

**(Hand-in problems must be done on separate pages. All short answer questions must be typed.)**

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- 1) Saponification is a process by which fatty acids are hydrolyzed from triacylglycerols by heating animal fat in a strongly alkaline solution.
  - a. If 193.2 g of KOH were required to completely saponify 1.00 kg of animal fat that is 100% saturated, what is the average number of carbons on the resulting fatty acids?
  - b. What is the average oxidation state of the fatty acid carbons?
  - c. What mass of molecular oxygen would be required to completely oxidize the 1.00 kg of fat?
- 2) In some autoimmune diseases, an individual develops antibodies that recognize both DNA and membrane lipids. What is the structural basis for this cross-reactivity?
- 3) Animals cannot synthesize linoleic acid (a precursor of arachidonic acid) and therefore must obtain this essential fatty acid from their diet. Explain why cultured animal cells, however, can persist in the absence of linoleic acid.