

CHEMISTRY 326

NAME_____Key_____

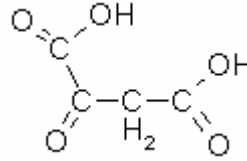
Summer 2005

EXAM 5

1. (9pts) Give the name and draw the structure of the α -keto acid resulting when the following amino acids undergo transamination with α -ketoglutarate

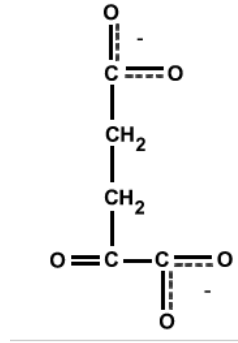
a. asp

OAA

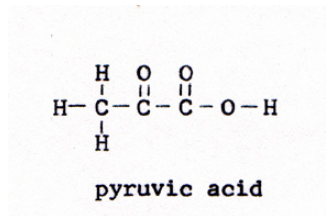


b. glu

α -ketoglutarate



c. ala



Pyruvate

2. (5pts) In what way is TCA involved in obtaining energy from fats.

The acetyl CoAs generated from β -oxidation funnel into TCA for complete oxidation.

3. (6pts) Give 2 reasons why fats contain more biochemical energy than carbohydrates.

1. Fats are more reduced

2. Fats have more carbons

4. (10pts) How much energy is realized from the complete oxidation of each of the following: (old convention)

a. Sucrose 72/76

b. 4 Acetyl-S-CoA 48

c. 30 moles of pyruvate 450

d. glucose from glycogen breakdown 37/39

e. 1 mole of 3-PGA 16

5. (20pts) Regarding the urea cycle:

a. In what organ does the cycle take place? Liver

b. How many moles of amino acid are needed for the synthesis of 1 mole of urea. 2

c. How many ATP **molecules** are used in the urea cycle? 3

d. How many ATP **equivalents** are expended in this process? 4

e. How many ATP molecules will be generated from the complete oxidation of 2 moles of Alanine? 30

f. What intermediary metabolite the source of the carbon atom in the urea molecule
Bicarbonate ion

g. Draw the structure of the urea molecule. 2NHCONH_2

h. What are the immediate precursors for the nitrogen atoms in the urea molecule?
 NH_4^+ & asp

6. (10 pts) How many ATP molecules are produced when the lipid myristic acid is completely oxidized to CO_2 and H_2O ? Show how you arrived at your answer. (old convention)

Myristic acid is saturated fatty acid with 14 Carbons.

It will yield 7 acetylCoAs that go to TCA = $12 \times 7 = 84$ ATPs

It will yield 6 $FADH_2$ & 6 NADH = $5 \times 6 = 30$ ATPs

Total 114 - 1 = 113 ATPs

7. (5pts) List and give the structures of the components produced on complete hydrolysis of lecithin.

Glycerol, P, 2 FA, choline

8. (15pts) Identify those steps in TCA that represent the MLS (Main Line Sequence). For each step, include in your answer the name of the substrate and the product plus any CoE needed and the enzyme.

Succinate \rightarrow fumarate \rightarrow malate \rightarrow OAA
CII fumarase dehydrogenase
FAD/Q water NAD+

9. (20pts) Answer true (T) or False (F):

- _F___1. The average carbon in fatty acids is relatively reduced thus, containing little stored metabolic energy.
- _F___2. Carbohydrates provide more metabolic energy per gram than fatty acids.
- _T___3. Fatty acid oxidation is an aerobic process.
- _F___4. The β -oxidation reactions alone provide 38 ATP molecules.
- _T___5. Mammals excrete nitrogen in the form of urea.
- _T___6. Acetyl-CoA can be produced from carbohydrates, proteins, and fats.
- _T___7. Phospholipids are the chief components of membranes.
- _T___8. Fatty acid synthesis occurs by successive additions of 2 carbon units.
- _T___9. Malonyl-CoA is synthesized from acetyl CoA.
- _T___10. β -oxidation takes place in the mitochondria.
- _T___11. TAGs are the storage form of fat.
- _T___12. Lecithin is a biological detergent and an integral part of lipid bilayers.
- _F___13. The urea cycle is an example of channeling.
- _T___14. Fatty acid synthase is a multifunctional enzyme
- _T___15. Asp can be transaminated to pyruvate generating OAA and Ala.
- _T___16. Linoleic acid is an essential fatty acid.
- _F___17. NADPH which is used in β -oxidation comes from HMP and the citrate shuttle
- _F___18. An acyl carrier protein is involved in both lipogenesis and lipolysis.
- _F___19. Pyridoxol phosphate is involved in the Schiff's base mechanism.
- _F___20. 4 moles of ATP are used in the urea cycle.