

**Name**

**Student Number**

**03-59-3310/3315**

**Midterm 2**

**27/03/19 (80 min)**

Fill out your name on each page. Make sure all pages are handed in at the end.

***Hint: There are questions of varying difficulty. Read through the exam and answer the easy ones first!***

The distribution of marks for the questions is approximate, and may change. You may use the back of any page for additional space or rough work.

Reviews:

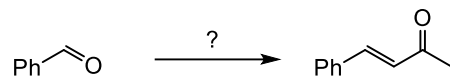
“Uber reasonable” – *Jim Green*

Q1	/14
Q2	/8
Q3	/12
Q4	/12
Q5	/8
<b>Total</b>	<b>/54</b>

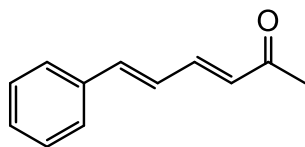
Name: \_\_\_\_\_

1. Quick fire round! [2 marks] each, unless otherwise stated

a) Suggest reagent(s) for the following reaction:

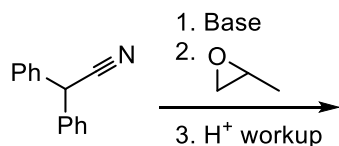


b) Circle all of the carbon atoms in this molecule that you would expect to be electrophilic (*i.e.* have a  $\delta^+$  charge)

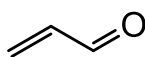


c) BRIEFLY describe the characteristics of a “soft” nucleophile

d) Draw the product of the following reaction



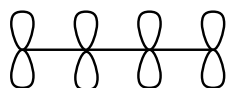
e) Indicate which atom has the largest coefficient in the LUMO of a dienophile, *e.g.* acrolein:



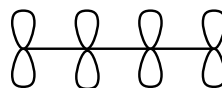
Name: \_\_\_\_\_

f) Shade the following diagrams to represent the HOMO and LUMO of butadiene, respectively.

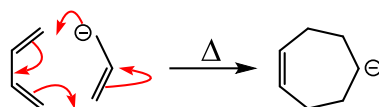
HOMO



LUMO



g) Is the following cycloaddition allowed under thermal conditions? BRIEFLY explain your answer



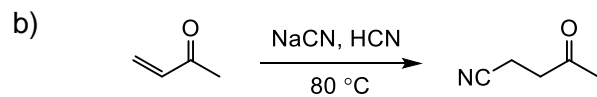
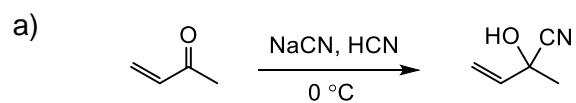
ALLOWED

or

NOT ALLOWED

Name: \_\_\_\_\_

2. Cyanide reacts differently with an  $\alpha,\beta$ -unsaturated system depending on the conditions. Provide a mechanism for each of these reactions, and **explain** the difference in reactivity between them [8 marks]

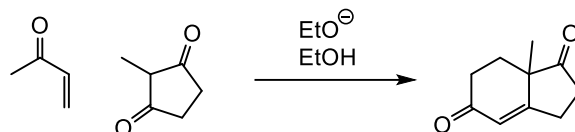


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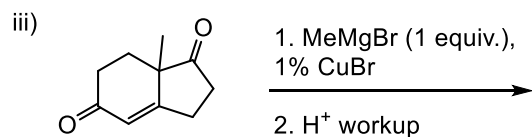
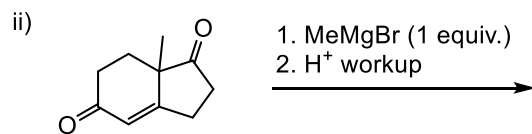
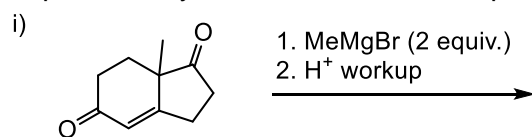
3.

a) The Wieland-Miescher ketone is a useful intermediate in the synthesis of steroids and terpenes, and is synthesised using a *Robinson Annulation*. Provide a mechanism for the reaction.

[6 marks]



b) Predict the product of these reactions of the Wieland-Miescher ketone; mechanisms are not required, but you should BRIEFLY explain your answers [2 marks each]

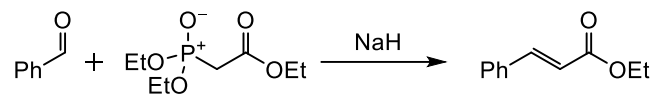


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4.

a)

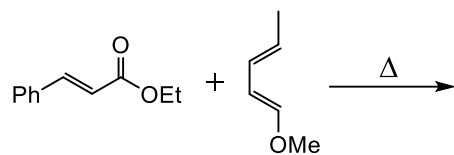
- i) Provide a mechanism for the *Horner-Wadsworth-Emmons reaction* below. You should explain the selectivity for the double bond geometry. [5 marks]



- ii) What reagent(s) would you use to make the HWE reagent from ethyl bromoacetate? [1 mark]

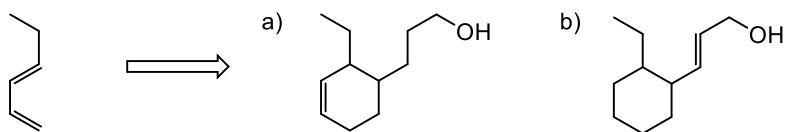
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- b) Predict the product of the following cycloaddition reaction (including stereochemistry). Is it an allowed reaction? Explain any and all selectivity, draw transition state etc. [6 marks]



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5. Both a) and b) can both be synthesised from the same starting material over several steps.  
Propose a synthesis of **ONE** of either a) or b). [8 marks]



Some chemicals that may or may not be useful:

H<sub>2</sub> Pd Lindlar Pd PPh<sub>3</sub> P(OEt)<sub>3</sub> Ph<sub>3</sub>PCuH LiAlH<sub>4</sub> CH<sub>3</sub>I

