

Name (Last, First): _____

Chem 3550 Test 4, Professor David L. Huffman, Monday, 11/21/2005

**Questions for TEST FORM A. THIS EXAM WILL BE COLLECTED AT 12:50 PM.
COMPLETE THE SCANTRON PORTION OF THE TEST BEFORE PROCEEDING TO
THE SHORT ANSWER SECTION.**

Number 1 through 15 are worth 6 points each.

1. The building blocks of cholesterol biosynthesis include
 - A. Acetyl CoA (also called Acetyl ScoA)
 - B. Propionyl CoA
 - C. copper
 - D. A and B above
 - E. A, B, and C above
2. Lipid bilayers of a cell membrane. . .
 - A. typically contain proteins with hydrophobic portions
 - B. usually don't contain cholesterol
 - C. typically have some glycerophospholipids
 - D. A, B, and C above
 - E. A and C above
3. Palmitoyl SCoA (also called Palmitoyl CoA) . . .
 - A. is the product of fatty acid oxidation in the cytosol
 - B. is the product of mitochondrial fatty acid synthesis
 - C. inhibits the action of Acetyl-CoA Carboxylase (also called Acetyl-ScoA Carboxylase)
 - D. A, B and C above
 - E. None of the above
4. Which of the following statements is true?
 - A. The rate determining state of Fatty Acid Synthesis is controlled by Acetyl-CoA Carboxylase
 - B. High levels of citrate activate Acetyl-CoA carboxylase.
 - C. The hormone glucagon (or epinephrine) stimulates the breakdown of triacylglycerols in adipocytes via a second messenger system.
 - D. A, B, and C above
 - E. A and C above
5. Low density lipoprotein particles . . .
 - A. have a higher density than Chylomicrons
 - B. transport cholesterol made in the liver to the tissues
 - C. A and B above
 - D. None of the above
6. The $\text{Na}^+\text{-K}^+$ ATPase pump
 - A. is an example of a passive transport protein
 - B. is an example of active transport system
 - C. helps to pump Na^+ out of the cell and K^+ into the cell
 - D. B and C above
 - E. None of the above
7. Acyl CoA synthetase . . .
 - A. links the acyl carrier protein (ACP) to fatty acids
 - B. activates fatty acids in the small intestine
 - C. is found in the cytosol
 - D. B and C above
 - E. A and B above
8. Sphingolipids . . .
 - A. are made from glycerol
 - B. are considered non-polar lipids
 - C. are usually not found in lipid bilayers
 - D. A and C above
 - E. None of the above
9. Fatty acid synthesis
 - A. needs reducing power from FAD
 - B. produces as the final product a fatty acid with only four carbon atoms
 - C. occurs primarily in the mitochondrial matrix
 - D. B and C above
 - E. None of the above
10. Fatty acid breakdown of odd-numbered chain length fatty acids
 - A. occurs in the cytosol
 - B. is not possible in human cells
 - C. occurs only in plants
 - D. A and B above
 - E. None of the above
11. Glutamate dehydrogenase (with the appropriate cofactors and reagents). . .
 - A. produces glutamate from oxaloacetate
 - B. produces alanine from valine
 - C. produces glutamine from glutamate
 - D. A and C above
 - E. None of the above
12. Alanine . . .
 - A. could be a precursor for glucose synthesis via gluconeogenesis since it can be made into pyruvate
 - B. can be synthesized from pyruvate and glutamate with the enzyme alanine aminotransferase
 - C. is considered an 'essential' amino acid
 - D. A and B above
 - E. A, B, and C above
13. Aspartate (with the appropriate enzyme(s) and reactant(s)) . . .
 - A. can be made from a citric acid cycle intermediate
 - B. could be converted into malate in two enzymatic steps
 - C. can be deaminated to produce an alpha keto acid and glutamate
 - D. A and B above
 - E. A, B, and C above
14. Serine (with the appropriate enzyme(s) and any needed cofactor(s)) . .
 - A. can be made from 3-phosphoglycerate in three steps
 - B. can be from glycine
 - C. can be obtained from dietary protein
 - D. A, B, and C above
 - E. None of the above
15. Unsaturated straight chain fatty acids . . .
 - A. usually have a lower melting point than saturated straight chain fatty acids with the same number of carbons atoms
 - B. are thought to be healthier than only saturated straight chain lipids in the diet
 - C. from natural sources have double bonds in the 'trans' configuration
 - D. A and B above
 - E. None of the above

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

16. Discuss **ONLY ONE** of the following. (15 points)
- Digestion of exogenous triacylglycerols starting in the mouth. Tell what happens in the mouth, stomach, and small intestine. Mention important enzymes and lipoproteins. Tell how they're transported and how they get to cells for utilization, but don't discuss what happens after they are released into the target cell.
 - Triacylglycerol breakdown in adipocytes and transport to cells for utilization. Mention any hormones involved. Would this occur under low or high blood glucose conditions? Mentions any enzymes in the adipocytes important for the breakdown of the triacylglycerols. Mention how products of the breakdown are transported to their cellular targets. Mention what happens to the lipid immediately after it is transported into the target cell and list the enzyme and reactants needed for this.

16.

17. Discuss **ONLY ONE** of the following (15 points).
- The process of fatty acid oxidation. Start from the entry of the fatty acid into the cell, but skip the activation step in the cytosol. Mention any transport mechanisms (with enzymes) into another part of the cell for oxidation to occur. Tell how the process is regulated. Once it gets to where it will be oxidized, list the steps and cofactors important for each step (especially the ones that remove electrons from the substrate). What are the products of fatty acid oxidation? Why do you think the heart generates most of its energy from fatty acids (think about energy yield)?
 - The process of fatty acid synthesis. Start in the mitochondria. Talk about how the process is regulated and mention any transport mechanisms (and enzymes) important in moving substrates to other parts of the cell. Talk about how the process starts. Mention any rate controlling steps. Describe how the process occurs with the types of reactions. List important cofactors and the product of the whole process. Be sure to mention the molecules that are the sources of the carbon atoms for the final product.

17.

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Extra space for page 2 answers

18. Discuss the importance of HDLs, LDLs, and VLDLs. (15 points)

- What is their purpose?
- Where are they made?
- What are their components?
- Be sure to mention the importance of cholesterol in lipid transport.

18.

19. Discuss the importance of cholesterol in human health. In what organ does cholesterol biosynthesis occur? (10 points)

19.

20. Name the enzyme that catalyzes the rate determining step of cholesterol biosynthesis(5 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 from the material you studied for test 4. Give at least three main points (15 points)

21.

22. Discuss ONLY ONE of the following (15 points).
- The role of bile salts in the body. Where are they made? Where are they stored? What is their primary role? They are one of the only means to remove what molecule from the body?
 - Compare the structural elements of glycerophospholipids and sphingolipids. What building blocks are they made from? Talk about how they can be modified to provide a variety of molecules. Why might a variety of structures be important in a cell membrane?
 - Compare active and passive transport. Give an example of each. Tell for each example that you chose why the transporter is important for cell function.

22.

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Extra Space for page 6 answers.

EXTRA CREDIT – 5 points

Draw the structure of cholesterol

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Part I : ____ x 6 = _____

Part II: _____

Total (out of 180) = _____

Total Normalized to 200 = _____