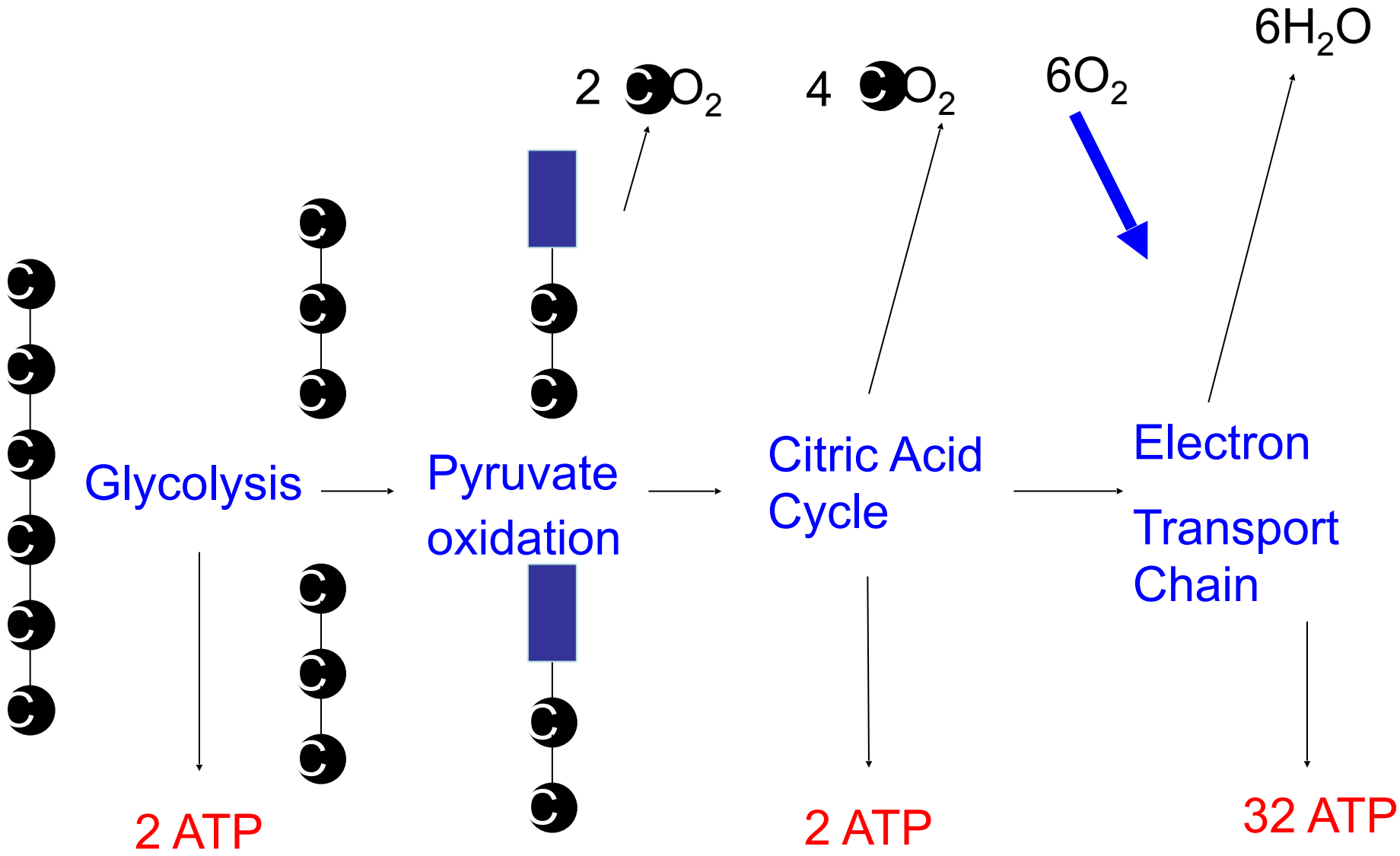
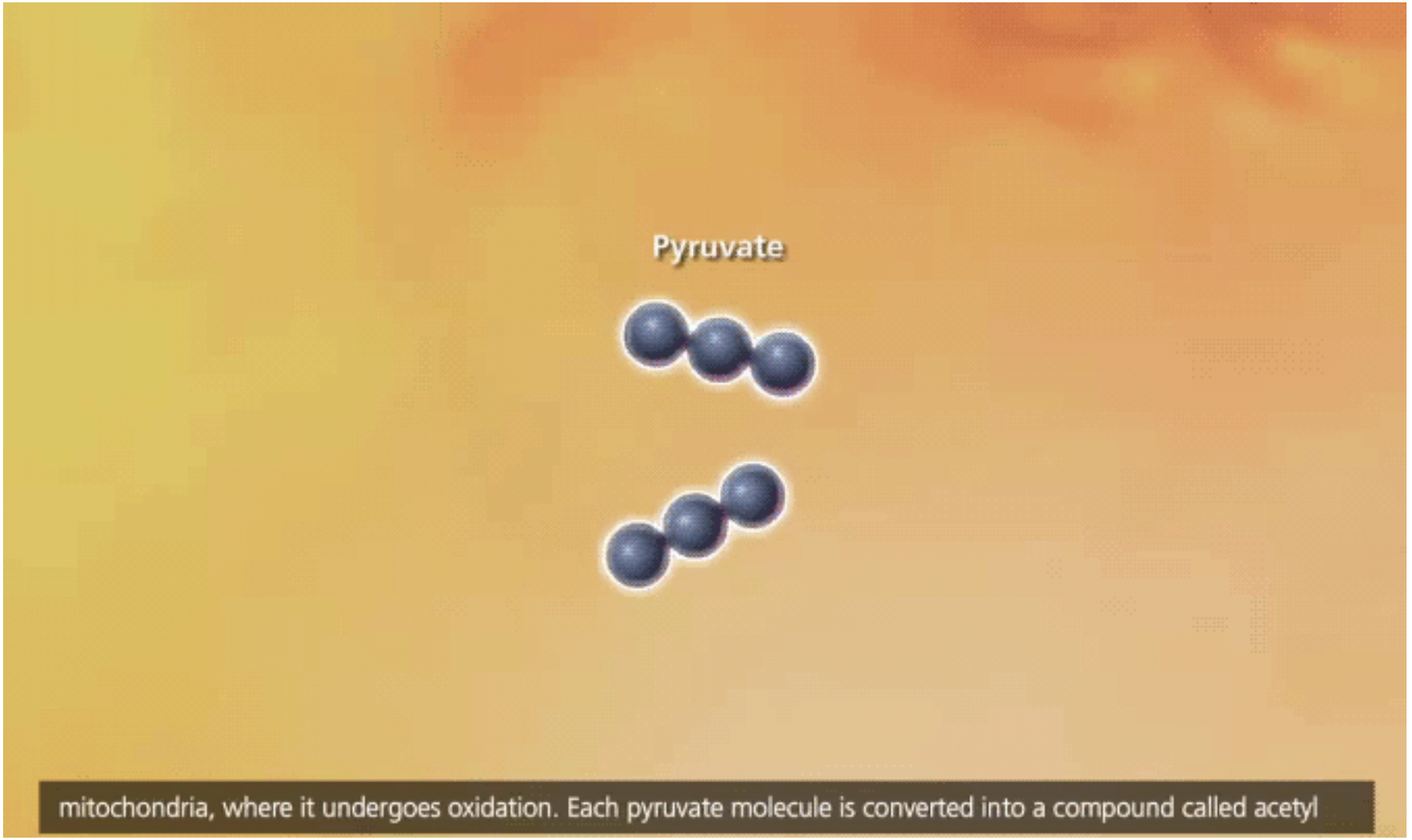
Glycolysis

a rap lecture
by
Glenn Wolkenfeld


2 CO_2
4 CO_2
$6O_2$
$6H_2O$
Glycolysis
Pyruvate oxidation
Citric Acid Cycle
Electron Transport Chain
2 ATP
2 ATP
32 ATP

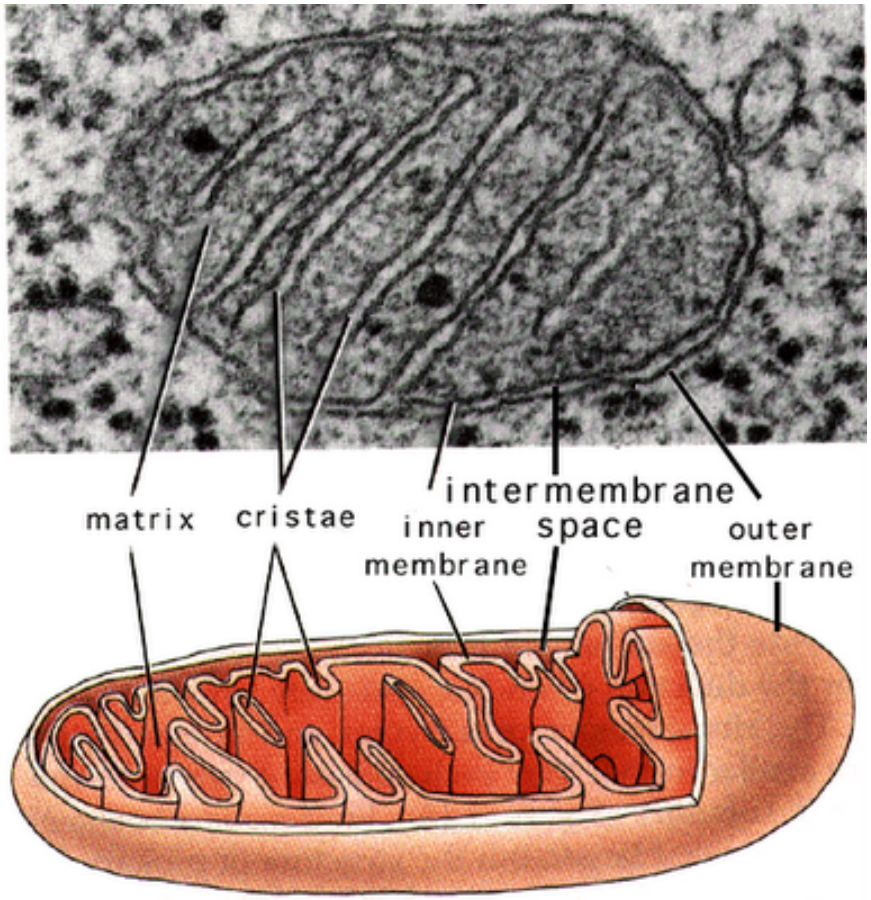
How the Krebs Cycle Works



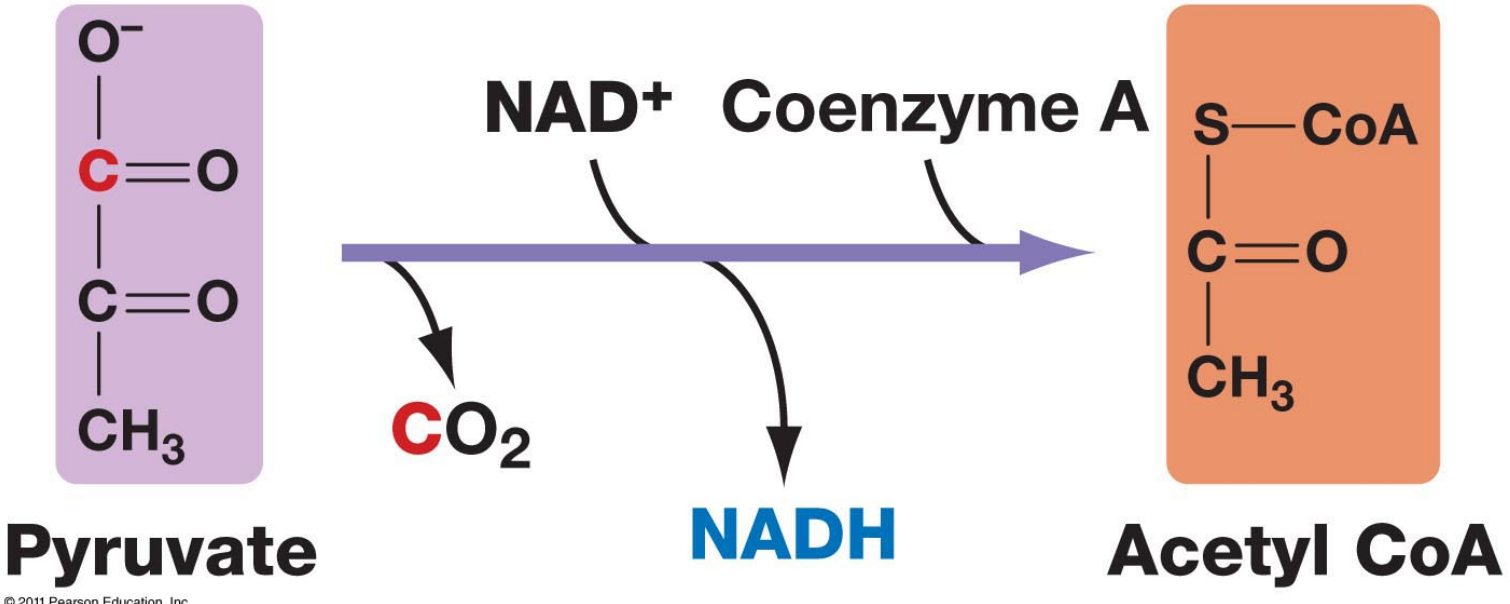
Aerobic Respiration:
Glycolysis, **Pyruvate Oxidation** & the Citric Acid Cycle

- Before pyruvate enters the Krebs Cycle, it is oxidized in the transition step.

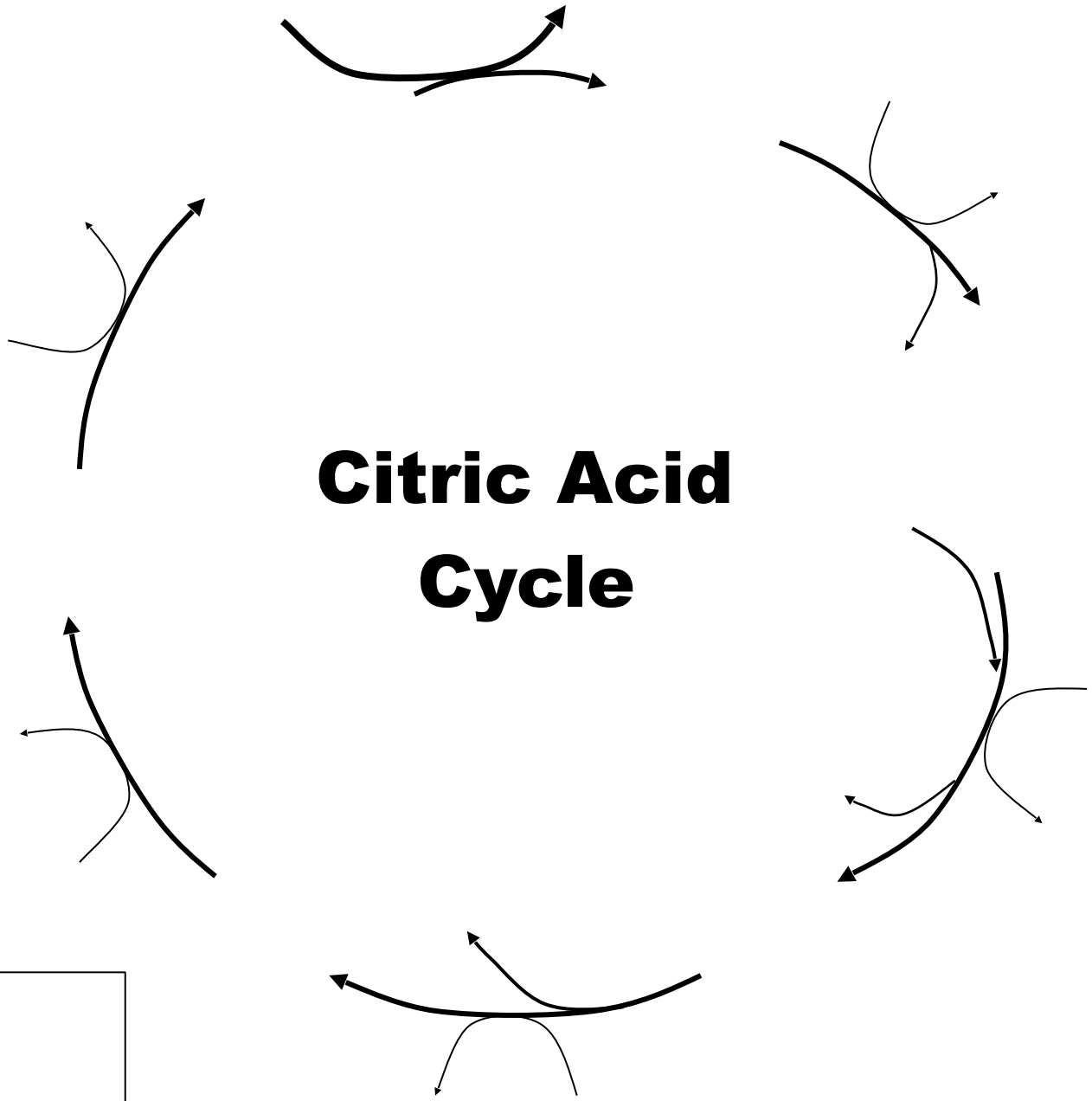
- Pyruvate molecules are actively transported into the mitochondrial matrix.



- Carbon dioxide is removed from the pyruvate
- Hydrogen atoms are removed and transferred to NAD+.
- reactions are carried out by enzymes
- A 2-carbon compound called an acetyl group is formed & is attached to coenzyme A.
- The resulting acetyl CoA can enter the Citric Acid Cycle.



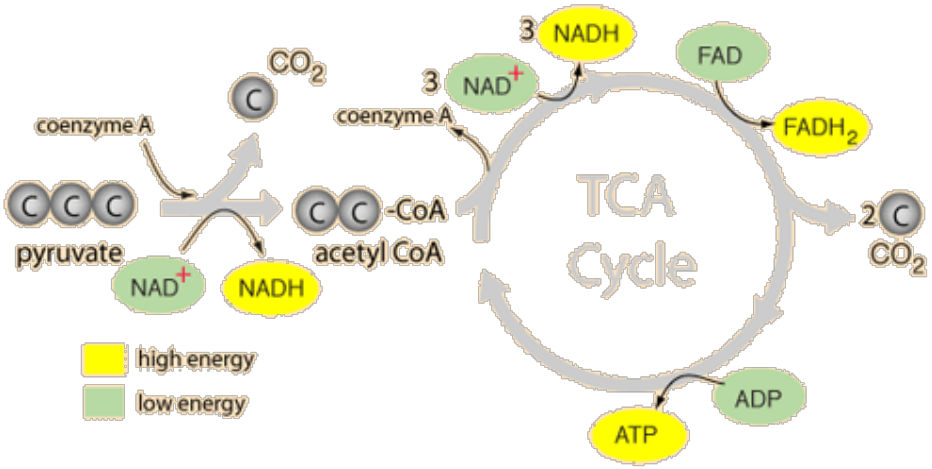
Citric Acid Cycle



NADH=
$FADH_2$=
ATP=

Aerobic Respiration:
Glycolysis, Pyruvate Oxidation & the **Citric Acid Cycle**

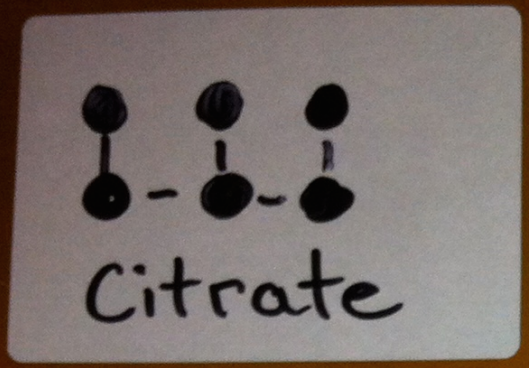
The Citric Acid Cycle (Krebs)

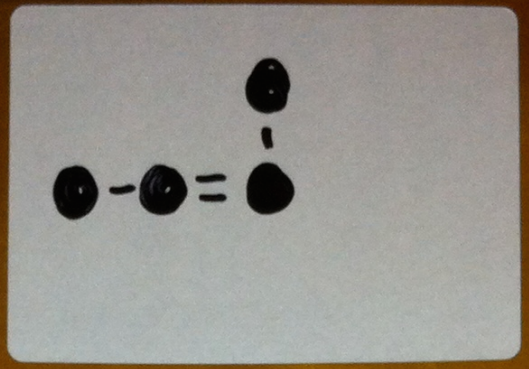


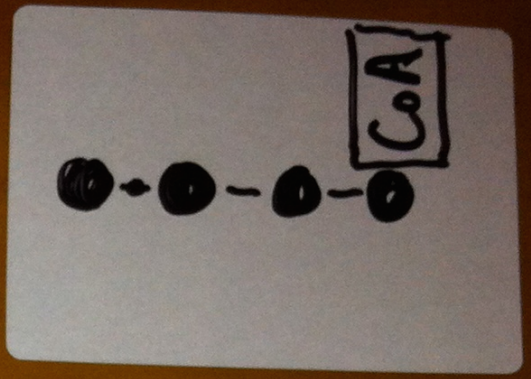
The Citric Acid (Krebs) Cycle

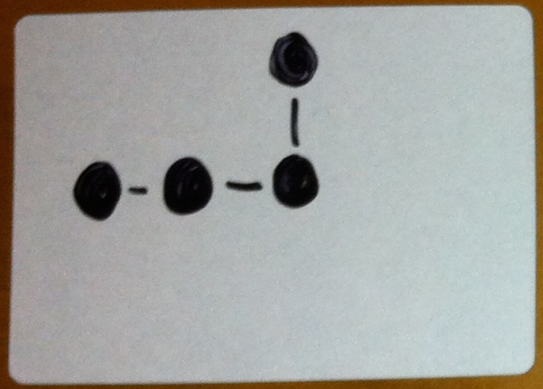
- Acetyl CoA from the transition step is combined with a 4C compound called oxaloacetate, forming 6C citrate.

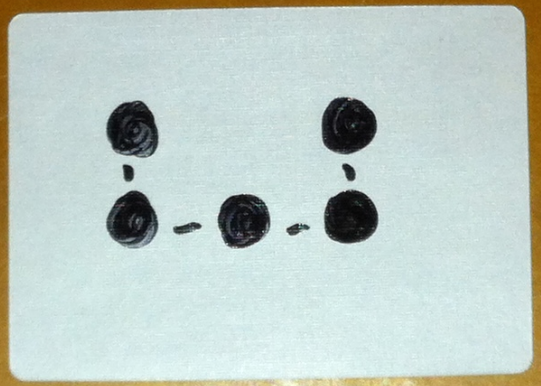
- Citrate undergoes a series of decarboxylation and dehydrogenation reactions which result in the regeneration of oxaloacetate.

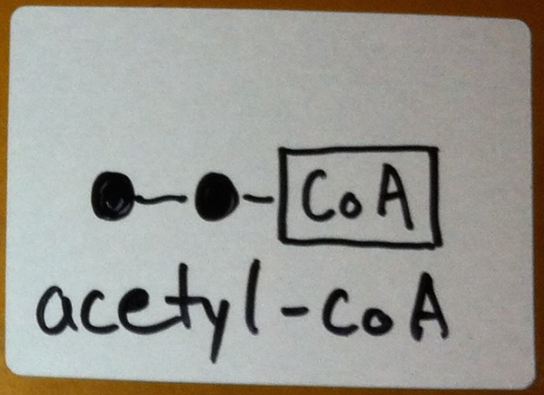

Citrate

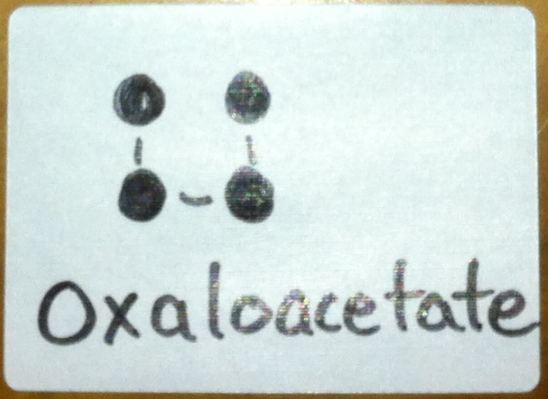



CoA

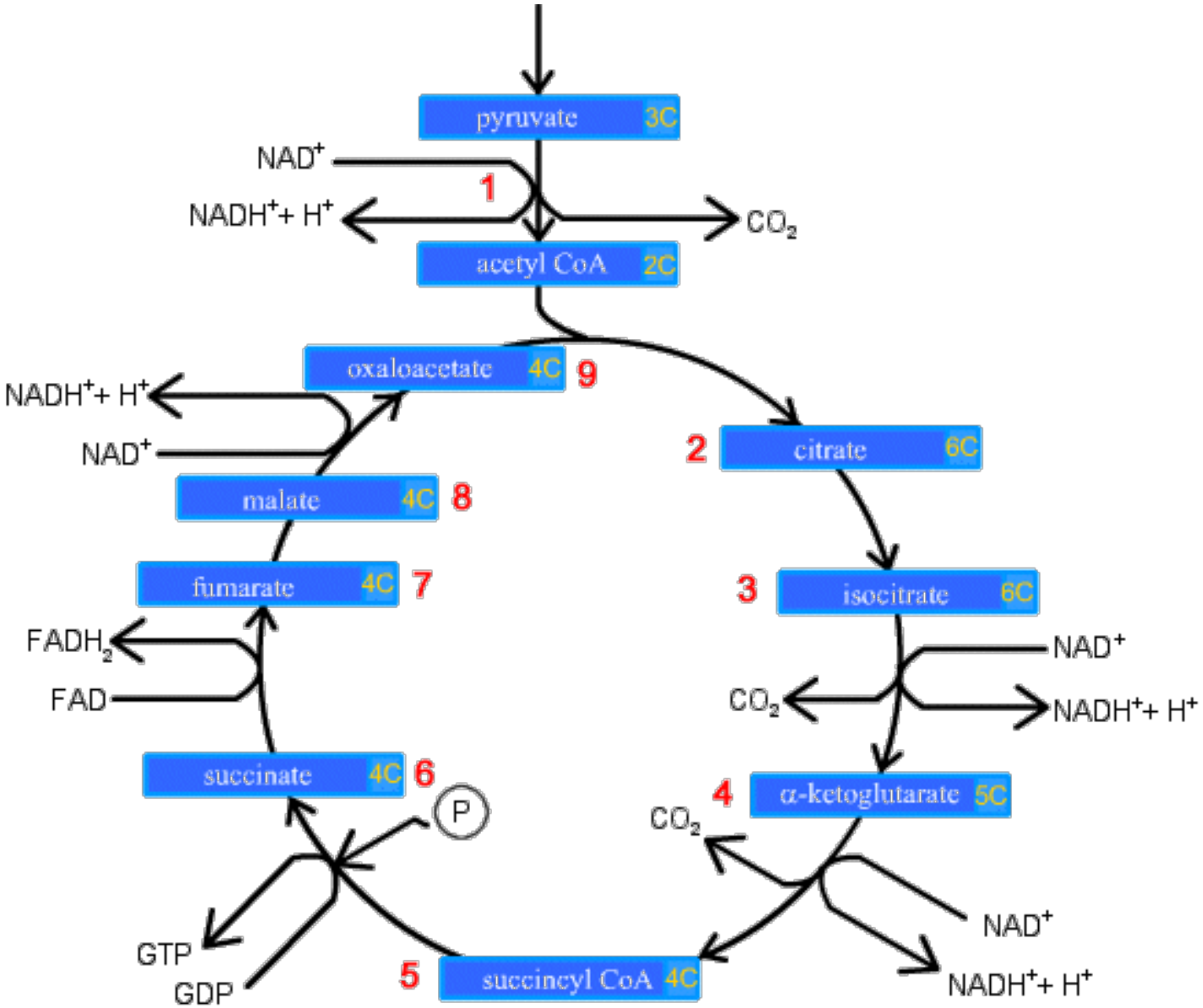




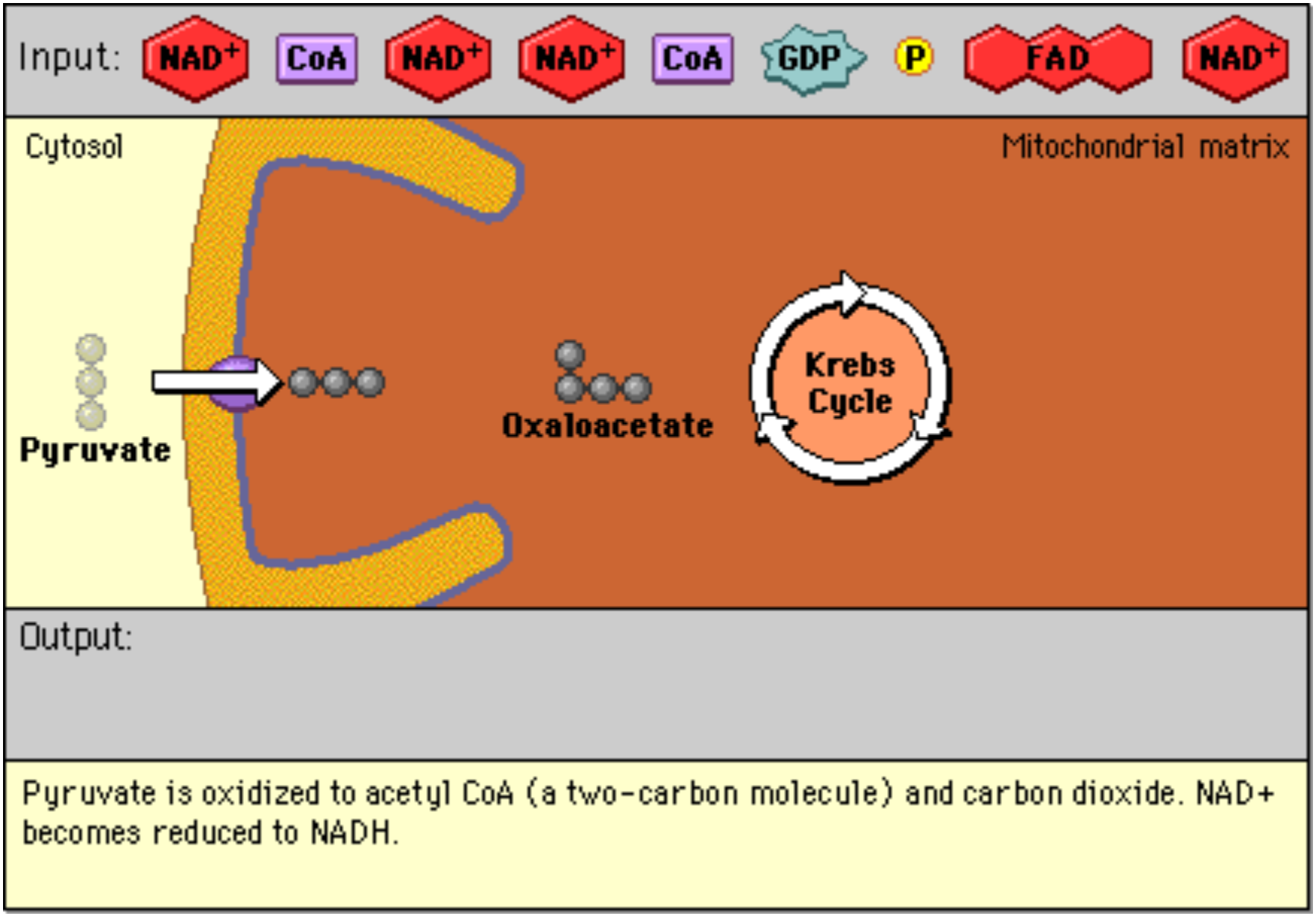

CoA
acetyl-CoA

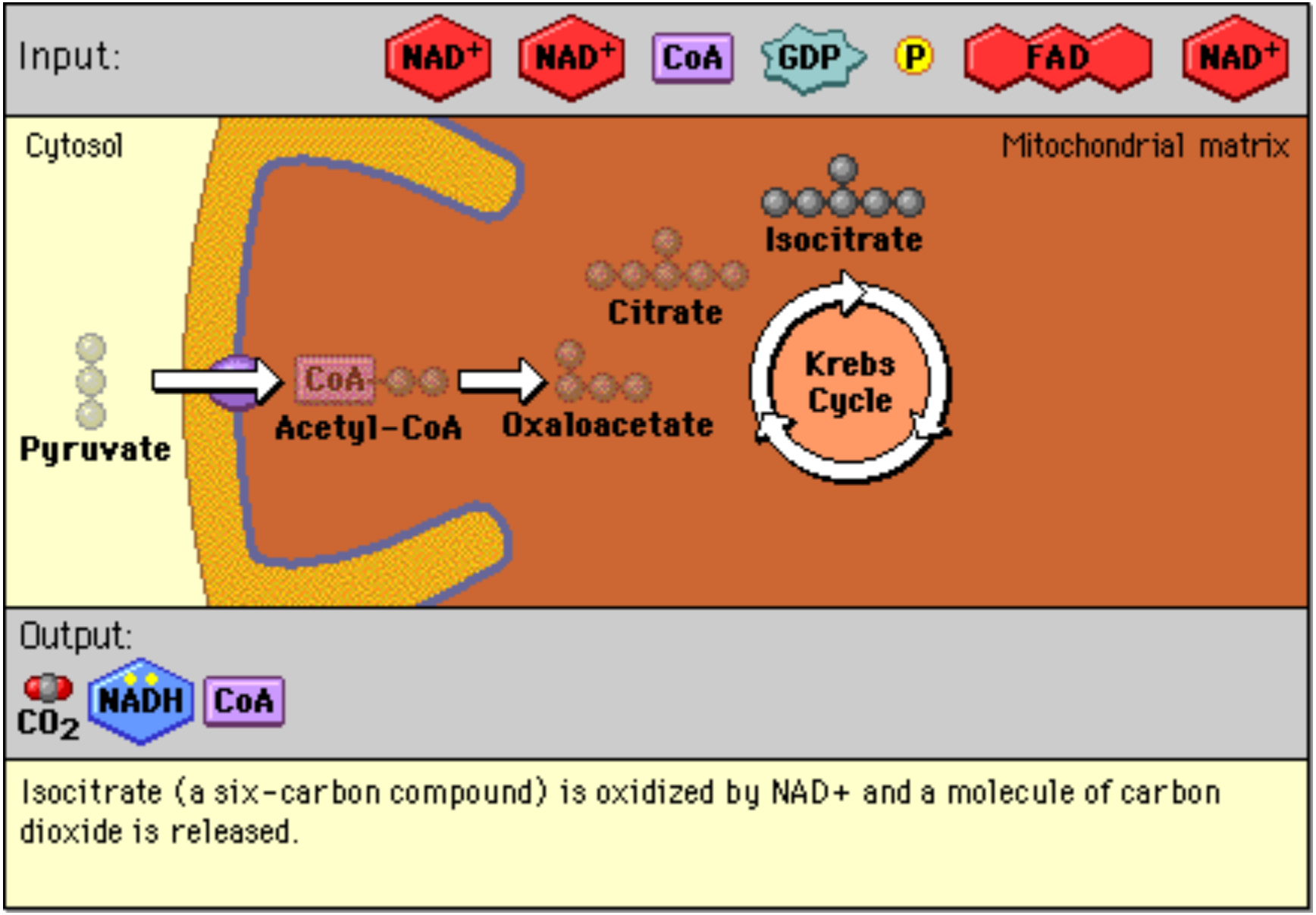

Oxaloacetate

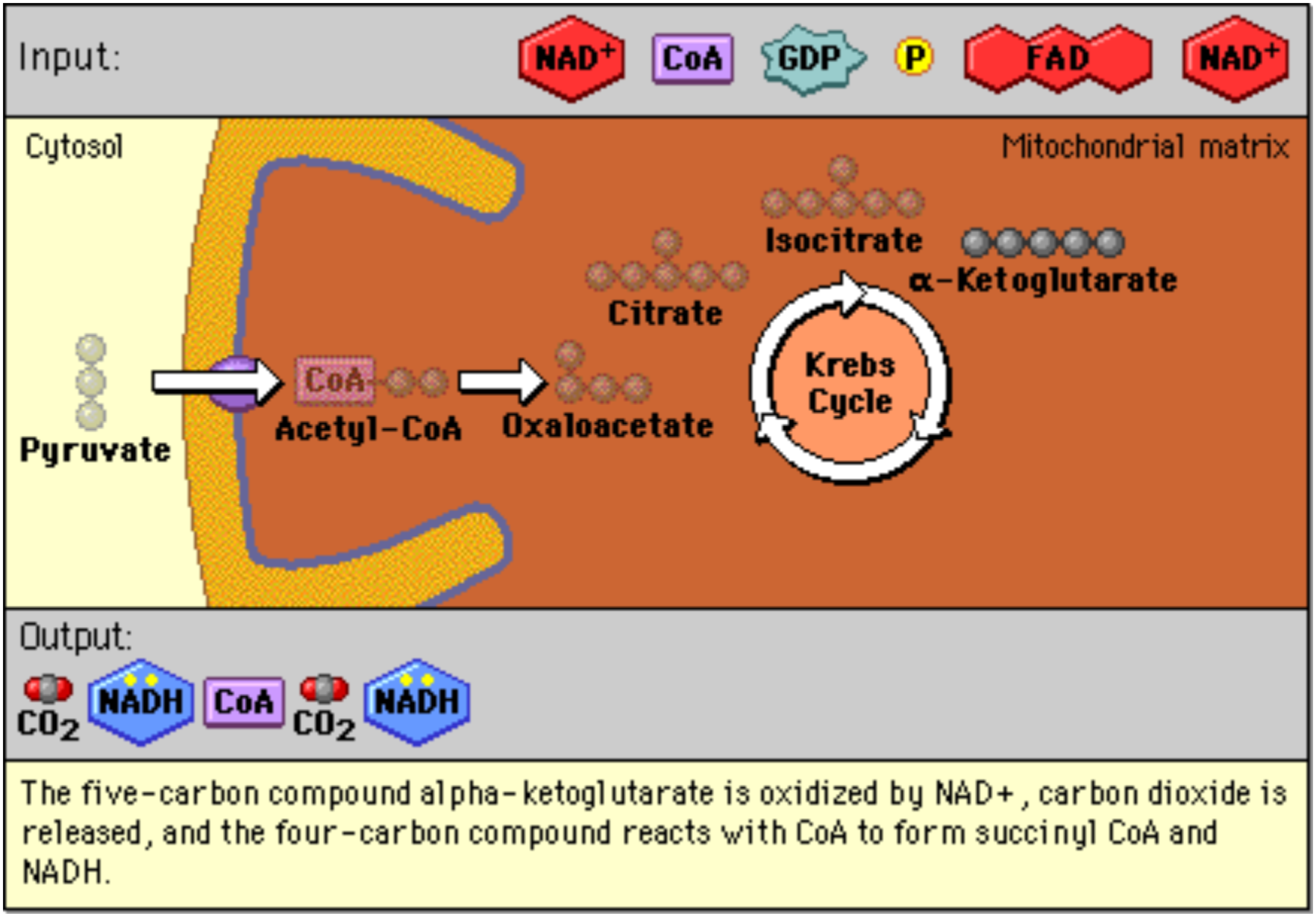
The Krebs Cycle



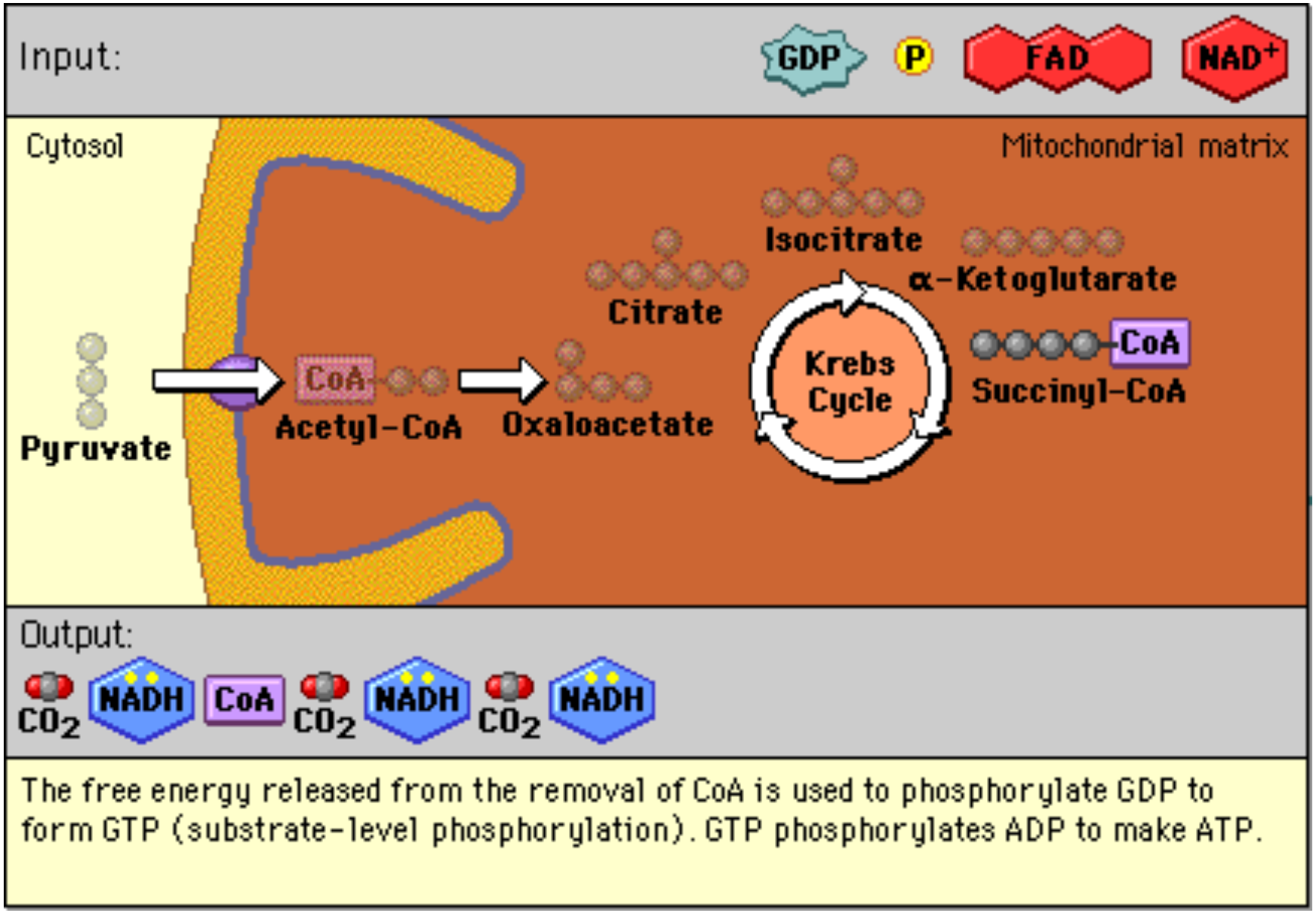
Krebs!!


Input:
NAD+
CoA
NAD+
NAD+
CoA
GDP
P
FAD
NAD+
Cytosol
Mitochondrial matrix
Pyruvate
Oxaloacetate
Krebs Cycle
Output:
Pyruvate is oxidized to acetyl CoA (a two-carbon molecule) and carbon dioxide. NAD+ becomes reduced to NADH.

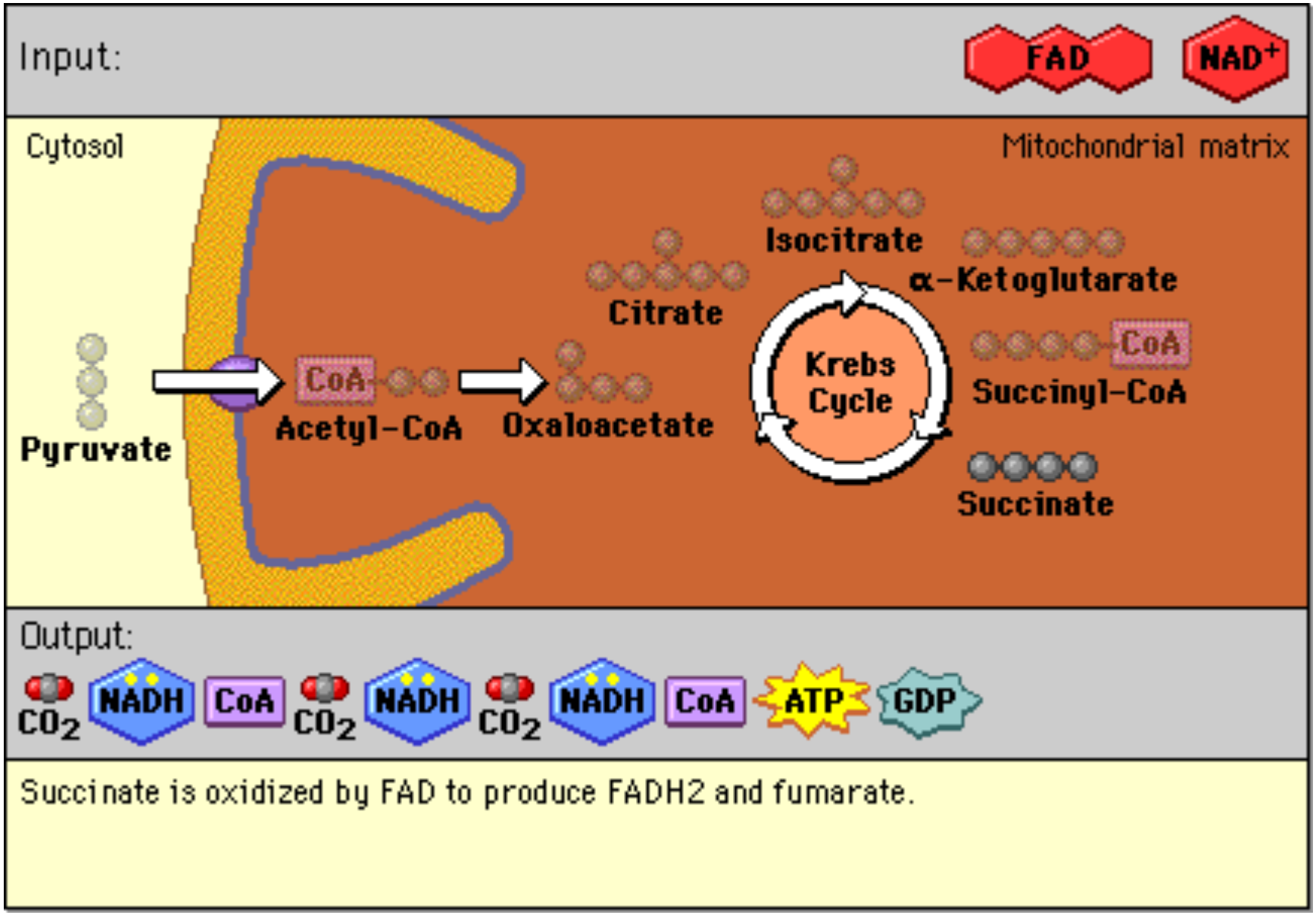

Input:
NAD+
NAD+
CoA
GDP
P
FAD
NAD+
Cytosol
Mitochondrial matrix
Isocitrate
Citrate
Krebs Cycle
Pyruvate
CoA
Acetyl-CoA
Oxaloacetate
Output:
CO2
NADH
CoA
Isocitrate (a six-carbon compound) is oxidized by NAD+ and a molecule of carbon dioxide is released.



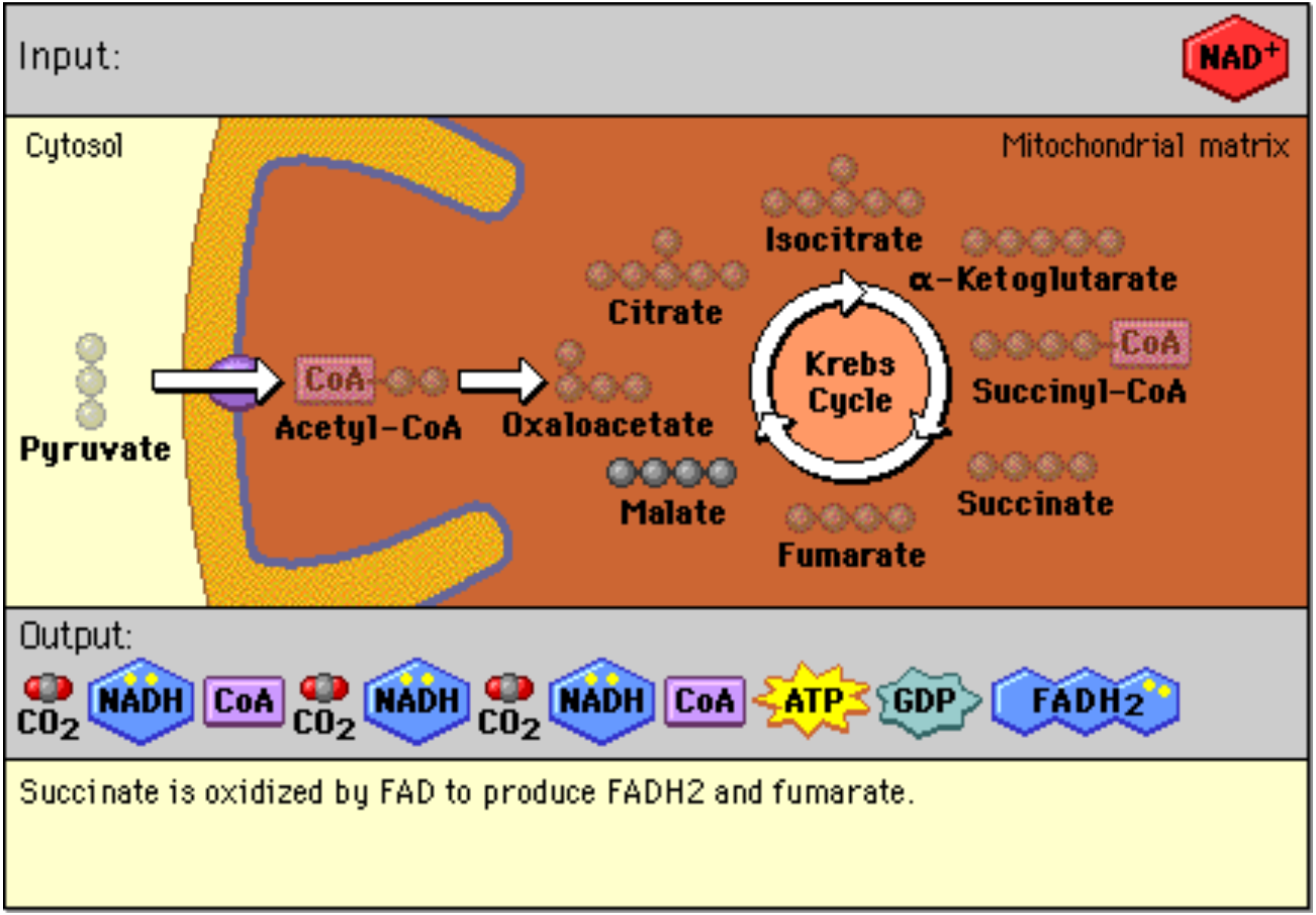
The five-carbon compound alpha-ketoglutarate is oxidized by NAD+, carbon dioxide is released, and the four-carbon compound reacts with CoA to form succinyl CoA and NADH.



The free energy released from the removal of CoA is used to phosphorylate GDP to form GTP (substrate-level phosphorylation). GTP phosphorylates ADP to make ATP.



Succinate is oxidized by FAD to produce FADH2 and fumarate.


Input:
NAD+
Cytosol
Mitochondrial matrix
Isocitrate
α-Ketoglutarate
Citrate
Krebs Cycle
CoA
Succinyl-CoA
Pyruvate
CoA
Acetyl-CoA
Oxaloacetate
Malate
Succinate
Fumarate
Output:
CO2
NADH
CoA
CO2
NADH
CO2
NADH
CoA
ATP
GDP
FADH2
Succinate is oxidized by FAD to produce FADH2 and fumarate.

Products of the Krebs Cycle

- Each turn of the Krebs Cycle produces:

4 molecules of reduced NAD+ (1 from Pyr Ox)

1 molecule of reduced FAD

1 molecule of ATP

3 molecules of CO_2 (1 from Pyr.Ox.)

- The Krebs Cycle turns twice for every glucose molecule broken down; per glucose molecule the yield is doubled: 8 NAD+; 2 FAD; 2ATP and 6 CO_2

Krebs!

A musical lecture by

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www.sciencemusicvideos.com