

Biological Oxidation.

① structure of mitochondria

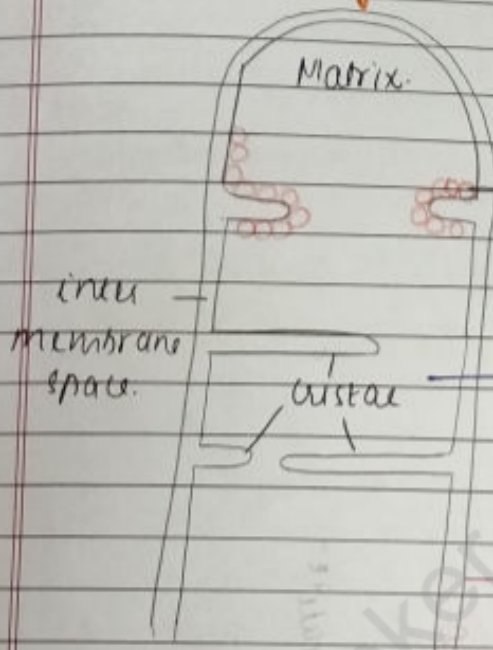


Fig Structure of mitochondrial membrane

Enzymes of inner membrane include:

- ① e^- carriers (complex I-IV)
- ② ATP synthase
- ③ Membrane transporters.

Enzymes of mitochondrial matrix:

- ① TCA enzyme.
- ② β -oxidⁿ enzyme
- ③ Pyruvate dehydrogenase.

outer membrane enzymes in outer membrane include:

- ① Acyl CoA synthetase /
- ② Glyceral P₀; Acyl transferase.

① → REDOX POTENTIAL → e^- transfer potential.

② [Oxidⁿ - e^- loss
Reductⁿ - e^- gain.

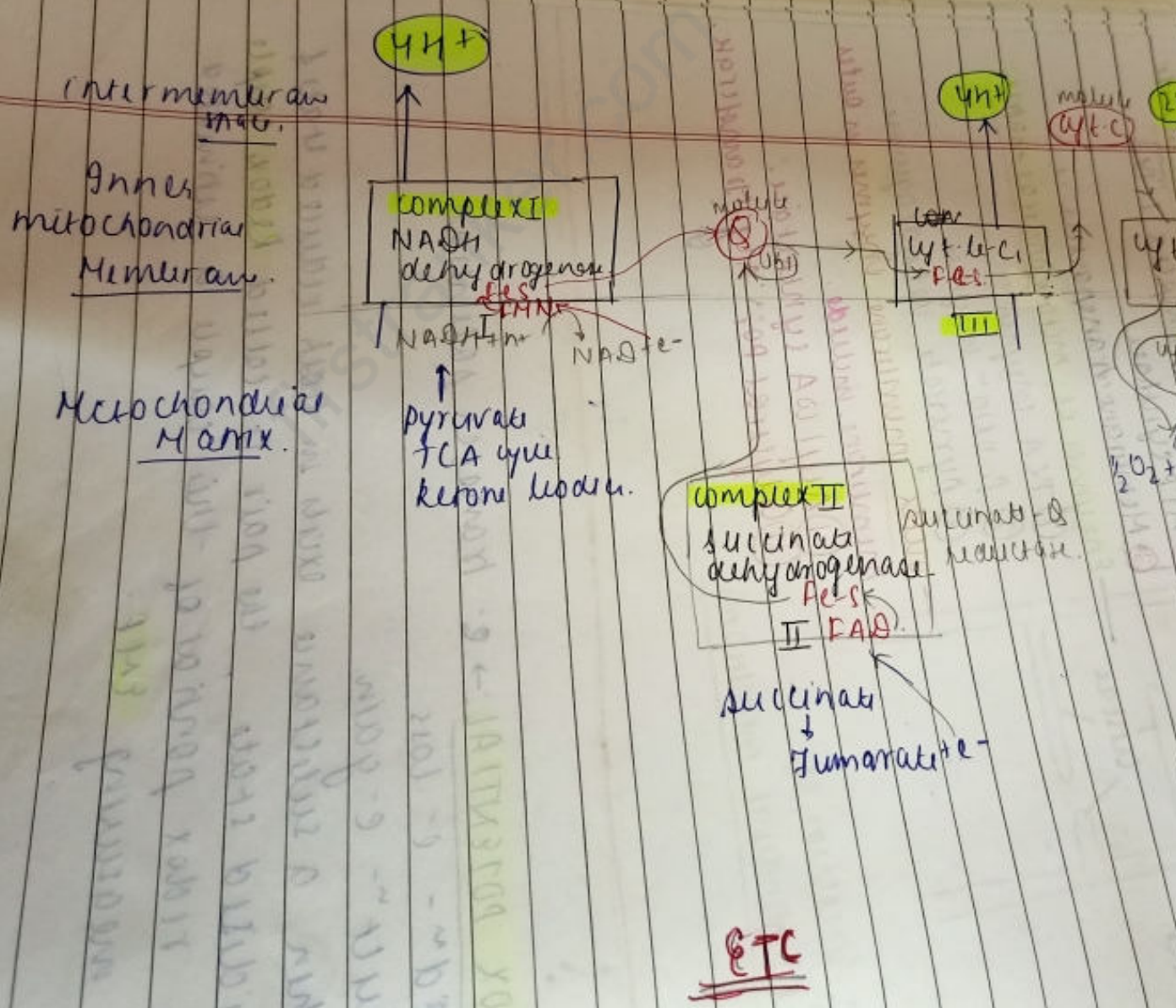
③ - When a substance exists in both reduced state & oxidised state, the pair is called Redox couple.

④ - The redox potential of this couple is estimated by measuring EMF.

METRO

THE TELEGRAPH CALCUTTA WEDNESDAY 23 SEPTEMBER

ce... on molest complaint by transpeople



Cytochrome c

Ubiquinone / Coenzyme Q

- (i) soluble protein
- (ii) mobile
- (i) diffuses rapidly within membrane
- (ii) Ubiquinone (Q) → Ubiquinol (QH₂)

OXIDATIVE PHOSPHORYLATION: chemiosmotic hypothesis

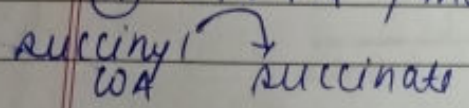
(i) The flow of e⁻ through the respiratory chain generates ATP by OP.
(ii) Energy released during the process of biological oxidⁿ is used to synthesize ATP.

- This coupling of oxidⁿ with phosphorylation is called oxidative phosphorylation.
- ~90% of ↑ energy PO₄³⁻ produced by complete oxidⁿ of 1 mol glucose is obtained via oxidative phosphorylation coupled to respiratory chain.

Substrate level phosphorylation:

- Energy from ↑ compound is directly transferred to nucleoside diPO₄³⁻ to form a tri-PO₄³⁻ without the help of ETC.

Ex: - (i) Net direct capture of 2 ↑ E-PO₄³⁻ - Glycolysis.
(ii) 2 ↑ E-PO₄³⁻ / mol of glucose - TCA cycle.



- All these phosphorylations occur at substrate level.
- ATP Generation with more exergonic metabolic rxn.

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Chemiosmotic Theory:

- ① - Coupling of oxidⁿ with phosphorylation is called oxidative phosphorylation.
- ② - Peter Mitchell proposed chemiosmotic theory to explain oxidative phosphorylation.
- ③ - Transport of protons from inside of IMM to intermembrane space.
- ④ - (4+) 1- intermembrane space.
 - H^+ gradient is produced across the membrane.
- ↓
- Electromotive force caused by electrochemical potential difference
- ↓
- drives ATP synthesis by ATP synthase (complex V).
- ⑤ - complex I, II, III, IV - Proton pumps.

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ATP synthase (complex V)

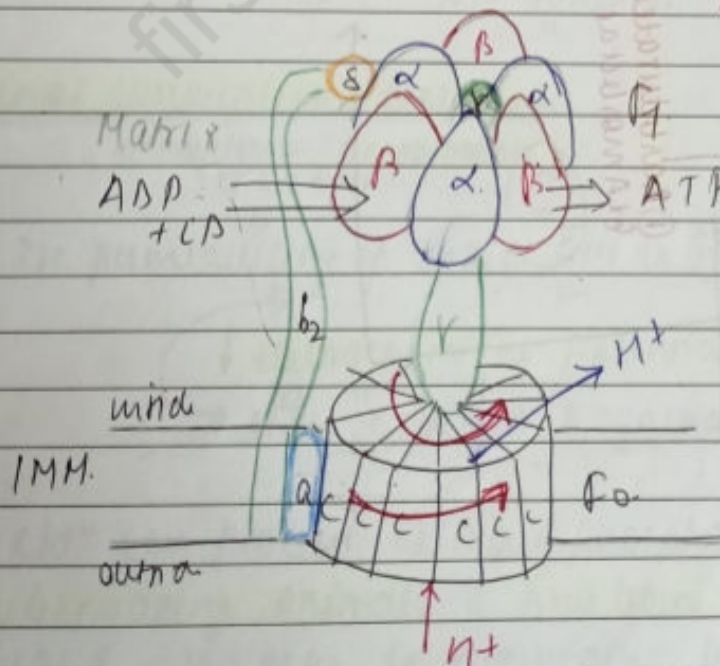
- (1) → Embedded in ~~inner~~ IMM.
- (2) → Proton motive force ^($\Delta\mu$) drives ATP synthase to synthesize ATP in the of ADP + P_i .
- (3) → It consists of 2 functional units:-

F_0 - 3 α & 3 β + γ

F_1 - active

- | | |
|--|---|
| (i) → consists of several protein subunits. | (ii) → consists of several subunits - form ball like shape. |
| (ii) → embedded in IMM. | (iii) → project into matrix. |
| (iii) → forms H^+ channel. | (iv) → contain phosphorylation mechanism. |
| (v) → flow of H^+ through F_0 F_0 rotate → | (vi) → ATP production in F_1 complex. |

binding change mechanism.



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moolest complaint by transpeople

have said in their complaint with Bowbazar police station that they had been verbally abused and physically molested.

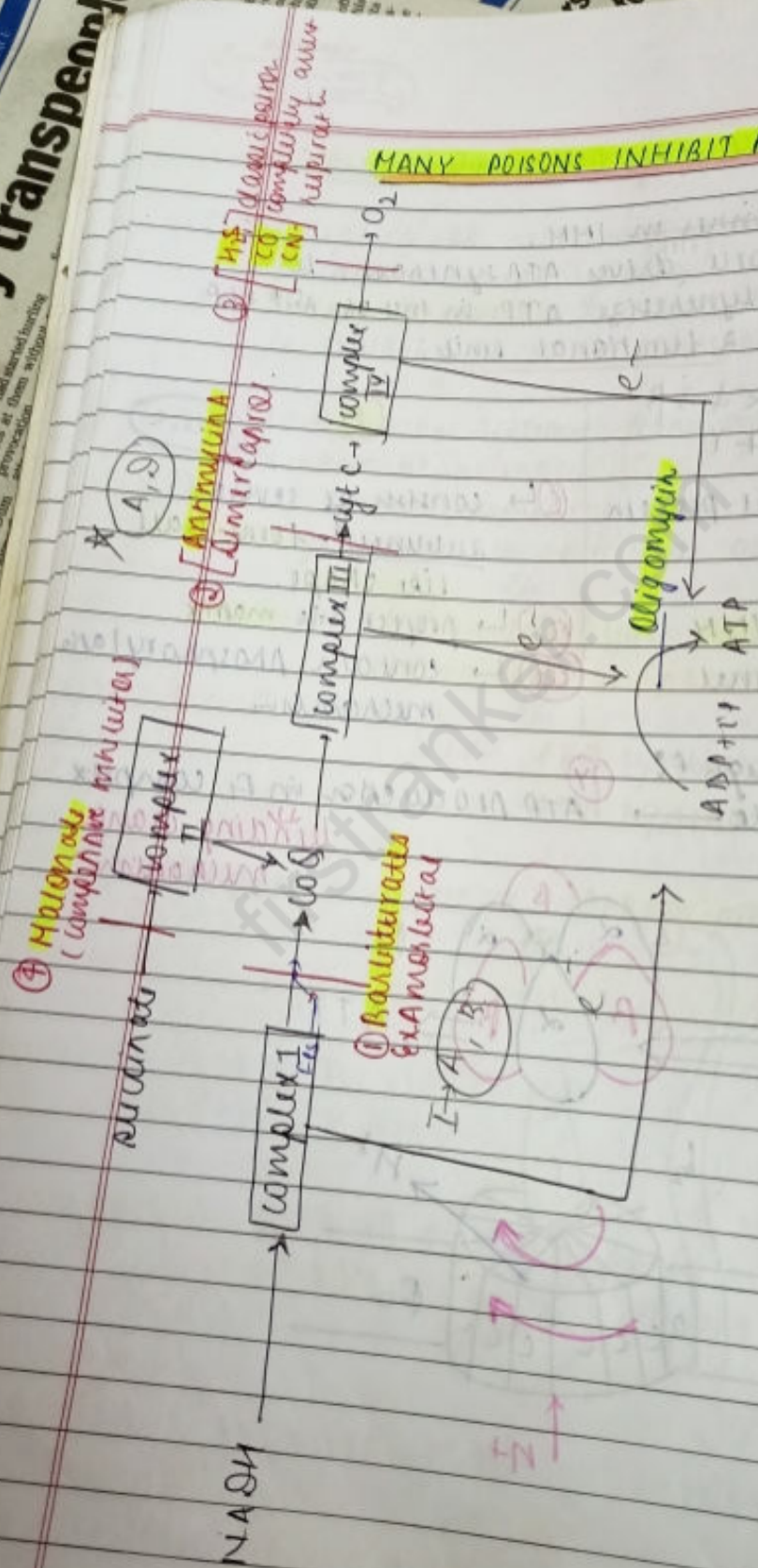
of by a drunk. They have said he is a police officer. "We came from Durgam Chattri and parked our car at the entrance of the police station."

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MANY POISONS INHIBIT RESPIRATORY CHAIN



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POISONS

① Inhibitors of Respiratory chain

- ① Barbiturates
ex- Amobarbital
- ② Antimycin A
Dimercaprol

④ H₂S
⑤ CO
⑥ CN⁻ } classic poisons

④ Malonate

② Inhibitors of oxidative phosphorylation

- ① Atractylaside:
inhibit transport of ADP into & ATP out of mitochondrion.
- ② Antibiotic oligomycin:
completely block oxid^m & oxidative phosphorylation by blocking e⁻ flow through ATP synthase.

③ Uncouplers

- ① allow oxid^m to proceed but e⁻ linked of being trapped by phosphorylatⁿ is dissipated as heat.
- ② achieved by removal of H⁺ gradient.
- ③ cause respiratory

Role of Uncouplers & their sig:

uncouplers - amphipathic
eg- 2,4-DNP

to become uncontrolled.

eg- 2,4-DNP.

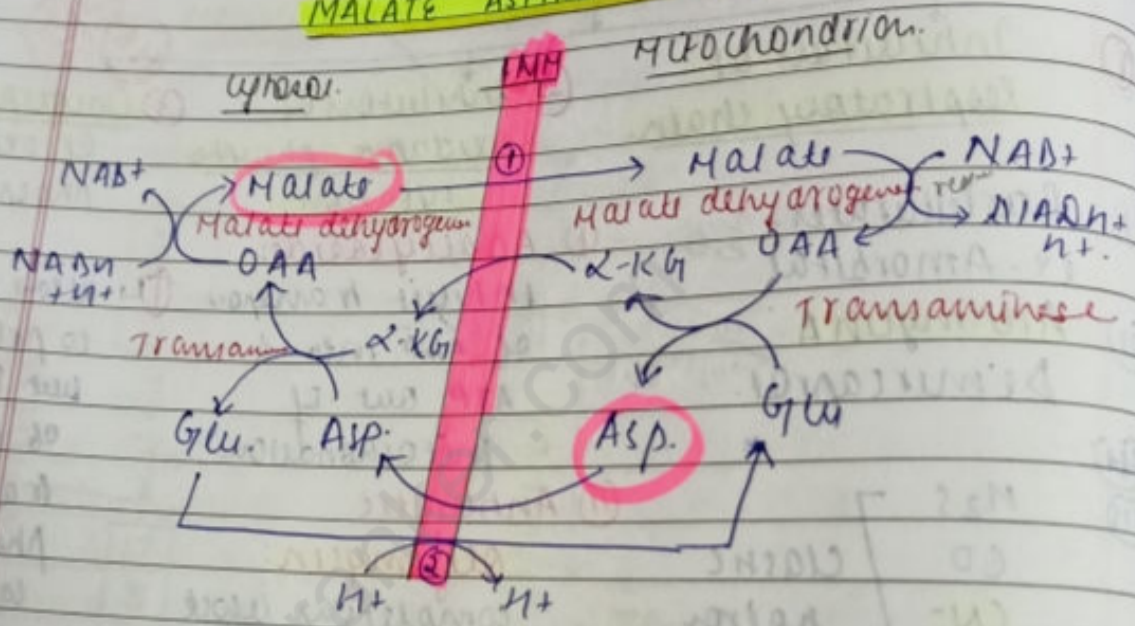
The permeability of lipid IMM to H⁺

↓ electrochemical potential.
short circuit ATP synthase.

∴ oxid^m can proceed without phosphorylation

- ① In hibernating animals & new born infants, liberation of heat is req. to maintain body temp.
- ② In brown adipose tissue, thermogenesis achieved by uncouplers.

MALATE ASPARTATE SHUTTLE



- ① - more universal utility.
- ② - complexity due to impermeability of IMM to AA.

$$\begin{matrix} \text{OAA} \\ \downarrow \\ \text{Glu} \end{matrix} \xrightarrow{\alpha\text{-KG}} \begin{matrix} \alpha\text{-KG} \\ \downarrow \\ \text{Asp.} \end{matrix}$$
- ③ - 2.5 mole of ATP formed / mol of O₂ atom consumed.
- ④ - In glycolysis 3 H₂O₂ 1.5 mol of ATP / O₂.