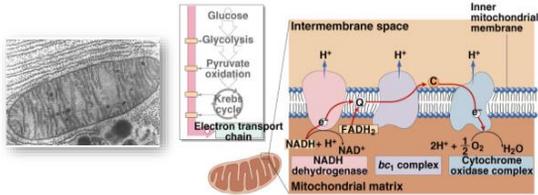
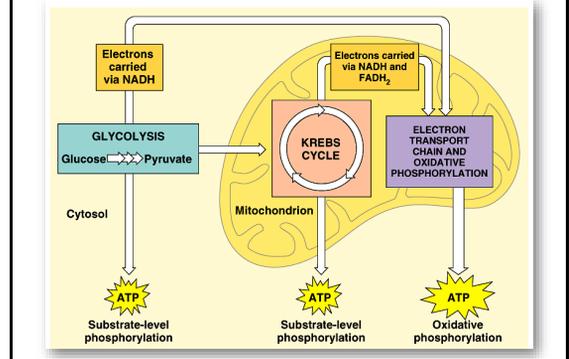


Chapter 9.3 Cellular Respiration: Electron Transport Chain



Cellular Respiration



ATP accounting so far...

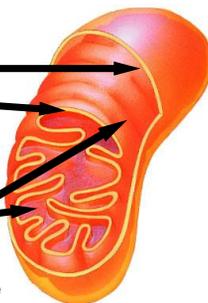
- Glycolysis → 2 ATP
- Oxidation of Pyruvate → ~ 0 ATP
- Kreb's cycle → 1 ATP [x2] = 2 ATP
- Life takes a lot of energy to run, need to extract more energy than just 4 ATP!

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 32 ATP** from 1 glucose!
 - ♦ only when in presence of O₂ (**aerobic**)

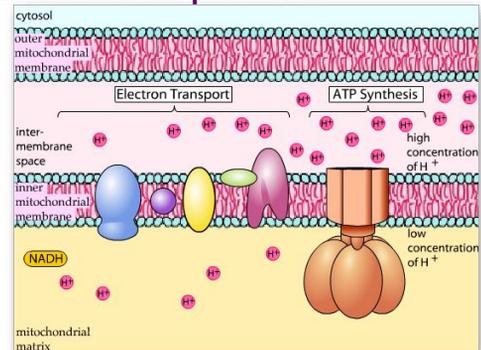
Mitochondria

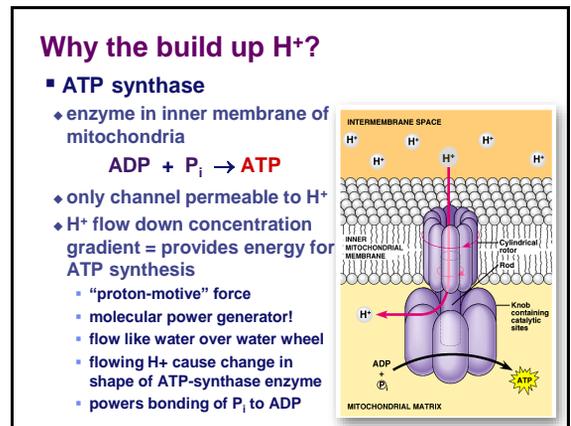
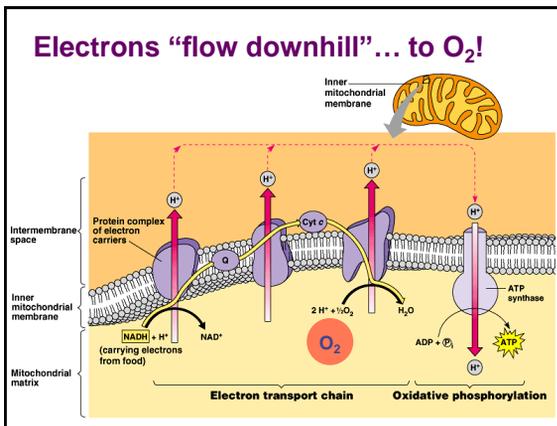
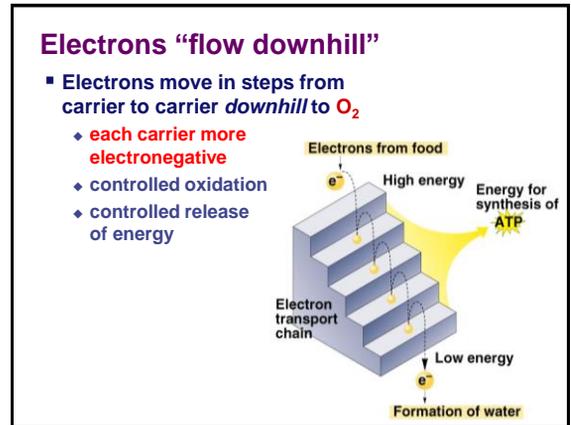
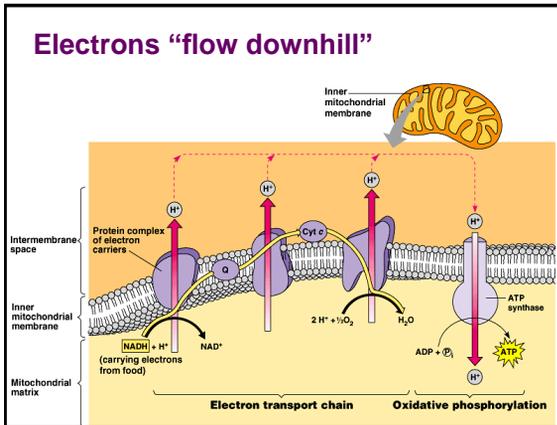
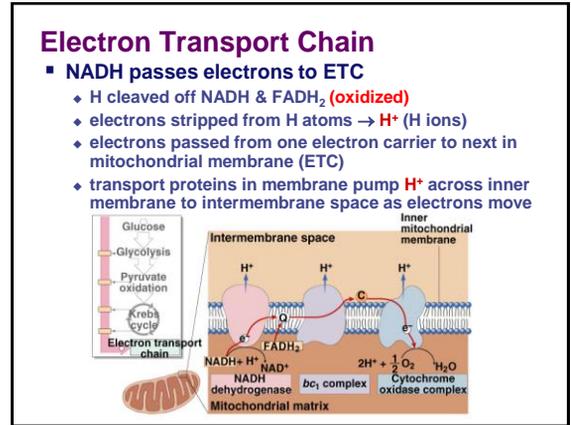
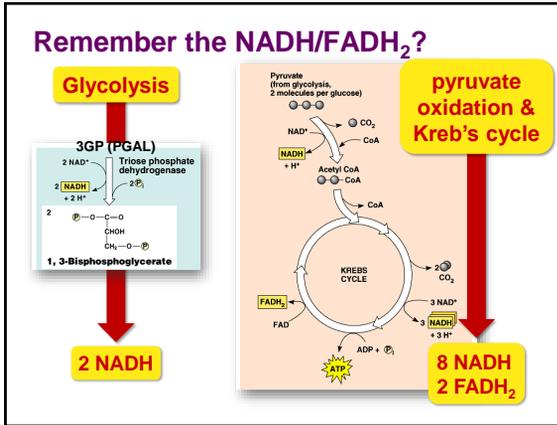
- **Double membrane**
 - ♦ outer membrane
 - ♦ inner membrane
 - highly folded **crisetae***
 - fluid-filled space between membranes = **intermembrane space**
- ♦ **matrix**
 - (mitochondrial matrix)
 - central fluid-filled space



Form fits function!

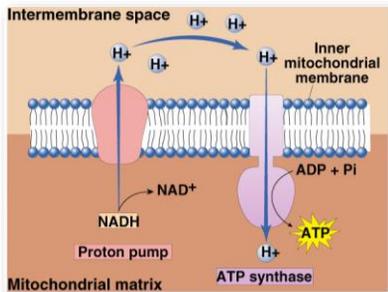
Electron Transport Chain





ATP synthesis

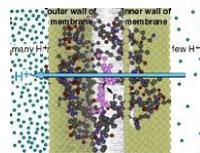
- Chemiosmosis couples ETC to ATP synthesis
 - build up of H⁺ gradient just so H⁺ could flow through ATP synthase enzyme to build ATP



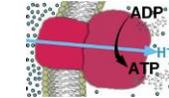
Peter Mitchell

1961 | 1978

- Proposed chemiosmotic hypothesis
 - revolutionary idea at the time

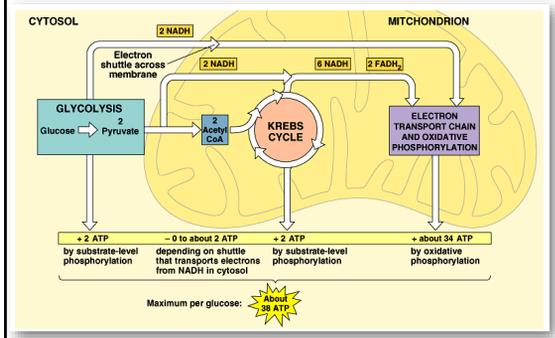


"proton motive force"



1920-1992

Cellular Respiration



Summary of Cellular Respiration



- 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 used that is not listed above?
- Why do we breathe...?

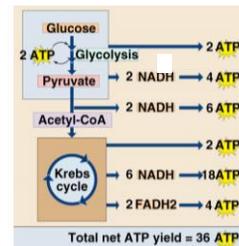
Why do we breathe?

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



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

What's the point?



The Point is to Make ATP!
Any Questions?