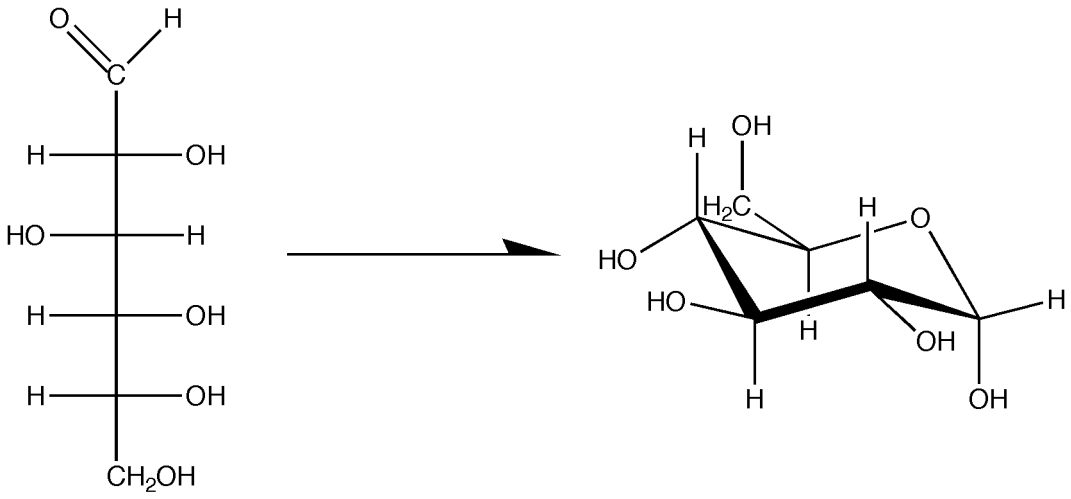
Chemistry 236, Spring 2008 Name(s):

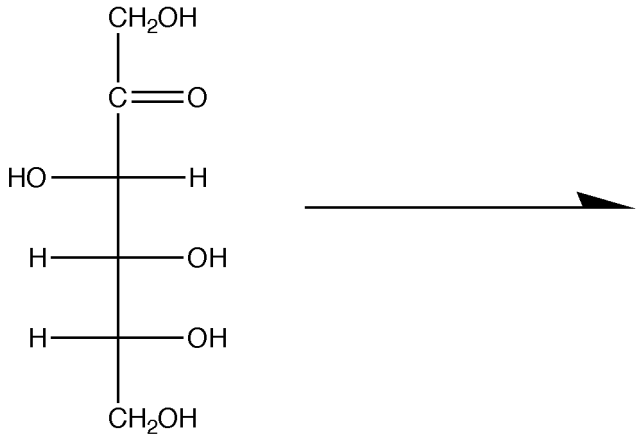
Exercise 4: Ketals, acetals, keto-, enol-

1. D-glucose, shown below, is an **aldose**; that is, a sugar that terminates in an aldehyde. It undergoes the formation of a hemi-acetal (called a **pyranose**) in the presence of water (in fact, the pyranose form is more stable, so most of the D-glucose ends up this way).

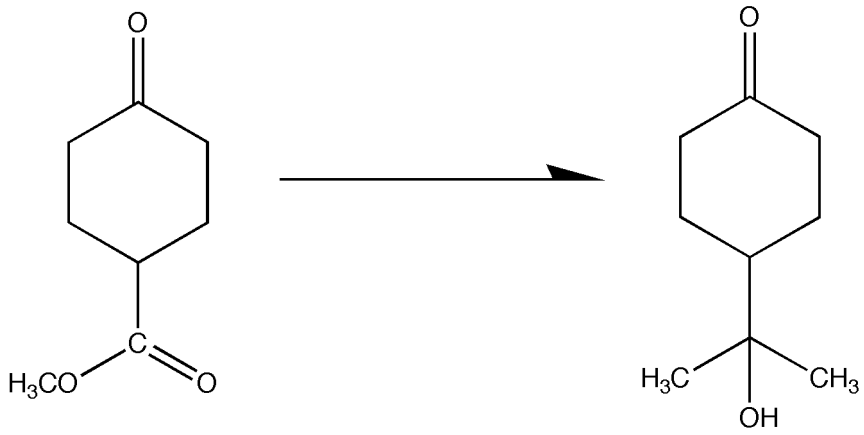


Show the mechanism of this reaction.

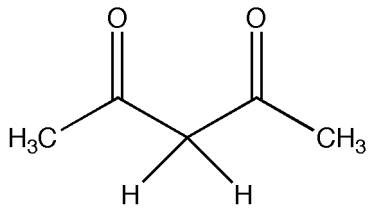
2. D-fructose, a **ketose**, undergoes a similar formation of a hemi-ketal. The difference is that D-fructose prefers to form the **furanose** form, which is based on an oxacyclopentane ring (that is, a five-membered ring with oxygen as one of the members). Show the product of this transformation, which occurs in water.



3. Suggest the sequence of reagents that would be necessary to effect this synthesis. Note that CH_3Li is a good reagent to add a methyl group, but it will attack the ring carbonyl first.



4. a. Acetylacetone (shown in its keto form) undergoes **tautomerization**. Draw the enol tautomer(s).



b. Would the keto and enol tautomers be distinguishable using NMR spectroscopy? In other words, describe the differences, if any, between the NMR spectra of the keto and the enol tautomers. You need not go into gross detail, just point out some differences.