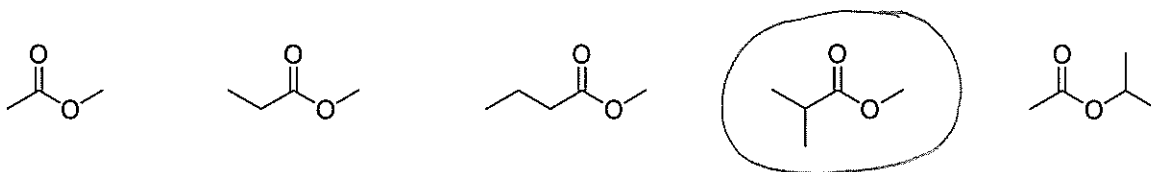


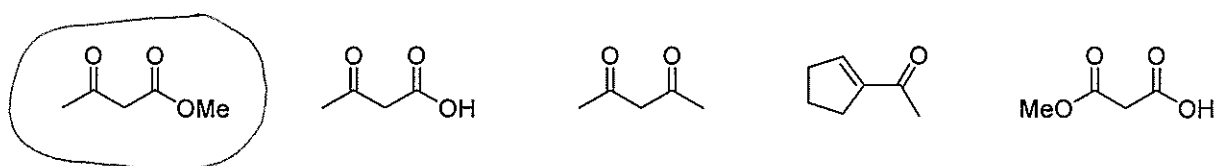
Key - Exam 3 - 3331 - Summer 09
Minger

Circle the best answer for each question (20 pts).

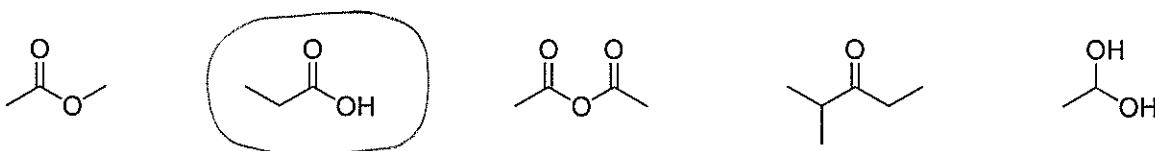
1. Which of the following esters *cannot* undergo a successful Claisen condensation with itself?



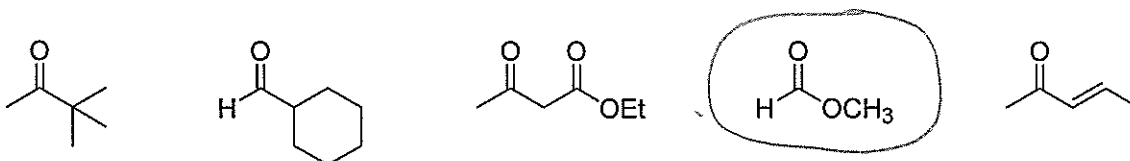
2. Which of the following is a product of a Claisen condensation?



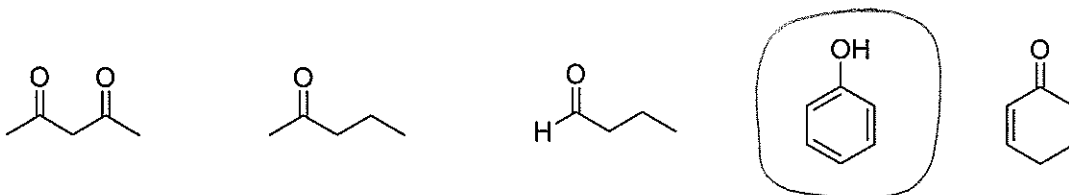
3. Which of the following is a product of the saponification of an ester, followed by an acidic workup (but **not** decarboxylation)?



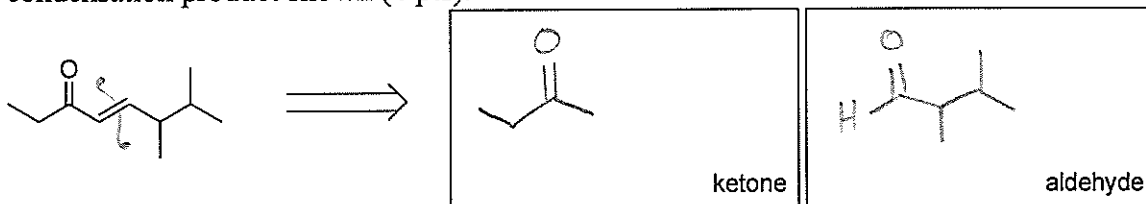
4. Which of the following compounds is **not** enolizable?

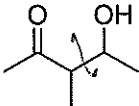


5. Which of the following compounds will have the largest amount of enol content at equilibrium?



2a. Draw the structures of the ketone and aldehyde that would have formed the aldol condensation product shown (4 pts).

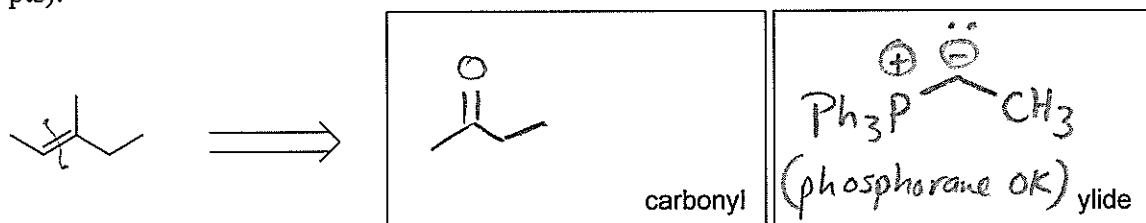


2b. This aldol reaction product:  was made using a (circle one, 4 pts)

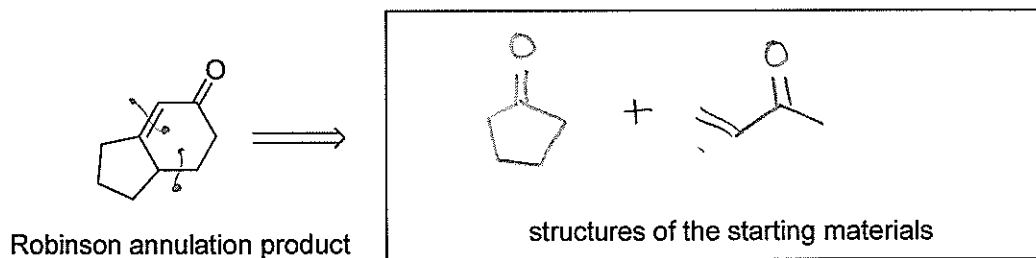
Thermodynamic enolate

Kinetic enolate

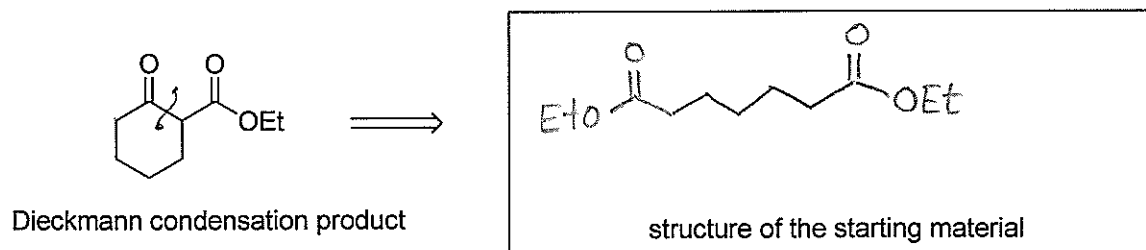
2c. Draw the structures of the carbonyl compound and the phosphorous ylide that would be combined to form the alkene product shown *in the most efficient manner* (4 pts).



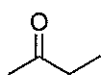
2d. Draw the structures of the two organic starting materials that were treated with sodium ethoxide in ethanol to make the Robinson annulation product shown. (4 pts)



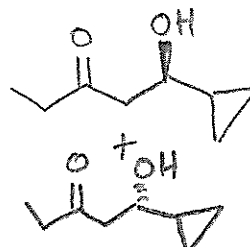
2e. Draw the structure of the organic compound that was treated with sodium ethoxide in ethanol to form the Dieckmann condensation product shown. (4 pts)



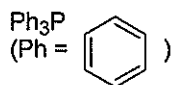
3. Predict the major organic product of each of the following reactions. Assume aqueous workup for all reactions if not shown explicitly. **Show stereochemistry in the product where appropriate.** (20 pts)



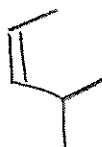
1. LDA, 1.1 equiv.
- 2.
3. H_3O^+ workup



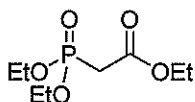
(racemate OK)



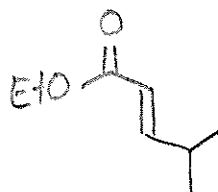
- 1.
2. NaNH_2
- 3.



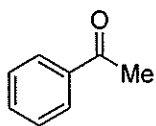
Z alkene



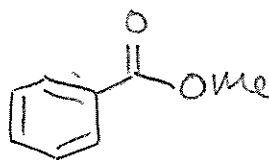
1. NaH or NaOH
- 2.



E alkene



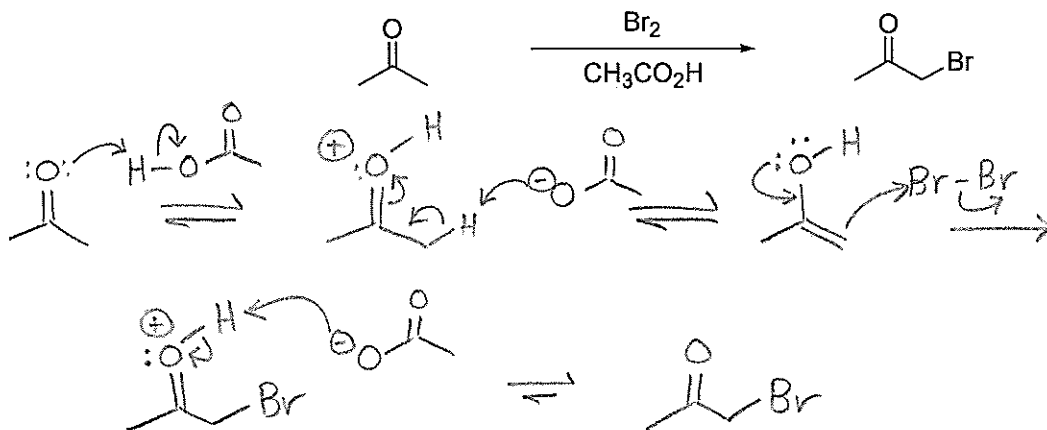
1. excess NaOH ,
3 equiv. Br_2 ,
then H_3O^+
2. MeOH , trace
 H_2SO_4



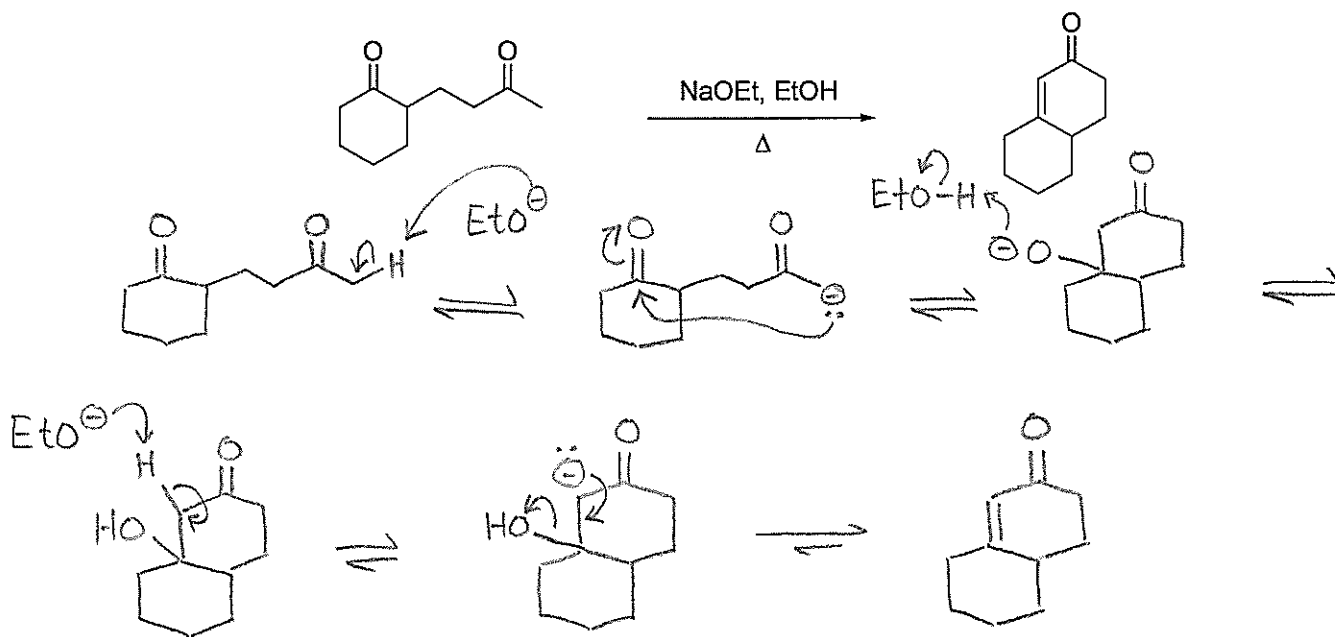
1. LDA
- 2.
3. H_3O^+



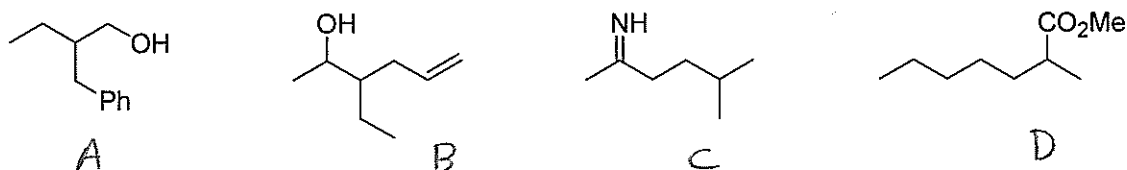
4a. Draw a mechanism for the transformation shown here. Include all necessary lone pairs, curved arrows and non-zero formal charges for full credit. (10 pts)



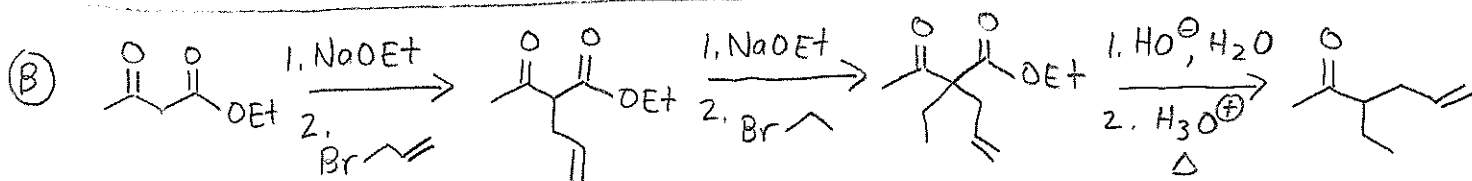
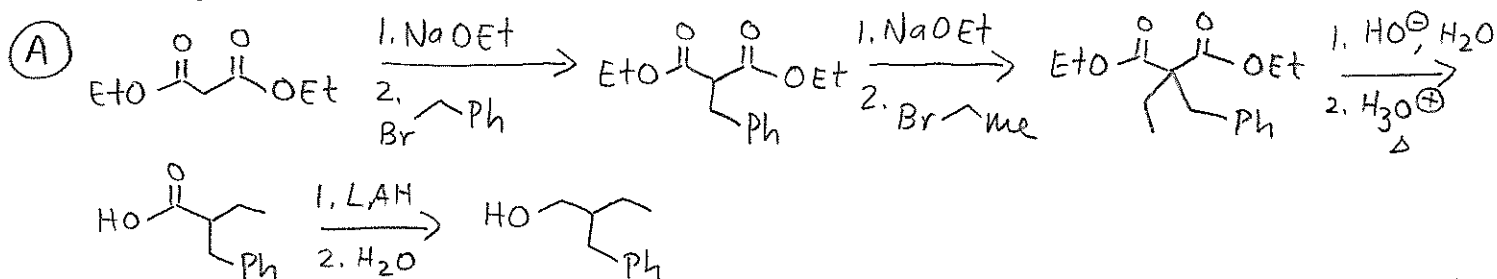
4b. Draw a mechanism for the transformation shown here. Include all necessary lone pairs, curved arrows and non-zero formal charges for full credit. (10 pts)



5. Each of the following compounds can be made using the malonic ester synthesis or the acetoacetic ester synthesis as a key part of the overall synthesis. Choose **any two** of these compounds and design a multi-step synthesis starting from either diethyl malonate or ethyl acetoacetate, as appropriate. (Structures are on the first page of the exam.) Show the reagents needed for each step and the product of each step. Do not draw any mechanisms. **Circle the two compounds you are going to make.** (20 pts)



Synthesis 1:



Synthesis 2:

