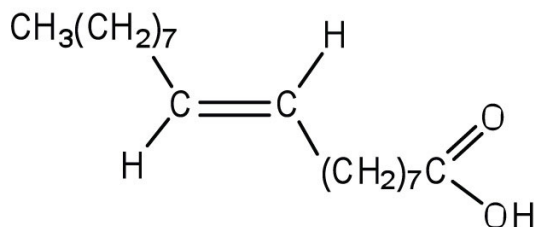


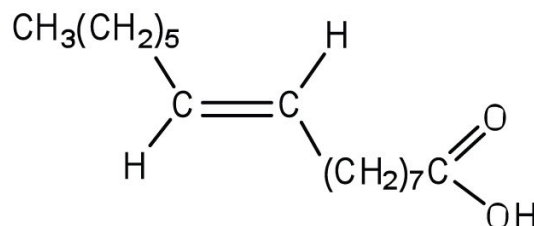
## 7.E: Lipids (Exercises)

### Additional Exercises

- The melting point of elaidic acid is 52°C.
  - What trend is observed when comparing the melting points of elaidic acid, oleic acid, and stearic acid? Explain.
  - Would you expect the melting point of palmitelaidic acid to be lower or higher than that of elaidic acid? Explain.

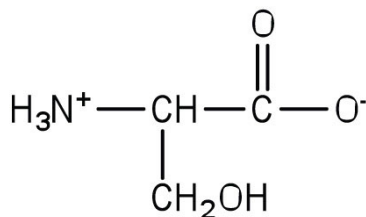


Elaidic acid



Palmitelaidic acid

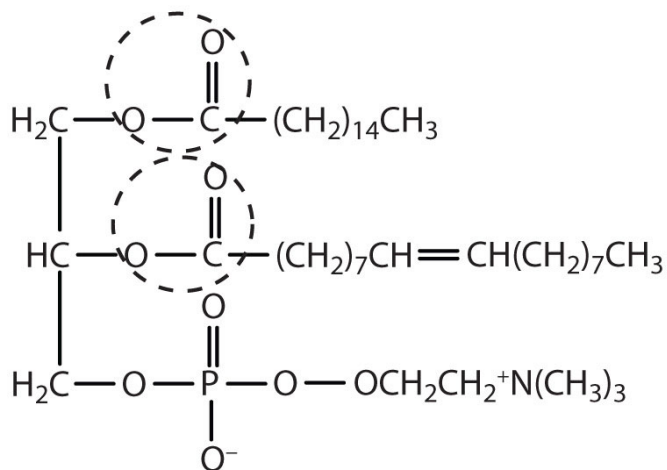
- Examine the labels on two brands of margarine and two brands of shortening and list the oils used in the various brands.
- Draw a typical lecithin molecule that incorporates glycerol, palmitic acid, oleic acid, phosphoric acid, and choline. Circle all the ester bonds.
- In cerebrosides, is the linkage between the fatty acid and sphingosine an amide bond or an ester bond? Justify your answer.
- Serine is an amino acid that has the following structure. Draw the structure for a phosphatidylserine that contains a palmitic acid and a palmitoleic acid unit.



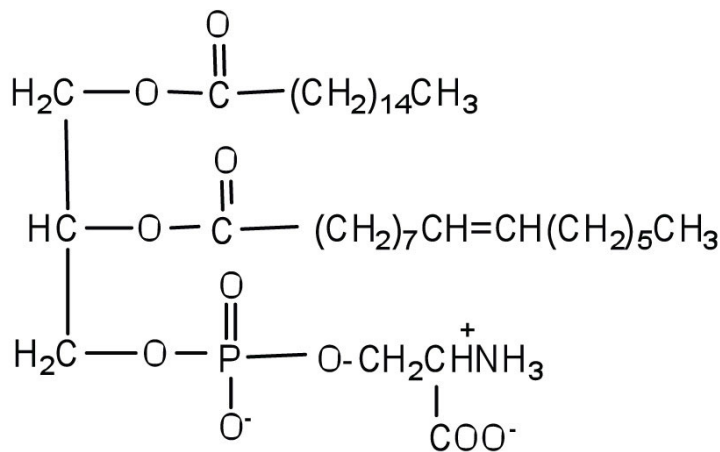
- Explain whether each compound would be expected to diffuse through the lipid bilayer of a cell membrane.
  - potassium chloride
  - $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$
  - fructose
- Identify the role of each steroid hormone in the body.
  - progesterone
  - aldosterone
  - testosterone
  - cortisol
- How does the structure of cholic acid differ from that of cholesterol? Which compound would you expect to be more polar? Why?
  - What fatty acid is the precursor for the prostaglandins?
  - Identify three biological effects of prostaglandins.
- Why is it important to determine the ratio of LDLs to HDLs, rather than just the concentration of serum cholesterol?

## Answers

1. a. Stearic acid has the highest melting point, followed by elaidic acid, and then oleic acid with the lowest melting point. Elaidic acid is a *trans* fatty acid, and the carbon chains can pack together almost as tightly as those of the saturated stearic acid. Oleic acid is a *cis* fatty acid, and the bend in the hydrocarbon chain keeps these carbon chains from packing as closely together; fewer interactions lead to a much lower melting point.
- b. The melting point of palmitelaidic acid should be lower than that of elaidic acid because it has a shorter carbon chain (16, as compared to 18 for elaidic acid). The shorter the carbon chain, the lower the melting point due to a decrease in intermolecular interactions.



3.



5.

7. a. regulates the menstrual cycle and maintains pregnancy  
 b. regulates salt metabolism by stimulating the kidneys to retain sodium and excrete potassium  
 c. stimulates and maintains male sex characteristics  
 d. stimulates the conversion of proteins to carbohydrates
9. a. arachidonic acid  
 b. induce smooth muscle contraction, lower blood pressure, and contribute to the inflammatory response

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