Name Key

Chem 452 - Fall 2012 - Quiz 4

1. Identify the term that best completes each of the following statements about carbohydrates:

   a. enantiomers are stereoisomers that are mirror images of one another.

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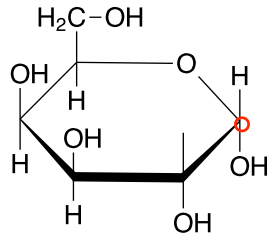
   b. diastereomers are stereoisomers with multiple chiral centers that differ in the chirality of some, but not all of the chiral centers.

   c. non-reducing sugars are sugars that are unable to convert Cu^{2+} to Cu^{+}.

   d. starch/amylose/amylopectin is a storage form of glucose that is found in plants.

   e. ketose is the name given to all sugars that contain a ketone group.

2. Given the structure shown below



   a. Circle the *anomeric* carbon

   b. Which anomer is shown? α-anomer

   c. What type of ring is represented by this structure? pyranose

   d. What is the name for this monosaccharide? α-D-galactopyranose

   e. Is this a reducing sugar? yes

   f. Draw the Fischer projection for this monosaccharide:

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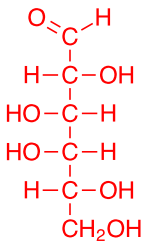

3. When phospholipids are mixed with water they spontaneously self-assemble into lipid bilayers. How is this self-assembly process similar to that for polypeptides when they fold to form protein tertiary structures, and DNA polynucleotides when they combine to form double helices?

All of these structures form in response to the same driving forces. Non-polar, hydrophobic regions are looking for ways to minimize their exposure to water. This is called the hydrophobic effect. In the formation of lipid bilayers, the non-polar fatty acid side chains are buried in the interior of the bilayer, in protein folding, the non-polar amino acid side chains are buried in the interior of the tertiary fold, and in DNA double helices, the non-polar faces of the nucleotide bases are buried and stacked in the center of the double helix. Conversely, the hydrophilic groups are left exposed to water: the polar head-groups of membrane lipids, the hydrophilic amino acid side chains of proteins, and the phosphate-ribose backbone of DNA, are all found on the water-exposed surfaces of the corresponding structures that they form.

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4. Draw the structure for the phospholipid *phosphotidylethanolamine* with an *stearyl* (18:0) acyl group at position 1 and an *linoleyl* (18:2 *cis*-$\Delta^{9,12}$) acyl group at position 2.

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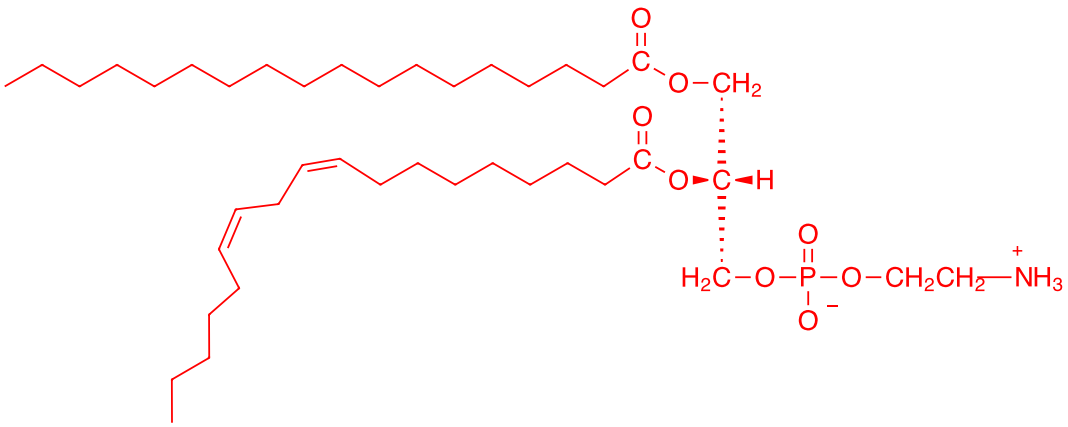

a. What effect would replacing the linoleyl group at position 2 with a second stearyl group have on the T_m for this phospholipid? Explain.

The substitution would raise the T_m (melting point). The *cis* double-bonds in the linoleyl group cause a disruption in the vander Waals interactions between the hydrophobic phospholipid side chains, which lowers the T_m. Replacing the linoleyl group with a second stearyl group that lacks any *cis* double-bonds, eliminates this effect.

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