Sp14 updates needed

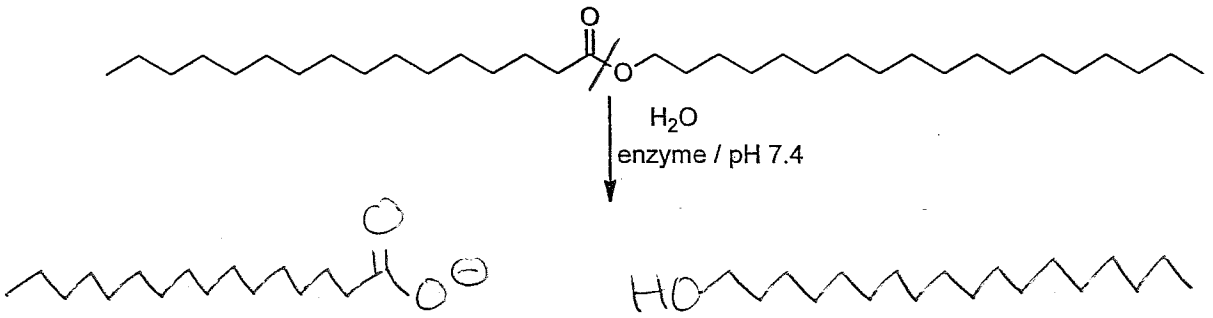
Key FB

Lipids Supplemental Homework

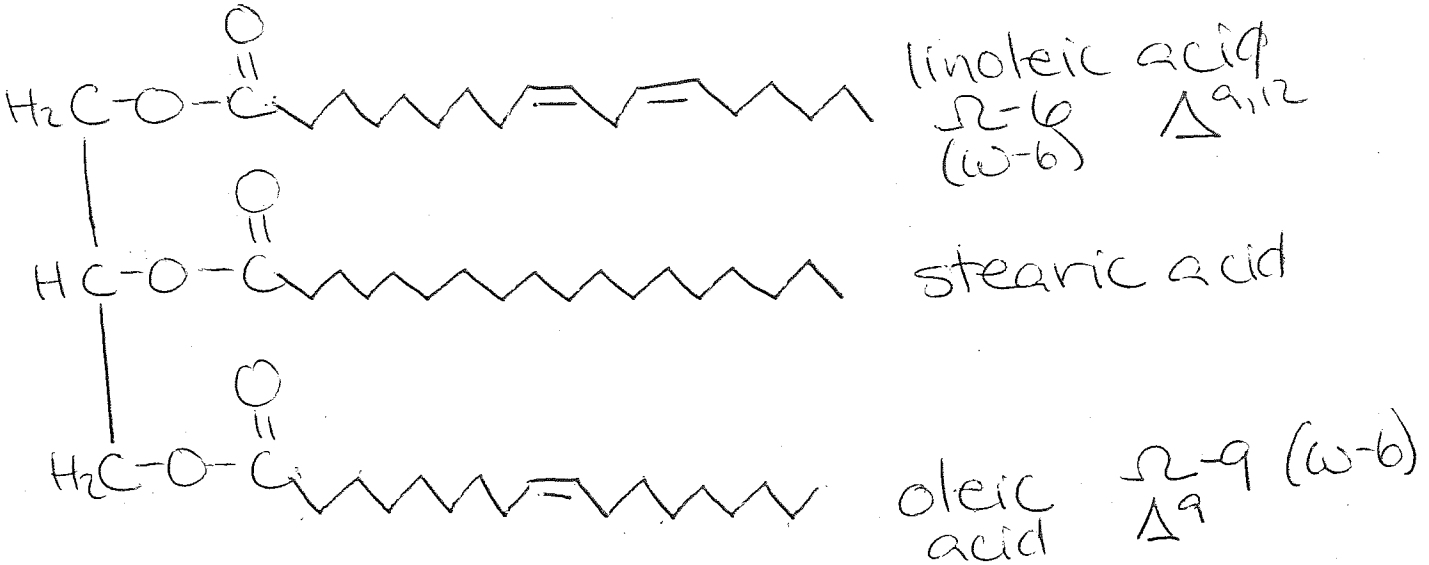
1. Add the corresponding lipid classification (wax, triglyceride, phospho- & glyco- lipids, steroids, eicosanoids) to the table below.

Lipid Classification	Function
a) phospho & glyco lipids	cell membranes
b) eicosanoids	inflammatory response
c) wax	water barrier
d) steroids	cholesterol, bile acids, vit D, sex hormones
e) triglycerides	long term energy storage

2. Draw a line through the bond that is broken in a hydrolysis reaction.
Draw the hydrolysis products of the wax below.



3. Draw a triglyceride using glycerine, linoleic acid*, stearic acid*, and oleic acid*. Label the hydrocarbon tails as saturated or unsaturated. For the unsaturated tails, add the delta (Δ) and omega (ω or Ω) classifications. *Use your text book to find the structures of the fatty acids.



*

solids

4. How do the carbon-tails of triglycerides help distinguish between fats and oils?

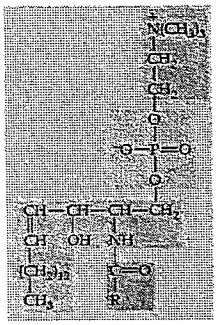
→ Fats have a higher % of sat'd CH tails

mostly liquids → Oils have a higher % of unsat'd CH tails

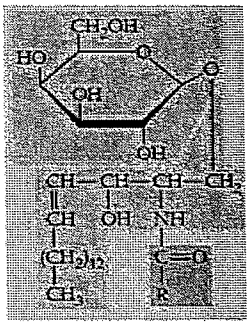
5. What is another way to distinguish between fats and oils? Hint: What is their source – plant or animal?

animals plants

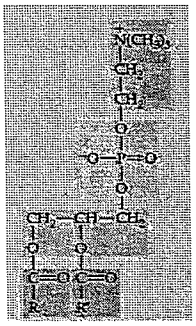
6. Label the membrane lipids below as glycolipid, glycerophospholipid, or sphingomyelin.

a) 

sphingomyelin

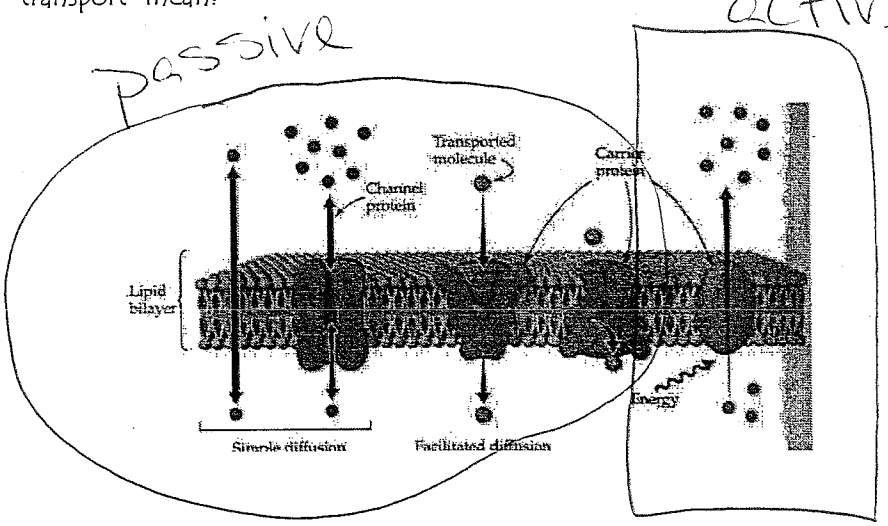
b) 

glycolipid

c) 

glycerophospho-lipid

7. Circle the passive transport pathway(s). Box the active transport pathways. What does the term "active transport" mean?



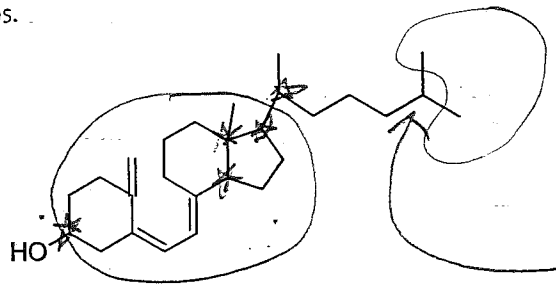
↑ requires energy as ATP for substances to cross membrane

For F13 students ⇒ make sure to review osmosis & dialysis for the final :)

* Sp14 = add osmosis & dialysis review

8. Star the chiral carbons and circle the original steroid ring system in vitamin D.
Hint: There are 5 chiral carbons.

vitamin D



matching grps so this C IS NOT chiral

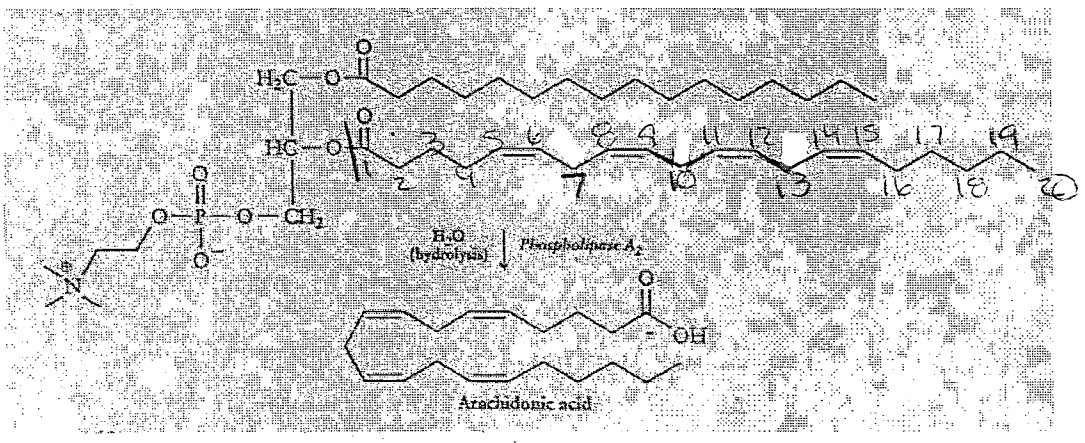
9. Our bodies synthesize eicosanoids from arachadonic acid as an inflammatory response to trauma and infection. Eicosanoids can be synthesized throughout the body because the arachadonic acid is produced from the hydrolysis of membrane lipids.

a) Draw a line through the ester bond of the phospholipid that is hydrolyzed to form arachidonic acid. see below

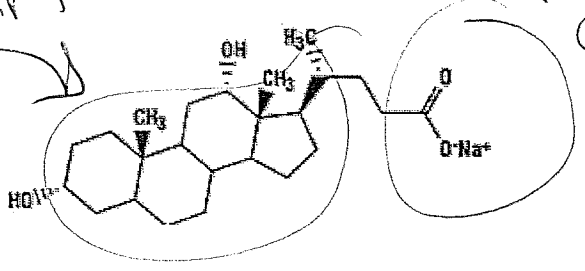
b) Number the carbon atoms of this fatty acid tail beginning with #1 on the carbonyl carbon. see below

c) Number the carbon atoms of arachidonic acid beginning with #1 on the carbonyl carbon. see below

d) Write the delta name for each of the unsaturated fatty acid tails in part (b) and (c). What do you notice? $\Delta^{5,8,10,14}$ for both



10. Why do we need bile salts (acids) to help us digest triglycerides? ← TAGs



non polar part helps solubilize fats & oils (TAGs)

ionized part creates H2O solubility

$10\,dL = 1\,L = 10^3\,mL$

$10\,dL = 10^3\,mL$

$10^3\,mg = 1\,g = 10^6\,\mu g$

$10^3\,mg = 10^6\,\mu g$

$1\,mg = 10^3\,\mu g$

11. A cholesterol screening finds the patient's blood serum has 45 mg/dL HDL & 125 mg/dL LDL..

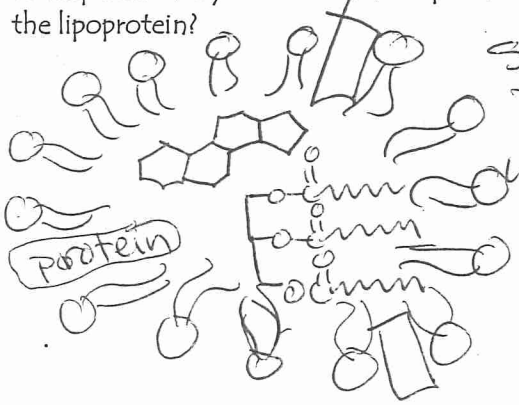
a) How many grams of HDL are present in 1.0 mL of the serum?

$$\frac{1.0\,mL}{10^3\,mL}\left|\frac{10\,dL}{1\,dL}\right|\frac{45\,mg\ HDL}{10^3\,mg}\left|\frac{1\,g}{10^3\,mg}\right. = 4.5\times10^{-5}\,g\ HDL$$

b) How many micrograms of LDL are present in 2.5×10^{-4} L of serum?

$$\frac{2.5\times10^{-4}\,L}{1\,L}\left|\frac{10\,dL}{1\,dL}\right|\frac{125\,mg\,LDL}{1\,mg}\left|\frac{10^3\,\mu g}{1\,mg}\right. = 312.5\,\mu g\,LDL \Rightarrow 310\,\mu g\ LDL$$

12. Describe the general structure of lipoproteins such as chylomicrons, LDL, HDL, etc. by drawing a portion to help illustrate your written description. How does the ratio of lipids to proteins affect the density of the lipoprotein?



single spherical layer of phospholipids embedded with proteins cholesterol &/or TAGs are located in the center for transport in aqueous body fluids

13. Use lauric acid, $CH_3(CH_2)_{10}CO_2H$, and the beta-oxidation cycle from your Lipids Part 2 Activity Packet, Video Tutorial Notes, or text book to answer the following questions.

a) How many ATP are needed to activate lauric acid for beta-oxidation? 2 ATP to activate

b) How many turns of the beta-oxidation pathway are needed for 1 molecule of lauric acid?

12 C's so $\frac{12}{2} - 1$ or $6 - 1 = 5$ turns

c) How many acetyl CoA molecules are produced from 1 molecule of lauric acid?

6 acetyl CoA produced

* How many NADH? How many $FADH_2$?

d) If each molecule of acetyl CoA can produce 12 ATP, then how many ATP are produced overall from 1 molecule of lauric acid?

activation -1 ATP

$5 \times \frac{FADH_2}{FADH_2}\left|\frac{2\,ATP}{}\right. + 10$ ATP

$5 \times \frac{NADH}{NADH}\left|\frac{3\,ATP}{}\right. + 15$ ATP

$6 \times \frac{acetylCoA}{acetylCoA}\left|\frac{12\,ATP}{}\right. = +72$ ATP

95 ATP

from 1 lauric acid