2.2 Osmosis Date: 04.02.2012

What is osmosis?

- Osmosis is the movement of *water* molecules from a solution of *higher water potential* to a solution of *lower water potential*, through a *partially permeable membrane*.
- Water moves **DOWN** the *water potential gradient*.

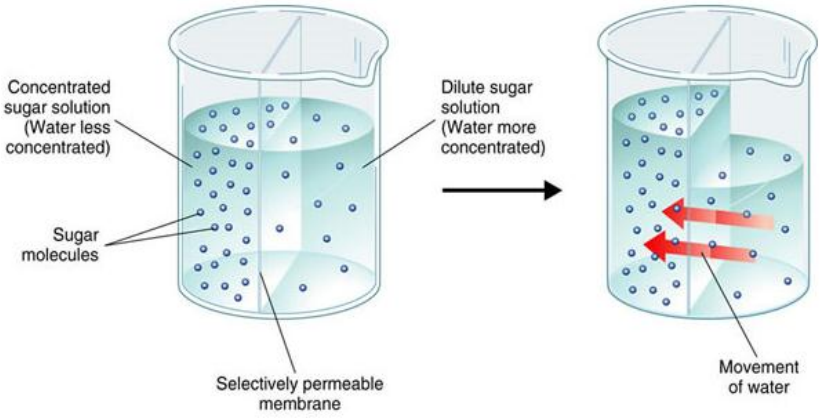
What is water potential and how is it related to osmosis?

- Water potential is a **measure** of tendency of water to move from one place to another.
- The term '*water potential*' is always used/connected to **OSMOSIS**.
- A **dilute** solution *contains more water molecules* per unit volume than a **concentrated** solution – therefore, has a **HIGHER** concentration than a concentrated solution.

Q. **Which one has a higher water potential?** Ans: **Beaker A** – More water, less sucrose molecules.

- When a *partially permeable membrane separates two solutions of different water potentials*, a **water potentials gradient** is established.
- When a water potential gradient is established, the process of **osmosis** will occur.

For example:



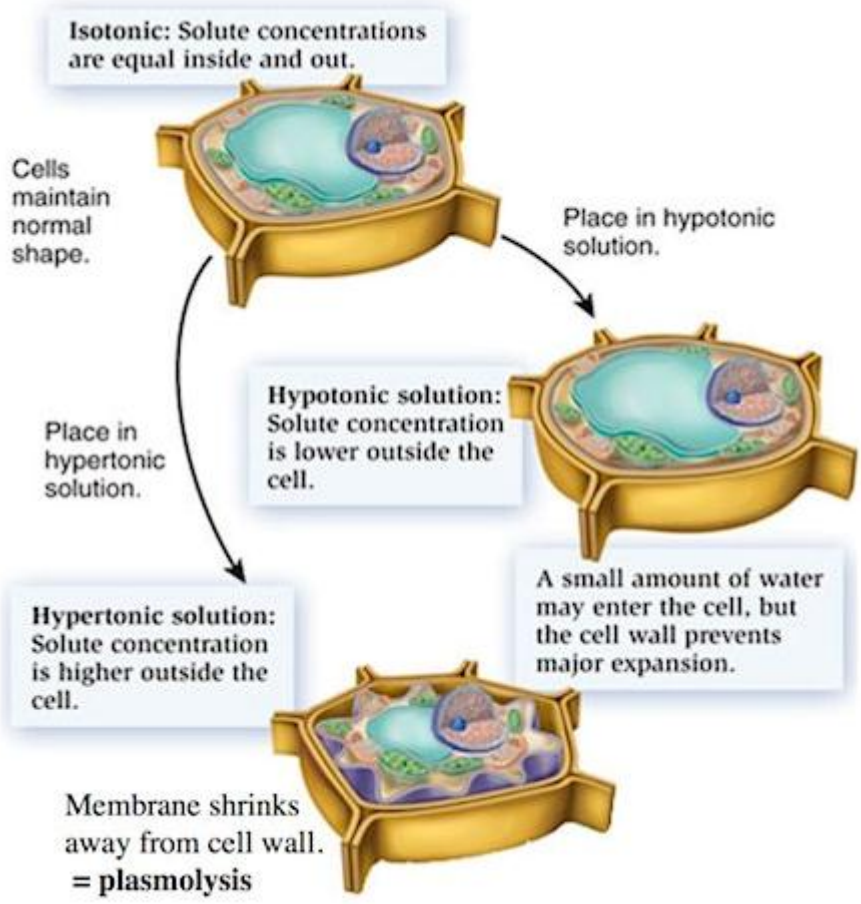
Remember:

The **cell wall** of plants = **permeable**! , While the **cell membrane** is = partially permeable!

How does osmosis affect living organisms?

- A plant cell *behaves differently* from an animal cell when placed in solutions with differing water potentials, due to the presence of the **cell wall** in plant cells.

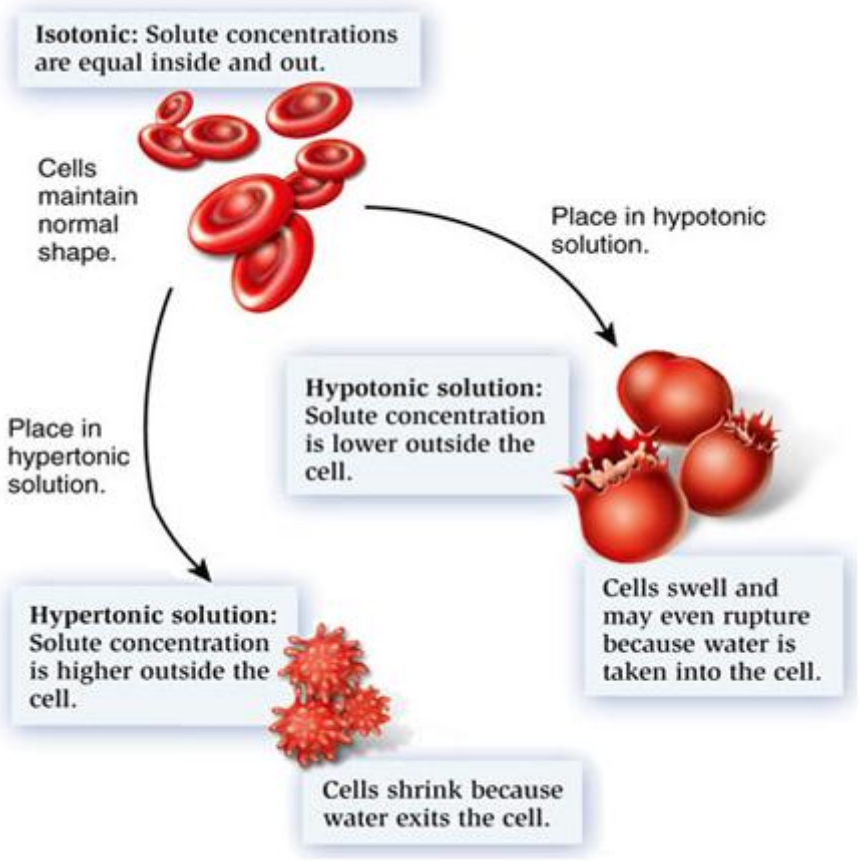
Q. **What happens to a plant cell in a solution with high/low/equal water potential?**



Isotonic solution	Hypertonic solution	Hypotonic solution
○ The solute concentrations are equal on both sides – equal water potential. ○ Therefore, normal movement of water inside and out. ○ Cell maintains its shape.	○ The solute concentrations are higher outside compared to the cell sap – low water potential outside. ○ Water molecules moves outside by *osmosis*. ○ The cytoplasm shrinks away from cell wall - Cell plasmolysis.	○ The solute concentration is lower outside the cell – high water potential outside. ○ Water molecules enter by *osmosis*. ○ Cell enlarges and becomes turgid. ○ *Cell wall prevents cell from bursting*.

- The turgidity of the cell with water is called **turgor**, and the pressure exerted by the water on the cell wall is the **turgor pressure**.

Q. **What happens to an animal cell in a solution with high/low/equal water potential?**



Isotonic solution	Hypertonic solution	Hypotonic solution
○ There is **equal water potential** inside and outside of the cell. ○ Therefore, normal movement of water inside and out. ○ Cell **maintains its shape**.	○ There is **low water potential outside** of the cell, and **high water potential inside** the cytoplasm. ○ Water molecules leaves by *osmosis*. ○ The cell **shrinks** in size (**crenated**).	○ There is **high water potential outside** the cell, and **low water potential** in the cytoplasm. ○ Water molecules enter by *osmosis*. ○ Cell expands and **bursts**.

- When the cell *shrinks* and *little spikes appear* on the *cell surface membrane*, this process is called **crenation**.
- An animal cell will become *dehydrated* and *eventually die* when placed in a solution of low water potential.

Q. **Why is turgor important in plants?**

- ✓ **Turgor** enables plant to **remain firm and erect** (due to turgor pressure within their cells).
- ✓ When there is **high evaporation** of water from the cells, they *lose their turgidity* and the *plant wilts*.
- ✓ **Plasmolysis** causes **tissues to become limp or flaccid**. Cells will be *killed if they remain plasmolysed for too long.*