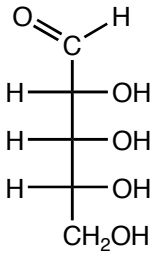
Name _____ Test 3 (4/11)
PHYS 0313 (Biochem) Spring 2007

1. A Fisher projection of ribose is drawn to the right.



a. (6 pts) Is ribose a D or an L sugar? (Hint: compare ribose to other D sugars like D-glucose or D-fructose.)

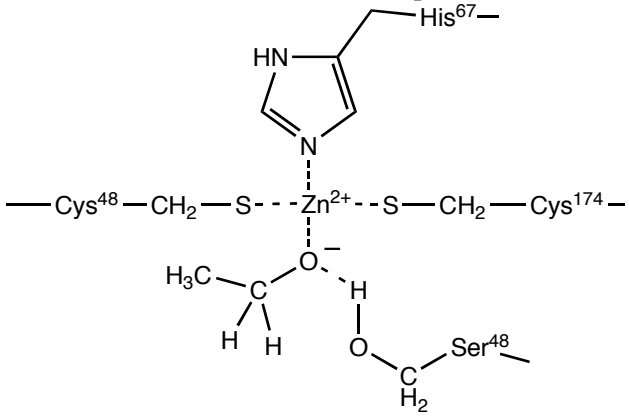
b. (8 pts.) Draw a Haworth projection of α-ribofuranose.

c. (6 pts.) On the Fisher projection to the right, identify the C atom on the O atom that act as the electrophile and the nucleophile during the cyclization reaction.

d. (6 pts.) On the Haworth projection above, identify the C atom and the O atom that acted as the electrophile and the nucleophile during the cyclization reaction.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____

2. In the initial stages of the oxidation of ethanol by alcohol dehydrogenase, ethanol is converted to ethoxide. A representation of the active site is drawn below.



a. (4 pts.) The histidine and cysteine residues play similar roles in alcohol dehydrogenase. What is their role?

b. (4 pts.) What feature does the histidine and cysteine residues share that allows the residues to do their jobs?

c. (6 pts.) What features of the active site stabilize the negative charge on the alkoxide?

3. In the pentose phosphate pathway, ribulose and ribose are interconverted.

a. (4 pts.) What type of reactions is this?

mutarotation | oxidation | isomerization | glycoside formation | esterification | reduction

b. (8 pts.) Draw the enediol intermediate for this reaction.

ribose-5-phosphate

D-ribulose-5-phosphate

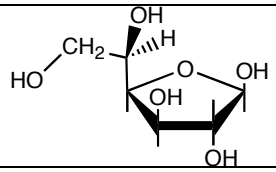
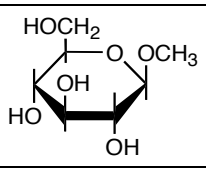
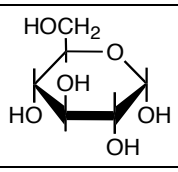
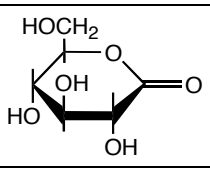
4. Oxidizing C_6 of glucose forms D-glucouronic acid.

a. (6 pts) Draw a Fisher projection of the linear form of D-glucose	b. (4 pts.) Draw a Fisher projection of the linear form of D-glucouronic acid

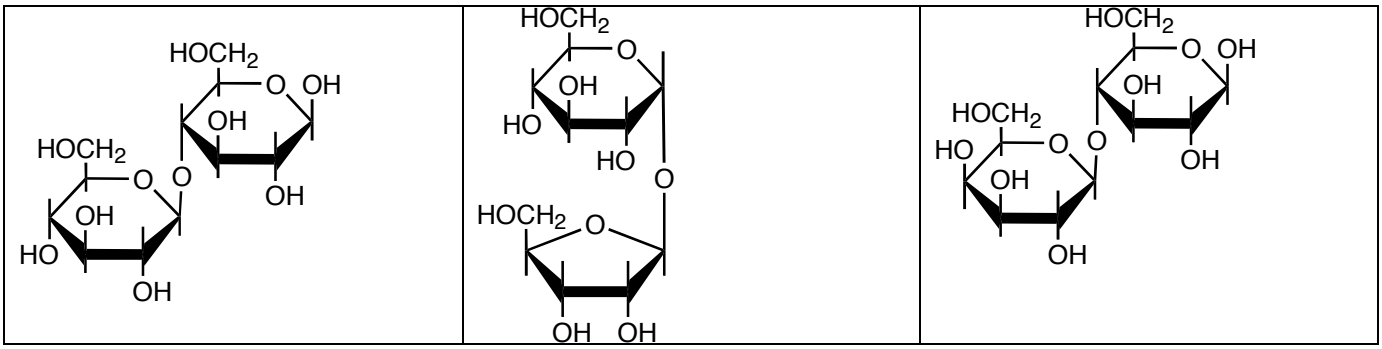
5. In order to oxidize C_1 of glucose, an enzyme must be able to access the linear form of the sugar.

a. (8 pts.) Which of the following sugars can be oxidized at C_1?

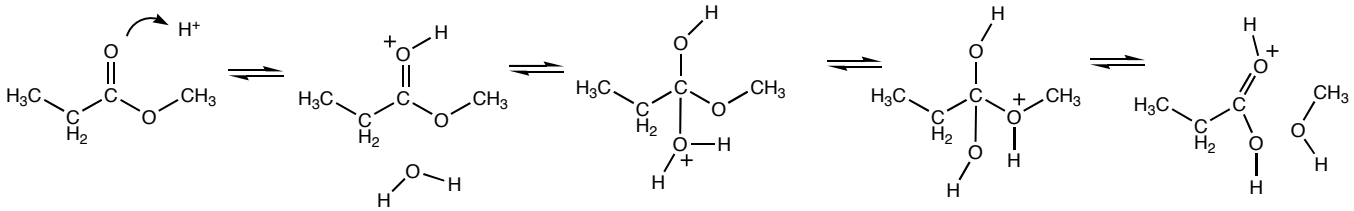
b. (4 pts.) For the sugars drawn below, are any of them already oxidized?

6. a. (6 pts.) For the following disaccharides draw an arrow that points to each anomeric carbon.
b. (6 pts.) Label the arrow "yes" if a mutarotation can occur at the designated anomeric carbon and "no" if a mutarotation cannot occur.



7. Below, the mechanism of a general acid catalyzed hydrolysis of an ester is drawn.



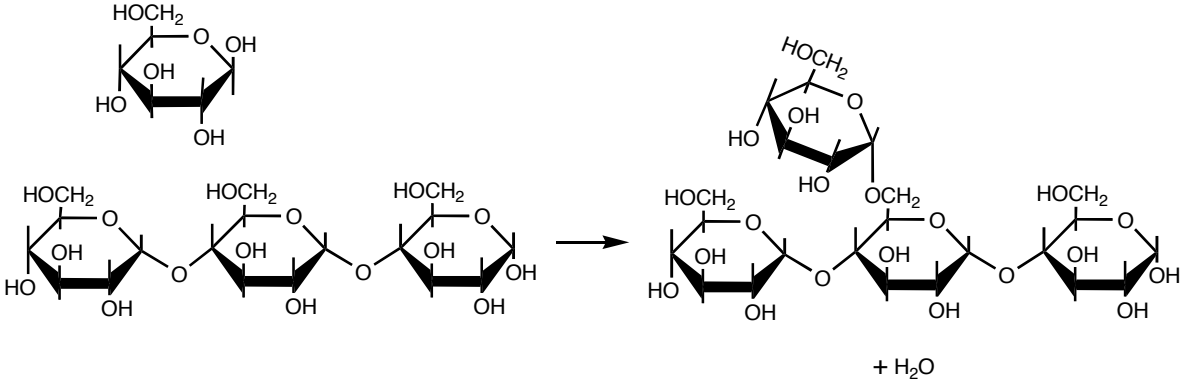
a. (6 pts.) Describe how protonating the carbonyl in step one increases the reactivity of the carbonyl.

b. (6 pts.) In step 2, a water molecule attacks the carbonyl. Add electron movement arrows two show how the bonds form and break in step two.

c. (6 pts.) In step three, a proton is released from the water molecule and another proton is added to the methoxy group. Describe why protonating the methoxy group is an important step in this mechanism.

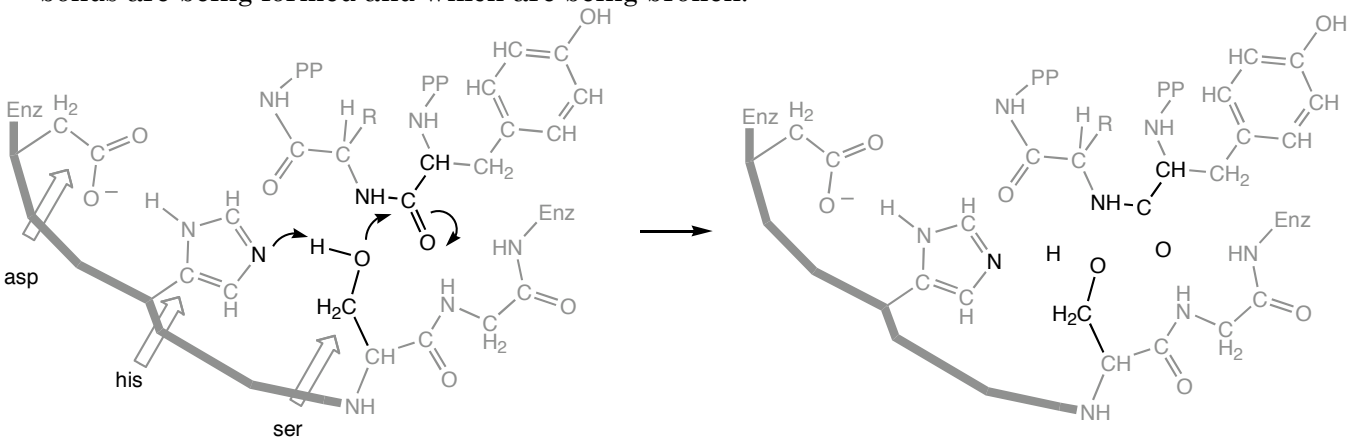
8. Glycogen is a branched polysaccharide. The reaction draw below is a representation of a branch forming on a molecule of glycogen.

a. (6 pts.) Describe how the reaction occurs. That is, indicate which atom acts as the nucleophile and which atom acts as the electrophile.



b. (4 pts.) Identify the oxygen atom from the monosaccharide or polysaccharide that became part of the water molecule that was produced as a byproduct of the reaction.

9. The active site of chymotrypsin is modeled below. The electron movement arrows indicate which bonds are being formed and which are being broken.



a. (6 pts.) Add the appropriate bonds and charges to the incomplete structure on the right.

b. (6 pts.) In this step of the reaction, what is the role of the serine residue?

c. (6 pts.) In this step of the reaction, what is the role of the histidine residue?