

Biochemistry 694:301
Second Test Dr. Deis
Thu. Oct. 25, 2001

Name _____
Last 5 digits of SSN _____
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. The difference between a Cerebroside and a Ganglioside is that
 - A. one is a sphingolipid, the other a phosphatidyl lipid
 - B. one contains a fatty acid amide, the other a fatty ester
 - C. one contains a sugar head group, the other an oligosaccharide
 - D. one has sugar phosphate, the other simply a sugar

2. Eucaryotic cell membranes are strengthened by
 - A. the cell wall
 - B. glycolipids
 - C. proteins like Spectrin
 - D. polyunsaturated fats
 - E. all of the above

3. Cardiolipin is found in
 - A. the mitochondrial inner membrane
 - B. the nuclear membrane
 - C. the eucaryotic cell membrane
 - D. the lysosome
 - E. the endoplasmic reticulum

4. Primary Active Transport – fueled by (what) to transport (what)?
 - A. sugars, sugars
 - B. ATP, ions
 - C. cAMP, amino acids
 - D. GDP, proteins
 - E. none of the above

5. The Acetylcholine Receptor is composed of how many subunits?
 - A. 1
 - B. 4
 - C. 5
 - D. 6
 - E. 8

6. Potassium can not pass through the voltage gated Sodium Channel because
 - A. inactivation prevents it
 - B. too much Sodium gets in way
 - C. K^+ is too positive
 - D. K^+ is too large
 - E. none of the above

7. Protein Kinase C transfers a phosphate to Serine in substrate proteins containing the sequence RKGSLRQ. Like Protein Kinase A, PKC has a regulatory domain with a pseudosubstrate sequence. Which of the following would be a good candidate for this sequence?
 - A. RAGSLRQ
 - B. RKASLRQ
 - C. RKGALRQ
 - D. RKG SARQ
 - E. RKGSLAQ

8. An inhibitor of the enzyme Acetylcholinesterase could be used as
 - A. a sleeping pill
 - B. inhibitor of gastric acidity
 - C. anti-inflammatory
 - D. antibiotic
 - E. nerve gas

9. The standard free energy change for transport of Glucose across a membrane would be
A. positive B. negative C. zero
10. In a handout, research was described that provided the "Fountain of Youth" for fruit flies, by:
A. cosmetic surgery D. transfecting SOD and Catalase
B. getting plenty of sleep E. sit-ups and aerobatics
C. antioxidant vitamins
11. We share our antibody-diversity generating system with
A. all plants and animals D. all jawed vertebrates
B. all higher animals E. mammals only
C. all deuterostomes including starfish etc.
12. The human genome holds some 30,000 genes. *Roughly* what percentage of these genes are devoted to producing antibody diversity?
A. 0.001% D. 1.0 %
B. 0.01% E. 10 %
C. 0.1% F. 100%
13. The antigen binding site of IgG is composed of
A. V_H and V_L D. 2 V_L
B. V_H and C_H E. none of the above
C. 2 V_H
14. The heavy chain of IgG is made up of beta sandwich segments which are clearly visible in the structure. How many beta sandwiches are there in one heavy chain?
A. 12 D. 3
B. 6 E. 2
C. 4 F. 1
15. If concentrations in a cell are $[ATP] = 2 \text{ mM}$, $[ADP] = 0.2 \text{ mM}$, and $[AMP] = 0.02 \text{ mM}$ what is the energy charge?
A. 2.22 D. 0.946
B. 1.0 E. 0.803
C. 0.992
16. What would be a good example of a "Stage III" process, in Krebs' analysis of catabolism?
A. Amylose hydrolysis D. protein hydrolysis
B. Glycolysis E. none of the above
C. Citric Acid Cycle

17. You drink a glass of milk. An hour later you have intestinal cramps and other gut symptoms. Chances are you have
- A. galactosemia
 - B. diabetes
 - C. lactose intolerance
 - D. malaria
18. Glucose which has been oxidized to have a carboxyl group at C-6 is called:
- A. Gluconate
 - B. Glucuronate
 - C. Glucarate
 - D. Fructose
 - E. Sedoheptulose
19. D-Xylulose forms a glycoside when a substituent is added to which position?
- A. 1
 - B. 2
 - C. 3
 - D. 4
 - E. 5
- 20.* Interpret the "chair" structure shown below. What is the name of the sugar represented?
- A. alpha-D-Mannose
 - B. alpha-D-Glucose
 - C. alpha-D-Galactose
 - D. beta-D-Allose
 - E. beta-D-Ribose
21. When insulin signals ingestion of food, GLUT-4 receptors are
- A. rapidly synthesized
 - B. rapidly destroyed
 - C. put into inactive mode
 - D. translocated to outer membrane
 - E. blocked by binding insulin
22. Aldolase forms a covalent connection between substrate and a residue of
- A. lysine
 - B. serine
 - C. cysteine
 - D. glutamate
 - E. alanine
23. The normal mechanism of G3PDH is directly disrupted by
- A. cyanide
 - B. 2, 4 DNP
 - C. Fru-2,6 BP
 - D. citrate
 - E. arsenate
- 24.* The graph below represents the kinetics of PFK-I when F6P is held constant and ATP is varied. The lines marked "+" show the kinetics in the presence of what?
- A. cyclic AMP
 - B. Calcium ion
 - C. 2,3 BPG
 - D. Glucose 6 P
 - E. Fru-2,6-BP
25. How many points is this question worth?
- A. 0
 - B. 1
 - C. 2
 - D. I don't know

PART II Answer these questions here on the question pages.

1. a. Draw Phosphatidyl Serine, and show how it would be cleaved by Phospholipase C.

(3)

- b. Draw a sketch which illustrates the Fluid Mosaic Model of membrane structure.

(2)

- c. Where is Acetylcholinesterase located? Why is it such a fast acting enzyme? Be as specific as you can.

(3)

- d. Briefly describe the process for an Excised Patch Mode Patch-Clamp Conductance experiment. What would one be trying to observe by doing this?

(2)

2. a. There are many people who can't smell some specific odor, like the scent of Musk. But it is rare to find anyone who can't experience "bitter" taste. Why is specific anosmia (loss of a certain smell) common, whereas loss of "bitter" is very rare? Give a molecular explanation, think of receptors.

(3)

- b. "Umami" is a meaty flavor. What does the "umami" receptor have in common with the beta-adrenergic receptor (which triggers cyclic AMP formation)?

(3)

- c. Phosphatidyl Inositol is cleaved into two "messenger" molecules, and then a third "messenger" is released. What are these 3 messengers which eventually cause the activation of Protein Kinase C?

(4)

3. a. Sketch the structure of IgG – show the chains and label the constant and variable regions within each chain.

(3)

- b. What genes are involved in generation of antibody diversity? Diagram the germ-line DNA as done in class and in the text. Label the gene segments and tell what the abbreviations stand for.

(3)

- c. Distinguish *functionally* between Class I and Class II MCH proteins. For a complete answer you have to discuss various T-cells, etc.

(4)

4.* a. What cofactors are represented below?

(4)

b. Draw the disaccharide D-mannopyranosyl 1-4 D-xylulofuranose in the Haworth projection. For partial credit just draw D-Mannose and D-Xylulose in the Fischer projection.

(4)

c. Draw the alpha and beta anomers of D-Fructopyranose

(2)

5. a. Show how Fructose-1,6-BP would be converted into Phosphoenolpyruvate by the enzymes of Glycolysis. Draw all reactants and products, name all enzymes, and indicate all cofactors. 1/2 point per fact. Note, you may simply write out the entire pathway if that is easier for you.

(8)

- b. Galactose is converted into Glucose by a 4-epimerase discussed in class. Show the reaction, being careful to represent the correct reactant and product. You may use "sticks" where appropriate but do show the epimerization.

(2)