Name _____

Exam III - Review Questions

1. Using a Fischer projection, draw a representative structure of a ketohexose:

   a. Ketohexose comprise how many stereoisomers? _____

   b. Is the structure you drew a "D" or an "L" sugar? _____

   c. Draw the *enantiomer* of the the structure you drew above:

   d. Draw a *diasteriomer* that is not an *epimer* of the structure you drew above:

2. In class we discussed the different types of polysaccharides produced from D-glucose monomers.

   a. Describe the differences, both *structural* and *functional*, between the polysaccharides that form when glucose monomers are connected by α (1→4) *versus* β (1→4) glycosidic bonds.

   b. What are the names of these polymers?
   α(1→4): _____ β(1→4):_____

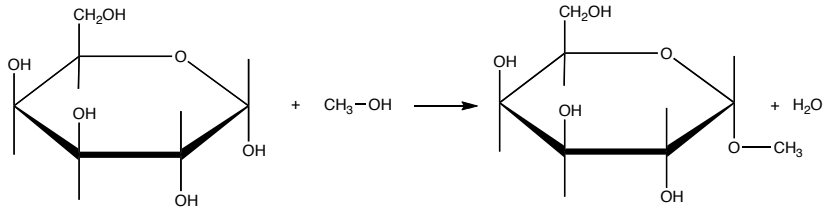
   c. Using Haworth projections, draw a representative disaccharide unit for each of these polymers:
   α(1→4): β(1→4):

   d. What are the names of these disaccharide units?
   α(1→4):_____ β(1→4):_____

3. Monosaccharides in the cell are often chemically modified. Draw a structure for each of the following modified monosaccharides:
   a. α-D-glucose-6-phosphate, which is α-D-glucose that is phosphorylated at carbon 6:

   b. β-D-N-acetylgalactosamine, which is β-D-galactose that has the hydroxyl group on carbon 2 converted to an amine which is then acetylated:

4. Monosaccharides, such as galactopyranose, can react with methanol to form methyl glycosides:



D-galactopyranose methanol methyl-D-galactopyranoside

   a. Describe how a solution of copper(II)sulfate can be used to determine if this reaction has gone to completion.

5. Describe in general terms the molecular basis for the A, B, and O blood types and why individuals with blood type O are considered universal blood donors..

6. When phospholipids are mixed with water they will 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?

7. Draw the structure for the phospholipid *phosphotidylserine* with an oleoyl (18:1 *cis*-Δ^9) acyl group at position 1 and an palmitoyl (16:0) acyl group at position 2.

8. While sphingomyelin molecule has a different chemical structure than a phosphoglyceride molecule, the two carry out a similar biological role. Describe this role and explain what features these molecules share that make them both suited to this role.

9. In class we described how hydropathy plots can be used to analyze the primary structures of proteins.
   a. Explain how a hydropathy plot is generated. Include in your answer a description of how one is drawn and what the x and y axes represent. Also describe how each amino acid residue is scored.

b. What conclusions can be drawn from a hydropathy plot.

c. Sketch a hydropathy plot for two proteins:
• One with seven transmembrane helices:

• One with a transmembrane β-barrel.

10. In words, describe Singer and Nicholson's fluid mosaic model of a biological membrane.

11. Some antibiotics function by transporting ions across membranes
    a. Why must transporters be used to move ions across a membrane?

    b. Some ion transport antibiotics act as carriers that bind an ion on one side of the membrane, diffuse through the membrane, and release the ion on the other side. The conductance of a lipid bilayer membrane containing a carrier antibiotic decreased abruptly when the temperature was lowered from 40°C to 36°C. In contrast, there was little change in conductance of the same bilayer membrane when it contained a different channel-forming antibiotic. Explain why:

12. In class we discussed the concepts of cooperativity and allosteric regulation with respect to both the activity of hemoglobin, which is an oxygen binding protein, and the activity of aspartate transcarbamoylase (ATCase), which is an enzyme.
    a. In both cases the terms "Tense (T)" and "Relaxed (R)" states were used to describe two different states for these proteins. Specifically, how do these terms relate to the cooperativity and allosteric regulation for these two proteins?

    b. Identify an example of an allosteric regulator for each protein. Describe where they bind and how they exert their effects in terms of the T and R states.