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Osmosis

1- Definition

Osmosis is the spontaneous movement of molecules from a high concentrated solution (hypertonic solution) to a less concentrated solution (hypotonic solution) across a semi-permeable membrane. This membrane allows the solvent to diffuse, but not the solute. The aim of the so-called selective diffusion is the equilibrium of the two solutions on both sides of the semi-permeable membrane.

2- Osmotic gradient

The osmotic gradient is the difference in concentration between two solutions on either side of a semipermeable membrane. When the equilibrium in both sides next to the semi-permeable membrane is reached, there is still an exchange of solvents across the membrane. This flow goes in both directions and in equal amounts, therefore the concentrations in both solutions are stable.

3- Osmotic pressure

As a selective diffusion process, osmosis is driven by the internal energy of the solvent molecules. Osmotic pressure is a colligative property. This means, that the property depends on the concentration of the solute, but not on its identity. Example:

The osmotic pressure difference would be zero, if pure water were on both sides of the semi-permeable membrane. If there would be for example human blood on one side and pure water on the other one, the osmotic pressure would be around seven atmospheres. Osmotic pressure has a big influence on the membrane transport in living organisms.

4- Turgor

Turgor is the pressure of the contents of the cell against its cell wall. It applies in any organism with cells (e.g. bacteria, plants and fungi) and helps to maintain the cell-shape.


Example in plant cells:

The cytoplasm contains a more concentrated solution so water will enter due to osmosis. Turgidity is a condition in which the contents of a cell are exerting a pressure on the cell wall because the vacuoles, which store water, are filled. If the plant cell loses water, the (central) vacuole becomes smaller, the cell membrane starts shrivelling inwards away from the cell wall and the plant wilts. This process is called plasmolysis and can be reversed by watering the plant.

Suppose an animal or a plant cell is placed in a solution of sugar or salt in water. 1. If the medium is hypotonic relative to the cell cytoplasm — the cell will gain water through osmosis. 2. If the medium is isotonic — there will be no net movement of water across the cell membrane. 3. If the medium is hypertonic relative to the cell cytoplasm — the cell will lose water by osmosis.

List of references: Pictures (in order of appearance): ^[1]

[2]

1.  ;
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