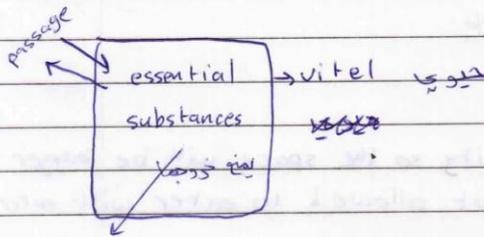


Chapter 7:- Cell membrane (if we destroy it, the cell will die)

* main function:-

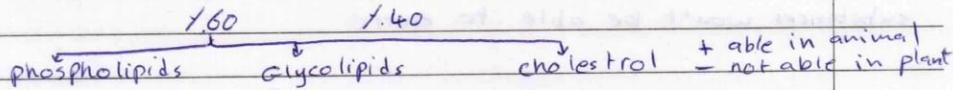
controlling the passage of material



* properties:-

- 1] selective permeability
- 2] thin 8nm (average)
- we can see it by electronic microscope

* made of lipids and proteins

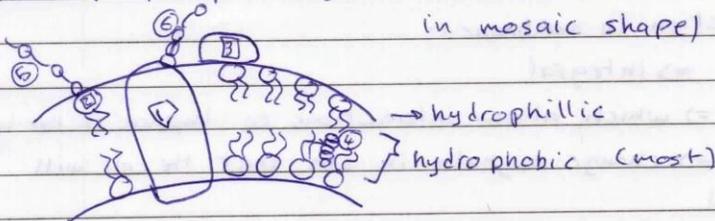


✂ عجزت

* molecular organization by Singer and Nicolson 1972

* The Fluid mosaic model \Rightarrow Freeze-fracture studies support this model.

* Fluid phospholipid bilayer:- (in which protein is embedded in mosaic shape)



1] integral protein (most important)

2] phospholipid (the cause of fluidity)

3] surface protein (peripheral protein)

4] cholesterol (hydrophobic) + phospholipids tail = hydrophobic

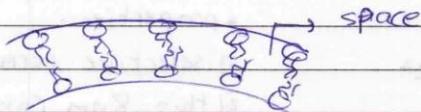
interactions. 5] Glycolipids on surface. 6] Glycoprotein

* membrane is bifacial

* membrane is fluid :-

Fluidity could increase or decrease, so it must be maintained

* membrane is rich in unsaturated fatty acid because it's more fluid.



* The temperature increase fluidity so the space will be bigger
=> big molecules which are not allowed to enter will enter

* If temperature decrease => space is smaller => good small substances won't be able to enter.

* The cell uses cholesterol to Maintain Fluidity (temp. buffer)

يستخدم الخلية الكوليسترول للحفاظ على السيولة (مخفف درجة الحرارة)

* fluid = motion = lateral (most) / ~~Flipping~~ (rarely)
Flipping (rarely)

* protein function in membrane :-

1] transport => integral

2] enzyme => which allow interactions to happen in memb

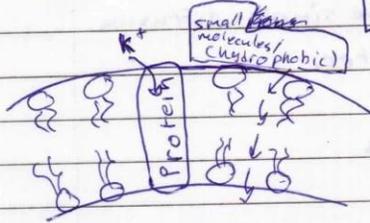
3] receptors => change signals in sth that the cell will understand.

4] intercellular joining

5] cell to cell recognition $\left\{ \begin{array}{l} \text{self} \\ \text{non-self} \end{array} \right. \Rightarrow$ Glycoprotein and some time glycolipids (because of their function they are on surface)

6] connect ECM and cytoskeleton to the cell

* selective permeability bec. phospho lipid bilayer
of special protein carrier



* large molecule => impermeable

* small
 } hydrophilic
 } hydrophobic (freely permeable by simple diffusion)

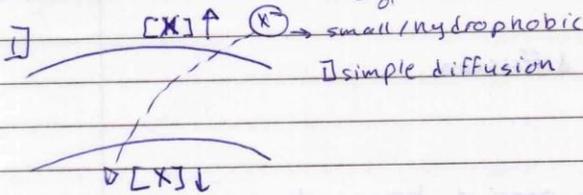
* CO₂ / O₂ ...

* Hydrophilic (polar/ions)

are moved by transport protein => restrictive permeability => because of the structure of the membrane

* movement across membrane :-

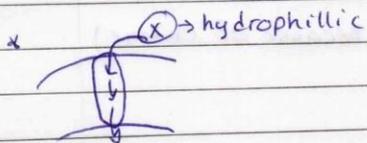
motion = kinetic energy ^{cause} of diffusion of small and hydrophobic



2] down hill (motion along the gradient) => passive => ...

* $\Delta[X] = 0 \therefore [X]_1 = [X]_2 \Rightarrow$ no movement

3] uphill (against gradient) => active => ...



* Passive transport \rightarrow facilitated diffusion (downhill)

* the different between it and the simple diffusion

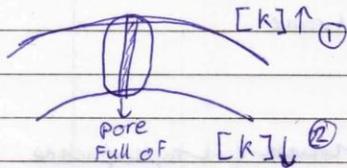
\Rightarrow this one needs a transporter.

* transporters (integral protein complex)

- passive
 - channels
 - carriers
- active \rightarrow carriers (pump)

\downarrow
group of polypeptide

1) channels (specific for 1 substance only)



eg: K^+ channel / Na channel

liquid
① \rightarrow ② = facilitated diffusion

② \rightarrow ① = active

* channels work only in passive transport

* channel = gated (open/close)

* regulated (open/close)

chemically &
(because of chemicals)

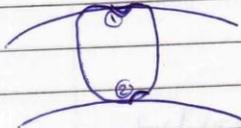
electrical
(because of charge)

2] carriers

(K) = subunit

□ = binding site = specific = receptive

⊠ = non-receptive



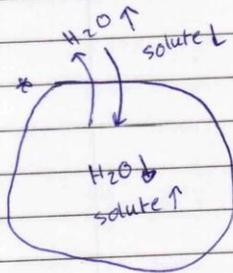
inactive conformation => binding => change in conformation ↑ protein binding site

=> Folding => binding site is closer to the cell

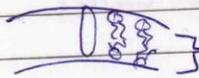
binding site * some carriers don't activate by connecting with substance they need also to connect with (P) => from ATP => energy => active transport.

* some carriers don't activate by connecting with substance they need also to connect with (P) => from ATP => energy => active transport.

* if ATP is not needed => passive carriers => work in facilitated diffusion.



isotonic (مساوية التركيز المائي) (المساوية)



hydrophobic = resist water molecules => some H2O ~~is~~ move without out channels => Most

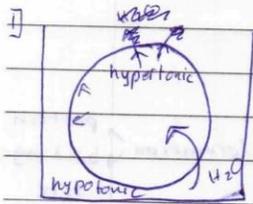
H2O move by channels => (Aquaporins)

* osmosis: movement of water from high concentration of water to low concentration of water.

* hypotonic less solute
* hypertonic more solute

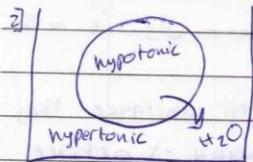
osmosis → animal cell (RBC)
 → plant cell

* animal cell :-

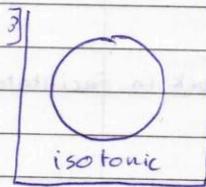


hypertonic

plasmolysis = (loss of cell membrane)

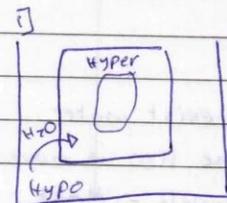


the cell will shrink => won't work well



the best

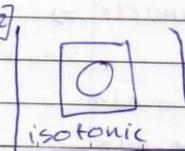
* Plant cell :-



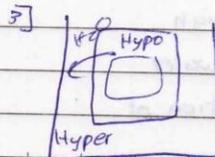
turgid (full of water)

the best

cell will → plasmolysis



flaccid
 ايسر

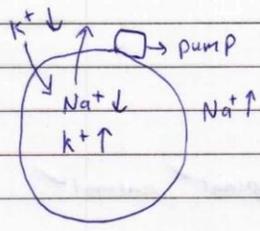


shrink → Gaps

→ plasmolysis

eg: glucose

* active transport :- polar / ionic = (electro-chemical gradient)
needs ATP (up hill, against the gradient)



* The cell always keeps $[Na^+]$ low / $[K^+]$ high, the cell has one carrier contains 2 binding site (move Na^+ out / K^+ in) = Na^+/K^+ pump

* carriers need ATP = pump

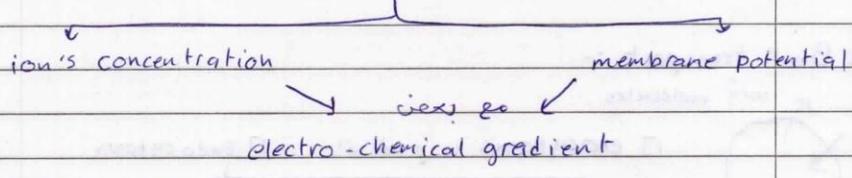
* it pumps 3 Na^+ out and 2 K^+ in = فرق ليك

∴ pump = ~~electrochemical pump~~ electrogenic pump

نقل في اتجاه

* Glucose is transported by active / uphill, against the gradient.

* electro-chemical gradient ⇒ 2 forces act on ions movement



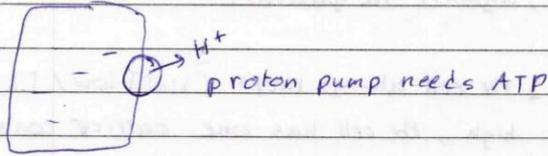
* $3Na^+$ out and $2K^+$ in - فرق + فرق
normal cell = (-) more than (+) charge

→ فرق ليك بين فرق جهد

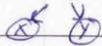
* membrane electrical potential = -50 (-) - indicate that the inner is more

range = -50 - -200
normal = resting potential. | negative than the outer.
 Na^+/K^+ pump change the cell to more negative

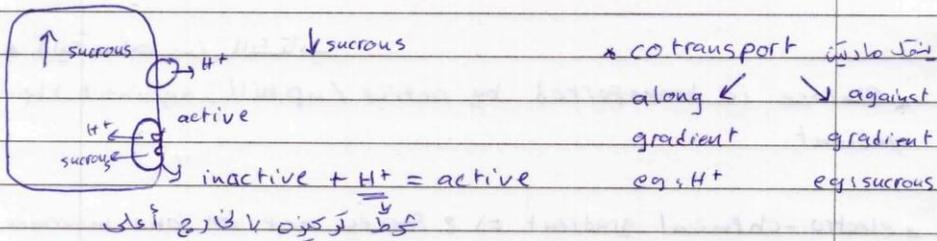
in plant cell the electrogenic pump = H^+ pump



indirectly active (secondary active) :- plant ✓ animal ✓
 CO transport سوا نقل مشترك لسكرتين



الطاقة المستخدمة في نقل جزيء ما في التوافق H^+ تركيزه خارج الخلية فتوفر البنية التحتية للخلايا.



Bulk transport :-

