis on a potato cell



**ASSIGN
BUSTER**

The Effect of Osmosis on a Potato Cell October 12th 2012 Osmosis Lab

Purpose: The purpose of this lab is to investigate the effects of osmosis on a potato cell as it is immersed for a period of time in solutions of different water concentrations. Hypothesis: If the potato is immersed into the distilled water, then it will be the heaviest out of the three. This is because water is at the lower is moving toward the area of higher concentration, which in this case is the potato. This solution is a hypotonic solution which is exactly opposite as a hypertonic because the outside of the cell has a higher concentration of water than the inside, and so the water on the outside goes inside the cell. As the water moves inside of the potato, it will cause the potato to gain weight and become heavier. If the potato is immersed into the saline solution, then it will stay the same. The concentrations of the two are the same, so the water will not have to move anywhere to become equal. That is because, this solution is an isotonic solution meaning that its solutes are in equilibrium, or are solutes that have the same concentration. This causes a concentration to diffuse across the potato cell membranes in both directions. The saline solution is at the same concentration as the potatoes so the water would not have to move to become equal. If the potato is immersed into the saturated solution, then it will become the lightest out of the three. This is because the solution contains a lot of salt. The salt does not dissolve because of the large amount already in the water, it to be saturated. During the process of osmosis, the water leaves the cells of the potato to the solution outside. This is happening because the water on the outside of the potato is at a higher concentration than the water inside of the potato. This causes weight the potato to lose weight and become lighter. This solution is a hypertonic solution, meaning the solute concentrations are different inside

<https://assignbuster.com/the-effect-of-osmosis-on-a-potato-cell/>

and outside the potato cell so the outside has higher solute concentration than the inside of the cell. The solutes with higher concentration of water always like to go to solutes with lower concentrations of water. Explanation: Osmosis is the movement of water across a semi-permeable from an area containing a low concentration of solute to an area containing a high concentration of solute. As the salt solution becomes more concentrated the potatoes will lose weight, less water would move into the potato by osmosis but in this solution. The potato in the distilled water will be the heaviest because the water is at a higher concentration, so it will move into the potato. The potato in the saline solution will stay the same because the concentration of solutes is the same so water will not have to move anywhere to become equilibrium. The potato in the saturated solution will be the lightest because the water from the potato will travel to the solution to even out the concentrations because the water in the potato is at higher concentration. The potato in the saline solution will stay the same.

Independent Variable: 3 Different solutions of water (Distilled, Saline, Saturated) Dependent Variable: Mass of potatoes Controlled Variable:

Amount of solution, size of potato, time, and temperature of water Materials:

1. Three plastic cups 2. Knife 3. Salt 4. Measuring Scoop 5. Water (150 ml x3) 6. Graduated Cylinder 7. Nine uniform, cylindrical pieces of potato 8.

Electronic Weigh scale Procedure: 1. Fill one of the cups with saline solution.

2. Fill the other cups with saturated solution 3. Fill the third cup with distilled water 4. Cut the potatoes into cylindrical pieces 5. Separate 3 pieces of

potatoes for each cup of solution 6. Blot out some of the water on the

potatoes. 7. Weigh the potatoes and record masses. 8. Then place the 3

pieces into each of the cups of water. 9. Cover all cups with plastic wrap and

<https://assignbuster.com/the-effect-of-osmosis-on-a-potato-cell/>

place in a safe area. 10. Leave potatoes in for 3-5 hours 11. Now weigh the potatoes and record the results. Safety Precautions: Don't drop the graduated Cylinder. Don't break the electronic weigh scale. Avoid getting salt in your eyes. Be careful when cutting potatoes into cylindrical pieces. Make sure to keep the electronic weigh scale dry when massing the potatoes.

Data Collection:

	Water Solution(Distilled)	Solution # 1(Saline)	Solution # 2(Saturated)	
Mass Before	4.0 g	4.2 g	4.6 g	
Mass After	4.5 g	4.2 g	3.2 g	
Average Mass	4.9 g	4.3 g	4.3 g	4.165 g
Percent Change	15%	0%	-23%	

The potato in the distilled water gained the most weight while in the saline solution, the weights stayed the same. In the saturated solution, the potatoes lost the most water and weigh less at the end. The potatoes cores in the distilled and saline solution looked the same at the end of the experiment while the one in the saturated solution looked more limp and soft than before.

Analysis: Average Mass: Mass of first potato + Mass of Second Potato + Mass of Third Potato / Amount of Masses (3)

Ex: $\frac{4.0 + 4.2 + 4.6}{3} = 4.26$

Percent Change: $\frac{\text{Average Mass After} - \text{Average Mass Before}}{\text{Average Mass Before}} \times 100\%$

Ex: $\frac{4.9 - 4.26}{4.26} \times 100\% = 15\%$

Looking at the graph of results for the experiment, as the concentration of salt increases the weight of the potato cores decrease. This is because the water is moving towards the area with the higher concentration. The potatoes gained the most weight while the saturated solution lost the most weight. The saline solution stayed the same because the solutions were at equilibrium.

Conclusion and Evaluation: The mass of each solution was averaged so it is just the number in the middle between

<https://assignbuster.com/the-effect-of-osmosis-on-a-potato-cell/>

the 3 other masses. It gives a general idea to see change in mass between solutions. It is better to use the average because every measurement includes some experimental error so an average value of results of several trials will give you a more accurate answer. If you make some sort of a mistake in one of your trials, then you won't report that mistake as your final answer. I also kept all of the controlled variables the same for the proper results. According to the final weight of the potato cores, my hypothesis is correct. For the distilled water, the final weight was a little above the original one the difference being the small amount of water captured inside from outside the potato. The potato in the saline solution was predicted to stay the same, which it did. The potato cores in the saturated solution gained the most weight as predicted as well. Osmosis will have an effect on a potato cell as it is immersed for a time in solutions of different water concentrations since there is a constant change in the results. This change is caused by the amount of salt concentration in each solution. Through out this lab, we see the effects of osmosis clearly, isotonic, hypotonic and hypertonic effects. These three types of effects of osmosis don't affect the shape and size of the potato core, because any plant cell has a strong cell wall that protects it. Since the sizes don't change, the weight of the potato core changes. I think the procedure was not the most reliable because we did not use the same potato throughout the whole experiment and we also did not dry out the potatoes for weighing the potatoes the same throughout. The results still came out pretty valid but I think if we made the procedure a bit more reliable by keeping things more constant. Luckily even if we did make a few mistakes or if the procedure was not completely reliable, we still averaged out the results. Not all of potato cores were damped the same, so the amount of

solution left inside each potato core can vary. Therefore, the recordings may be slightly inaccurate. We should make one person dry all of the potato cores, so it would be more likely for them to be the same. To make the data more reliable we could have also used the same potato because the other potato may have not been exactly the same and come out with different results. We all had to be careful when cutting the potatoes into the cylindrical pieces because the corer was sharp and the potato would move around a lot when you tried to cut it. You also had to make sure that you dried the potatoes well enough that it wont make the electronic scale wet. We also needed to be careful when using the graduated cylinder and to not drop it because it was made of glass. I think I could further investigate osmosis with a different factor as opposed to concentration of water. I could investigate the effects of temperature on osmosis, or surface area.