

Exam 3

CHM 202E- Organic Chemistry II

April 24, 2006

Name (Please Print): \_\_\_\_\_

Exam Key

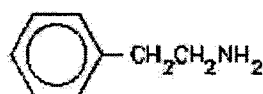
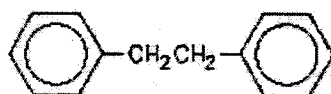
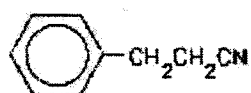
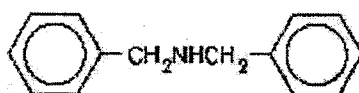
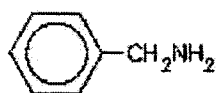
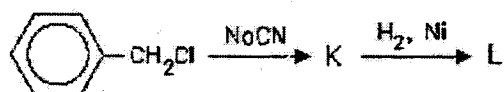
You have: → Test Form 2 ←

To be properly graded, you must bubble in your correct Test Form number on your Scantron!

The last sheet is a scratch page. You can rip it out after we tell you to begin!

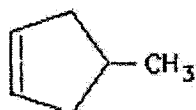
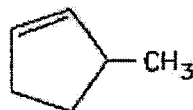
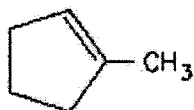
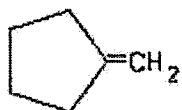
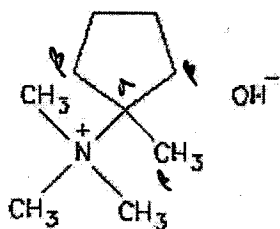
25 questions. 100 pts total. All questions worth an equal amount.

1. What would be the product, L, of the following reaction? Assume the Ni catalyst in the second step functions the same as Pd on C.



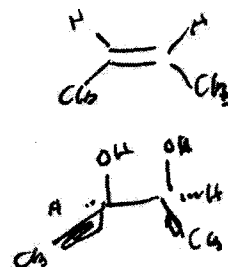
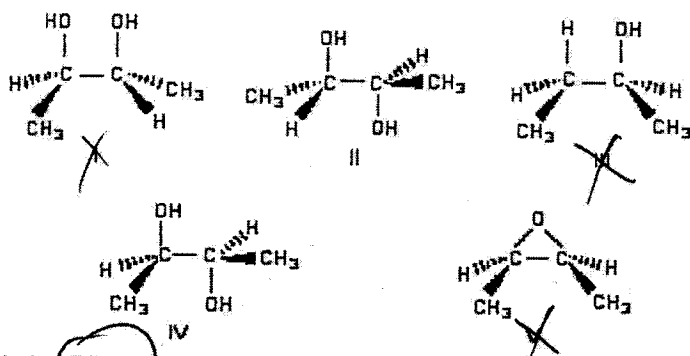
- A) I B) II C) III D) IV **E) V**

2. What is the chief product of the Hofmann elimination reaction applied to the compound shown?



- A) I** B) II C) III D) IV E) V

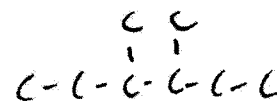
3. Hydroxylation of *cis*-2-butene with cold alkaline (basic)  $\text{KMnO}_4$  yields



- A) I (B) II C) III D) IV E) V

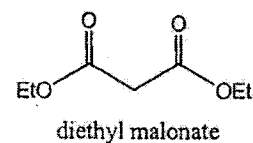
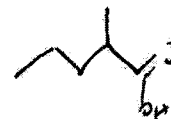
4. An alkene adds hydrogen in the presence of a catalyst to give 3,4-dimethylhexane. Ozonolysis of the alkene followed by treatment with zinc and water gives a single organic product. The structure of the alkene is:

- A) 
$$\begin{array}{c} \text{CH}_3 \quad \text{CH}_3 \\ | \quad | \\ \text{CH}_3\text{CH}=\text{C}-\text{CHCH}_2\text{H}_3 \quad (\text{cis or trans}) \end{array}$$
- B) 
$$\begin{array}{c} \text{CH}_3 \quad \text{CH}_2\text{CH}_3 \\ | \quad | \\ \text{CH}_3\text{CH}_2\text{C}=\text{CCH}_3 \quad (\text{cis or trans}) \end{array}$$
- C) 
$$\begin{array}{c} \text{CH}_3 \\ | \\ \text{CH}_2=\text{CCH}_2\text{CHCH}_2\text{CH}_3 \\ | \\ \text{CH}_3 \end{array}$$
- D) 
$$\begin{array}{c} \text{CH}_2 \\ || \\ \text{CH}_3\text{CH}_2\text{CCHCH}_2\text{CH}_3 \\ | \\ \text{CH}_3 \end{array}$$
- E) 
$$\begin{array}{c} \text{CH}_3\text{CH}_2\text{CH}-\text{CHCH}=\text{CH}_2 \\ | \quad | \\ \text{CH}_3 \quad \text{CH}_3 \end{array}$$



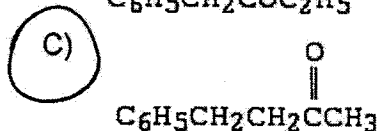
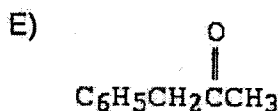
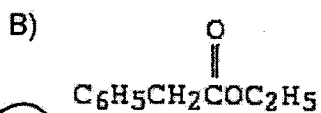
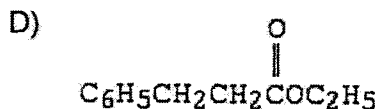
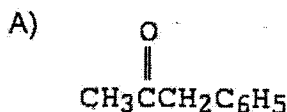
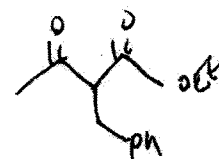
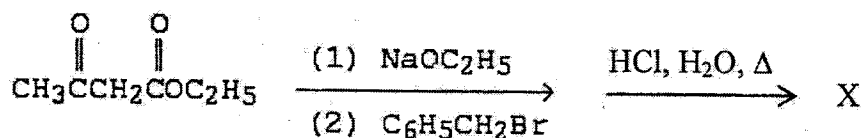
5. Which organic reagents would you need to make 2-ethylpentanoic acid from diethyl malonate?

- A) 3-bromohexane and sodium ethoxide  
 B) bromoethane, 1-bromopropane, sodium ethoxide  
 C) 3-bromopentane and sodium ethoxide  
 D) bromoethane, 2-bromopropane, sodium ethoxide  
 E) 2-bromopentane and sodium ethoxide

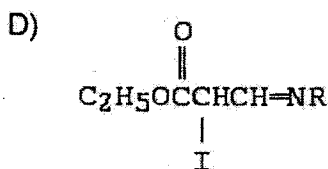
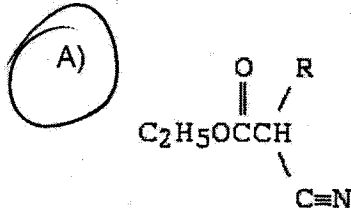
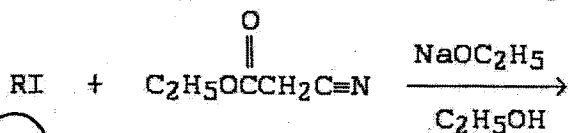




6. The product, X, of the following reaction sequence, would be:



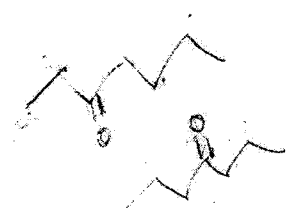
7. The following generalized reaction, would give which product?



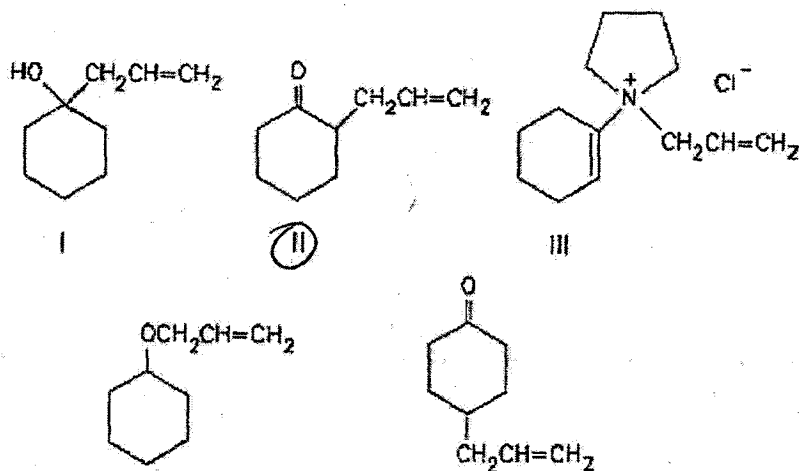
8. Treatment of 3-heptanone with sodium borohydride followed by  $\text{H}_3\text{O}^+$  yields two organic products while treatment of 4-heptanone with the same sequence of reagents yields one organic product. Which statement best explains this observation?

*NaBH<sub>4</sub>*

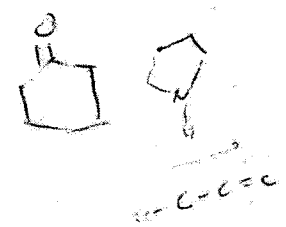
- a. 3-heptanone is more reactive
- b. 4-heptanone less susceptible to reductive transformation
- c. 3-heptanone has two different leaving groups whereas 4-heptanone only has one
- d. 4-heptanone is less susceptible to oxidative transformation
- e. none of the above



9. What product is finally formed when the initial compound formed from cyclohexanone and pyrrolidine is mixed with allyl chloride ( $\text{ClCH}_2\text{CHCH}_2$ ) and that product is hydrolyzed in  $\text{HCl}/\text{H}_2\text{O}$ ?

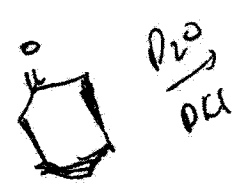


- A) I (B) II C) III D) IV E) V

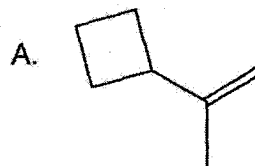


10. A dilute solution of cyclohexanone in  $\text{D}_2\text{O}/\text{DCl}$  is shown to exchange all its  $\alpha$ -hydrogens for deuterium to form 2,2,5,5-tetradeuteriocyclohexanone. Which best explains this outcome under these conditions?

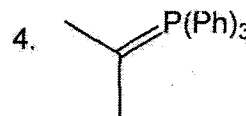
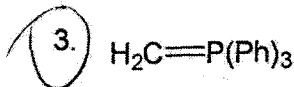
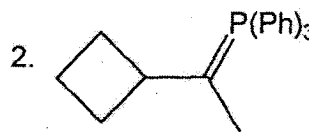
- a. enolate formation is reversible  
 b. enolate formation is irreversible  
 c. enol formation is reversible  
 d. enol formation is irreversible  
 e. the kinetic isotope effect governs the product outcome



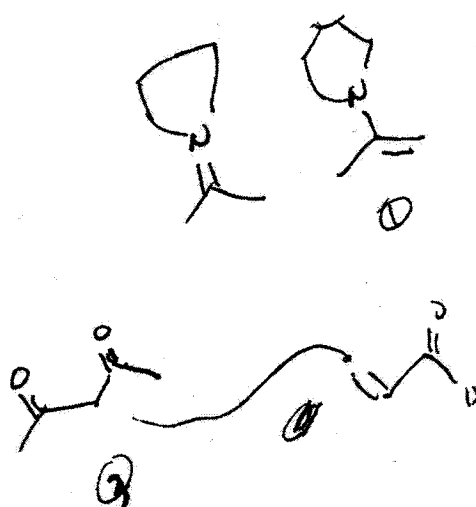
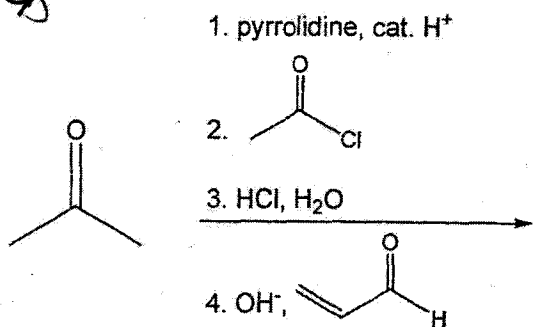
11. Which would be the preferred ylide for making A via a Wittig reaction? (Assume you would pair this with the appropriate partner molecule).

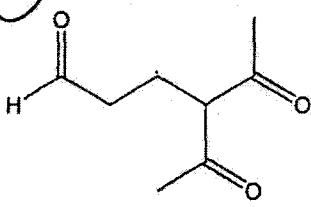
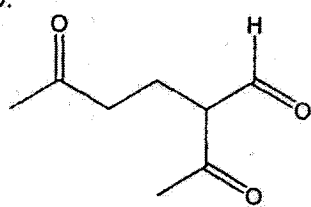
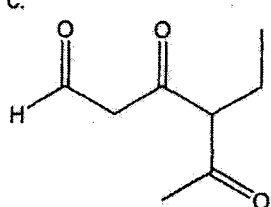
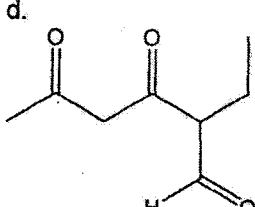


- a. 1  
 b. 2  
 c. 3  
 d. 4  
 e. 2 or 3 equally preferred

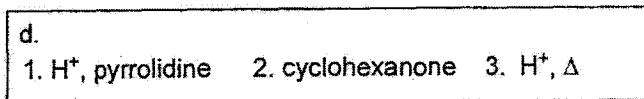
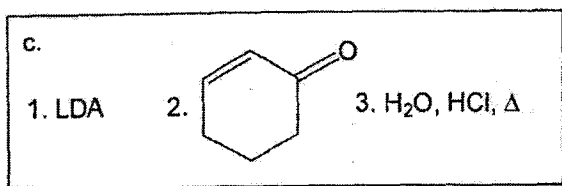
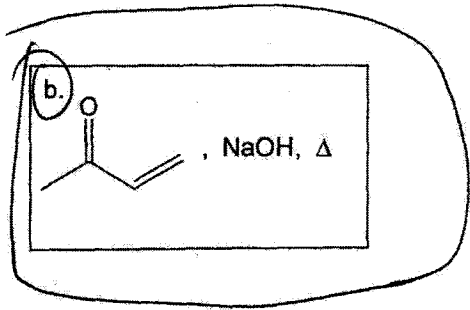
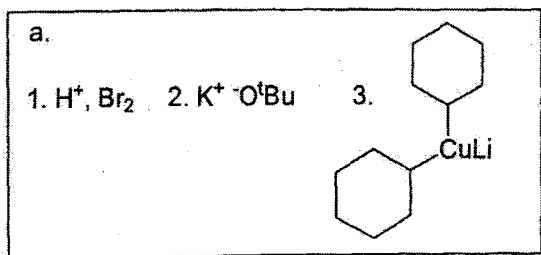
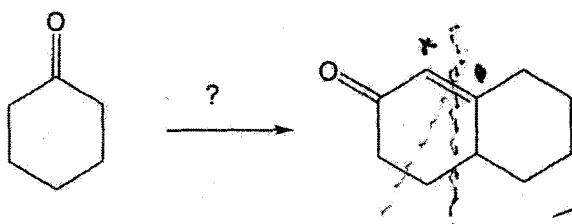


12. Indicate the product of the following:



- a. 
- b. 
- c. 
- d. 
- e. None of the above

13. Identify the proper reagents/conditions for the following transformation.



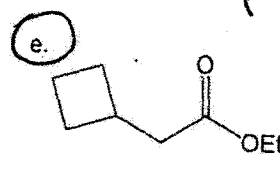
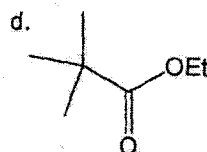
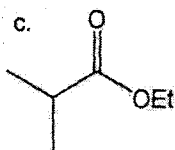
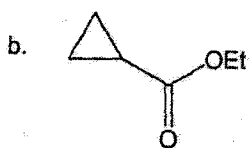
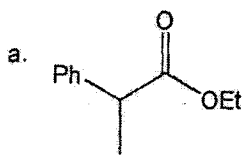
e. None of the above



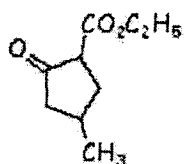
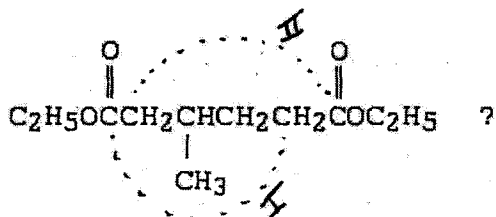
14. Which would form a Claisen condensation product when treated with NaOEt followed by acidification?

*need two alpha H's!*

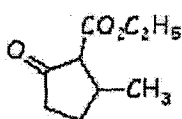
*overshoot step needs to protonate*



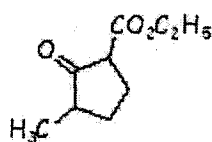
15. What is(are) the product(s) of the Dieckmann condensation of this diester (in other words, treating this with sodium ethoxide in ethanol yields...)



I



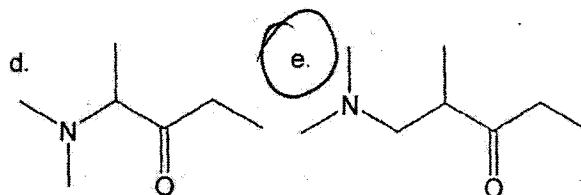
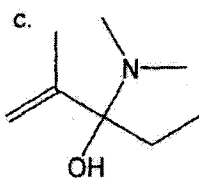
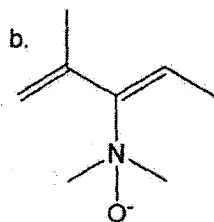
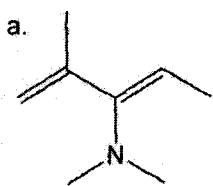
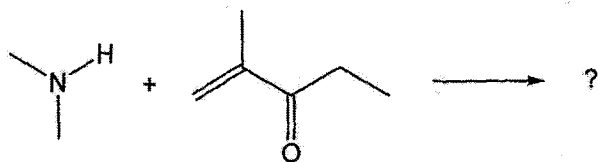
II



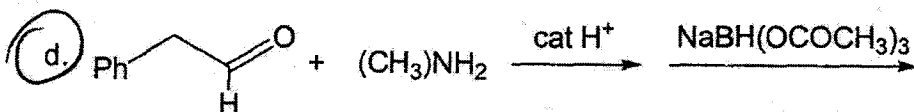
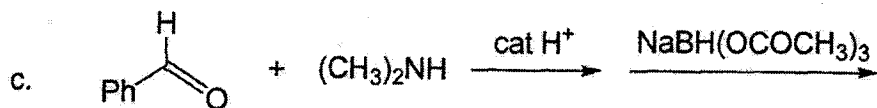
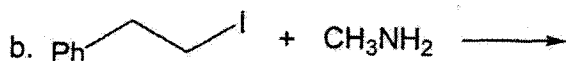
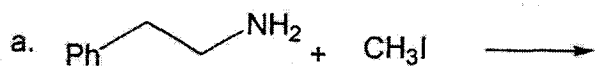
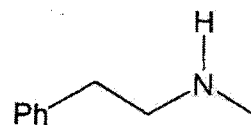
III

A) I B) II C) III **D) I and II** E) I, II, and III

16. Identify the major product. Other than the two reactants shown, there are no other additives.



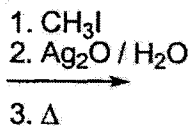
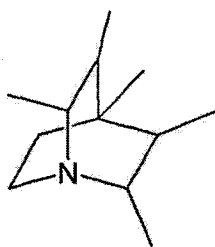
17. Identify the best method to prepare the compound shown at right.



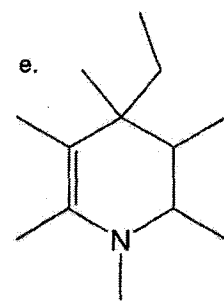
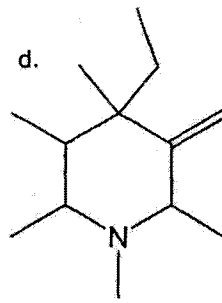
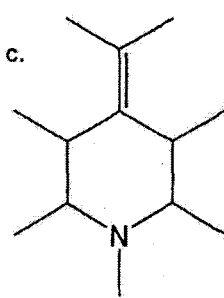
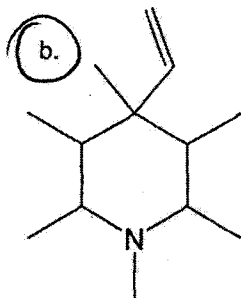
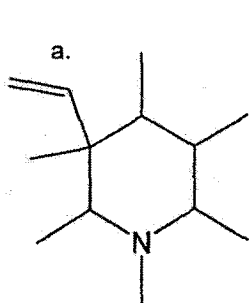
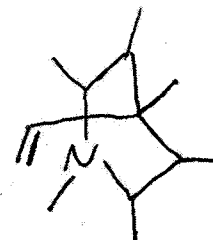
e. None of the above

*red. amination*

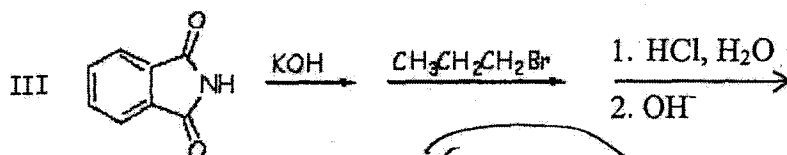
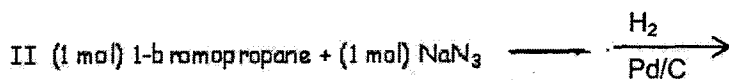
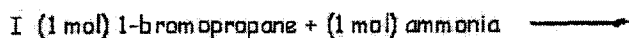
18. Indicate the product.



?



19. Which of the following would be recommended to prepare propanamine (pure)?

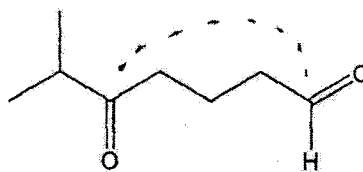


A) I B) II C) III D) I and II **E) II and III**

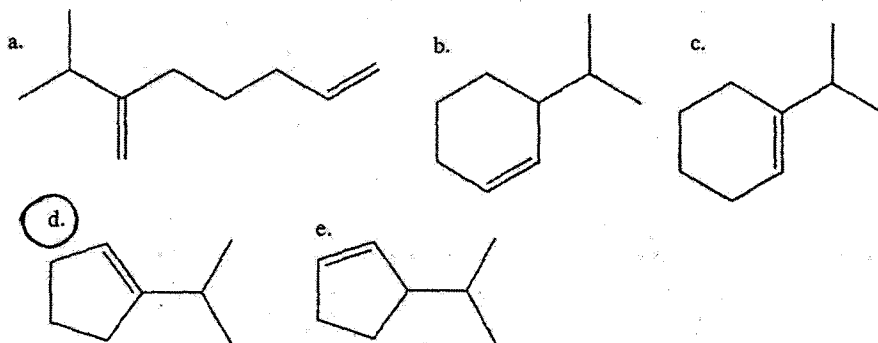


20. An alkene with molecular formula  $C_8H_{14}$  is treated with ozone and then zinc and water.

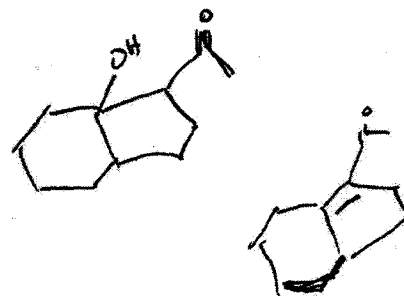
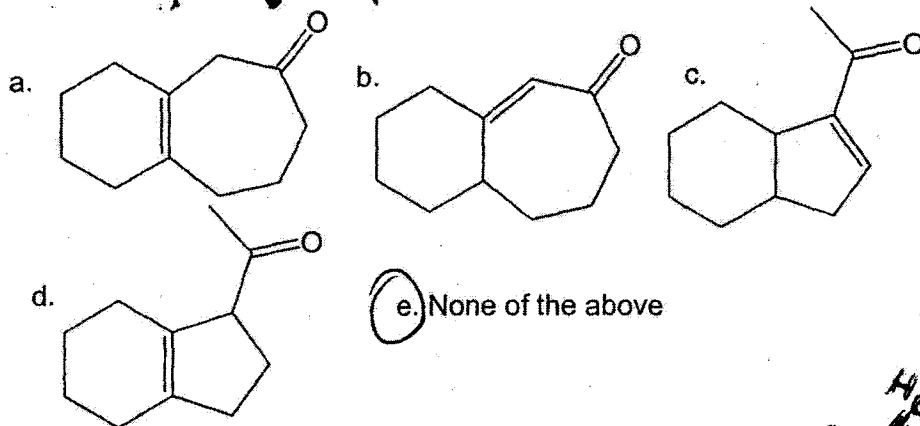
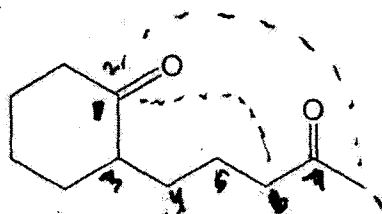
The product isolated from these reactions is:



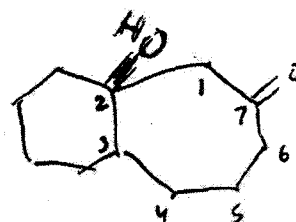
What is the structure of the alkene?



21. Indicate the major product.

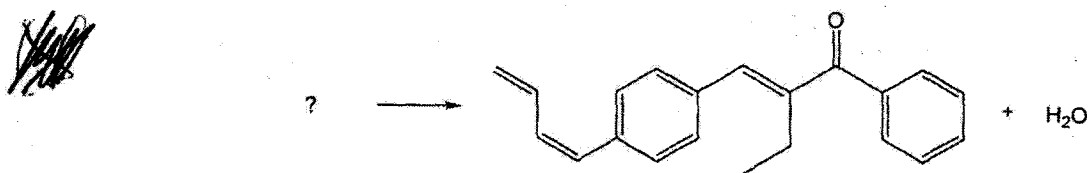


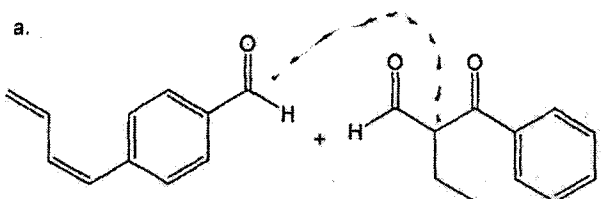
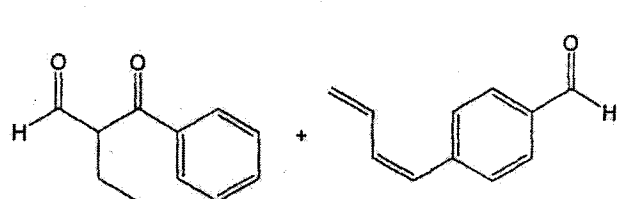
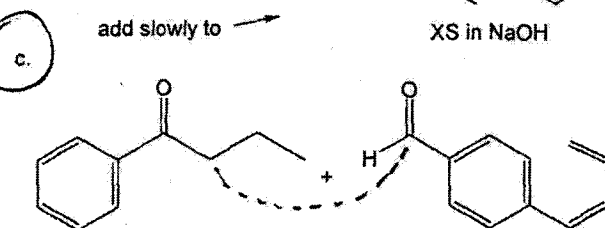
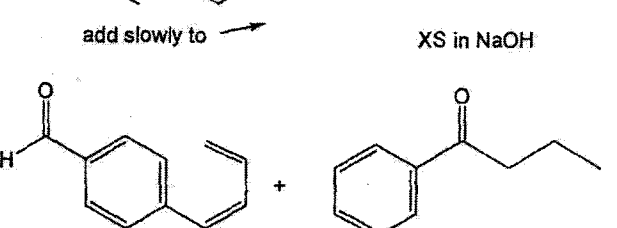
See P. 881



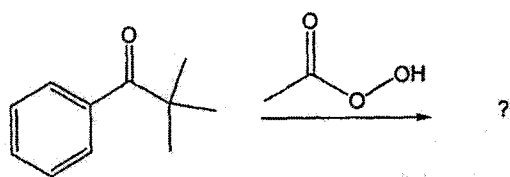
5 mem. ring more  
stable than 7 ∴  
only 5 mem ring forms

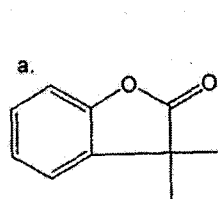
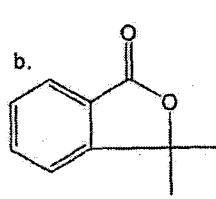
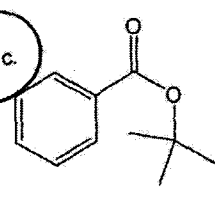
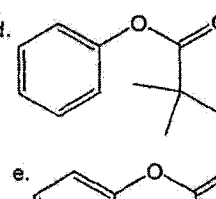
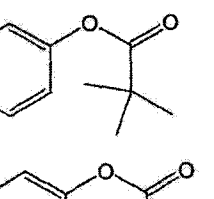
22. Which pair of compounds/conditions is best suited to making the following?



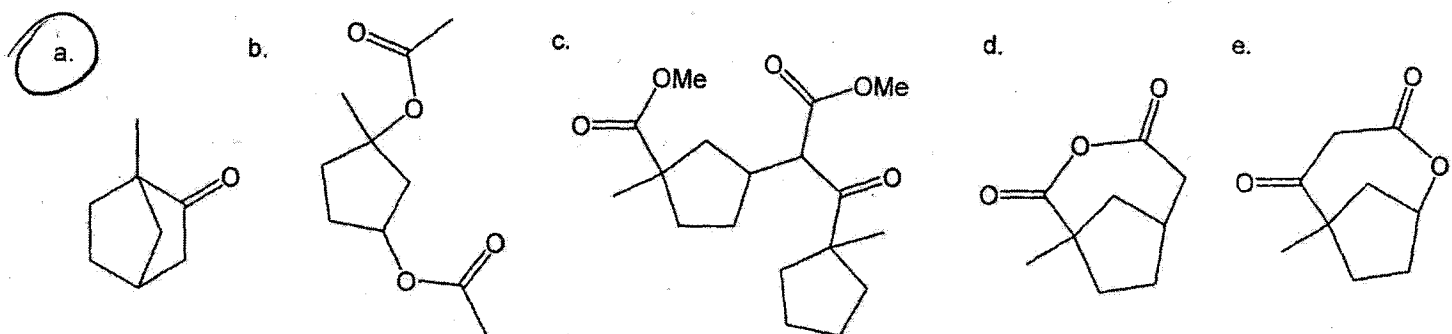
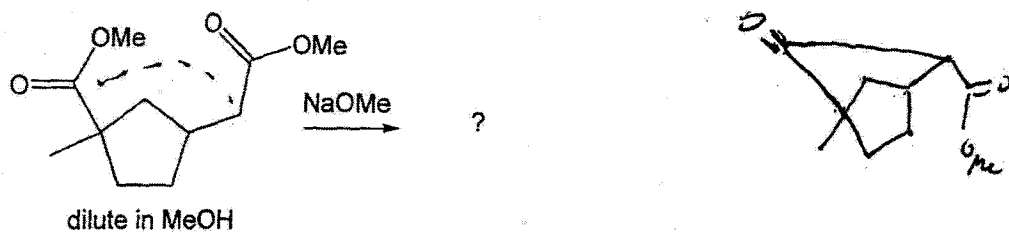
- a.  add slowly to  $\longrightarrow$  XS in NaOH
- b.  add slowly to  $\longrightarrow$  XS in NaOH
- c.  add slowly to  $\longrightarrow$  XS in NaOH
- d.  add slowly to  $\longrightarrow$  XS in NaOH
- e. None of the above

23. Identify the product.

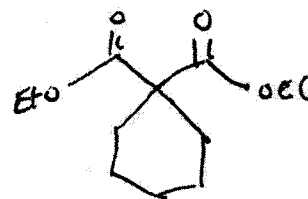
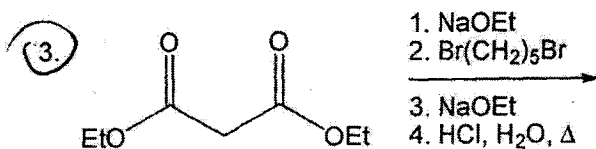
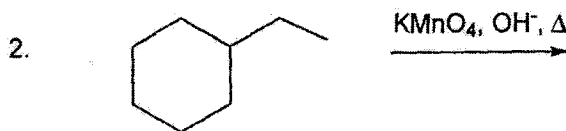
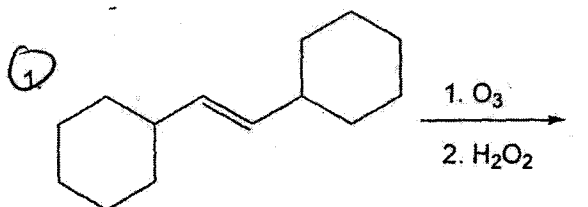
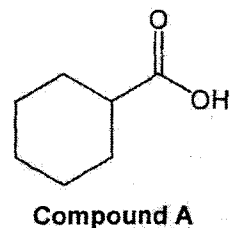


- a. 
- b. 
- c. 
- d. 
- e. 

24. A dilute methanol solution of the compound shown below was treated with sodium methoxide. Indicate the major product.



25. Identify all possible valid routes to compound A from the choices below.



- a. 1 only
- ~~b. 1, 2~~
- ~~c. 2, 3~~
- d. 1, 3
- ~~e. 1, 2, 3~~