CHEM106 Test 3
Tuesday, March 9, 2019

Name: Key

Follow the directions for each section and answer what you are asked succinctly, neatly and as specifically as you can.

Section 1: Rules

1) (10 points) Write out the following:
   a. Rules for mechanisms that I taught you

   1) CHP: Electrophiles
      NOS: Nucleophiles
   2) Draw the substrate and the product(s) and identify what is changing
   3) Attack the electrophile with your chosen nucleophile

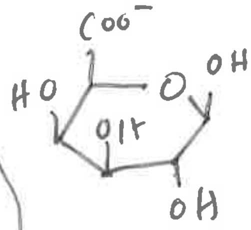
   b. Rule for the chemical structure of α-D-glucose

   Haworth α-D-glucose follows the DDUDU rule for drawing the non-hydrogen substituents.

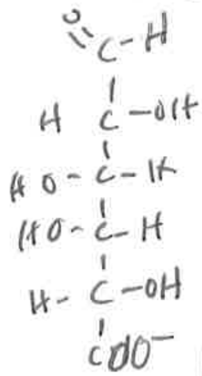
Section 2: Sugars

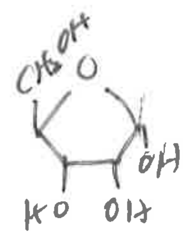
2) (10 points) Draw the Fisher projection and the Haworth projection for one of the following sugars. Write the name of the sugar under the Haworth projection.

Your choices are: β-D-galacturonic acid, α-D-ribose, β-D-mannose

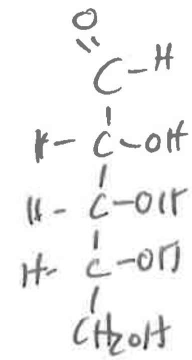


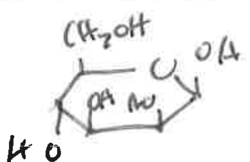
β-D-Galacturonic acid

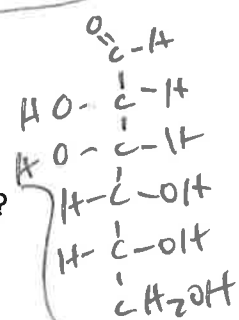




α-D-ribose







β-D-mannose

3) (5 points) What is a glycosidic bond?

A glycosidic bond is a bond between 2 monosaccharides (or a monosaccharide and an alcohol)

4) (5 points) Draw **one** of the following disaccharides: maltose, sucrose, trehalose, lactose. Write the name of the disaccharide underneath it, making certain to include the linkage in the name.

Maltose: α-D-glucose-(1→4)-D-glucose

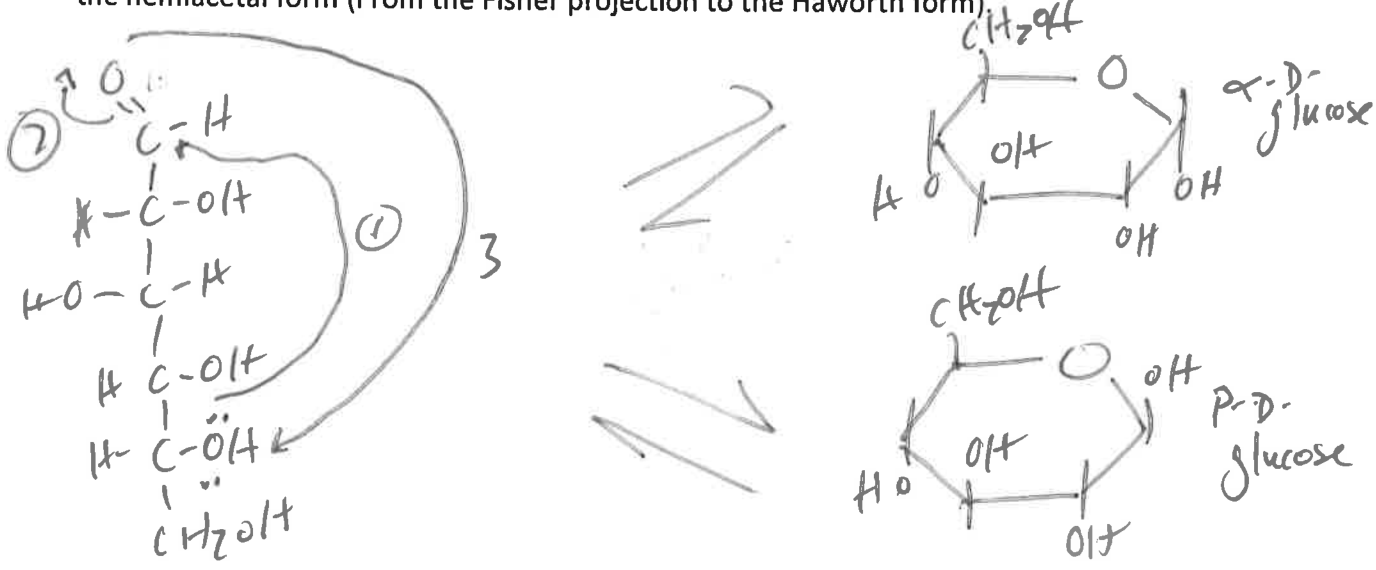
Sucrose: α-D-glucose-(1→2)-β-D-fructose

Trehalose: α-D-glucose-(1→1)-α-D-glucose

Lactose: β-D-galactose-(1→4)-β-D-glucose

you can draw them from the names

5) (10 points) Draw the mechanism by which a linear D-glucose molecule self-converts to the hemiacetal form (From the Fisher projection to the Haworth form).



6) (5 points) Is the sugar you drew in question ~~3~~ 4 a reducing sugar? Why or why not?

Maltose and Lactose ARE reducing sugars

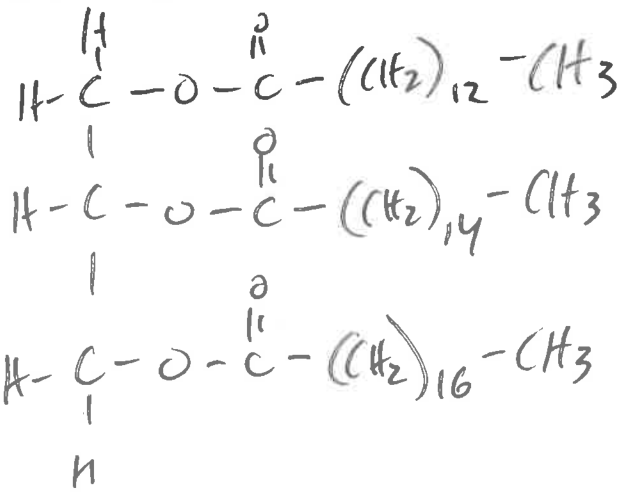
Sucrose and Trehalose ARE NOT reducing sugars.

A reducing sugar has a free anomeric carbon.

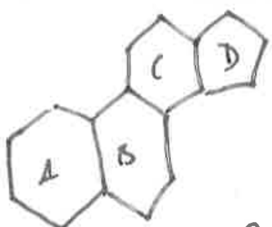
Section 3: Lipids, Membrane and Membrane Proteins

7) (5 points) Draw the structure of a triacylglycerol that has myristic acid, palmitic acid and stearic acid substituents (label each fatty acid under the chain).

myristic acid = 14 carbons Palmitic acid = 16 carbons
stearic acid = 18 carbons



8) (5 points) Draw the base structure of a sterol molecule. What effect does inserting cholesterol molecules into the lipid bilayer have on the membrane?



Four rings
3- six membered rings
1- five membered ring.

when cholesterol inserts into the membrane, it decreases the fluidity of the membrane.

9) (10 points) What do organisms do to the lipids in their cell membranes to keep them from freezing during cold weather? Why does this work?

They increase the number of unsaturated fatty acids attached to their phosphoacylglycerol molecules in the membrane. This decreases the IMFs and makes the membrane more fluid so it doesn't freeze.

10) (10 points) What are the two types of membrane proteins? Briefly describe the chemical features of each that makes them what they are.

① Integral membrane proteins
- Span the lipid bilayer
- usually composed of all alpha-helices or a single β-sheet folded into a barrel.

② Peripheral membrane proteins: loosely associated with the surface of the bilayer.

11) (10 points) It has been said many times that Active Transport of solutes into or out of the cell relies upon the energy of ATP hydrolysis. We have learned that this isn't exactly true. How is ATP used to facilitate active transport in cells?

CONFORMATIONAL CHANGE OF TRANSPORT PROTEIN DUE TO PRESENCE OF Phosphate group BEING COVALENTLY ATTACHED TO THE PROTEIN

Section 4: Reaction Mechanisms

12) (10 points) Draw the reaction mechanism for a serine protease that hydrolyzes the peptide bond between a glycine and an alanine.

See slides, book chapter and DocCam notes.

We went through this mechanism so many times...

13) (10 points) Lysozyme is an enzyme that catalyzes the hydrolysis of the β-1,4 glycosidic bond between N-acetyl-muramic acid and N-acetyl glucosamine in the cell walls of bacteria. Given the following active site setup as a starting point, come up with a plausible mechanism that will allow the hydrolysis of the glycosidic bond between sugar monomers.