1.3.2. Osmosis

Recap

We previously learnt about diffusion, as well as key examples of where it occurs. We also learnt about how different factors affect the rate of diffusion, and we also covered surface area : volume ratios.

Key Aims

1. *Osmosis Basics*
2. *Calculations*

AQA Specification

Water may move across cell membranes via osmosis.

AQA Specification

Osmosis is the diffusion of water from a dilute solution to a concentrated solution through a partially permeable membrane.

Osmosis only occurs in the movement of water. It is the net movement of water from an area of high concentration to low concentration. Importantly, it occurs only across a **partially** permeable membrane.

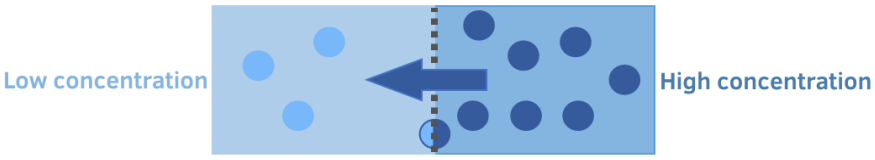


Fig 1. Osmosis. Water moves from and area of high to low concentration.

The concentration of water can also be referred to as water potential. A high concentration of water is a high water potential and a low concentration of water is a low water potential. Therefore, in osmosis, water moves from a high to a low water potential.

Calculations

- **Measuring rate of water uptake.** Again we must remember that rate is a change divided by the time period. Therefore, if you have an apple that has an initial mass of 50g and a mass of 62g after 30 minutes, you work out the changes as 12/30 = 0.4g/minute. If you want to work out the change in mass per hour, you must change your calculation slightly. The time period is then 60/40. So you then multiple 12 by 60/40. This will give you a value of 18g/hour

- **Percentages.** Percentages can be used to easily compare values from the start and finish of osmosis. You can get a value for the percentage change in mass of an object. This will allow you to

Study Mind Tip

AQA questions often have a mark for remembering that the membrane must be partially permeable in osmosis.

then compare values between different specimens. In order to calculate this, you must take the mass at the end, then subtract it from the original mass. Then divide this value by the original mass. To get the percentage, you must then multiply it by 100. Using the above data, the percentage change would be:

1. (62-50)/50 x 100. This gives you 24%.

- **Percentages 2.** If you get a negative value, this is a percentage loss, if you get a positive value, it is a percentage gain.

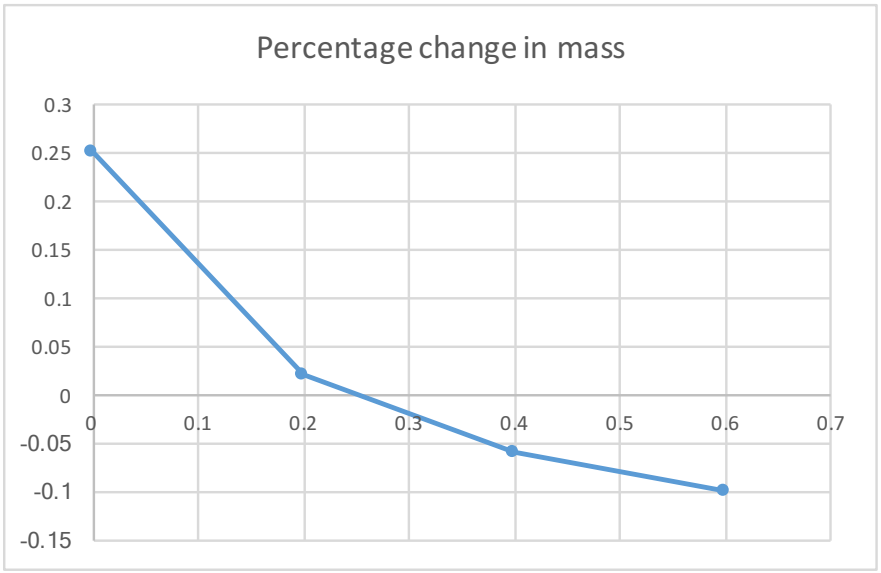
Study Mind Tip

Remember that osmosis only involves water, whereas diffusion can involve any sort of substance.

You must be able to plot graphs using such data.

AQA Specification

Students should be able to use simple compound measures of rate of water uptake, use percentages, calculate percentage gain and loss of mass of plant tissue and be able to plot, draw and interpret appropriate graphs.



Study Mind Tip

Learn why it is more valuable to use percentage change in mass, rather than just the change in mass.

If we take this graph, with concentration of sucrose on the x axis and percentage change in mass on the y axis, we can see how the concentration affects the change in mass.

The point at which the graph cross the x axis, is the value for the sucrose concentration that is equal to the concentration of dissolved substances in the cells of the object. Here, there will be no more concentration gradient and so there will be no osmosis. After this point, the concentration is greater outside the cell, so water exits the cell via osmosis.