University of Canterbury

Mid Year Examination and Test Period 2009

Prescription Number(s):	CHEM 362
Paper Title:	Organic Chemistry

Time Allowed:	2.5 hours
Number of pages:	TEN

This paper is in **TWO** sections:

SECTION A: (50 marks)
Answer **ALL** questions.

SECTION B: (50 marks)
Answer **TWO** questions.

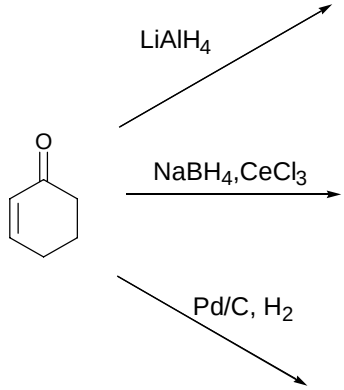
SECTION A

(Answer **ALL** questions in this section.)

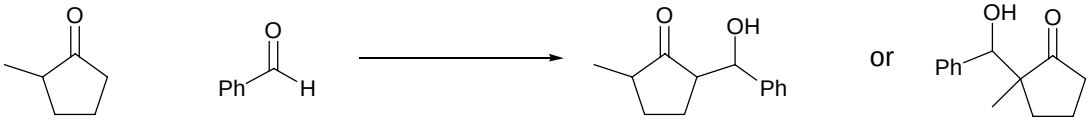
1. (10 marks)

Answer ***EITHER*** (a) ***OR*** (b)

(a) Predict the outcome of the reaction of the molecule below with each of the reducing agents shown. Provide an explanation for the different reaction outcomes and mechanisms for the reactions. In all cases you should assume an aqueous workup at the completion of the reaction.



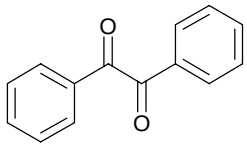
(b) In the following conversion two regioisomeric products (A and B) are possible; illustrate how the use of specific enol equivalents could be used to give selectivity between these products. You should include mechanistic detail of the formation of your enol equivalents and their subsequent reactions.

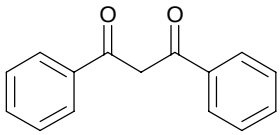


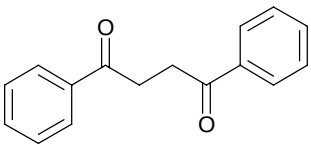
A **B**

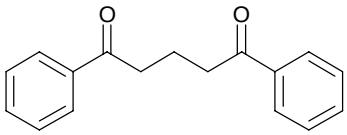
2. (10 marks)

Using retrosynthetic analysis show how the relationship between the two carbonyl functional groups influences your suggestions for a synthesis of **THREE** of the following compounds. You must use starting materials containing only one aromatic ring. Show, by means of structural diagrams, mechanisms for the reaction sequences you use.



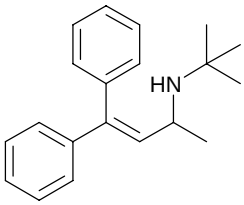






3. (28 marks)

Using retrosynthetic analysis, show how **FOUR** of the following molecules, (a) – (e), could be synthesised. You *must* use the starting material shown as part of your synthetic scheme, though you may use any other carbon fragment as required. Include all reagents required.

(a) 

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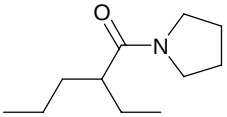
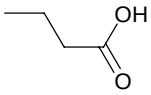
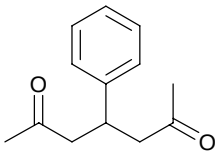
(b) 

from 

(c) 

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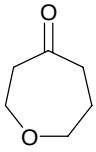
(d) 

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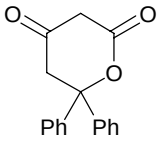
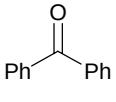
(e) 

from 

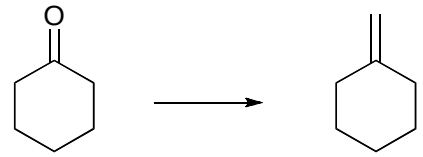
SECTION B

(Answer **TWO** questions in this section.)

4. (a) Explain how you may achieve **two** of the following transformations.

(8 marks)

(i)



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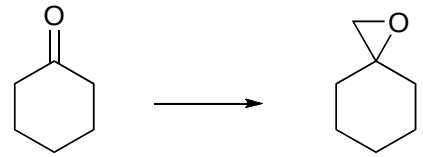

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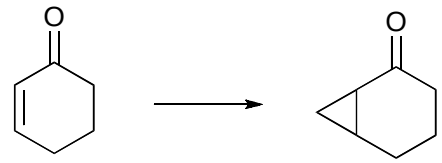
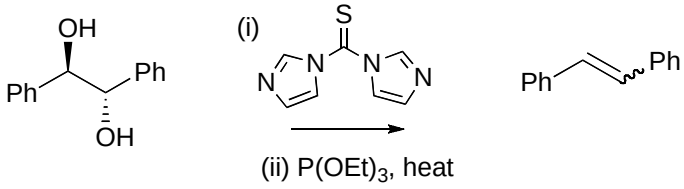


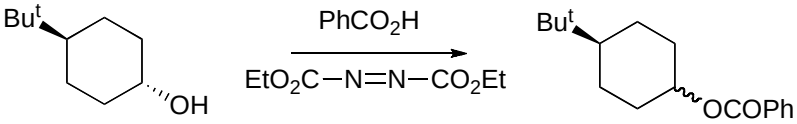
(b) For **two** of the following examples predict the stereochemistry of the product, and give a mechanistic rationalization for its formation. *(8 marks)*

(Note: ∿∿ means that only one stereoisomer is formed, but does not specify which it is)

(i)



(ii)



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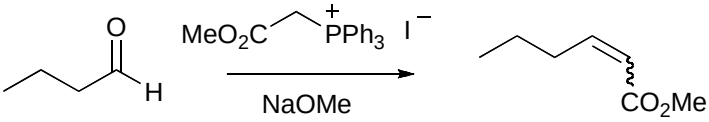
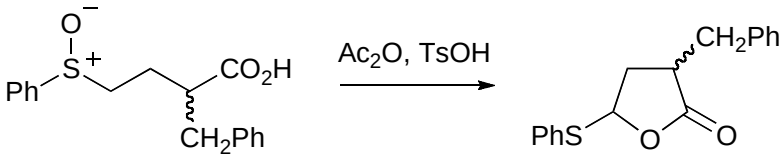


Question 4 continued on following page

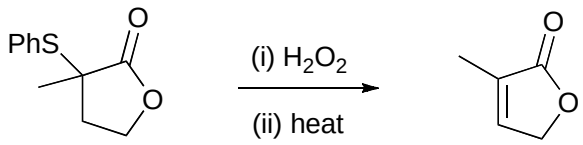
Question 4 continued

(c) Provide mechanisms for **two** of the following transformations. *(9 marks)*

(i)



(ii)



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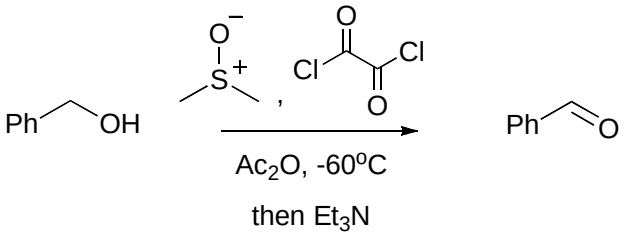
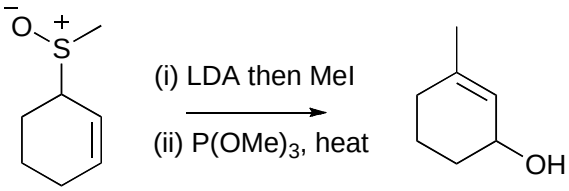
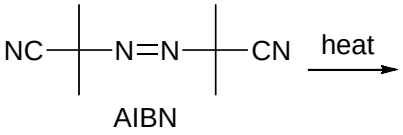


(iv)



5. (a) For **three** of the following examples, identify the reactive intermediate species that would be produced and give mechanisms for their formation.

(9 marks)

(i) 

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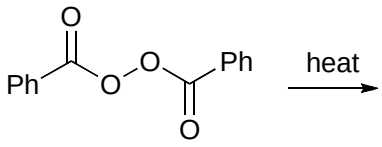
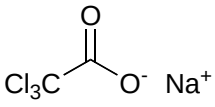
(ii) 

(iii) $CHCl_3$ NaOH →

(iv) 

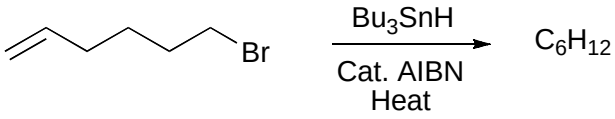
Question 5 continued on following page

Question 5 continued

(b) For **four** of the following synthetic transformations, deduce the structure of the products formed and give mechanisms for their formation. Your answer should also include a brief explanation of any regiochemical / stereochemical control that is observed during the reaction, as appropriate.

(16 marks)

(i)



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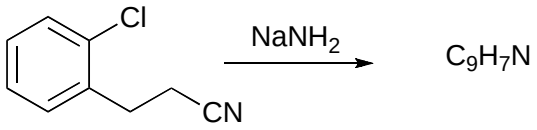

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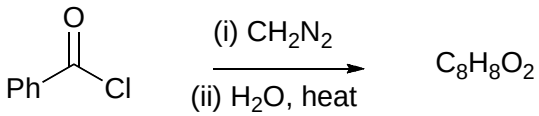
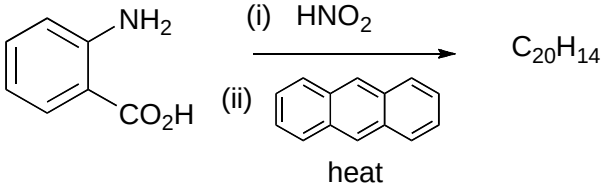
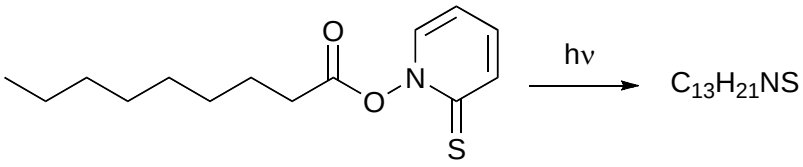


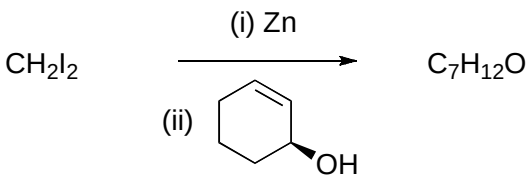
(iv)



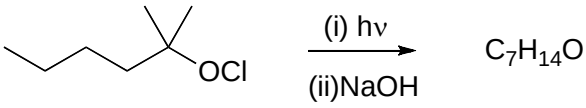
(v)



(vi)

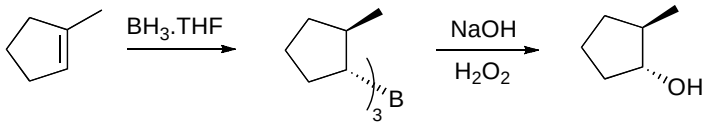


(vii)



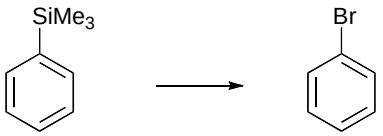
6. (a) Give a mechanistic explanation for the following reaction sequence, commenting on the aspects of regiochemistry and stereochemistry that arise.

(7 marks)

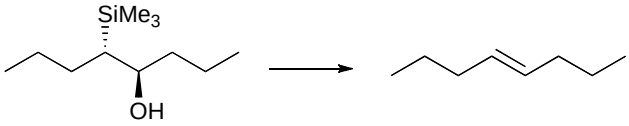


(b) For **three** of the following synthetic transformations, indicate what reagents may be used to achieve them, and give mechanisms for them. *(12 marks)*

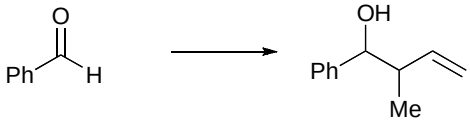
(i)



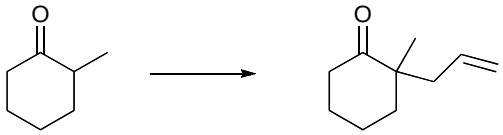
(ii)



(iii)



(iv)



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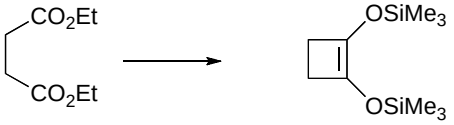
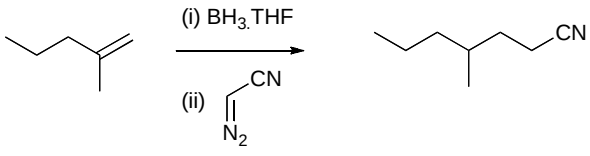


(c) Give a mechanism for **one** of the following synthetic transformations.

(6 marks)

(i)



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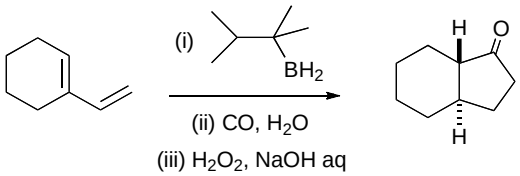

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