

# Oxidative Phosphorylation



## What

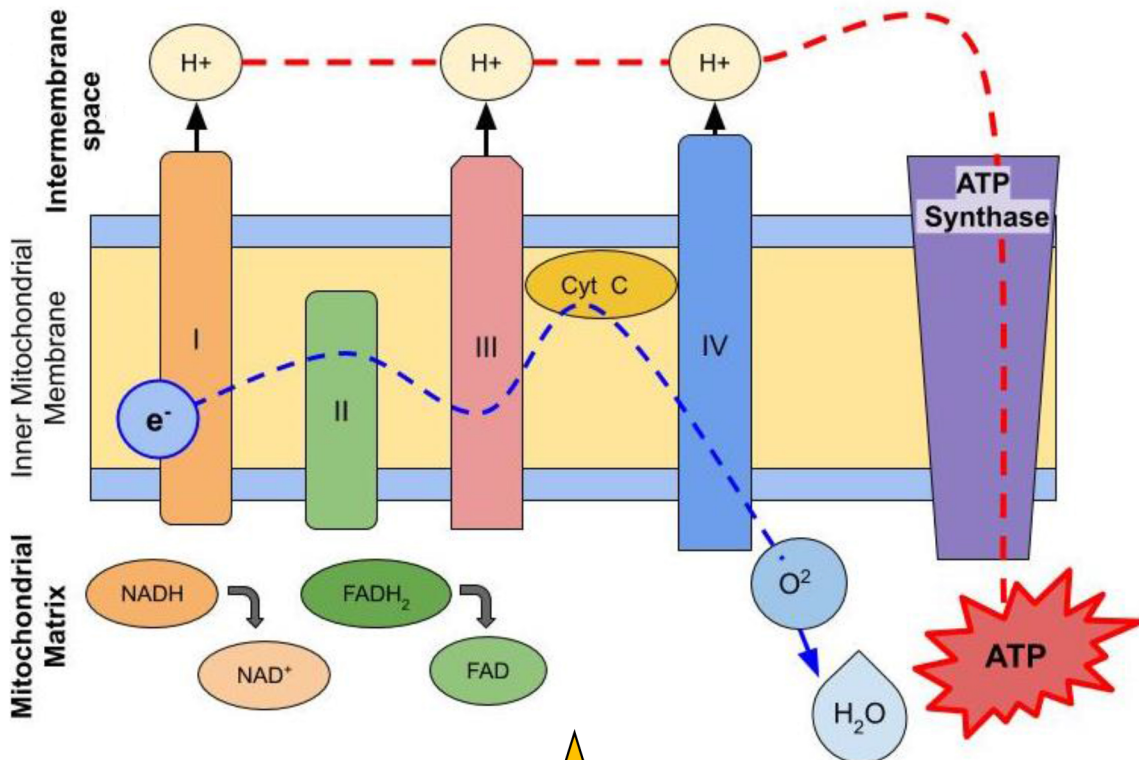
Major energy-producing pathway in the cell. Carriers from the citric acid cycle pass electrons to the electron transport chain to generate an electrochemical gradient. Hydrogen ions then flow down the gradient through the ATP synthase protein. This process yields **ATP**, the primary energy source of the cell.

## Where

Within **mitochondria**. The proteins of the electron transport chain, and ATP synthase, are embedded in the **inner mitochondrial membrane**. Hydrogen ions are pumped into the **intermembrane space**, and ATP is finally produced in the **mitochondrial matrix**.

## When

This process yields high amounts of energy but can only occur when **oxygen** is present as the final electron acceptor. This is why aerobic organisms need to breathe.



## The Electrochemical Gradient

This is a form of stored energy. A gradient is created when the **charge** and **concentration** of an ion are different across a membrane or space. In oxidative phosphorylation, hydrogen ions flow down their electrochemical gradient to drive the production of ATP.



The high concentration of hydrogen atoms in the intermembrane space makes it more acidic than the mitochondrial matrix.

## Net Yield

1 NADH  $\rightarrow$  2.5 ATP  
1  $FADH_2$   $\rightarrow$  1.5 ATP  
1 Glucose  $\rightarrow$  30-32 ATP