

# Physical actions taking place during absorption of water.

## ① Imbibition

- A guided movement of water molecules results in adsorption of water on the surface of hydrophilic particles (adsorbants).
- A special type of Diffusion.
- Imbibition takes place due to difference of water potentials of liquid imbibed and the surface of adsorbant by affinity between adsorbant and liquid (Adhesion force).
- Imbibition takes place till equilibrium between seed water & outside water.

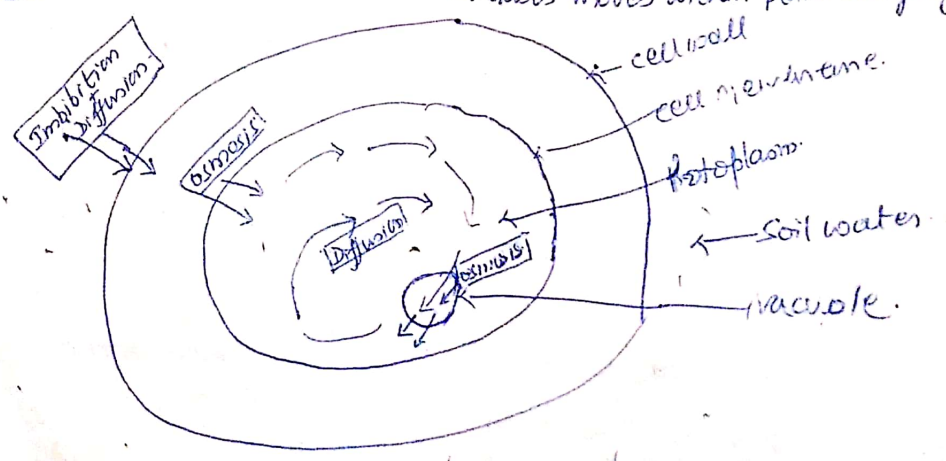
## ② Diffusion

- Random <sup>and independent</sup> movement of molecules or particles of a substance from a region of higher concentration to a region of lower concentration till equilibrium or dynamic equilibrium.
- <sup>Free</sup> Movement of crystal or molecules or ions of any substance dependent on their kinetic energy, which tends to disperse them throughout the medium.
- Takes place in gas, liquid & solid medium.
- Remain fast in gaseous medium than liquid medium.
- Takes place without any membrane or through freely permeable membrane. → No energy expenditure takes place.
- Takes place at any temp; more than absolute zero.
- By diffusion molecules are transported to short distance passively.
- Diffusion is a slow process.
- Also takes place in non-living medium.
- Temperature, pressure and concentration affects rate of diffusion.
- Diffusion also depend on size of substance, smaller diffuse faster.

### Role of Diffusion in plant body.

- distribution of metabolites equally in cell.
- Transport of gases, water, <sup>organic food</sup> & minerals between adjacent cells.
- Acts during gaseous exchange by stomata.
- In animals, acts for transfer of soluble food materials to different parts of body through blood.
- Gases moves within plant body by diffusion.

Diagram



↳ both of Physical actions taking place during absorption  
 ↳ Plant cell is capable of all → osmosis  
 → Imbibition & Diffusion.

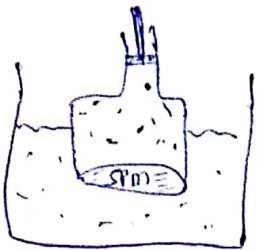
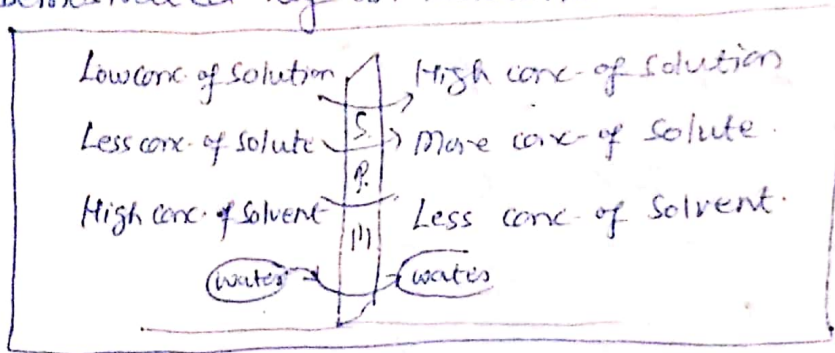
"Physical actions taking place during absorption of water by root-cell!"

## Types of Diffusion

- (1) Simple diffusion → <sup>always takes place from high to low conc.</sup> free diffusion without any membrane <sup>passing</sup> through a membrane crossing lipid layer of membrane is called as simple diffusion.
- Substances having solubility in lipid pass <sup>very</sup> simple diffusion across cell membrane without involving metabolic energy.
  - $\text{O}_2$  →  $\text{CO}_2$
- (2) Facilitated diffusion → <sup>always takes place from high to low conc.</sup> transport protein molecules across cell membrane <sup>diffuse</sup> through.
- Hydrophilic substances insoluble in lipid <sup>diffuse</sup> through.
  - This process is called as facilitated diffusion by which water crosses cell-membrane without involving metabolic energy. → depends upon solubility in lipids.
  - cannot transport molecules from low to high conc.
  - Undesired substances or inhibitors react with side-chain of Amino acids very sensitive to inhibitors.

### ③ Osmosis! →

- Movement of only water or solvent molecules <sup>of any solution</sup> through a semi permeable membrane from <sup>a region of</sup> low conc. of solution to high conc. of solution region, till equilibrium.
- osmosis takes place from low conc. of solute to high conc. of solute having medium.
- osmosis takes place from high conc. of solvent to low conc. of solvent medium.
- special type of diffusion ~~that~~ through a semi permeable membrane. → Also called as 'selective diffusion'.
- osmosis takes place from high to low temp., pressure & concentration having ~~solvent~~ solvent.
- demonstrated by an instrument called as 'osmometer'.



osmometer

① Exosmosis: → Movement of water from inside to outside of a living cell or a semi-permeable membrane.

→ A cell after exosmosis shrinks or plasmalemma shrinks and this cell is called as 'Flaccid cell'

→ Exosmosis leads to Flaccidity of cell. → expansion of volume of periplasmic space

⇒ Plasmolysis → when a cell is put in a hypertonic solution, water comes out from the cell.  
→ Exosmosis from a living cell is also called as Plasmolysis.

→ Incipient Plasmolysis → A cell quickly regains after plasmolysis, when put in pure water. This type of plasmolysis is called as 'Incipient Plasmolysis'

→ Complete Plasmolysis → A cell regains after a long time after plasmolysis, when put in pure water. Distance between cell wall & cell-membrane remain large after complete plasmolysis.

→ Cytomolysis → Plasmolysis leading to death of cell. No regain.  
→ Acute plasmolysis.

→ Tonoplast Plasmolysis: → vacuolar shrinkage without protoplasmic plasmolysis.

② Endosmosis: → Movement of water from outside (soil) to inside of living root hair cell through semi-permeable membrane.

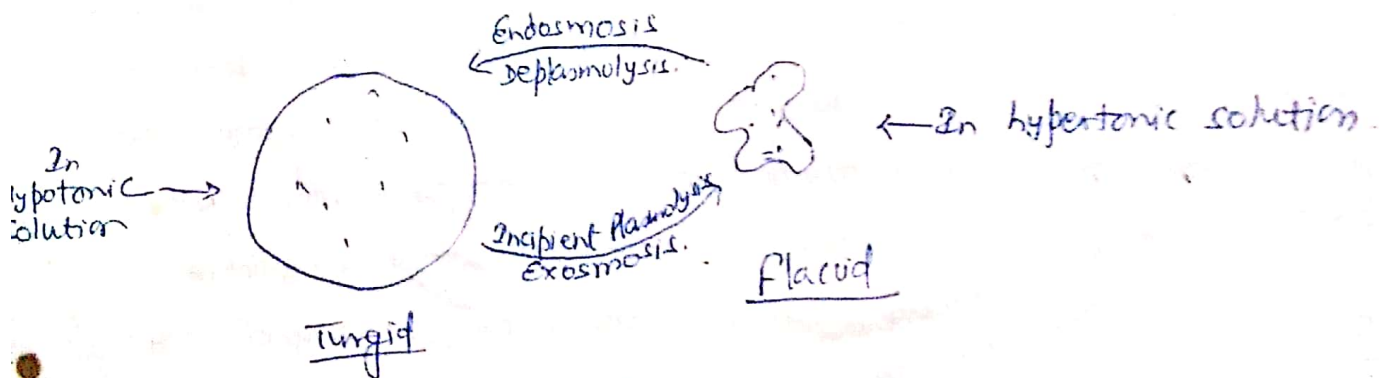
→ water & minerals enter within cell through cytoplasmic membrane or plasmalemma by endosmosis.

→ A cell after endosmosis swells and this cell is called as 'Turgid cell'.

→ Endosmosis leads to Turgidity of cell.

→ T.P. of a Turgid cell remain very high

⇒ Deplasmolysis → A plasmolysed flaccid cell is kept in hypotonic solution or pure water, the flaccid cell after endosmosis absorbs water and becomes turgid. This process of endosmosis by a plasmolysed cell is called as Deplasmolysis.



③ Reverse osmosis → osmotic flow of water from hypertonic solution to hypotonic solution separated by semi-permeable membrane after application of external pressure.