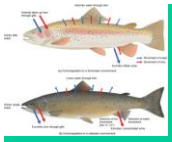
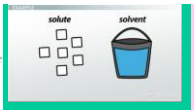
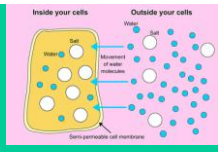
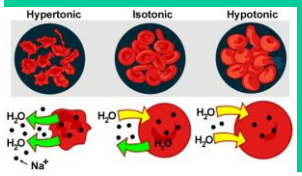
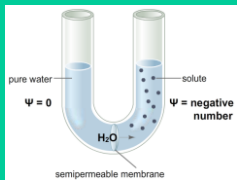






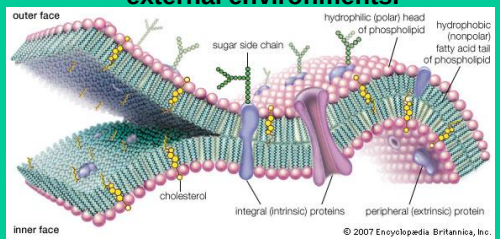
2.8 Tonicity and Osmoregulation





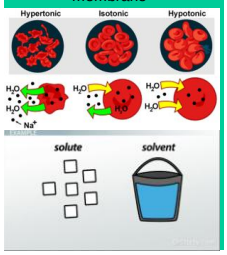
ENDURING UNDERSTANDING

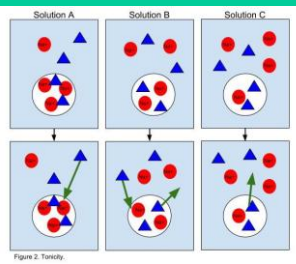
ENE-2 Cells have membranes that allow them to establish and maintain internal environments that are different from their external environments.



ENE-2.H Explain how concentration gradients affect the movement of molecules across membranes.

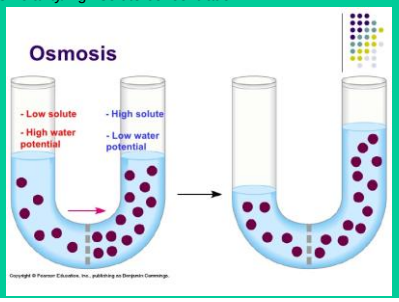
- External environments can be hypotonic, hypertonic or isotonic to internal environments of cells
  - Solute concentration in solvents can differ inside and outside of cells
  - Tonicity is a measure of this differential solute concentration across a membrane





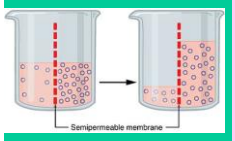
ENE-2.H Explain how concentration gradients affect the movement of molecules across membranes.

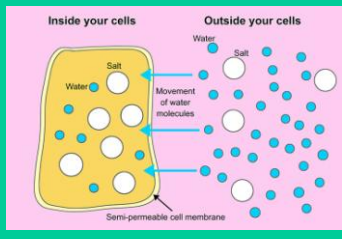
- Water moves by osmosis from areas of high water potential/low osmolarity/low solute concentration to areas of low water potential/high osmolarity/high solute concentration.



ENE-2.H Explain how concentration gradients affect the movement of molecules across membranes.

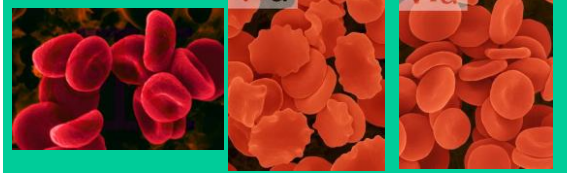
- Osmosis is diffusion of water across a selectively permeable membrane.
  1. Produced by water diffusing towards higher solutes
  2. Osmotic pressure is hydrostatic pressure.





ENE-2.H Explain how concentration gradients affect the movement of molecules across membranes.

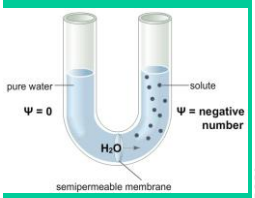
- Direction of Tonicity
  1. Isotonic to External- relative solute concentration of two environments are equal.
  2. Hypotonic to External- relative solute concentration of external environment is less than internal (water moves in)
  3. Hypertonic to External- relative solute concentration of external environment is greater than internal (water moves out)

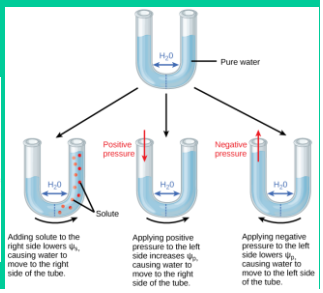


ENE-2.H Explain how concentration gradients affect the movement of molecules across membranes.

– RELEVANT EQUATION

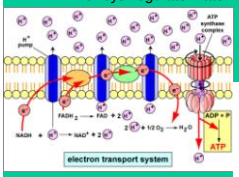
Water Potential: $\Psi = \Psi_p + \Psi_s$
Ψ_p = pressure potential
Ψ_s = solute potential

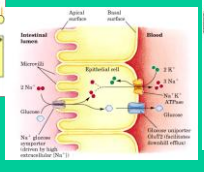


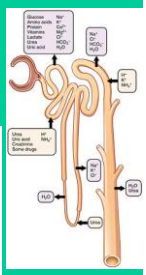


ENE-2.I Explain how osmoregulatory mechanisms contribute to the health and survival of organisms

- Growth and homeostasis are maintained by the constant movement of molecules across membranes.
  - ETC generates ATP
  - Intestine absorbs glucose
  - Kidneys regulate water balance and ions

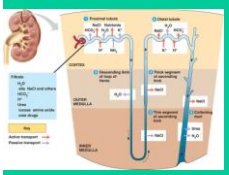


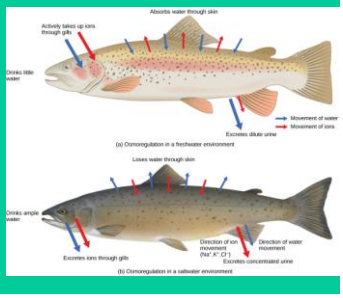




ENE-2.I Explain how osmoregulatory mechanisms contribute to the health and survival of organisms

- Osmoregulation maintains water balance and allows organisms to control their internal solute composition/water potential





ENE-2.I Explain how osmoregulatory mechanisms contribute to the health and survival of organisms

- SOLUTE POTENTIAL OF A SOLUTION

$$\Psi_s = -iCRT$$

where:
i = ionization constant
C = molar concentration
R = pressure constant
R= (0.0831 L*bars/mol*K)
T = temperature in Kelvin
(°C + 273)

i for:
Sucrose = 1
NaCl = 2)