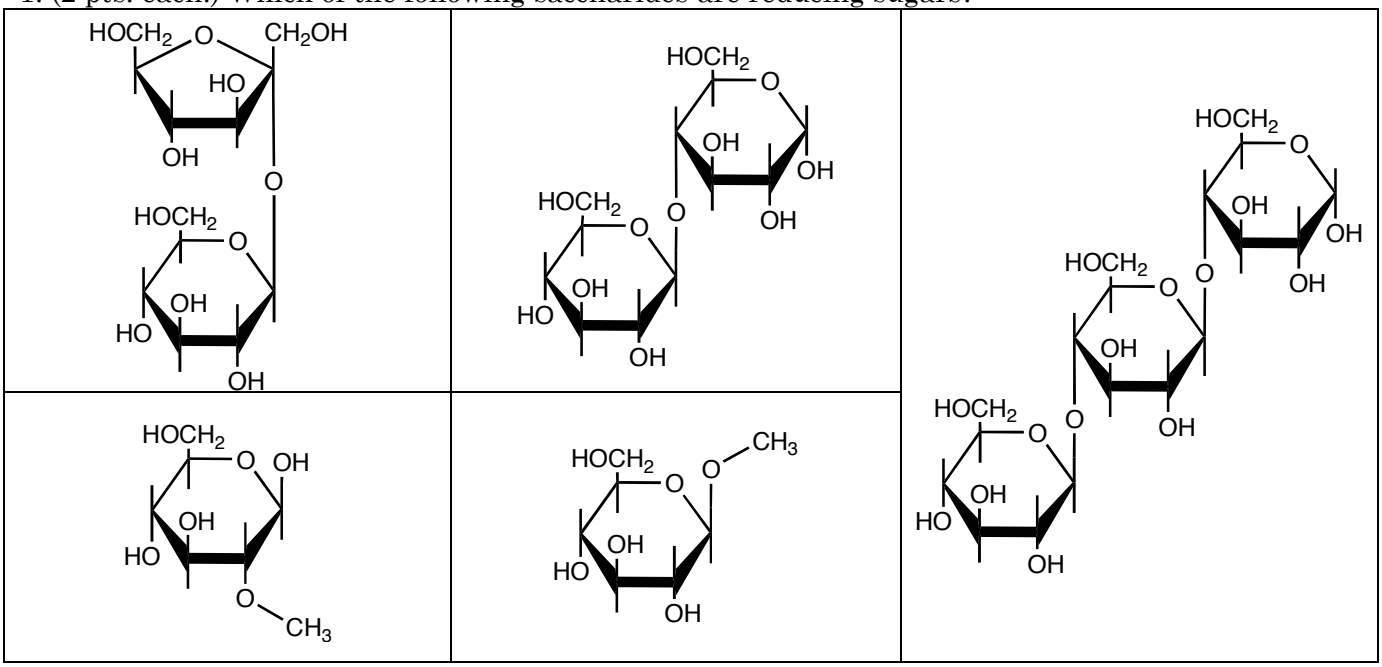
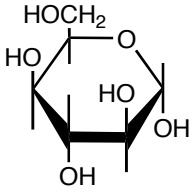
Test 3 Name_____
PHYS 0213
(Biochem)

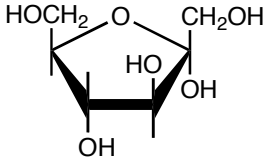
1. (2 pts. each.) Which of the following saccharides are reducing sugars?



2. (6 pts.) Identify the nucleophilic site(s) on the following sugar.

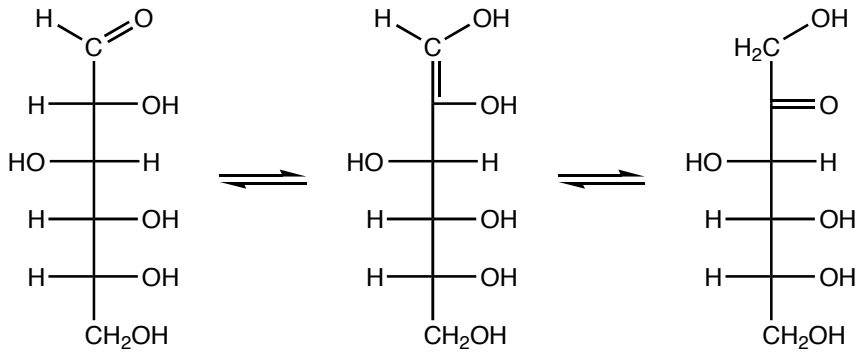


3. (6 pts.) On the following molecule, identify the site most prone to be attacked by a nucleophile.



4. (6 pts.) During aerobic oxidation, molecular oxygen acts as the oxidizing agent. In glycolysis and in the pentose phosphate pathway different oxidizing agents are used. Name the oxidizing agents (abbreviations are acceptable) that are used in the glycolytic and pentose phosphate pathways.

5. (10 pts.) Isomerization of sugars often occurs through an enediol intermediate. The two-step conversion of glucose to fructose through an enediol intermediate is shown below.



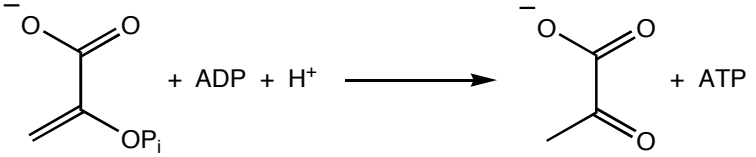
Draw the mechanism by which this transformation occurs. Assume that there is an enzyme near by to add and remove H^+ 's as needed.

6. Polysaccharides are typically linked to polypeptides by serine, threonine, or asparagine.
   a. (6 pts.) What is it about each these three amino acids that allows them to form glycosidic linkages with polysaccharides?

   b. (2 pts.) Which amino acid—serine, threonine, or asparagine—forms N-glycosidic linkages with polysaccharides?

   c. (6 pts.) Draw a □-glycosidic linkage between D-glucose and serine (do not worry about the stereochemistry of the □-carbon of serine).

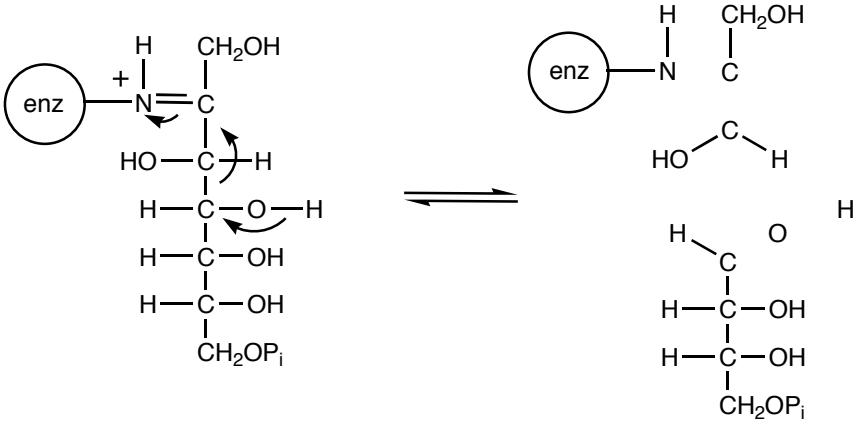
7. (6 pts.) Phosphoenolpyruvate has a high phosphate group transfer potential. In other words, it can transfer phosphate to ADP and form ATP. What is it about the conversion of phosphoenolpyruvate to pyruvate that helps drive the reaction to completion?



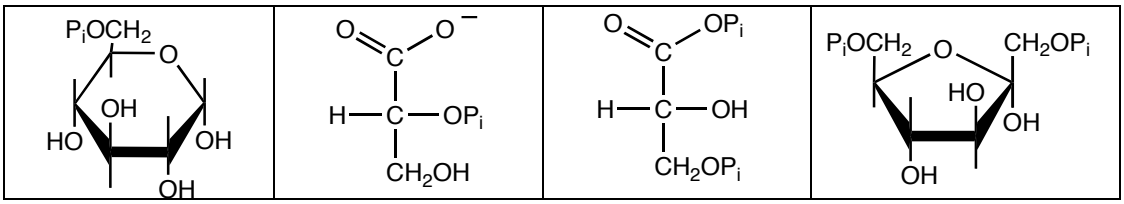
8. (8 pts.) The pentose phosphate pathway serves two primary purposes. What are they?

9. (8 pts.) In the pentose phosphate pathway, the enzyme transaldolase transfers a three carbon unit from D-sedoheptulose to D-glyceraldehyde-3-phosphate. In one step, the following reaction occurs.

Based on the mechanism arrows on the left, fill in the missing bonds and charges on the structure on the right.



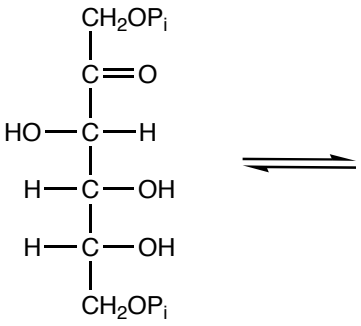
10. (8 pts.) Which of the following molecules participates directly in the formation of ATP from ADP.



11. In glycolysis, fructose-1,6-bisphosphate is broken apart by the enzyme aldolase. The products of the reaction are glyceraldehyde-3-phosphate and dihydroxyacetonephosphate.

a. (2 pts.) Indicate which C–C bond on fructose-1,6-bisphosphate is broken during the reaction.

b. (8 pts.) Draw and label the products of the reaction.



12. In glycolysis, the production of fructose-6-phosphate from glucose-6-phosphate is driven by the formation of fructose-1,6-bisphosphate in a subsequent step. In gluconeogenesis, fructose-6-phosphate is formed from fructose-1,6-bisphosphate.

a. (3 pts.) Write a chemical equation (use names and abbreviations) for the conversion of fructose-6-phosphate to fructose-1,6-bisphosphate in glycolysis.

b. (3 pts.) Write a chemical equation (use names and abbreviations) for the conversion of fructose-1,6-bisphosphate to fructose-6-phosphate in gluconeogenesis.

c. (2 pts.) The reaction in part a. is considered to be irreversible. Why then can fructose-6-phosphate form during gluconeogenesis (is the reaction in part b. the same as the reaction in part a.)?