CHEM 310 Exam 4

Dr. Hanna

November 19, 2007

Honor Pledge:

In Part V of the Winthrop University Student Conduct Code, it is stated that "A fundamental tenet of all institutions of higher learning is academic honesty. … Misrepresentation of someone else's work as one's own is a most serious offense in any academic setting. … Academic misconduct includes but is not limited to providing or receiving assistance in a manner not authorized by the professor in the creation of work to be submitted for academic evaluation including papers, projects, and examinations …"

By my signature below, I pledge that I did not commit academic misconduct (cheat) on this examination.

KEY

Printed Name _____ Signature _____

Part 1 _____/16

Part 2 _____/24

Part 3 _____/36

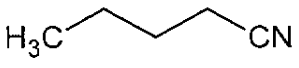
Part 4 _____/12

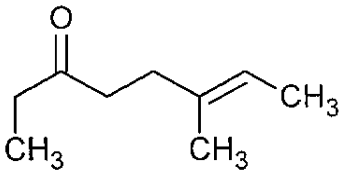
Part 5 _____/12

Total _____/100

Part 1: Nomenclature (~~20~~ 16 pts)

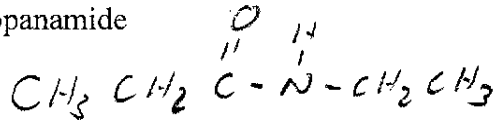
Write IUPAC names for the following compounds (indicate stereochemistry where required):

i)  PENTANENITRILE

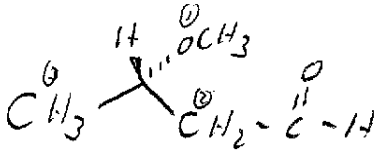
ii)  (E)-6-METHYLOCT-6-EN-3-ONE

Draw structures corresponding to the following IUPAC names:

iii) *N*-Ethylpropanamide

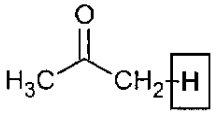


iv) (*S*)-3-Methoxybutanal

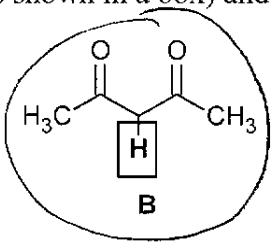


Part 2: General Concepts (24 pts)

i) Circle the stronger acid (the acidic proton is shown in a box) and explain your choice.



A

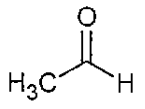


B

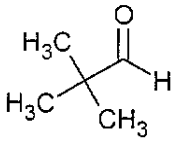
MORE RESONANCE STRUCTURES CAN BE DRAWN FOR CONJUGATE BASE (3 FOR B VS 2 FOR A)

∴ B PRODUCES MORE STABLE ENOLATE & IS THUS MORE ACIDIC THAN A

ii) Acetaldehyde (**A**) will undergo aldol condensation but pivaldehyde (**B**) will not. Explain.



A



B

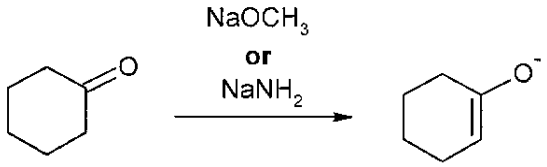
ALDOL CONDENSATION REQUIRES THE FORMATION OF AN ENOLATE ION.

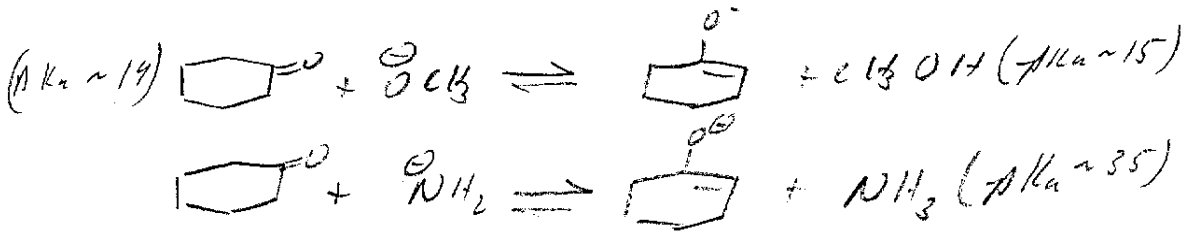
A - HAS α-H'S & CAN FORM ENOLATE

B - HAS NO α-H'S AND THUS CANNOT FORM AN ENOLATE

The pKa's of ammonia (~35) and methanol (~15) will be helpful in answering the next two questions:

iii) In the reaction shown, which would be the better base to use to form the enolate of cyclohexanone (pKa ~ 19) – $NaNH_2$ or $NaOCH_3$? Why?



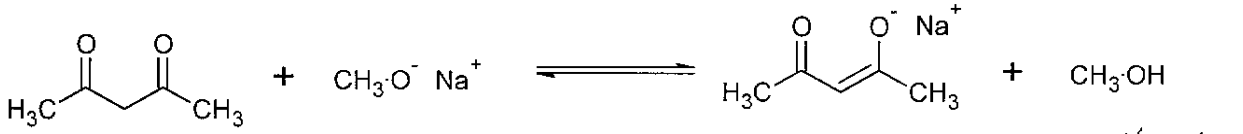


$^{\ominus}NH_2$ IS STRONGER BASE – FAVORS PRODUCT ENOLATE AT EQUILIBRIUM.

∴ $^{\ominus}NH_2$ IS BETTER.

(USE OF $^{\ominus}OCH_3$ ACTUALLY FAVORS REACTANTS AT EQ. – VERY LITTLE ENOLATE FORMS)

iv) In the reaction below, which compound is present in greater amount at equilibrium, 2,4-pentanedione (**A**, pKa = 9) or its enolate (**B**)? Justify your answer.



A

pKa = 9

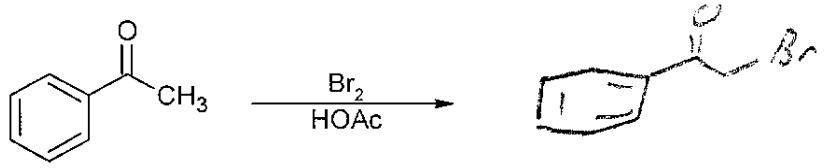
B

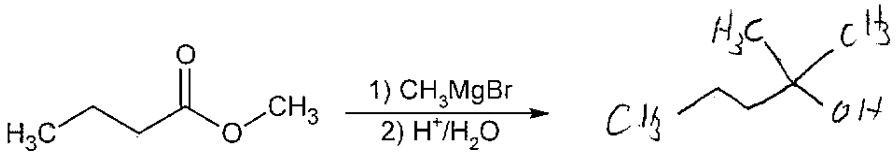
pKa ~ 15

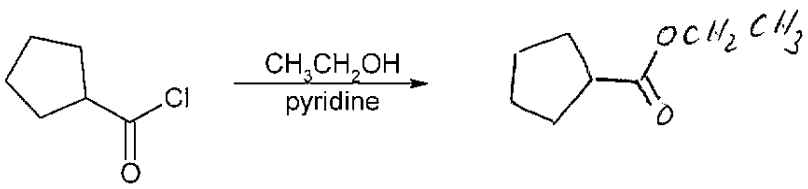
A IS STRONGER ACID THAN CH_3OH, ∴ THIS RXN FAVORS PRODUCTS AT EQUILIBRIUM.

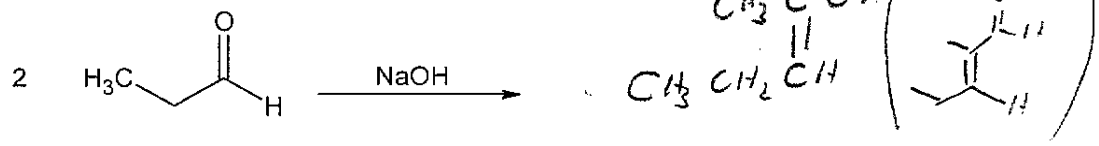
Part 3: Reactions (36 pts):

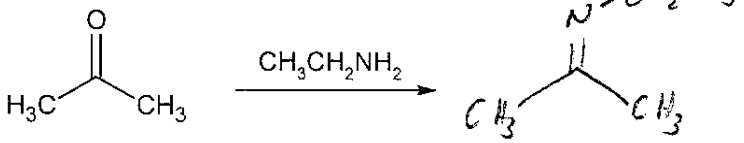
3a. Provide the major organic product(s) of the following reactions. Indicate stereochemistry where necessary.

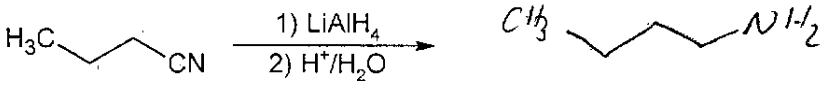
i) 

ii) 

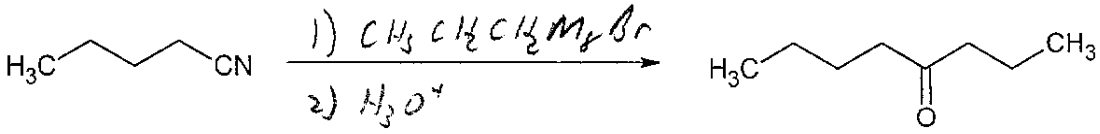
iii) 

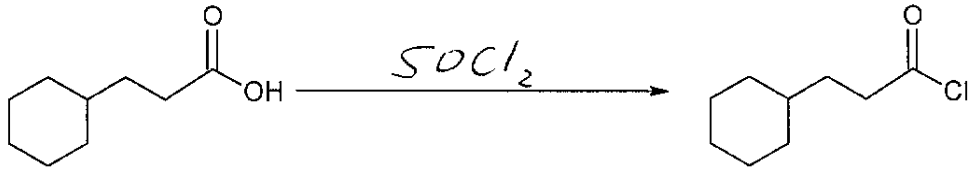
iv) 

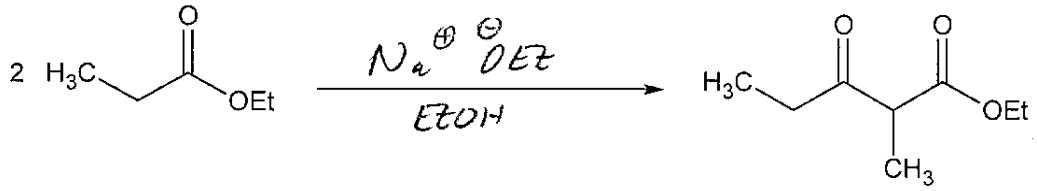
v) 

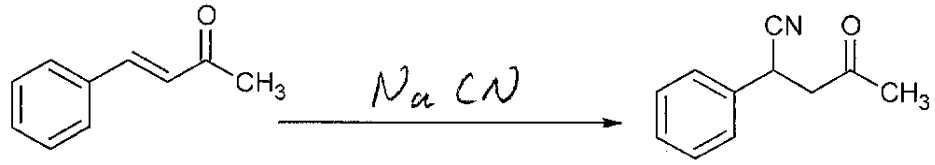
vi) 

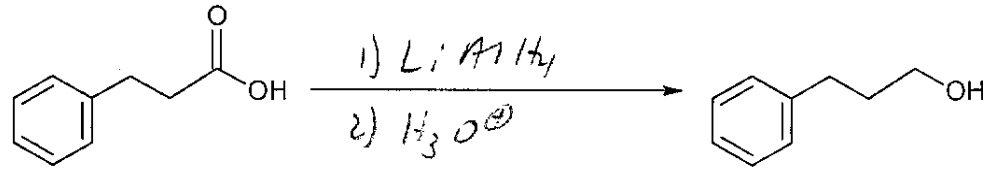
3b. Provide the reagents necessary to accomplish the following transformations:

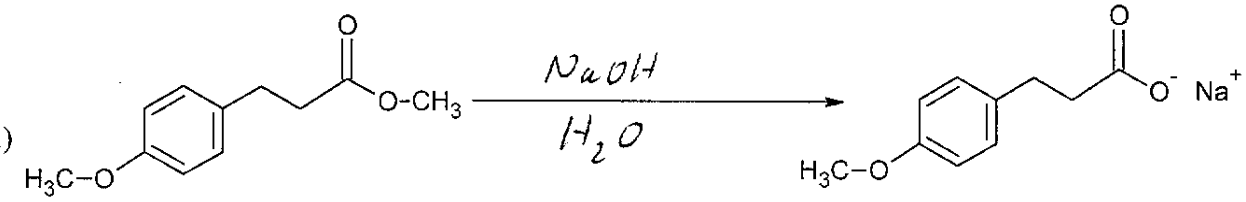
i) 

ii) 

iii) 

iv) 

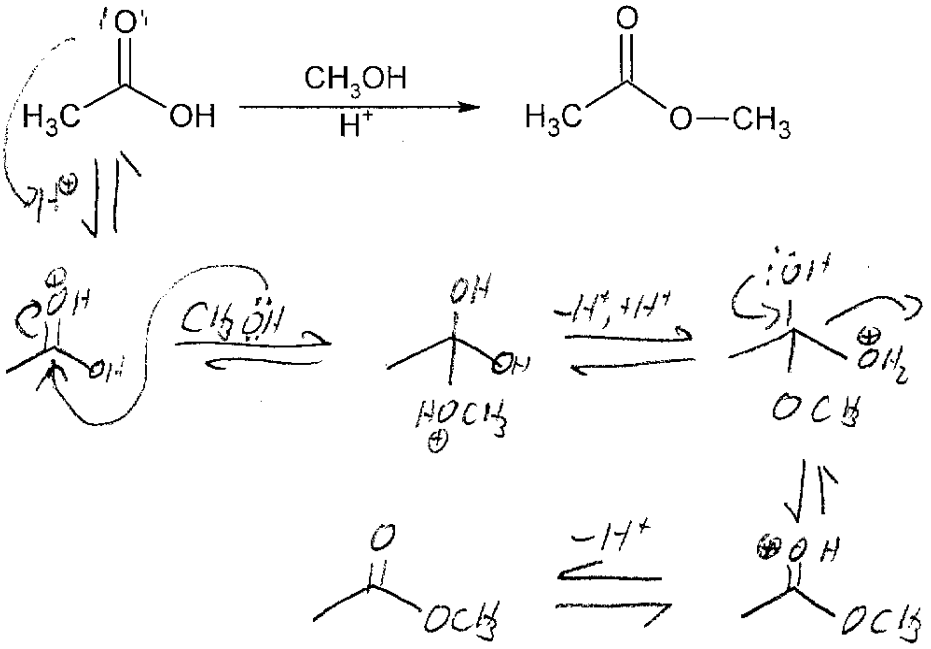
v) 

vi) 

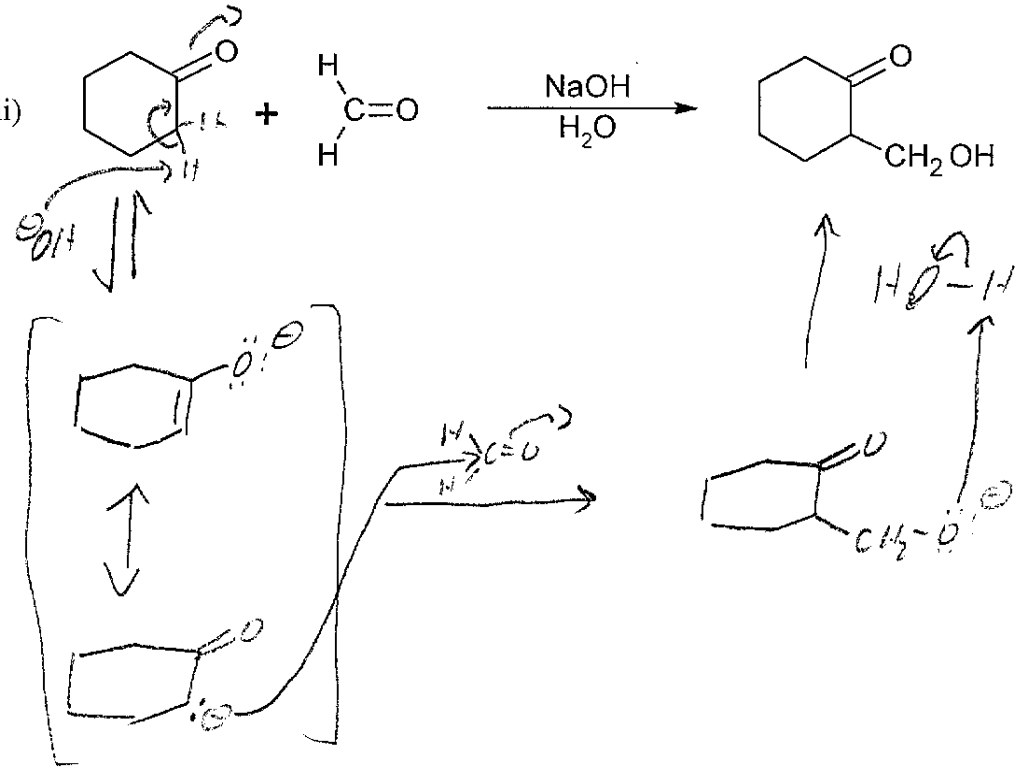
Part 4: Mechanisms (12 pts)

Draw arrow-pushing mechanism for the following reactions:

(i)



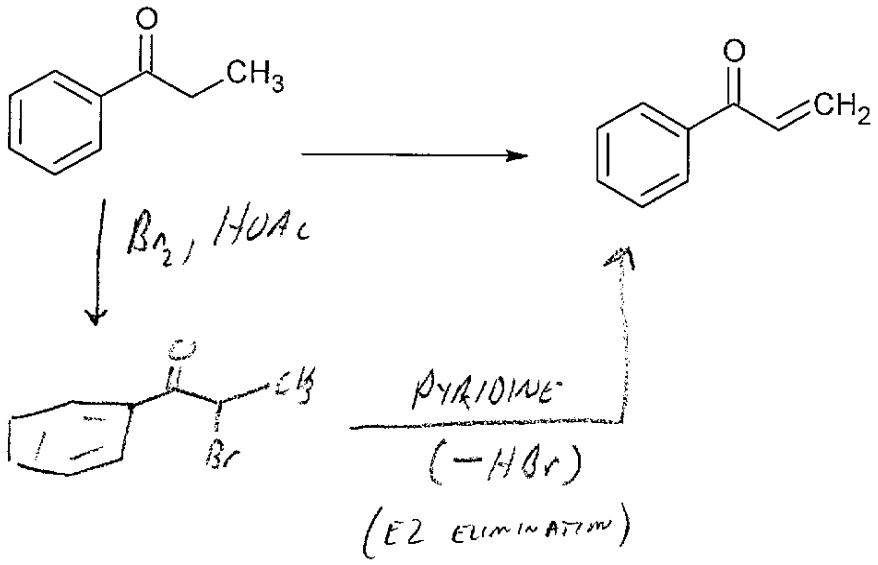
(ii)



Part 5: Synthesis (12 pts)

Provide a synthesis of each of the following compounds starting from the indicated compound and any other reagents you may need:

(i)



(ii)