

### Information

Osmosis is a “type of diffusion where water passes through a semi-permeable membrane from where water is in high concentration to a low concentration.”

A French scientist (Jean-Antoine Nollett) discovered osmosis in 1748. He discovered it by filling a pig’s bladder with alcohol. This was then placed in water for several hours. The water had moved into the pig’s bladder but very little alcohol had moved out. The pig’s bladder was a semi-permeable membrane.

The particles in a liquid are constantly moving. When small particles or water molecules meet a semi-permeable membrane they may pass through. But larger particles, like glucose cannot get through the membrane at all. If there is a high concentration of water molecules on one side of the membrane, then water molecules will pass through the membrane and the water appears to have moved through the membrane to the lower concentration.

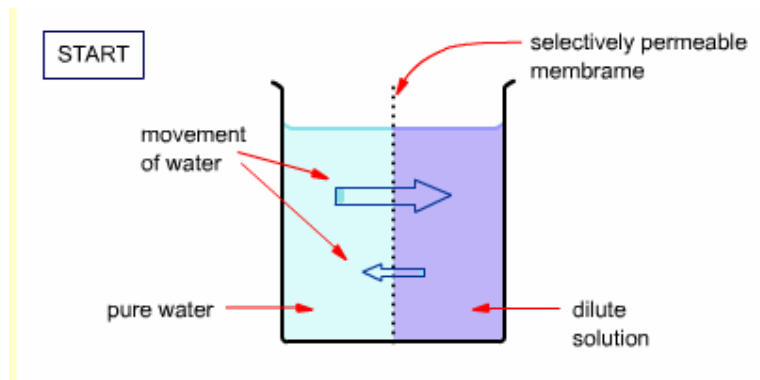
If the concentrations on both sides of the membrane are equal, then there will be no movement of water. This is the Isotonic Point. In this way we can find the concentration of cytoplasm. If the concentration of a sugar solution that caused no

osmosis to occur was found, then the concentrations of both the sugar solution and the cytoplasm must be equal.

This process happens in both plant and animal cells. Plants have a strong cellulose wall surrounding them. So they gain water through the roots by osmosis and move water into the plant cells using osmosis. This is how plants become turgid or stiff, which helps keep them upright. Then the pressure of the cell will rise so that no more water can enter the cell. This is called “Hydrostatic pressure” it works against osmosis. But when plants are faced with a low concentrated water solution (sucrose) they will lose water and become flaccid. Which is the opposite of turgid. So the plant cell will shrink instead of grow. When a plant is placed in an equal concentration solution between water and sugar then the plant will be “in between being turgid or flaccid” so the plant won’t shrink but neither will it be able to raise its leaves in the sunlight. So the plants favour a high concentration of water.

Animal cells don’t have cell walls so when placed in a pure water solution they may well swell up and burst because there is nothing to support the cell membrane. In concentrated solutions the animal cell has all its water sucked out. So like the plant cell it shrinks. But unlike plant cells, animal cells are best in an even solution. This process also happens in human bodies. The kidney removes some water and sugars so that we are evenly balanced between the two.

Animals are faced with problems too concerning balance between water and sugar. Animals, which live on dry land, must conserve water. So must animals living in the sea because the sea is very salty. But animals living in fresh water must get rid of excess water as quick as they can.



In this diagram, more water molecules pass from the water into the dilute solutions than pass back into the dilute solution. This is because of the higher concentration of water in the pure water than there is in the solution. This results in the movement of molecules down the “concentration gradient” from the water to the solution. The level on the higher concentrated side of the membrane will rise whilst the level on the less concentrated side will fall.

When the concentration of water is the same on both sides, the movement of water will stay the same in both directions. So now the system is equal.

The concentrations of sugar solution depend on the amount of water present. The more distilled water present, the less sugar solution present. The Sucrose has a low concentration of water. So when water is added it will diffuse into the sucrose, diluting it. If more Sucrose is in the container then the diffusion won’t happen as much. With 10 millilitres of sucrose and 0 millilitres of pure water it is “a region of low concentration of water.” This is because there is much less water. The solution is pure Sucrose because there is no water present to dilute it.