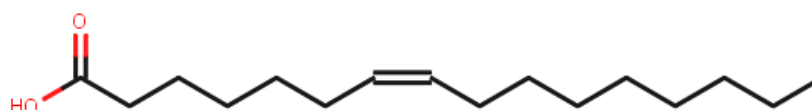
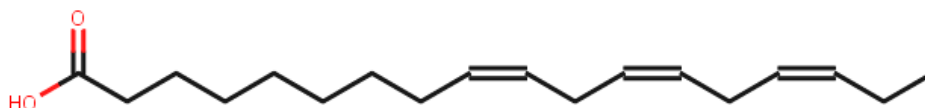


## Fatty Acid and Phospholipid Class Activity

1. Draw the skeletal structures of each of the following fatty acids:
  - a. 18:0
  - b. 16:1 cis- $\Delta^9$
  - c. 20:4 cis,cis,cis,cis- $\Delta^5 \Delta^8 \Delta^{11} \Delta^{14}$
  - d. 16:2 cis, cis  $\Delta^{10} \Delta^{13}$
2. Write the name for each fatty acid in problem 1 using the omega nomenclature.
3. Classify each of the fatty acids in problem 1 as:
  - a. Saturated or unsaturated
  - b. cis fat or trans fat (or N/A)
  - c. omega 3, 6, or 9.
  - d. Most likely to be essential or unessential
4. Provide the name (using both conventions) for the following fatty acids and state whether they are likely to be essential or unessential



5. Building a phospholipid:
  - a. Show the product of a condensation reaction between carbon 1 of glycerol and 18:0.

b. Now show the product of a condensation reaction between C2 of the 5a product and 18:1n-9.

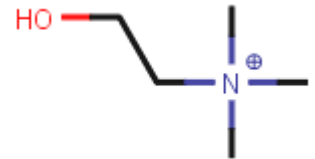
c. Now show the product of a condensation reaction between the product of 5b and phosphoric acid.

d. Finally, let's finish the polar head group. Determine the product of a condensation between 5c product and the alcohol functional group of serine. This is phosphatidylserine. Serine is the polar head group and the "phosphatidyl" tells you that it's linked up to a phospholipid.



Serine

6. Draw phosphatidylcholine that is made with 16:0 and 20:3n-3.



Choline

7. Consider cholesterol:

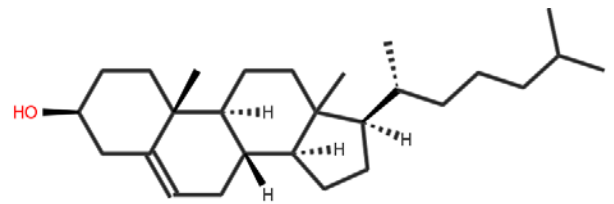
a. Is cholesterol a planar molecule? How do you know?

b. Can cholesterol be part of a lipid bilayer? Why do you make this prediction?

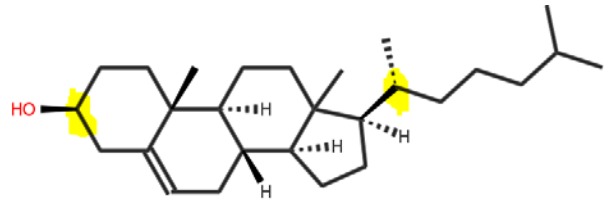
c. How many H-bonds can cholesterol make?

d. Why are some of the hydrogen atoms shown in the skeletal structure?

e. Sketch a lipid bilayer that shows how cholesterol is a participant in the structure. Remember to take into account that each phospholipid contains one unsaturated fatty acid.



- f. The distance between the two highlighted carbons on cholesterol is almost exactly 10 Å (angstroms where 1 Å = 10<sup>-10</sup> m). Noting that the distance between C<sub>1</sub> and C<sub>3</sub> in propane is 251 pm, predict how the position of the 1<sup>st</sup> double relative to the carboxylic acid. For example Δ<sup>3</sup> would be the 3<sup>rd</sup> carbon.



8. Fatty acids in fat tissue differs from phospholipids because they replace the polar head group with another fatty acid.
- How does this change the physical properties of the fatty acids? Why are these properties important for fat tissue?
  - To use stored fat as an energy sourceThe enzymes that are responsible for breaking apart fat (either dietary or stored in your adipocytes) are called lipases. These enzymes catalyze hydrolysis reactions. Predict the product(s) of lipase degradation of the compound shown below:

