

BIOSC 1820  
Metabolic Pathways and Regulation  
Spring, 2012  
Prof. Jeffrey L. Brodsky  
Quiz #5  
April 4, 2012

NAME: KEY

1. Indicate for each of the following three questions the full name of the complex in the electron transport chain that is being referred to:

A. This complex catalyzes the step that represents the biggest "drop" in free energy (i.e., the  $\Delta G$  for 2 electrons transported through this complex is the most negative).

Cytochrome oxidase

B. The transfer of 2 electrons from this complex is inhibited by rotenone and amytal.

NADH-Ubiquinone Oxidoreductase OR  
NADH Dehydrogenase

C. This complex contains cytochrome  $b_{560}$ , which insulates the electron transport chain.

Succinate-Ubiquinone Oxidoreductase OR  
Succinate Dehydrogenase

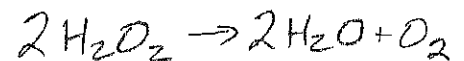
2. The Oxygen evolving complex

is associated with P680 in Photosystem II and reacts with water.

3. The Adenine Nucleotide Translocase (or antiporter) requires which component of the PMF to function?

The Electrical Component (OR  $\Delta G_{\text{ELECTRICAL}}$   
OR  $\Delta \psi$ )

4. The following reaction is catalyzed by which enzyme?



Catalase

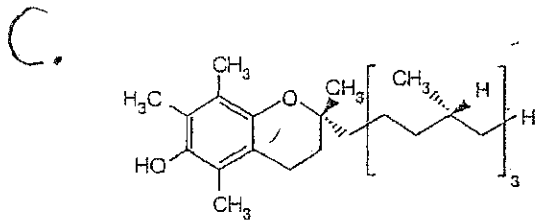
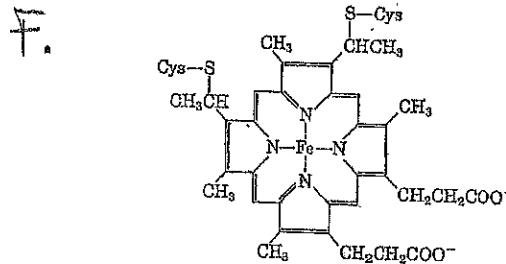
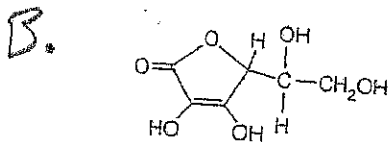
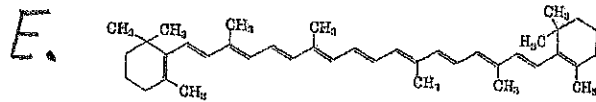
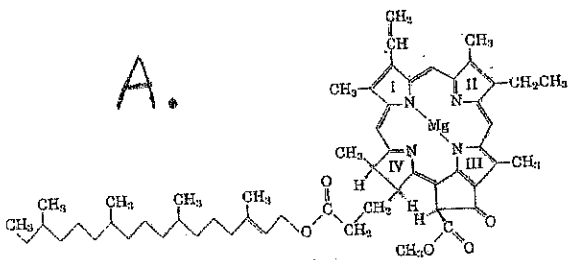
5. Which of the following structures:

i. Will lead to the consumption of oxygen without allowing ATP synthesis in a respiring mitochondria? D (uncoupler)

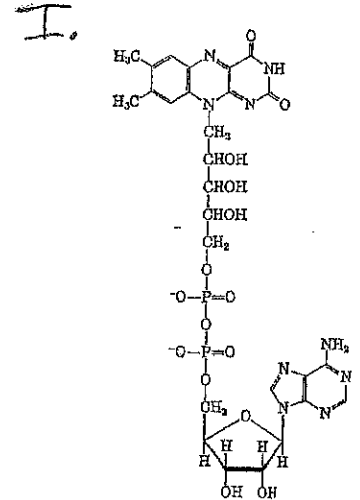
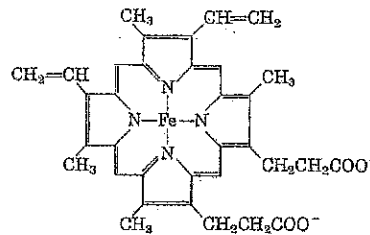
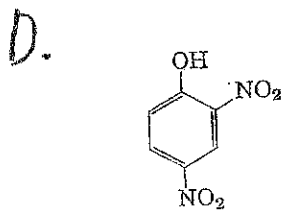
ii. is  $\beta$ -carotene? E

iii. is a chlorophyll? A

iv. is found in cytochrome c? F (NOTE Cys linkage)



G.  $Mn^{2+}$



6. In plants that are exposed to sunlight, protons are pumped into which compartment against their concentration gradient?

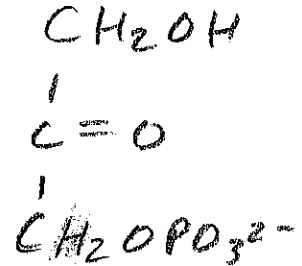
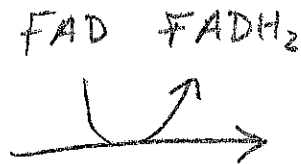
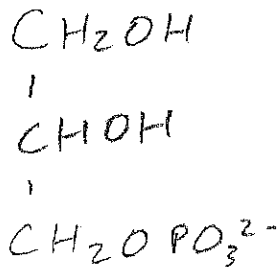
The thylakoid lumen

-2- ("thylakoid" is OK)

7. Assuming that there was no non-specific "leak" of protons across the mitochondrial inner membrane, what effect would oligomycin have on the continued breakdown of glucose in a cell in the presence of oxygen? Why?

Oligomycin inhibits  $H^+$  movement back into the mitochondria via the ATP Synthase. In the absence of  $H^+$  transport, it gets "harder" to keep pumping protons, so in turn it gets harder for NADH to release electrons. As a result, NAD pools drop and glucose breakdown

8. Draw the structure AND give the name of the product of the following reaction: steps.



Dihydroxyacetone phosphate

Name one tissue in which this reaction is critical for the delivery of electrons into the mitochondria:

Skeletal muscle or Brain

9. Based on the results in the paper that was discussed in the recitation, name TWO factors that contribute to the amount and/or speed of ATP synthesis in the experiment using isolated chloroplasts.

- The pH difference between the inside/outside
- The concentration of the acid
- The time at which ADP/ $P_i$  were added
- The buffering capacity of the acid