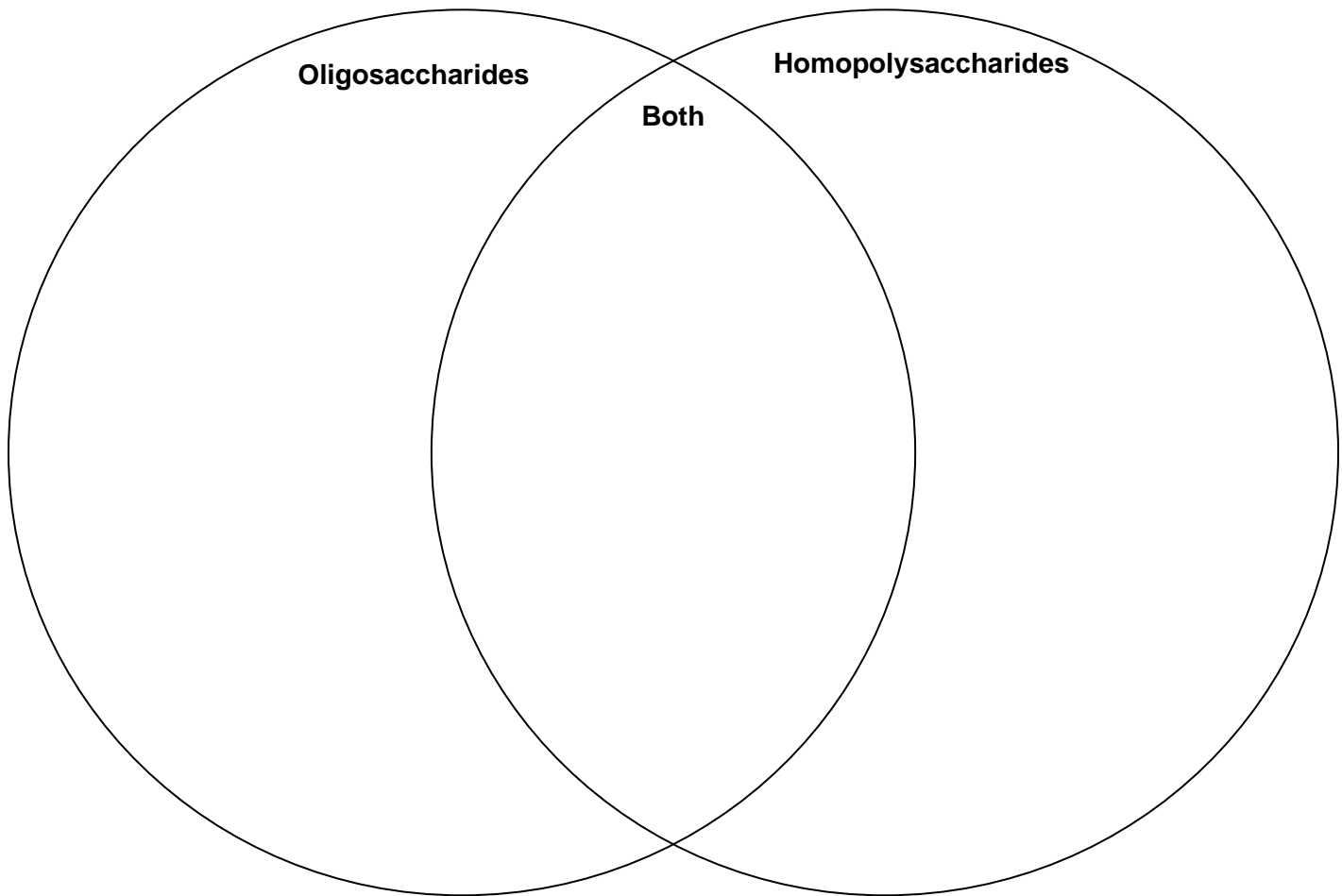
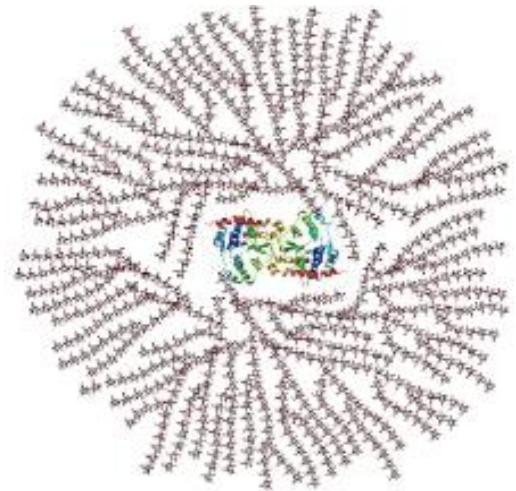


Part I - Carbohydrates

1. In the Venn diagram below, distinguish between oligosaccharides and homopolysaccharides by detailing their similarities and differences. (Double click to edit diagram)



2. Functionally, why is it important for glycogen to be branched in a way similar to the diagram on the right?



3. Vertebrates are usually incapable of breaking down _____ sugar linkages. One notable exception to this is the disaccharide _____. However, some individuals lacking the enzyme responsible for cleaving this bond are not able to break down this bond.

In other organisms, polysaccharides connected by this linkage are typically used for _____. Cows and other ruminants are able to break this bond because they have gut bacteria which produce enzymes to cleave this linkage.

4. How can α and β anomers be generated from a straight chain? Be specific, making sure to indicate which product is formed from what kind of reaction.

5. For the cyclization reaction of each of the species below, describe which group is the nucleophile and which is the electrophile (ex. -OH group off 4th carbon):

D-Fructose:

Nucleophile:

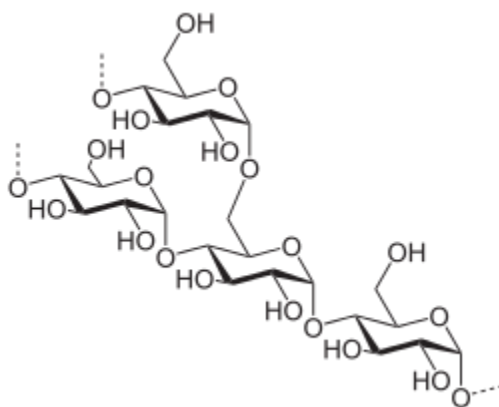
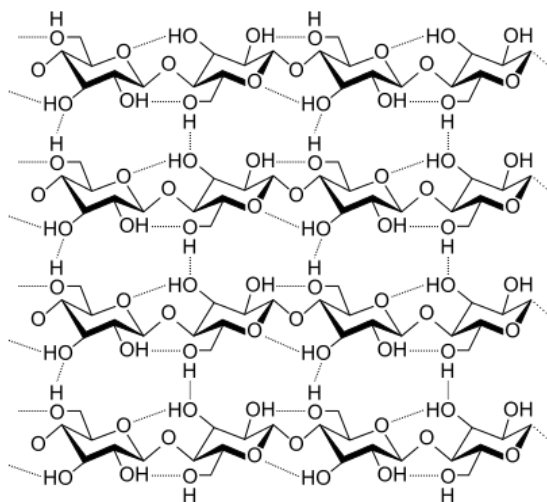
Electrophile:

D-Glucose:

Nucleophile:

Electrophile:

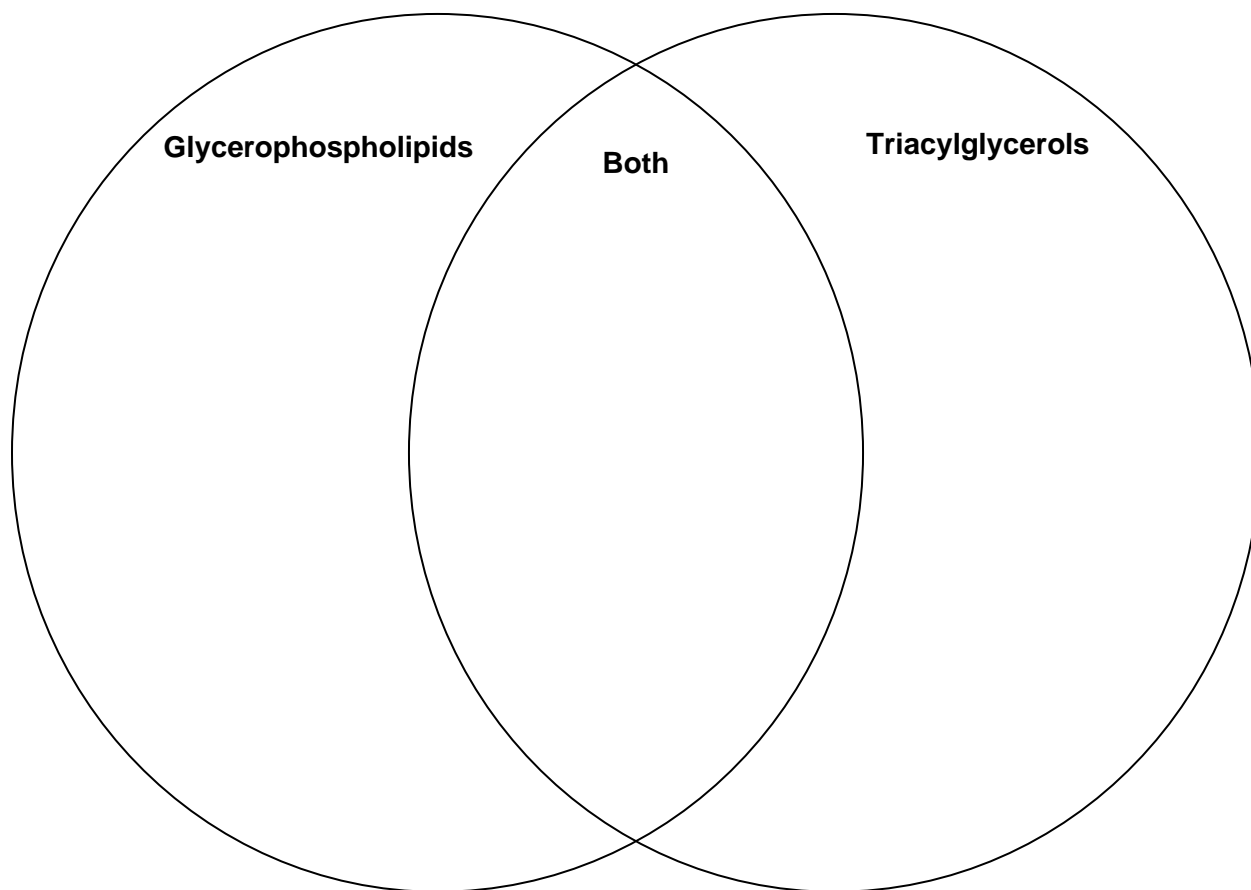
6. Consider the binding patterns of cellulose (left) and starch (right).



Describe two differences you see between the structures. How might these differences contribute to differences in biological functions?

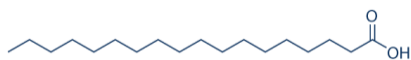
Part II - Lipids

1. In the Venn diagram below, distinguish between glycerophospholipids and triacylglycerols by detailing their similarities and differences. (Double click to edit diagram)

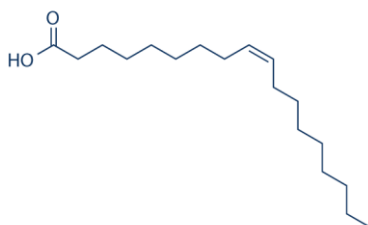


2. The melting points of a series of 18-carbon fatty acids decrease significantly with an increase in saturation (amount of double bonds in aliphatic chain):

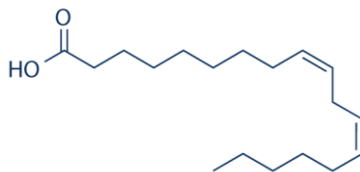
Stearic acid: 69.6°C



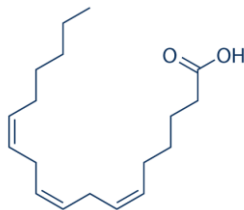
Oleic acid: 13.4°C



Linoleic acid: -5°C

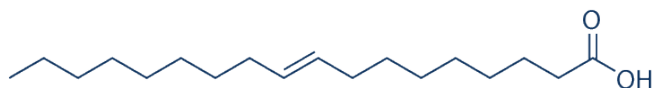


Linolenic acid: -11°C

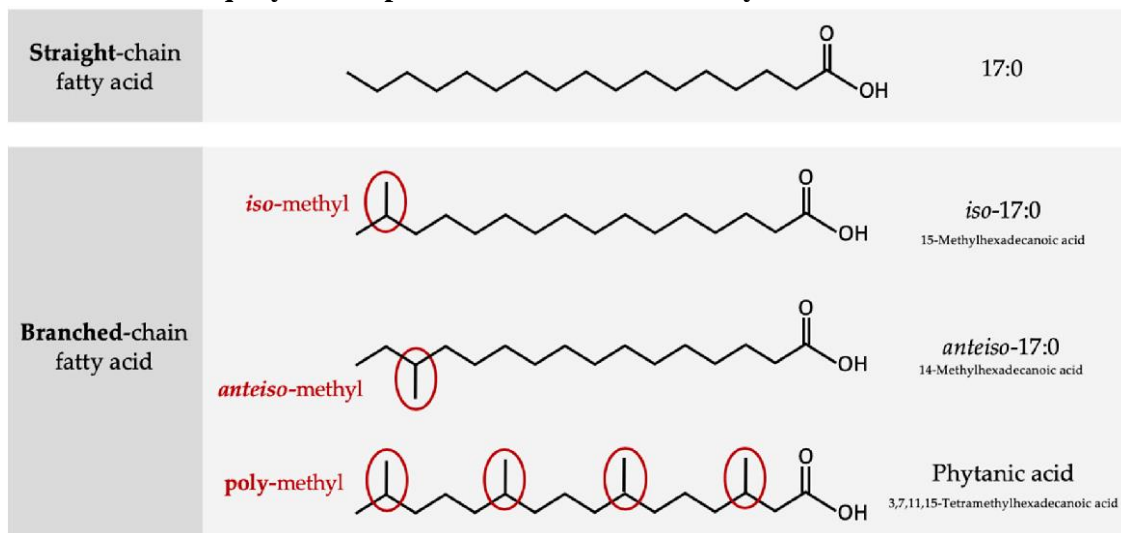


a.) Why might the melting points of these compounds follow this trend? Think of the structural consequences on a large scale.

b.) Predict whether oleic acid (shown above) or elaidic acid, a trans-fat (shown below) would have a higher melting point. How did you arrive at your conclusion?



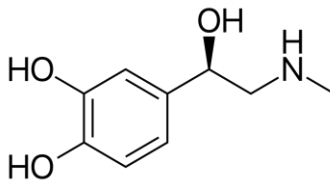
3. Bacterial cells are uniquely able to produce branched-chain fatty acids such as the ones shown below:



How would the incorporation of these branched chain fatty acids into a membrane impact the fluidity of the membrane?

4. Hormones are the body's way of signaling to adapt to changing conditions. These hormones may act extracellularly or intracellularly to induce a cellular response depending on their polarity. For the following small molecule hormones below, predict whether the hormone would bind to proteins in the aqueous extracellular domain or diffuse through the lipophilic intermembrane space:

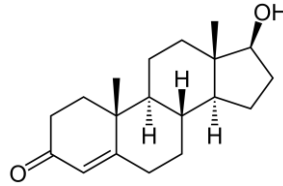
- a. Adrenaline



Intracellular

Extracellular

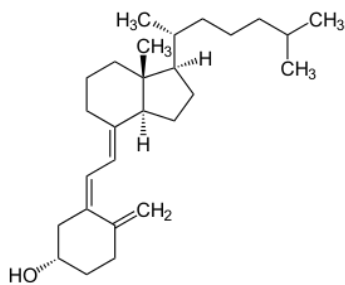
b. Testosterone



Intracellular

Extracellular

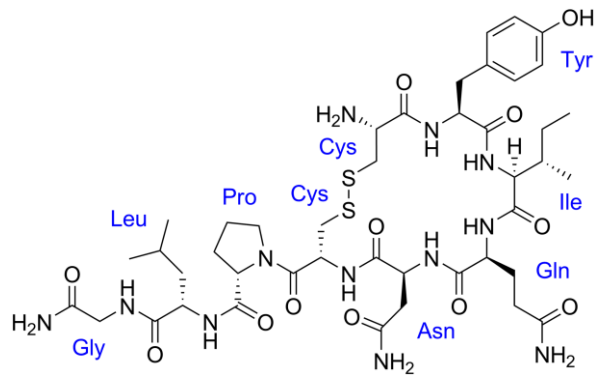
c. Cholecalciferol (Vitamin D₃)



Intracellular

Extracellular

d. Oxytocin



Intracellular

Extracellular