

# Difference Between Osmosis and Diffusion in Biology

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## Key Difference - Osmosis vs Diffusion in Biology

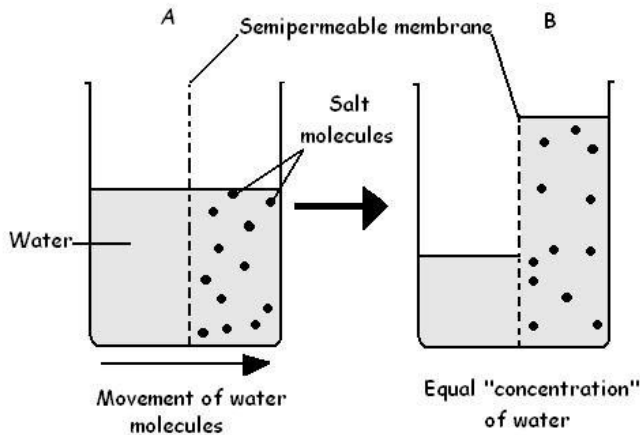
**Osmosis** is the process of spontaneous net movement of solvent [molecules](#) (water molecules) through a semi-permeable membrane to a region of higher solute concentration. It tends to equalize the solute concentration on either side of the membrane. The [diffusion](#) is the total net movement of molecules or [atoms](#) from a region of higher concentration with a higher chemical potential to a region of lower concentration with lower chemical potential. Thus, the molecules are moving down a concentration gradient. The **key difference** between osmosis and diffusion in biology is that **osmosis is the process of movement of solvent molecules through a semi-permeable membrane to a region with higher solute concentration while diffusion is the process of movement of both solvent and solute molecules down a concentration gradient in any mixture.**

## What is Osmosis?

In [Biology](#), osmosis is the process of movement of a substance across a semi-permeable membrane in order to balance the concentration of another substance. For example, in a biological cell, water molecules move across the semi-permeable [plasma membrane](#) of the cell in order to balance the solute concentration (eg: salt concentration) in and out of the cell. Osmosis is a passive process which takes place spontaneously without any energy consumption of the cell. The osmosis deals with biochemical solutions.

A [solution](#) is made up of two parts such as the [solvent and the solute](#). Solutions are made by dissolving solutes in solvents. The [salt](#) water is the best example in which salt is the solute and water is the solvent. There are three types of solutions such as [isotonic](#), [hypotonic](#) and [hypertonic](#). In an isotonic solution, the solute concentration inside the cell and outside the cell is equal. Under these conditions, there is no net movement of the solvent molecules across the [cell membrane](#). When the net movement is zero, the amount of water moving inside and outside the cell across the plasma membrane becomes equal.

In a hypotonic solution, there is high solute concentration inside the cell than outside the cell. Hence, water molecules enter the cell rather than leaving the cell. Hypertonic refers to the opposite of hypotonic. There is a higher concentration of solute outside the cell than inside the cell. In this case, more water molecules will leave the cell than entering the cell in order to lower the solute concentration outside.

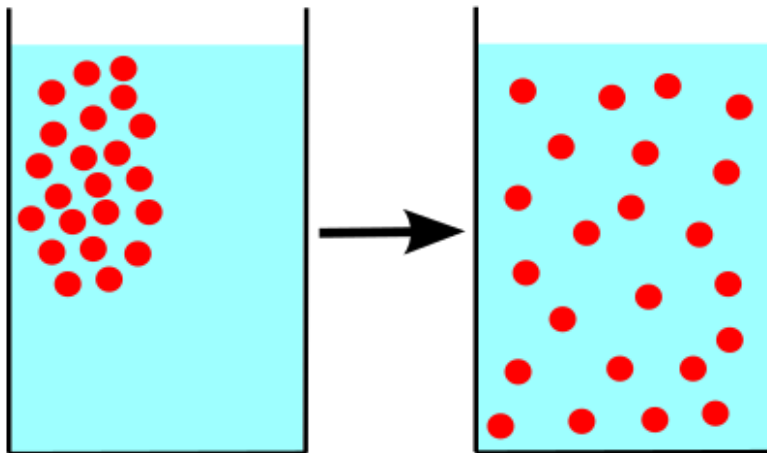


**Figure 01: Osmosis**

Osmosis affects [plants and animal cells](#) differently. In hypotonic conditions, animal cells are bursting out due to the absence of cell wall. But in hypertonic situations, both plant cells and animal cells tend to be shrinking. These incidents reveal that how important osmosis is for plant and animal cells for their survival.

## What is Diffusion?

Diffusion is the process of net passive movement of particles (atoms, [ions](#) or molecules) from a region of higher concentration to a region of lower concentration in any mixture. Particle movement proceeds until the concentration of a particular substance becomes uniform.



**Figure 02: Diffusion**

The diffusion rate is affected by the factors such as short distance, large surface area, small size molecules, big concentration difference and high temperatures increase.

Larger molecules diffuse very slowly. Gases and small molecules in a liquid can be easily diffused from a higher concentration environment to a lower concentration environment of that particular molecule. Several of the diffusion examples in biological systems are as follows,

- Gas exchange at alveoli in respiration.
- Gas exchange for photosynthesis in plant leaves.
- Transfer of neurotransmitter “acetylcholine” at a synapse.

## What are the Similarities Between Osmosis and Diffusion in Biology?

- Both processes are involved in particle movement.
- Both processes are passive processes.
- Both processes are not consuming cell’s energy molecules known as “ATP”.
- Both processes are very important for cell’s survival.
- In both processes, particles move from higher concentration to lower concentration.

## What is the Difference Between Osmosis and Diffusion in Biology?

Osmosis vs Diffusion	
Osmosis is the process of movement of solvent molecules through a semi-permeable membrane to a region with higher solute concentration.	Diffusion is the process of movement of molecules down a concentration gradient in any kind of mixture.
Solute and Solvent Movement	
In osmosis, only solvent (water molecules) are moving.	In diffusion, both solute and solvent molecules are moving.
Semi-permeable Membrane	
In osmosis, the semi-permeable membrane is involved.	In diffusion, the semi-permeable membrane is not involved.
Need of Water	
In osmosis water is needed for its movement.	In diffusion, water is not needed for its

	movement.
<b>Concentration Gradient</b>	
Osmosis follows an uphill concentration gradient.	Diffusion follows a downhill concentration gradient.
<b>Importance</b>	
The osmosis is important to distribute nutrients throughout the cell and for the release of metabolic waste.	The diffusion is important to create energy through respiration and photosynthesis.
<b>Process</b>	
Osmosis happens when water moves from in and out depending on the solute concentration.	Diffusion happens in the gaseous state or liquid state down a concentration gradient.
<b>Examples</b>	
Swelling up of <a href="#">red blood cells</a> when exposed to fresh water, uptake of water by plant root hairs are some examples of osmosis.	A perfume filling a whole room, a drop of food coloring spreading out to uniformly color a cup of water are some examples of diffusion

## Summary - Osmosis vs Diffusion in Biology

Osmosis is the process of spontaneous movement of solvent molecules through a semi-permeable membrane to a region where a higher solute concentration is present. It tends to equalize the solute concentration on both sides of the membrane. On the other hand, diffusion is the total net movement of molecules or atoms from a region of higher concentration to a region of lower concentration. So, the molecules are moving down a concentration gradient. This is the difference between osmosis and diffusion in biology.

### Reference:

1. Helmenstine, Ph.D. Anne Marie. "Understand the Difference Between Osmosis and Diffusion." ThoughtCo. [Available here](#)
2. "Diffusion." Wikipedia, Wikimedia Foundation, 20 Nov. 2017. [Available here](#)
3. "Osmosis." Wikipedia, Wikimedia Foundation, 14 Oct. 2017. [Available here](#)

### Image Courtesy:

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