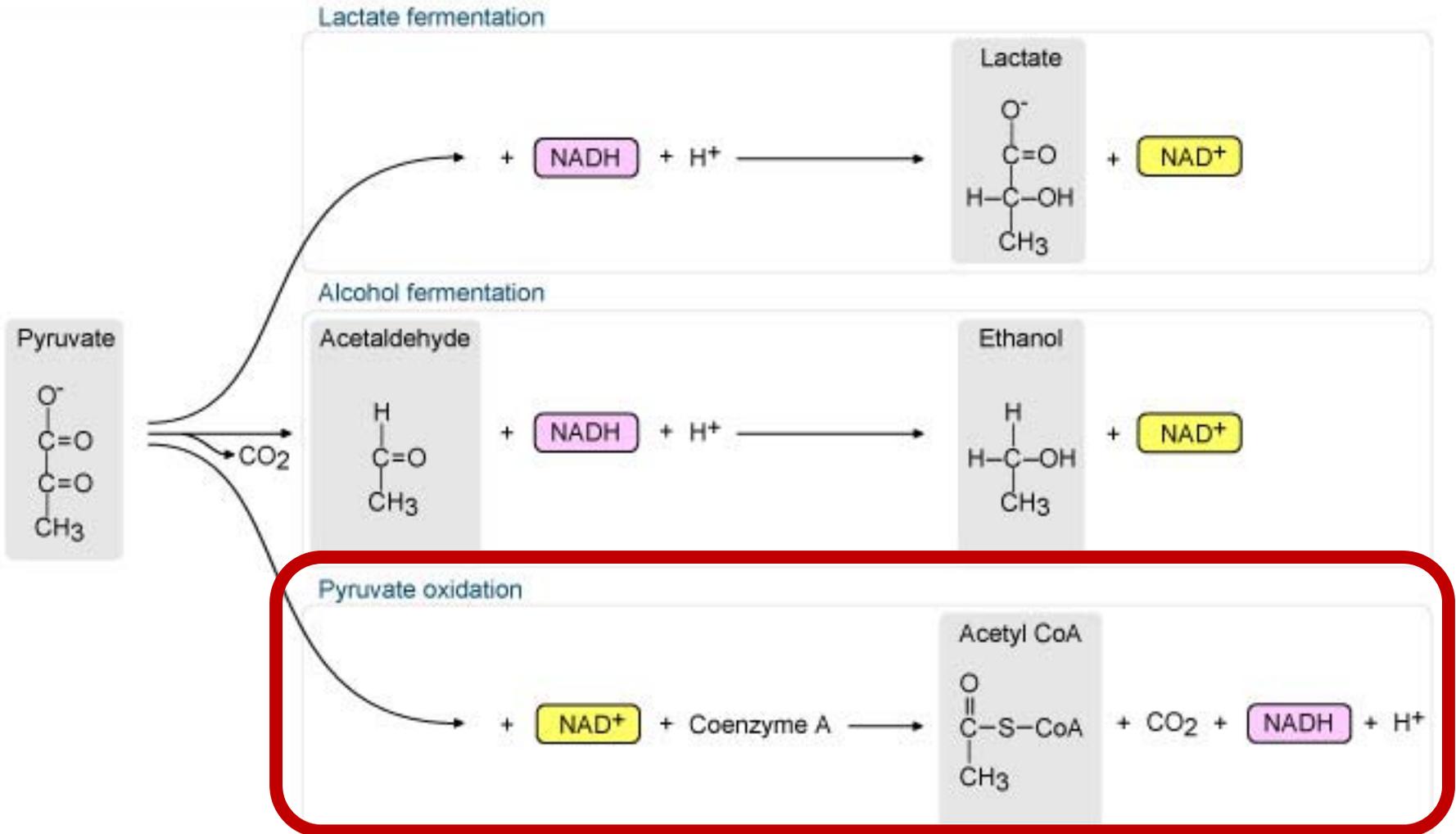


Pyruvate Oxidation & Krebs Cycle

The Transition Step &
8-Step Process in the Mitochondrial Matrix

Pyruvate is a Branching Point

The Fate of Pyruvate



Pyruvate Oxidation

The Transition Step

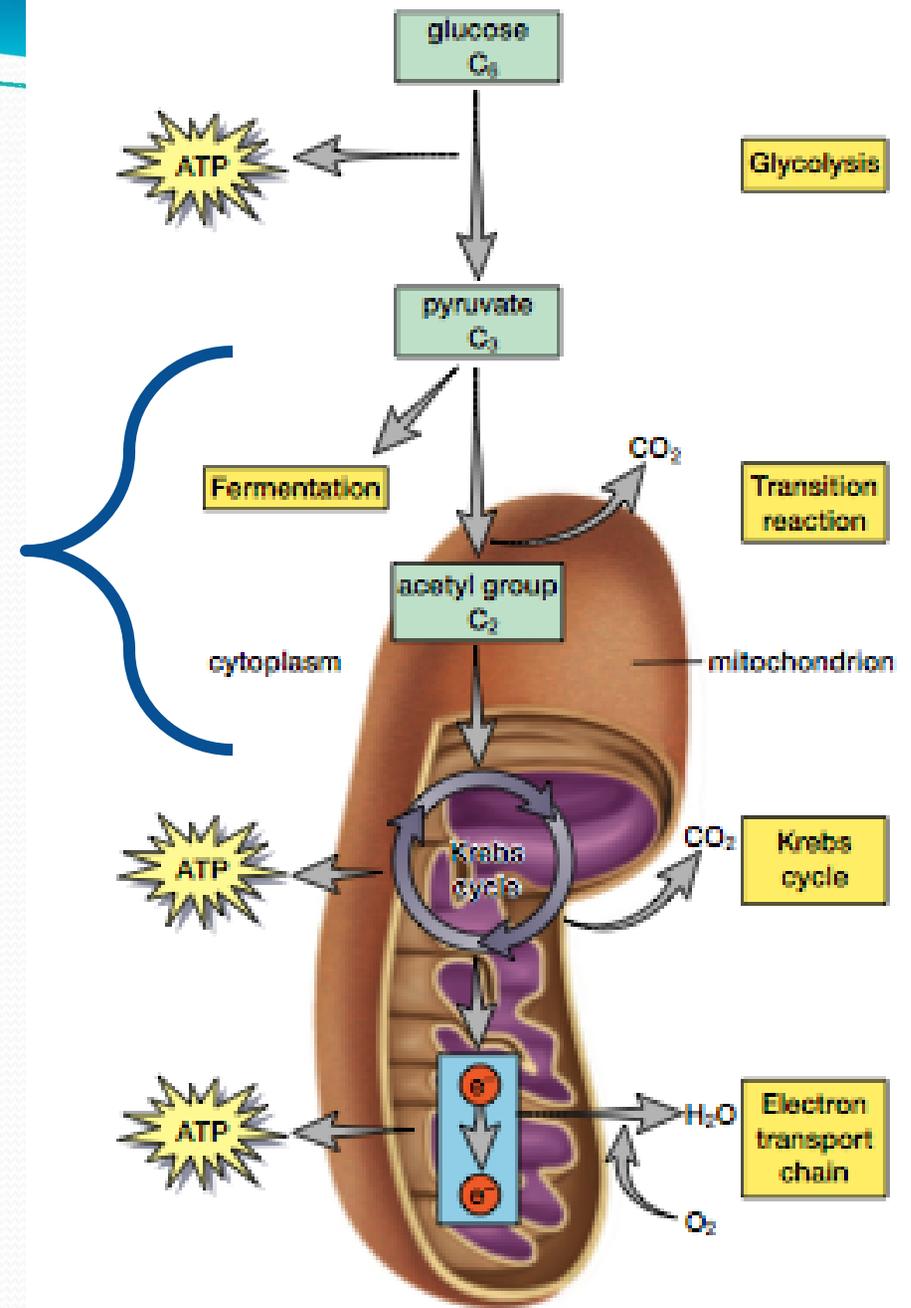


Figure 3.3 Steps of cellular respiration

Pyruvate Oxidation

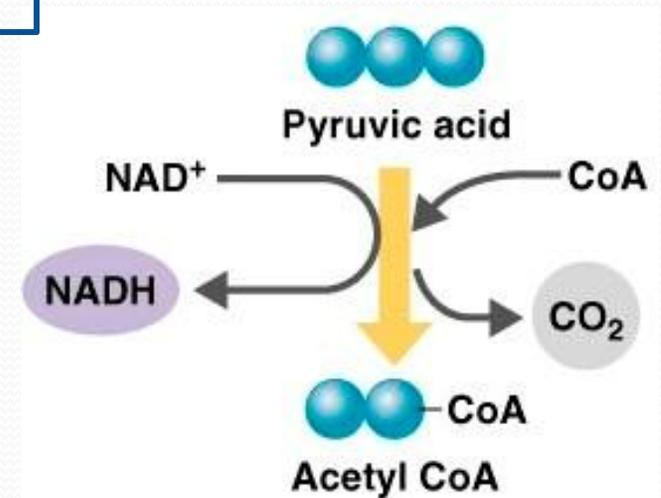
The Transition Step:

- A molecule of

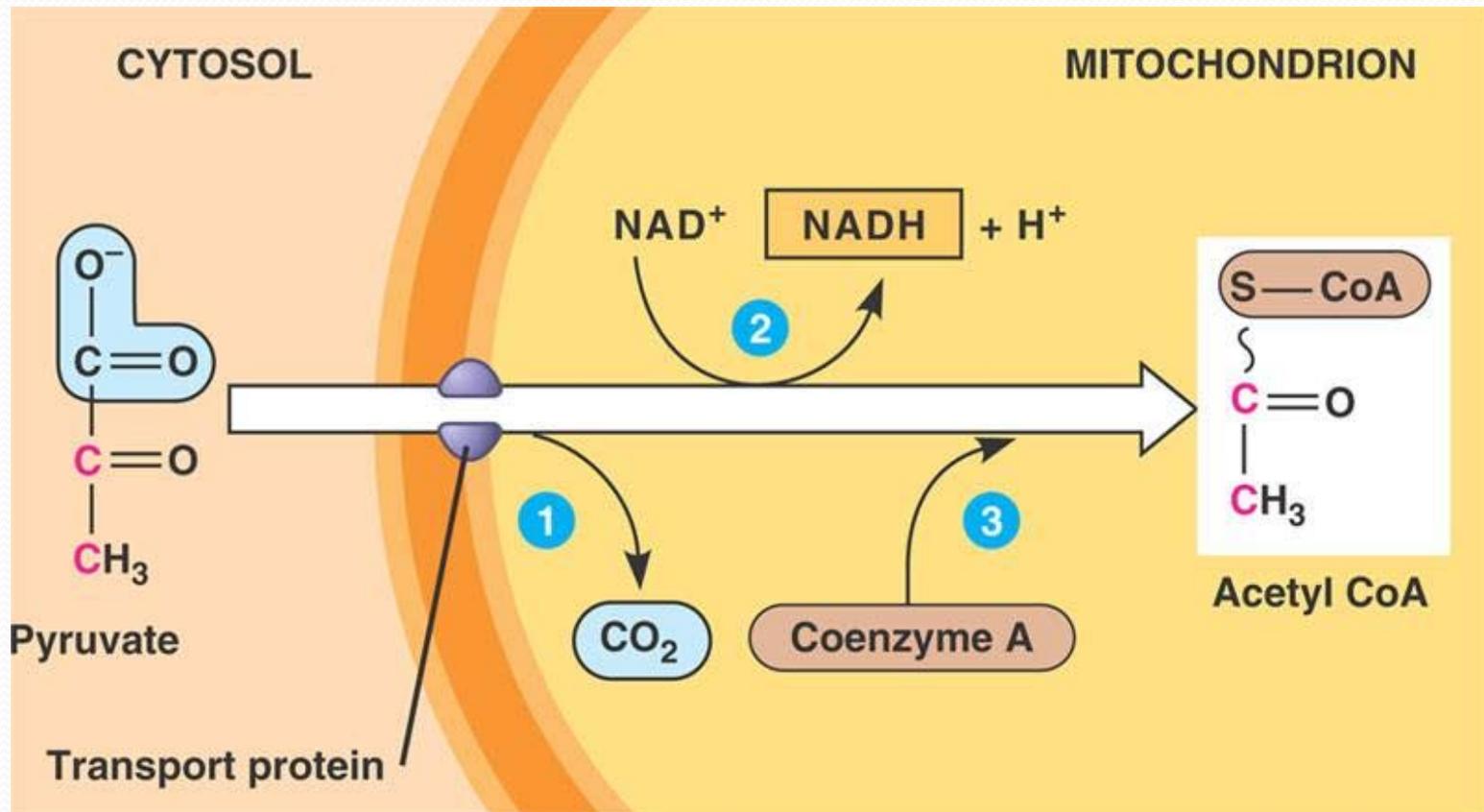
enters the mitochondrion from the cytoplasm. One atom is removed via

and hydrogen is removed using

- becomes attached to the remaining atoms, creating which enters the Krebs cycle.



Pyruvate Oxidation

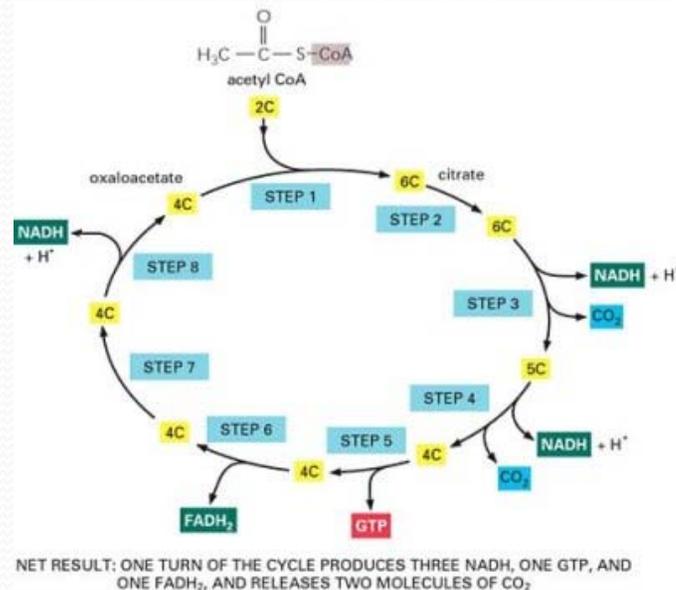


What is the word reaction for pyruvate oxidation?



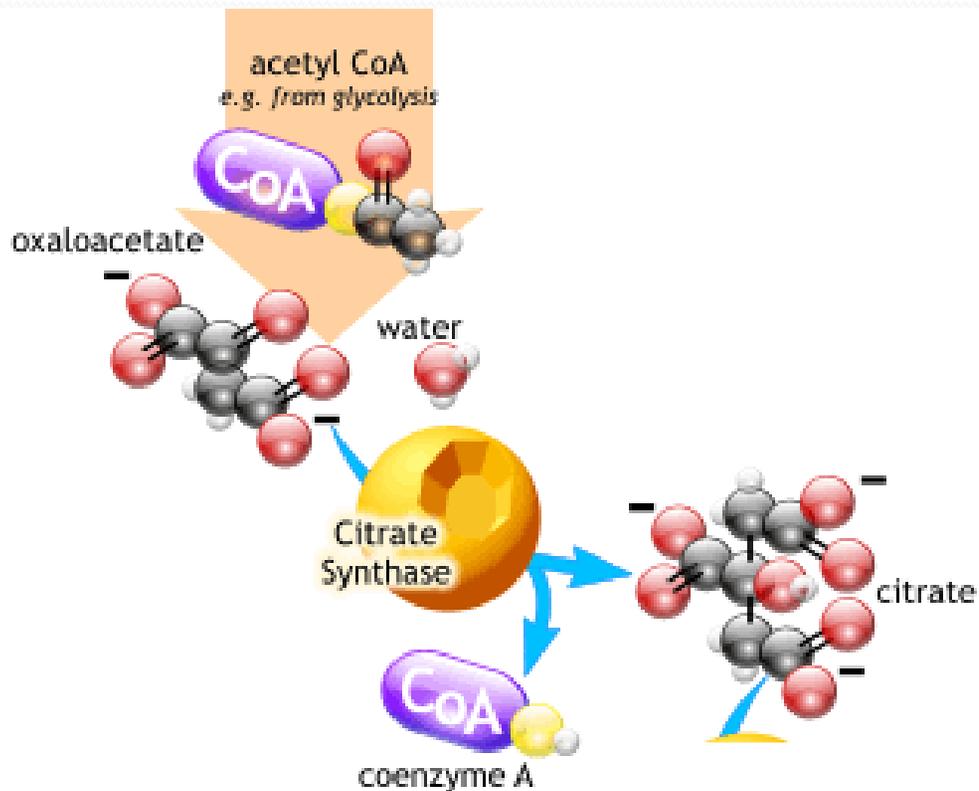
The Krebs Cycle

- Each step is **catalyzed** by a specific **enzyme**
- A cyclical process because **oxaloacetate**, the product of step 8 is the **reactant** in step 1.
- Cycle turns **twice** for every glucose molecule oxidized



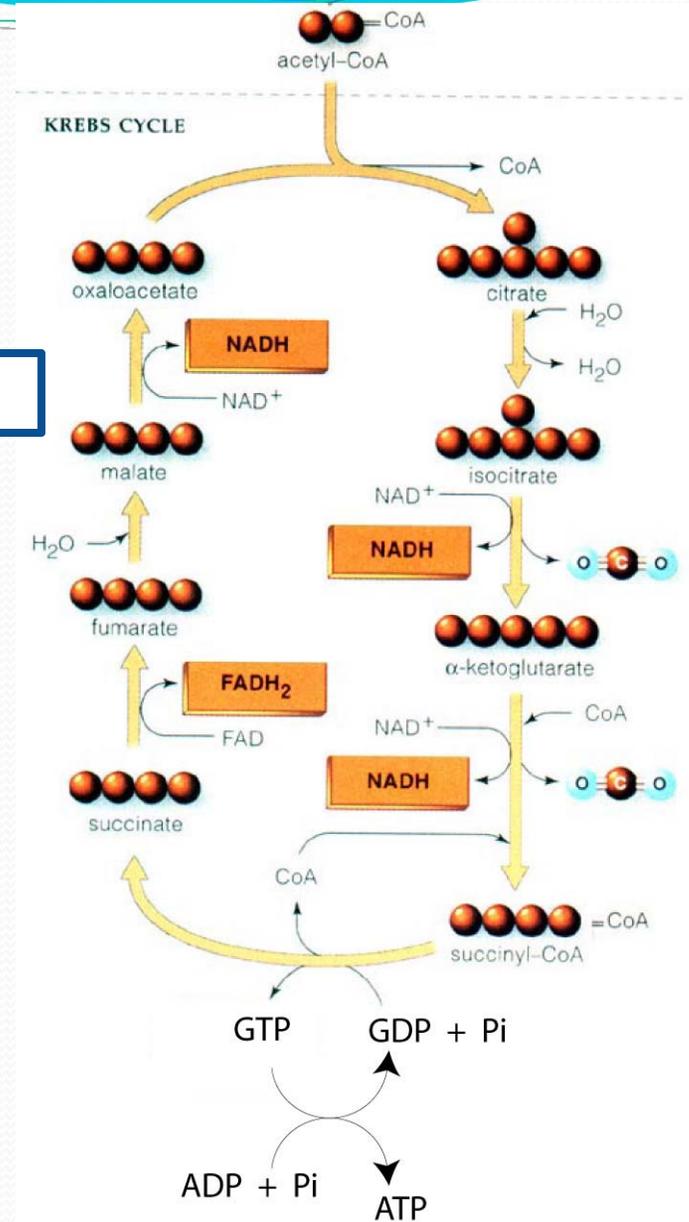
Let the Cycle Begin....

- **Acetyl-CoA** enters the cycle and combines with **oxaloacetate** to make the 6-carbon compound **citrate**



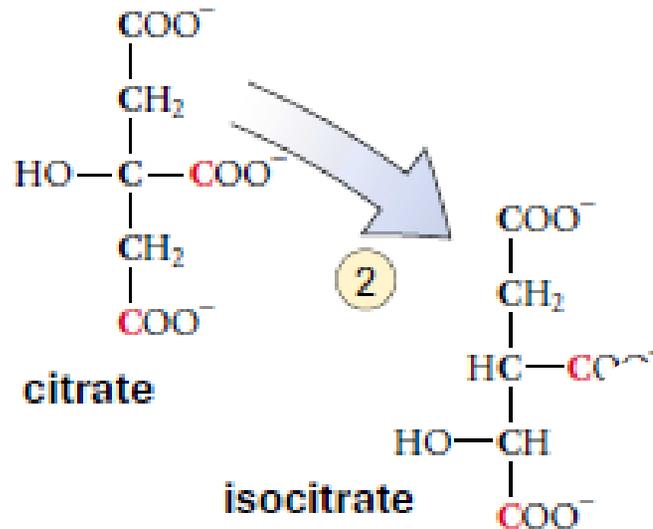
- During the 8 steps of the Krebs cycle, **citrate** undergoes a number of reactions, releasing **CO₂** and **ATP** in a number of steps.

- **citrate** is eventually converted into **oxaloacetate** so it can be used again in the cycle.



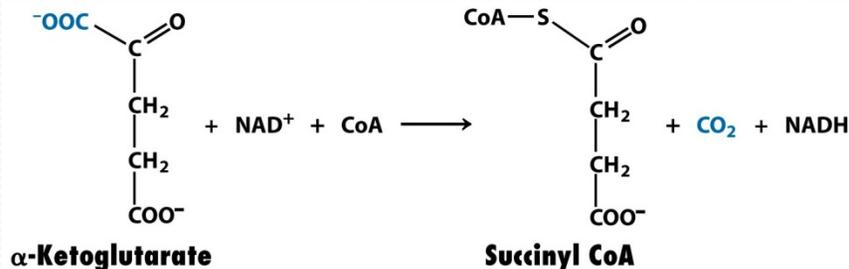
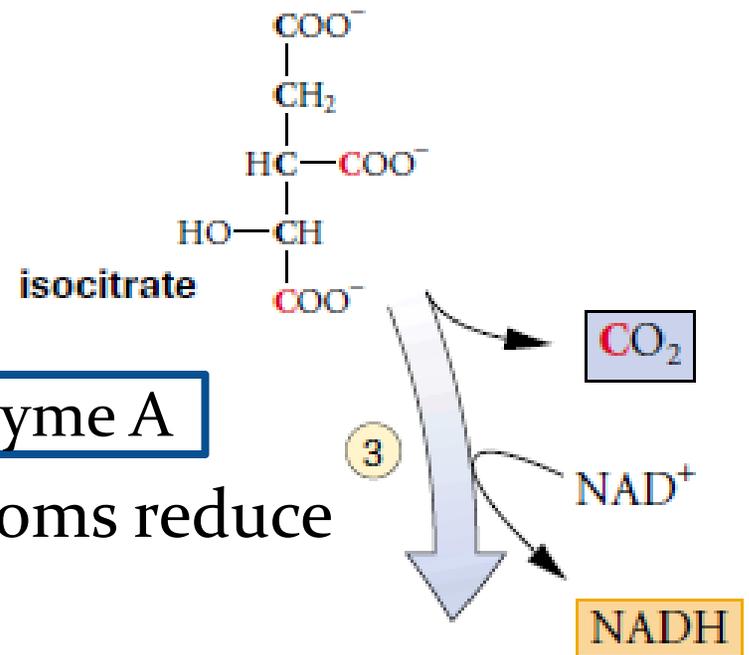
The 8 Steps:

- **Step 1:** Acetyl-CoA reacts with a molecules of oxaloacetate to form citrate . CoA is released.
- **Step 2:** citrate is rearranged to isocitrate

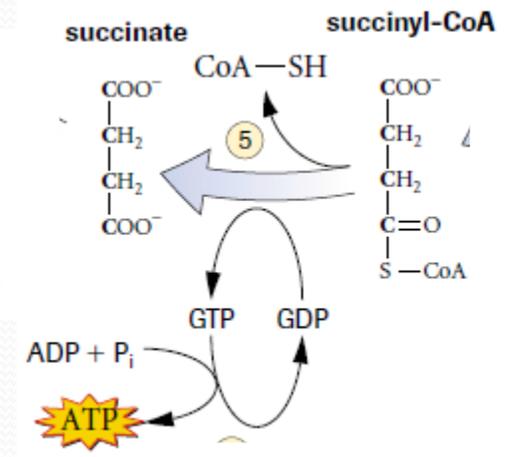


- **Step 3:** Isocitrate is converted to α -ketoglutarate by losing a CO_2 and 2 hydrogen atoms that reduce NAD^+ to NADH

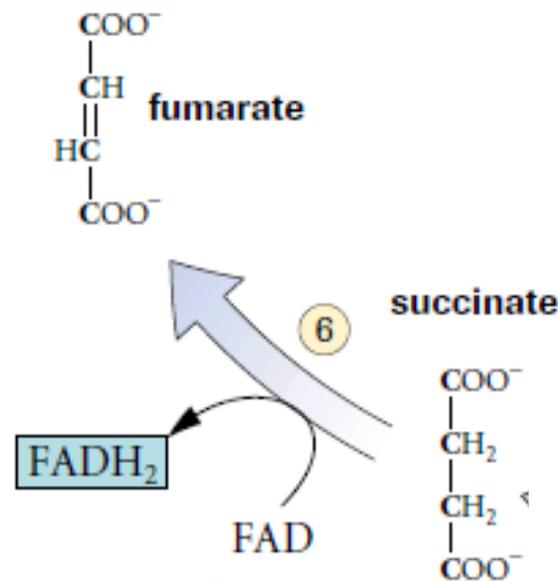
- **Step 4:** α -ketoglutarate is converted to Succinyl-CoA. A CO_2 is removed, coenzyme A is added and 2 hydrogen atoms reduce NAD^+ to NADH



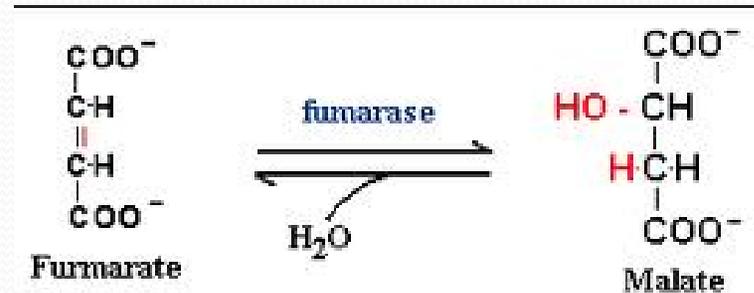
- Step 5:** Succinyl-CoA is converted to succinate. ATP is formed by substrate level phosphorylation and coenzyme A is released.



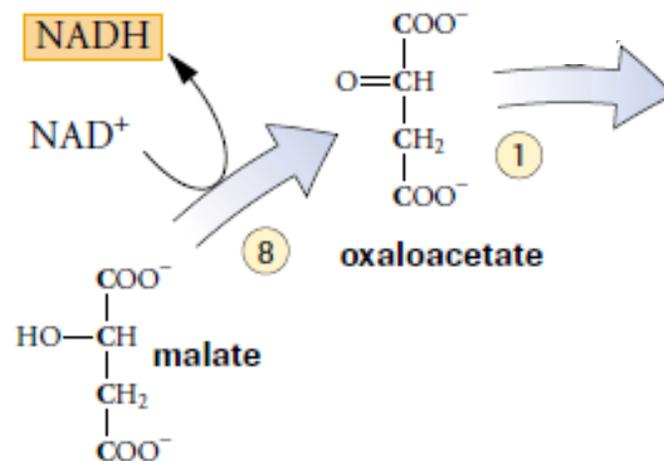
- Step 6:** succinate is converted to fumarate. FAD is reduced to FADH₂.



- **Step 7:** **fumarate** is converted to **malate** via the addition of **H₂O**



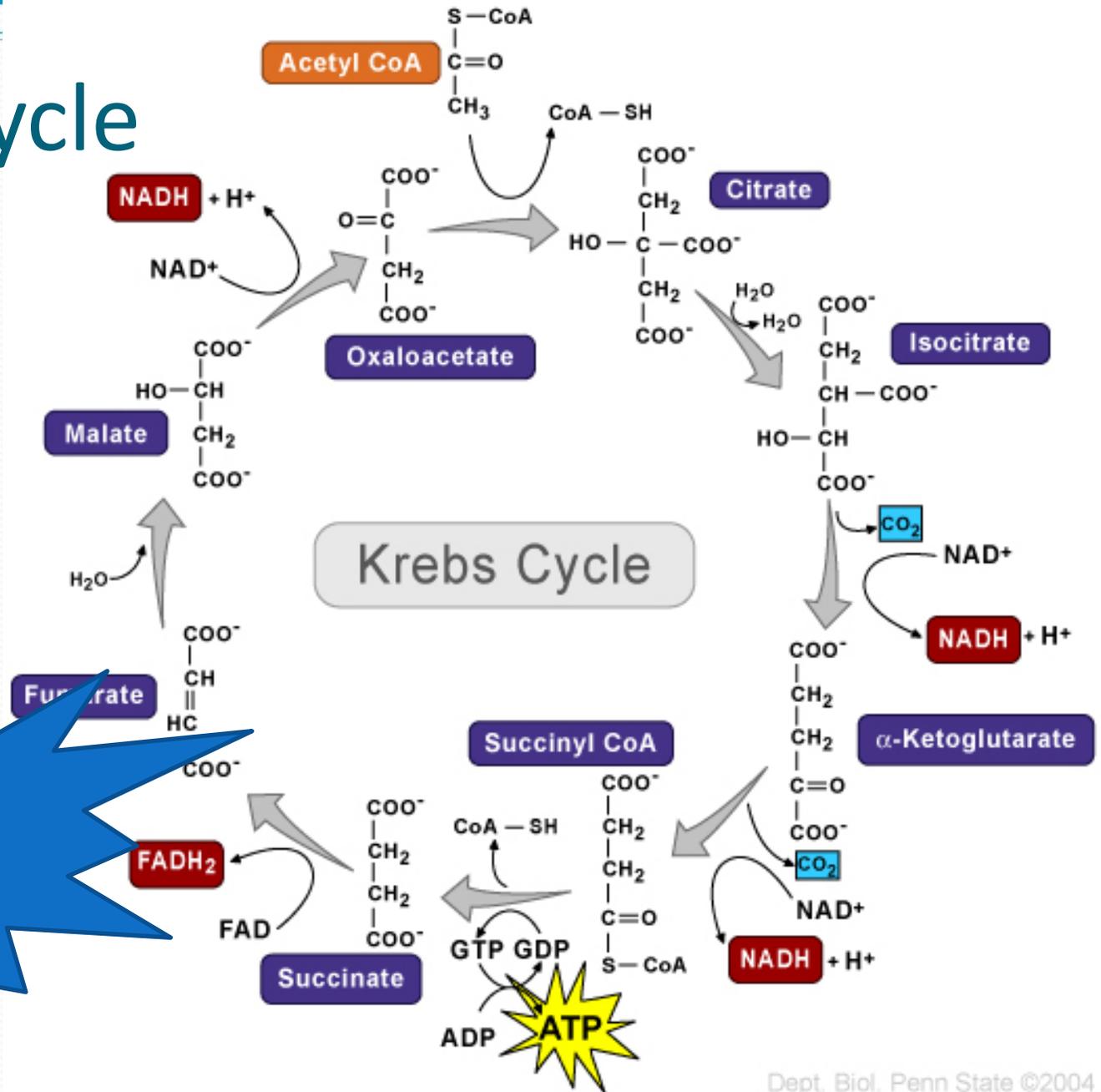
- **Step 8:** **Malate** is converted to **oxaloacetate** and **NAD⁺** is reduced to **NADH**.

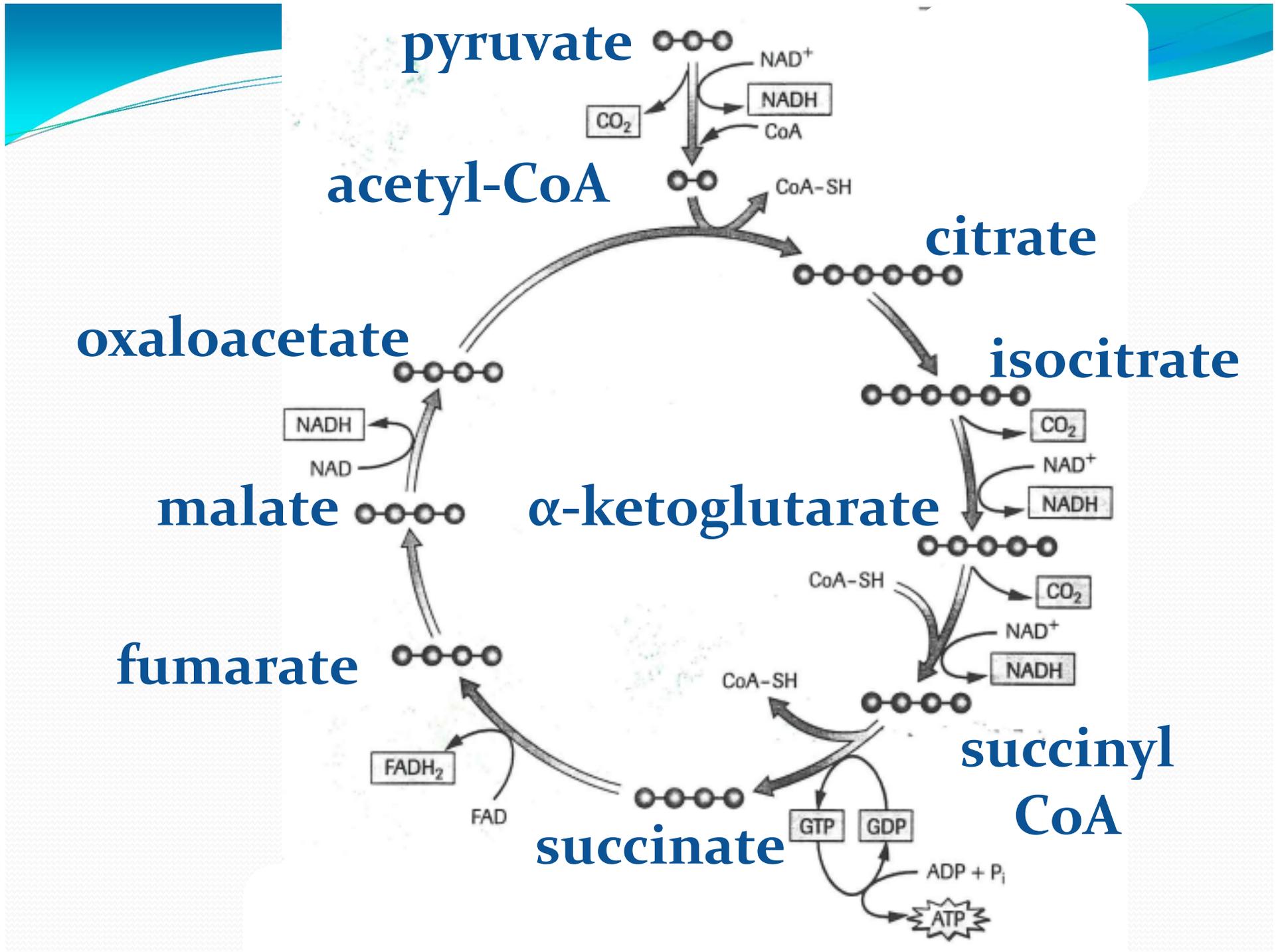


The Krebs Cycle Summary

- 4 CO₂
- 2 ATP
- 6 NADH
- 2 FADH₂

**For every
GLUCOSE**



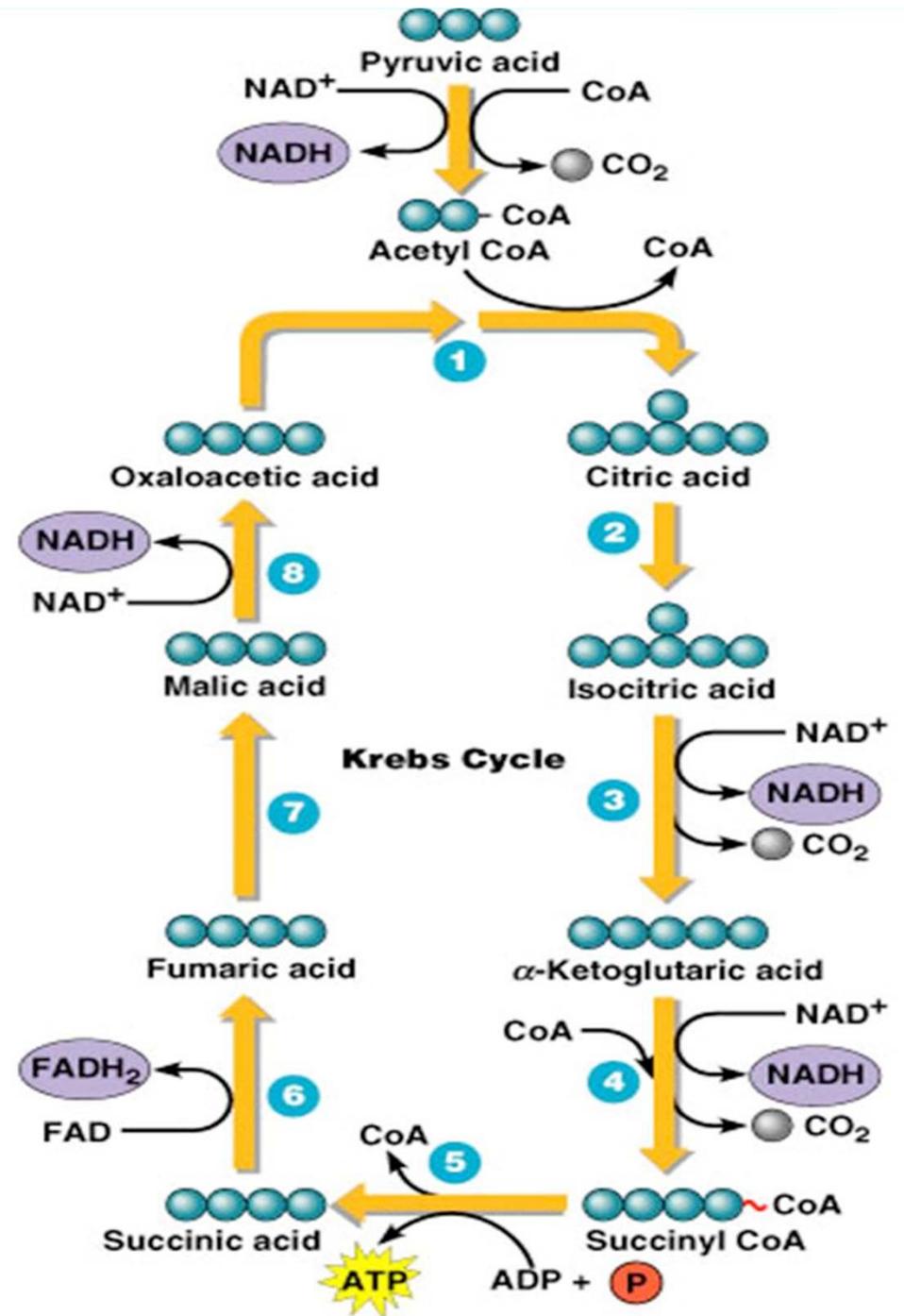


How many oxidation reactions occur in Krebs? Where?

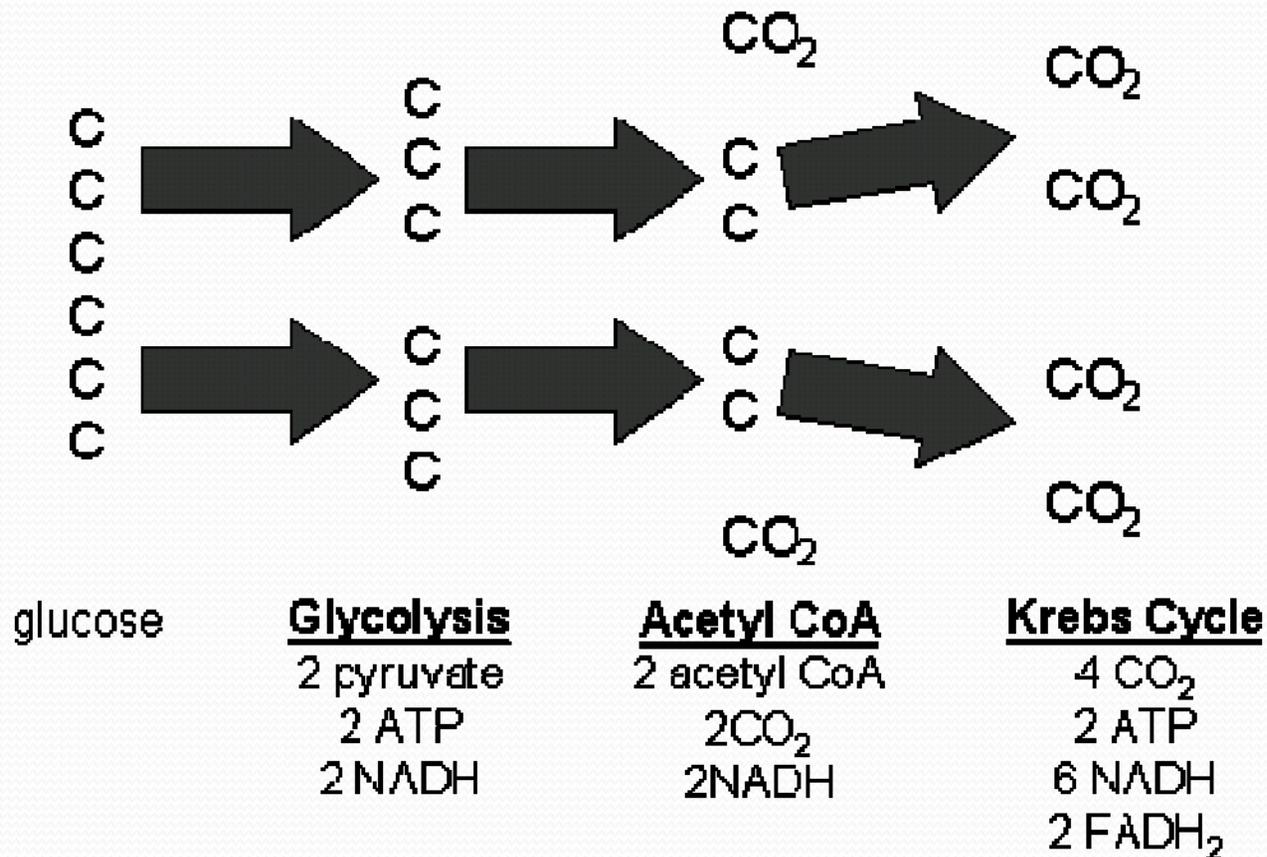
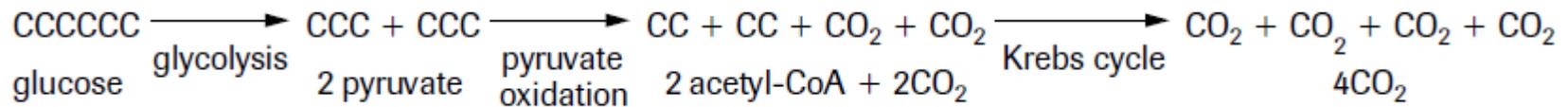
Where does the condensation reaction occur?

Where does the isomerization reaction occur?

Where does substrate-level phosphorylation occur?



The Fate of Glucose's Carbon Atoms



Please, Introduce Yourself...



- Hello, my name is _____
- I am a _____
(#-Carbon molecule,
high energy molecule....)
- I become _____ (molecule)
with the help of _____ (molecule)
OR
- I am responsible for _____ (doing...)
OR
- I come from _____ (molecule) via _____ (process)

