Exercises

Lipids Part 2

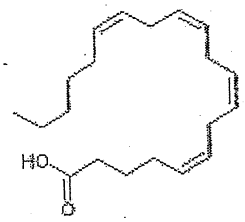
1. Identify each of the following structures. Write the corresponding letter next to each name.

F Triglyceride
H Glycolipid
G Wax

A Fatty Acid
B Eicosanoid
D Bile salt

E Sphingolipid
C Glycerphosholipid

A.



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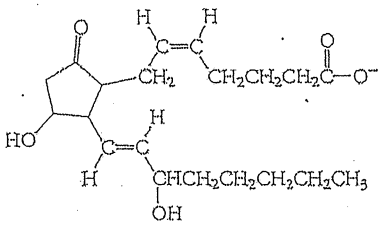

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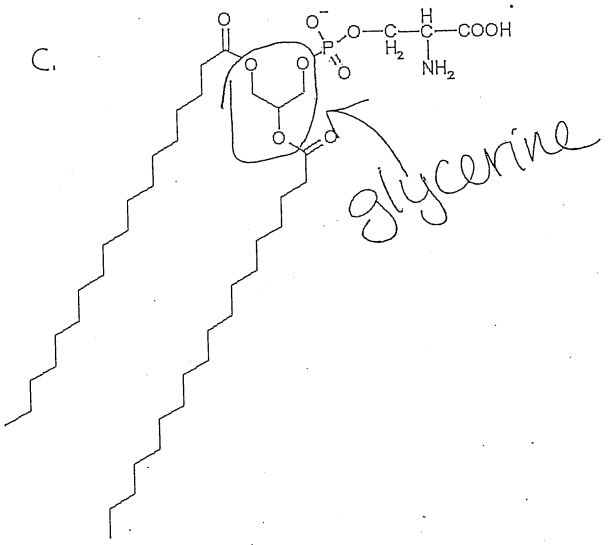

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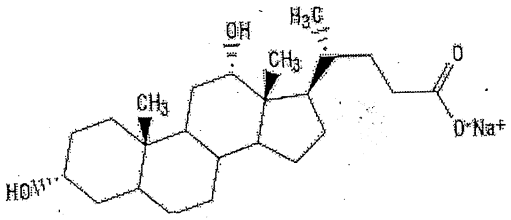

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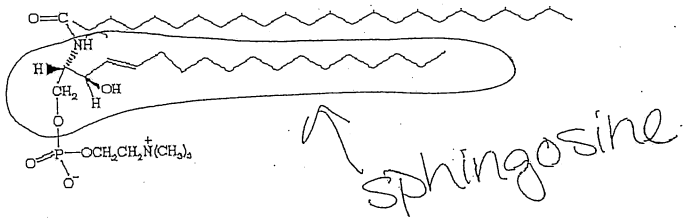

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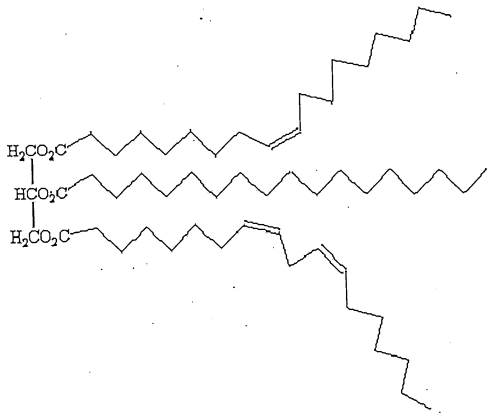

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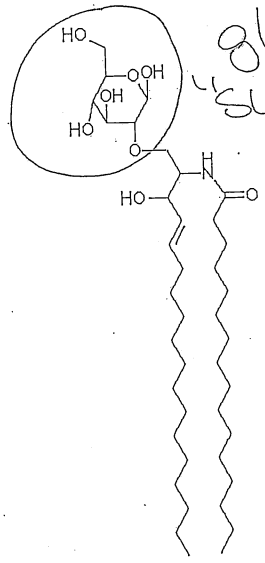

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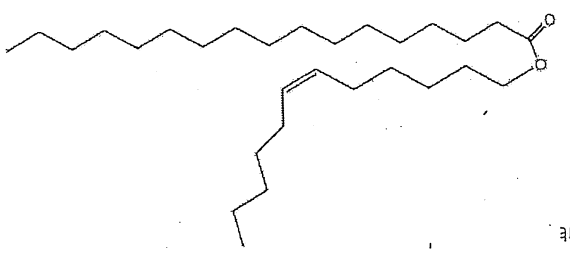
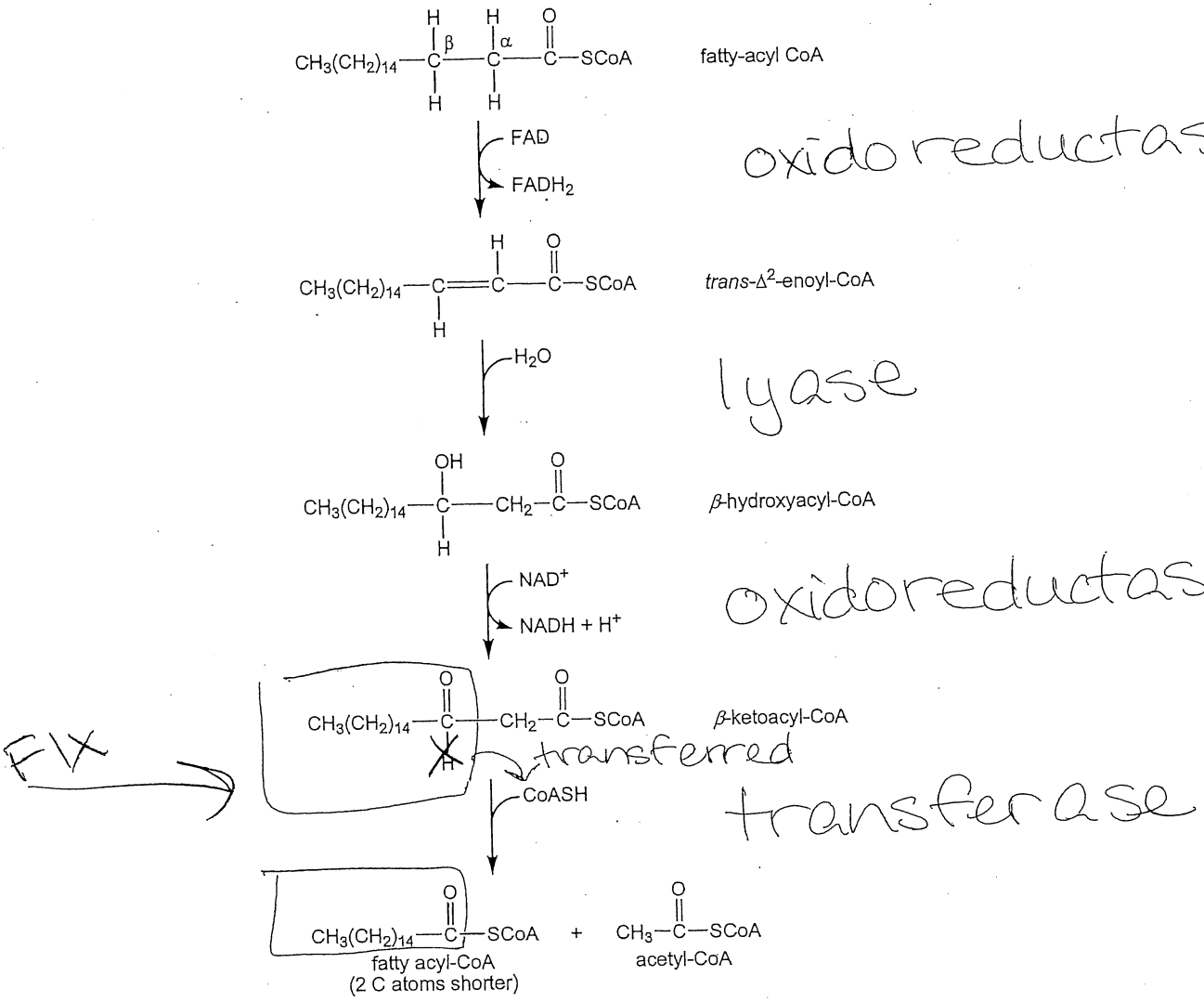


2. Classify the enzymes needed to catalyze the four steps of the β-oxidation pathway.
The enzyme classifications are oxidoreductase, hydrolase, lyase, ligase, isomerase, and transferase.



3. Explain why glycolysis is called a linear pathway and β-oxidation is called a spiral pathway.

In glycolysis, glucose is converted to 2 pyruvate during 1 completion of the pathway. In β-oxidation, the activated acid is converted to Acetyl CoA through one turn of the pathway. It is not a circular pathway b/c the activated fatty acid has 2 less Carbons each turn.

4. Consider the β-oxidation of arachidic acid, $CH_3(CH_2)_{18}CO_2H$.

a) How many turns of β-oxidation are needed to completely catabolize arachidic acid to acetyl CoA?

C-20 fatty acid

9 turns

b) Explain why the answer to part (a) is not 10.

The C-4 activated fatty acids forms 2 molecules of AcetylCoA on the 9th turn.

c) How many $FADH_2$ molecules would be produced from the complete β-oxidation of aracidic acid?

9 $FADH_2$

d) How many NADH molecules would be produced from the complete β-oxidation of arachidic acid?

9 NADH

e) How many Acetyl-CoA molecules would be produced from the complete β-oxidation of arachidic acid?

10 Acetyl-CoA molecules

f) Overall, how many ATP molecules can be produced from one molecule of arachidic acid?
Hint: How many ATP molecules can be produced from each turn of the β-oxidation pathway and each Acetyl CoA?

9 turns x 5 = 45 ATP

10 Acetyl CoA x 12 = 120 ATP

activation = - 2 ATP

163 ATP