

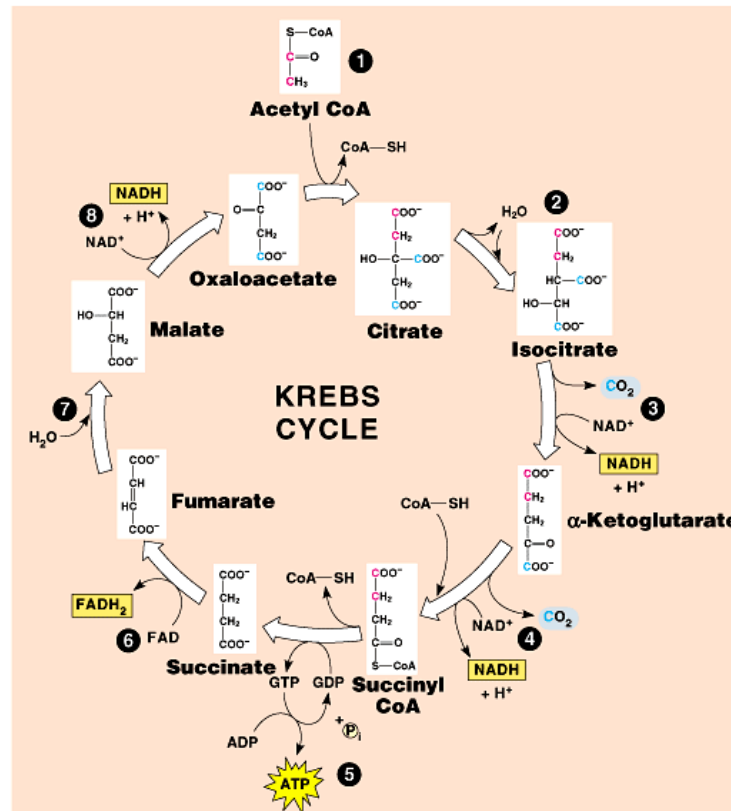
# A.P. Biology Mr. Tesoro




⌘ Homework Reminder:

⌘ Do Now: Why must glycolysis be followed with fermentation when a cell is undergoing anaerobic respiration?

# Aim: What is the Krebs's cycle?



# Anaerobic vs aerobic respiration



- ⌘ Anaerobic respiration (glycolysis + fermentation) is not very efficient. Only 2 net ATP are produced per glucose.
- ⌘ Reduced NADH gives up its high energy electrons to pyruvate but does not generate any more ATP.

# What is aerobic respiration?



- ⌘ Aerobic respiration occurs in the mitochondria and gets the most out of the reduced NADH.
- ⌘ Oxygen is the ultimate electron acceptor
- ⌘  $O_2 + 2NADH + 2H^+ \rightarrow 2H_2O + 2NAD^+$   
energy

# Summary steps of aerobic respiration



- ⌘ 1) glycolysis (cytoplasm)
- ⌘ 2) Oxidation of pyruvate (pyruvic acid) to acetyl-CoA
- ⌘ 3) Kreb's cycle (citric acid cycle)
- ⌘ 4) Electron transport chain

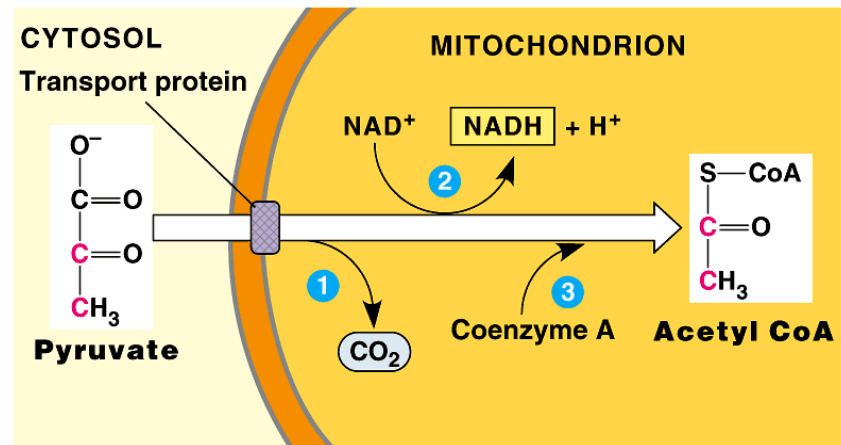
# Oxidation of pyruvate to acetyl-CoA

⌘ As pyruvate enters the mitochondrion, a multienzyme complex modifies pyruvate to **acetyl CoA** which enters the Krebs cycle in the matrix.

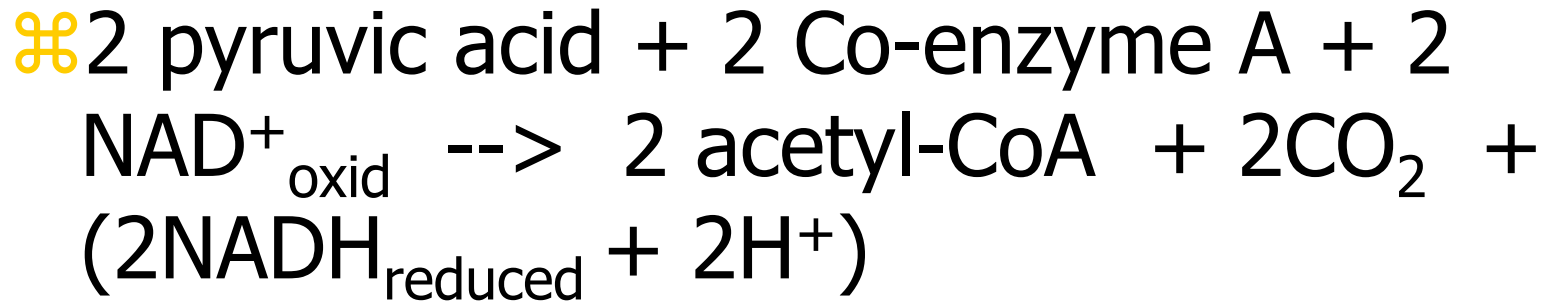
☑ A carboxyl group is removed as  $\text{CO}_2$ .

☑ A pair of electrons is transferred from the remaining two-carbon fragment to  $\text{NAD}^+$  to form  $\text{NADH}$ .

☑ The oxidized fragment, acetate, combines with coenzyme A to form acetyl CoA.



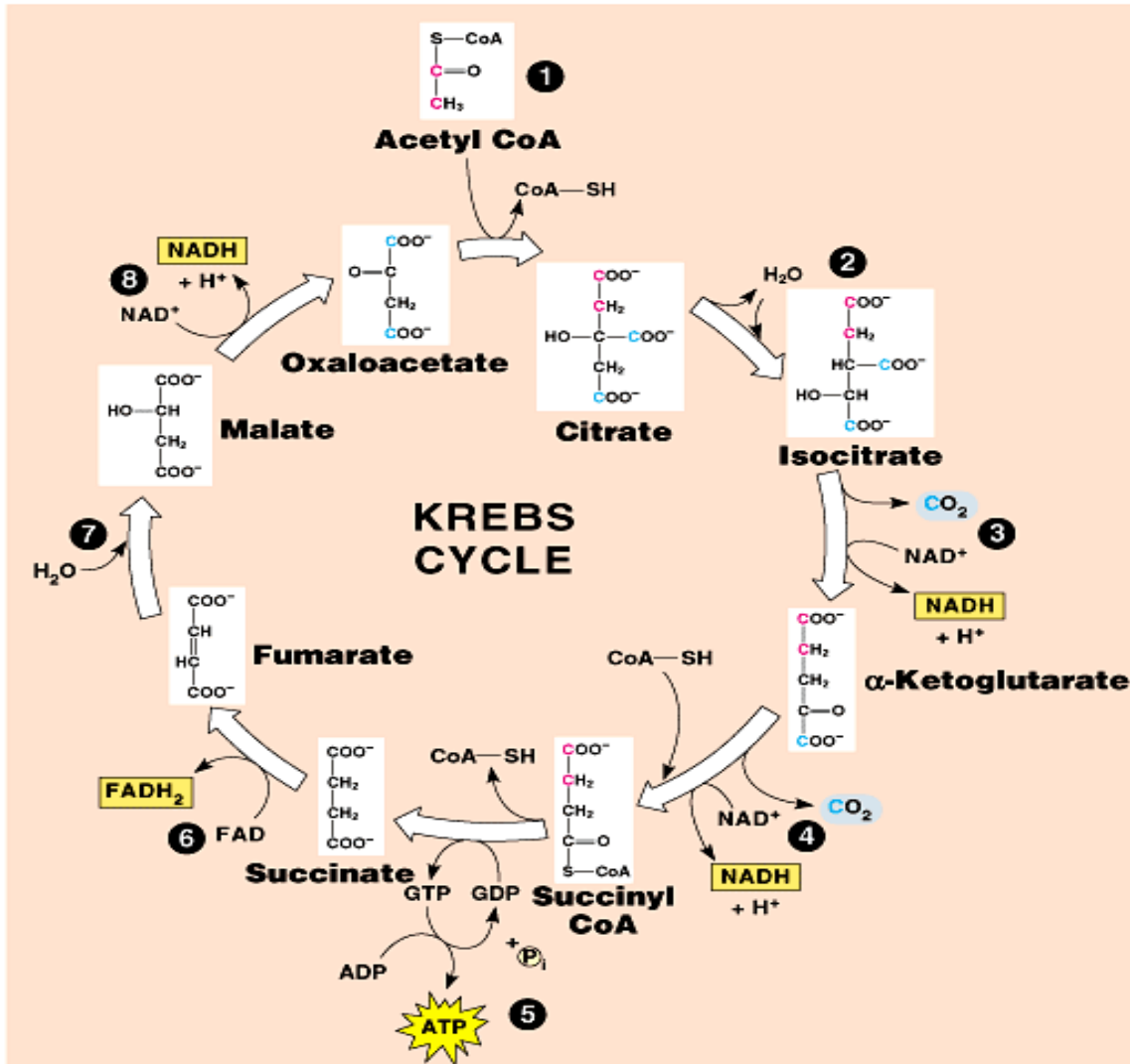
# Oxidation of pyruvate to acetyl-CoA: a summary



⌘ Note: 2 more  $\text{NADH}_{\text{reduced}}$  have been made.

⌘ The Krebs's cycle follows this process.

# Kreb's cycle



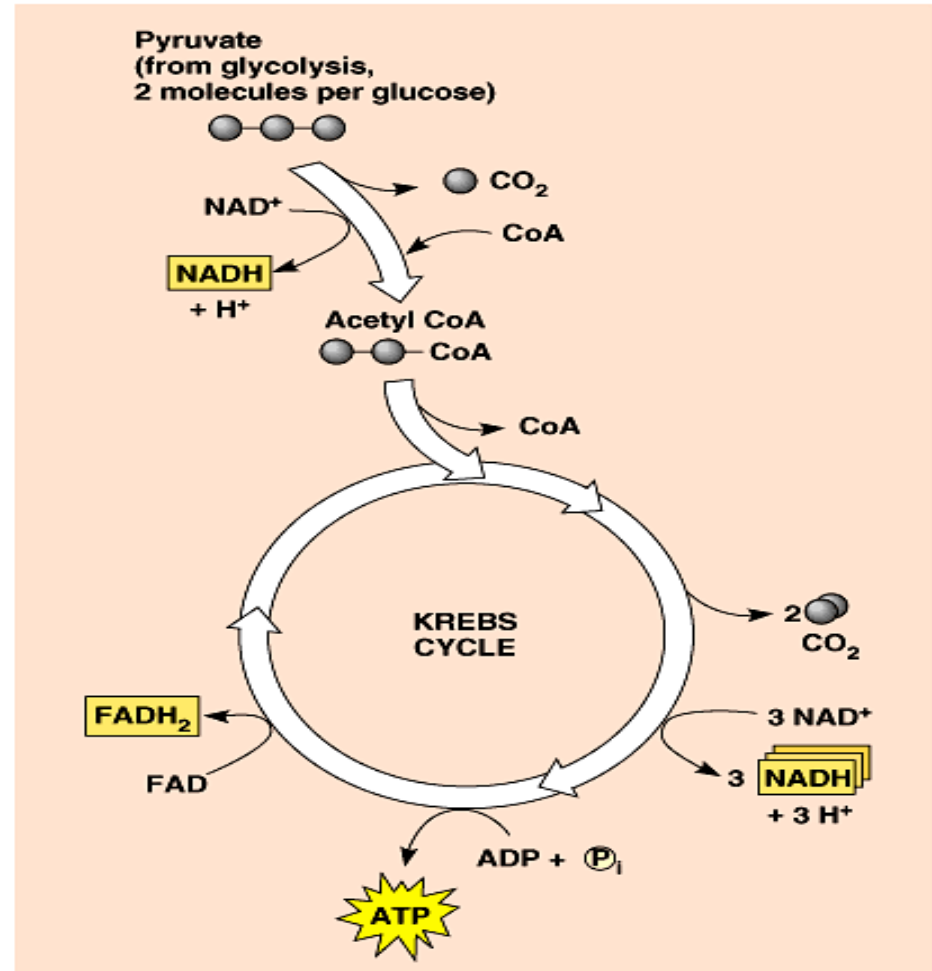
The Krebs cycle is named after Hans Krebs who was largely responsible for elucidating its pathways in the 1930's.



# Kreb's cycle

The conversion of pyruvate and the Krebs cycle produces large quantities of electron carriers.

For each glucose, the Kreb's cycle turns TWICE.



# Summary of Kreb's cycle

The Kreb's cycle produces, after two turns:

⌘ 4CO<sub>2</sub> (2 CO<sub>2</sub> per turn)

⌘ 6 NADH<sub>reduced</sub> (3 per turn)

⌘ 2 FADH (1 per turn)

⌘ 2 ATP (1 per turn) by substrate level phosphorylation