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Chem 3550 Test 3 Makeup, Professor David L. Huffman, Wednesday, 11/10/2005

Questions for TEST FORM A. THIS EXAM WILL BE COLLECTED AT 12:50 PM. PAGE 5 IS FOR SCRATCH WORK. DO NOT USE YOUR OWN PAPER.

Number 1 through 15 are worth 6 points each.

1. Glycogen is a . . .
 - A. polymer of galactose
 - B. hormone
 - C. A and B above
 - D. None of the above
2. Glucagon is . . .
 - A. secreted from the pancreas
 - B. a polymer of glucose
 - C. A and B above
 - D. None of the above
3. Pyruvate (with the appropriate enzyme and cofactors) . . .
 - A. can be converted to ethanol under anaerobic conditions in the muscle
 - B. can be converted to galactose in the mitochondria
 - C. can be converted to acetylCoA in the mitochondria
 - D. A and B above
 - E. None of the above
4. Fructose-2,6-bisphosphate . . .
 - A. Regulates the action of fructose-1,6-bisphosphatase
 - B. Regulates the action of phosphofructokinase
 - C. A and B above
 - D. None of the above
5. The production of oxaloacetate from malate requires . . .
 - A. ATP and the enzyme malate dehydrogenase
 - B. NAD^+ and the enzyme malate dehydrogenase
 - C. FAD and the enzyme malate dehydrogenase
 - D. None of the above
6. Glycogen phosphorylase
 - A. is activated by phosphorylation
 - B. is activated by the hormone insulin
 - C. produces glucose-6-phosphate is one of its products
 - D. A, B, and C above
 - E. A and B above
7. In the liver, phosphofructokinase . . .
 - A. catalyzes a reaction that is reversible
 - B. is an enzyme of the gluconeogenesis pathway
 - C. activity is enhanced by higher glucagon concentrations
 - D. None of the above
8. The pyruvate dehydrogenase complex . . .
 - A. produces NAD^+
 - B. produces acetylCoA
 - C. has lipoamide as a cofactor
 - D. A and B above
 - E. B and C above
9. Succinate dehydrogenase.
 - A. reduces NAD^+ to NADH
 - B. is part of Complex II of the electron transport chain
 - C. converts succinate to fumarate
 - D. B and C above
 - E. A, B, and C above
10. Citrate synthase . . .
 - A. catalyzes a reaction that has a negative standard free energy value
 - B. is activated by high citrate levels in the cell
 - C. needs both oxaloacetate and acetylCoA (same as acetylSCoA) as reactants
 - D. A, B, and C above
 - E. A and C above
11. NADPH . . .
 - A. is produced by the pentose phosphate pathway (also called phosphogluconate)
 - B. is produced by the citric acid cycle
 - C. is produced by the electron transport chain
 - D. A and B above
 - E. B and C above
12. NADH . . .
 - A. donates electrons to Complex I
 - B. accepts electrons from Complex II
 - C. is the oxidized form of the cofactor
 - D. A and C above
 - E. B and C above
13. Complex IV . . .
 - A. accepts electrons from cytochrome *c*
 - B. contains no iron atoms
 - C. accepts electrons from O_2
 - D. None of the above
14. ATP is produced by the action of . . .
 - A. pyruvate kinase
 - B. phosphoglycerate kinase
 - C. the $\text{F}_0\text{-F}_1$ ATP synthase complex
 - D. A, B, and C above
 - E. None of the above
15. Which of the following molecules **cannot** cross (traverse) the inner mitochondrial membrane?
 - A. malate
 - B. oxaloacetate
 - C. pyruvate
 - D. A and B above
 - E. A and C above

**SHORT ANSWER PORTION OF TEST. VARIABLE NUMBER OF POINTS.
TELL ME WHAT YOU KNOW. DO NOT LEAVE ANSWERS BLANK.**

16. Draw the structures of three different sugars and name them. Draw both the linear and cyclic forms. Label the cyclic forms as alpha or beta. (15 points)

16.

17. Discuss only **ONE** of the following (15 points)
- How cytosolic NADH electrons are shuttled into the mitochondria – mention enzymes and intermediates.
 - How electrons flow down the electron transport chain – mentions sources of electrons and pathways.
 - How lactose is broken down and enters glycolysis (talk about how **BOTH** sugars enter into glycolysis). Mention the first few reactions for the entry of each hexose into glycolysis. Which hexose is energetically more costly to metabolize?
 - The steps where NADH and FADH₂ are produced by the citric acid cycle. List both enzymes and reactants and products involved in the production of these cofactors.

17.

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EXTRA SPACE FOR PAGE 2 ANSWERS

18. Discuss only **ONE** of the following. (15 points)
- A metabolic branch point of glycolysis (prior to pyruvate). Discuss the metabolic choices and how the cell decides which path to follow.
 - The hormonal regulation of blood glucose and the effect it has on glycolysis, gluconeogenesis, and glycogen metabolism. Mention any organs involved in this process as well as hormones.
 - The Cori cycle and the reason for it. Make sure and mention any transport phenomena operative. For the part of it that takes place in the liver discuss the first few steps of the conversion of the three carbon metabolite to the PEP (phosphoenolpyruvate); that is, name of enzymes, reactants, products, and cofactors necessary.

18.

19. Describe how the electron transport chain is coupled to oxidative phosphorylation. Talk about how this coupling takes place and what the end product of this process is. Is it possible or desirable to uncouple this process?(10 points)

19.

20. Is anabolism an oxidative or a reductive process? Explain why. (10 points).

20.

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EXTRA SPACE FOR PAGE 4 ANSWERS

21. Discuss a topic of your choice from metabolism that is unrelated to your previous answers. Give at least three main points. Don't make your answer too general. (15 points)

21.

22. Very briefly itemize only **ONE** of the following. (10 points)

- a. The two step breakdown of ethanol into acetate. Name enzymes and cofactors involved.
- b. Two factors that affect the activity of an enzyme. Name the enzyme and tell whether they increase or decrease enzyme activity.
- c. Three ways in which sugars can be used other those going directly into glycolysis – just list them with the name of the sugar (For example, _____ can be used to make _____)

22.

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SCRATCH PAPER or A PAGE TO PLACE ADDITIONAL ANSWERS. THIS FORM MUST BE RETURNED WITH YOUR EXAM. DO NOT DETACH.