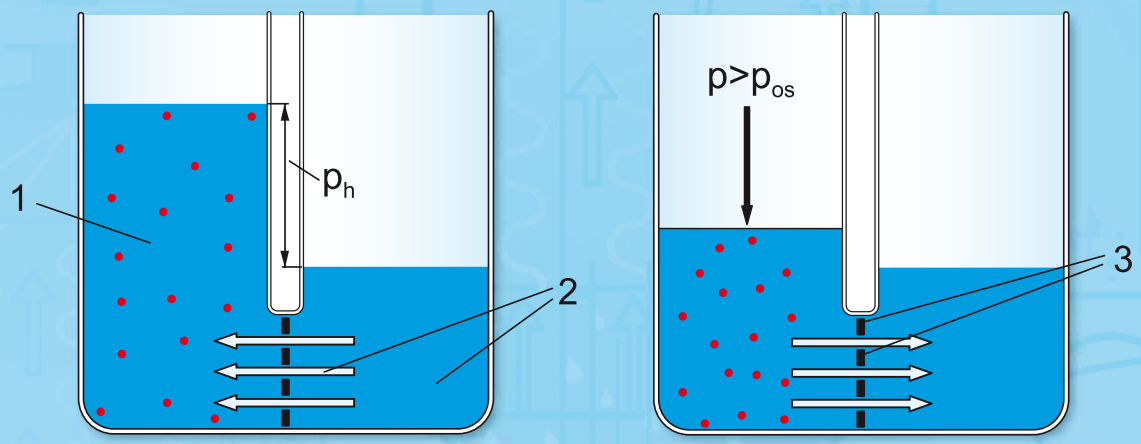
BASIC KNOWLEDGE

# MEMBRANE SEPARATION METHODS

Technical membrane separation methods allow liquid and gaseous mixtures to be separated down to a molecular level. Examples of membrane separation methods include reverse osmosis, dialysis and pervaporation. Applications include obtaining drinking water from sea water and treatment of landfill leachate.

Essentially, in all membrane separation methods a feed mixture is separated into a permeate and a retentate using a selectively permeable membrane. The part of the mixture that passes through the diaphragm is known as the permeate. The retentate is left behind. Pressure forces, concentration differences or electrical field forces can act as motive forces for the process.

Reverse osmosis is a frequently used membrane separation method. Understanding this process requires a knowledge of osmosis (see figure). Pure solvent (e. g. water) and an aqueous solution of a substance are located in a tank, only separated by a semi-permeable membrane. The membrane is only permeable for the solvent.




*Principle of osmosis (left) and reverse osmosis (right):*
***1** solution, **2** pure solvent, **3** semi-permeable membrane, $p_h$ hydrostatic pressure, $p_{os}$ osmotic pressure*

The tendency to compensate for concentration differences causes pure solvent to pass through the membrane into the solution. The level on the side containing the solution increases until osmotic equilibrium is reached. At this point, the resulting hydrostatic pressure is equal to the osmotic pressure.

To reverse this process (reverse osmosis), a pressure greater than the osmotic pressure must be exerted on the solution. This forces the solvent to diffuse out of the solution. Depending on the aim of the separation, this method can be used to obtain pure solvent (sea water desalination) or a more concentrated solution (e. g. fruit juice concentrate) as the product.