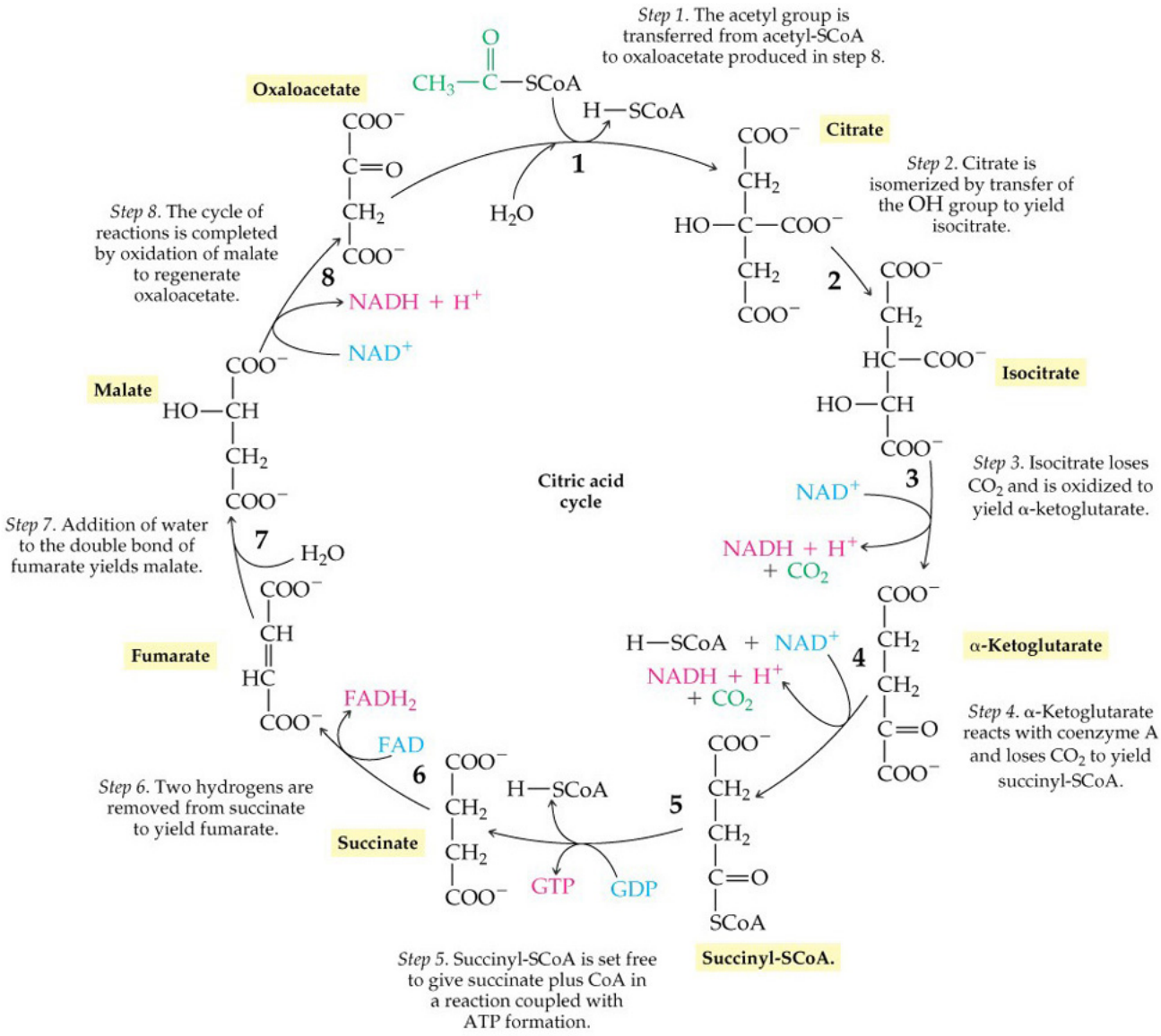
Chem 306
Chapter 21 – Bioenergetics
Lecture Outline II

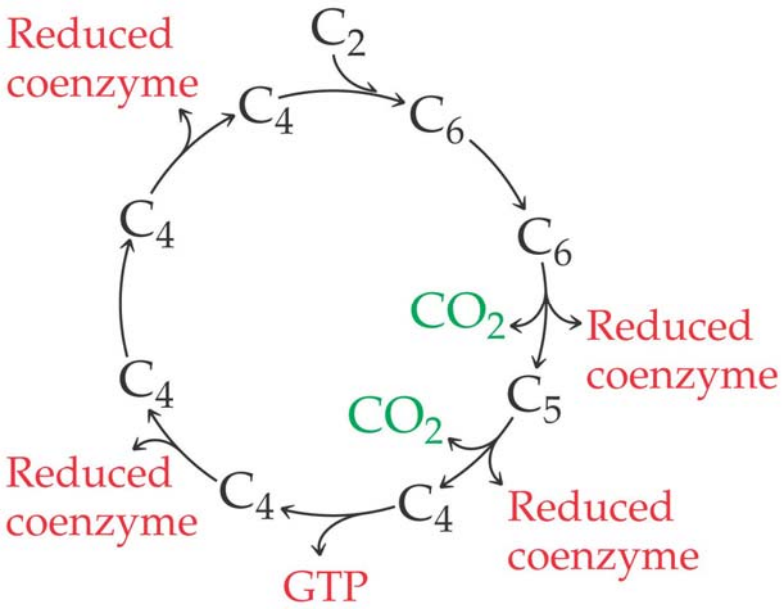
I. What is the citric acid cycle (CAC)?



Enzymes of the Citric Acid Cycle

Step no.	Enzyme Name	Reaction Product
1	Citrate synthase	Citrate
2	Aconitase	Isocitrate
3	Isocitrate dehydrogenase complex	α-Ketoglutarate
4	α-Ketoglutarate dehydrogenase complex	Succinyl-SCoA
5	Succinyl CoA synthetase	Succinate
6	Succinate dehydrogenase	Fumarate
7	Fumarase	Malate
8	Malate dehydrogenase	Oxaloacetate

Another representation of the citric acid cycle



Recap – The citric acid cycle is a series of reactions that

1.

2.

3.

4.

5.

Can you write the overall reaction of the citric acid cycle from the diagram on pg 13?

How is the rate of the citric acid cycle controlled?

1. High energy usage – ADP or ATP accumulates?

2. Low energy usage – [NADH] high or low?

*** Questions to ponder**

1. *Why is this pathway considered to be a cyclic pathway?*
2. *In each turn of the CAC, two molecules of CO_2 are released. In which steps is CO_2 released?*

3. *In which step of the CAC do two carbons enter?*

4. *What metabolite (substrate) provides the source of carbons for the CAC to oxidize?*

5. *Four of the eight steps in the CAC are oxidations. Which four? How can you tell?*

6. *Look carefully at steps 2, 3, and 4. Would the chemistry of step 3 be possible if step 2 were eliminated?*

Animation – Citric Acid Cycle

http://www.science.smith.edu/departments/Biology/Bio231/krebs.html

OSU Marching Band

http://www.youtube.com/watch?v=FgXnH087JIk&mode=related&search=