

Name: _____

Class: _____

Date: _____

Read each question carefully. Some questions have multiple parts. Answer all questions with complete sentences.

1. What characteristic(s) are the same for all lipids? What structural feature is responsible for this?

p. 764

- Lipids are insoluble in water (soluble in nonpolar solvents).
- Lipids share no common chemical structure.

2. In 2-3 sentences discuss an important biological use of lipids.

Answers will vary.

3. While carbohydrates are an important source of energy for the body, lipids (fats) contain more energy than carbohydrates. Give two reasons why.

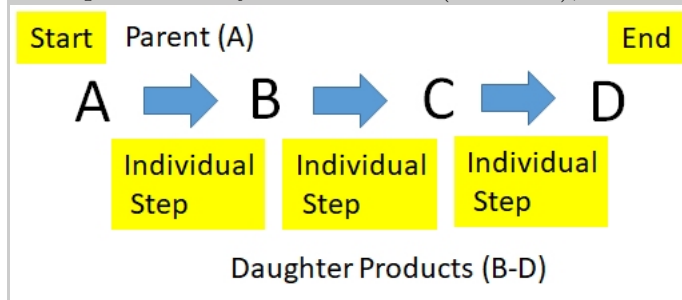
p. 770

- They are more reduced (fat oxidation number = +2, carbohydrate = 0).
- They have more C-H bonds than in carbohydrates. Fats are 70% carbon by mass and Carbohydrates are 40% carbon by mass.

4. Define the term "biological pathway" and give an example of one. Include a properly labeled (parent, daughter, enzymes) sketch in your answer.

A biological pathway is a series of actions among molecules in a cell that leads to a certain product or a change in the cell. It can trigger the assembly of new molecules, such as a fat or protein, turn genes on and off, or spur a cell to move

Examples will vary - Eicosanoids (Ch. 28.3), Steroids (Ch. 28.6), Atherosclerosis (Ch. 28.7)



5. What is meant by the term essential when discussing lipids?

Fatty acids that humans and other animals must ingest because the body requires them for good health but cannot synthesize them.

Key points:

- Humans can't synthesize them.
- Must be obtained from diet
- Required for good health

6. Answer the following questions about Fatty Acids:

- (a) Which has a higher boiling point saturated or unsaturated? Explain.

Saturated b/c the molecules are more linear and stack closer together and form more LDF interactions requiring more energy to separate them

- (b) Which is healthier ω -3 or ω -6? Explain.

p. 766 - The location of the C=C in the fatty acid. ω -3 FA are healthier because the ω -6 FA are more potent and cause abnormal responses such as allergic reactions and asthma.

(c) Which is healthier cis or trans? Explain.

Cis fatty acids are generally considered healthier, they are more common in nature, they don't stack as well, a diet high in Cis decreases the risk of atherosclerosis.

7. Is the following fatty acid molecule pictured:

(a) ω -3 or ω -6

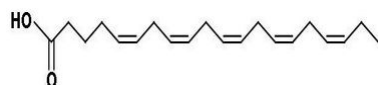
7. ω -3

(b) cis or trans

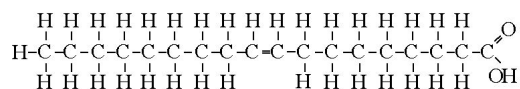
7. trans

(c) Saturated or Unsaturated

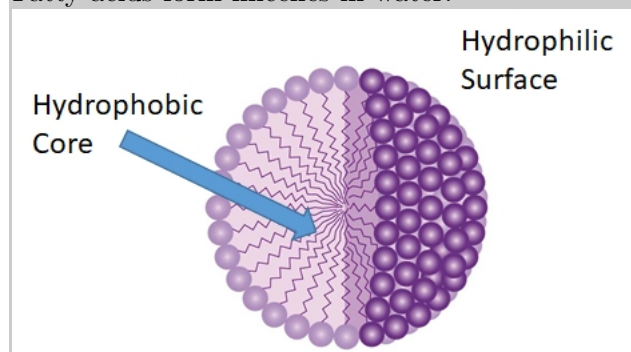
7. Unsaturated



8. Show how the following molecule would aggregate in water.



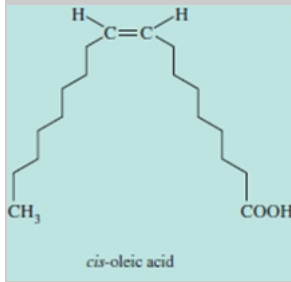
Fatty acids form micelles in water.



9. Draw an example of each of the following molecules. Answer any additional questions given.

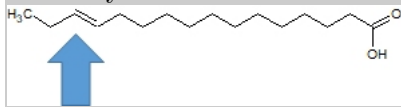
(a) Cis-fatty acid (Which is healthier cis or trans?)

Must include C=C double bond and a -COOH group.



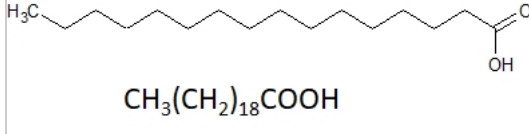
(b) ω -3 fatty acid (Which is healthier ω -3 or ω -6?)

ω -3 fatty acid is healthier



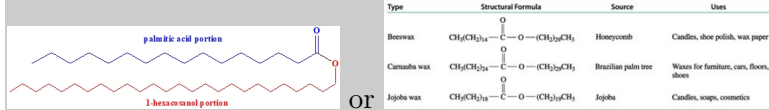
(c) A saturated fatty acid (Which is healthier saturated or unsaturated?)

Saturated means no C=C double bonds. Unsaturated is healthier.

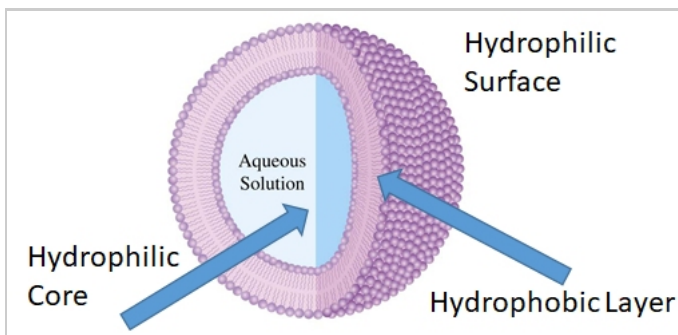


(d) A wax (What Function Group does a wax have?)

Waxes are giant esters

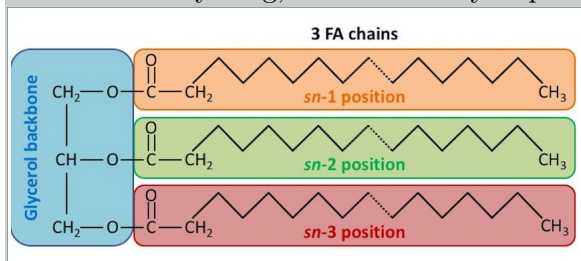


(e) A liposome (label the hydrophobic and hydrophilic parts)

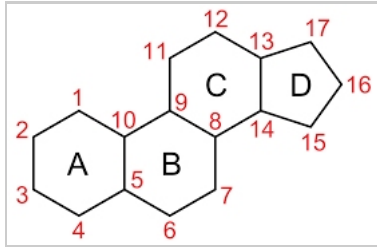


(f) A triacyl glycerol (circle the hydrophilic portion)

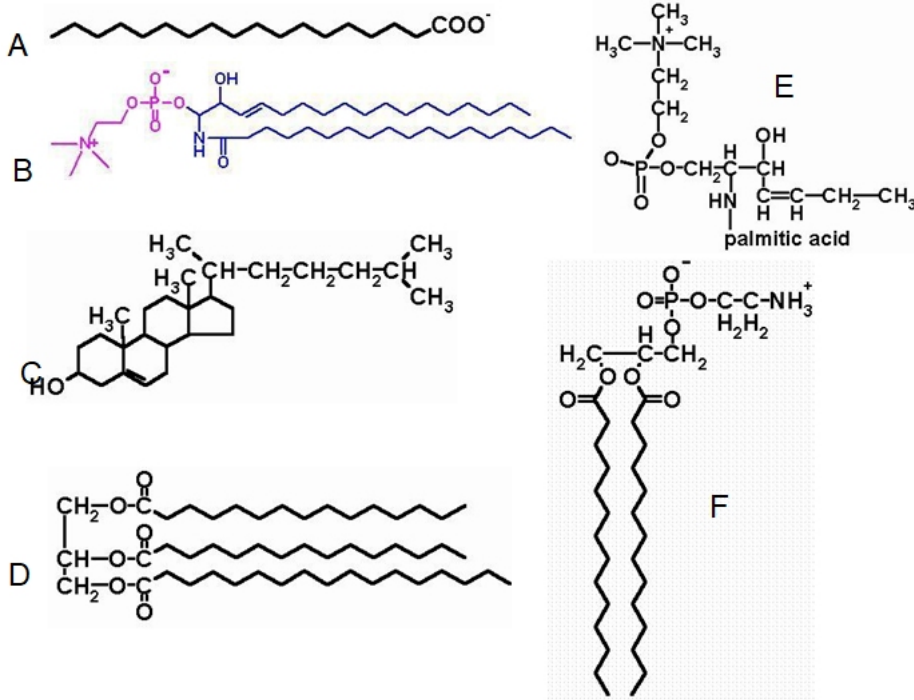
Don't circle anything, none of it is hydrophilic (its all hydrophobic)



(g) The steroid core



10. What class of compounds best identifies each of the following compounds? Be as specific as possible. (Choices: Amino Acid, Eicosand, Enzyme, Fatty Acid, Glycolipid, Phospholipid, Polypeptide, Protein, Sphingolipid, Steroid, Triacylglycerol, or Wax.)



(a)

10(a) Fatty Acid

(b)

10(b) Sphingolipid

(c)

10(c) Steroid

(d)

10(d) Triacylglycerol

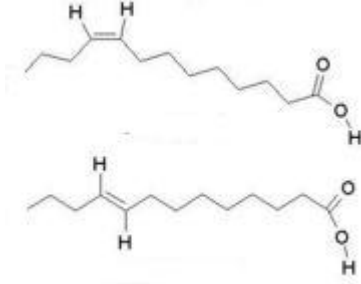
(e)

10(e) Sphingolipid

(f)

10(f) Phospholipid

11. Answer the following questions about the molecule pictured below:



(a) Circle the cis fatty acid. Explain.

Circle the top one.

(b) Circle the hydrophilic part of the molecule.

Circle the CA part of the molecule

(c) Which is considered better for in dietary terms, cis or trans fatty acids? Explain.

Cis fatty acids are generally considered healthier, they are more common in nature, they don't stack as well, a diet high in Cis decreases the risk of atherosclerosis.

12. Answer the following questions about the molecule pictured below:



(a) Is the molecule an $\omega - 3$ or a $\omega - 6$ fatty acid? Explain.

$\omega - 3$ the first C=C is on the third carbon from the CH₃ side.

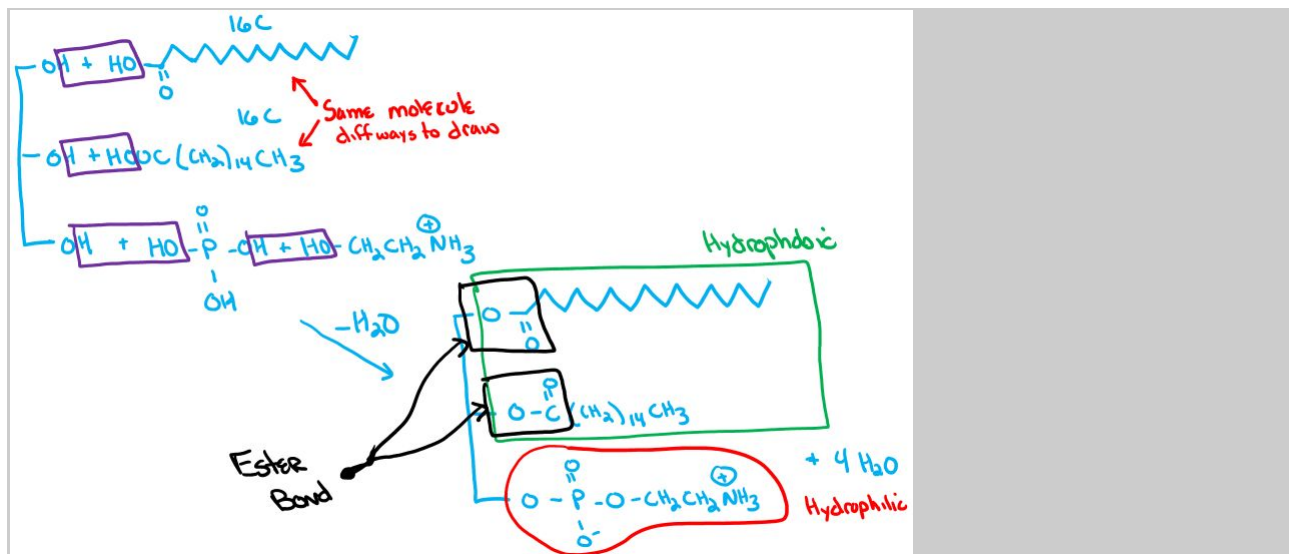
(b) What is meant by the term "essential" as applied to fatty acids.

Fatty acids that humans and other animals must ingest because the body requires them for good health but cannot synthesize them.

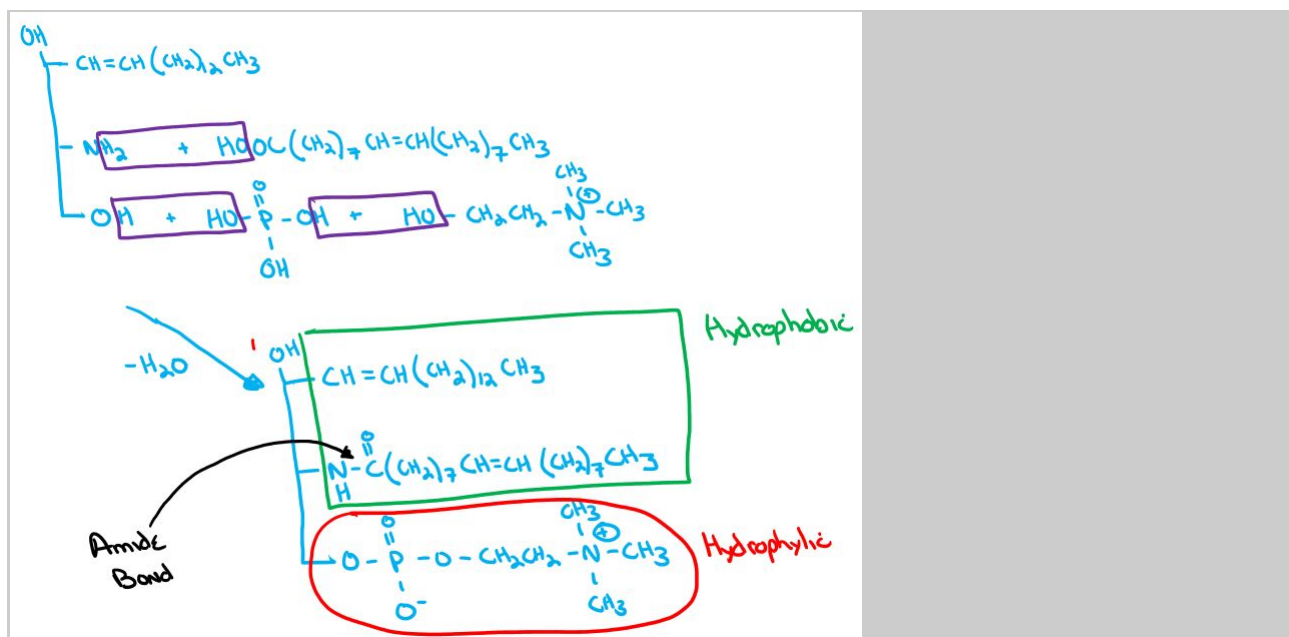
Key points:

- 1) Humans can't synthesize them.
- 2) Must be obtained from diet
- 3) Required for good health

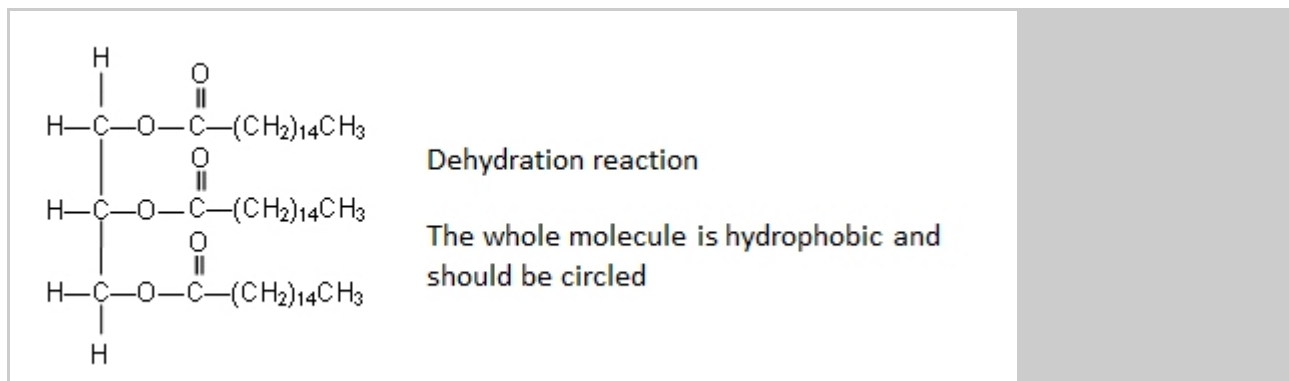
13. Draw a phospholipid made from glycerol, stearic acid, and ethanolamine (Circle the hydrophobic portion. What type of reaction occurred to make the molecule?)



14. Draw the formation reaction (reactants \rightarrow products) for a sphingolipid. What type of reaction occurred? Circle the hydrophilic part.



15. Draw a triacylglycerol (or triglyceride) made from glycerol and palmitic acid (Circle the hydrophobic portion. What type of reaction occurred to make the molecule?)



16. Describe what would visually occur if you mixed Linolenic acid and Bromine. What feature of the molecule does this test for? (Hint: Draw the reactants, it may help you.)

Orange \longrightarrow Clear

Tests for $C=C$.

17. What is atherosclerosis? What are the 4 ways discussed in your book to lower cholesterol?

Book: p.777-779

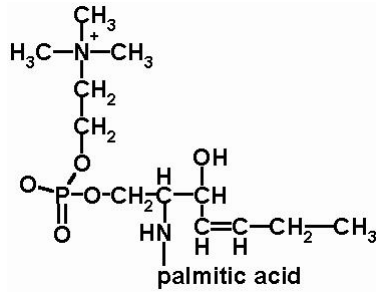
(Hein 28.7) Metabolic disease that leads to deposits of cholesterol and other lipids on the inner walls of arteries which can lead to coronary thrombosis/heart attacks.

It is produced by the improper transport of cholesterol/lipids in the body. A high LDL concentration is an indication of this.

Symptoms are generally increased blood pressure due to the narrowing of arteries due to the accumulation of fatty deposits (plaque) in blood arteries.

1. Low cholesterol diet
2. Decrease Triacylglycerol production
3. Inhibit metabolic synthesis of cholesterol
4. Increase excretion
5. Decrease absorption

18. Draw products formed when the following molecule undergoes hydrolysis, **AND** answer the following questions about it.



It will break apart to make sphingosine, phosphate, palmitic acid and L-serine (all found in the CS)

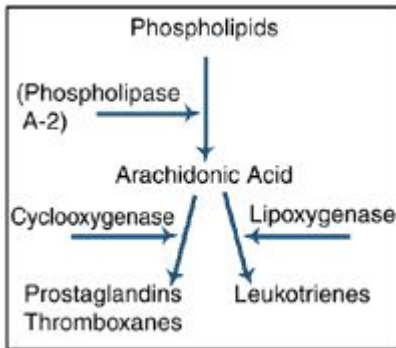
- (a) Circle the hydrophilic part of the molecule.

Circle the phosphate and amino-alcohol portion (it the +/- parts)

- (b) Circle the amide bond.

Circle the part just above palmitic acid that includes the C-NH part.

19. The following metabolic pathway shows the production of local hormones made from arachidonic acid. Answer the following questions about metabolic pathways.



- (a) Circle the parent molecule. Define the term.

Phospholipids (that start of the biological pathway)

- (b) Put a square around the daughter molecules. Define the term.

Arachidonic Acid, Prostaglandins/Thromboxanes and Leukotrienes

- (c) What class of molecules does cyclooxygenase belong too?

Enzyme it ends in -ase