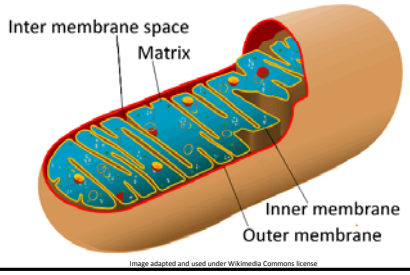
Key Points

- **Definition:** process for the transfer of H atoms to oxygen
- **Location:** mitochondria
- **Tissues:** most tissues & cell types (not red blood cells)
- **Functions:** 'energy trapping' direct phosphorylation of ADP to produce ATP

Mitochondrial Compartments

Oxidative phosphorylation takes place in association with the inner compartments of the mitochondria



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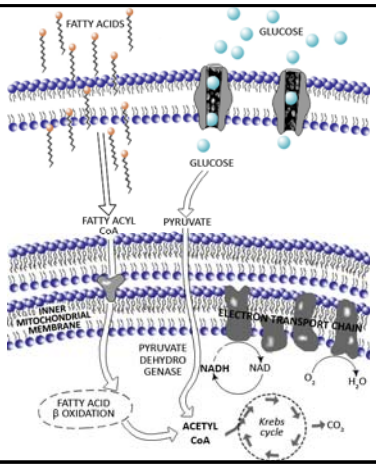
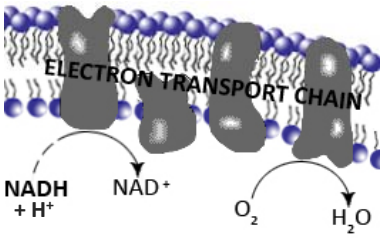
Cell Structure



Components of the cytochrome chain are 'buried' in the membrane



Stepwise transfer of H atoms to O_2

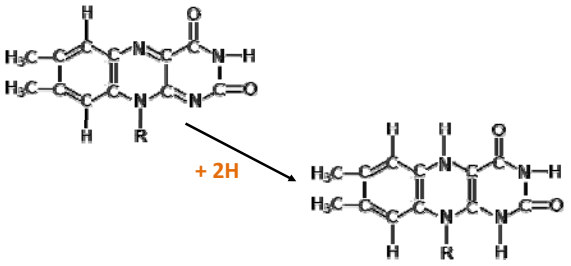
(NADH + H^+ $\xrightarrow{O_2}$ NAD^+ + H_2O)

NADH + H^+ → 2H → Carrier → Carrier → e- → Carrier → Carrier → e- → O_2 → H_2O

Components of the electron transport chain

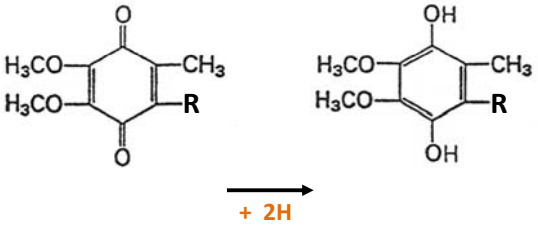
- H pair acceptors:
  - Flavin cofactors
  - Coenzyme Q CoQ
- Electron acceptors:
  - Iron sulphur proteins
  - Cytochrome proteins

Flavins act as H acceptors

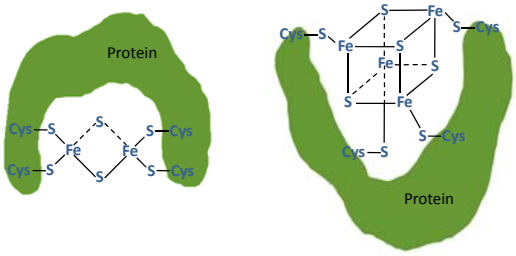


$FADH_2$

Role of CoQ as H acceptor

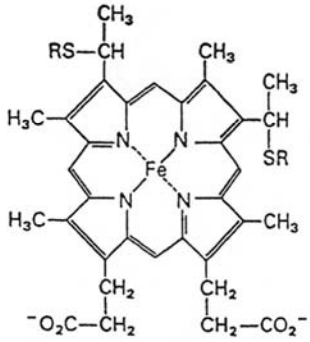


Iron-sulphur proteins (FeS proteins)



Electron Carriers $Fe^{2+} \overset{e^-}{\rightleftharpoons} Fe^{3+}$

HAEM ring of a cytochrome protein (electron acceptor)

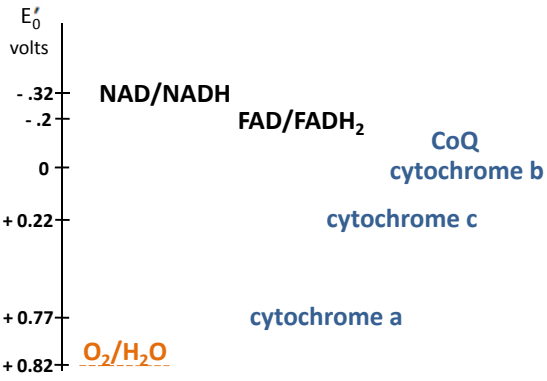


$Fe^{2+} \overset{e^-}{\rightleftharpoons} Fe^{3+}$

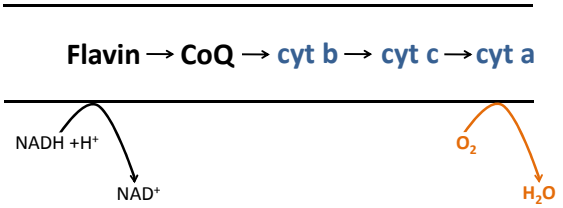
Redox carriers

- Every cofactor involved in oxidation / reduction reactions can be assigned a value known as its oxido-reduction potential (or redox potential) E_0'
- This redox potential describes the ability of the carrier to donate its electrons to another electron acceptor molecule
- Electrons 'flow' from a carrier with a negative E_0' value to a carrier with a more positive E_0' *value*

Redox values



Arrangement of oxidation/reduction carriers in the electron transport chain



Order of carriers in the electron transport chain