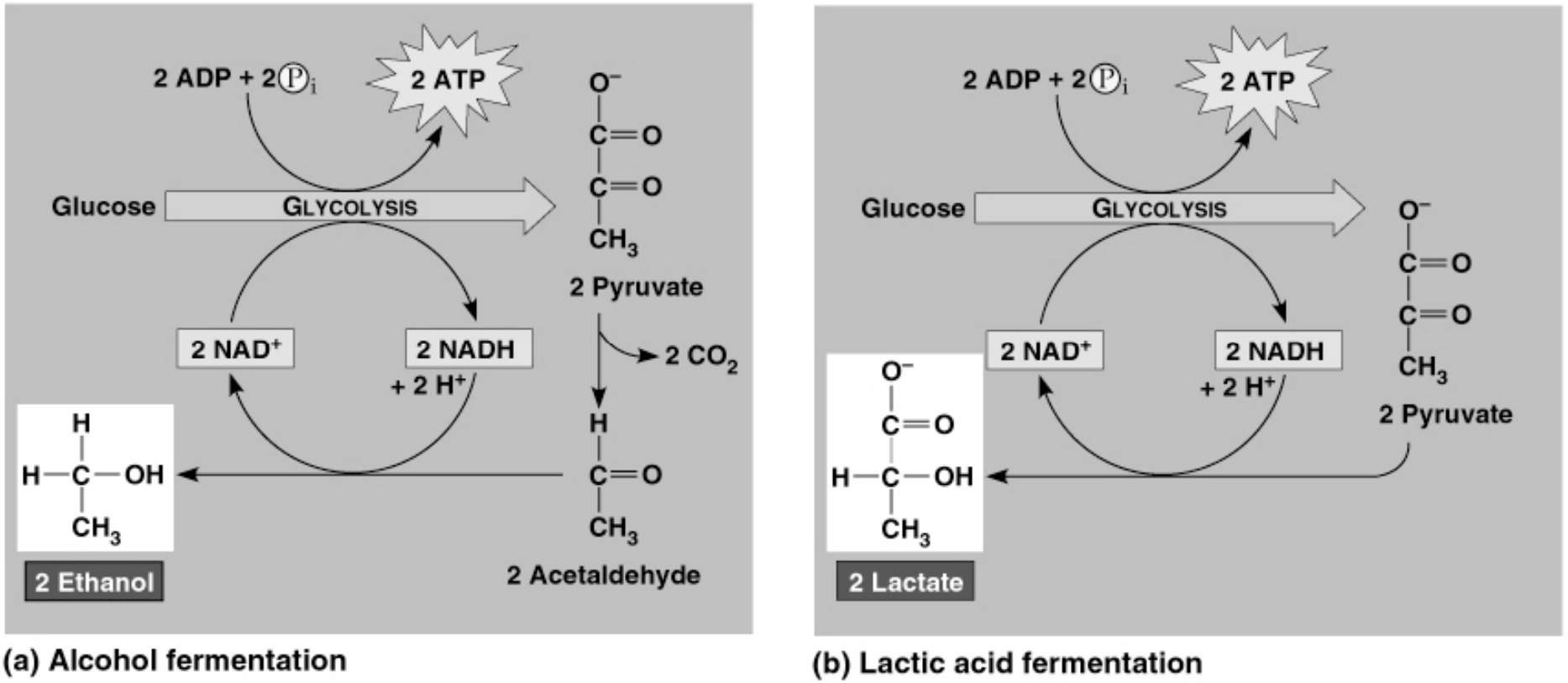
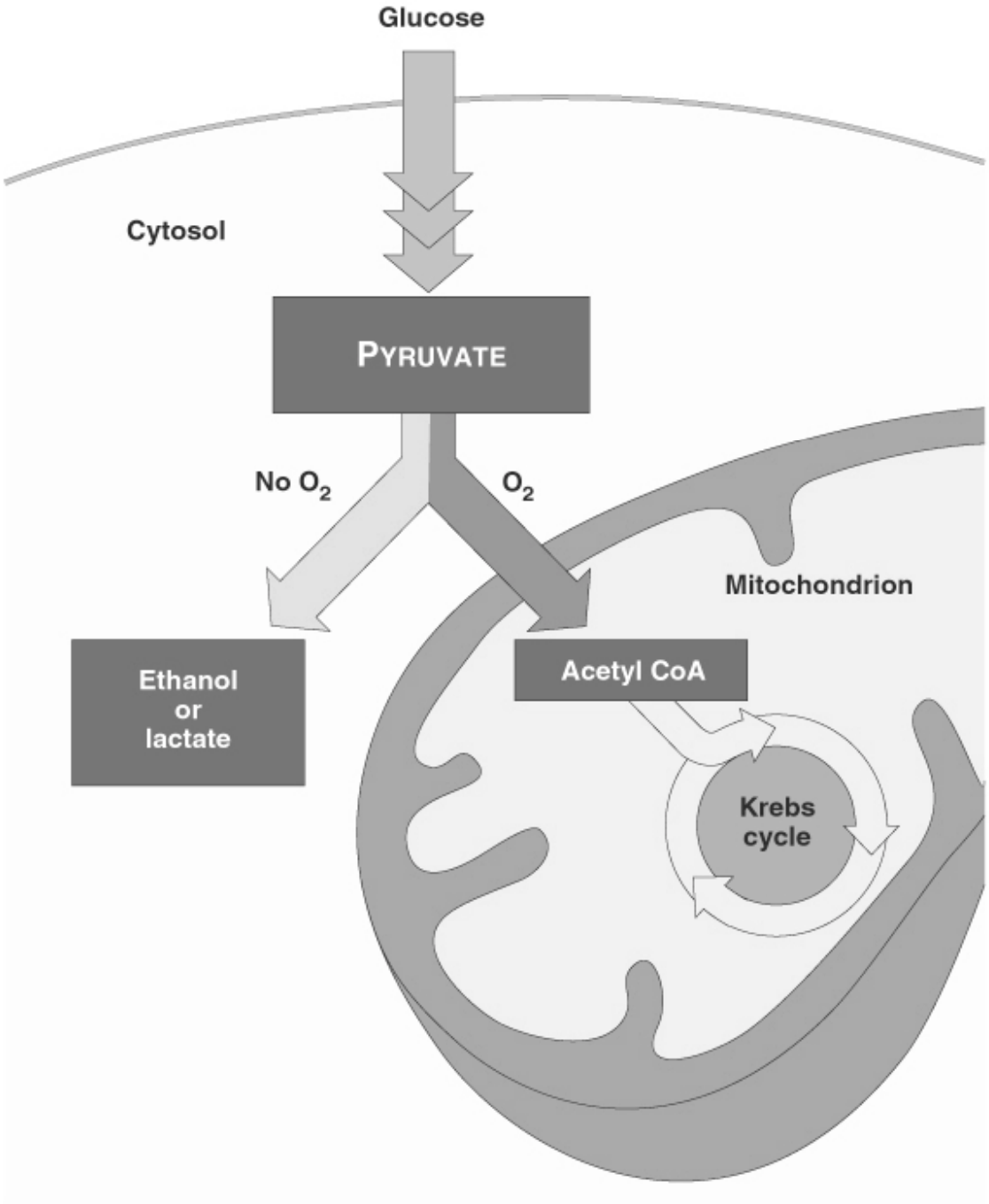
Anaerober Glucoseabbau: Fermentation

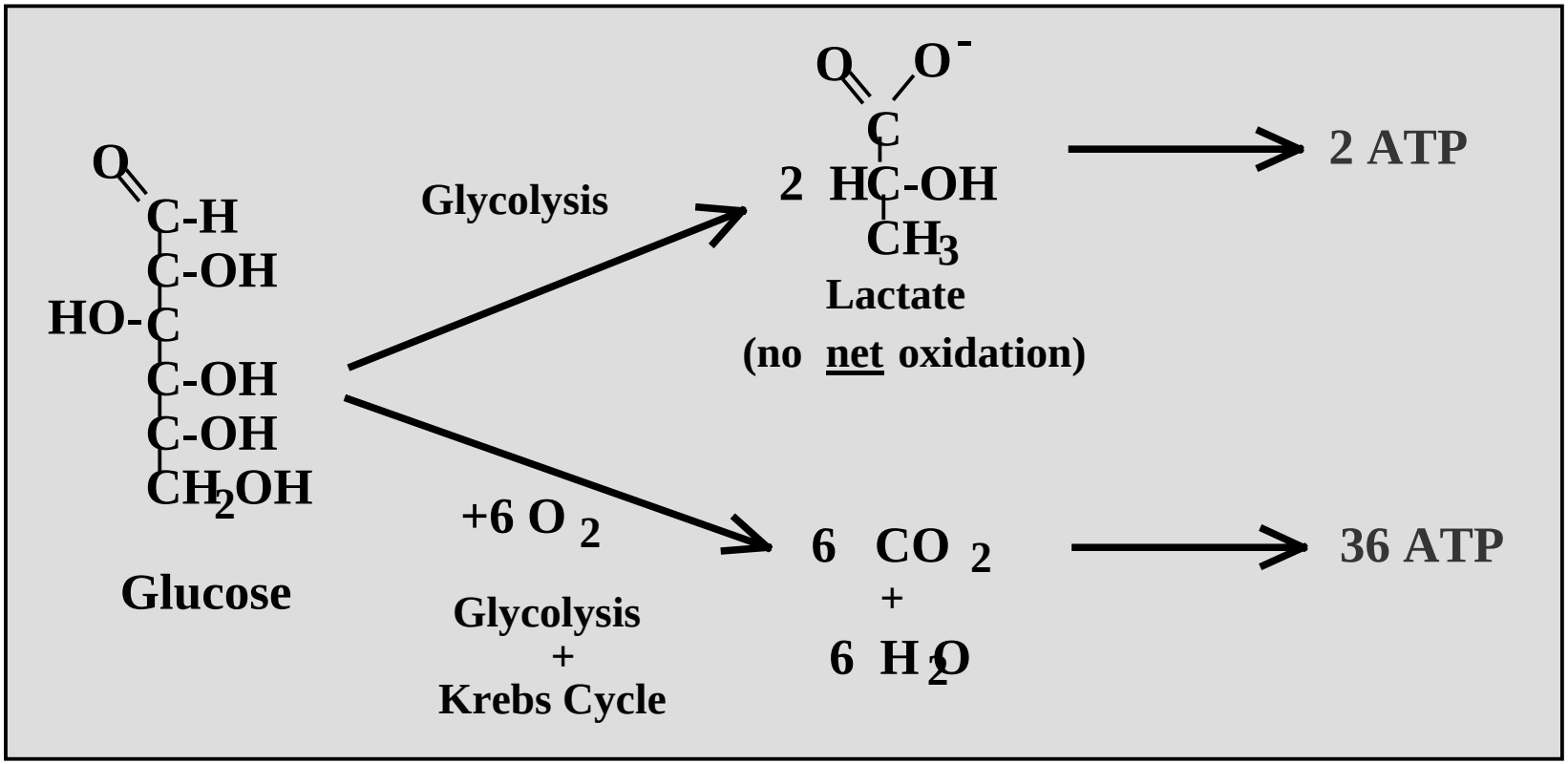


NAD+ muß regeneriert werden (durch NADH Oxidation). Je nach Organismus wird “Alkoholische Fermentation” oder “Milchsäure Fermentation” betrieben.

Figure 9.18: Pyruvate as a Key Juncture in Catabolism



In **Glycolysis** Glucose is converted to two molecules of **Pyruvate** with no **net** oxidation. However, the rearrangement of the oxidation state (one end fully oxidized and the other fully reduced) is lower in free energy allowing the production of two molecules of ATP

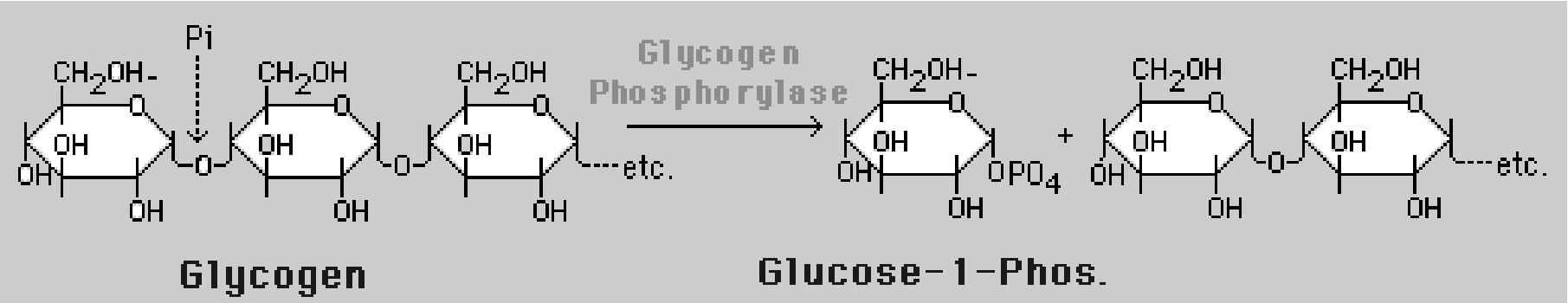


Complete oxidation of glucose (or other carbohydrates) leads to the production of far more ATP than can be gained from **Glycolysis** alone.

Regulation of Glycolysis -- steps where glucose enters the process

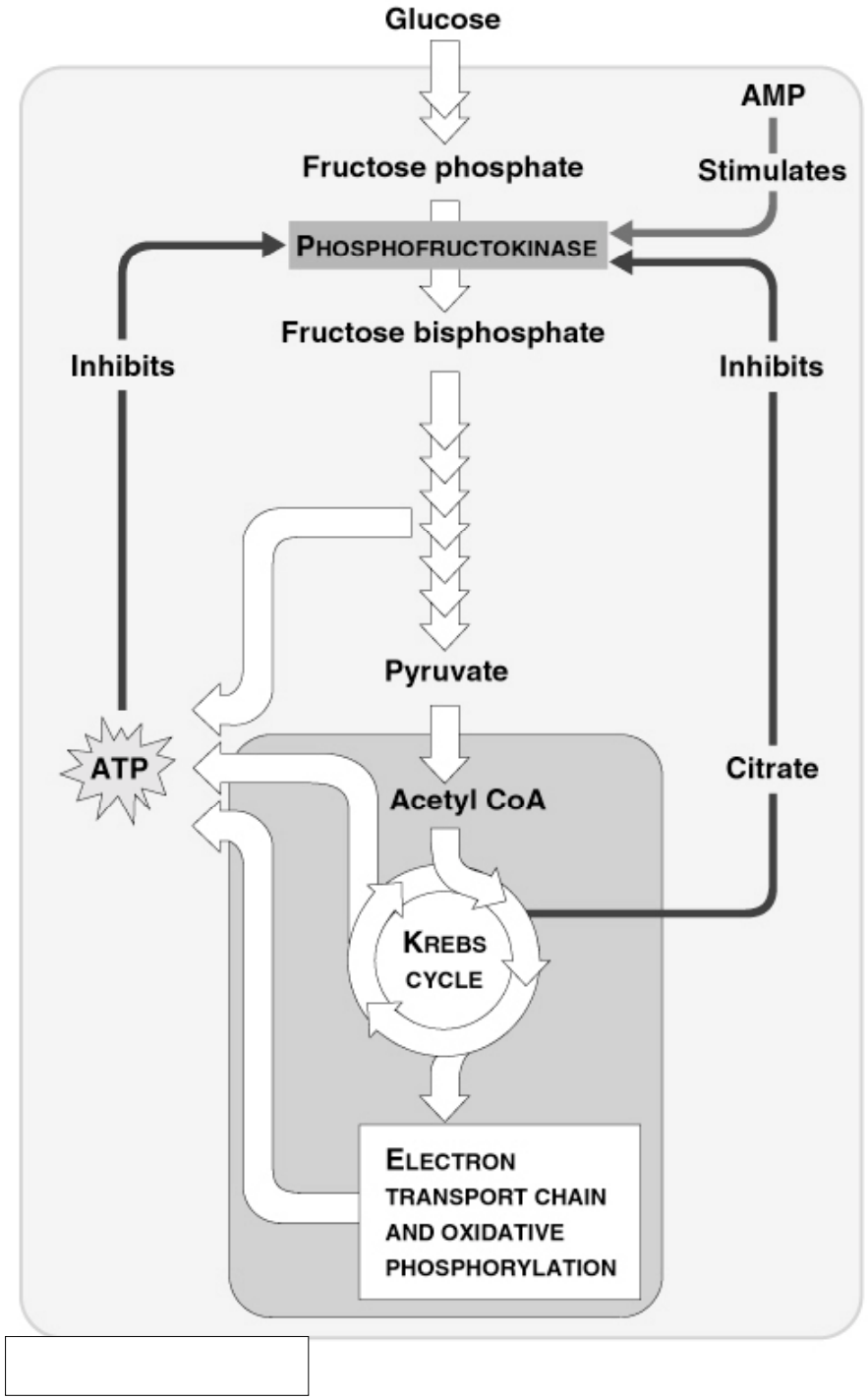
Hexokinase is the enzyme which phosphorylates glucose to produce glucose-6-phosphate using one of the phosphates from ATP. This is one of the enzymes which is regulated .

Glycogen Phosphorylase



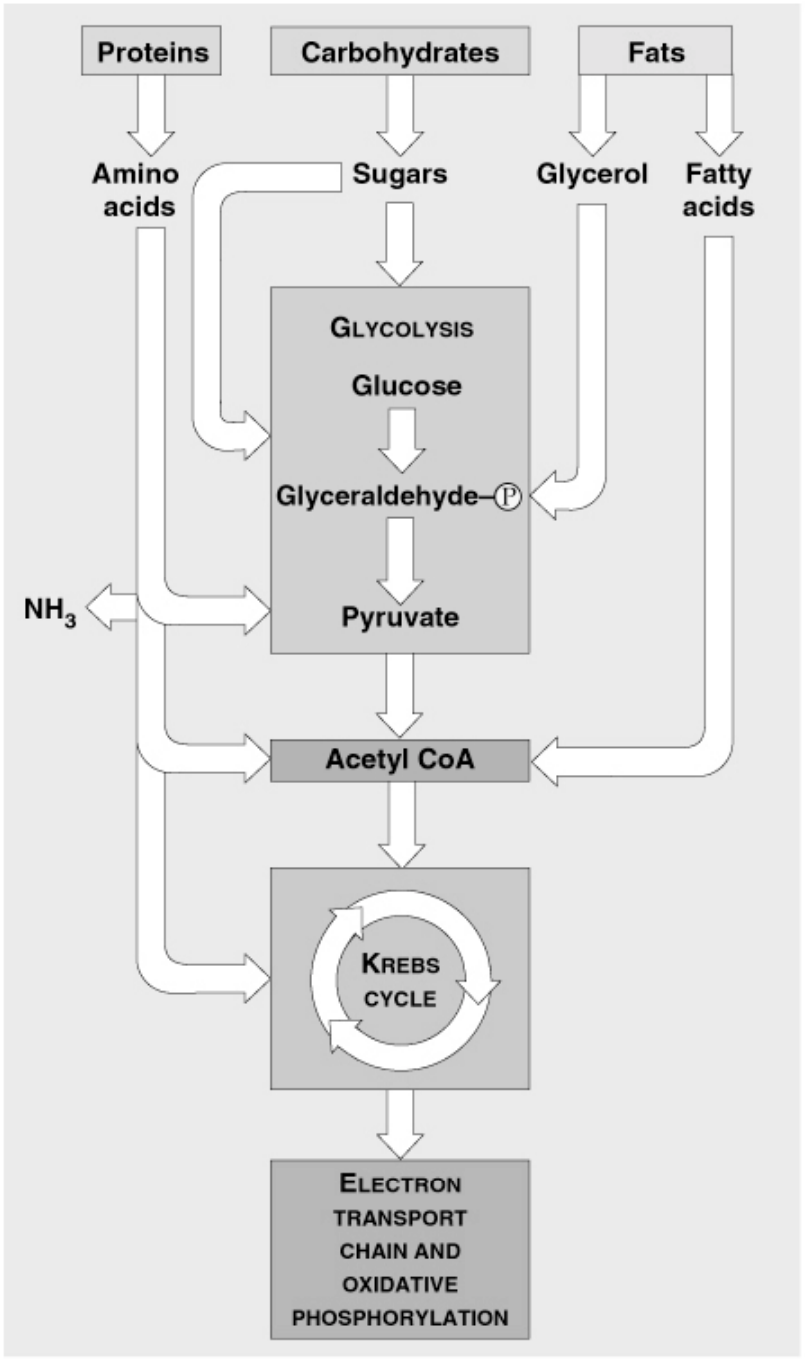
When metabolizing glycogen, our cells remove glucose units one at a time breaking **glycosidic** bonds with phosphate to make glucose-1-phosphate and the remaining glycogen chain. This is one of the key points of regulation of glycolysis.

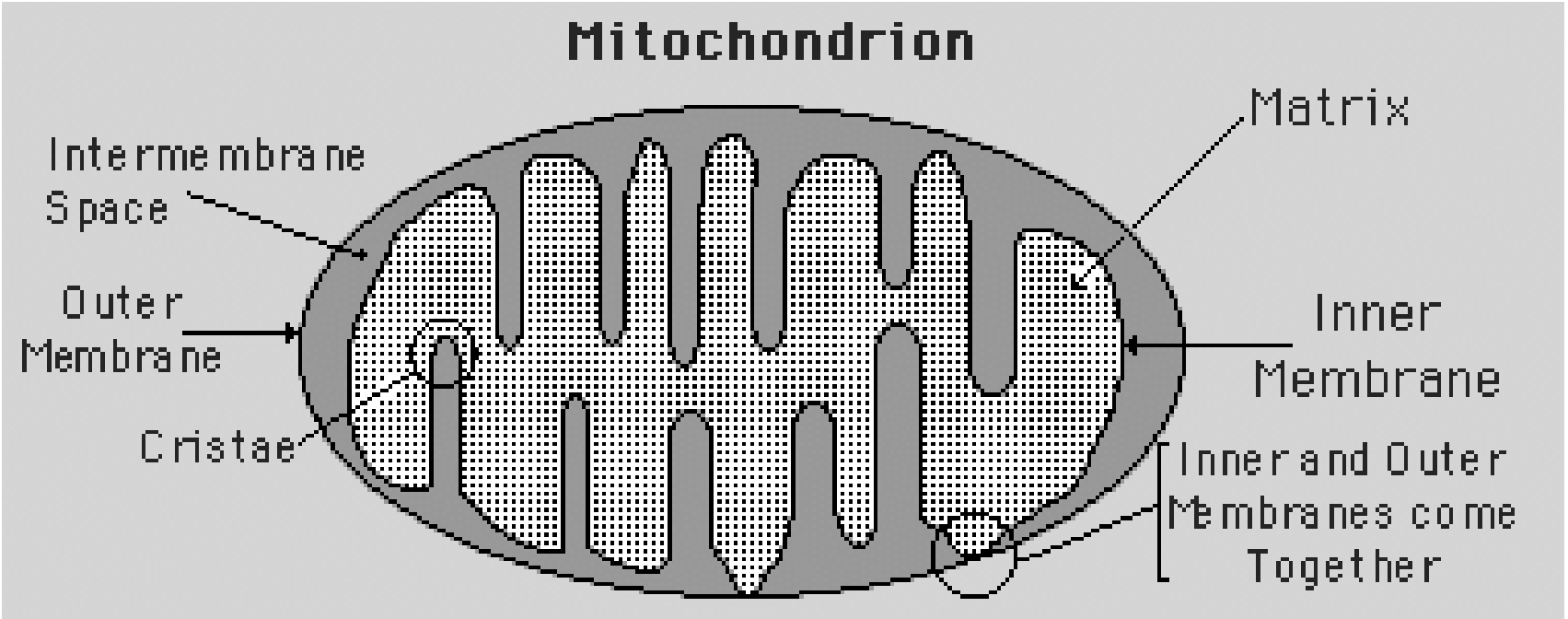
Zentrale Rolle des Pyruvats im Katabolismus



Katabolismus verschiedener Nahrungsstoffe

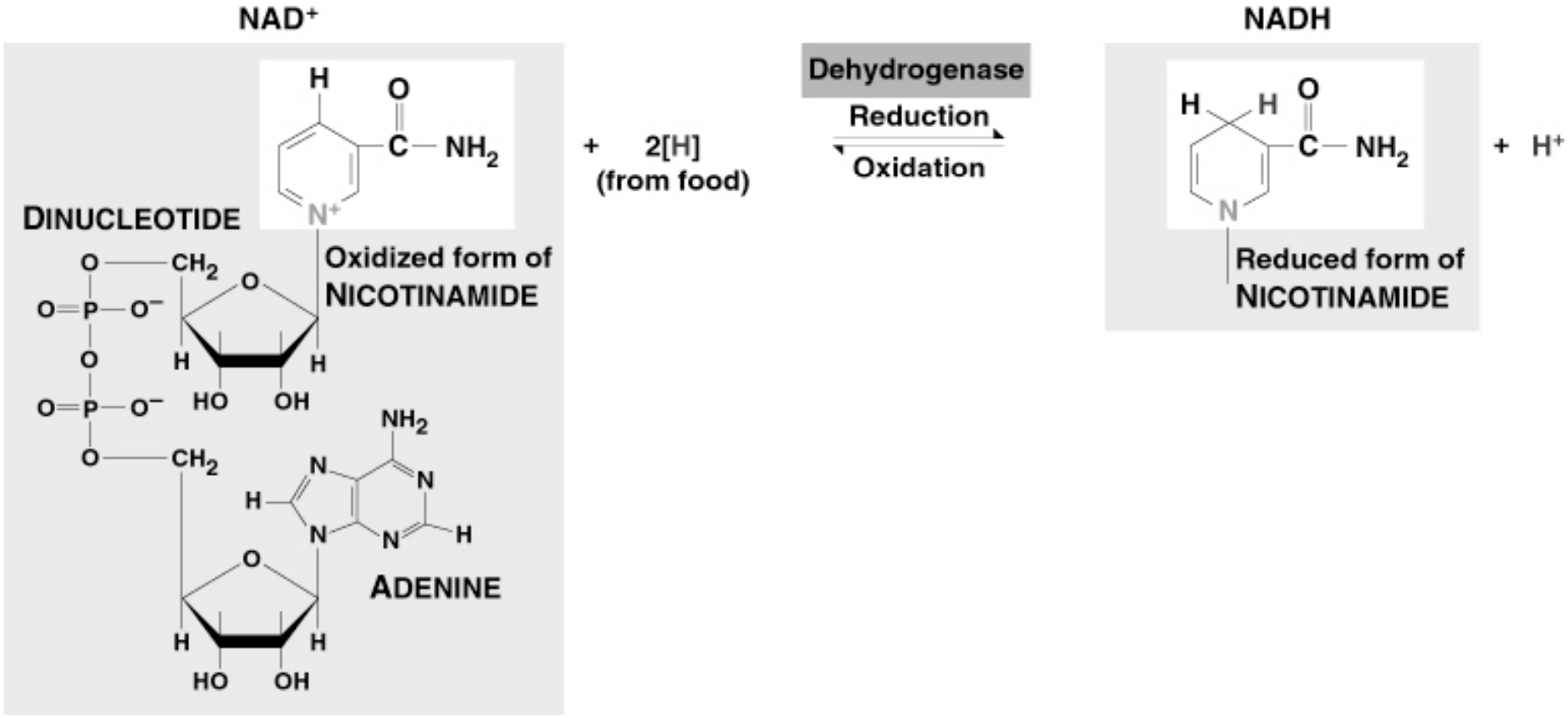
Alle drei Klassen von Nährstoffen- **Proteine, Fette, und Kohlenhydrate**- werden der **Glycolyse oder dem Citrat-Zyklus** zugeführt und werden oxidiert um Energie in Form von **ATP** zu generieren.



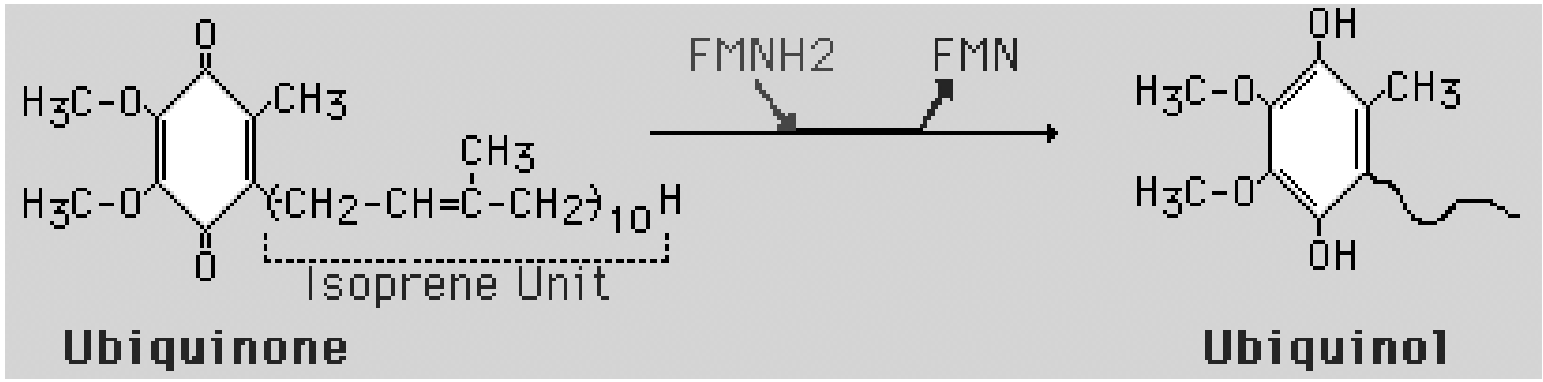


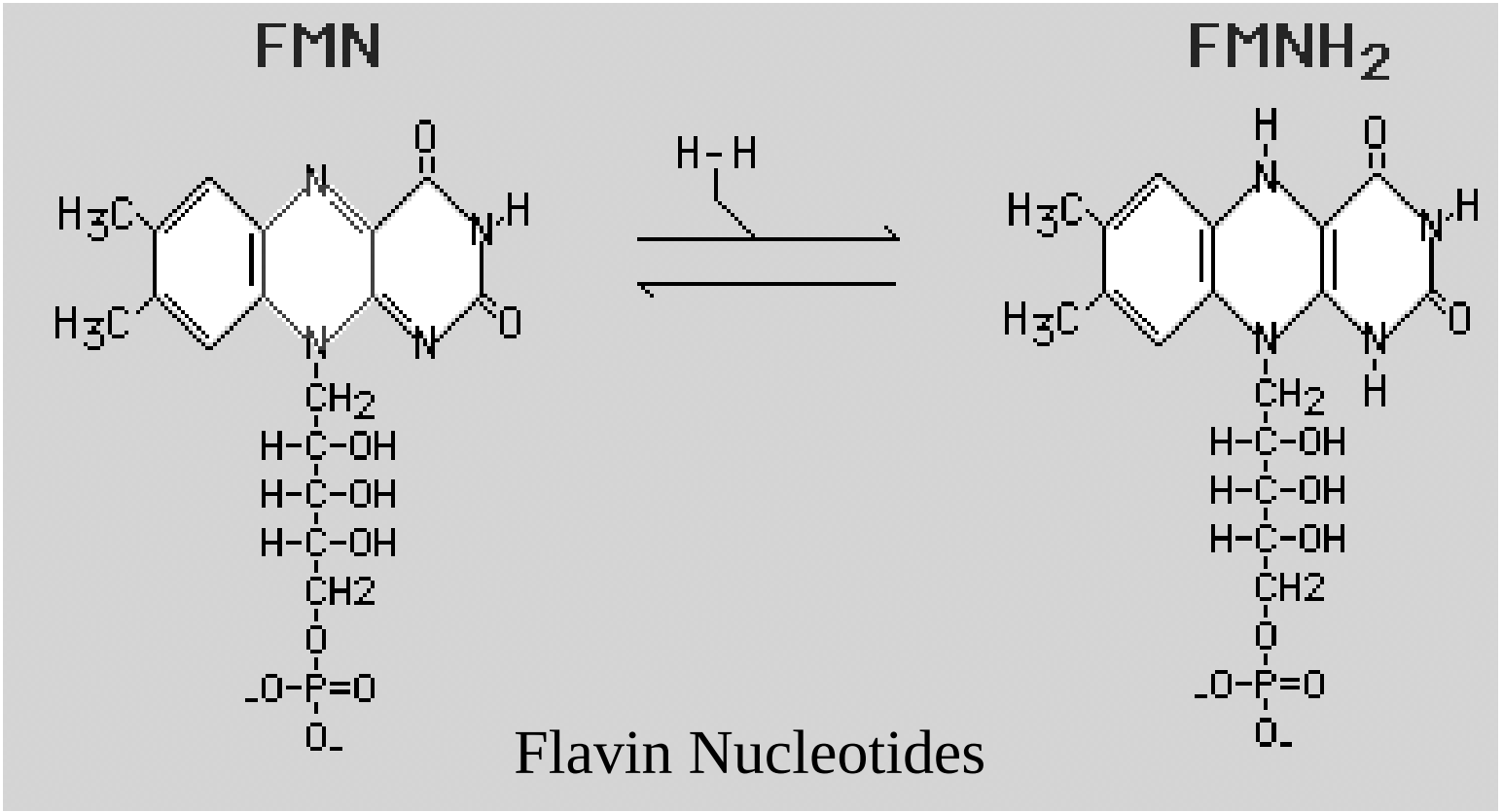
The mitochondrion is a complex organelle with a double membrane defining two internal compartments. The Matrix compartment contains the enzymes required to metabolize pyruvate and fatty acids as well as the mitochondrial genetic system.

Figure 9.4: NAD^+ as an electron shuttle.



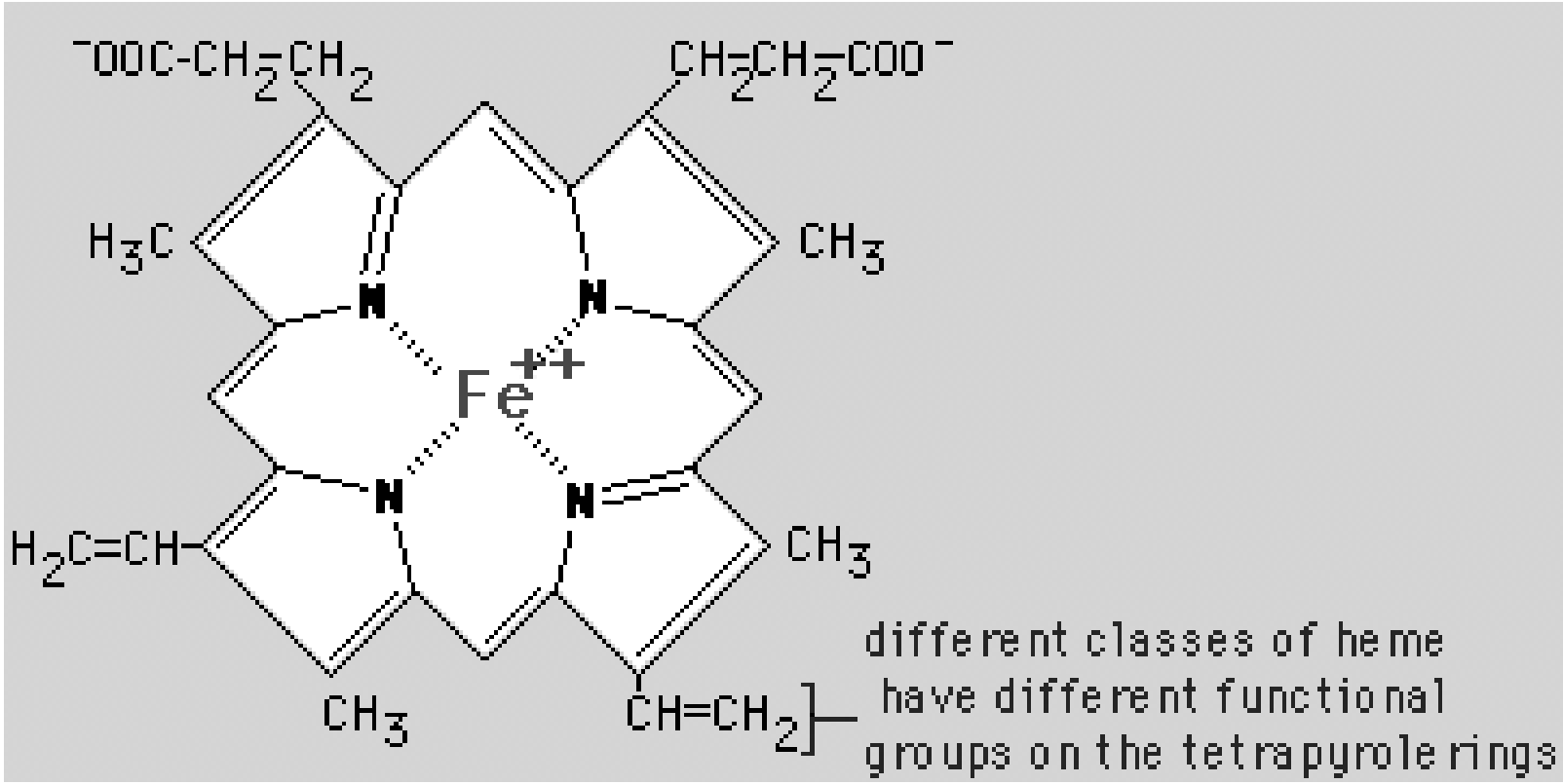
NAD+/NADH is an electron carrier molecule that also carries protons, it essentially binds a molecule of H_2.





The Quinones and the Flavin Nucleotides are electron carrier molecules that also bind protons; like NAD+/NADH they are H_2 carriers.

Cytochrome sind Proteine die eine gebundene Haem-Gruppe als Elektronenüberträger enthalten: $Fe^{++,}$ Fe^{+++}, + 1 Elektron $\rightleftharpoons$



Cytochrome übertragen nur Elektronen.

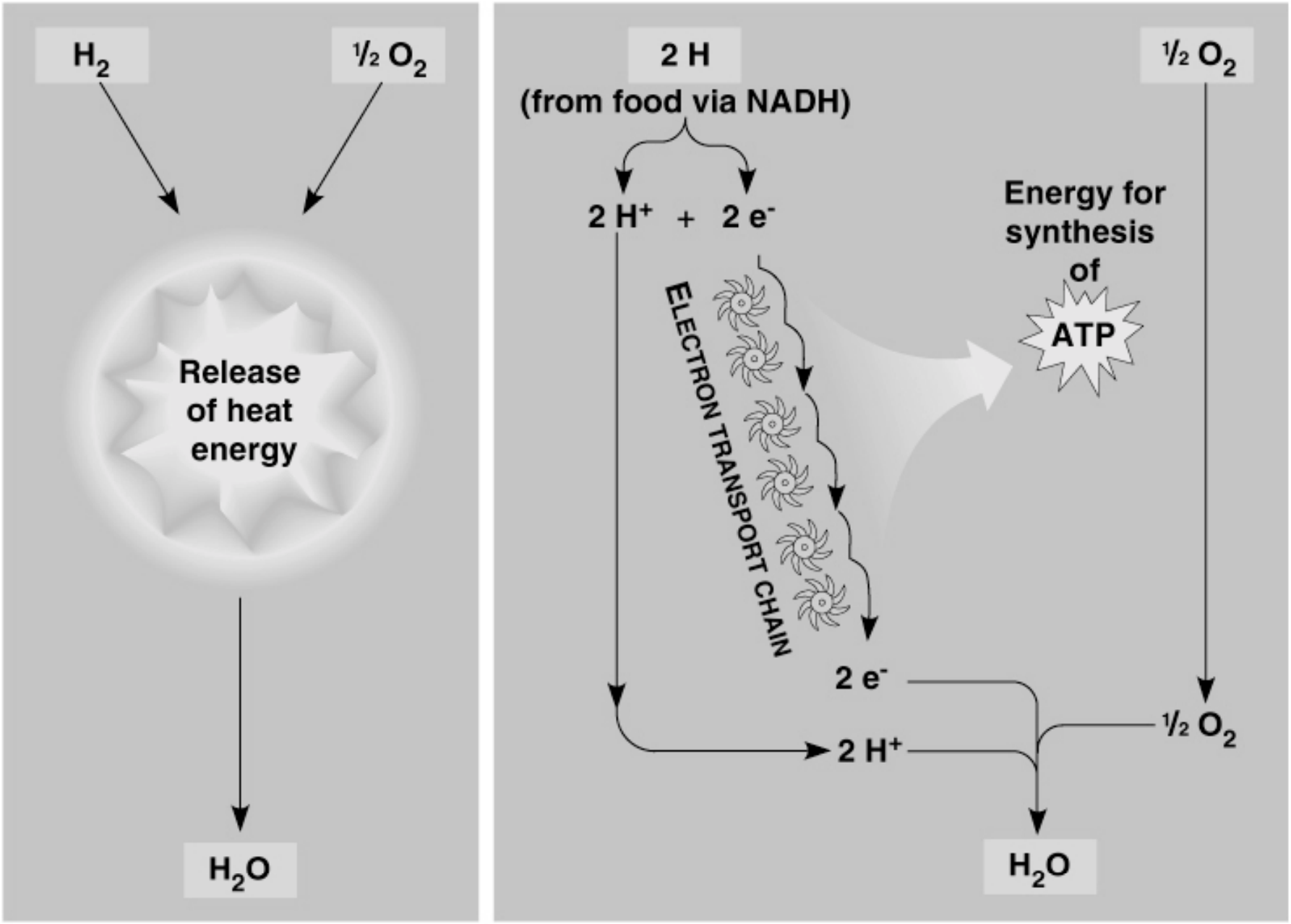
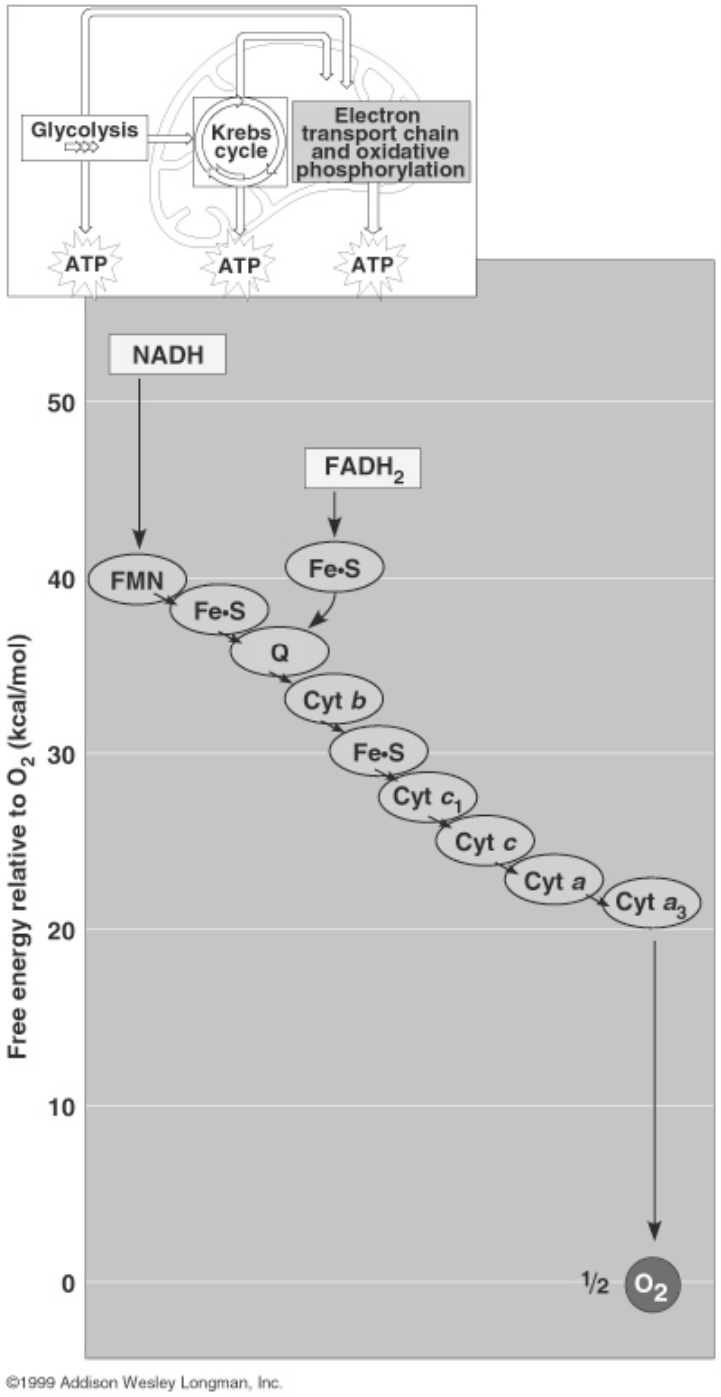
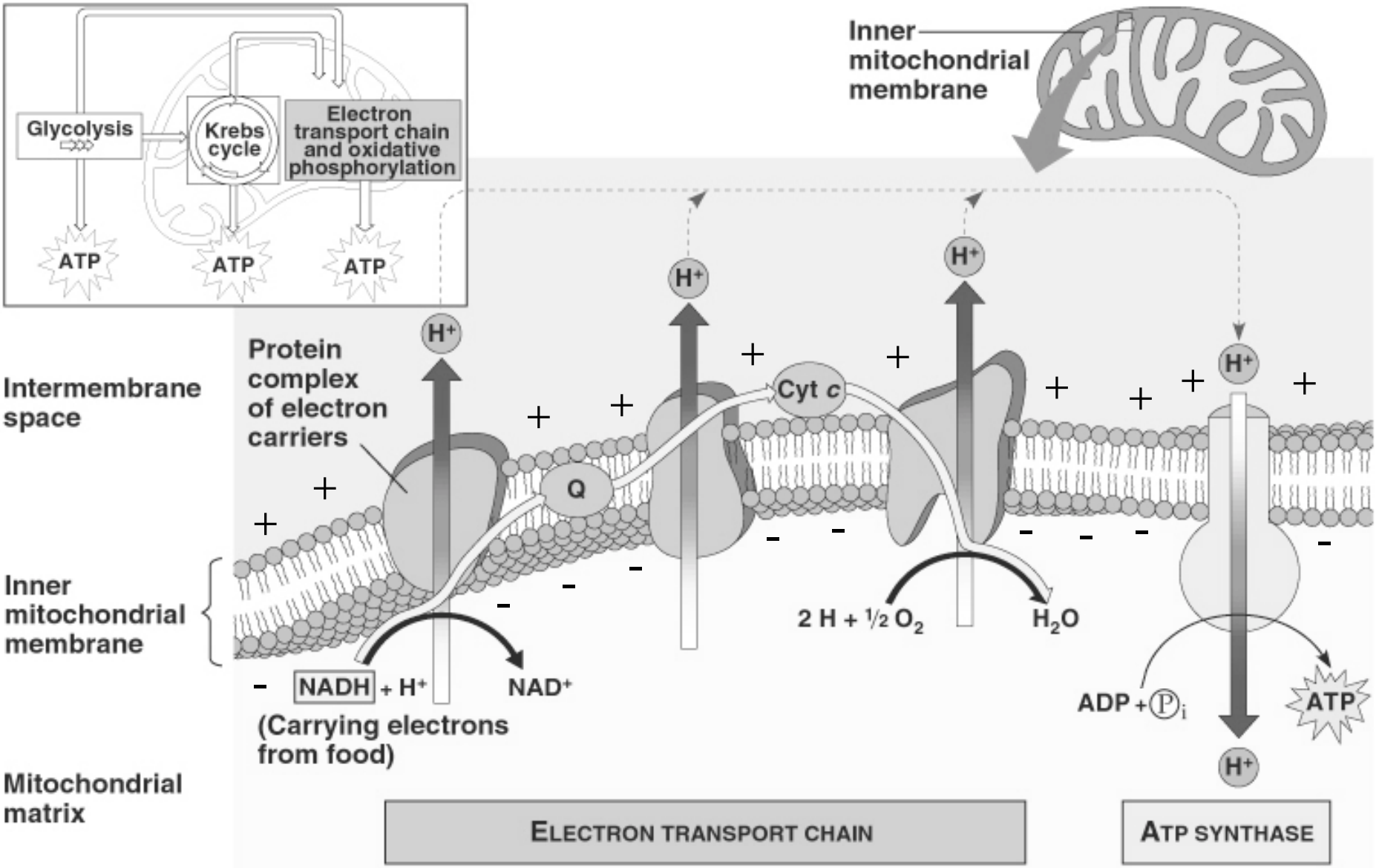


Figure 9.5: An introduction to electron transport chains

Stufenweise Nutzung der Energie in der Atmungskette

Die Elektronen mit hoher potentieller Energie im NADH und in $FADH_2$ reagieren nicht direkt mit O_2, sondern werden über mehrere Elektronenüber-träger mit abnehmender potentieller Energie zum Sauerstoff gebracht.

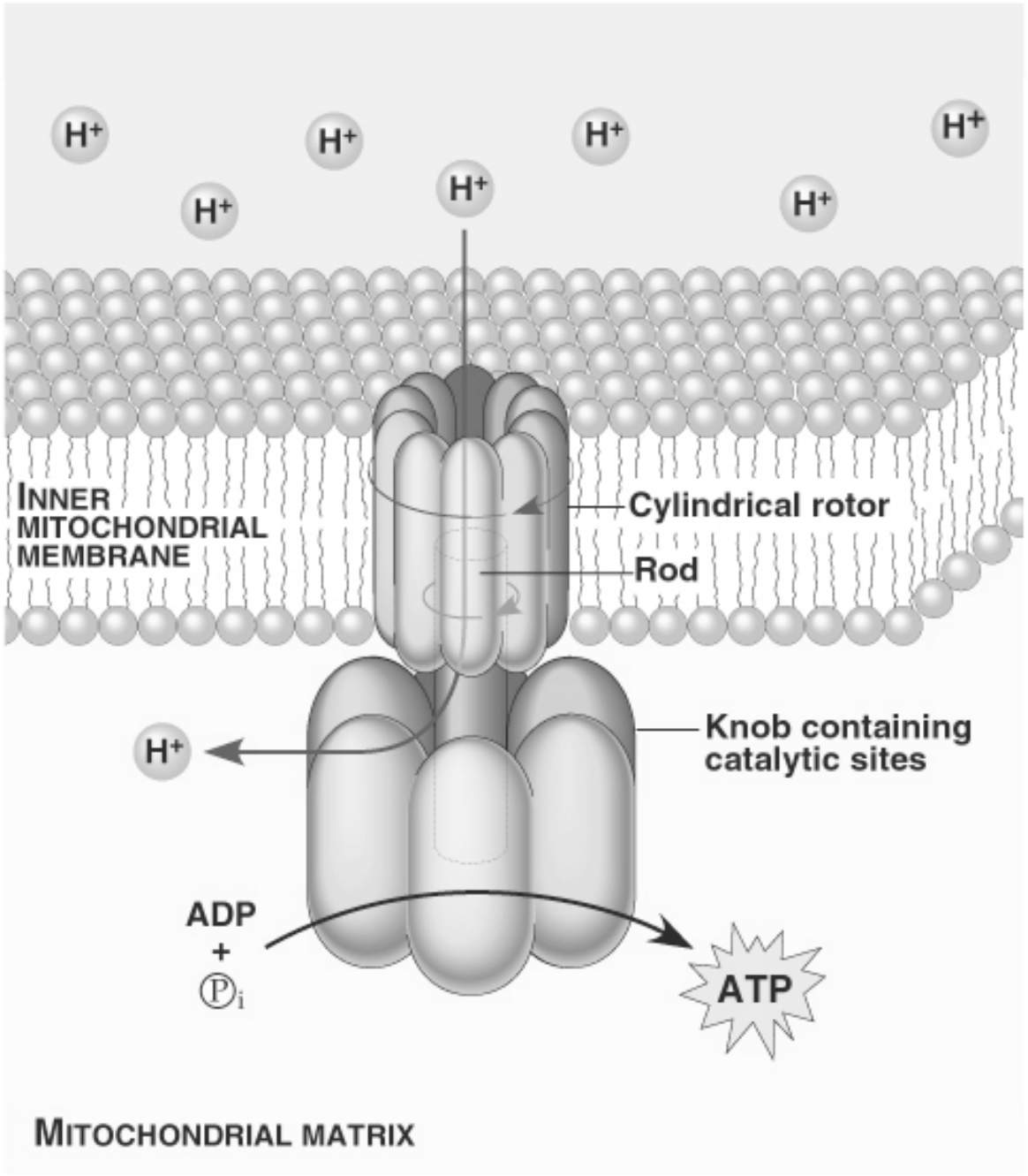


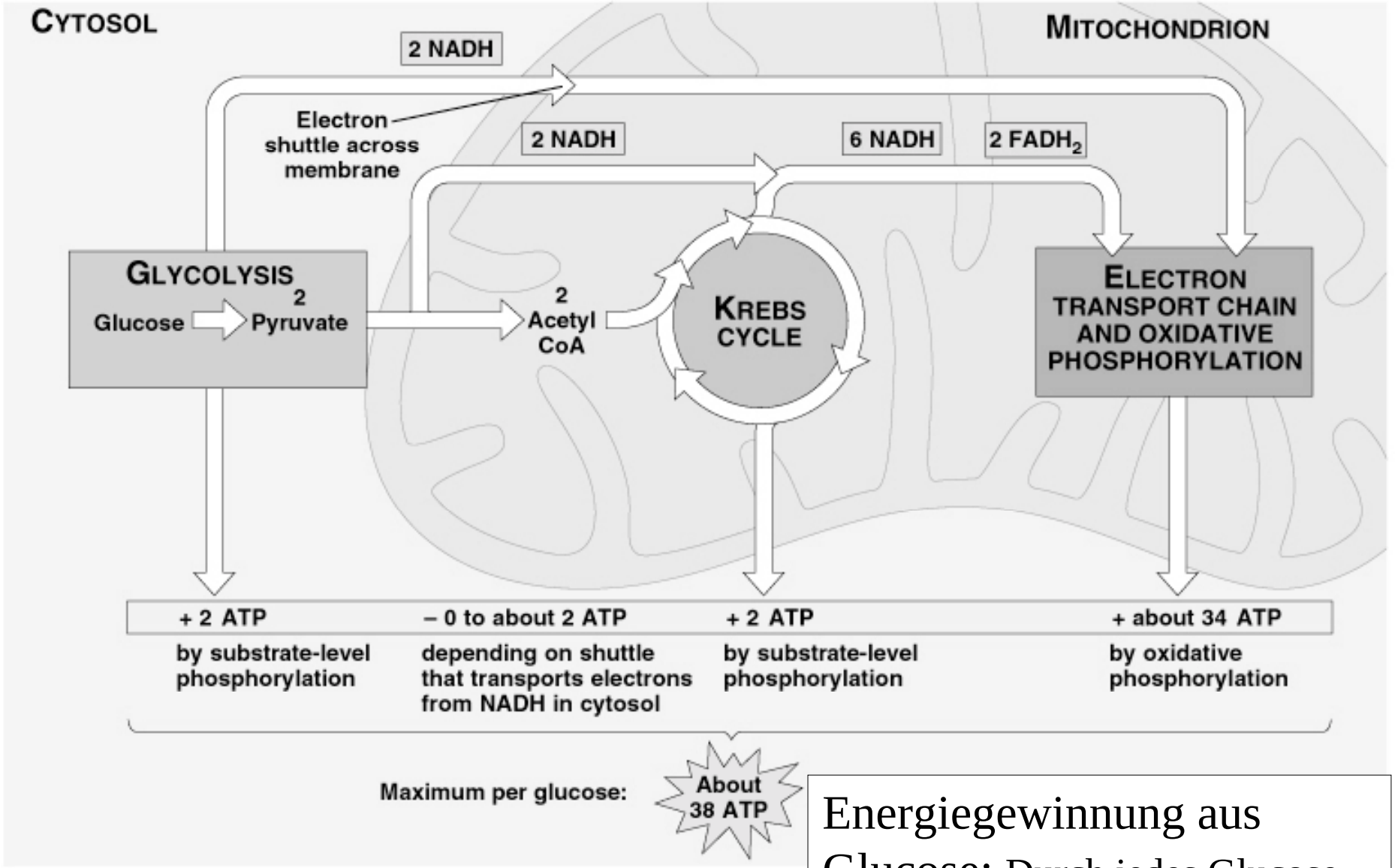


Chemisosmose: Wie in der mitochondrialen Membran Elektronen-transport und oxidative Phosphorylierung gekoppelt sind

Die ATP Synthetase

eine molekulare Maschine.
Teile des Moleküls rotieren,
während Protonen durch die
Membran transportiert werden





Energiegewinnung aus Glucose: Durch jedes Glucose-molekül können in der Atmung bis zu 38 ATP gewonnen werden.