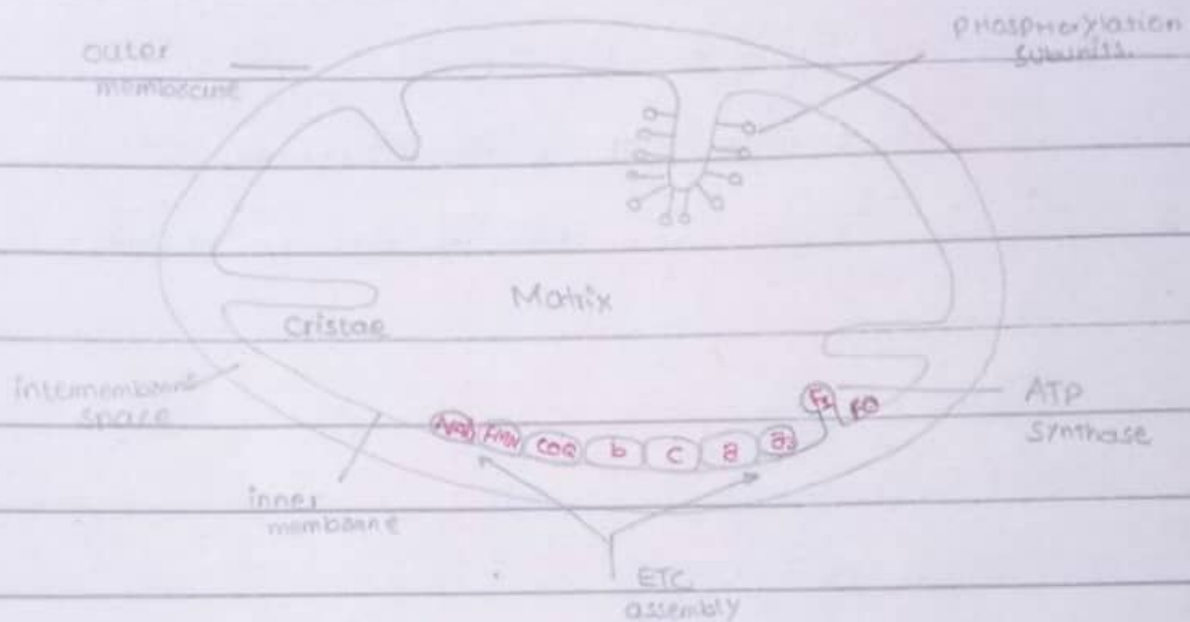


Bioenergetics

Draw and Explain structure of Mitochondrion with location of ① ETC ② location of different Enzym

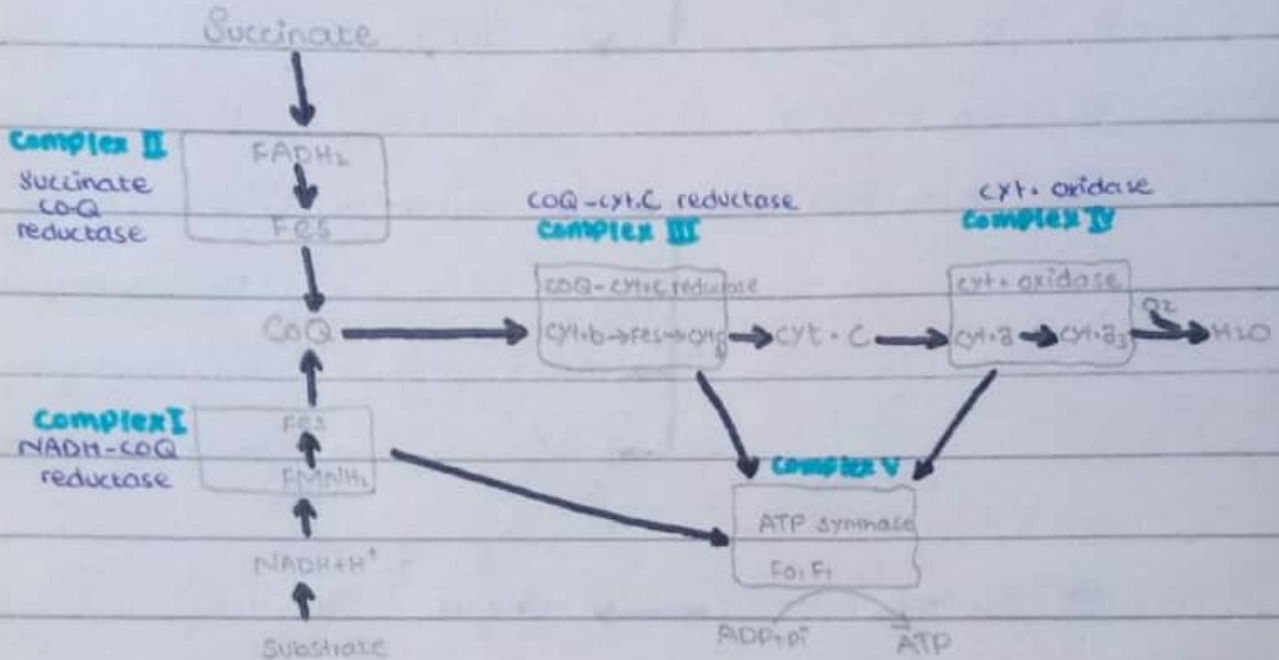


Mitochondrial matrix contain Enzyme which are responsible for ① β oxidation of fatty acid ② Citric acid cycle ③ oxidation of amino acid.

Inner mitochondrial membrane which is impermeable to H^+ , K^+ , Na^+ & small molecule of ATP, ADP. There are phosphorylated subunits which are center for synthesis of ATP synthesis.

ETC assembly present in inner mitochondrial membrane.

Draw ETC and Explain various segment along with their inhibitors:



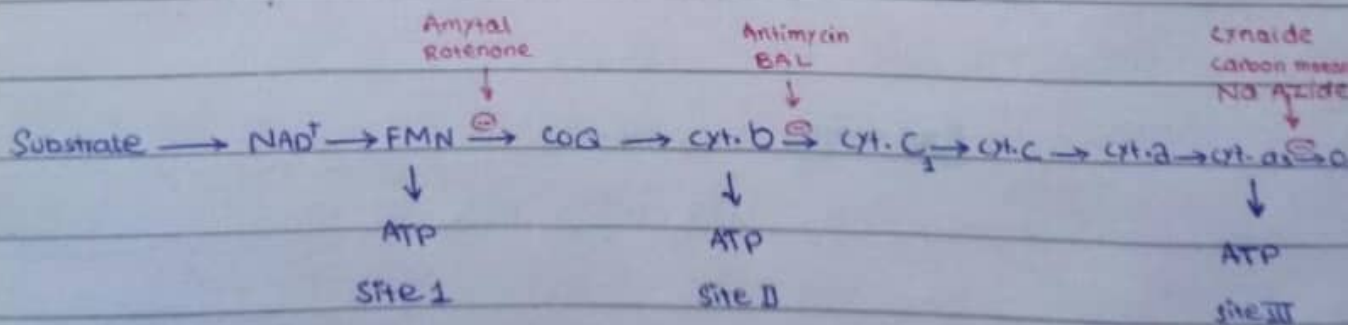
→ ETC is a series of electron carrier containing

NAD, FAD, FMN, CoQ, cyt. b, c, and a & a₃.

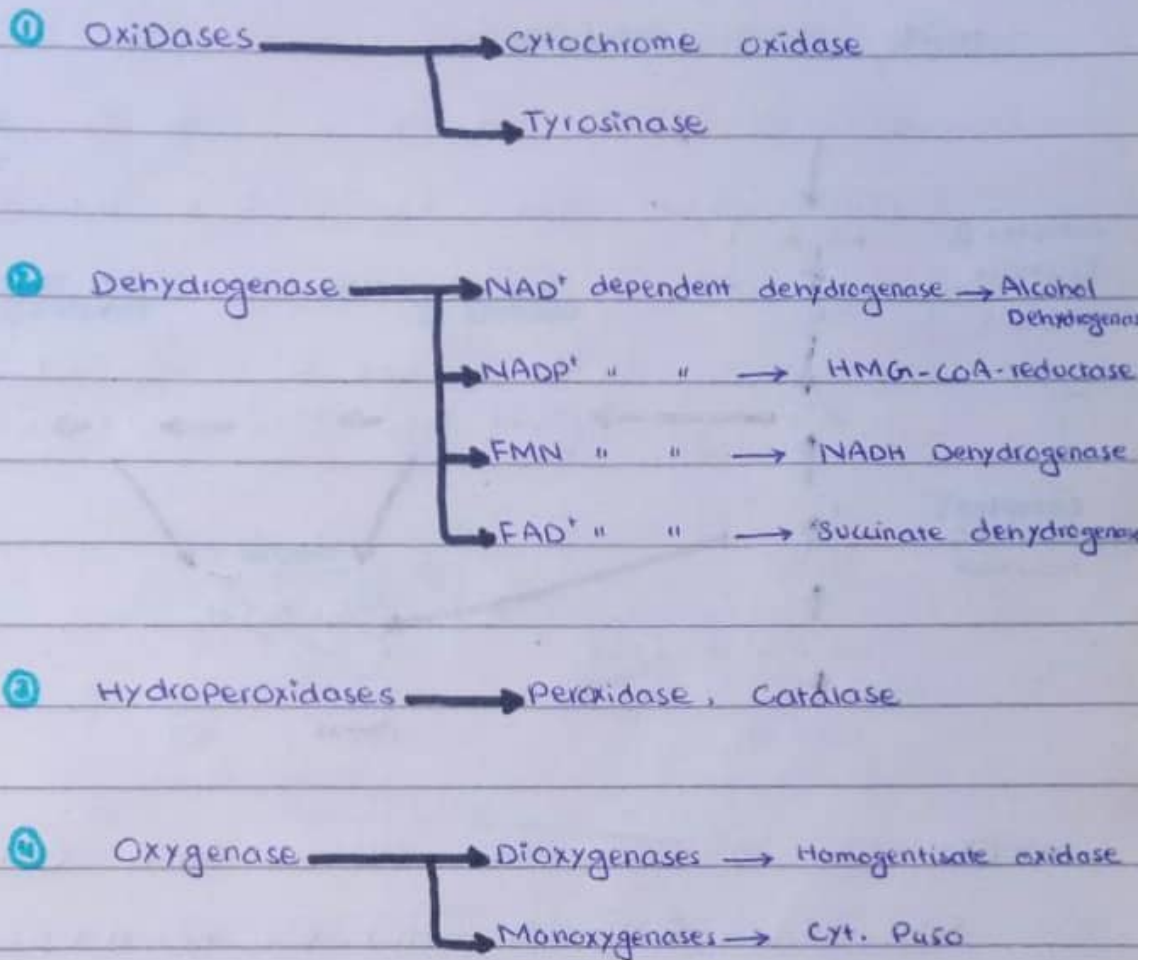
→ It takes place in the inner mitochondrial membrane.

→ Complex V causes ATP synthesis by oxidative phosphorylation.

Inhibitors:



Classify Enzyme Coenzyme of Oxidative Phosphorylation:



Substrate level Phosphorylation:

Energy From high energy Compound is directly transferred to Nucleoside diphosphate to form triphosphate without of ETC.

Example: Pyruvate Kinase
Succinate thiokinase

Oxidative Phosphorylation Mention Physiological and Synthetic uncouplers along with their role:

The transport of electron through Electron Transport Chain is linked with release of free energy. The process of generation of ATP from $ADP + P_i$ coupled with ETC is called oxidative phosphorylation.

Uncouplers:

There are certain substances which uncouple ETC from oxidative phosphorylation, called synthetic uncouplers.

- ① 2,4 dinitrophenol
- ② Dinitroresol
- ③ Pentachlorophenol
- ④ large doses of salicylate.

2,4 Dinitrophenol:

They ↑ permeability of H^+ ion in inner Mitochondrial Membrane. Causes ETC to proceed at rapid rate without maintaining proton gradient.

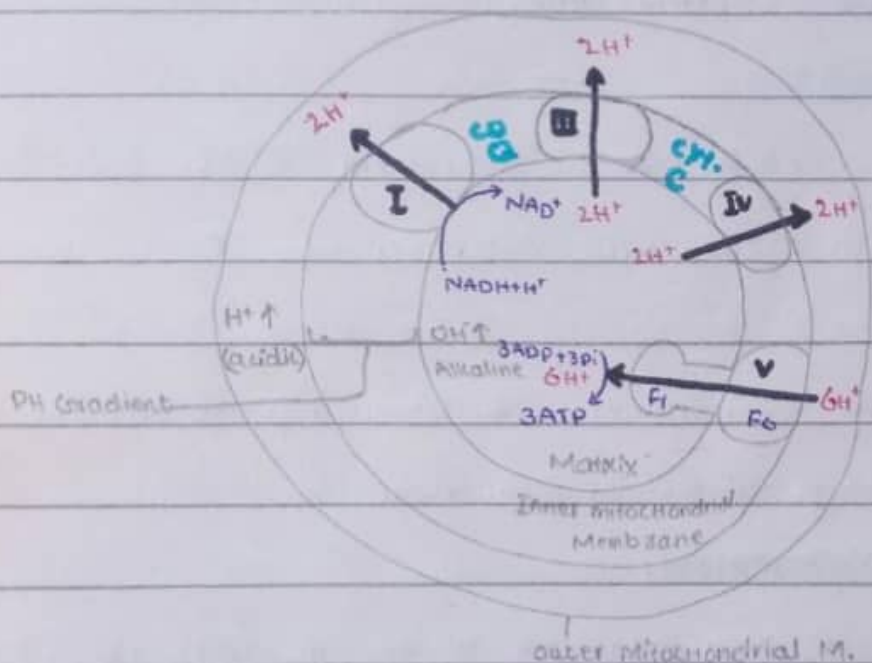
Energy produced by this mechanism is dissipated as heat instead of forming ATP.

Physiological uncouplers:

- 1) long chain Fatty acid
- 2) Conjugated bilirubin
- 3) Thermogenin
- 4) Thyroxine

Chemiosmotic theory :

This Hypothesis state that Proton that have transferred to cytosolic side of inner mitochondrial membrane can enter mitochondrial matrix by passing through Channel in ATP Synthesis and catalyze the



P:O ratio : P:O ratio refer to no. of inorganic phosphate molecule utilize for ATP generations for energy Atom of oxygen consume.

→ 2.5 for NADH

→ 1.5 for FADH₂

Cyanide Poisoning :

Cyanide is potent inhibitor of ETC. It binds with Fe^{3+} of cytochrome oxidase and causes blockage in mitochondrial respiration.

Cyanide poisoning causes death because of tissue asphyxia.

Treatment :

Antidote kits available which contain amyl nitrate and sodium nitrate.

Redox potential :

Oxidation reduction potential or simply redox potential is quantitative measure of tendency of redox pair of to lose or gain electron.

More negative redox potential represent more tendency to lose electrons and more positive redox potential represent more tendency to accept electrons.

$NAD^+ / NADH$ -0.32 volts

$NADP^+ / NADPH$ -0.32 volts

Fumarate / Succinate +0.03 volts