

WATER POTENTIAL

"Chemical potential of water is a quantitative expression of the free energy associated with the water"

Potential for performing work

Water $\xrightarrow{\Delta E}$ Water flow

DEF:

Ability of water to perform work.

• Total K.E of water molecules due to which they move, is called water potential.

$$\psi_w = \psi_s + \psi_p$$

Units \rightarrow mPa.



Chemical Potential = Joules/mole

Pure water = $\psi_w = 0$

Solution = $\psi_w = \text{(-ive)}$

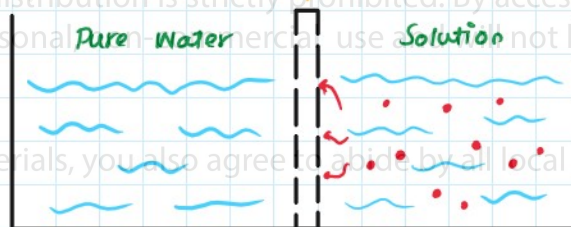
"Water movement is always from higher potential to lower potential."

OSMOTIC PRESSURE

"The pressure exerted upon a solution to keep it in equilibrium with pure water when the two are separated by a semi-permeable membrane is known as osmotic pressure."

• Osmotic Pressure \rightarrow measurement of tendency of water to move by osmosis.

Semipermeable membrane



OSMOTIC POTENTIAL

\rightarrow Always in -ive

Solute Potential
water molecules.

\rightarrow Tendency of solute molecules to attract

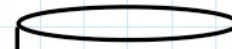
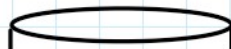
Solvent
مذيب

Solute
مذاب

• Solute consume K.E of water molecules.

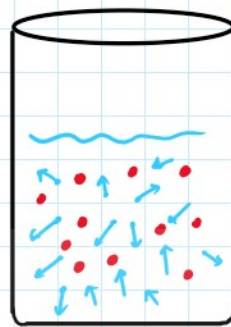
Cell Cytoplasm

-0.5 - -1.0 mPa

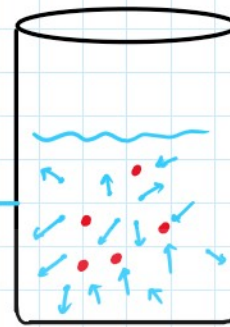


K.E of water molecules.

$$\psi_s = -ive$$



Hypertonic Solution



Hypotonic Solution

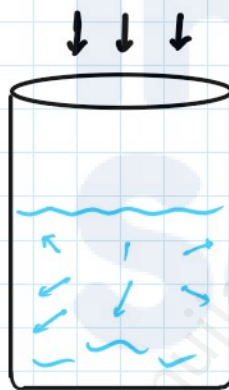
Cell Cytoplasm
-0.5 - -1.0 MPa

PRESSURE POTENTIAL

→ Pressure exerted by the protoplast against the cell wall.

$$\psi_p = +ive$$

atmospheric pressure



Greater than atmosphere



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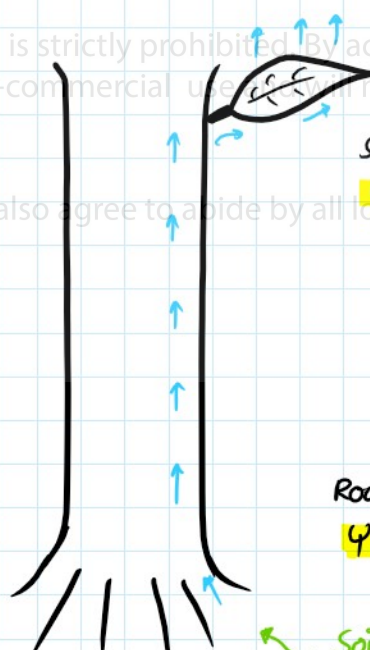
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Root ψ_w < Soil ψ_w

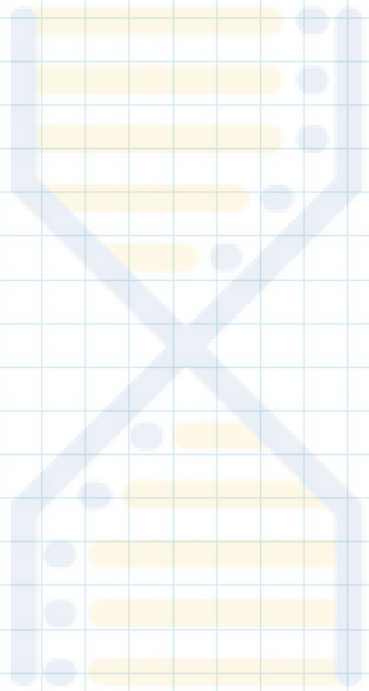
Leaves ψ_w > Atmosphere ψ_w

Stem ψ_w > Leaves ψ_w

Root ψ_w > Stem ψ_w



Soil



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