

UNIVERSITY OF WARWICK
FINAL YEAR EXAMINATIONS: April 2010

CHEMISTRY (M.Chem. Year 4)
PAPER I: Synthetic Chemistry I (Organic) & Advanced Medicinal Chemistry

Time allowed for candidates offering **ONE SECTION:** 1½ hours
Time allowed for candidates offering **TWO SECTIONS:** 3 hours

Answers to each section should be written in a separate booklet.

Percentages in square brackets are intended as a guide to the time candidates should spend in answering the corresponding part of the question. Read carefully the instructions given in each section that you attempt.

SECTION A: SYNTHETIC CHEMISTRY I (ORGANIC) (CH402)

Answer 2 questions from questions 1, 2 and 3.

You should NOT attempt MORE than TWO questions in this section since ONLY the first will be marked.

1. Answer ALL Parts.

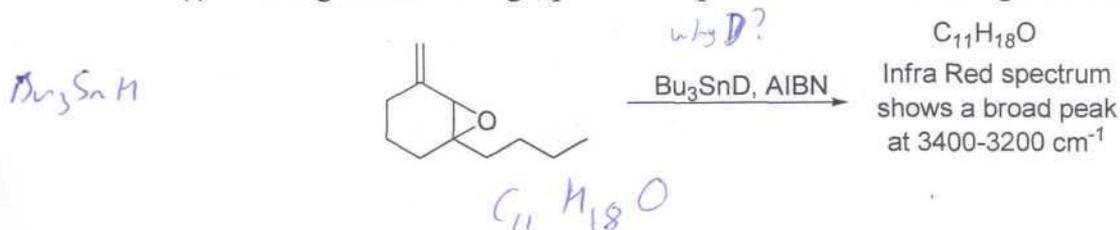
- (a) Predict the major product arising from the ring-opening reaction of each of the radicals **1** and **2**. What factors will influence the regiochemistry of the ring-opening?



[20%]

- (b) The Bu_3Sn radical can add reversibly to alkenes.

- (i) Using this knowledge, predict the product of the following reaction.



[5%]

- (ii) Draw all the possible intermediates in the reaction and explain how they are formed. Your answer should also include a mechanistic scheme.

[45%]

(Question 1 continues on the next page)

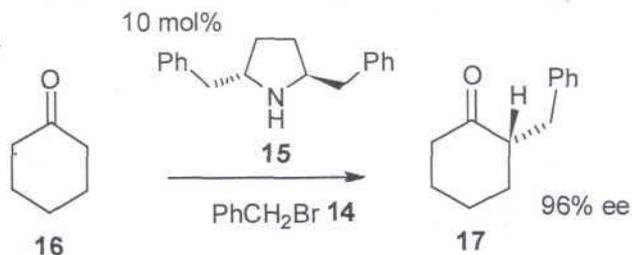
section A continues on the next page

- (c) Propose a mechanism for the formation of **13** from **12**.



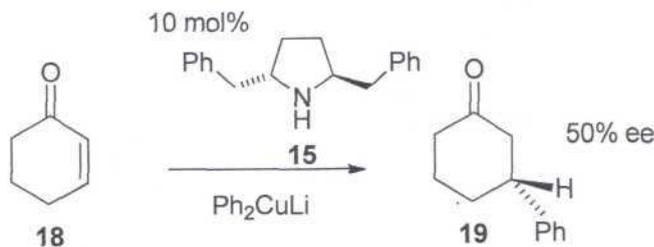
[15%]

- (d) The heterocyclic compound **15** can be used to catalyse the addition of PhCH₂Br, **14**, to **16** to give the enantiomerically enriched product **17**.



Given this information:

- (i) illustrate the intermediate that will be formed upon reaction of **15** with **16**, and give a mechanism for its formation; [15%]
- (ii) Explain, with the aid of appropriate illustrations, how the catalyst subsequently controls the absolute configuration of the product **17**. [15%]
- (iii) Explain why the use of **15** to catalyse the addition of phenylcuprate to **18** gives the product **19** with a much lower enantiomeric excess (ee) than it does for the conversion of **16** to **17**.



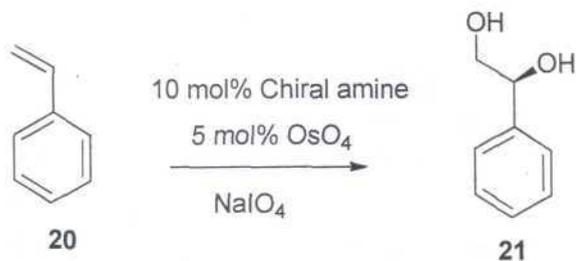
[10%]

- (e) Describe two other approaches to the asymmetric synthesis of **17**, in each case showing which bond adjacent to the chiral centre would be created. Specific mechanisms and reagents are not required.

[10%]

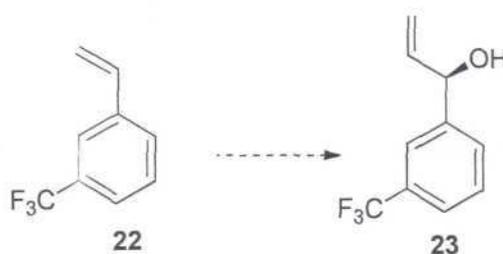
3. Answer ALL parts.

- (a) The Sharpless Asymmetric Dihydroxylation (AD) reaction converts styrene **20** into diol **21** in high enantiomeric excess (ee).



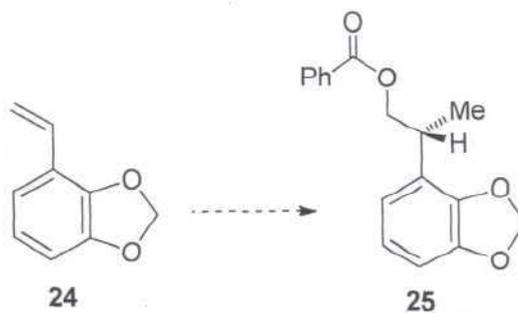
Using this information, devise reaction sequences for the following transformations (reagents should be given for each step, but mechanisms need not be shown):

- (i) allylic alcohol **23** from alkene **22**;



[15%]

- (ii) ester **25** from alkene **24**.



[15%]

(Question 3 continues on the next page)

30

