Metabolic Biochemistry 3350
Dr. Melissa Kelley
Exam III
November 16, 2005

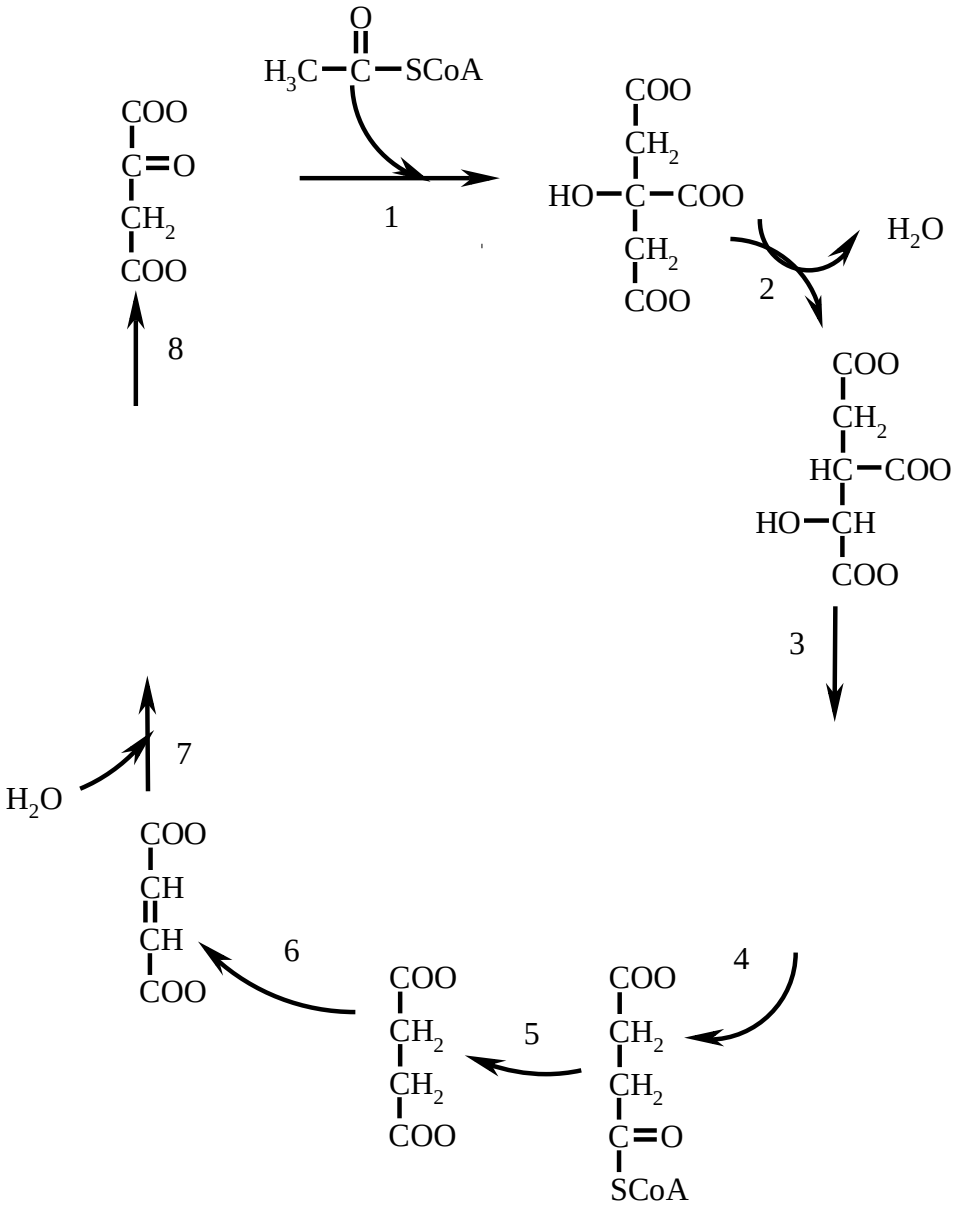
1. (15 points)The citric acid cycle is frequently described as the major pathway of aerobic catabolism, which means that it is an oxygen-dependent degradative process. However, none of the reactions of the cycle directly involves oxygen as a reactant. Why is the pathway oxygen-dependent?

2. A culture of bacteria growing at 37°C was shifted to 25°C. At 37°C the phospholipids consisted of palmitic acid (16:0) and myristic acid (14:0) and phosphatidyl ethanolamine ($CH_2CH_2NH_3^+$)

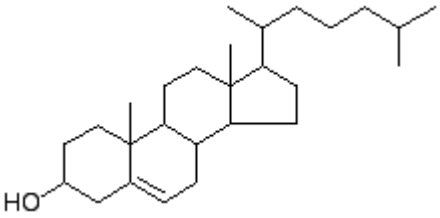
a. (10 points) Draw the structure of the phospholipid present at 37 °C

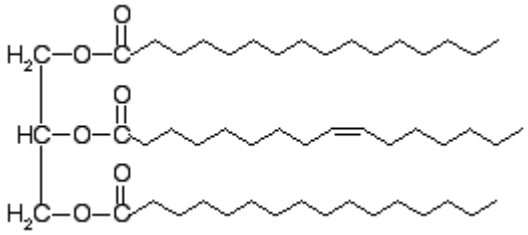
b. (10 points) How would you expect this temperature shift to alter the fatty acid composition of the membrane phospholipids? In other words what types of fatty acids may be present in the membrane at 25°C to maintain membrane fluidity.

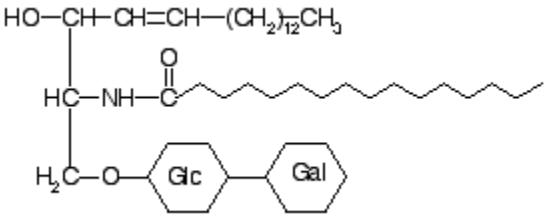
3. (20 points) Shown below is the citric acid cycle missing the metabolic intermediates. Draw the missing intermediates. In addition, show where CO_2, NADH, $FADH_2$, and ATP leave the cycle.

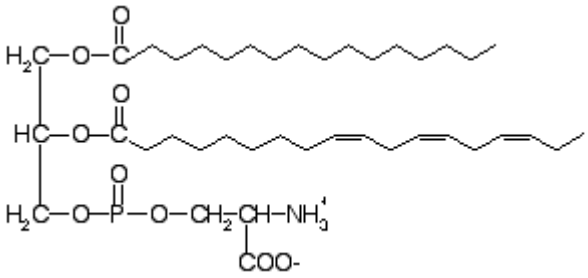


4. (20 points) Identify the following lipids by class and identify which of the following might be found in animal cell membranes and which of the following is used as an energy source or as a precursor to steroid hormone.





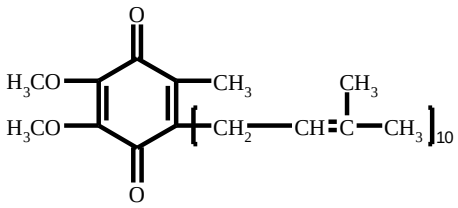




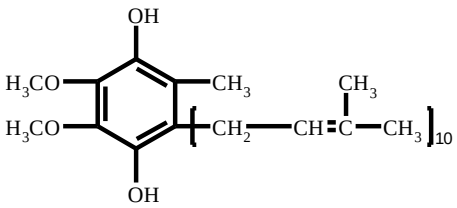
5. (20 points) In the space provided below draw the mitochonidria. In the drawing below, draw all of the players in electron transport and oxidative phosphorylation. Your answer should include all of the cofactors including ADP + Pi and ATP. Furthermore, the drawing should show the electron flow and H^+ flow and mitochondrial location.

6. (15 points) A good biochemical friend of yours has modified Coenzyme Q. By examining the structures of Coenzyme Q shown below, determine if electron transport would increase, decrease or remain the same if the modified Coenzyme Q is used. Briefly explain your biochemical reasoning and if this change would effect oxidative phosphorylation and the TCA cycle.

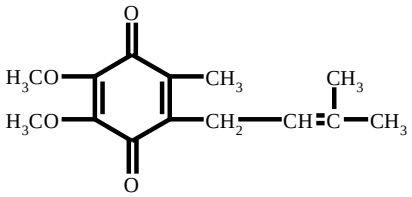
Coenzyme Q (oxidized form)



Coenzyme Q (reduced form)



Coenzyme Q modified (oxidized form)



Coenzyme Q modified (reduced form)