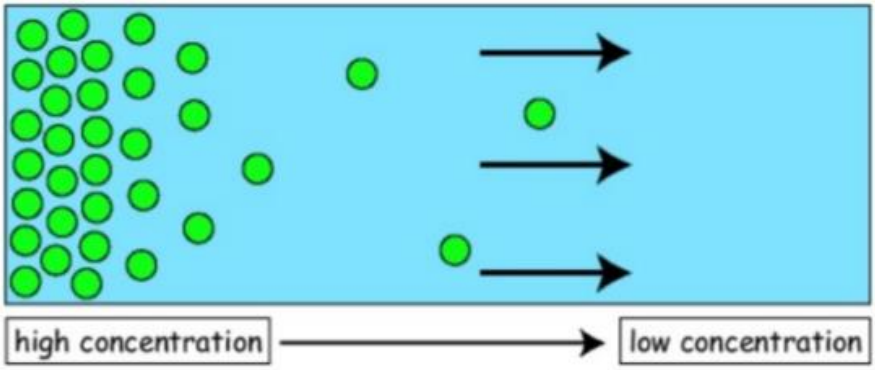
LO: Define diffusion and describe its role in nutrient uptake and gaseous exchange in plants and humans

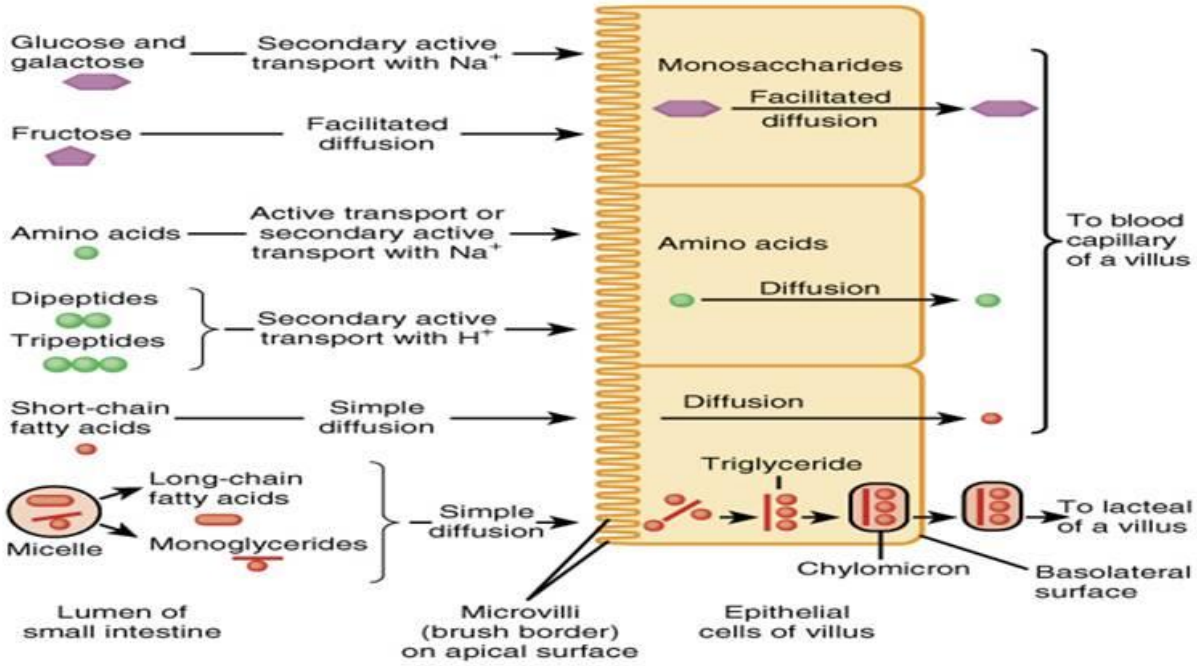
Definition: Diffusion is the net movement of particles from a region of higher solute concentration to a region of lower solute concentration.



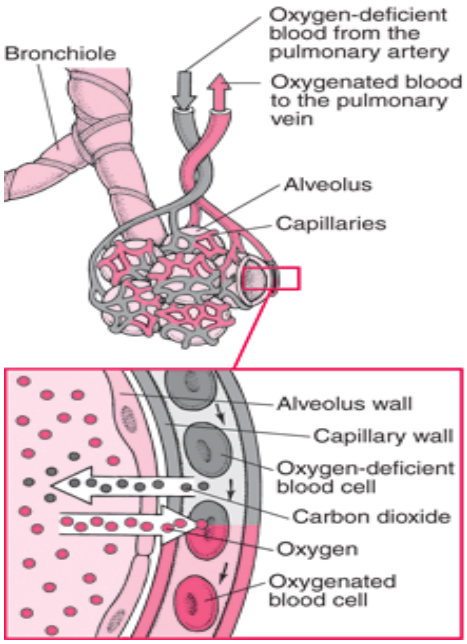
Role of diffusion in nutrient uptake and gaseous exchange:

Humans:

- Digestion: Absorption of glucose, amino acids, fatty acids and glycerol in small intestines

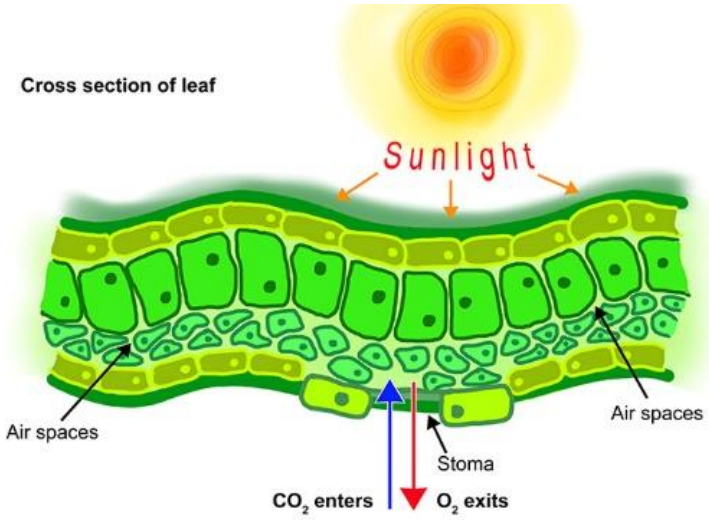


- Respiration:
  - Exchange of gases between alveoli and blood
  - Exchange of gases between blood capillaries, tissue fluid and body cells



Plants:

- Photosynthesis: Exchange of gases between leaves and environment through stomata



- Transport in plants: Absorption of mineral salts/ ions by root hair cells

Characteristics of diffusion:

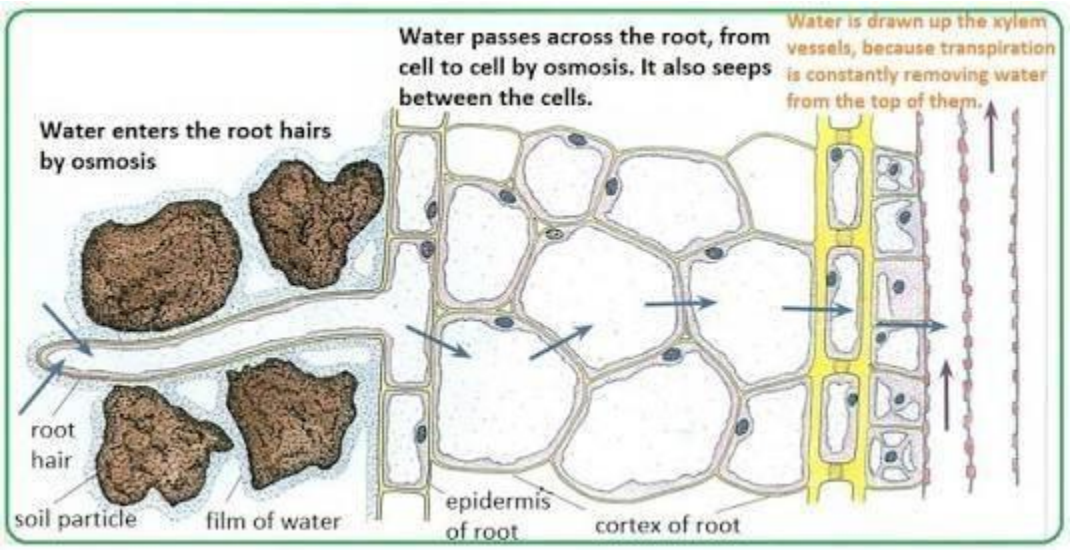
- passive process, does not require energy
- can take place with or without a membrane
- involves any type of molecules
- down a concentration gradient

LO: Define osmosis and describe the effects of osmosis on plant and animal tissues

Definition: Osmosis is the net movement of water molecules from a region of higher water potential to a region of lower water potential down a water potential gradient through a partially permeable membrane.

Effects of osmosis:

- Intake of water by cells
- Transport in plants: Absorption of water from surroundings by root hair cells

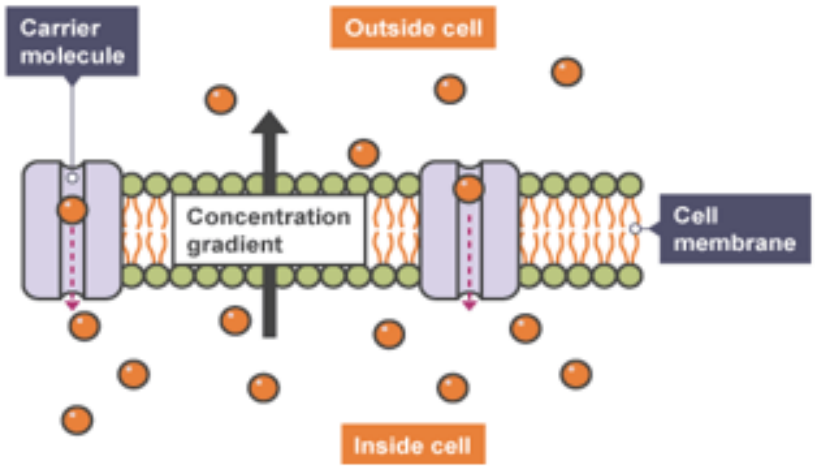


Characteristics of osmosis:

- passive process, does not require energy
- requires a partially permeable membrane
- involves water molecules only
- down a water potential gradient

LO: Define active transport and discuss its importance as an energy-consuming process by which substances are transported against a concentration gradient, as in ion uptake by root hairs and uptake of glucose by cells in the villi

Definition: Active transport is the movement of particles from a region of lower solute concentration to a region of higher solute concentration against a concentration gradient. Energy is required for this process.



Importance of active transport:

- Transport in plants: Although there may be a higher concentration of mineral salts in the cell sap of the root hair cells and a lower concentration in the soil, mineral salts can still move into the root hair cells by active transport.
- Digestion: Energy is required for cells in the villi to absorb glucose into blood capillaries against a concentration gradient.

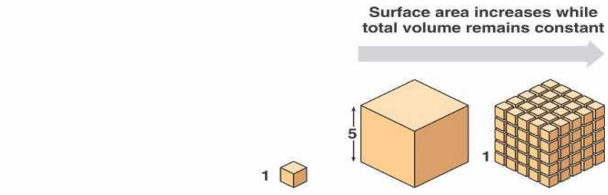
Characteristics of active transport:

- requires energy
- requires a cell membrane
- against a concentration gradient

Importance of surface area to volume ratio in diffusion and osmosis

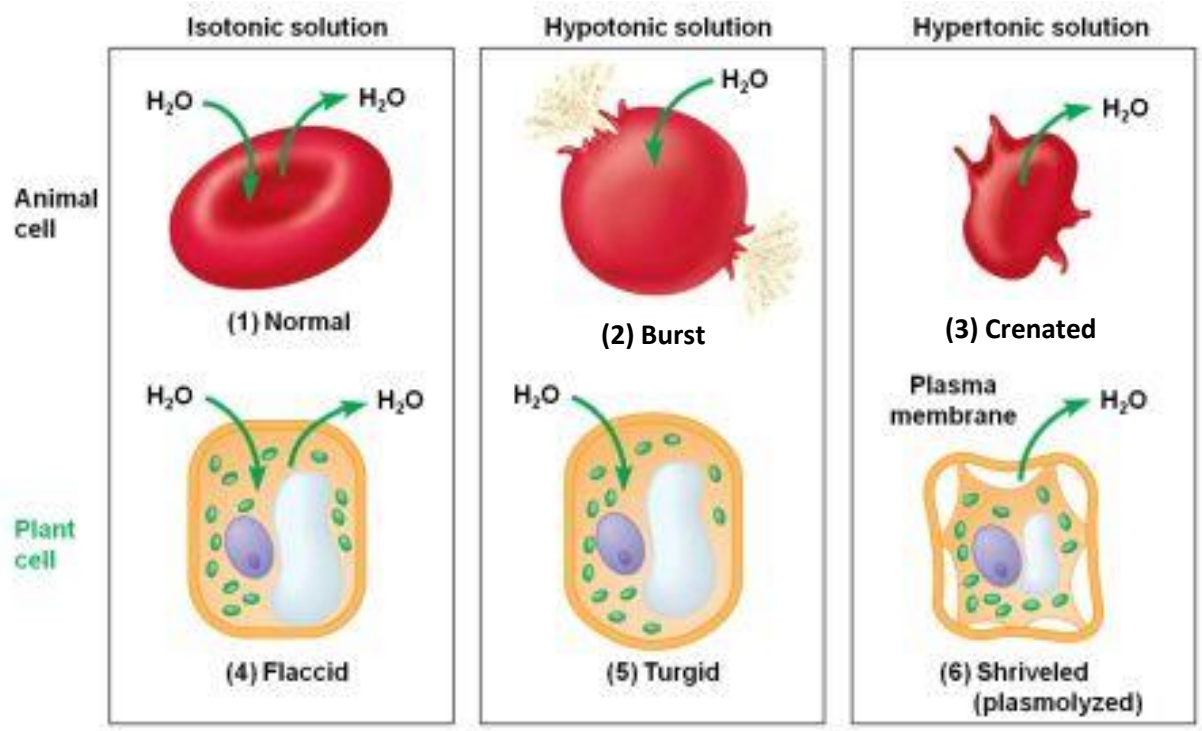
A **higher surface area to volume ratio** is desirable because of

- faster exchange of gases in alveoli
- faster oxygen absorption in red blood cells
- faster absorption of water and mineral salts in root hair cells
- faster absorption of nutrients in villi of intestines



Total surface area (height × width × number of sides × number of boxes)	6	150	750
Total volume (height × width × length × number of boxes)	1	125	125
Surface-to-volume ratio (surface area / volume)	6	1.2	6

Effect of osmosis on plant and animal cells



	Placed in Solution with higher water potential	Placed in solution with same water potential	Placed in solution with lower water potential
Plant Cell	Net movement of water molecules from the solution of higher water potential to the cell sap of the plant cell of lower water potential by osmosis. Cell becomes turgid.	No net movement of water molecules. Cells maintain their shape.	Net movement of water molecules from the cell sap of the plant cell of higher water potential to the solution of lower water potential by osmosis. Cell becomes flaccid or plasmolysed.
Animal Cell	Net movement of water molecules from the solution of higher water potential to the cytoplasm of the animal cell of lower water potential by osmosis. Cell swells and bursts.		Net movement of water molecules from the cytoplasm of the animal cell of higher water potential to the solution of lower water potential by osmosis. Cell shrinks and becomes crenated.