

BIOSC 1820  
Metabolic Pathways and Regulation  
Spring, 2010  
Prof. Jeffrey L. Brodsky  
Quiz #5  
April 7, 2010

NAME: KEY

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

A. The complex includes heme-containing copper:

Cytochrome oxidase

B. Cytochrome  $b_{560}$  is present in this complex to prevent an electron "leak", and mutations in this protein give rise to degenerative disease:

Succinate dehydrogenase or

Succinate Ubiquinone oxidoreductase

C. The 2 electrons in this complex are received from a freely diffusible, membrane integrated quinone:

Ubiquinone-cytochrome c oxidoreductase

D. This complex is the largest (~850 kDa) of the four:

NADH dehydrogenase or

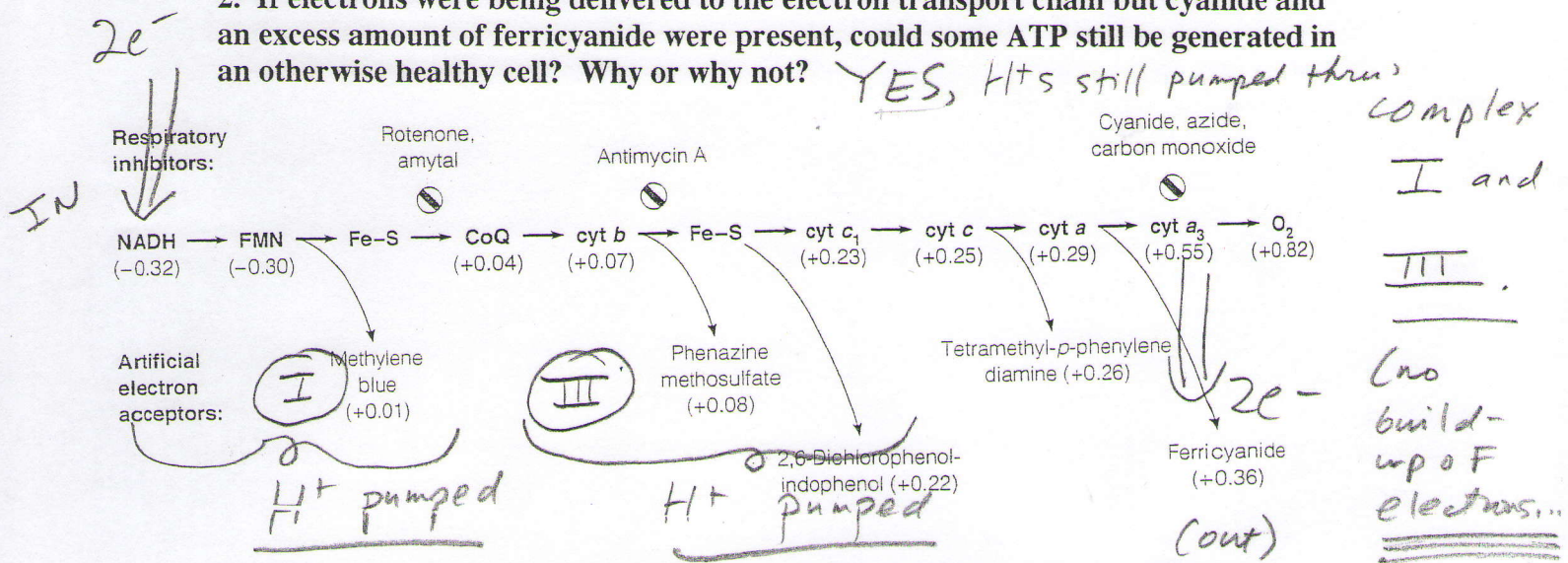
NADH-ubiquinone  
oxidoreductase

E. 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

2. If electrons were being delivered to the electron transport chain but cyanide and an excess amount of ferricyanide were present, could some ATP still be generated in an otherwise healthy cell? Why or why not?

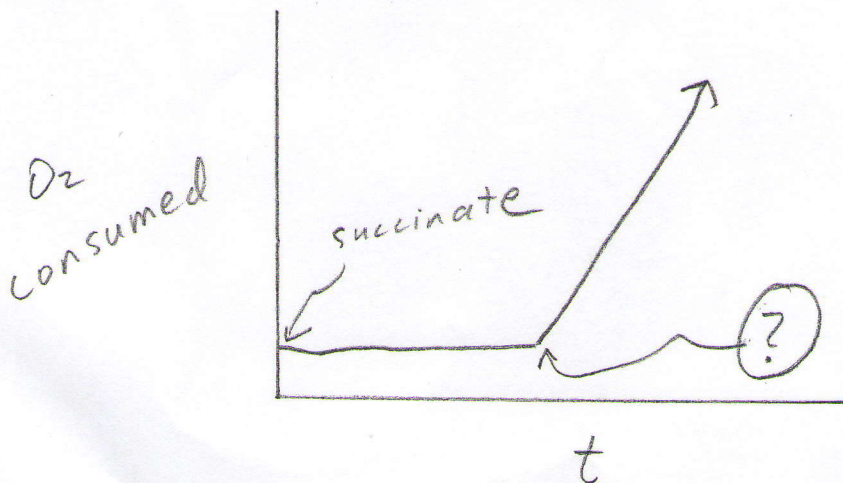
YES, H<sup>+</sup>s still pumped thru



3. What are the names of the two metabolic enzymes that are required to deliver NADH equivalents from the cytoplasm into the mitochondrial matrix in liver, kidney, and heart (2 points)?

- aspartate amino transferase (or asp transaminase or glutamate transaminase)
- malate dehydrogenase

4. The following diagram represents a plot for oxygen consumption versus time for an isolated mitochondria. Even though succinate has been added, other reactants must be present before oxygen is consumed (as indicated with an arrow). What are these reactants and why must they be added?



ADP + P<sub>i</sub> must be added:  
 without these, there is a build-up of H<sup>+</sup>s and no more electrons can flow through the chain since it is too "hard" to pump additional H<sup>+</sup>s

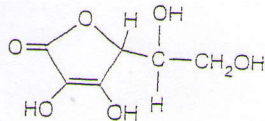
5. Which of the following structures:

i. is an uncoupler? C

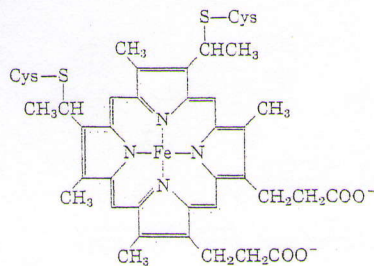
ii. is vitamin C? A

iii. is a substrate for catalase? G

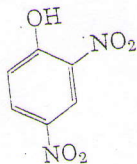
A.



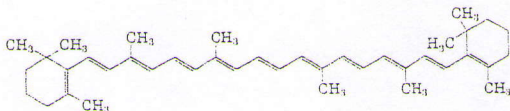
B.



C.

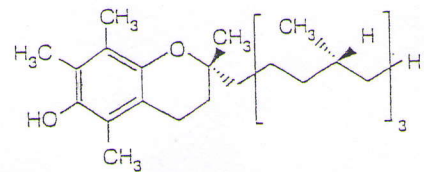


D.



E.  $O_2^-$

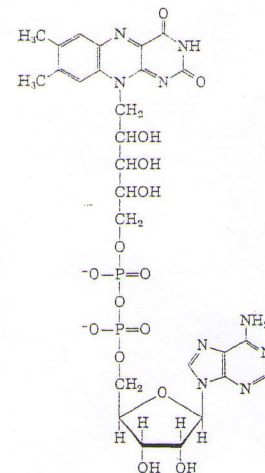
F.



G.

$H_2O_2$

H.



6. In which compartment within the plant chloroplast does the oxygen-evolving complex reside (please be specific)?

The lumen of the thylakoid.

7. Which of the following statements about the photosynthetic electron transport chain is FALSE?

A. The cytochrome  $b_6f$  complex plays a key role in the generation of the proton gradient

B. The final electron acceptor is NAD

(NADP)

C. The overall potential energy of reduced P700 is higher than reduced P680

D. During cyclic electron transport, electrons are transported back into an earlier step in the electron transport chain by ferredoxin

E. None of the above—each of the statements above is TRUE

8. (Recitation) If you were to repeat the experiments described in the Jagendorf and Uribe paper, which acid do you think would generate the most ATP if used at the same, non-toxic concentration, acetic acid or HCl? Why?

HCl -- it is a stronger acid

(so the  $H^+$  gradient would be greater)