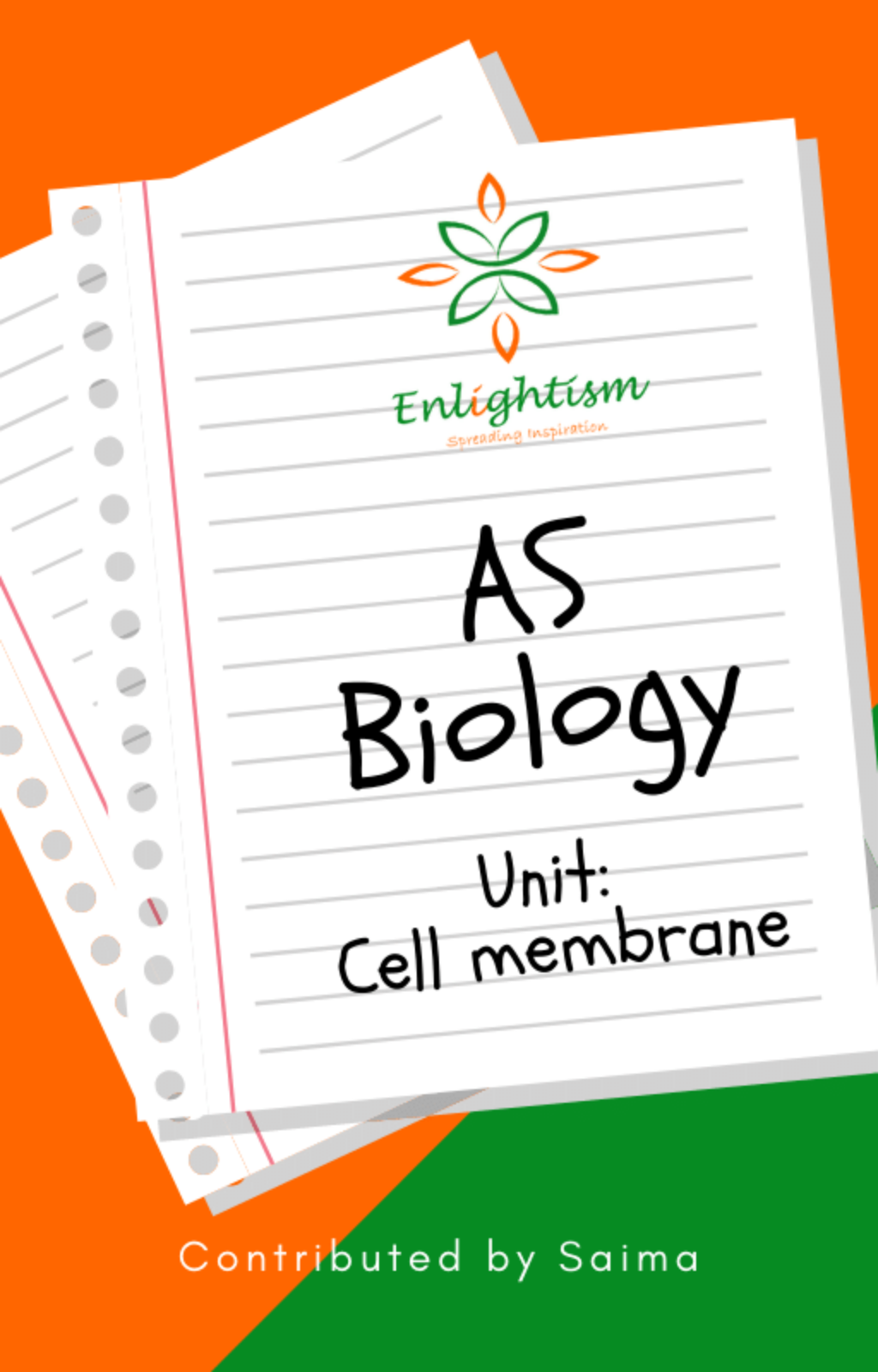
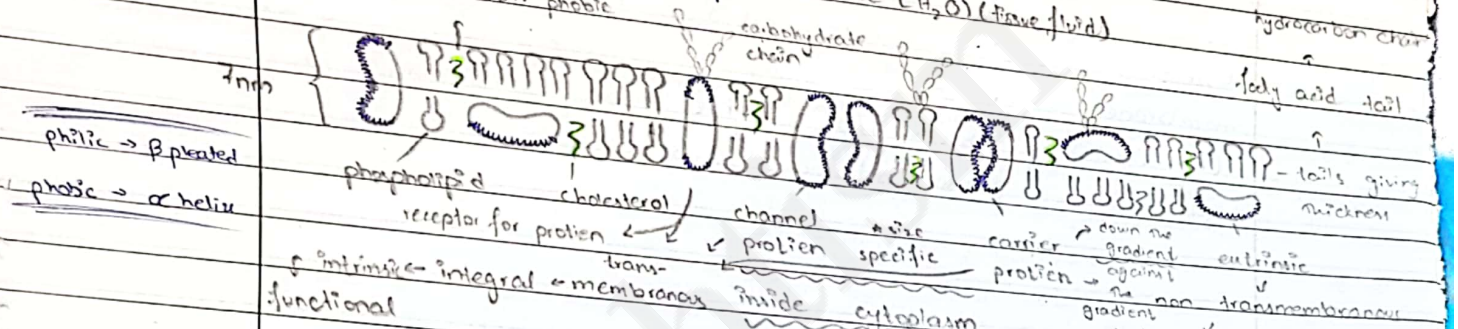

Enlightism
Spreading Inspiration
AS
Biology
Unit:
Cell membrane
Contributed by Saima

Cell Membrane

Wednesday

→ Thickness : 7 nm
→ observed with electron microscope
→ common feature in prokaryote and eukaryote
→ fluid mosaic model
→ freeze fracture technique outside (H_2O) (tissue fluid)



philic → β pleated
phobic → α helix

fluid mosaic pattern

cell membrane contains 2 monolayers of phospholipids which diffuse into each other. Between them protiens are scattered (in diff: patterns / mosaics). This is fluid mosaic model.

*phospholipids are movable

phospholipids → movable

protien → 99% movable

*membrane stays intact due to hydrophobic & hydrophilic interactions

*increasing temp → increases kinetic energy → mobility increase → denaturation of memb: since it does not remain intact

Sajid

Day / Date

freeze fracture technique

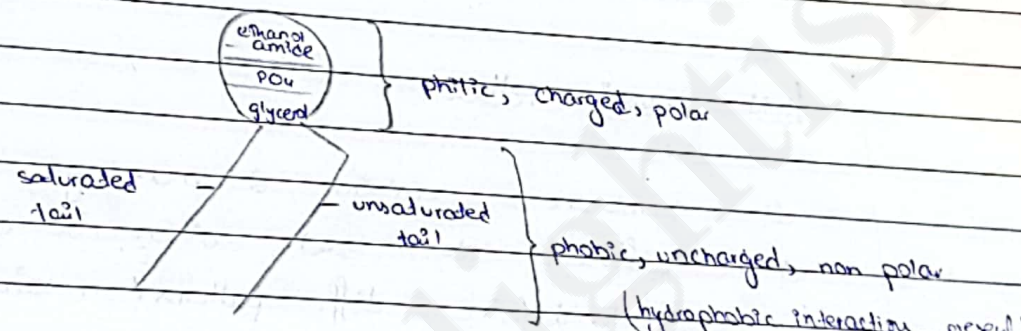
Cell membrane is fluid therefore it is difficult to cut it's cross section. For taking the cross sections we keep the cell in a freezer. Membrane becomes hard, easy to cut the cross section. This is called freeze fracture technique.

⇒ Composition varies. Mitochondria membrane and Thylakoid membrane contain 80% protien and 20% other things (cholesterol & phospholipid). myelin sheath contains 20% protien & 80% phospholipids and cholesterol.

↑ protien = metabolically active

↑ phospholipid & cholesterol = metabolically less active

Phospholipids



proportion of the tails keeps changing membrane

↓ rigid

- → increase saturated tails
- → less cholesterol
- → longer tail (more phobic interactions)

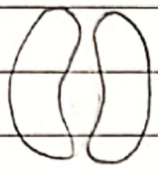
↓ fluid

- → increase unsaturated tails
- → increase cholesterol
- → shorter tails

Sajid

/ Date 17th Oct' 19 Thursday

Protiens



varies depending on the size of molecule that will pass

substrate specific (lock & key)

carriers

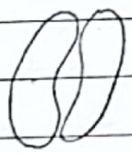
channels

- → single specific passive movements → no energy req:
- → no ATPase
- → always down the gradient
- → movement of molecules faster
- → contains no carbohydrate chains
- → keeps on changing it's position while transporting
- → fixed shape
- → allows H_2O soluble things

enzyme ATPase

- → having receptors
- passive / active
- → enzyme ATPase
- → down / against depends on need
- → slower
- → contains carbohydrate chains
- → does not keep on changing it's location
- → keeps on changing it's shape
- → H_2O soluble as well as H_2O insoluble

} while things are passing through. Otherwise both do



aqua porins

↓

only permeable to water

glycoprotiens

↓

receptor for protien (signaling)

↓

antigen (attached on cell membrane)

↓

when falls in plasma antibody

electron carriers

Sajid

Day / Date

O_2 & CO_2 pass through phospholipid bilayer

Cholesterol

functions

↓ increasing fluidity

↓ plugs entry of ionic solution via phospholipid bilayer which is totally non-polar

Carbohydrates (chains)

always on outside of cell membrane

↓ develops hydrogen bonding with H_2O molecules around

↓ giving mechanical stability to cell membr

helps in anchoring of cell membr with H_2O mol's around

→ chains are recognition site

→ binding (lock & key) occurs on the protein

length of chain keeps on changing

= mechanical stability anchoring

glycoprotien

↓ receptor

↓ protien receptor

↳ glycoprotien

(in membr) antigen ↙

↑ antibody (fallen out in plasma) (Blymphocytes)

Sajid

Day / Date

(the carbohydrate chains in glycolipid binds)

- glycolipid
  - receptor for steroid (aligon) (similar to protien)
  - helps in joining cells to make tissues

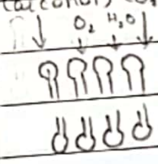
→ plant cells are joined via plasmodismatat

exchange processes

↓ P	↓ P	↓ P	↓ A	↓ A
diffusion	faciilated diffusion	osmosis	active transport	bulk transport

diffusion organic solvents (alcohol) CO_2 O_2 H_2O

*water is polar but passes through phospholipids due to small size



diffusion via phospholipids

O_2 CO_2 → no polar pass through non polar tail

pure H_2O ↑ polar small

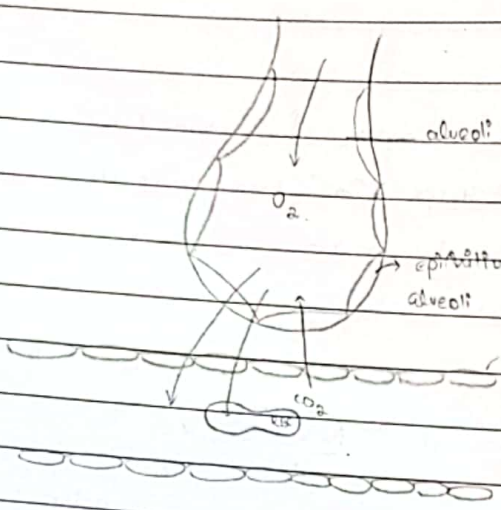
organic solvents ↑ phospholipids soluble in alcohol.

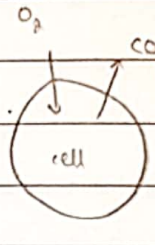
diffusion depends upon

- ↓ SA of molecule
- ↓ size of molecule
- ↓ thickness of membrane
- ↓ nature of molecule
- ↓ Conc: gradient
- ↓ temp:

Day / Date

*alcohol causes more damage to animal cells exposed to plant cells since cholesterol also dissolves in alcohol





(diffuse via phospholipid bilayer)

tissue fluid

# of membranes crossed

O_2 ↙ ↘ CO_2

in plasma ⇌ 4, 5 ⇌ in RBC

8, 10

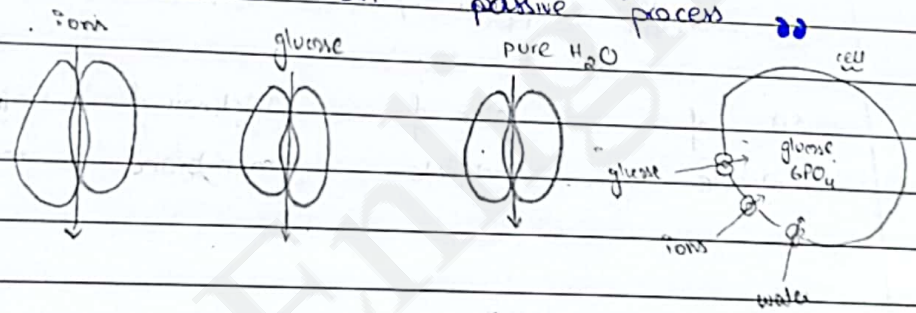
in plasma ⇌ 4, 5 ⇌ in RBC

8, 10

# of monolayers of phospholipids

facilitated diffusion

" diffusion via channel (protien) always down the gradient. It is an passive process "



Q. Why is glucose converted in glucose $6PO_4$.

* no channel / carrier for glucose $6PO_4$

bigger molecule is trapped in cytoplasm of cell and cannot leave via the same channel. It does not move via phospholipid bilayer as it has become charged.

to prevent backflow once inside increased

Sajid

Day / Date

diff b/w fac: diff

sim

- movement down the conc: gradient
- passive process

diff

- channels
- polar substances

Q cell membrane of mitochondria (inner) is less permeable to ions, water & salts, what should be it's composition. [3]

→ more cholesterol
→ less channels & carriers
→ unsaturated phospholipid tails
→ longer phospholipid tails

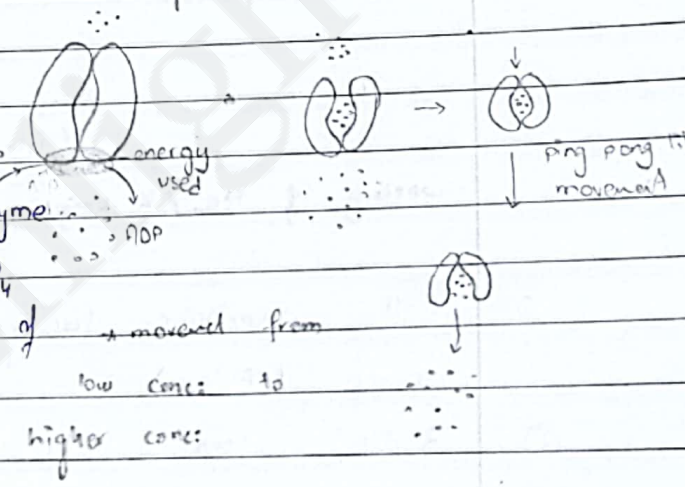
*channels are preffered over carriers for movement however channels exhaust uptake

active transport Q [4]

"movement of molecules from an area of lower conc: to an area of higher conc: against the conc: grad: using energy it is an active process."

from mitochondria
via aerobic respiration → O_2 present

1) always via Carriers
2) against the gradient
3) enzyme present on carrier. ATPase we provide ATP enzyme will break ATP → ADP → $1PO_4$ is used for changing shape of carrier (configurational changes) of molecules against gradient.



Sajid

Day / Date

carriers work depending on need of cell

if

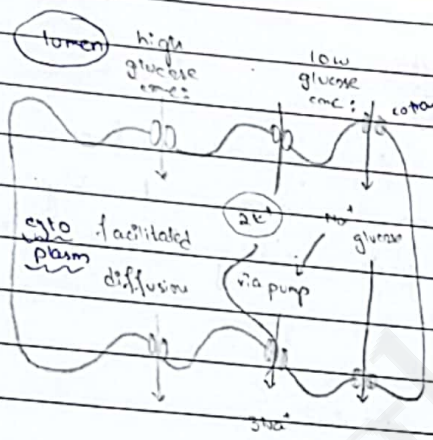
glucose more outside → enter via facs diff:

glucose more inside → enter via active transport

Carriers

ATPase → Proton pump → transport in plants → loading of sucrose

Na^+ / K^+ pump → ATPase



(active transport)
The Na^+ is pumped out creating low conc: in cytoplasm
Na^+ being polar, drags glucose along into the cytoplasm (secondary active transport)

working of Na^+ / K^+ pump:

① Cell membrane facing blood capillary contains Na^+ / K^+ pump (ATPases)

② 3 Na^+ ions enter the blood, in return 2 K^+ ions enter the cytoplasm. K^+ ions exits the lumen via facilitated

Sajid

Day / Date

diffusion.

③ due to the movement of Na^+ ion from the cytoplasm, there is deficiency of Na ion in the cytoplasm of cell.

④ To maintain the conc: of Na^+ ion. in the cytoplasm, Na^+ ion with glucose enters the cytoplasm via co-transporter protien or symporter (a chamel from which 2 things pass at a time)

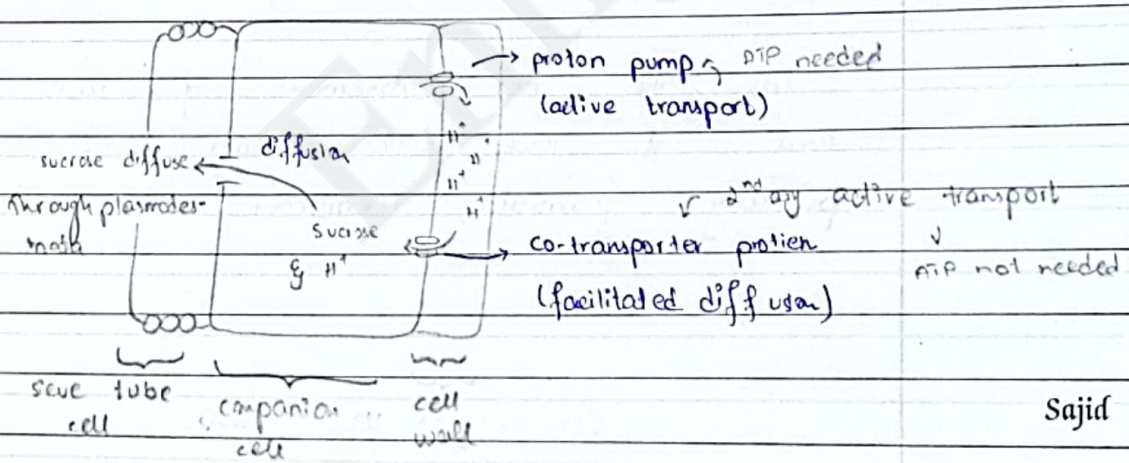
⑤ Na^+ ions are charged ions. They produce a dragging force or driving force which takes glucose with it inside cytoplasm

⑥ from cytoplasm, glucose enters the blood via facilitated diffusion

⑦ Secondary active transport depends for it's working on active transport. No active transport mean no secondary active transport.

⑧ When Na^+ ions enter into the cytoplasm, water potential becomes lower or more negative. To maintain it, water rushes from lumen into the cytoplasm, back into the blood via aqua porin. Reabsorption of water also occurs.

proton pump
↓
transport in plants



Sajid

Day / Date

Q What is passive movement?

Q What is active process?

Q Give diff: b/w diffu: & faci: diffu:

Q Give diff: b/w faci: diffu: & active transport.

Osmosis

"In the net movement of water molecules from area of lower conc: down the gradient through partially permeable membrane."

- Sajid

wilting → plasmolysis

carrier works according to need whilst channel does not

Day / Date 24th Oct '19 Thursday

* incipient plasmolysis ↓ start of plasmolysis

Osmosis / H_2O

phospholipids (pure H_2O passes through) | aquaporins (H_2O channels to aid movement of H_2O) * | channels / carriers

Plant cell

Isotonic: no change

hypotonic: increase in size, cell turgid, slight ↑ in ψ_w

hypertonic: plasmolysed, temporary / permanent

Animal cell

isotonic: no change

hypotonic: bursting / lysis

hypertonic: permanent crenation

Osmosis

water potential

pure water = 0 ψ_w

↓ solute

lower / -ve

same

Solute Potential

wp becomes lower / negative

Solute pressure

conc. of solute ↓ becomes higher

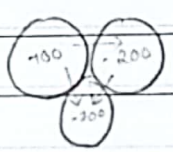
* when solute is added, both wp & sp become lower / -ve

however the solute pressure becomes higher / +ve.

conc. of solute

When sucrose is added in seive tube cell, wp or sp becomes lower / -ve, solute pressure becomes higher

turgor pressure



water movement

Sajid

Day / Date

Bulk transport :-

Bigger molecules → Proteins

↓

to which

↙ ↘ ↘

Phospholipids | Channels | Carriers

× | × | ×

* cell membrane itself

↙ ↘

making it | breaking it

(energy req: active)

bulk transpal

↙ ↘

solid | liq

↓ ↓

phagocytosis | ovary egg

↓ ↓ (pinocytosis)

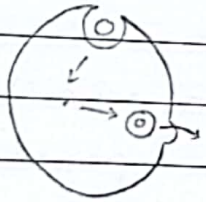
memb: engulfed pathogen, | follicle cell

foldings developed

around pathogen

↓

endo cytosis



the memb: containing waste throws out its contents, & itself becomes a part of the CSM act therefore we can say the membrane grows

Sajid

ADH, glucagon, insulin, FSH, LH → protien in nature

Date 28th Oct'19 Monday

Cell Signalling:

It is communication b/w cells

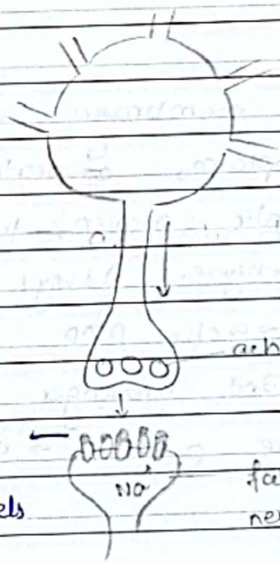
↓

① Insulin dumped in plasma, produced by pancreas, binds with CSM of liver cells.

→ glucose uptake increases
→ CSM's permeability increases
→ glucose converted into glycogen
→ rate of resp: ↑es

↓

②



ach neuro transmitter

never enters ←

NO

falls on CSM of another neurone

acetylcholine
↓
protien in nature

ion channels open
↓
signal transferred

Owen

Eis
Saeed

signal (hormones)

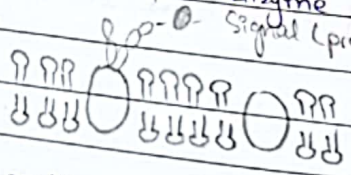
Protein

bigger molecule

never enters the cell

binds on csm on receptor (glycoprotien)

when the cell series of enzyme catalled reac: starts



1. Signal protien
2. Binds on cell membrane receptor
3. Inside in cytoplasm, G protien activated
4. Activates → enzymatic protien, transmembranous
5. Activates on enzyme. Adenyl cyclase
6. Converts ATP → cyclic AMP
7. Cyclic AMP 2nd menenger
8. Converts inactive protien → active

Steroid

receptor glycolipid

enter the cell

passes non polar tails

receptor

in cytoplasm & nucleus

ATP → cyclic AMP

2nd messenger

enzyme

nucleus some mito- chondria other enzymes

outside

enzyme

enzyme 1

enzyme 2

enzyme 3

enters nucleus

binds on mitochondria

secreted

switches on gene

more ATP metabolism

outside

transcription starts

exocytosis

Sajid

ite

29th Oct '19

Tuesday

Cell membrane Q's

Q, what are extracellular and intracellular enzymes?

↓ outside, enzyme u in signalling

↓ work inside, help in cell signalling

Q There is a protien (toxin) produced by bacteria, works on RBC.
Can dissolve / damage
a) phospholipids bilayer
b) channels ion
c) carriers down & against grad
what will be effect on working of RBC if in tissue fluid

a) uncontrolled water enters, lysis happens (haemolysis
b) glucose & ions will have an influx, wp will drop so water will also rush in, lysis occurs

Sajid

ay / Date

1) Water enters, bursting

scenario: cell wall of a plant cell damaged

→ cell will not burst.

Q. How mitochondria destroyed by cell signalling and why is it destroyed? [3]

signal within the cell binds on mitochondria, series of enzyme controlled reactions, mitochondria will be denature. OR/

signal send to lysosome to destroy worn out mitochondria. It will engulf.

reason: Mitochondria working inefficiently

*signal is never protein either protein or steroids always enter

Q. Explain how the structure of phospholipids allows the formation of phospholipids bilayer of cell membrane. [3]

head phylic towards water, phobic tails come close, phobic interactions created, bilayer made.

Q. RBC placed in NaCl solution is crenated because it has an abnormal shrivelled appearance Explain how this RBC has shrivelled. [3]

placed in hypertonic, water moved out, cell crenates, exo osmosis

Sajid

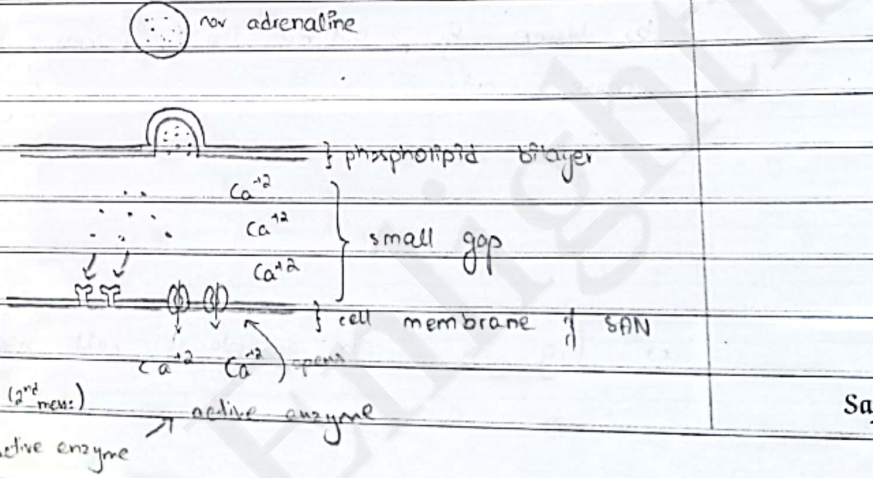
*partitioning of a cell into 2 is cytokinases.

Q1 Following liver tissue damage chemicals are produced and released into circulation. These chemicals are able to stimulate liver cells to help tissue repair. Explain how this is an example of cell signalling. [3]

signal from blood plasma. Binds on liver cells. mitosis gene activated (rapid repair is mitosis). receptor is specific. lock and key. Sofar of enzyme controlled reaction. Cell divides

•lock & key •specificity

Q2 The activity of SAN (Sino atrial node) on heart controlled by nervous system nerve cell in SAN

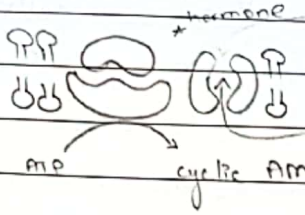


Day / Date

Q a) With reference to figure outline the process of cell signalling.

→ non adrenalin secreted (exocytosis)
→ bind on receptor
→ lock & key
→ within cell ATP → AMP (2nd mess)
→ calcium channel is opened

Q b)



Inactive protein → active enzyme → active enzyme ATGL adipose triglyceride Lipase

Adipose contains fats

fats → fatty acids + glycerol

a) Name the bond broken by active ATGL to break fats.

ester

b) Name & outline the process by which fatty acids move out.

facilitated diff: / active transport
(any one)

c) fig is an example of cell signalling. within the

Sajid

adipocyte. With ref: to fig: outline procen of cell signalling.

d) All adipocyte (non fat depositing) use fats on source of energy why not RBC.

↓ does not have enzyme, nucleus,

Q a some alveolar cell produces a surfactant that helps to prevent collapse of alveoli on exhalation. Too much surfactant decreases elficiency of gas exchange. In alveoli a glycoprotien known as GM. CSF is released by some cell of immune system when there is too much surfactant in alveoli. Excess surfactant is then broken down by alvolar macrophage. Receptors GM. CSF are on cell surface membrane of alveolar macrophage. Explain how maintaining correct quantity of surfactant in alveoli is result of cell signalling process.

Sajid

Contact Us For Queries Or Suggestions

Email us at: contact@enlightism.com

Follow Us At:
@enlightism

ENLIGHTISM.COM