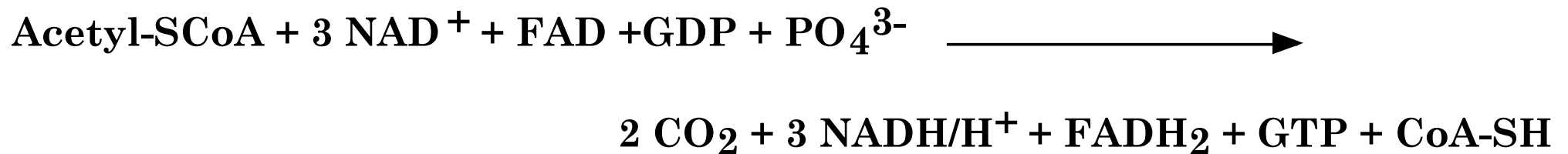


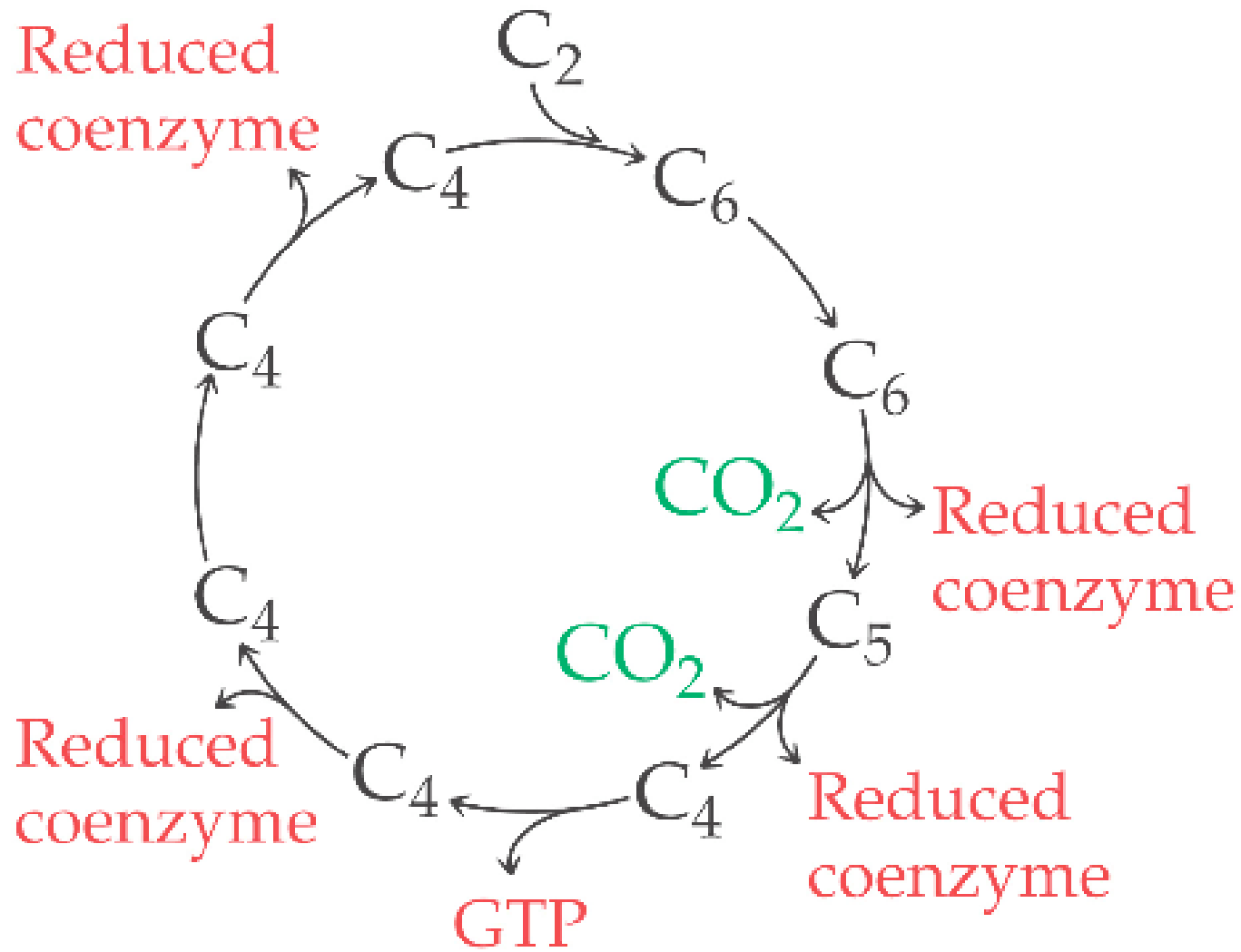
# The Citric Acid Cycle

The citric acid cycle is a cyclic set of reactions which oxidize Acetyl-S-CoA using  $\text{NAD}^+$  and FAD into  $\text{CO}_2$ ,  $\text{NADH}/\text{H}^+$ , and  $\text{FADH}_2$ . In the process a molecule of GTP is also synthesized.

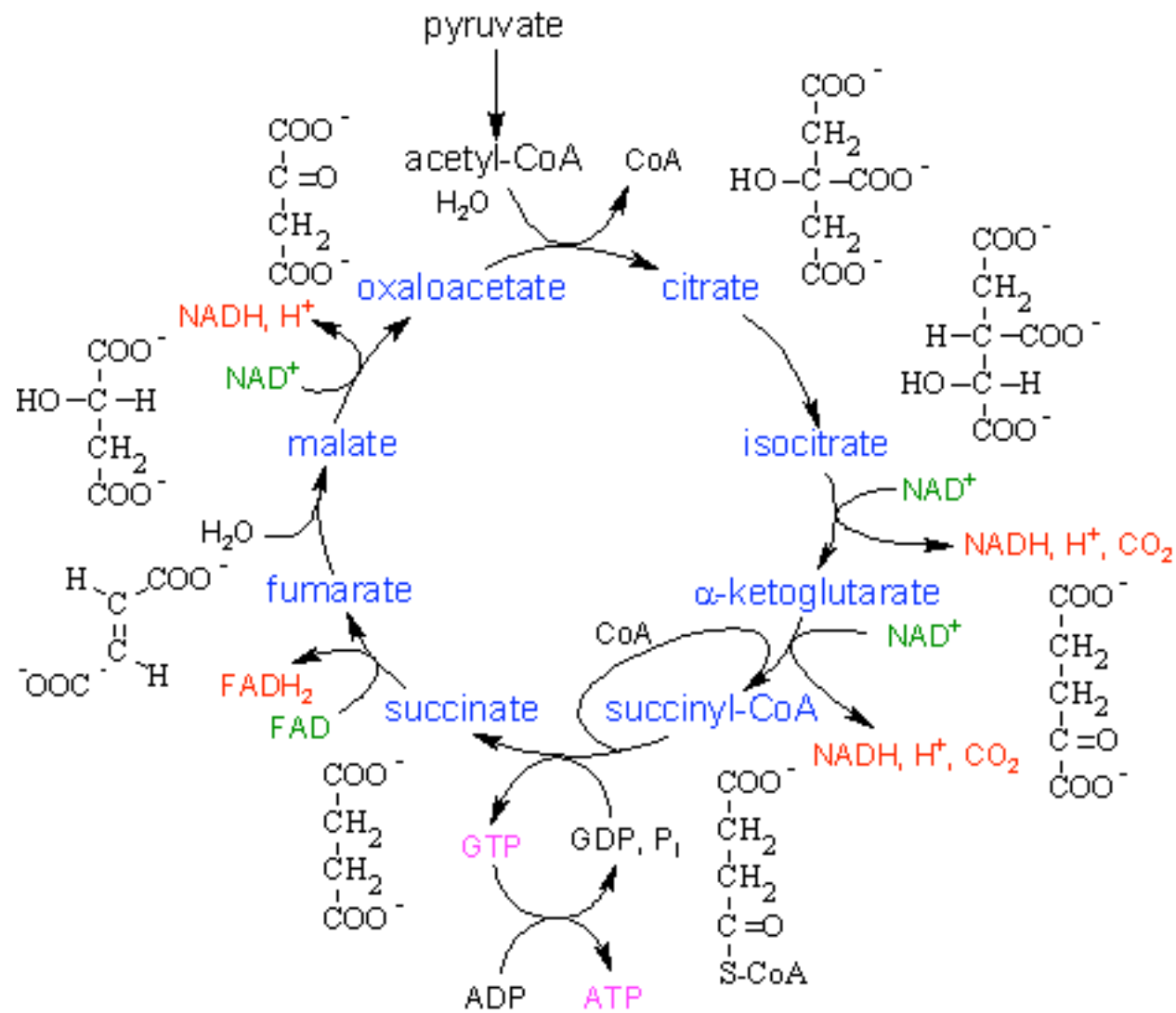
The net reaction of the citric acid cycle is:



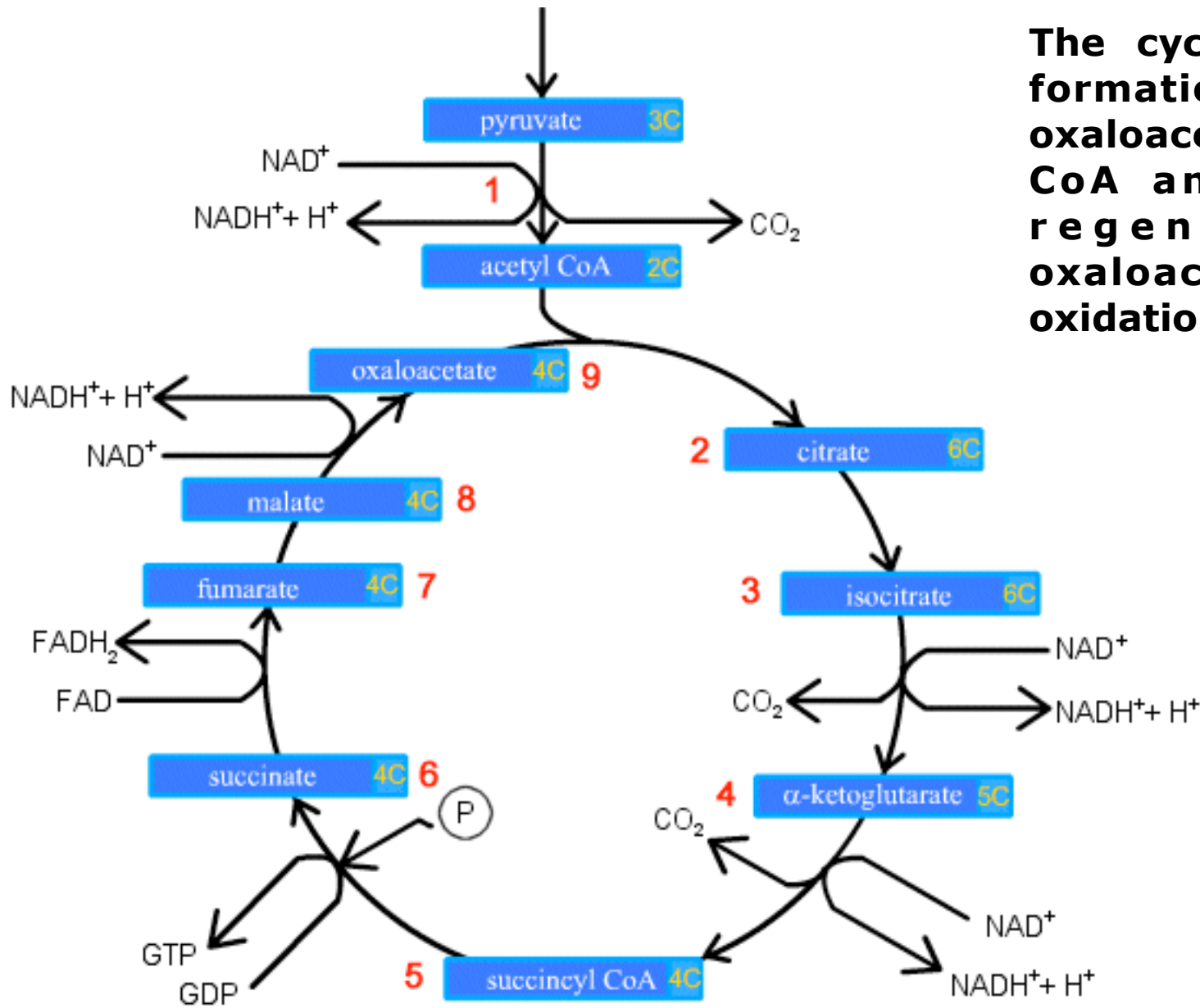
# The Citric Acid Cycle



# The Cycle as a Series of Chemical Transformations

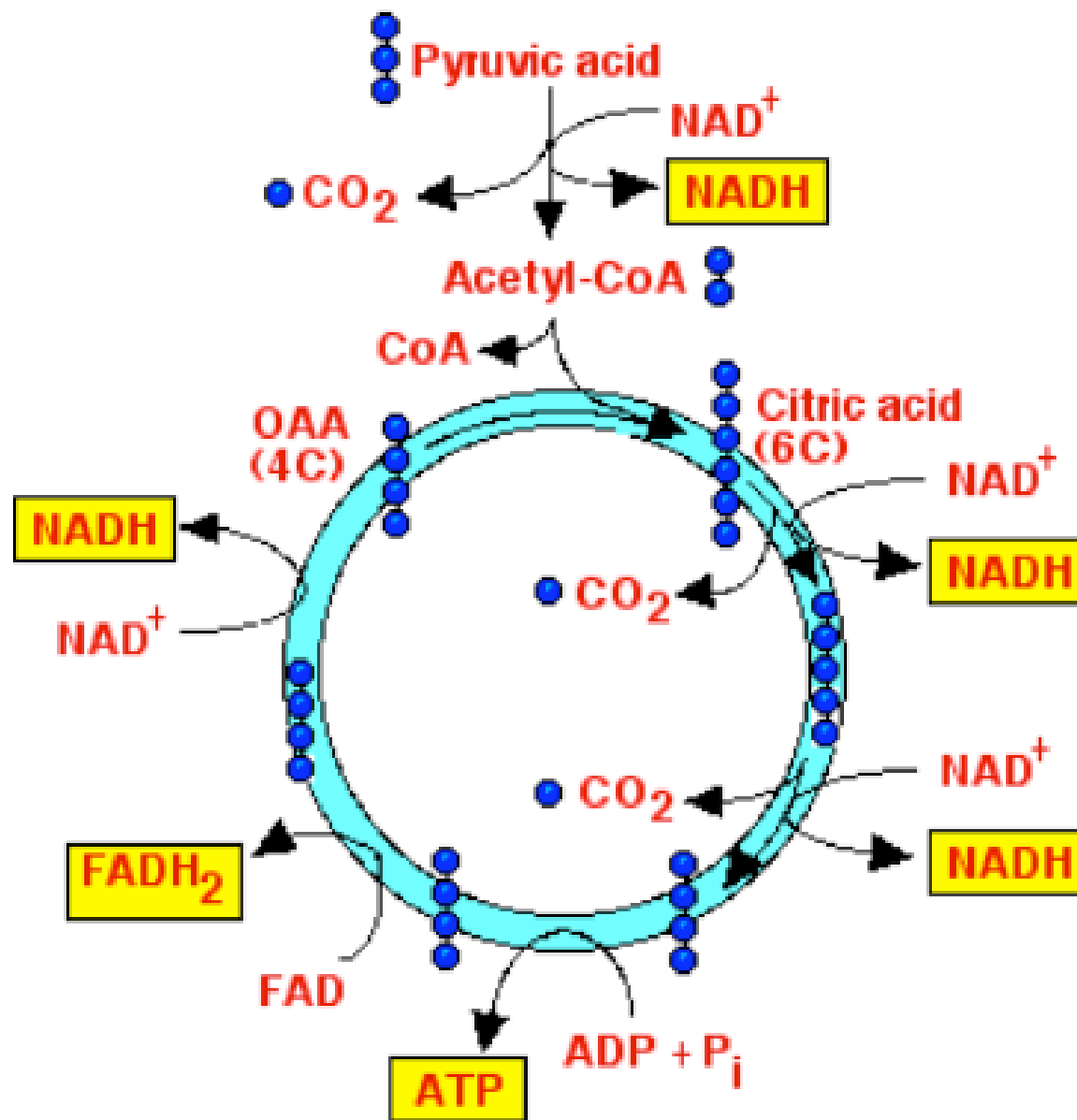


# The Cycle as a Cycle

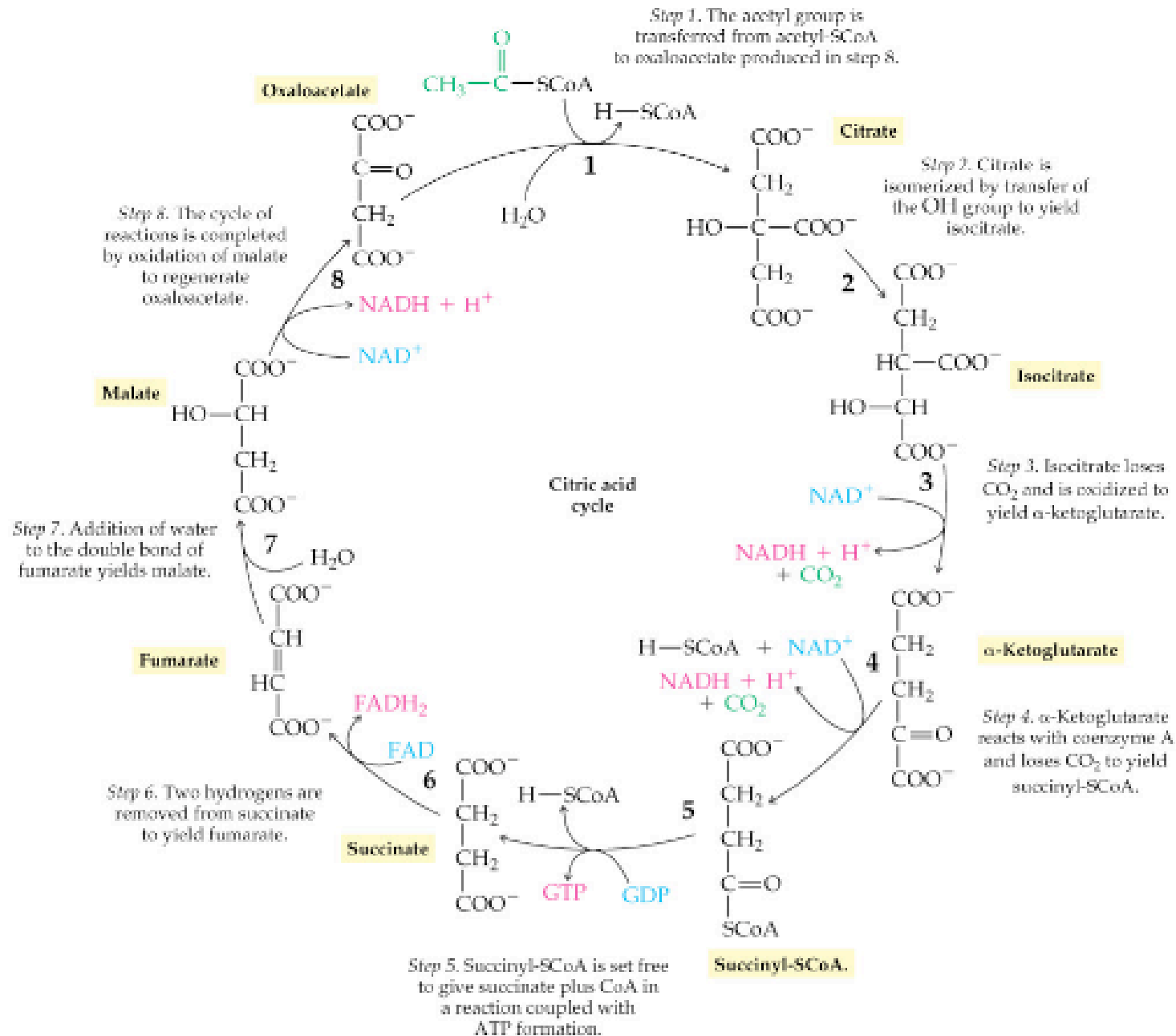


The cycle begins with the formation of citrate from oxaloacetate and acetyl-S-CoA and ends with the regeneration of the oxaloacetate acid by the oxidation of L-malate.

# The Cycle as a Generator of Energy

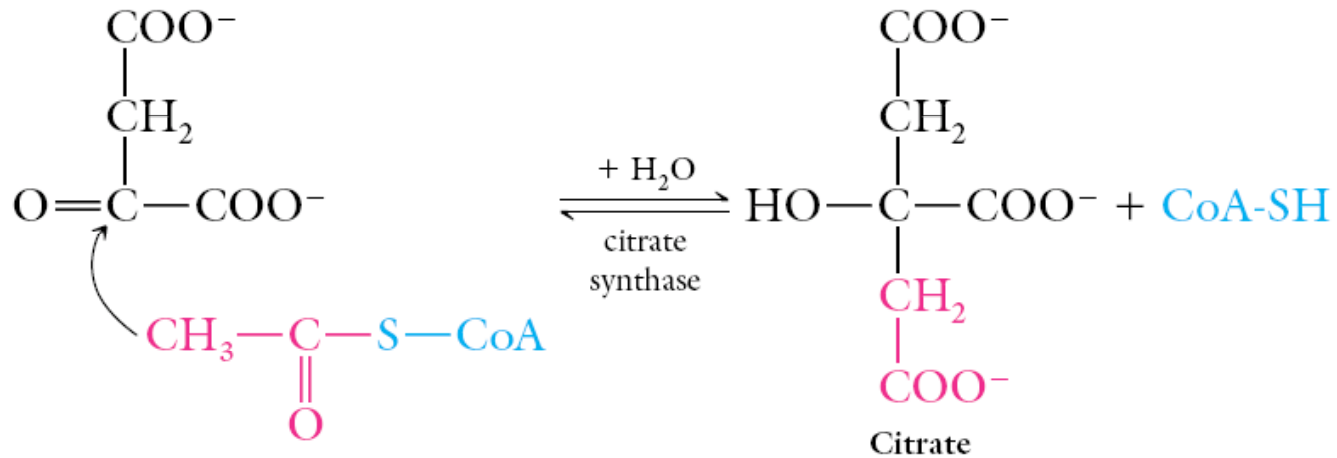


# Each Reaction is Catalyzed by a Specific Enzyme

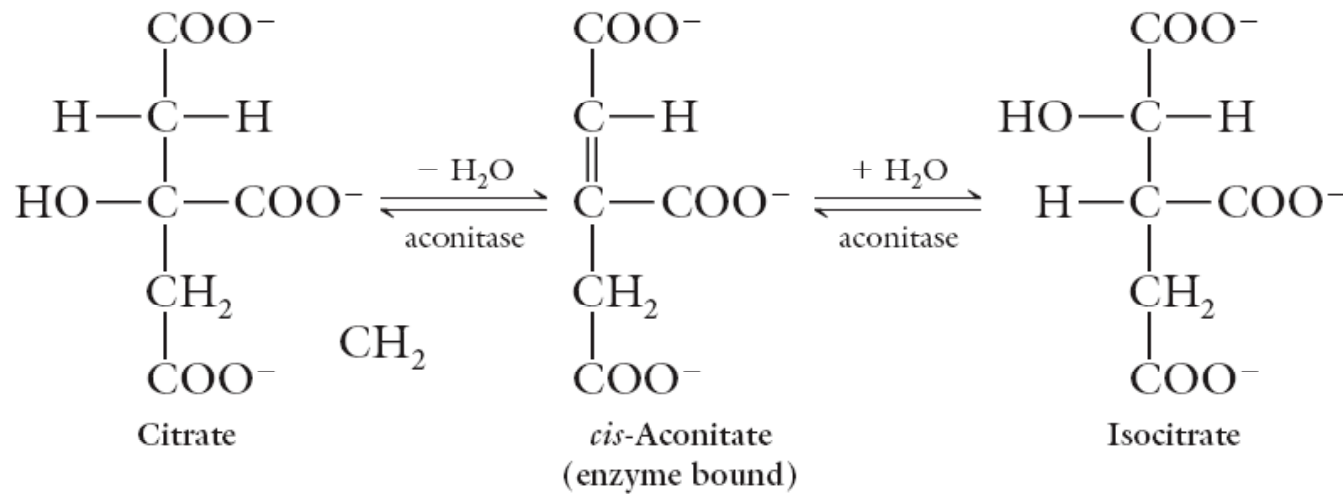


# Specific Reactions of the TCA Cycle

1)

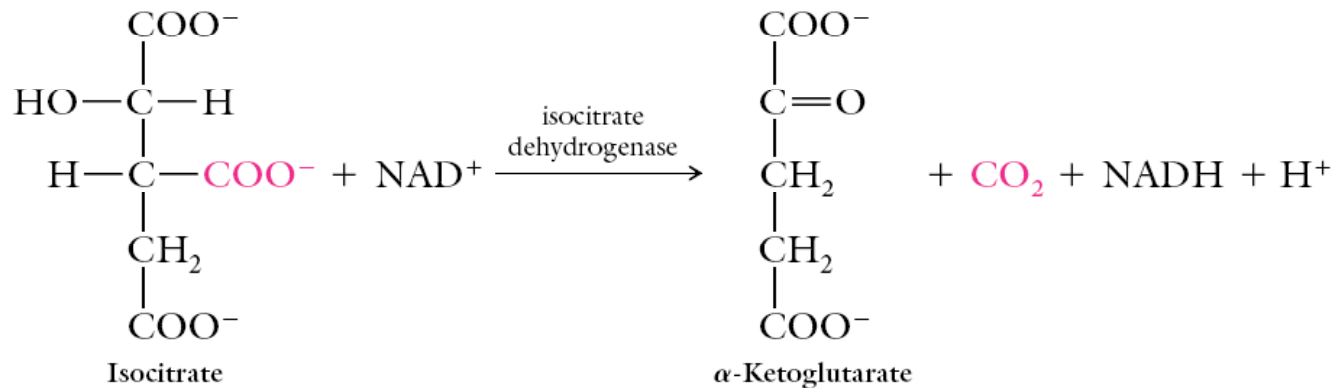


2)

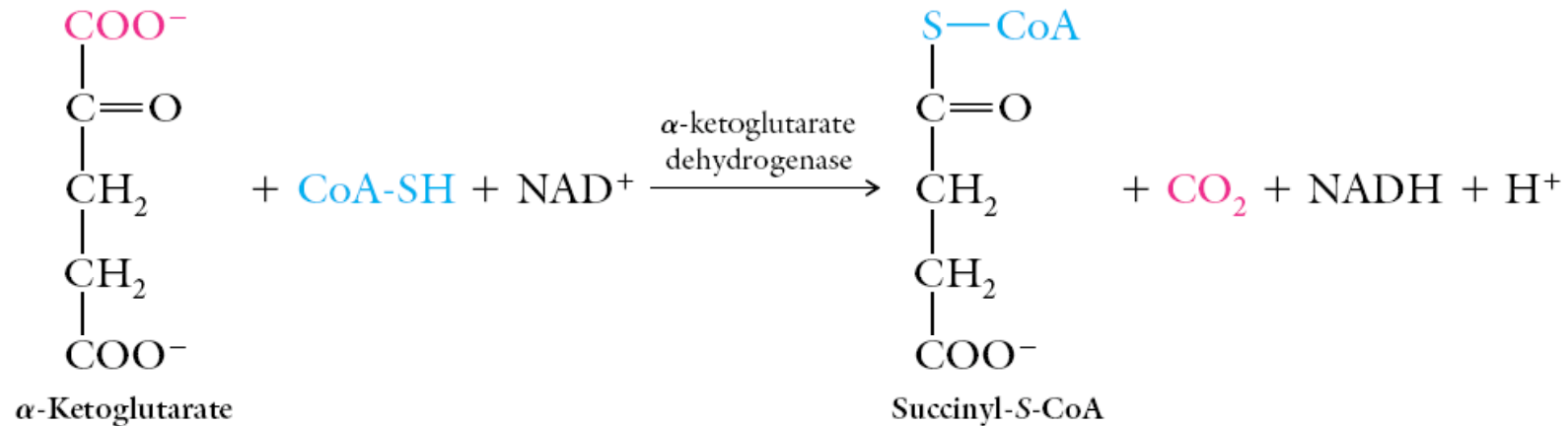


# Specific Reactions of the TCA Cycle

3)



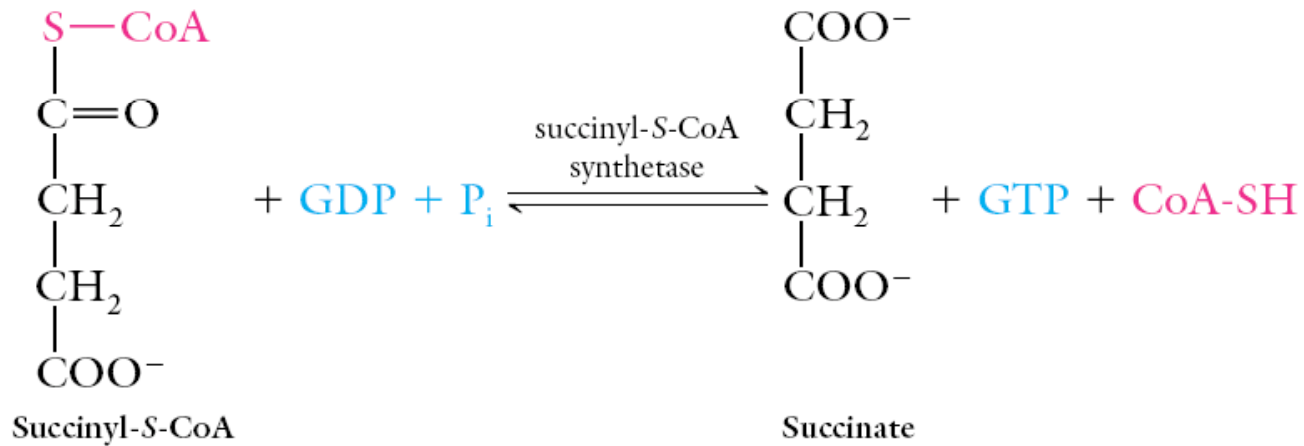
4)



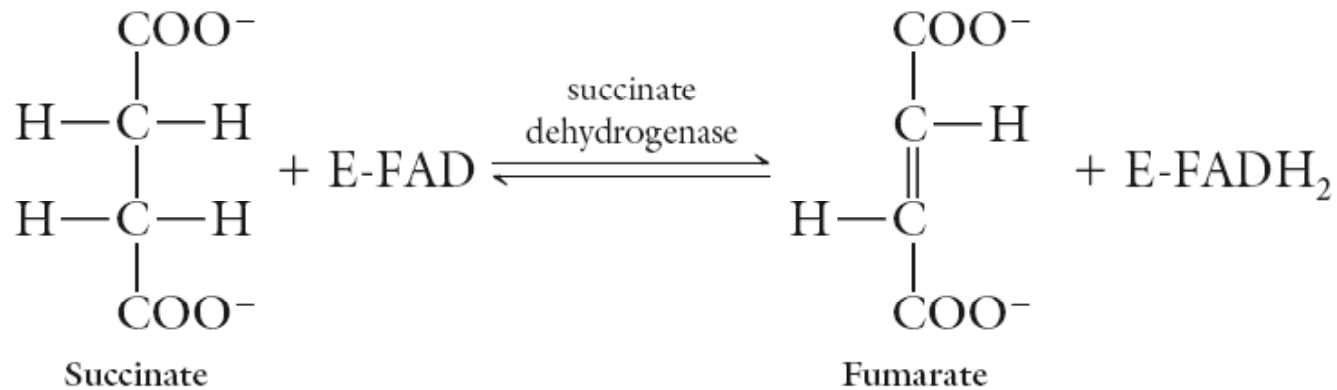


# Specific Reactions of the TCA Cycle

5)

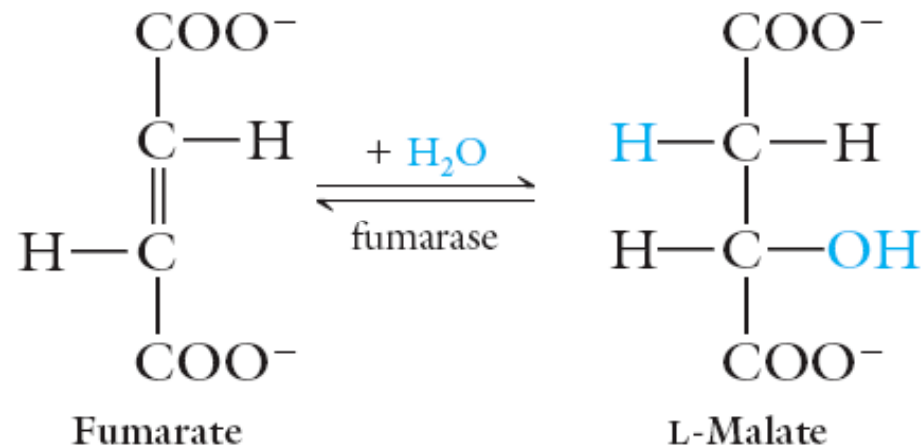


6)

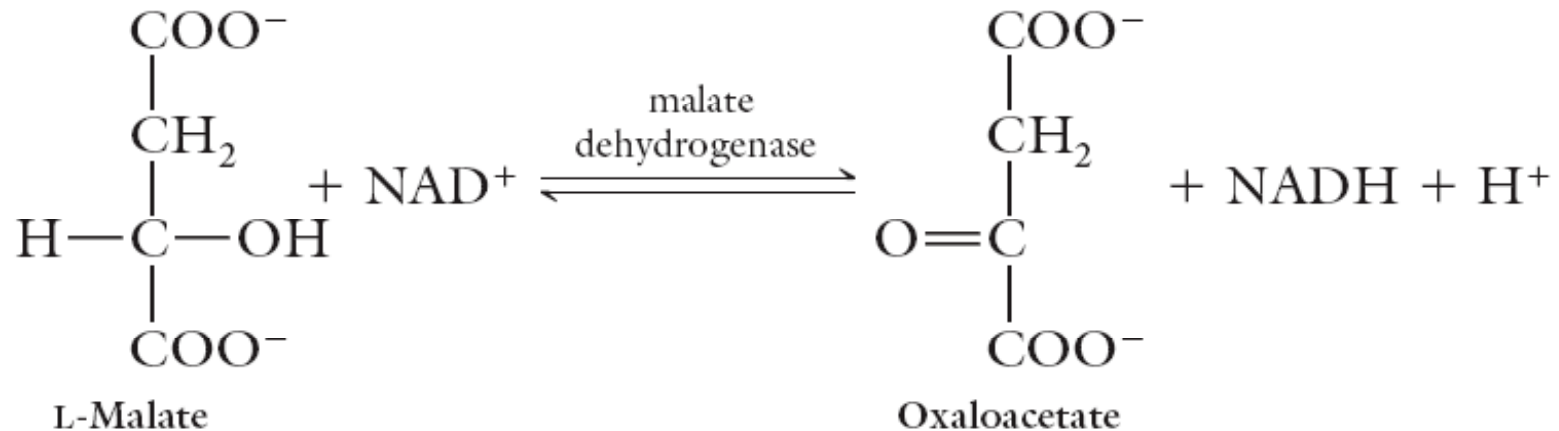


# Specific Reactions of the TCA Cycle

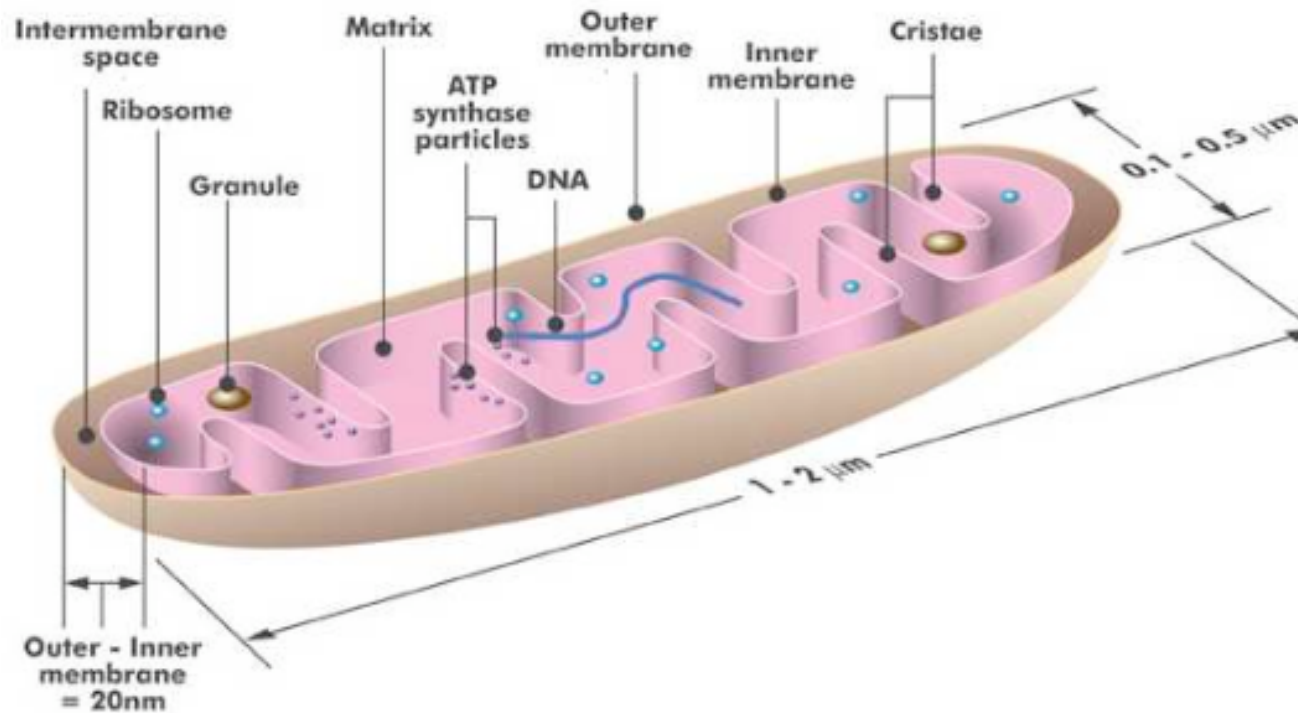
7)



8)



*(A close examination of the reaction steps will show that the two CO<sub>2</sub> molecules released by the cycle are not derived from the two carbon atoms on the original acetyl-S-CoA.)*



## Mitochondrial Location of Citric Acid Cycle Enzymes

### Inner membrane

aconitase  
 succinate dehydrogenase  
 electron-transport chain  
 succinyl-S-CoA synthetase  
 fumarase  
 malate dehydrogenase  
 pyruvate dehydrogenase

### Matrix space

citrate synthase  
 isocitrate dehydrogenase  
 $\alpha$ -ketoglutarate dehydrogenase