

Mitochondria

Structure: Outer membrane: highly permeable

Inner membrane: impermeable

Cristae: folds of inner membrane, which extend to matrix

Proteins: transport proteins (H^+ /pyruvate symporter, ADP/ATP antiporter)

respiratory chain (terminal oxidation)

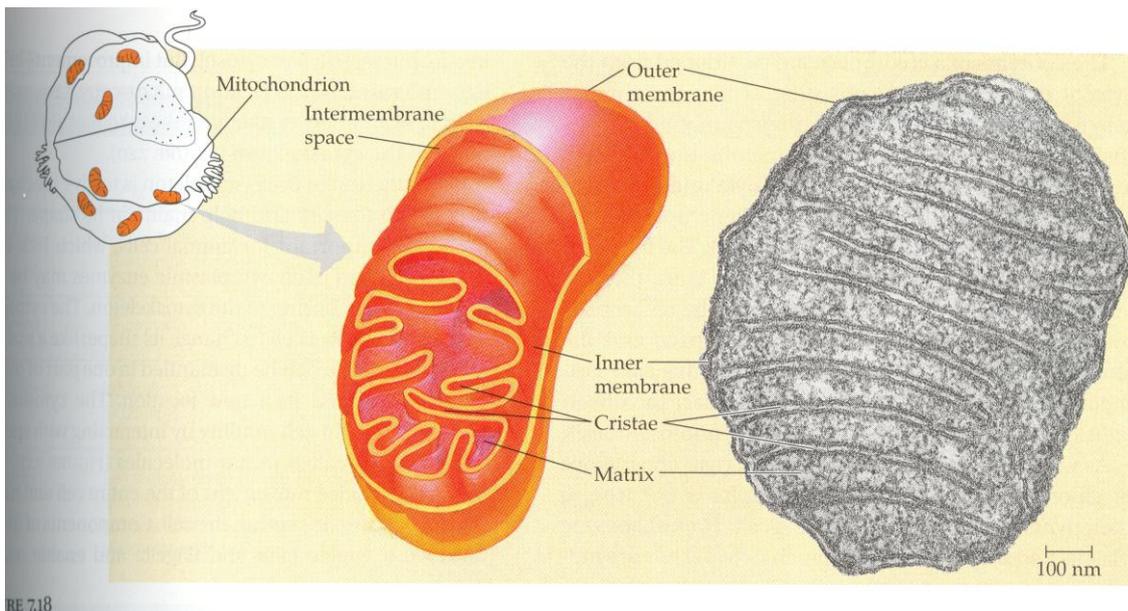
ATP synthase

Matrix:

enzymes (citric acid cycle + others)

genetic apparatus (mitochondrial DNA)

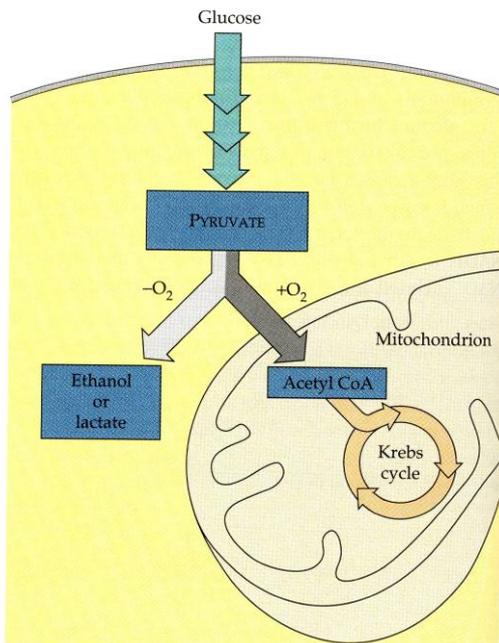
Intermembrane space



Structure of mitochondrion (from Campbell: Biology)

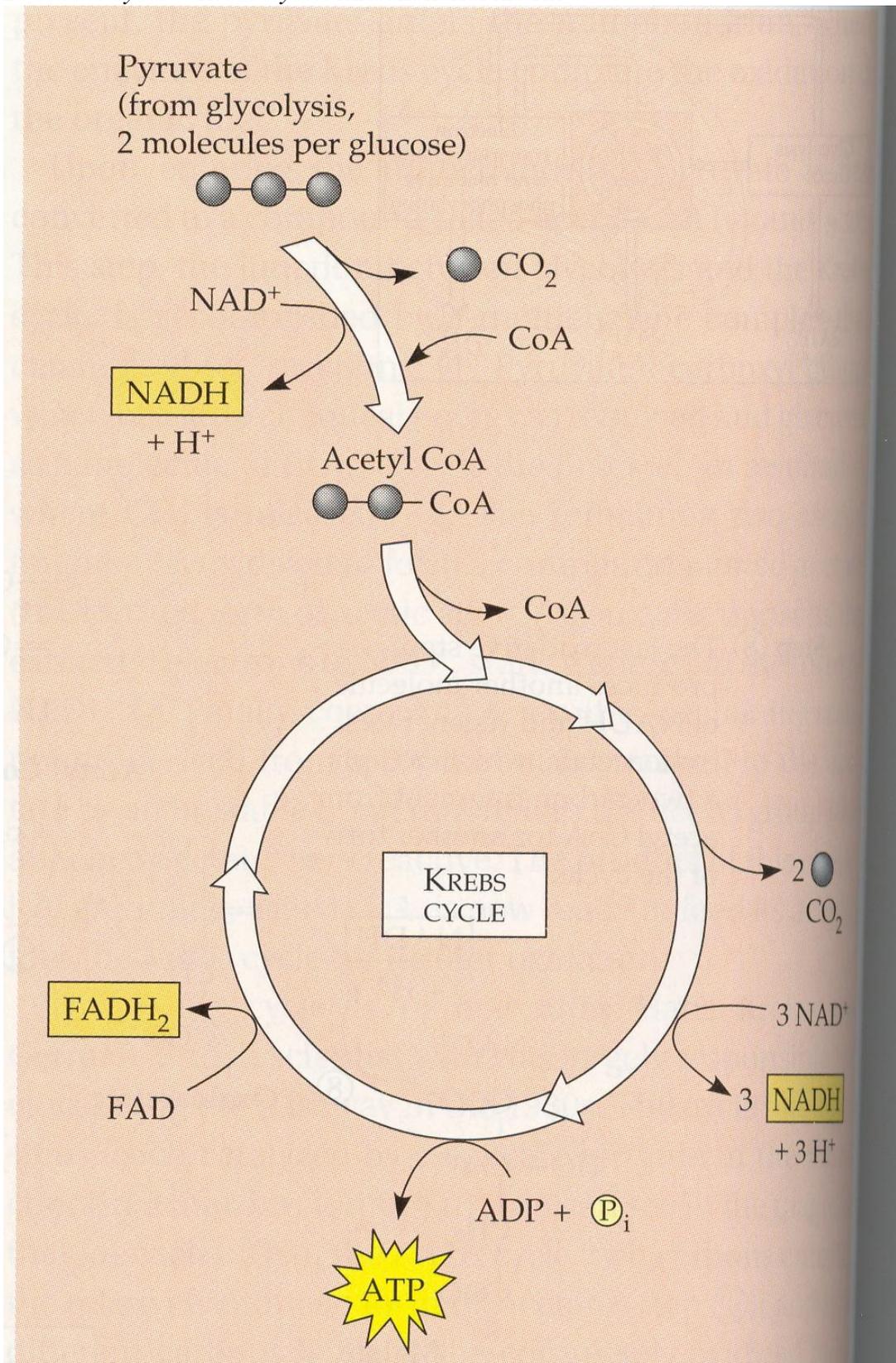
Function: ATP production

1. *Glycolysis:* happens in the cytoplasm!



Glycolysis (from Campbell: Biology)

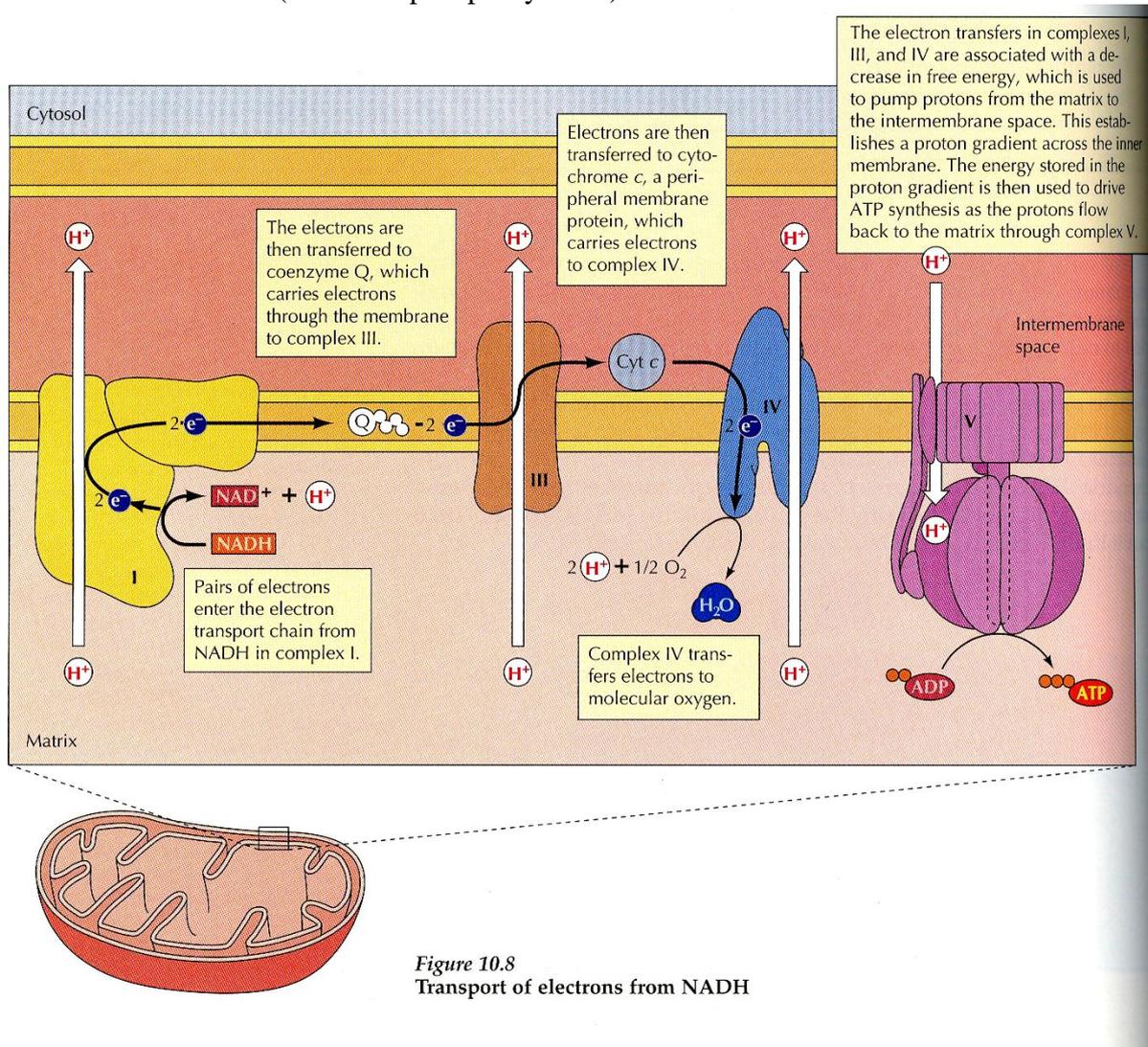
2. Citrate cycle = Krebs cycle: mitochondrial matrix



Citrate cycle (from Campbell: Biology)

4C compound, which reacts with acetyl-CoenzymeA: oxalacetate
6C compound, which is formed: citric acid (citrate)
H⁺ and GTP and reduced coenzymes (NADH, FADH₂) are produced

3. Terminal oxidation (oxidative phosphorylation): inner membrane



Terminal oxidation (from Cooper: The cell)

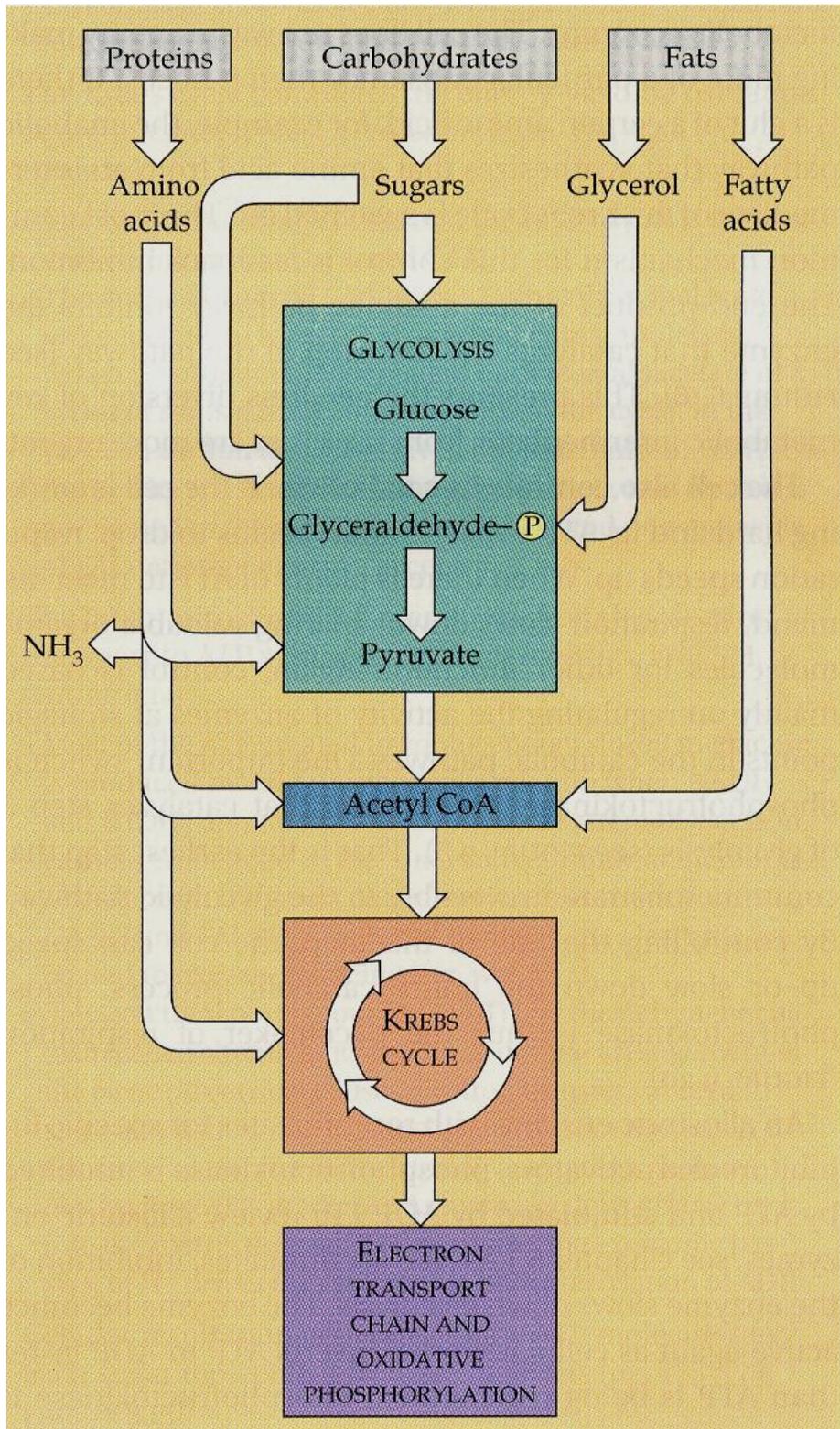
Electrons of FADH_2 : complex II. \rightarrow complex III. \rightarrow complex IV.

Cytochromes: contain Fe (Fe^{2+} or Fe^{3+})

Difference in concentration of H^+ ions between matrix and intermembrane space is used by ATP synthase to produce ATP from $\text{ADP} + \text{P}$

ATP synthase: uses the energy of passive H^+ transport

How to produce energy from other macromolecules?



Breakdown processes (from Campbell: Biology)

Mitochondrial DNA: codes for mRNAs, tRNAs, rRNAs

→ some of the proteins are synthesized by the mitochondrion itself, other are imported from the cytoplasm.

Endosymbiosis theory