Problem Set 10
Chapter 19

1. Describe what a ketone body is and where each is formed. Tell why ketone bodies increase during starvation, even to the point of causing ketoacidosis.

2. How much ATP is produced when:
   a) Fatty acid oxidation with no oxygen available.
   b) Hydrolysis of triacylglycerides to fatty acids and glycerol
   c) A cell with only the α-glycerol phosphate shuttle completely oxidizes palmitic acid.
   d) A cell with no acyl-CoA transferase completely oxidizes palmitic acid.

3. How much ATP is produced from the complete oxidation of the following fatty acids to CO₂?
   a) cerotic acid 26:0
   b) linoleic acid

4. Name three ways the body uses lipids.

5. Describe the overall pathway for the biosynthesis of oleic acid.

6. Describe why the ratio of acetoacetic acid/β-hydroxybutyrate in the blood is a good indicator of a person’s metabolic state.

7. Why is lenoleic acid an “essential” fatty acid?

8. Individuals with abnormally low levels of carnitine in their muscles suffer from muscular weakness during moderate exercise. In addition, their muscles have significantly increased levels of triacylglycerides.
   a) Explain these two effects.
   b) Can these individuals metabolize muscle glycogen (broken down into glucose) aerobically?

9. Draw a general pathway for converting carbohydrates to fatty acids in a liver cell, and indicate which process occurs in the cytosol and which occur in the mitochondria.

Things to know:
1. Know the activators and inhibitors of fatty acid synthesis and the breakdown of fatty acids.
2. Know the enzymes and steps involved in fatty acid synthesis and breakdown of fatty acids.
3. Be able to tell how much ATP is made from the breakdown of fatty acids.
4. Know the table of common fatty acids.
5. Know how triacylglycerides are formed and broken down, and know how much ATP is produced or needed for these reactions.
6. Need to know the carriers of fatty acids in the blood.
7. Need to know the overall reaction for palmitic acid synthesis.