

**CHEM 100: Exam #5**  
**May 7, 2002**

Name (printed) \_\_\_\_\_

100 points. Read carefully! Write your answers **in the space provided**.

**Part I: Fill in the blanks.** (2 pts. each)

1. The "dead-end" product of anaerobic glycolysis in animals \_\_\_\_\_
2. The final product of anaerobic glycolysis in yeast \_\_\_\_\_
3. The oxidizing agent (cofactor needed) in glycolysis \_\_\_\_\_
4. A polymer of  $\beta$ -D-glucose \_\_\_\_\_
5. A disaccharide \_\_\_\_\_
6. A cofactor involved in oxidations of secondary alcohols to ketones \_\_\_\_\_
7. Metabolic pathway in which GTP is produced \_\_\_\_\_
8. The major membrane component other than lipids \_\_\_\_\_
9. The sugar residue in RNA \_\_\_\_\_
10. A lipid component of cell membranes that adds rigidity \_\_\_\_\_

**Part II: True/False.** (2 pts. each) Circle T or F.

11. T F Biosynthesis requires reducing power (reduced cofactors) and energy.
12. T F The citric acid (Kreb's) cycle takes place in the cytoplasm.
13. T F In acetyl-S-CoA the acetate is esterified to Coenzyme A through a thioester linkage.
14. T F Oxaloacetate from the citric acid cycle is the starting point for the biosynthesis of glucose.
15. T F The pentose phosphate pathway produces NADH for reducing power.
16. T F The citric acid cycle produces energy in the form of ATP directly.
17. T F Through oxidative phosphorylation, 1 NADH is converted into 1 FADH<sub>2</sub> molecule.
18. T F Glycolysis and gluconeogenesis follow the same pathway. The direction of flow along the pathway is governed solely by the relative concentrations of the various molecules.
19. T F Nonpolar amino acid residues are usually found on the interior of a globular protein.
20. T F Acetyl-S-CoA is the end product of glycolysis.
21. T F Anaerobic means with oxygen.
22. T F Any triphosphorylated nucleotide (such as GTP or UTP) is equivalent in energy to ATP
23. T F The pentose phosphate pathway is also called  $\beta$ -oxidation
24. T F Conjugated enzymes are those that are fully active with no other cofactors or nonprotein parts
25. T F Secondary protein structures such as  $\alpha$ -helices and  $\beta$ -sheets are stabilized primarily by disulfide bonds.
26. T F The oxidation of reduced cofactors such as NADH and FADH<sub>2</sub>, and the conversion of ADP to ATP are two separate, but linked processes.
27. T F Alpha oxidation of fatty acids is an important energy-producing pathway.
28. T F For a biological pathway to proceed spontaneously it must have a negative value for  $\Delta G$ .
29. T F Glycolysis takes place in the mitochondria.
30. T F Allosteric enzymes can be activated or inhibited.

31. T F More energy in the form of ATP is produced from the complete degradation of three glucose molecules (18 carbons) to carbon dioxide and water than from the complete degradation of an 18-carbon fatty acid to carbon dioxide and water.
32. T F Cell membranes are bilayers composed mainly of phospholipids and cholesterol, along with included proteins
33. T F Anabolic reaction are one that take larger molecules and turn them into smaller molecules (degradation reactions), producing energy
34. T F Oxidative phosphorylation cannot take place in red blod cells, which have no mitochondria
35. T F Metabolic pathways have at least one committed step

**Part III: Short Answer.**

36. (4 pts.) Draw a chemical structure to explain why fatty-acid catabolism is referred to as  $\beta$ -oxidation.

37. (10 pts.) Calculate the number of ATP molecules that would be produced from the complete oxidation of myristic acid ( $C_{14}$ , no double bonds). Show your work.

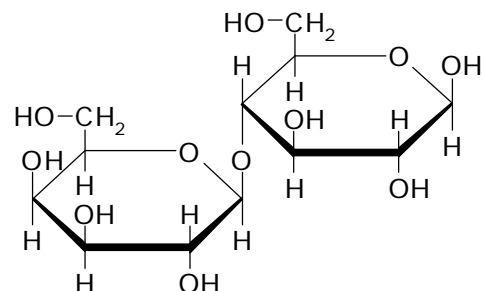
38. (10 pts.) Amylose (plant starch) is a polymer of glucose with  $\alpha(1\rightarrow4)$  linkages.

a) (2) Explain what is meant by an  $\alpha(1\rightarrow4)$  linkage.

b) (3) Explain **how** and **why** the structure of glycogen (animal starch) differs from that of amylose.

c) (2) Name the common disaccharide below.  
(Note: the sugar on the left is galactose.)

d) (3) Draw arrows to and label the glycosidic bond(s) and the anomeric carbon(s).



39. (6 pts.) Identify the class of enzyme involved in each of the following reactions.

a.

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b.

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c.

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40. (up to 10-point bonus) You're gonna like this one. Propose a question about biomolecules or metabolism for which you studied and that you wish that I had asked on this exam. Then, correctly answer your question. Bone-headed questions will receive an appropriate number of points.