University of Canterbury

End-of-year Examinations 2008

Prescription Number(s):	CHEM 322
Paper Title:	Organic Chemistry

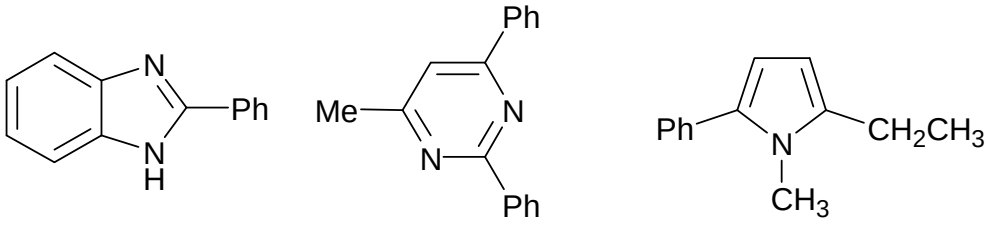
Time Allowed:	Two hours
Number of pages:	Six

Answer **ALL** questions.
Total marks = 100.

TURN OVER

1. (a) (6 marks)

Show how each of the following compounds could be prepared by reaction between a binucleophile and a bielectrophile.

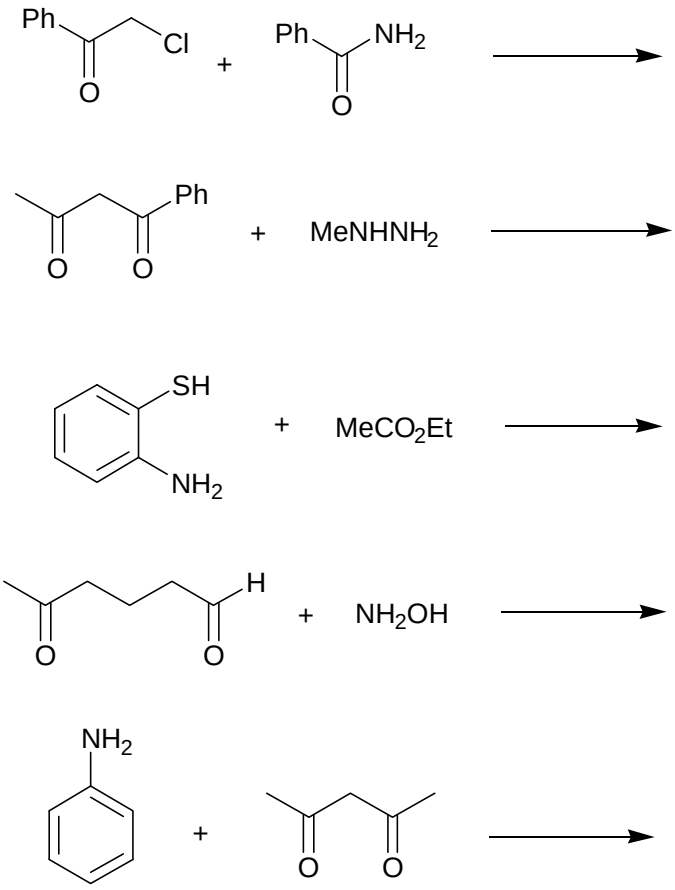


(b) (7 marks)

List the most commonly employed reaction types used for the formation of bonds in the construction of heterocyclic compounds.

(c) (5 marks)

Predict the products of the following reactions.

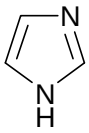


(d) (7 marks)

Pyridine is is sometimes described as π-deficient. What does this mean and how is it reflected in the properties of pyridine?

2. (a) (11 marks)

The structure of imidazole is shown below.



(i) Explain why there are only two peaks in its ^{13}C NMR spectrum.

(ii) Which carbon(s) would be the most downfield in the spectrum?

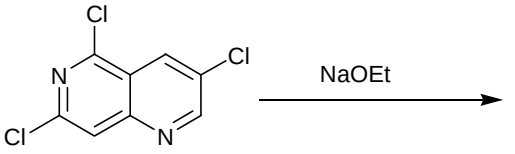
(iii) Explain why imidazole is both acidic and basic.

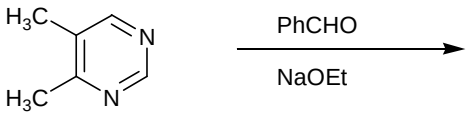
(iv) How many isomeric methylimidazoles are possible?

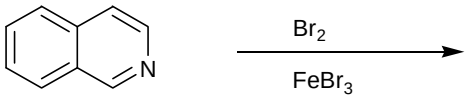
(v) Show one method of synthesising an imidazole ring.

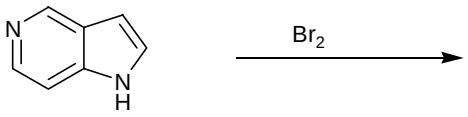
(b) (5 marks)

Predict the products of the following reactions.









Question 2 continued on following page

Question 2 continued

(c) (6 marks)

Pyridine is very unreactive towards electrophilic aromatic substitution. Outline TWO ways in which pyridines can be activated towards electrophilic substitution.

(d) (3 marks)

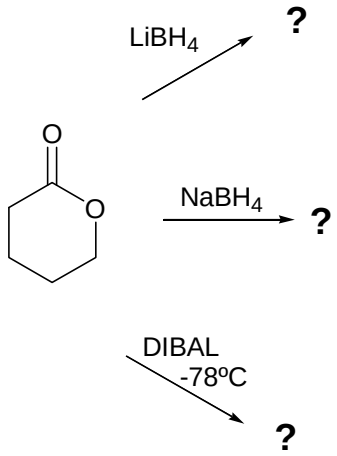
Show a reaction involving a Diels-Alder reaction of

(i) a five-membered heterocycle

(ii) a six-membered heterocycle.

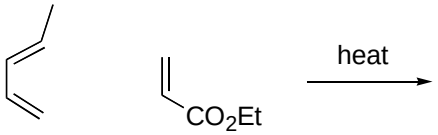
3. (10 marks)

Predict the outcome of the reaction of the lactone with each of the reducing agents shown. Provide an explanation for the different reaction outcomes and provide mechanisms for the reactions.



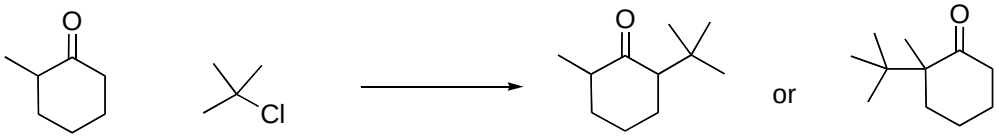
4. (10 marks)

Using clear mechanistic reasoning, predict the product of the following reaction. Account for the regio- and stereoselectivity of the reaction.



5. (10 marks)

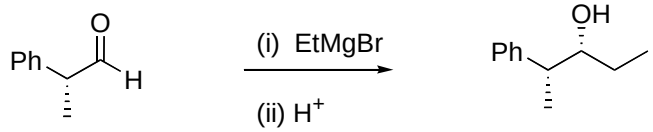
In the following reaction, two products are possible. Provide specific reaction conditions that would lead to each product and explain why these reaction conditions give the required selectivity.



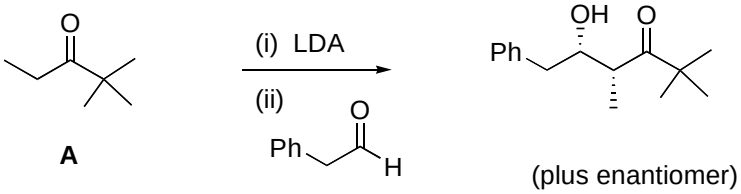
6. (20 marks)

(a) Using clear diagrams account for the stereochemistry of the product in the following reactions:

(i)

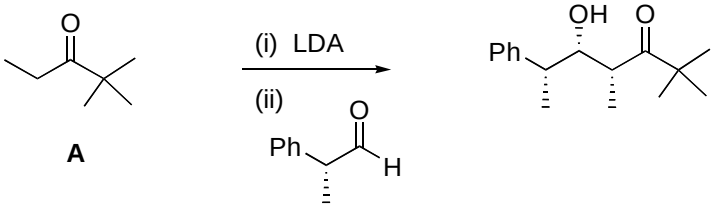


(ii)

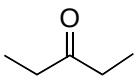


(plus enantiomer)

(iii)



(b) Explain what effect altering ketone A for ketone B below will have on the stereoselectivity of reactions (ii) and (iii) in part (a) above.



B

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