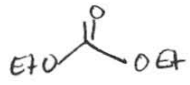
Practice Exam #4

I. General Knowledge & Exam 3 review (38 pts)

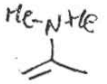
1. (9 pts) Give the structures of the molecules indicated below and provide the names of any structures shown.

$CHBr_3$

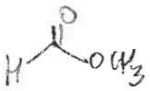
bromoform



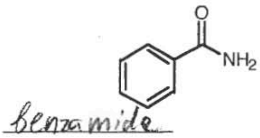
diethyl carbonate



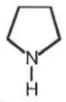
any enamine



methyl formate

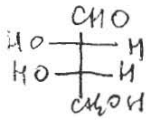


benzamide

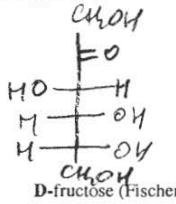


Pyrrolidine

the enolate anion of acetone



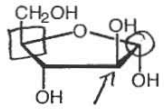
any **L**-aldotetrose



D-fructose (Fischer)

~~projection~~)

2. (8) A cyclic structure of **arabinose** is shown below. 1) Circle the anomeric carbon 2) Box-in the family carbon 3) Point an arrow at carbon atom(s) which differ in stereochemistry from that in rybose.

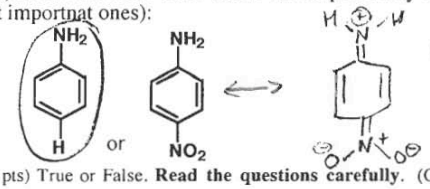


In each pair, circle what best describes the structure:

a) Fischer or (Haworth) projection
b) (D) or L family
c) (α) or β anomer
d) pyranose or (furanose)

Provide full name for this structure: α-D-arabinofuranose

3. (4) Circle the more basic amine and explain why using resonance structures (show only the most important ones):



decreased e-density on the N atom relative to the parent amine (aniline)

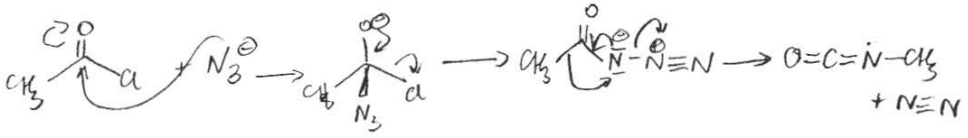
4. (6 pts) True or False. **Read the questions carefully.** (Circle **T** or **F**)

i. In unsymmetrical ketones, kinetic deprotonation occurs at the more substituted carbon atom. **T** (**F**)

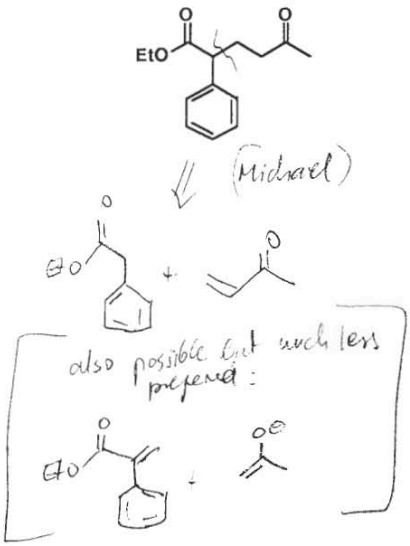
ii. It is easier to α-deprotonate ketones than esters. (**T**) **F**

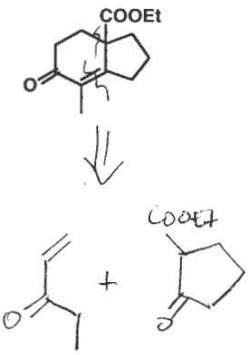
iii. Enolate anions are isoelectronic with carboxylate anions. (**T**) **F**

5. (7 pts) Pyrolysis of acyl azides followed by hydrolysis of the resulting isocyanante is one of the most convenient ways to prepare amines from carboxylic acids. Please write this reaction below for the preparation of acyl azide from acetyl chloride and sodium azide and its subsequent pyrolysis to the corresponding isocyanate. Use e- pushing arrows for all steps, showing also the reactive intermediate formed.



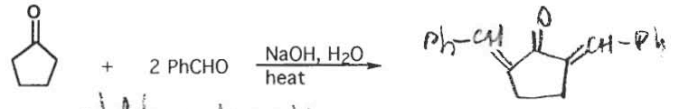
5. (4 pts) Write the organic reactant(s) needed to prepare the products below in one or two steps and provide the needed reagent(s) and/or conditions.





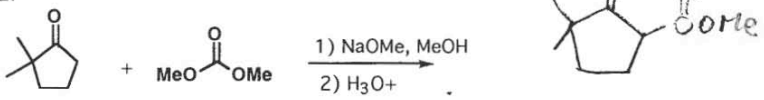
II. Reactions (32 pts) Draw structures (including stereochemistry) of the expected organic products formed under the following reaction conditions and provide the names of the reactions where requested.

1.

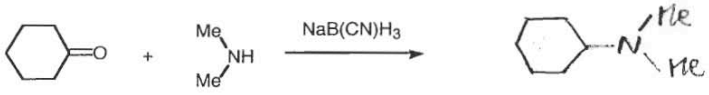


name: aldol condensation

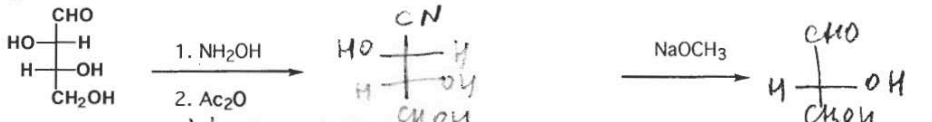
2.



3.



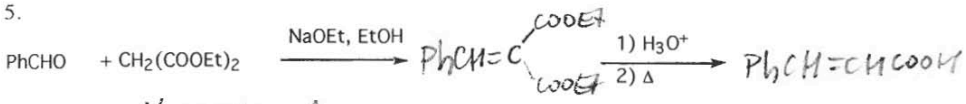
4.



name: Wohl degradation

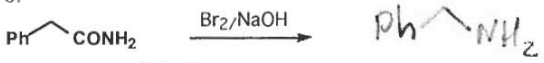
product name: D-glyceraldehyde

5.



name: Knoevenagel

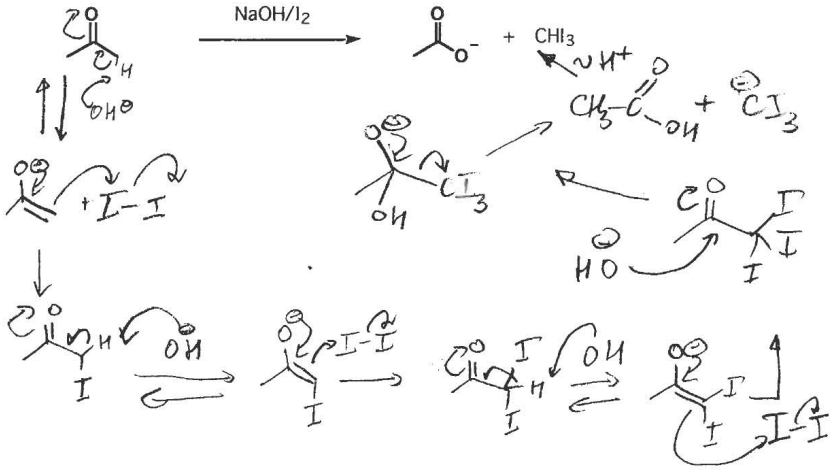
6.



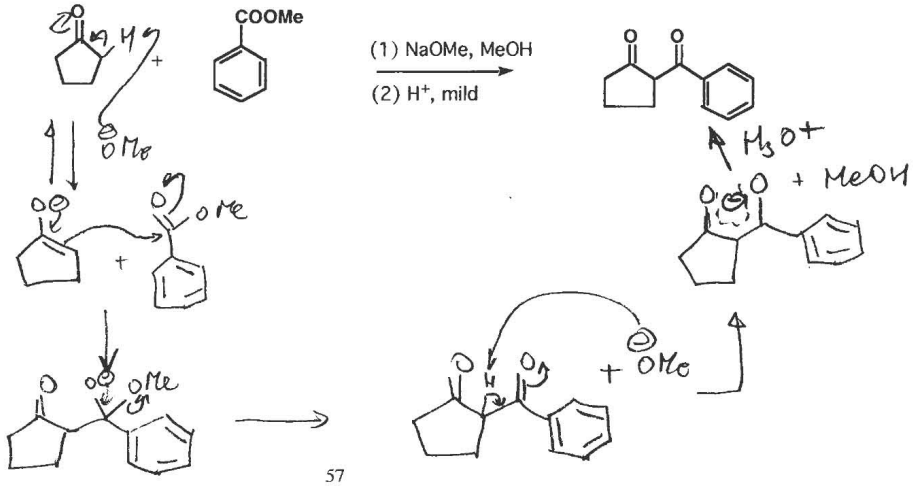
name: Hofmann

III. Mechanism (20 pts) Provide detailed mechanisms for the transformations given below, showing every step in the process clearly. Use electron pushing arrows whenever you wish (they are not required but may be helpful to you).

(a) (10 pts)

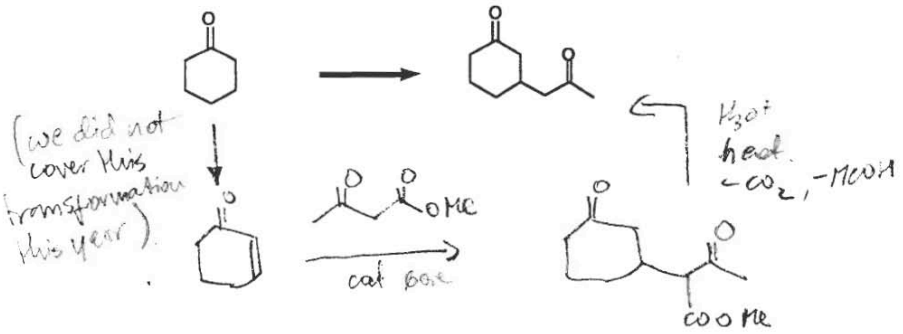


(b) (10 pts)



IV. Synthesis (15 pts) Provide a reaction sequence to accomplish ***one of the two*** following conversions (left to right) using any reagents needed to convert the carbons of the starting material into the product structure. Show reactants, products, and necessary reagents for each step in the sequence, but do not show mechanisms here.

(1)



(2)