Transport across the Plasma Membrane

The structure of the plasma membrane provides it with the property of *selective permeability,* meaning that not all substances can cross it. Those that can, do so in different ways depending on their size and characteristics

Passive transport

Simple diffusion is a passive process in which substances move freely through the lipid bilayer of the plasma membranes of cells without the help of membrane transport proteins Nonpolar, hydrophobic molecules move across the lipid bilayer through the process of simple diffusion. Such molecules include oxygen, carbon dioxide, and nitrogen gases; fatty acids; steroids; and fat-soluble vitamins (A, D, E, and K). Small, uncharged polar molecules such as water, urea, and small alcohols also pass through the lipid bilayer by simple diffusion.

Facilitated diffusion

This passive process is used by some substances that are unable to diffuse through the semipermeable membrane unaided, e.g. glucose, amino acids. Specialised protein carrier molecules in the membrane have specific sites that attract and bind substances to be transferred, like a lock and key mechanism.

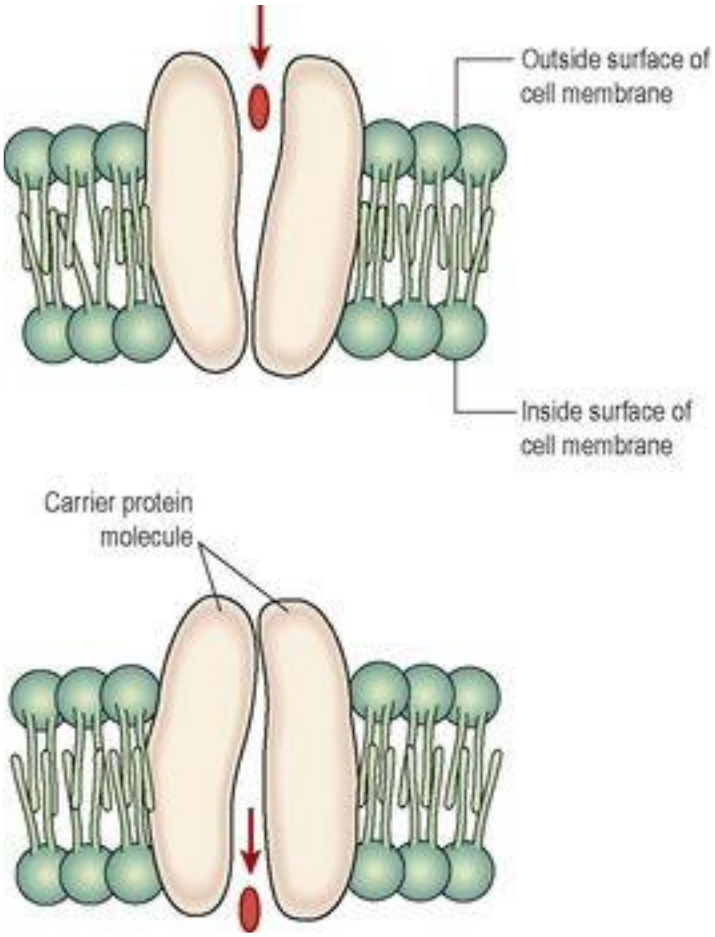

Figure Specialised protein carrier molecules involved in facilitated diffusion.

Osmosis

Osmosis is passive movement of water down its concentration gradient towards equilibrium across a semipermeable membrane . While diffusion of solute molecules across a semipermeable membrane results in equal on centrations of the solute on both sides of the membrane, *osmosis* refers specifically to diffusion of water down its concentration gradient. Osmosis roceeds until equilibrium is reached, at which point the solutions on each side of the membrane are of the same concentration and are said to be *isotonic*.

The importance of careful control of solute concentrations in the body fluids can be illustrated by looking at what happens to a cell (e.g. a red blood cell) when it is exposed to solutions that differ from normal physiological conditions.

Plasma osmolarity is maintained within a very narrow range because if the plasma water concentration rises, i.e. the plasma becomes more dilute than the intracellular fluid within the red blood cells, then water will move down its concentration gradient across their membranes and into the red blood cells.This may cause the red blood cells to swell and burst. In this situation, the
plasma is said to be ***hypotonic*.**

If the plasma water concentration falls so that the plasma becomes more concentrated than the intracellular fluid within the red blood cells (the plasma becomes *hypertonic*), water passively moves by osmosis from the blood cells into the plasma and the blood cells shrink.

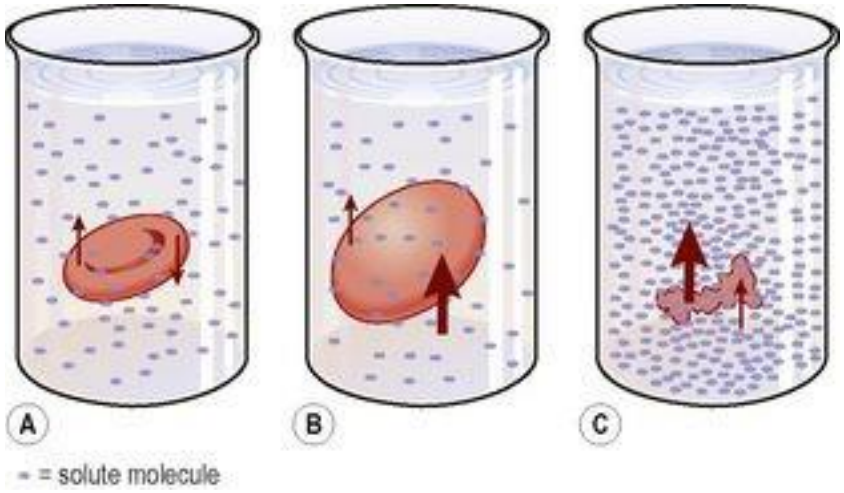

Figure The process of osmosis. Net water movement when a red blood cell is suspended in solutions of varying concentrations (tonicity): **A.**Isotonic solution. **B.** Hypotonic solution. **C.** Hypertonic solution