Department of biology

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(Animal physiology))

Stage (-3-)

LEC- ((2))

cell membrane

By

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Transport across the cell membrane

One of the important functions of the cell membrane is to facilitate the transport of materials from the outside to the inside of the cells. Transport of materials is accomplished via many possible mechanisms. These include:

1-Passive transport: The Cell does not use energy.

2-Active transport: The Cell does use energy.

Types of Passive Transport:

- Simple diffusion
- Facilitated Diffusion
- Filtration
- Osmosis

Simple diffusion

The process of the net movement of solutes from a region of high concentration to a region of low concentration is known as "Diffusion". The differences in concentration between the two regions are termed As "Concentration gradient", diffusion occurs down the concentration gradient

A biological example of diffusion is the gas exchange that occurs during respiration within the human body. Upon inhalation, oxygen is brought into the lungs and quickly diffuses across the membrane of alveoli and enters the circulatory system by diffusing across the membrane of the pulmonary capillaries. Simultaneously, carbon dioxide moves in the opposite direction, diffusing across the membrane of the capillaries and

entering the alveoli, where it can be exhaled.

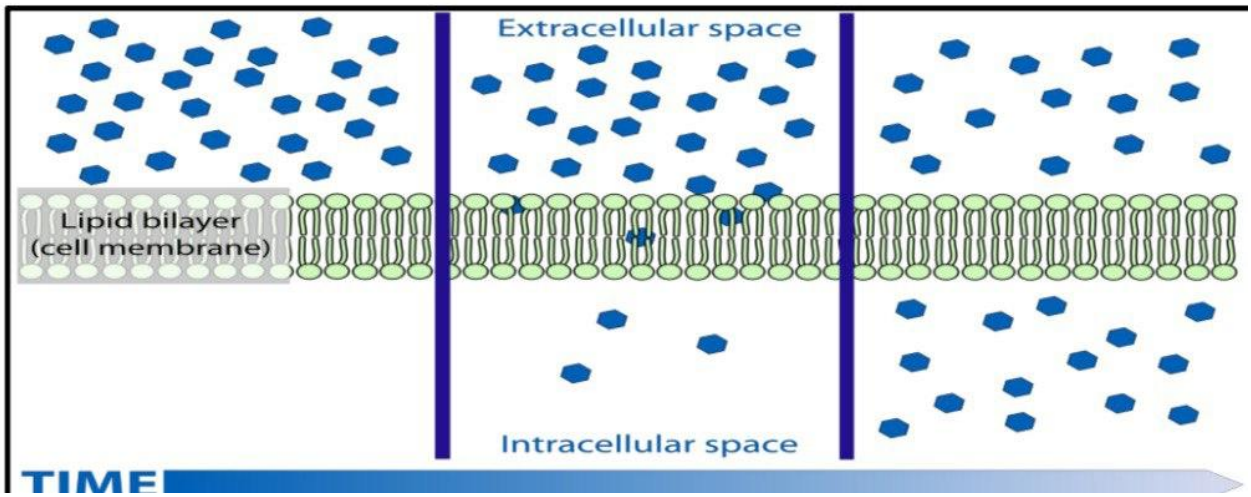
The process of moving oxygen into the cells and carbon dioxide

out occurs because of the concentration gradient of these substances, each

moving away from their respective area of higher concentration toward areas

of lower concentration. Because the gases are small and uncharged, they can pass directly through the cell membrane without any special

membrane proteins. No energy is required



Facilitated Diffusion

The process of the movement of molecules across the cell membrane

via special transport proteins that are embedded within the cellular membrane

It is known as "Facilitated Diffusion" or called "Carrier-mediated diffusion".

Many large molecules, such as glucose and ions, such as Cl-, Na+, cannot pass through

through the plasma membrane.

An example of facilitated diffusion is when glucose is absorbed into

cells through Glucose transporter 2 (GLUT2) in the human body. There are

many other types of glucose transport proteins, some that do require energy,

and are therefore not examples of passive transport. Since glucose is too large

a molecule to fit into the pores of cells and insoluble in lipids, it requires

a specific channel to facilitate its entry across plasma membranes and into

cells. When diffusing into a cell through GLUT2, the driving force that moves

glucose into the cell is still the concentration gradient.

The main difference between simple diffusion and facilitated

diffusion is that facilitated diffusion requires a transport protein to 'facilitate' or assist the substance through the membrane. After a meal, the cell is signaled to

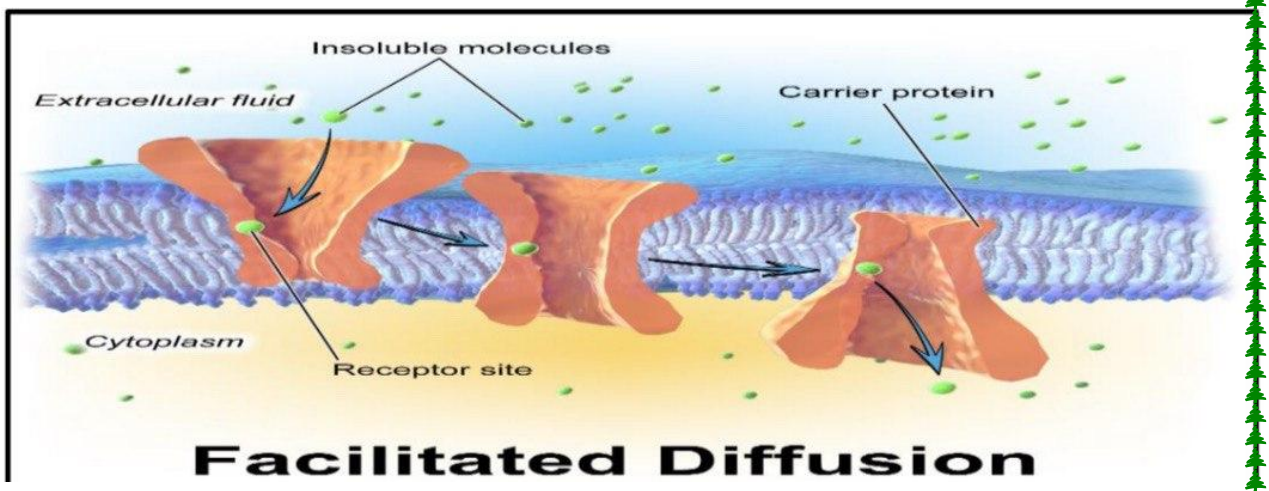
move GLUT2 into the membranes of the cells lining the intestines,

called enterocytes. With GLUT2 in place after a meal and the relatively high

concentration of glucose outside of these cells as compared to within them, the

concentration gradient drives glucose across the cell membrane through

GLUT2.



Filtration

Filtration is the process of the movement of water and solute

molecules across the cell membrane due to hydrostatic pressure generated by

the cardiovascular system. Depending on the size of the membrane pores, only

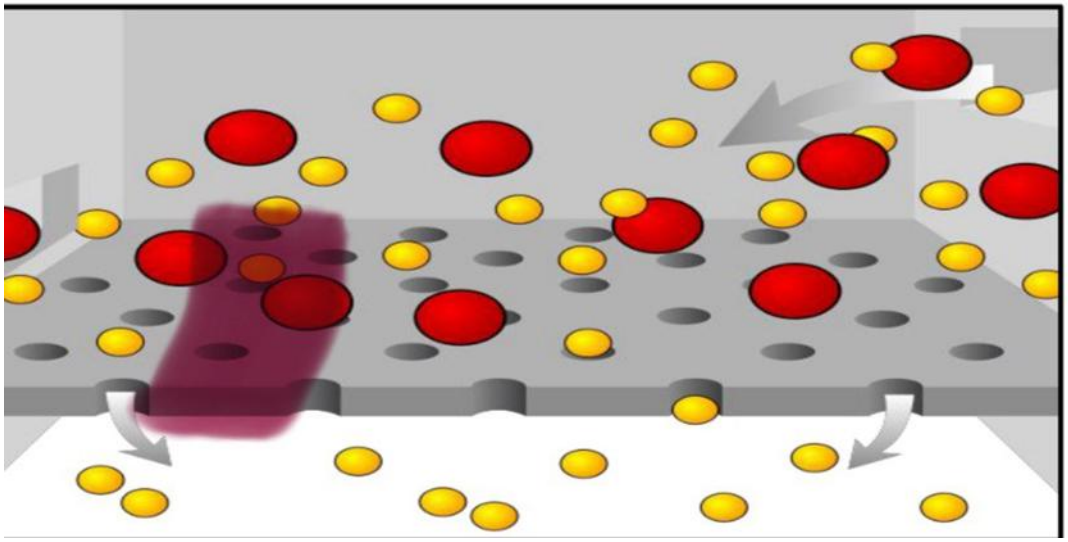
solutes of a certain size may pass through it. The membrane pores of the

Bowman's capsule in the kidneys is very small, and only albumins (the smallest

proteins) can filter through it. On the other hand, the membrane pores of liver

cells are extremely large to allow a variety of solutes to pass through them and be

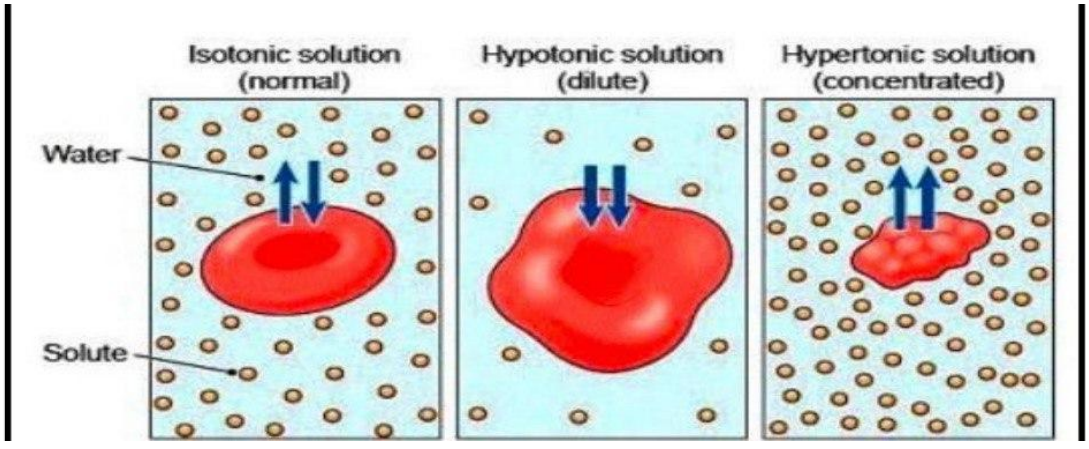
metabolized.



Osmosis

Osmosis is the type of diffusion of water molecules across a selectively permeable membrane, from a solution of high-water potential to a region of low water potential (from a region of lower solute concentration to a region of higher solute concentration).

Depending on the condition of the extracellular environment, different things can happen to the cell. If the cell is exposed to an "Isotonic" environment (same solutes concentration inside and outside the cell), the movement of water into and out of the cell occur at the same rate. If the cell exposed to a "Hypertonic" environment (outside of the cell has higher solute concentration than the inside), the cell will shrivel because of loss of water. If the cell is exposed to a "Hypotonic" environment (inside of the cell has higher concentration than outside), the cell takes up more water and becomes bloated and will eventually burst.



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