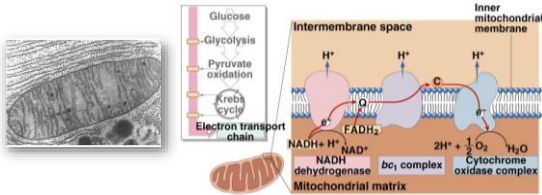
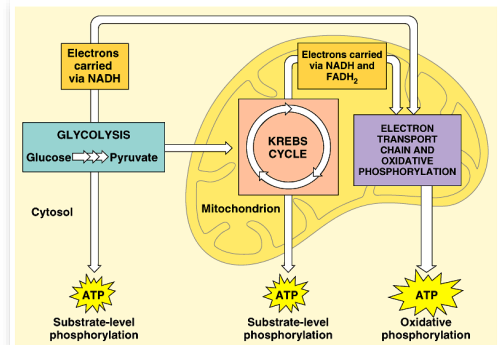


Chapter 9.3 Cellular Respiration: Electron Transport Chain



Cellular Respiration



ATP accounting so far...

- Glycolysis → **2 ATP**
- Oxidation of Pyruvate → **~ 0 ATP**
- Kreb's cycle → **1 ATP [x2]**
- Life takes a lot of energy to run, need to extract more energy than just **4 ATP!**

There's got to be a better way!

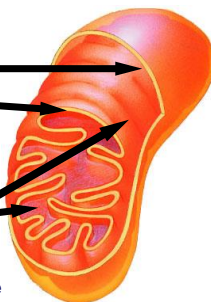
There IS a better way!

- **Electron Transport Chain**
 - ♦ series of molecules built into inner mitochondrial membrane
 - mostly integral transport proteins
 - ♦ transport of electrons down ETC linked to ATP synthesis
 - ♦ yields ~ **additional 34 ATP** from 1 glucose!
 - ♦ only when in presence of O₂ (**aerobic**)

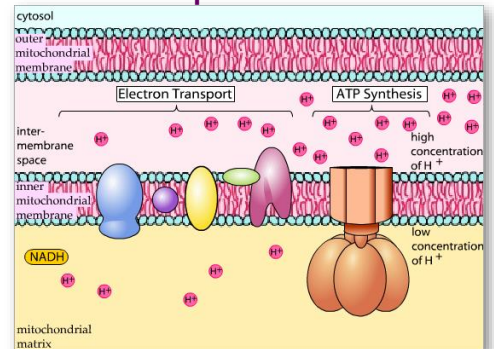
Mitochondria

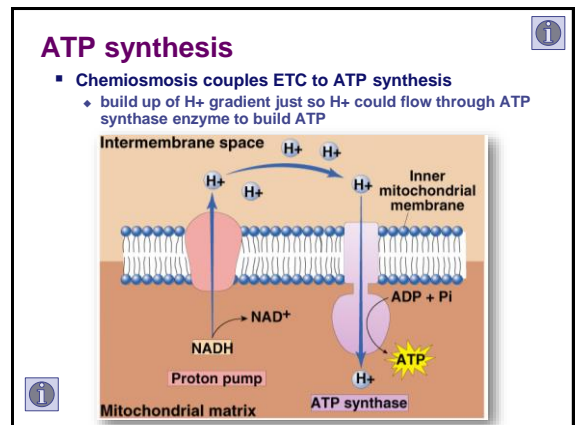
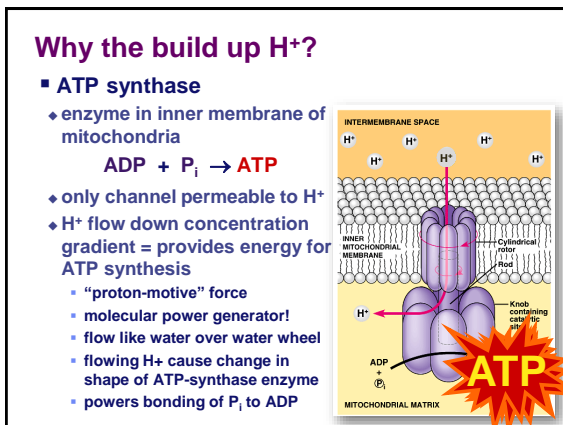
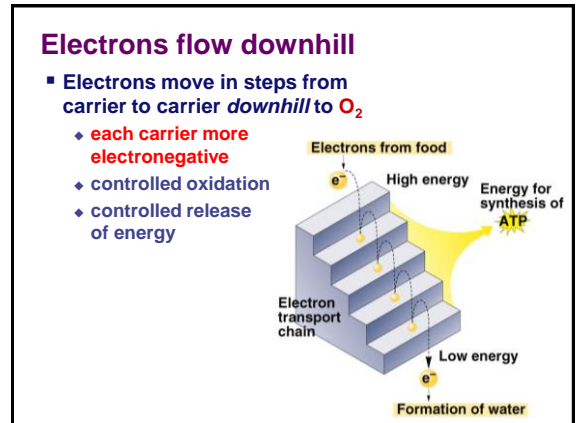
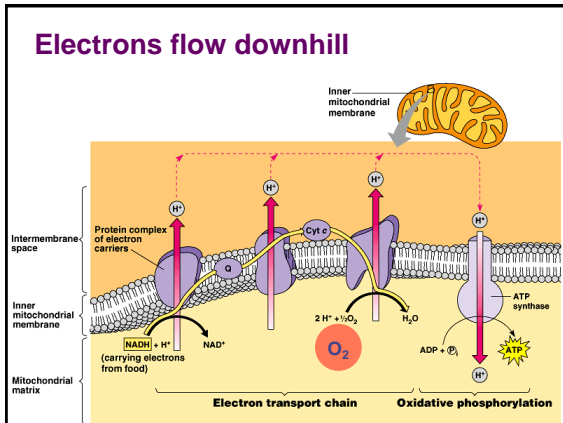
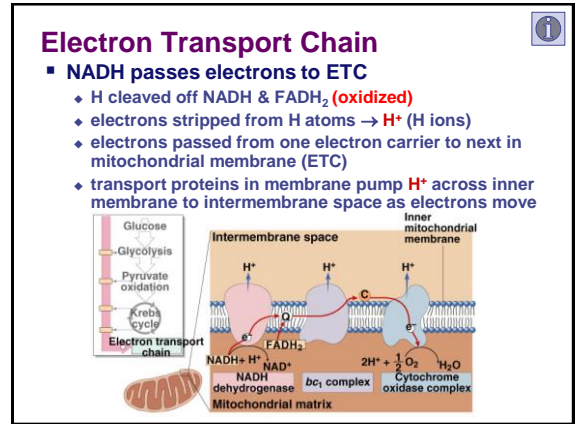
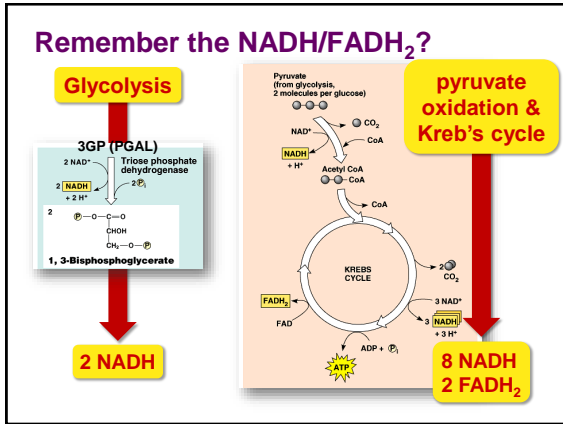
- **Double membrane**
 - ♦ outer membrane
 - ♦ inner membrane
 - highly folded **crisetae***
 - fluid-filled space between membranes = **intermembrane space**
- ♦ **matrix**
 - (mitochondrial matrix)
 - central fluid-filled space

Form fits function!



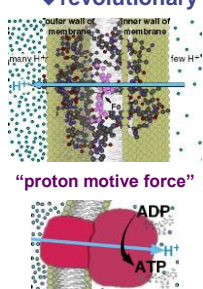
Electron Transport Chain






Peter Mitchell 1961 | 1978

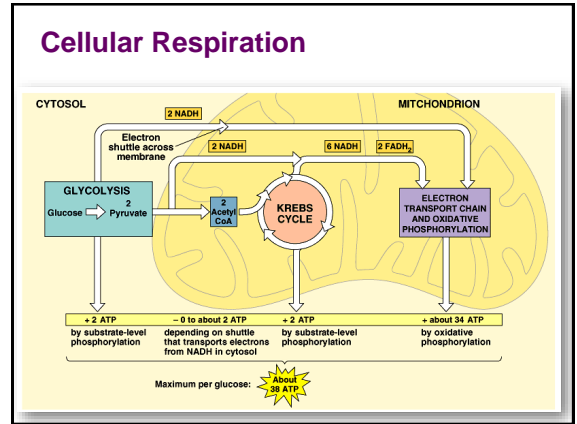
- Proposed chemiosmotic hypothesis
 - revolutionary idea at the time



"proton motive force"



1920-1992



Summary of Cellular Respiration

$$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + \sim 36 \text{ ATP}$$

- Where did the glucose come from?
- Where did the O₂ come from?
- Where did the CO₂ come from?
- Where did the H₂O come from?
- Where did the ATP come from?
- What else is produced that is not listed above?
- Why do we breathe...?

Why do we breathe?

- What is the final electron acceptor in electron transport chain?

O₂
- So what happens if O₂ unavailable?
 - ETC backs up
 - ATP production ceases
 - cells run out of energy
 - and you die!