

Biochemistry 694:301
Second Exam, Dr. Deis
Monday Aug. 9, 2004

Name _____

Row Letter ____ Seat Number ____

This exam consists of two parts. Part I is multiple choice. Each of these 25 questions is worth two points. Answer the Part I questions on this sheet, below. Answer the Part II questions on the question pages.

Please use BLOCK CAPITAL letters like this --- A, B, C, D, E. Not lowercase!

- | | | |
|----------|-----------|-----------|
| 1. _____ | 10. _____ | 18. _____ |
| 2. _____ | 11. _____ | 19. _____ |
| 3. _____ | 12. _____ | 20. _____ |
| 4. _____ | 13. _____ | 21. _____ |
| 5. _____ | 14. _____ | 22. _____ |
| 6. _____ | 15. _____ | 23. _____ |
| 7. _____ | 16. _____ | 24. _____ |
| 8. _____ | 17. _____ | 25. _____ |
| 9. _____ | | |

GRADE:

Part I Total _____

Part II:

II-1 _____

II-2 _____

II-3 _____

II-4 _____

II-5 _____

Part II Total _____

Total, I & II _____

- 1.* Which membrane lipid is represented below?
A. Phosphatidyl Choline
B. Phosphatidyl Ethanolamine
C. an Archaeal Lipid
D. Sphingomyelin
E. Cardiolipin
2. Glycolipids are most often a combination of
A. sugars and protein
B. phytol and glycerate
C. phosphatidates and sugar
D. sugar and sphingolipids
E. glucose and cholesterol
- 3.* The membrane shown at right is
A. gram positive (more primitive than gram negative)
B. gram positive (more advanced than gram negative)
C. gram negative (more primitive than gram positive)
D. gram negative (more advanced than gram positive)
4. Which of the following is an "ABC Transporter"?
A. Calcium pump
B. Acetylcholine receptor
C. Voltage gated K⁺ channel
D. Multidrug res. protein
E. GLUT4 receptor
5. The sodium channel excludes potassium because potassium is too large to fit through the opening. The potassium channel excludes sodium as well – how?
A. Sodium has a more positive charge
B. Sodium retains its water of hydration
C. Sodium can't bind to carbonyl groups in channel
D. Sodium would rather go through its own channel
6. If Homer Simpson had actually eaten the toxic part of the Fugu fish, what would be his first symptom of poisoning?
A. heart explodes
B. a red rash
C. pain in the joints
D. lips feel numb
E. upset stomach
7. One reason why ATP hydrolysis is a "high energy" process is that the products benefit from resonance stabilization. What's the other main reason?
A. charge repulsion
B. anhydrides are all hi
C. phosphate bonds are weak
D. the gas constant doesn't apply
E. high levels of phosphate in cell
8. What is the value of Atkinson's Energy Charge Function when [AMP] = 1 M, [ADP]= 2M, and [ATP] = 3M?
A. 0.1
B. 0.25
C. 0.33
D. 0.5
E. 0.67
F. 0.9

- 9.* The structure below represents which cofactor?
- A. NAD⁺
 - B. NADH
 - C. NADP⁺
 - D. NADPH
 - E. FAD
 - F. FADH₂
10. Protein Kinase C causes phosphorylation of the target sequence KGSLR in its substrates. PKC normally "chews its tail" which has the altered sequence:
- A. AGSLR
 - B. KASLR
 - C. KGALR
 - D. KGSAR
 - E. KGSLA
11. Which of the following is NOT mediated by a 7TM protein?
- A. Smell
 - B. Hearing
 - C. Taste
 - D. Vision
 - E. Epinephrine stimulation
12. Calmodulin binds to a maximum of how many Calcium ions?
- A. one
 - B. two
 - C. three
 - D. four
 - E. six
 - F. 24
13. Fructose 2,6 bisphosphate is a "signal" molecule which means
- A. too much ATP
 - B. not enough glucose
 - C. cell is too hot
 - D. lots of glucose
 - E. lots of ATP
14. The mechanism of G3PDH begins with a covalent reaction between carbon one of G3P and a residue of which amino acid in the enzyme's active site?
- A. ser
 - B. cys
 - C. lys
 - D. his
 - E. glu
15. GLUT4 allows glucose to enter the cell, and is an example of
- A. primary active transport
 - B. secondary active transport
 - C. facilitated diffusion
 - D. simple diffusion
 - E. antiport
16. Where is G6Pase found in liver cells?
- A. the cytoplasm
 - B. the lumen of the E.R.
 - C. the nucleus
 - D. the mitochondrial matrix
 - E. the mito. intermembrane space
 - F. not found in liver cells
17. Which of the following is **not** an inhibitor of Pyruvate DH Complex?
- A. NADH
 - B. Acetyl CoA
 - C. ATP
 - D. Citrate
 - E. none of the above

18. The Citric Acid Cycle occurs where in eukaryotic cells?
A. the cytoplasm D. the mito. intermembrane space
B. the lumen of the E.R. E. the mitochondrial matrix
C. the nucleus
19. Which enzymes contain at least one iron sulfur cluster?
A. Aldolase and Hexokinase
B. Pyruvate DH complex and ICDH
C. Succinate DH and Aconitase
D. Fumarase and Succ CoA Synthetase
20. Unlike other organisms, organisms that have the Glyoxylate Cycle can
A. make glucose from fatty acids D. run gluconeogenesis
B. make fatty acids from glucose E. run Citric Acid Cycle backward
C. make acetyl CoA from fatty acids
21. When mitochondria are uncoupled, electron transport moves electrons rapidly from NADH to H₂O (-52.6 kcal) without making any ATP whatever. If the energy is not trapped as ATP, where does it go?
A. re-establish proton gradient D. flashes of light
B. synthesize other molecules E. heat is generated
C. the energy is destroyed F. tiny radio waves
22. Which conformational state of the F1 "knob" has the highest affinity for ADP?
A. open C. tight
B. loose D. none of the above
23. In brain and skeletal muscle, when NADH is produced in the cytoplasm by Glycolysis, how many ATP are produced by electron transport/ ox phos?
A. 1.0 D. 2.5
B. 1.5 E. 3.0
C. 2.0 F. 10
24. In the mitochondrial electron transport chain, cytochrome c is reduced directly by
A. c₁ D. a
B. b_L E. a₃
C. Rieske FeS F. none of the above
25. Most popular movie clip?
A. Monsoon Wedding D. Amadeus
B. Apocalypse Now E. Simpsons
C. Big Night F. Sponge Bob

PART II Answer these questions here on the question pages.

1. a. Sketch the Acetylcholine Receptor, and briefly describe the synaptic events that occur when Acetylcholine arrives at the postsynaptic membrane. Tell what ACH does, and how ACH is broken down.

(5)

b.* The picture below is a book illustration showing the inactive and active forms of a Protein Kinase. Identify which Protein Kinase this is, tell why the inactive form is inactive, and briefly describe what is involved in the activation steps. Label the arrows.

(5)

2. a. Draw the Krebs Diagram showing the stages of Catabolism, label each stage with how much energy it evolves.

(3)

- b. How does Insulin affect the distribution of GLUT4 receptors in Liver Cells? Your answer should include a diagram showing before/after Insulin stimulation.

(3)

- c.* Identify the cofactors represented below. Be careful to specify the right oxidation state etc. You may abbreviate your answer.

(4)

3. a. Show Glycolysis starting with Fructose 1,6 bis-P and ending with Glyceraldehyde-3-P. Draw all reactants and products, indicate cofactors, and name enzymes. 1/2 point per fact.

(6)

- b.* On the two graphs below, show how the kinetics of Phosphofructokinase vary with ATP with F6P, in presence and absence of F2,6BP.

(4)

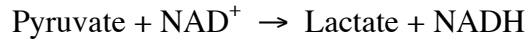
4. a. Show the Citric Acid Cycle from alpha-ketoglutarate to Malate. Draw reactants and products, indicate cofactors, and name enzymes. 1/2 pt per fact. (Hint, do not *reverse* any irreversible steps. Citrate Synthase is *irreversible*).

(8)

- b. Show how Pyruvate reacts with TPP at the beginning of the Pyruvate DH complex. Draw Pyruvate, the five membered ring of Thiamine, and the products through to HETPP. You do not have to show the remaining steps of Pyruvate DH.

(2)

5. a. For the following reaction, catalyzed by Lactate Dehydrogenase, calculate the ΔE° and the $\Delta G_o'$. The value of a Faraday is 23.06 kcal/volt/mol. State equations, show work, and circle both answers.



Reduction Potentials:



(4)

- b. Fill in the blanks:
(6)

In the Q cycle, Q becomes reduced to QH_2 and then flips (inward? outward?).

It gives its first electron directly to _____.

The second electron first goes to cyto. _____ and then to cyto _____

In order to show complete reduction of a Q on the matrix side of the inner membrane the events of the Q cycle have to be shown _____ times.

The iron sulfur cluster of Complex III is called the _____.