B.Sc Part I (Zoology) (Hons.)
Date 25/01/2021
(1st PDF)

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ELECTRON TRANSPORT SYSTEM (E.T.S.) & OXIDATIVE PHOSPHORYLATION.

During different reactions of glycolysis and Kreb's cycle oxidation take place with the help of dehydrogenase enzymes. Due to oxidation, hydrogen and electrons are released which are pass through different electron carriers and react with oxygen at the end of ETS. as a result water molecule produced. During transfer of hydrogen atoms from one enzyme carrier to another in ETS, large amount of energy is released in the form of ATP. The enzymes takes part in the process are called respiratory chain enzymes.

These enzymes are present in F_1-particle of mitochondria. The hydrogen acceptors are found in the form of Co-enzymes like NAD (nicotinamide adenine dinucleotide) and FAD (Flavin adenine dinucleotide) which convert into $NADH_2$ and $FADH_2$ respectively.

on this topic with reference to the play, 'The Bishop's Candlesticks'.

one molecule of $NADH_2$ provide 3ATP whereas 1 $FADH_2$ provide 2ATP.

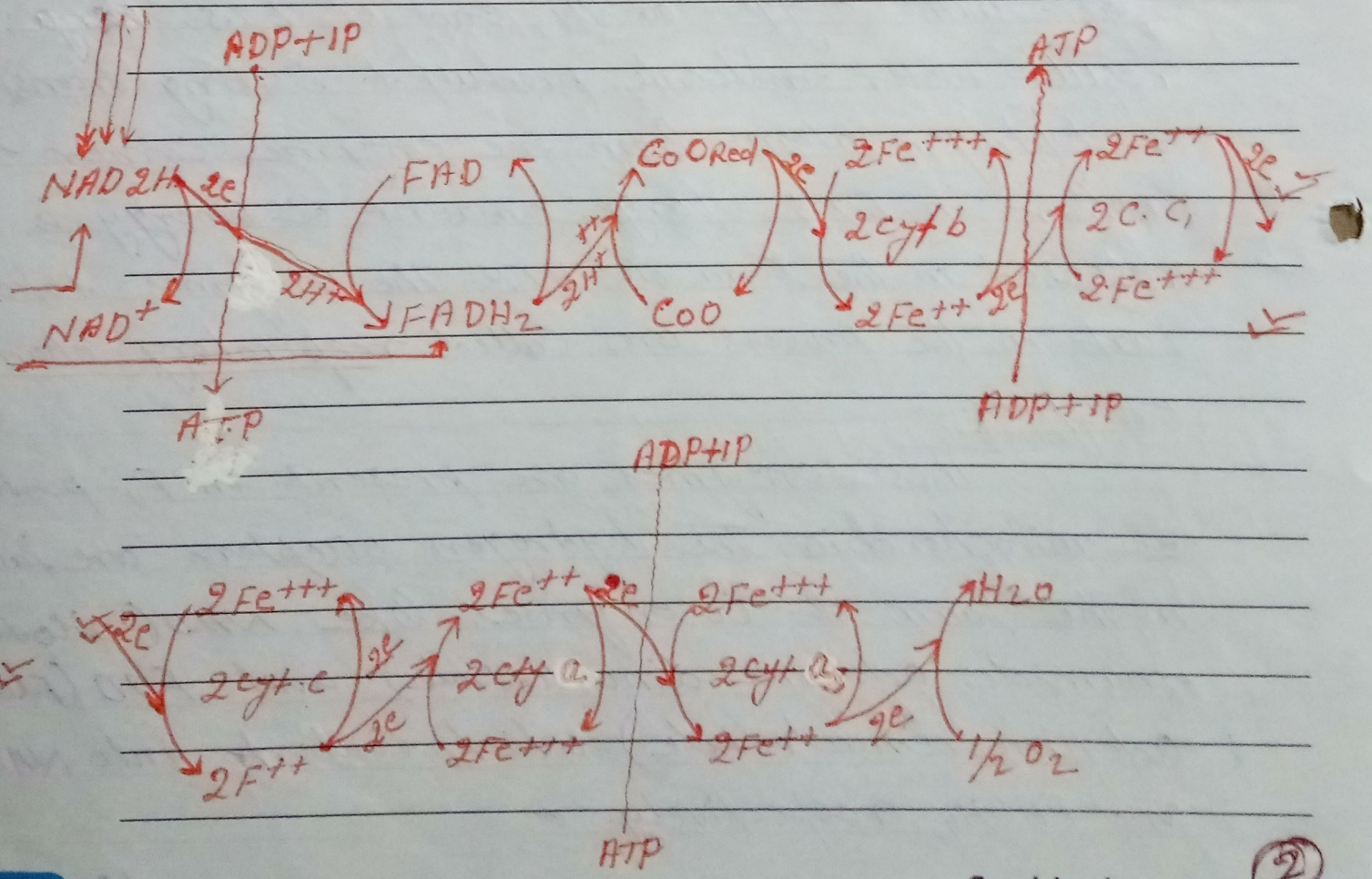
(1) Net gain of ATP in glycolysis at the end of ETS:—

$2ATP + 2NADH_2 = 2ATP + 2 \times 3 ATP = 2ATP + 6ATP = 8ATP$

(2) Net gain of ATP in Kreb's cycle at the end of ETS:—

$8NADH_2 + 2FADH_2 + 2G.T.P = 8 \times 3 ATP + 2 \times 2 ATP + 2 \times 1$ ATP $= 24 ATP + 4ATP + 2ATP = 30 ATP$

(3) Net gain of ATP in Complete oxidation of glucose during aerobic respiration:— $8ATP + 30ATP = 38ATP$



(2nd PPT)

MECHANISM of E.T.S.

The reactions takes place in electron transport system are collectively called mechanism of ETS. These reactions are as follows:

(1) $2H \longrightarrow 2H^+$ (proton) + $2e^-$ (electrons)

(2) $2NAD + 2H^+ + 2e \longrightarrow 2NADH_2$ (NADH$_2$ enters into E.T system of mitochondria

(3) $2FAD + 2H^+ + 2e^- \longrightarrow 2FADH_2$

From $FADH_2$ electrons are accepted by Co enzyme ubiquinone (CoQ).

(4) Coenzyme ubiquinone + $2H^+ + 2e^-$ → Co enzyme ubiquinone (reduced).

From CoQ, H^+ move to the matrix of mitochondria and electrons are accepted by cytochromes. Cytochromes are iron containing pigments of cells in which aerobic respiration takes place. These pigments are reduced by accepting electrons and oxidized by donating electrons.

(5) 2 cytochrome b ($2Fe^{+++}$) + $2e^- \rightleftharpoons$ 2 cytochrome b ($2Fe^{++}$)

(6) 2 cytochrome c_1 ($2Fe^{+++}$) + $2e^- \rightleftharpoons$ 2 cytochrome c_1 ($2Fe^{++}$),

(7) 2 cytochrome c ($2Fe^{+++}$) + $2e^- \rightleftharpoons$ 2 cytochrome c ($2Fe^{++}$),

(8) 2 cytochrome a ($2Fe^{+++}$) + $2e^- \rightleftharpoons$ 2 cytochrome a ($2Fe^{++}$),

(9) 2 cytochrome a_3 ($2Fe^{+++}$) + $2e^- \rightleftharpoons$ 2 cytochrome a_3 ($2Fe^{++}$),

Both cytochrome a and a_3 together are called

cytochrome oxidase. These electrons from cyto-chrome oxidase react with atom of oxygen and make it reactive. This activated oxygen react with two protons of hydrogen and convert into water molecule.

(10). $O + 2e^- \longrightarrow O^-$

(11) $O^- + 2H^+ \longrightarrow H_2O$

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