

Chemistry 326
Fall 2009

Name _____

Check Section:

Tuesday _____

Wednesday _____

Thursday _____

Exam 4

If I cannot read your writing I will not grade the answer and it will be assigned "0" points.

1. In what reaction(s) of TCA does substrate level phosphorylation occur? **Name** and **give the structure(s)** of the reactant(s) and the product(s). Indicate the enzyme and any coenzymes or cofactors involved in the reaction. (10pts)

2. Match the coenzymes below with their roles in the Pyruvate dehydrogenase complex reaction. (10pts)

Coenzymes:

- a. CoEnzyme A
- b. NAD^+
- c. TPP
- d. FAD
- e. Lipoic acid in oxidized form

Roles: use the ***letter*** from the CoE choices that corresponds to your answer

- _____ Accepts the C-2 acyl group from the lipoamide
- _____ Initial electron acceptor in oxidation of pyruvate
- _____ Attacks and attaches to the carbonyl carbon of pyruvate
- _____ Oxidizes the reduced lipoamide
- _____ Oxidizes the reduced FADH_2

3. How much energy can be realized from each of the following when they are completely oxidized to CO_2 and water? ($\text{NADH} = 2.5\text{ATPs}$ and $\text{FADH}_2 = 1.5\text{ATPs}$) (10pts)

- a. Fructose-1,6-bisphosphate _____
- b. 2 Alanines _____
- c. 5 acetyl CoA _____
- d. Stearic acid _____
- e. Maltose _____

4. Give the name and draw the structure of the α -keto acid resulting when the following amino acids undergo transamination to α -ketoglutarate. (5pts)

a. Asp

b. Ala

5. Why do we need fats in our diets? (5pts)

6. Answer true (T) or False (F): (20pts)

- _____ 1. The average carbon in fatty acids is relatively reduced thus, containing relatively large amount of potential metabolic energy.
- _____ 2. Carbohydrates provide less metabolic energy per gram than fatty acids.
- _____ 3. Fatty acid oxidation is an anaerobic process.
- _____ 4. The β -oxidation reactions alone provides 5 ATP molecules.
- _____ 5. Mammals excrete nitrogen in the form of urine.
- _____ 6. Acetyl-CoA can be produced from carbohydrates, proteins, and fats.
- _____ 7. Phospholipids are the chief components of membranes.
- _____ 8. Fatty acid synthesis occurs by successive additions of 2 carbon units.
- _____ 9. Malonyl-CoA is synthesized from acetyl CoA.
- _____ 10. β -oxidation takes place in the cytosol.
- _____ 11. TAGs are the storage form of fat.
- _____ 12. Lecithin is a biological detergent and an integral part of lipid bilayers.
- _____ 13. The urea cycle is an example of a spiral pathway.
- _____ 14. Fatty acid synthase is a multifunctional enzyme.
- _____ 15. Asp can be transaminated to pyruvate generating α -ketoglutarate and Ala.
- _____ 16. Linoleic acid is an essential fatty acid.
- _____ 17. NADPH which is used in β -oxidation comes from HMP and the citrate shuttle
- _____ 18. An acyl carrier protein is involved in both lipogenesis and lipolysis.
- _____ 19. Pyridoxal phosphate is involved in the Schiff's base mechanism.
- _____ 20. Thiamine deficiency will cause an increase in blood levels of α -ketoglutarate.

7. Glycerol can be converted into a compound used in either EMP or GNG. Name the compound and in a sentence or two explain how this occurs. (5pts)

8. Where is the labeled carbon found when the following compounds are added to a liver homogenate carrying out palmitate synthesis? Explain your answer.(10 pts)

a. $H^{14}CO_3^-$

b. $H^{14}C-CO_2CoA$

9. Write an equation for the hydrolysis of ATP to release 2 high energy bonds. List 4 places in metabolism that appeared in this course that use this type of hydrolysis of a triphosphate nucleotide. (10pts)

1. _____

3. _____

2. _____

4. _____

10. In a transaminase reaction, the amino acid Asp reacts with α -ketoglutarate.(15pts)

a. Name the products of the reaction.

a. _____; b. _____

b. In mammals, what is the fate of the ammonium ion released by oxidative deamination in the liver mitochondria?

c. Draw the structure of the urea molecule. (no partial credit).

d. How many ATPs (molecules) are generated when the amino acid, Ala, is oxidatively deaminated and the keto-acid resulting from the deamination is completely oxidized to carbon dioxide and water.

a _____; How did you arrive at your answer?