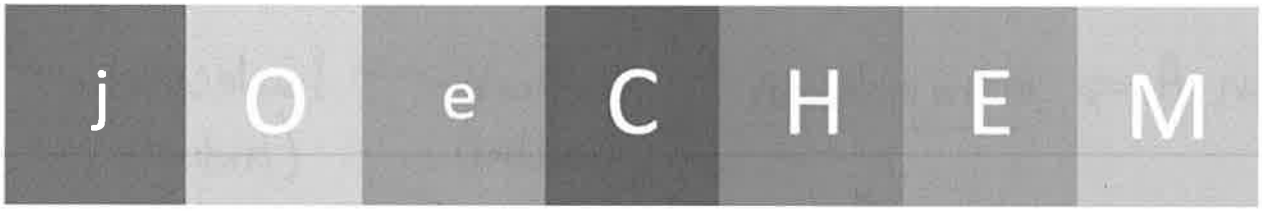
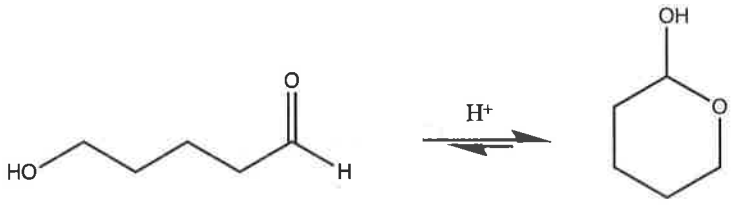
Organic Chemistry II

Exam 3

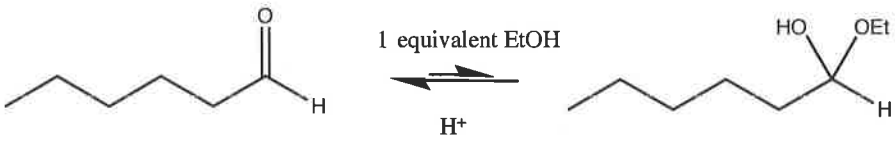


1.) Below are 2 hemiacetal forming reactions. Reaction A is **favorable**, while Reaction B is **not favorable**. Provide a BRIEF explanation as to why this is the case.

Reaction A



Reaction B



Rxn A ⇒ intramolecular

1 molecule → 1 molecule
(reactant) (product)

neutral entropy

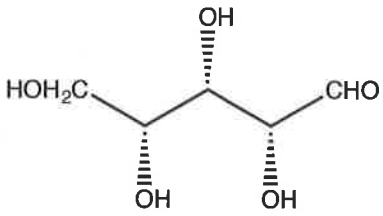
Rxn B ⇒ intermolecular

2 molecules → 1 molecule
(reactant) (product)

bad entropy

Rxn A is more favorable

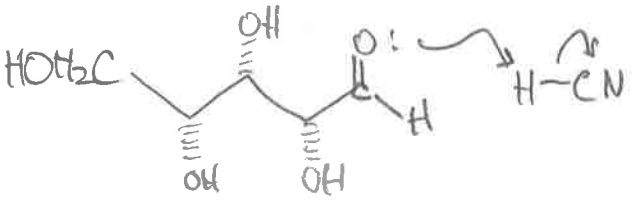
2.) When D-xylose is subjected to the reaction sequence below, two new 6 carbon sugars (A and B) are observed. Provide the structures for the resulting two 6 carbon sugars, **and** explain why two products are observed.

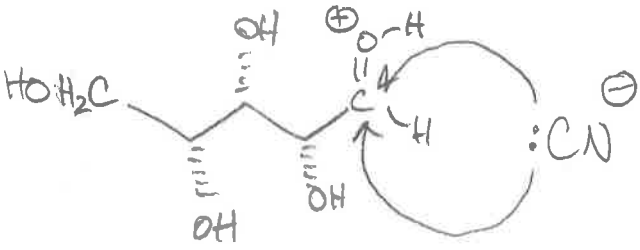


1.) HCN
2.) H_2
3.) H_3O^+

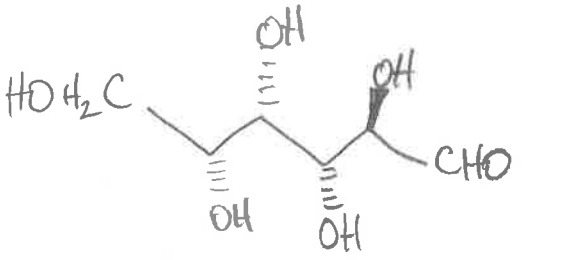
A + B

(Two 6 Carbon Sugars)

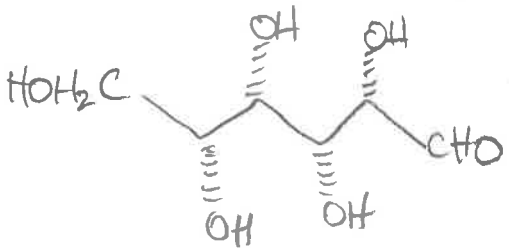




* carbonyl is sp_2 (trigonal planar, flat), so $:CN^{\ominus}$ attacks from above and below. *



+

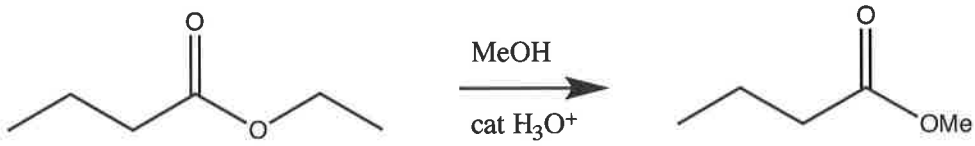


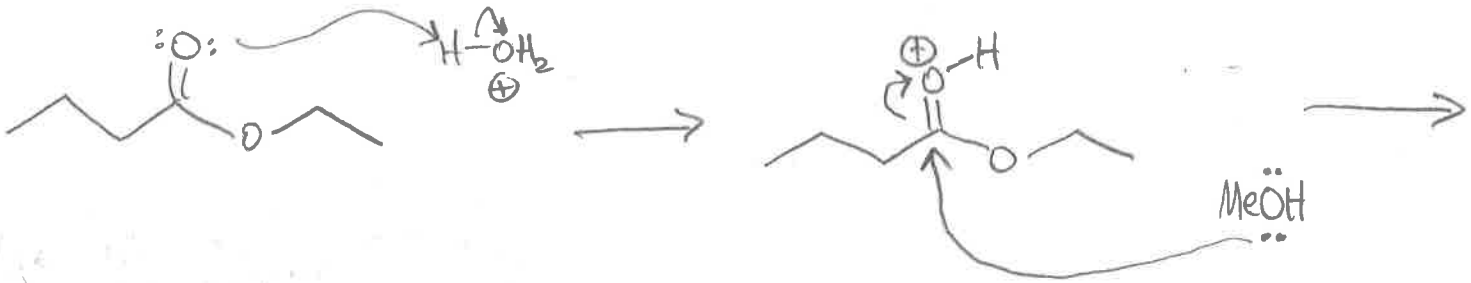
A

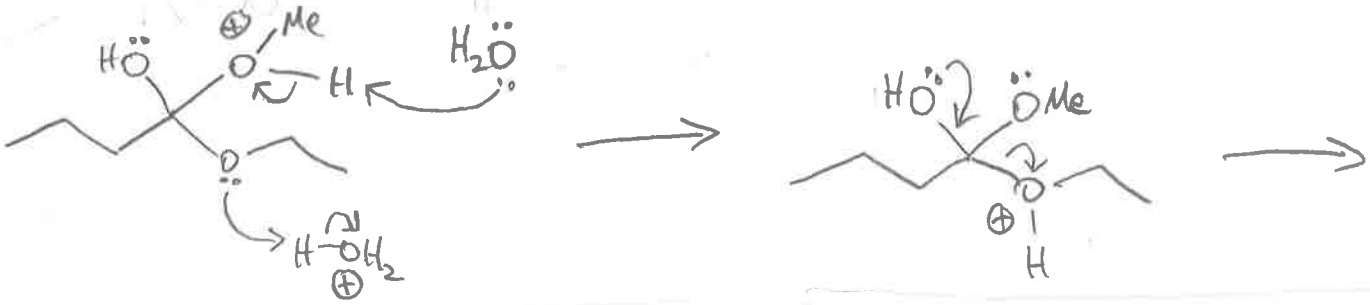
B

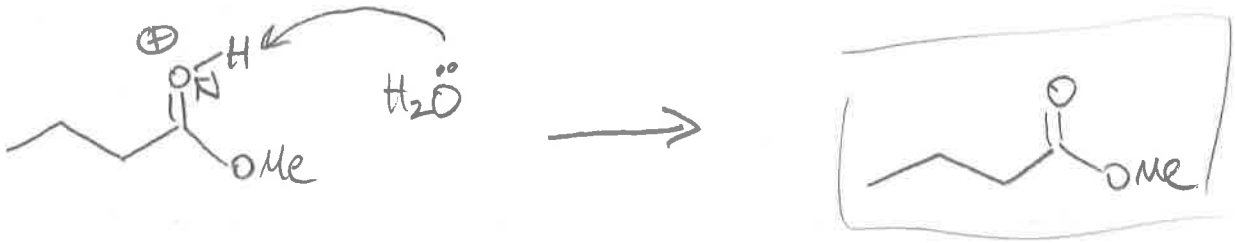
transesterification — addition-elimination mechanism

3.) Given the reaction below, draw the full arrow-pushing mechanism.

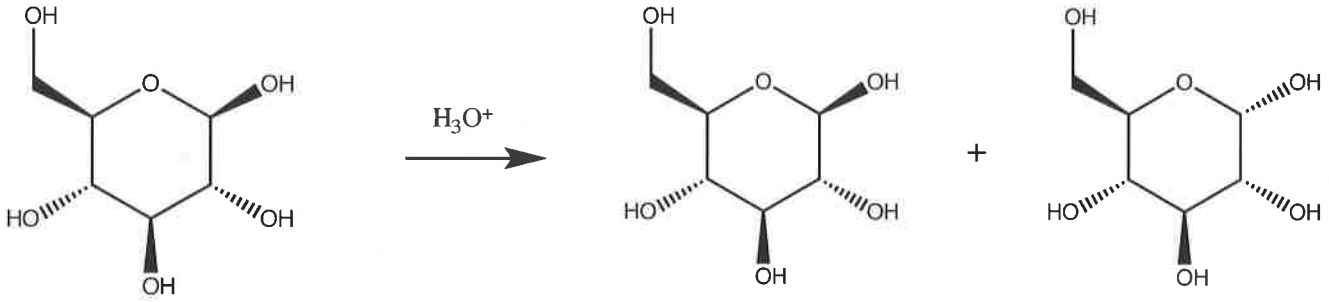


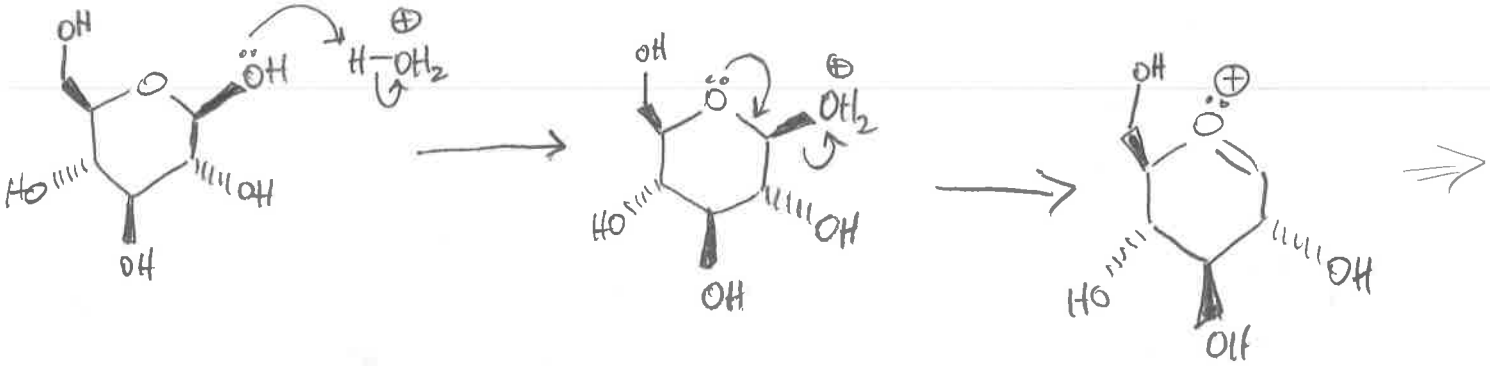


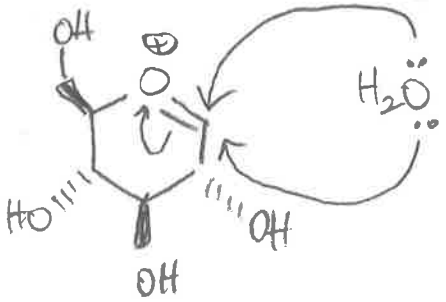


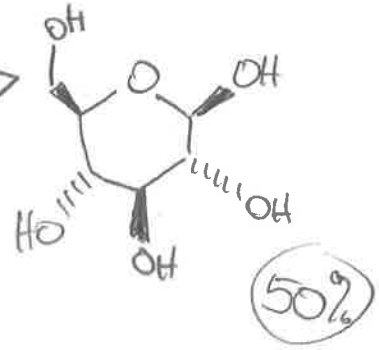


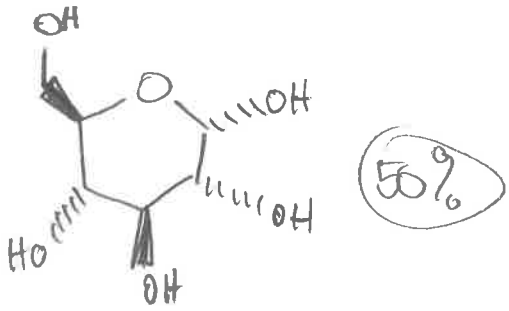
4.) Pictured below is D-glucose (the all equatorial sugar, remember?). When D-glucose is subjected to acidic conditions, it is observed that the stereochemistry at the anomeric carbon is effectively altered, resulting in a 50%-50% mix of wedge and dash at that position.
Draw the full arrow pushing mechanism that illustrates this transformation.







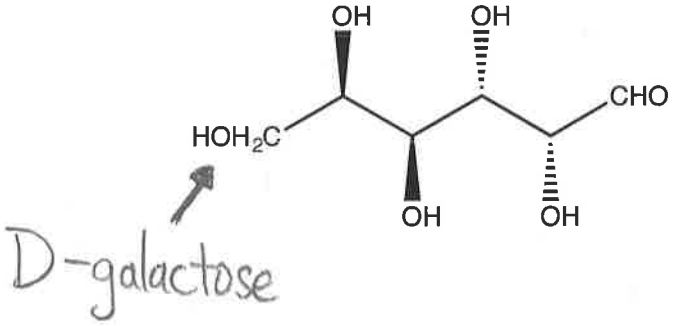




* Carbon to be attacked is sp^2, trigonal planar (flat): attack happens from on top and below.

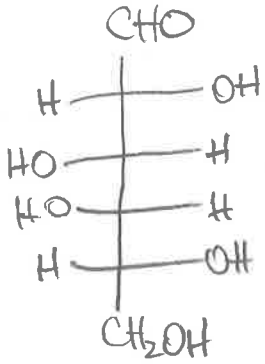
5.) Given the hexose below (in bond-line form), redraw the structure as a: Fischer Projection, Haworth Projection*, and Chair Conformation*

Use a squiggly line at the anomeric position for the Haworth Projection and Chair Conformation

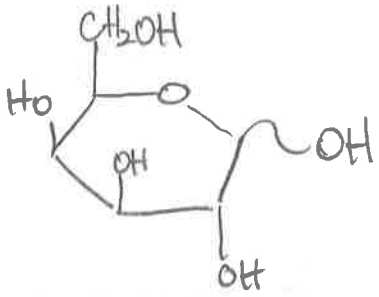


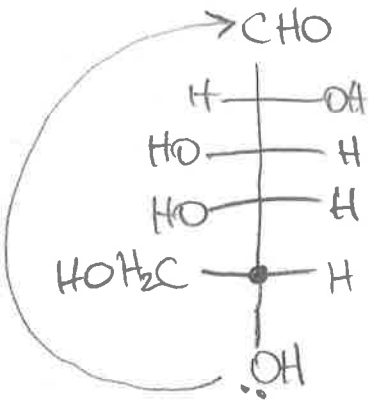
D-galactose

Fischer Projection:



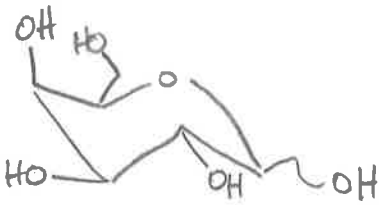
Haworth Projection:



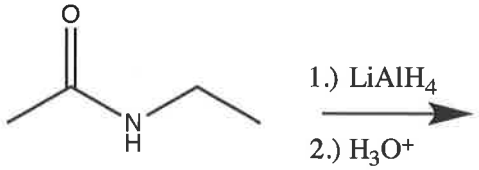


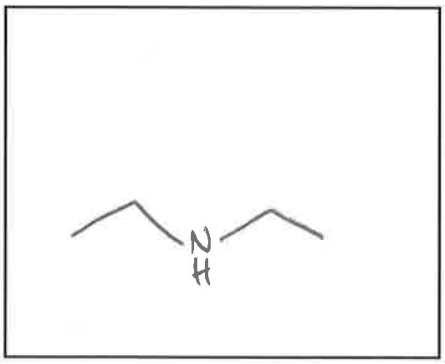
- double switch on last carbon to more easily draw Haworth Projection

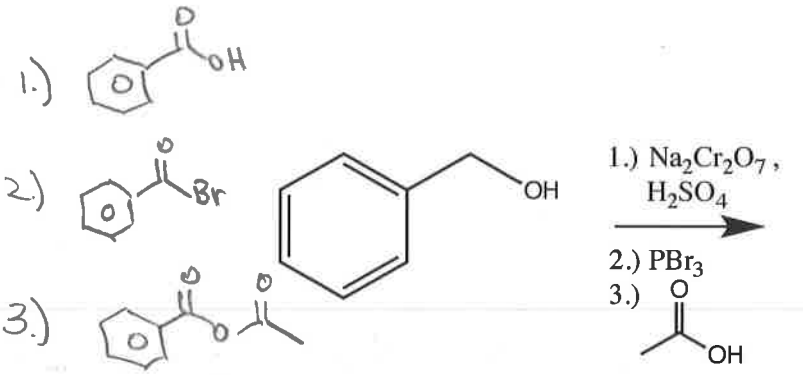
Chair Conformation:

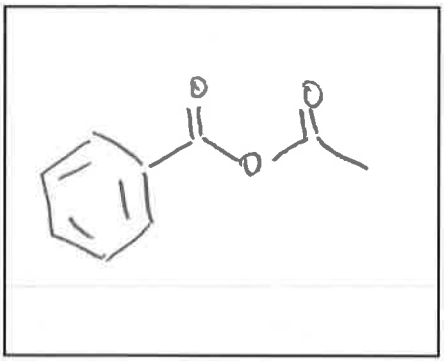


6.) The reactions below are shown missing their **final product**. For each problem below, correctly predict the final product. If you believe no product is formed/no reaction occurs, write "**NR**".

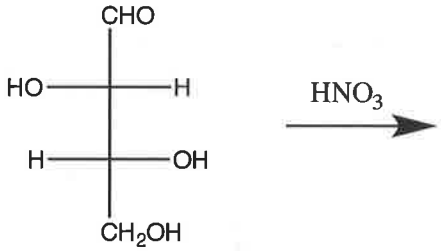


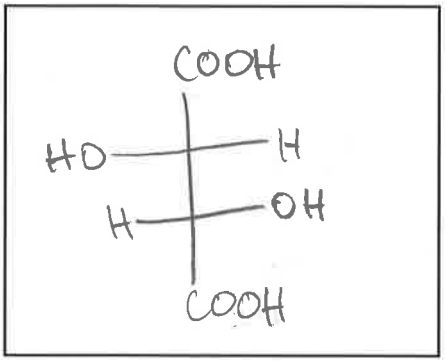




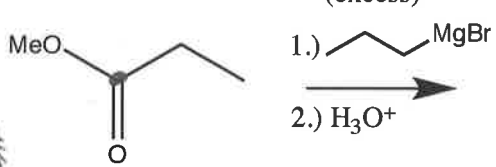


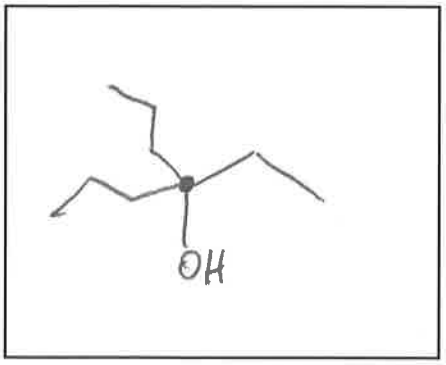
oxidize top and bottom of sugar to Carboxylic acids





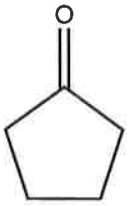
attack ester twice: hard nucleophile

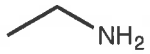




Reductive Amination

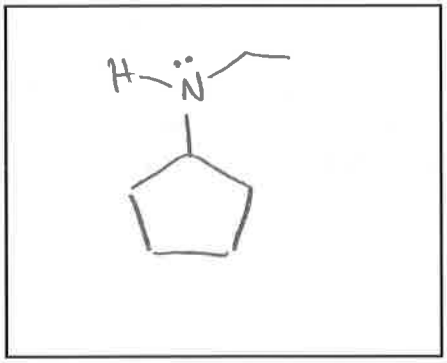
- make imine, then reduce it to an amine



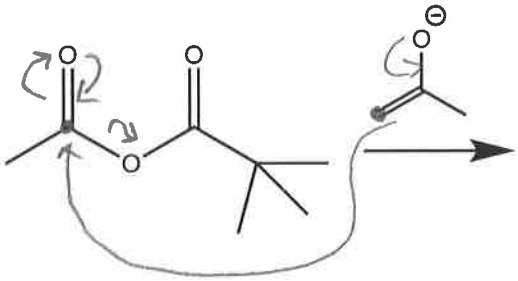
1.) 

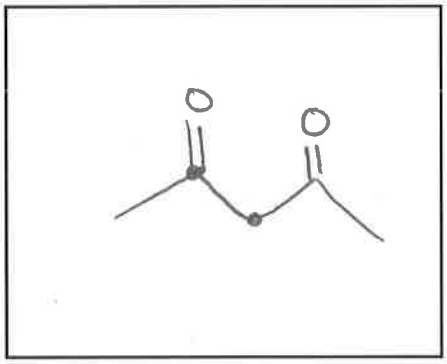
H^+, $-H_2O$

2.) $NaBH_3CN$, H^+

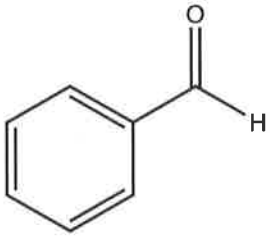


attack less hindered carbonyl carbon





Mannich Rxn



Et, Et
N
H

1.) H^+, $-H_2O$

2.)