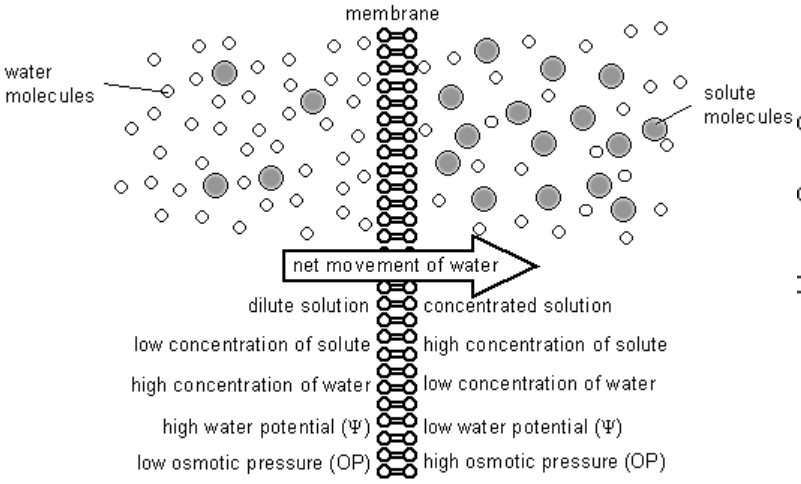
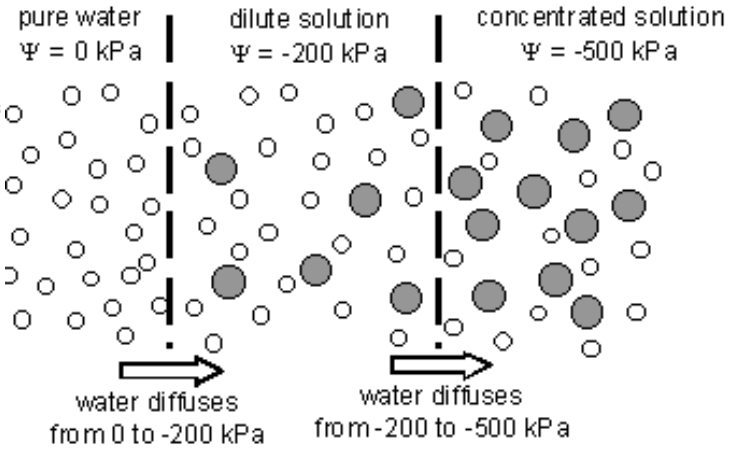




Osmosis leads to an increase in the volume of a solution. If the solution is in a closed system e.g. a cell, this results in an increase in pressure. Hydrostatic pressure is the pressure created by water in an enclosed system. It has the same units as water potential, kPa. At a cellular level, this pressure is relatively large and potentially damaging.

An isotonic solution is a solution of equal concentration to a cell. Same concentration of water outside and inside cell.

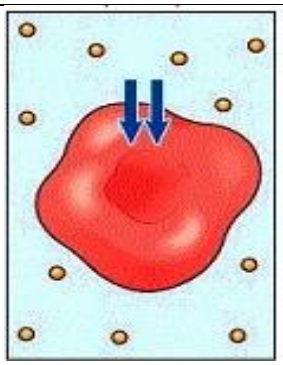
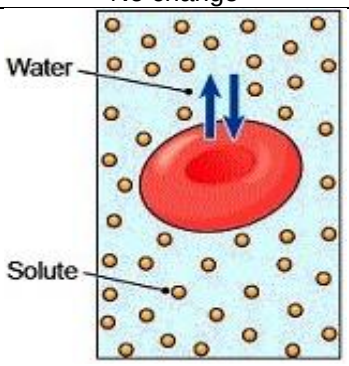
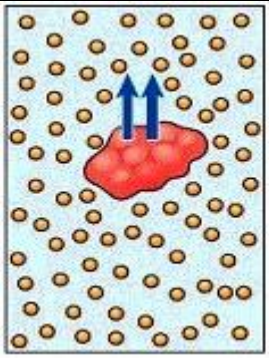
A hypertonic solution is a solution of higher concentration than a cell. Concentration of water is lower outside so more solutes.

A hypotonic solution is a solution of lower concentration than a cell. Concentration of water is higher outside, so less solutes.

If an animal cell is placed in a solution with a higher water potential than that of the cytoplasm, water will move into the cell by osmosis, increasing the hydrostatic pressure inside the cell. All animal cells have thin cell surface membranes and no cell walls. The cell surface membrane cannot withstand the increased pressure and will break causing the cell to burst – cytolysis. Cytolysis is the bursting of an animal cell caused by increasing hydrostatic pressure as water enters by osmosis.

If an animal cell is placed in a solution that has a lower water potential than the cytoplasm, it will lose water to the solution by osmosis down the water potential gradient. This will cause a reduction in the volume of the cell and the cell surface membrane to 'pucker' – crenation. Crenation is when the cell shrinks by osmosis because water leaves the cell.

To prevent cytolysis/crenation, multicellular animals usually have control mechanisms to make sure their cells are continuously surrounded by aqueous solutions with an equal water potential (isotonic). In blood, the aqueous solution is blood plasma.

Water potential (Ψ) of external solution compared to cell solution	Higher (hypotonic)	Equal (isotonic)	Lower (hypertonic)
Net movement of water	Enters cells	Water constantly enters and leaves at equal rates	Leaves cell
Sate of cell	Swells and bursts	No change	Shrinks
Direction of osmotic water movement			

Plant cells contain a variety of solutes, mainly dissolved in a large permanent vacuole. However plants are unable to control the water potential of the fluid around them, for example, the roots are usually surrounded by almost pure water.

Plant cells have strong cellulose walls surrounding the cell surface membrane. When placed in a hypotonic solution, water enters by osmosis, the increased hydrostatic pressure pushes the membrane against the rigid cell walls – turgor. Turgor is the pressure exerted by the cell surface membrane against the cell wall in a plant cell. As the turgor pressure increases, it resists the entry of further water and the cell is said to be turgid.