Study Guide LIPID METABOLISM
1. Describe the details of triacylglyceride digestion in the lumen of the intestines.
2. What are bile salts? Why are they necessary?
3. What is the role of Fatty Acid Binding Protein? Describe the structure of I-FABP.
4. When you take a blood sample, why is albumin in the fatty layer? How does albumin effect the free fatty acid concentration in blood?
5. FA are taken up by intestinal epithelial cells, how are they 'packaged' for transport through the blood.
6. How is the glycerol moiety of the triacylglyceride utilized?
7. How does glucagon & epinephrine effect mobilization of F.A.'s? (this is a signaling/cascade question)
8. How are F.A.'s activated for transport into the mitochondrion?
9. Why is it important to form the acyl-AMP intermediate?
10. If inorganic pyrophosphatase is inhibited, what will happen to F.A. oxidation?
11. Why is the acyl CoA synthase the committed step to FA oxidation?
12. Carnitine is formed in the liver and transported to the heart muscle. If liver carnitine synthesis would be inhibited, what would happen to lactic acid production? Why? (give a very complete answer based on your knowledge of Biochemistry)
13. Describe the actual transport of the acyl group into the mitochondrion, starting with acyl-CoA.
14. How are F.A.'s of different lengths metabolized in the mitochondrion?
15. How are unsaturated F.A.'s oxidized? Odd -chain F.A.'s?
16. How would a B12 deficiency affect odd-chain F.A. oxidation?
17. How does peroxisomal β-oxidation differ from mitochondrial F.A. oxidation?
18. (A) Why is hydroxybutyrate an 'excellent' oxidative alternative to glucose during starvation by peripheral tissues.
   (B) How is hydroxybutyrate produced in the liver?
19. (A) Describe the mechanism of FA β-oxidation.
   (B) Describe the mechanism of FA synthesis.
   (C) Where does FA synthesis occur?
20. Describe the structure of the β-oxidation pathway in the matrix of the mitochondria.
21. Describe the structure of Fatty Acid Synthase.
22. Describe the reciprocal regulation of F.A oxidation and synthesis.
23. Describe the citrate cycle for moving acetylCoA out of the mitochondria.
24. How is citrate the acetyl-CoA carrier into the cytosol? How is citrate back converted to acetylCoA?
25. Why is acyl-CoA carboxylase the committed step in F.A. synthesis?
26. Describe the structural differences between fatty acid synthase in E. coli and liver (animal cells).
27. Acetyl groups are formed in the matrix of the mitochondria, F.A. synthesis occurs in the cytosol. How are acetyl group transported to the cytosol from the mitochondrial matrix?

28. How and where are unsaturated F.A. formed?

29. The FAS makes a FA that is C16, where and how is this extended by 2C length?

30. Essential fatty acids must be obtained from diet. What are these F.A. used to synthesize?

31. What conditions in the cell cause the formation of ketones?

32. How is acetoacetate formed (steps in synthesis)?

33. What are the fates of acetoacetate? How is acetoacetate back converted to acetyl-CoA?

34. Explain how the NADH/NAD ratio affects the hydroxybutyrate/acetoacetate ration in the matrix of the mitochondria in ketogenesis.

**Cholesterol and Ketogenesis**

1. What conditions in the cell cause the formation of ketones?

2. How are HMG-CoA and acetoacetate formed (steps in synthesis)?

3. What are the fates of hydroxybutrate and acetoacetate? How is acetoacetate back converted to acetyl-CoA in peripheral tissues? What is the role of succinylCoA?

4. Explain how the NADH/NAD ratio affects the hydroxybutyrate/acetoacetate ratios in the matrix of the mitochondria in ketogenesis.

5. Cholesterol synthesis and ketogenesis are similar pathways, how are they similar, how do they differ?

6. Cholesterol synthesis is unique since it is a branched pathway. What are other products of this pathway and why are they important.

7. What is the rate-controlling enzyme of cholesterol synthesis, where is it locate, what is the substrate and product of this enzyme.

8. How is the rate-controlling enzyme of cholesterol synthesis regulated?

9. Explain the extra-hepatic cycle for cholesterol?

10. What is the function of ACAT?

11. How is cholesterol packaged for transport through the blood?

12. Where in the liver cell does cholesterol synthesis occur?