

The effect of osmosis on a potato chip essay sample



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In this case study I will be looking at how osmosis affects a potato chip. My aim is to investigate the effect of varying concentrations of certain salt solutions, and water, on the amount of osmotic activity between the solution and a potato chip of a given size and mass.

Osmosis

Osmosis is the movement of a solvent, usually water, through a semi-permeable membrane (the semi-permeable membrane only being permeable to the solvent). The solvent moves from a low concentration (hypotonic solution) to high concentration (hypertonic solution). Ignoring factors such as osmotic pressure, the process only stops once the concentrations are balanced on both sides of the semi-permeable membrane.

Low concentration High concentration

Lots of water molecules Few water molecules

The cell walls of plants have semi-permeable membranes. This allows osmosis to occur in samples of plant material e. g. potato.

1. If the medium surrounding the cell has a higher water concentration than the cell, the cell will gain water through osmosis. Such a solution is called a hypotonic solution.
2. If the medium has exactly the same water concentration, there will be no net movement of water across the cell membrane. Such a solution is called an isotonic solution.

3. If the medium has a lower concentration of water than the cell, meaning that it is a very concentrated solution the cell will lose water by osmosis. Such a solution is called a hypertonic solution.

Osmosis is mainly used by plants to enable them to keep their turgor pressure, or the ability to be turgid. Plants use osmosis in their leaves for support, therefore keeping them stable. They use osmosis because the osmotic entry of water is opposed and eventually equalled by the pressure exerted by the cell wall, creating a steady state. The osmotic pressure keeps them turgid.

My Plan

I will be observing how different levels of water/salt concentrate affect a potato chips' mass when the potato is submerged in the solvent. I will be carrying out my experiment on 15 separate potato chips. Three potato chips will be used for each solution of salt concentrate: 1mol dm^{-3} , 2mol dm^{-3} , 3mol dm^{-3} and 4mol dm^{-3} , and there for my control, water. All of my potato chip will be fully submerged and I will make them each the same length and width. Each beaker will contain the same amount of liquid/solvent. Each sample will then be left completely for 72 hours. I will measure the potato chips mass before and after the experiment and will be observing the percentage (Δ) mass change and the total mass change of all of the chips.

Variables

To ensure my experiment was a fair test I had to keep some variables in my experiment the same whilst changing only one key variable. The variables that I could have changed were the temperature during the experiment, the environmental conditions during the experiment, the length and width of the potato chips, the volume and strength of the solutions, how the potato chips are weighed and lastly how long the samples submerged in the solution.

I will carry out all of my tests at room temperature which will control the factor of temperature. To ensure that environmental factors like light and humidity do not affect my results all of my samples will be placed in the same conditions in the same place. I will use the same weighing scales on each of the chips to remove the possibility that each set of scales take a different reading.

All of my samples will each have the same surface area, I will do this by cutting each potato chip using the same apple corer (controlling the width) and then cutting the end off of them all (controlling the length). This will result in each of the samples having a very similar surface area and volume. The outer skin of a potato has different cells from those inside the potato and to stop this from affecting my results I will cut the ends off of all of my samples.