

III) Fatty acid CoA - ligase

IV) Kin. hydroxylase

### ENZ. OF I.M.

- resp. chain enzymes
- ATP - synthetase
- succinate dehydrogenase.
- $\beta$ -Hydroxybut. dehydrogenase
- Fatty acid acyl transferase.

### ENZ. MATRIX

- Mal. dehydrogenase
- Isocit. "
- $\alpha$ -ketacid "
- Fumerase
- Aconitase
- Cit. synthetase
- $\beta$ -oxid<sup>n</sup>. enz.

### ENZ. OF SPACE BETW. O.M. & I.M.

- Adenyl kinase
- Nucleoside diphosphokinase.

## FUNCTIONS

\* [Mitochondria contain a large battery of enzymes & co-enzymes which contribute ~~in~~ much in their functional activities & are involved both in catabolic & anabolic activities occurring inside the cell] Their functions can be studied under ~~before~~ following headings: -

### ① PRODUCTION OF ENERGY:

Enz., found in mit.; help in the oxid<sup>n</sup> of assimilated ~~car~~ major food stuffs - carbohydrate, proteins & fats. In this process, they are converted into pyruvic acid, amino acids & fatty acids & glycerol respectively. These products pass thru' several steps to produce water,  $\text{CO}_2$  & energy. These successive steps are:  $\rightarrow$

- Glycolysis
- oxid<sup>n</sup>. of Pyruvate
- Kreb's Cycle &

#### d. Oxidative phosphorylation.

Breakdown of glucose into pyruvate (P.A.) is called "Glycolysis" & enz. for it are found in cytosol, i.e., ~~outside~~ outside the mitochondrion. P.A. is oxidised to acetyl CoA giving a pair of  $H^+$  ions ( $2H^+$ ).

Acetyl CoA enters the mitochondrion & the Krebs's cycle starts. It condenses w/ oxalo-acetate to form citrate which ~~again~~ again undergoes ~~steps~~ steps of oxid<sup>n</sup>. & red<sup>n</sup>. rxns. giving rise to oxalo-acetic acid. During this process, 4- dehydrogenation rxns. take place liberating 1 pair of  $H^+$  ions ( $2H^+$ ) ~~at~~ at each step. One ATP mole is formed at the substrate level. Thus, 4-pairs ( $8H^+$ ) of  $H^+$ -atoms are removed by the dehydrogenases & accepted by their coenz. parts - NAD & FAD. An overview of TCA cycle is given below:  $\rightarrow$

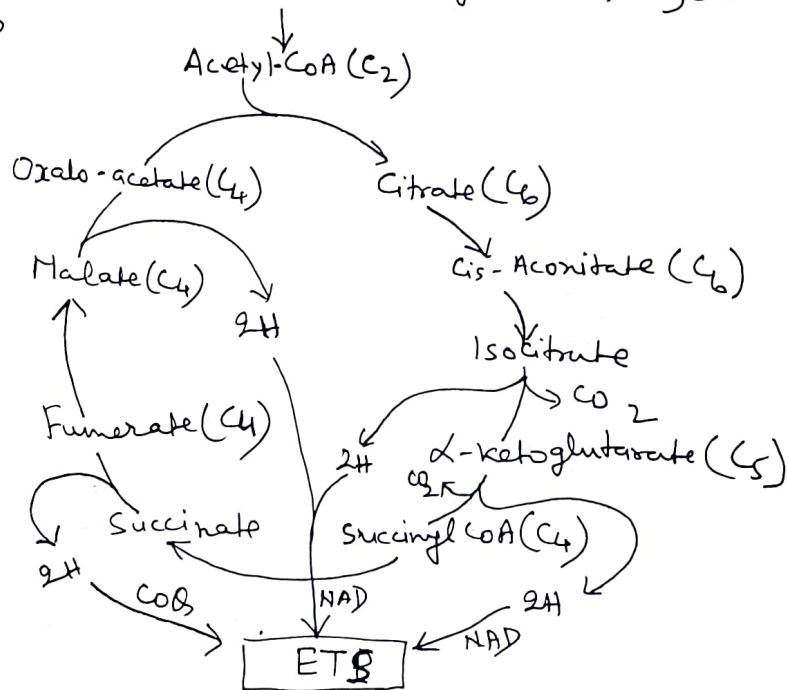
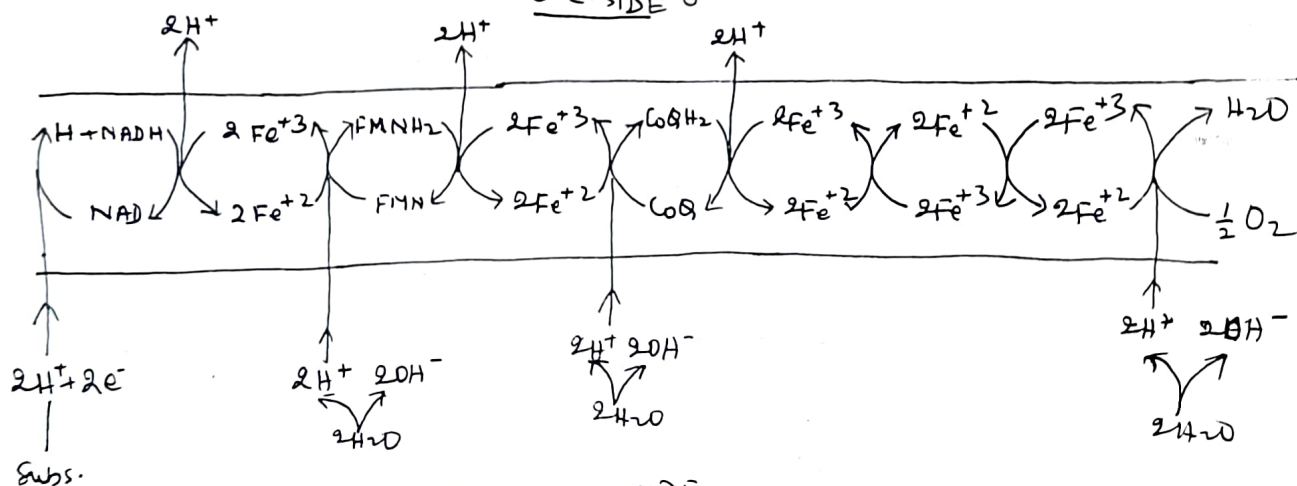
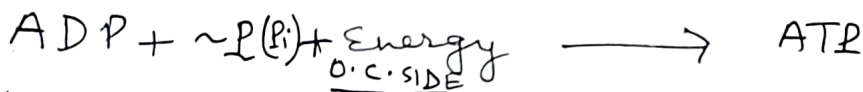


Fig: An Overview of TCA - Cycle

#### ELECTRON TRANSPORT SYSTEM [ETS]

$H^+$  ions, thus, formed are passed down the "Electron Tr. System". 3 moles of ATPs (2 ATPs, when succinate is the acceptor), are generated per pair of electrons passing thru' ETS which are arranged in the sequence of increasing redox potential. The electrons are transported along chain of electron-carrying moles until

16. ~~When~~ they reach cyt. aa<sub>3</sub> or cytochrome oxidase which promotes the transfer of electrons to oxygen (O<sub>2</sub>), the final electron acceptor in aerobic orgs. Each atom of O<sub>2</sub> accepts 2-electrons from 2-H<sup>+</sup> atoms & are taken up from aq. medium to form H<sub>2</sub>O. In this process, energy is liberated in the form of ATP. ADP mole captures free energy as ~P & thus, helps in the formation of ATP. In this process, oxid<sup>n</sup>. & phosphorylation are ~~so~~ tightly coupled. This process of ATP formation is called "Oxidative Phosphorylation". Thus, ADP plays an imp. role in this process & the sk<sup>n</sup> runs as:-



M.T. MAT. SIDE

Fig: Electron Tr. System (ETS)

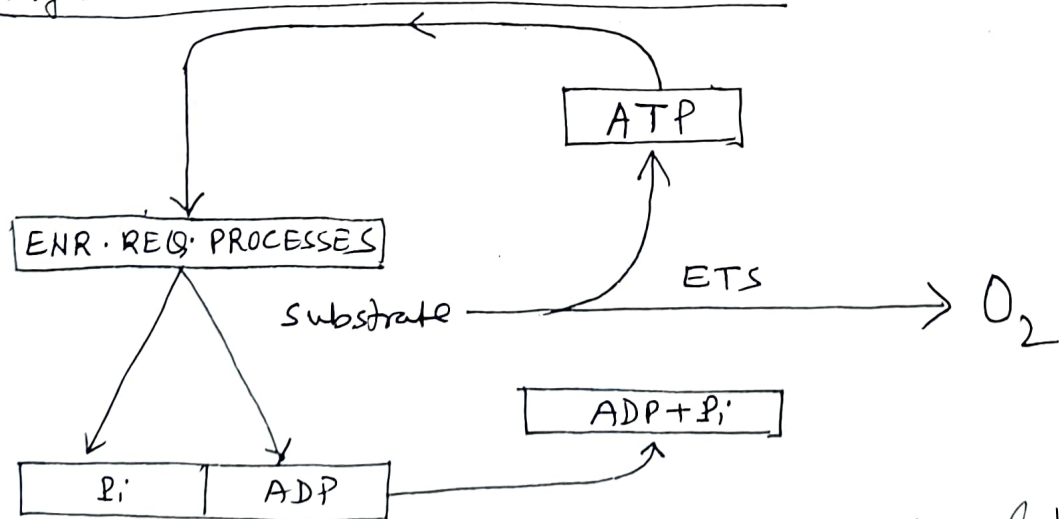
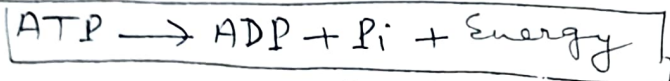


Fig: Roll of "ADP" In Oxid. Phosphorylation

Thus, energy is stored as ATP. One mole of glucose after its complete oxidation give rise to 38-ATP moles. Whenever, energy is needed, ATP-mole releases its energy utilized for any work.



Due to this property, they are called the power house of the cell.

## (2) ATP - TRANSPORT:

\*[ATP mole collect at sites where energy req. is high causing them to squeeze out, thus, lowering conc. of ATP. Thus] mit. help in ATP-transport.

## (3) STORAGE OF YOLK:

In the early stage, protein granules start accumulating & form yolk plates. [Mit. may become transformed into large yolk bodies as reported by Masso & Favard - 1958.]

## (4) SECRETION — Honiberg stated that they contain proteolytic enz. & in some manner related to zym. granules.

## (5) LIPID SYNTHESIS

\*[A set of enzymes + mt in] mit. helps in the synthesis of lipids [like lecithin & phosphatidyl ethanolamine.]

## CONCLUSION

In this way, mitochondria are mainly responsible for energy production & the energy stored in ATP moles are ~~used~~ utilized by cells for vital activities. Hence, it is justified to call them the "Power House" of the cell.