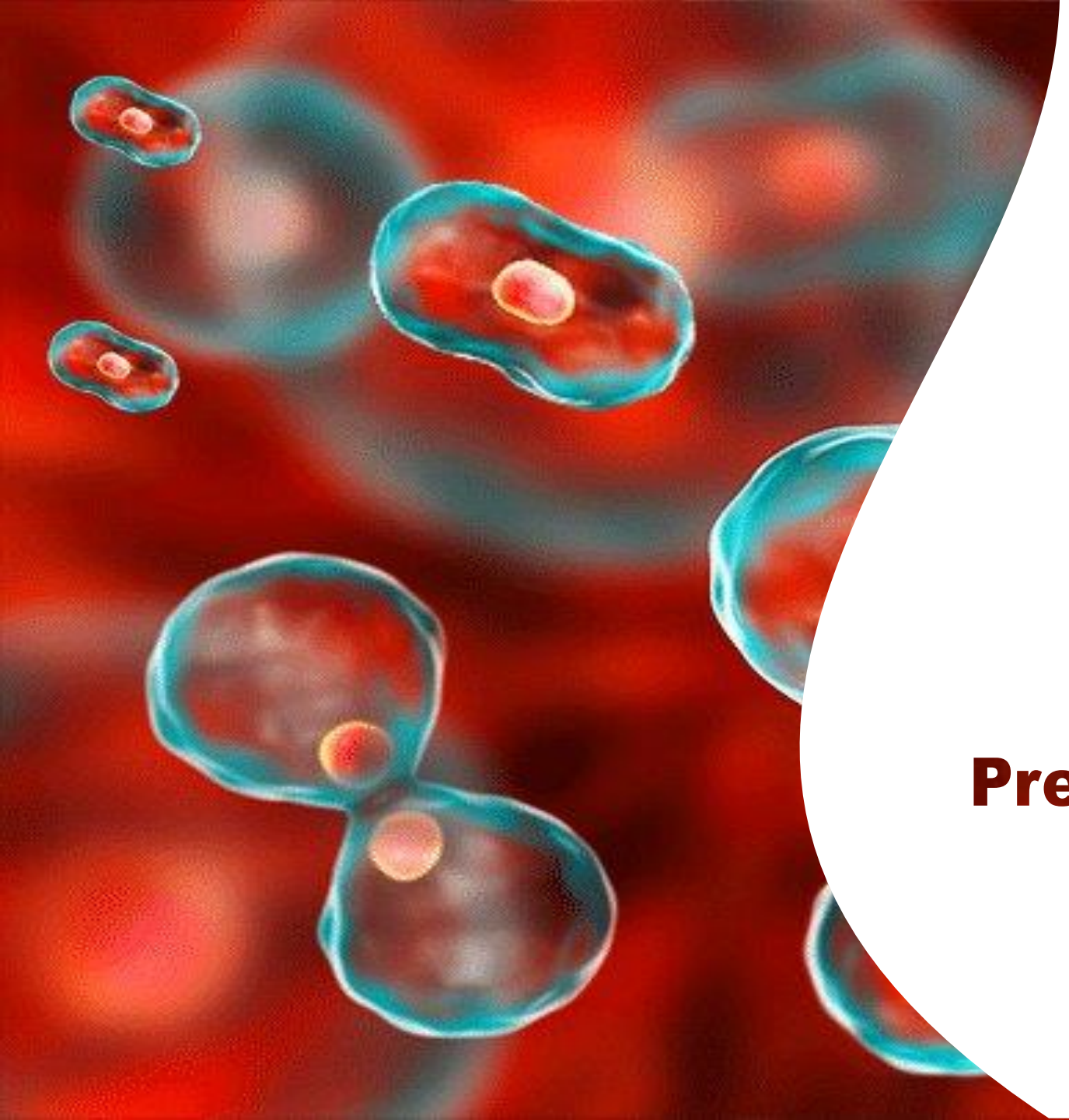
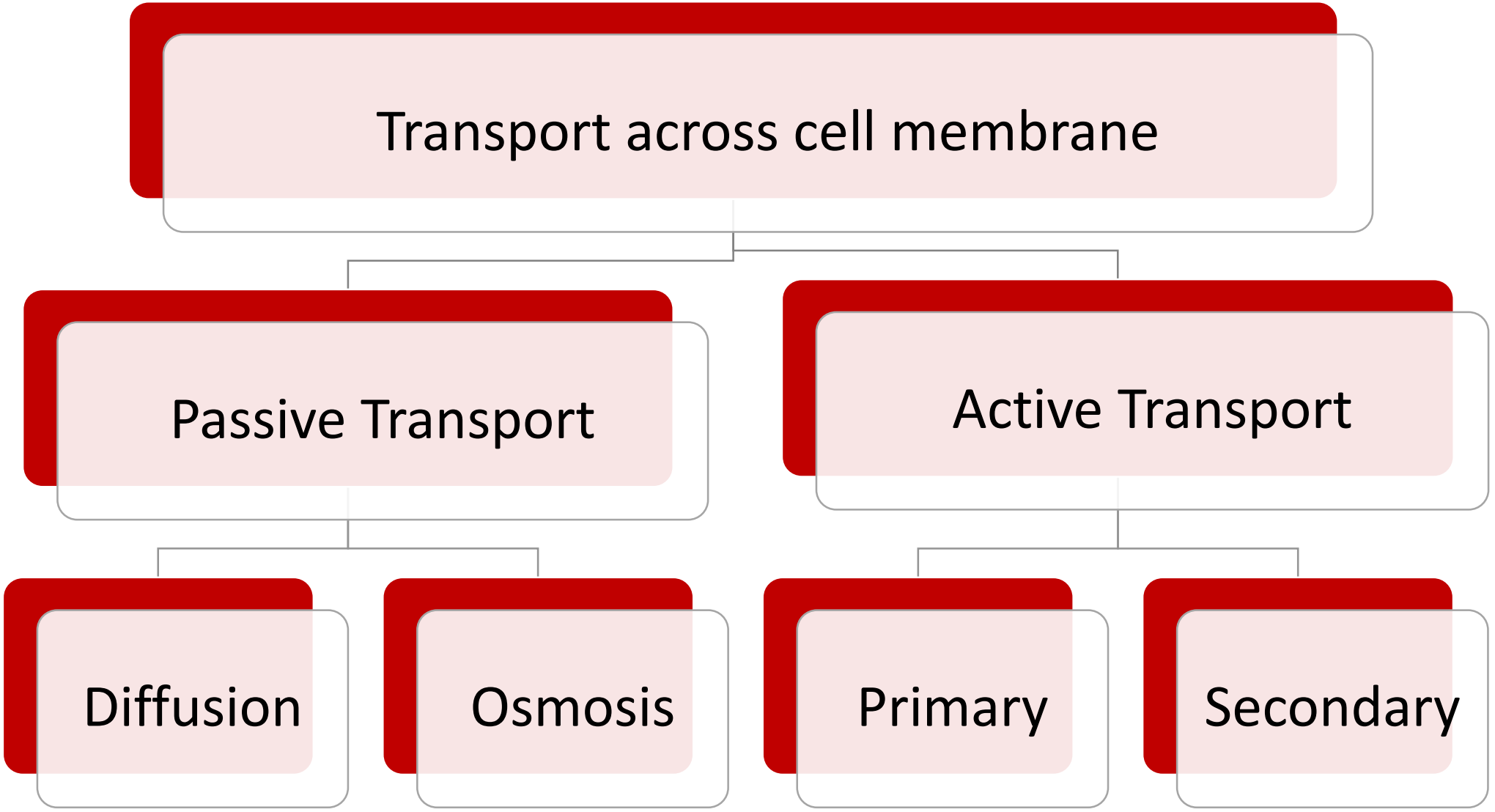


Osmosis

Prepared by : Ms. Lavan Ali

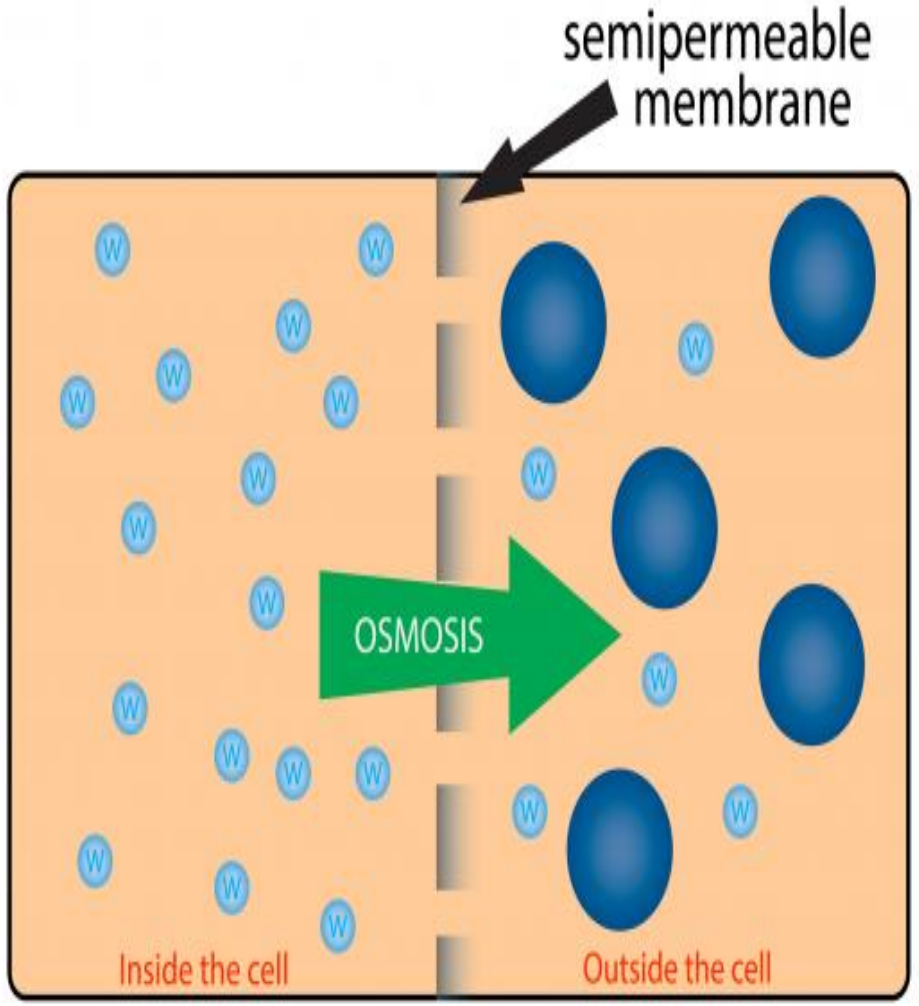
Outline :

- Transport Across cell membrane
- Osmosis
- Osmotic Pressure
- Why Is Osmosis Important to Cells?
- Practical Section/ Osmosis in Potatoes


Transport across cell membrane
Passive Transport
Active Transport
Diffusion
Osmosis
Primary
Secondary

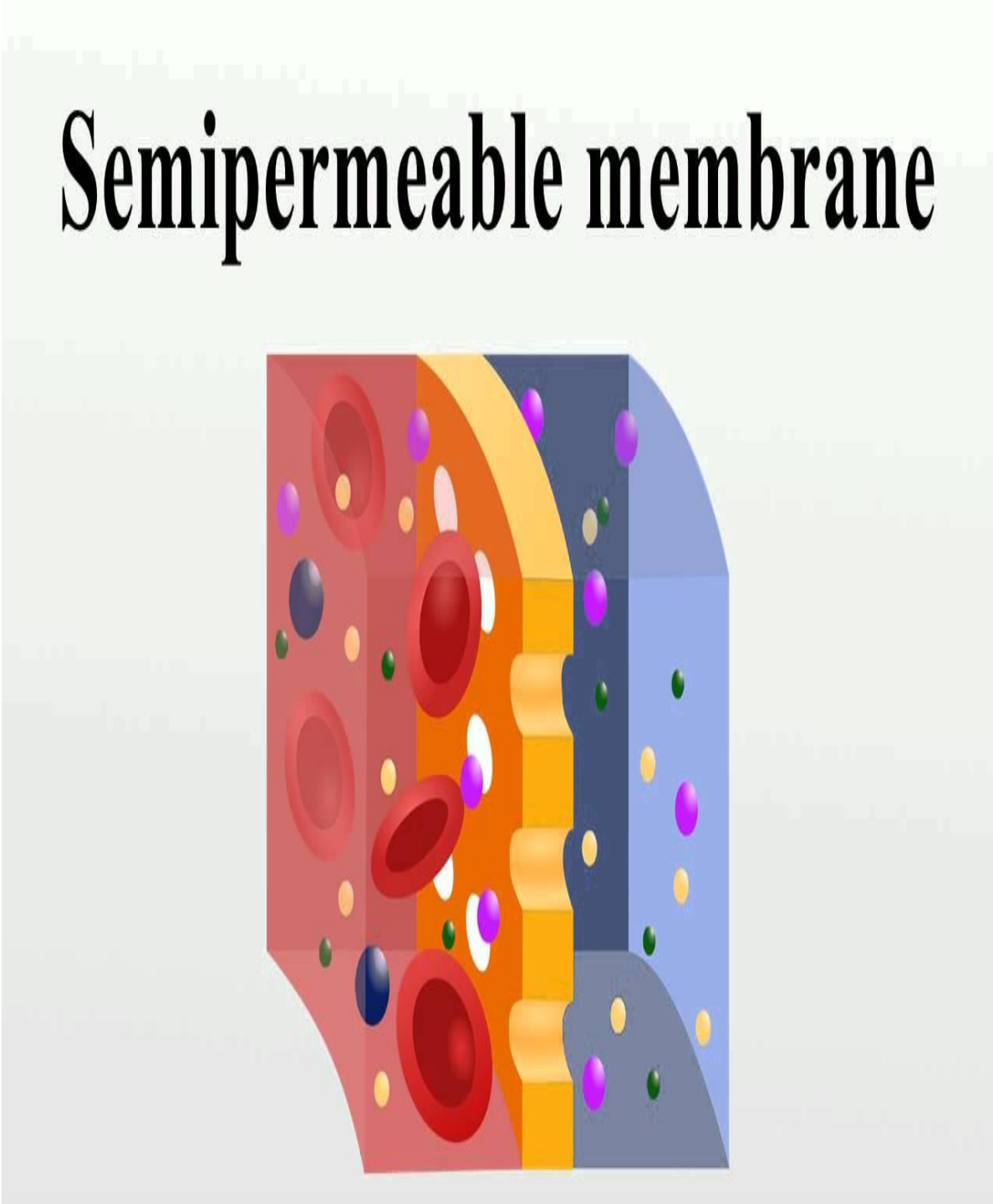
Osmosis

Osmosis is the diffusion of free water Molecules from a region of high concentration of free water molecules to a region of low concentration of free water molecules across a semi-permeable Membrane.



Semi-permeable membranes

- are very thin layers of material which allow some things to pass through them, but prevent other things from passing through.
- Cell membranes are an example of semi-permeable membranes.
- Cell membranes allow small molecules such as oxygen, water carbon dioxide and glucose to pass through, but do not allow larger molecules like sucrose, proteins and starch to enter the cell directly.

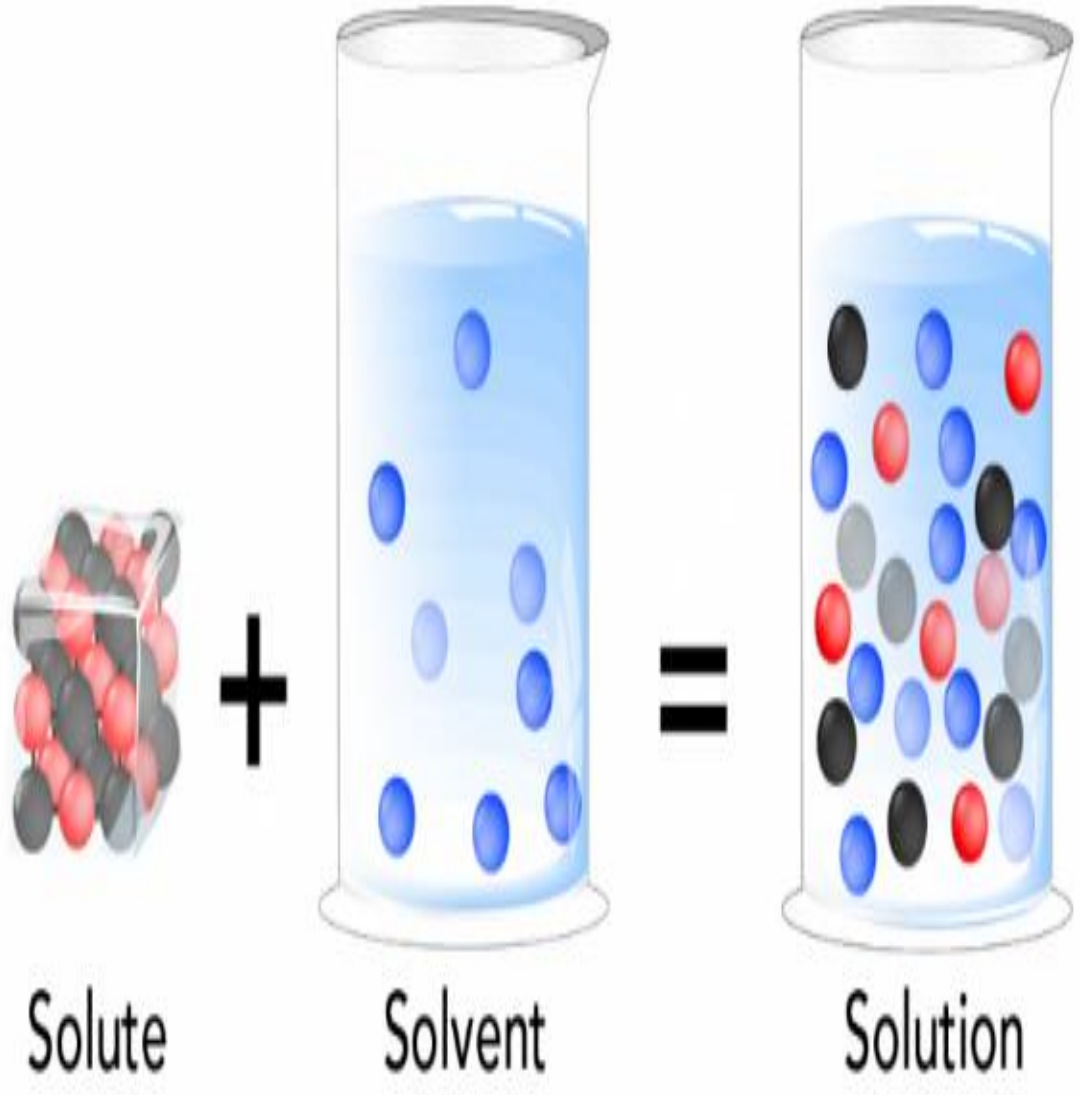


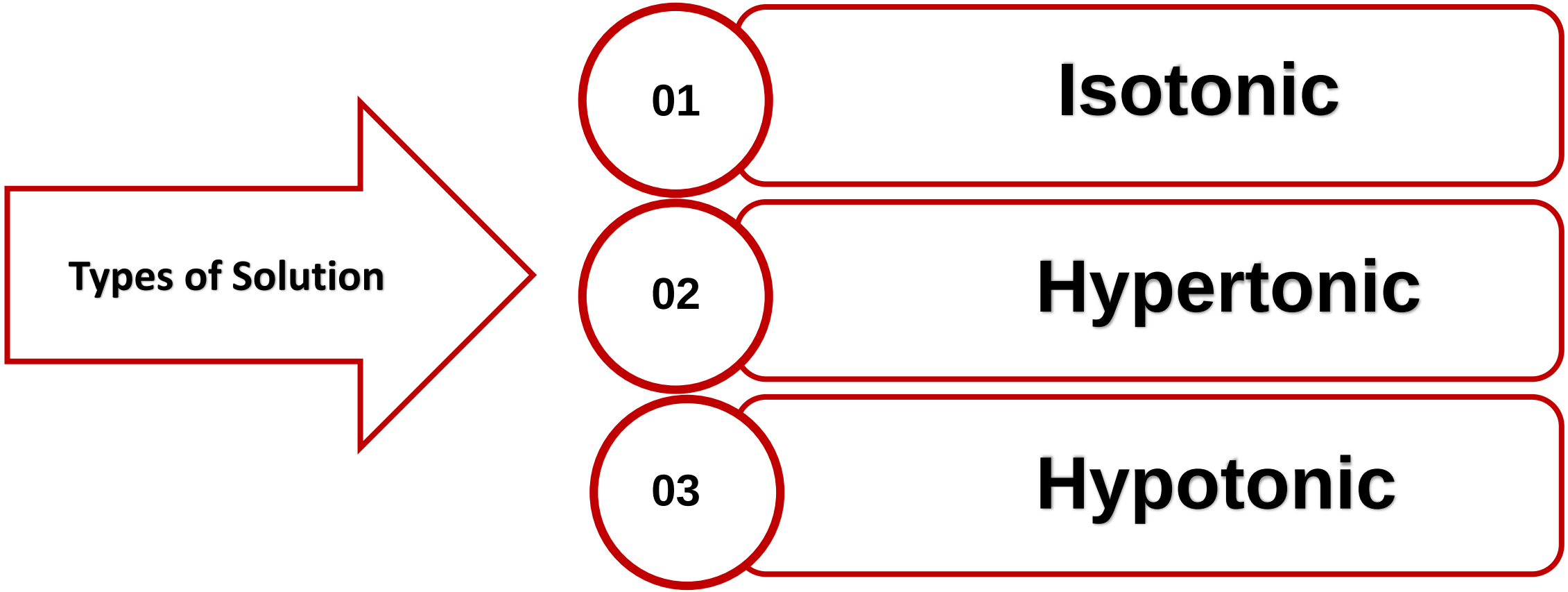
Solutions

- **Solutions** are made of solute and a solvent

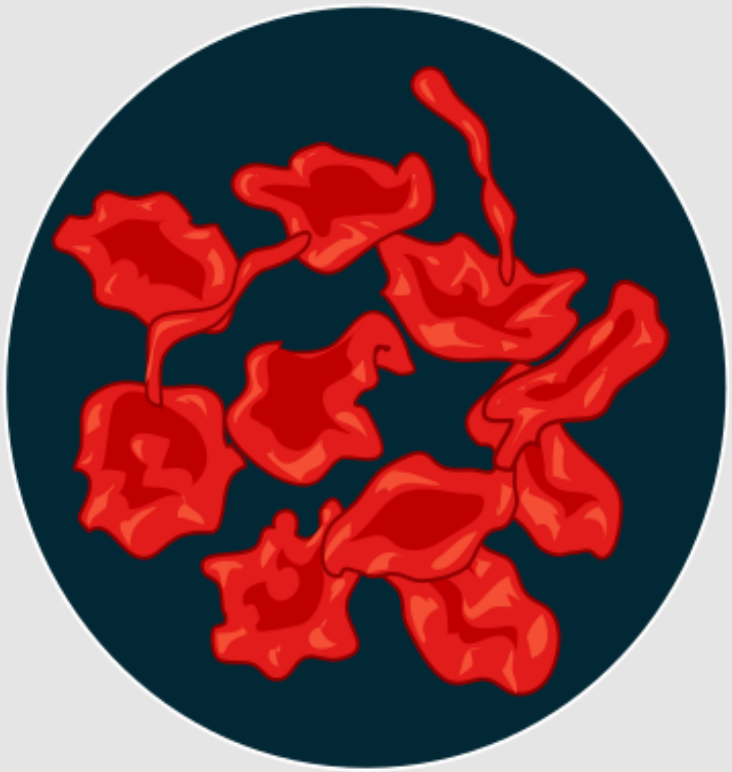
- **Solvent** - the liquid into which the solute is poured and dissolved. (Ex. Water)

- **Solute -** substance that is dissolved or put into the solvent. Salt and sucrose are solutes

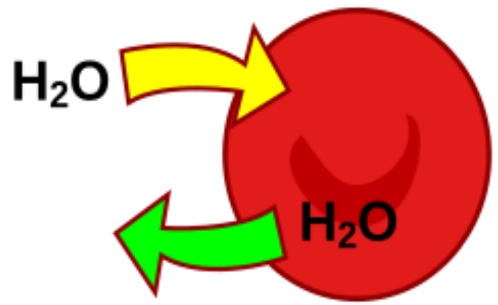



Types of Solution
01
Isotonic
02
Hypertonic
03
Hypotonic

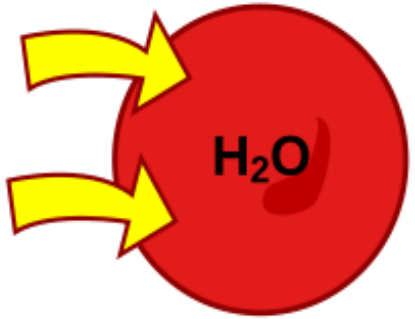
Hypertonic



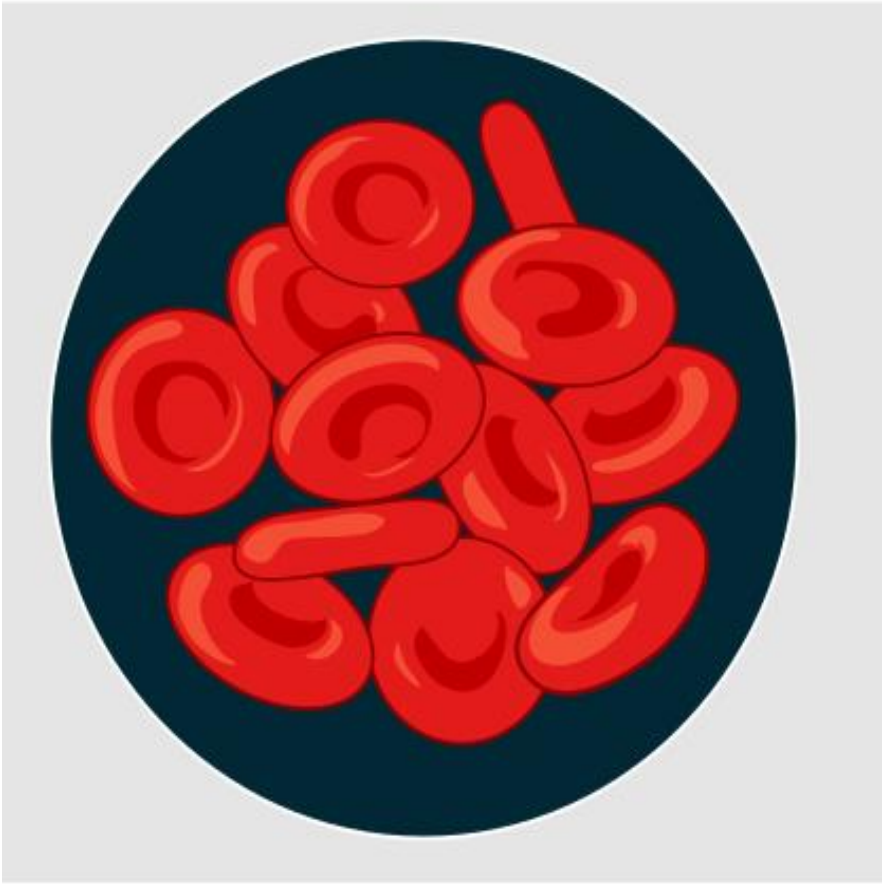
Isotonic

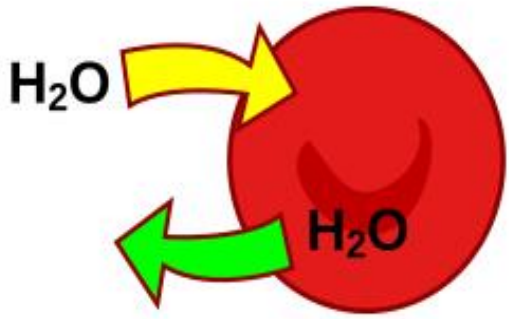


Hypotonic



Isotonic





Isotonic

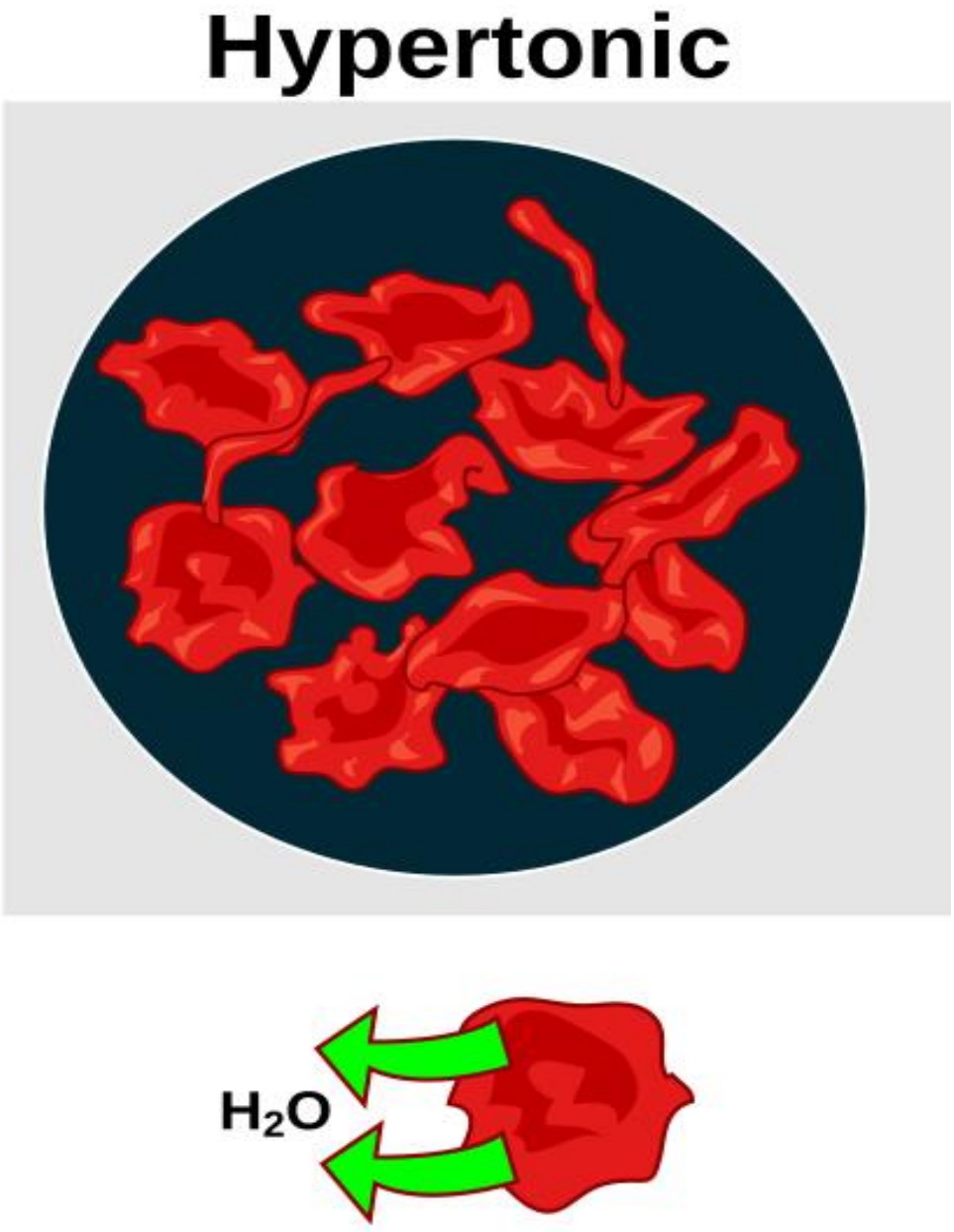
The concentration of solute in the solution can be **equal to** the concentration of solute in cells. In this situation the cell is in an isotonic solution **(iso = equal or the same as normal).**

A red blood cell will retain its normal shape in this environment as the amount of water entering the cell is the same as the amount leaving the cell.

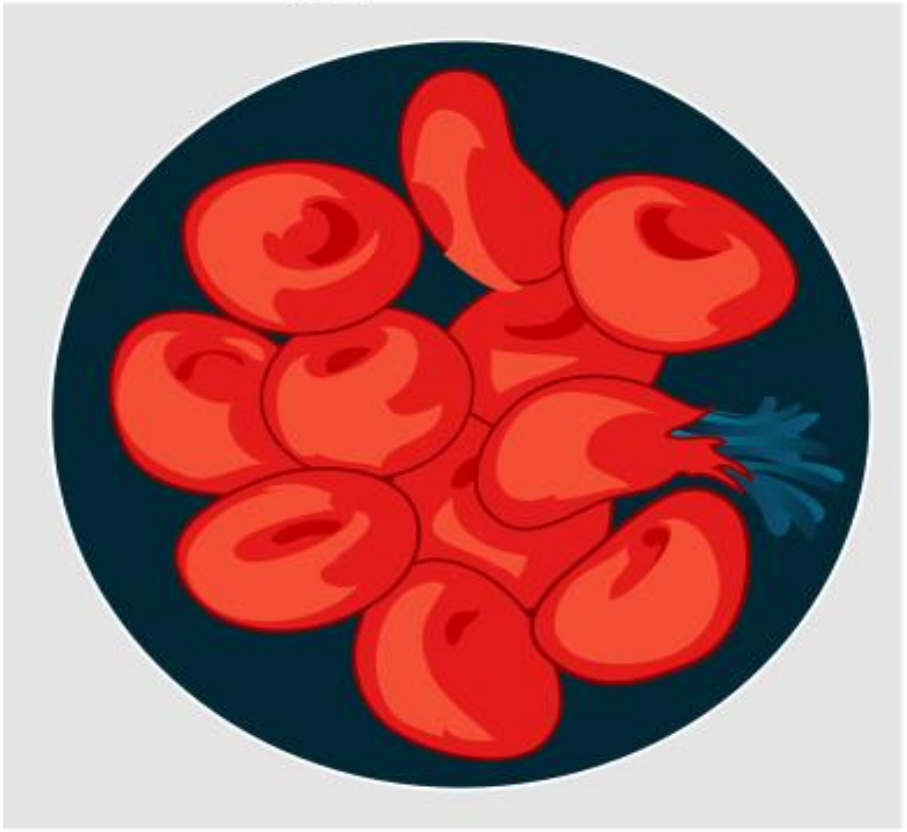
Hypertonic

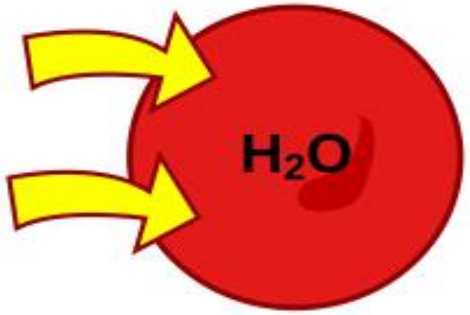
The concentration of solute in the solution can be **greater than** the concentration of solute in the cells. This cell is described as being in a hypertonic solution **(hyper = greater than normal).**

In this situation, a red blood will appear to shrink as the water flows out of the cell and into the surrounding environment.



Hypotonic





Hypotonic

The concentration of solute in the solution can be **less than** the concentration of solute in the cells. This cell is in a hypotonic solution **(hypo = less than normal).**

A red blood cell in this environment will become visibly swollen and potentially rupture as water rushes into the cell.

Type of Solution	Concentration of Solute	Concentration of water	Effect on Cell
Hypertonic	Higher outside of cell	Lower outside of the cell	Cell loses water, shrinks
Isotonic	Same inside and outside of cell	Same inside and outside of cell	Cell loses and gains water, retains shape
Hypotonic	Lower outside of cell	Higher outside of cell	Cell gains water, expands

Types of osmosis

Exosmosis

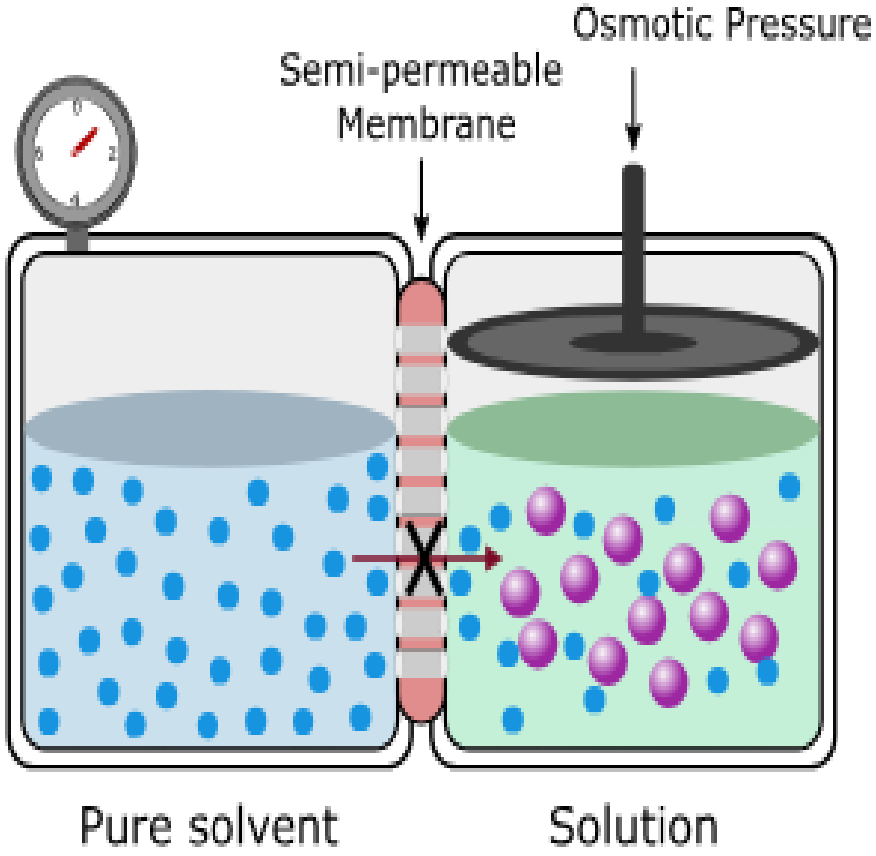
When a substance is placed in a **hypertonic solution**, the solvent molecules move outside the cell and the cell becomes flaccid or undergoes plasmolysis. This is known as exosmosis.

Endosmosis

When a substance is placed in a **hypotonic solution**, the solvent molecules move inside the cell and the cell becomes turgid or undergoes deplasmolysis. This is known as endosmosis.

Osmotic pressure

- is the pressure required to stop water from diffusing through a membrane by osmosis.
- It is determined by the concentration of the solute. Water diffuses into the area of higher concentration from the area of lower concentration.
- When the concentration of the substances in the two areas in contact is different, the substances will diffuse until the concentration is uniform throughout.



Osmotic Pressure

Why Is Osmosis Important to Cells?

Why Is Osmosis Important to Cells?

1. Maintains Cell Shape and Size

Osmosis regulates the movement of water into and out of cells which helps them maintain their shape and size. For instance:

In animal cells ,osmosis ensures that the cells neither shrink (dehydrate) nor swell excessively (burst). This is important for the cell's survival as changes in size can disrupt normal cell function.

2. Regulates Internal Environment (Homeostasis)

Osmosis is a key process for maintaining **homeostasis** the stable internal environment of the cell.
For example in **kidney cells** osmosis helps remove waste and balance water and salt concentrations in the blood.

Why Is Osmosis Important to Cells?

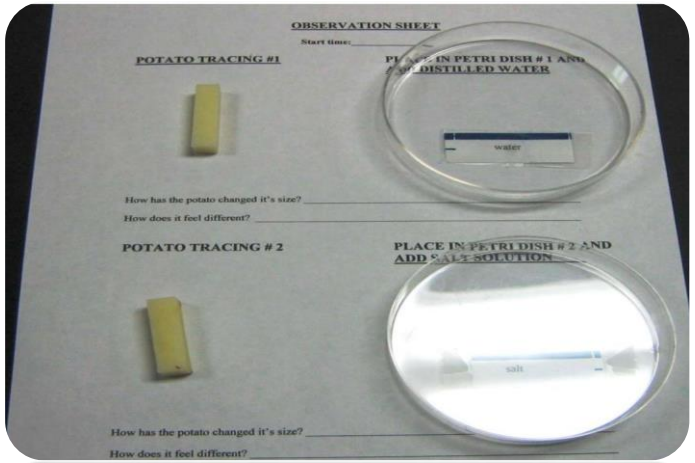
3. Nutrient and Waste Exchange
Osmosis allows cells to absorb essential nutrients from their surroundings and eliminate waste products. In the **small intestine** for example osmosis helps absorb water from digested food into the bloodstream.

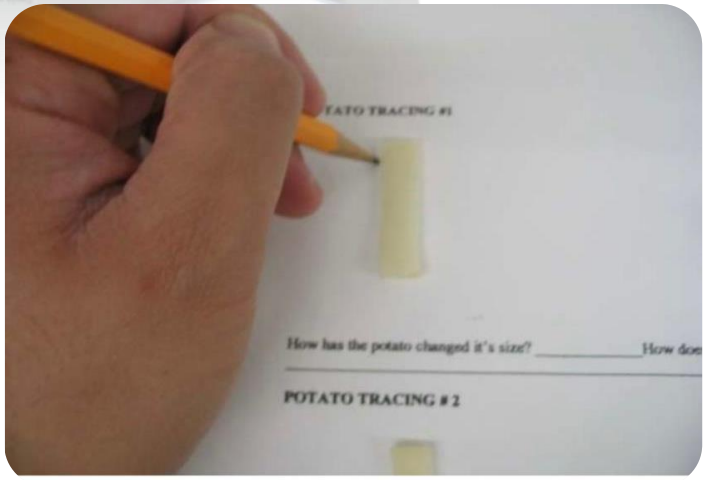
4. Supports Metabolic Reactions
Many chemical reactions within the cell require water as a medium or reactant. Osmosis ensures that the cell remains hydrated and has the appropriate concentration of water necessary for these reactions to take place.

5. Prevents Cell Damage
Osmosis helps cells avoid damage caused by imbalances in water. If too much water enters a cell, it could burst (lyse) especially in animal cells.

Practical Section/ Osmosis in Potatoes

1. Place the two petri dishes on the Potato Activity Sheet.
2. Fill two small cups with distilled water and salty water.
3. Feel both potato slices to check their rigidity, without breaking them.
4. Draw the perimeter of the first potato on the Potato Activity Sheet, place it in petri dish #1, and cover it with distilled water. Place the lid on the dish.
5. Draw the perimeter of the second potato on the Potato Activity Sheet, place it in petri dish #2, and cover it with the salty water. Place the lid on the dish.





Practical Section/ Osmosis in Potatoes

6. Record the Start Time.
7. After 25 minutes, gently remove each potato slice, blot it with a paper towel, and compare its size to the original outline to observe changes in length.
8. Write the result.