Cell Membrane

- **Transport across membrane**

Types of transportation through the cell:

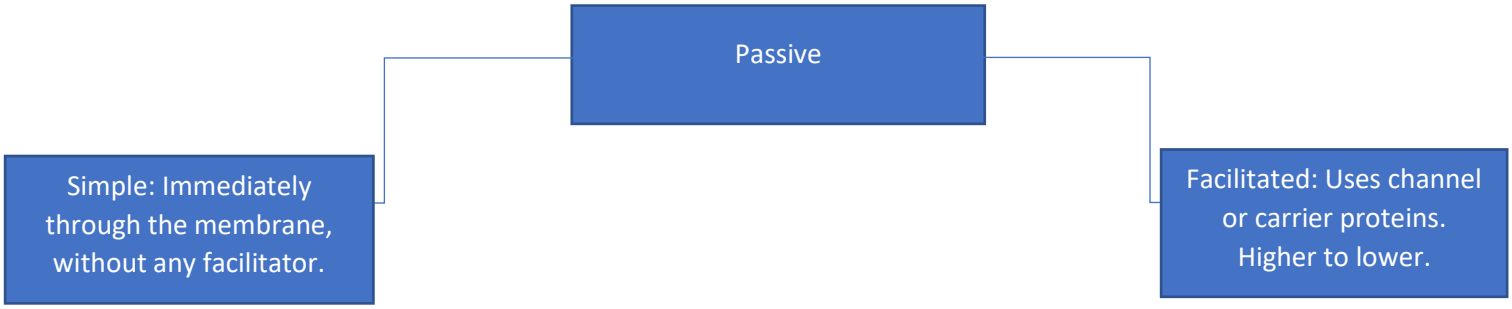
1. Passive transport
2. Active transport
3. Cotransport
4. Exocytosis and Endocytosis

- **Passive transport**

This transport doesn't require energy to cross the substance through the membrane (from higher concentration to lower concentration) ---- down the concentration gradient.

There are 2 types of passive transport:

- Simple diffusion (this is for small non-polar molecules- through the membrane immediately)
- Facilitated diffusion: this requires specific proteins (like aquaporins for water or gated ion channels) to maneuver some substances from the higher concentration to the lower (this is for ions and polar molecules)



- ## Osmosis

The movement of water from high concentration of water to lower concentration of water through aquaporins.

The idea of osmosis that there are 2 areas of water that have 2 different concentration of minerals (like salt and ions). Instead of the movement of ions to achieve equlibruim, water moves from the place it has lower concentraion of minerals (the hypotonic region) to the higher concentration of minerals (the hypertonic region). So the concentration of water doner increases and the concentration of the receiver decreases until equlibruim is achieved (the solution becomes isotonic)

- Animal cells and the effects of the environment's concentration (Tonicity)

A. Lysis: when the environment is hypotonic (water only comes in, so it burts).
B. Normal: when the environment Is isotonic (water comes in and out)
C. Shriveled: when the environment is hypertonic (water only comes out, so it shrinks).

- Plant cells and the effects of the environment's concentration (Tonicity).

A. Turgid: the ideal form of plant cells. When it is surrounded with a hypotonic environment (water only comes in, so it the cell becomes compacted)
B. Flaccid: when the environment of the cell is isotinic (not ideal for the plant)
C. Plasmolyze: when the environment of the plant is hypertonic(not ideal for the plant)

- ## Active transport

It happens for the molecules that need to be transported in opposite direction of the concentration level (from lower level to higher level- uphill). Thus, the transporter needs energy in the form of ATP to execute this. ------- pumping [redacted]

Pumping of solutes against the concentration or electro-chemical gradiant (uphill)

If we want to take for example the soduim-potassium ions pump that are in animal nerve cells, the active transportation procedures are as followed:

Supposeably the pump's binding face is inward towards the cell, 3 sodouim ions bind with the pump. When the sodium ions bind, this stimulates the ATP to add a phosphpo group to the protein (pump). This process is called phosphorylation. Phosphorylation causes the protein to change conformation (direction) to the extracellular fluid, pumping the sodium ions out of the cell membrane. When the conformation barrier is on the EC Fluid side, it binds with potasium ions so that it gets transported inside the cell. When the 2 potasium ions bind with the pump, this triggers the phosphate group to get released, and so changing the conformation to the inward part of the cell (to the original conformation).

From this, we can conclude that **a** postive charge is lost inside the cell, thus creating a voltage in the membrane. For this reason, we call pumps that cause this voltage across the membrane **Electrogenic pumps.**

These elctrogenic pumps help store energy that can be used for cellular work (the voltage gets trapped for cellular work, such in cotransport).

- **Cotransport**

Cotransport is the opertaion of transporting 2 molecules at the same time. However, the 2 of these molecules differ in the way of transportation; one gets passievly transported, and the other actively.

Like the sucrose-H^+ cotranspoter; as in it transports the protons **down** its concentration gradient, and the sucrose **against** its concentration gradient.

The cotransporter changes conformation direction when the 2 molecules are binded to it. Like for example the sucrose-H^+ cotranspoter, the sucrose will be already binded to the cotransporter, and when the H^+ gets attached it changes conformation.

Cotransportation also need energy [redacted] for the stability of elelctrochemical gradient.

- **Endocytosis and Exocytosis (Bulking)**

Endocytosis and Exocytosis are the transportation methods used for large molecules, such as polysaccharides and proteins across the membrane via vesicles. This, of course, requires energy.

*Endocystosis: the taking of macromolecules by forming vesicles from the plasma membrane.

Types of endocytosis:

a) Phagocytosis – cellular eating.
b) Pinocytosis – cellular drinking.
c) Reciptor-mediated endocytosis (a more selective type of endocytosis).

*** revise LDLs of cholestrol and hypercholesterolemia

*Exocytosis: The secretion of macromolecules outside the cell. Secretion happens as follows:

1. A vesicle from inside the cell collects the macromolecules
2. The vesicle fusses with the cell membrane, and then the vesicle gradully opens to the fussion as the membrane expands. As a result, the macromolecules go out of the cell.

Notes:

i. Passive and active transportations are involved in only small molecules. On the other hand, exocytosis and endocytosis are involved in transporting large molecules.

ii. In the facilitated passive transport, we have 2 types of molecules: either polar molecules like sugars, and ions. Polar molecules move along the concentration gradient only. However, ions have 2 deciding factors that determines how and when they should be transported: the concentration gradient, and the electro gradient. As in the effect of the membrane potential of the ion. With both of them, this diffusion gradient is called the electrochemical gradient. for that, ions move along the electrochemical gradient (not concentration gradient)

iii. As we know, the ATP is consumed by the transporter of the solute. For this reason, the connection that happens between the molecules and the transporter doesn't need energy.

iv. Pumps can welcome more than 1 ion type, like the sodium-potassium pump.

v. In the sodium-potassium, the 2 ions get transported individually; as when the potassium binding sites are unreceptive when they are sodium ions binded, and same goes when potassium ions are binded.
vi. The binding sites of the sodium-potassium sites become unreceptive by tightening.
vii. The sodium-potassium pump is the main electrogenic pump in animal cells. While on the other hand, the main electrogenic pump in plant cells, fungi and bacteria is Proton pumps
viii. Receptor mediated endocytosis **may** allow other molecules that don't have a receptor to enter, but on a much lower extent.
ix. The vesicles used in Endocytosis and Exocytosis are formed from the plasma membrane.
x. Receptor-mediated endocytosis is used to take in cholesterol