BCH 4054 **HOUR TEST 2** **NAME_____**
October 9, 1998

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Points

(12) 1. Diagram the **thylakoid membrane**, identifying the space on each side of it. On your diagram place, in proper orientation, the following:

CF_1, CF_o, plastocyanin, pigment system I, pigment system II, cytochrome b/f complex, site of O_2 production, site of NADPH production, Rubisco, and ferredoxin.

(6) 2. Compare starch and sucrose synthesis in plants with respect to (a) location in cell, and (b) activated sugar precursor.

(10) 3. The light reaction of photosynthesis involves two separate pigment systems. For each of the following statements, indicate in the blank whether the statement refers to pigment system I (**P.S.I**), pigment system II (**P.S.II**), **both**, or **neither**.

_____	Is involved in cyclic photophosphorylation.	_____	Contains a pigment with an absorption maximum of 680 nm.
_____	Is concentrated along the stromal surface of the thylakoid membrane.	_____	Absorption of light produces a strong reductant and a weak oxidant.
_____	Contains bacteriorhodopsin.	_____	Contains antenna chlorophyl.
_____	oxidizes reduced plastocyanin.	_____	Contains a manganese cluster.
_____	contains pheophytin.	_____	reduces a quinone.

(10) 4. Compare eukaryotic fatty acid oxidation with fatty acid synthesis, giving at least **five ways** that the pathways differ from each other.

(12) 5. Describe the role of each of the following vitamins in lipid metabolism:

(a) biotin (vitamin H)

(b) carnitine (vitamin Bt)

(c) vitamin B-12

(d) pantothenic acid

(6) 6. *Cis*-vaccenate is an 18-carbon monounsaturated fatty acid with a double bond in the 11,12 position (i.e. 11-$C_{18:1}$).

(a) To what *omega* family does *cis*-vaccenate belong?

(b) How would you account for its presence in animals where the fatty acid desaturase activity is specific for the 9,10 position?

(6) 7. Describe the role of citrate in fatty acid biosynthesis.

(10) 8. Two enzymes involved in lipoprotein metabolism are **lipoprotein lipase** and **LCAT**. Explain:

(a) The reaction catalyzed by each enzyme. (Give reactants and products).

(b) The apoprotein cofactor required by each enzyme.

(c) The lipoprotein(s) with which each enzyme reacts.

(4) 9. Apolipoprotein **B-48** is a truncated version of apolipoprotein **B-100**. Contrast these two apoproteins with respect to (a) site of synthesis, and (b) lipoprotein(s) containing each.

(10) 10. Following are five characteristics of one or more of the reactions of cholesterol biosynthesis. Associate each characteristic with one or more of **five** stages of cholesterol biosynthesis from acetyl-CoA, by placing the number or numbers of the stages in the blank to the left of the characteristic:

_____ (a) Release of inorganic pyrophosphate

_____ (b) Requirement for NADPH

_____ (c) Requirement for O_2

_____ (d) Release of CO_2

_____ (e) Requirement for ATP

Stages:

1. acetyl-CoA → mevalonate
2. mevalonate → isopentenyl PP
3. isopentenyl PP→squalene
4. squalene→lanosterol
5. lanosterol→cholesterol

(6) 11. What is the **first committed step** in biosynthesis of cholesterol and other isoprenoids? Identify by giving the **name of the enzyme,** and the **structure** of the reactants and products. (okay to use abbreviations for nucleotide coenzyme cosubstrates).

(8) 12. Give the structure of the three **ketone bodies**. Explain why these compounds accumulate in blood of diabetics when insulin is deficient.