

The Open University of Sri Lanka  
Faculty of Natural Sciences  
B.Sc. Degree Programme



Department	: Chemistry
Level	: 5
Name of the Examination	: Final Examination
<b>Course Code and Title</b>	<b>: CYU5303 Organic Chemistry II</b>
Academic Year	: 2020/2021
Date	: 02.12.2021
Time	: 01.30 p.m. - 03.30 p.m.
Duration	: 2 hours
Index number	:

### General Instructions

1. Read all instructions carefully before answering the questions.
2. This question paper consists of **Four** questions in **six** pages.
3. **Answer All FOUR (04) questions. All questions carry equal marks.**
4. Answer for each question should commence from a new page.
5. Draw fully labelled diagrams where necessary
5. Relevant log tables are provided where necessary.
6. Having any unauthorized documents/ mobile phones in your possession is a punishable offense
7. Use blue or black ink to answer the questions.
8. Circle the number of the questions you answered in the front cover of your answer script.
9. Clearly state your index number in your answer script

1) Answer any **FOUR (04)** parts from (a) – (e).

a) Explain why pyridine undergoes electrophilic substitution very slowly while nucleophilic substitution occurs rapidly.

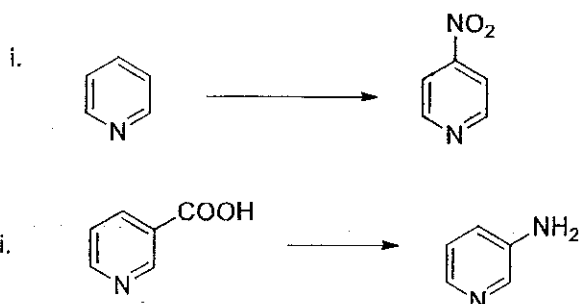
(Hint; consider the resonance structures of pyridine)

(25 marks)

b) Explain why electrophilic substitution in pyrrole occurs mainly at C-2 position and not at C-3 position.

(25 marks)

c) How would you achieve the following transformations? Give the necessary reagents and essential experimental conditions.



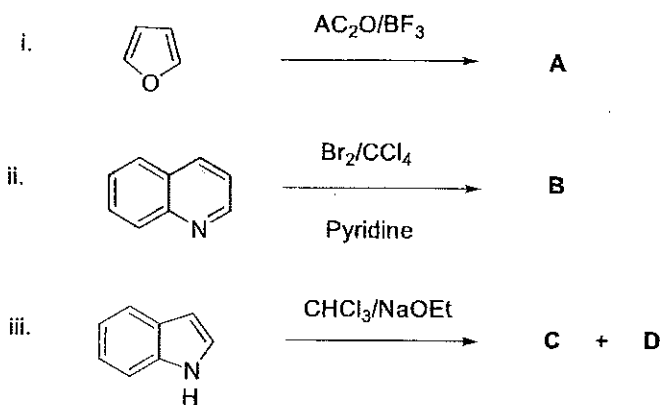
(25 marks)

d) Giving the necessary reagents indicate how you perform the following transformation? Give the mechanism for the reactions.



(25 marks)

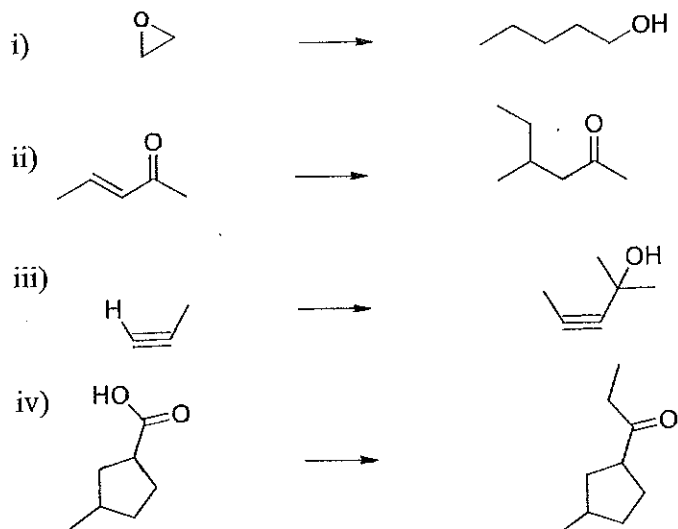
e) Predict the products of the following reactions.



(25 marks)

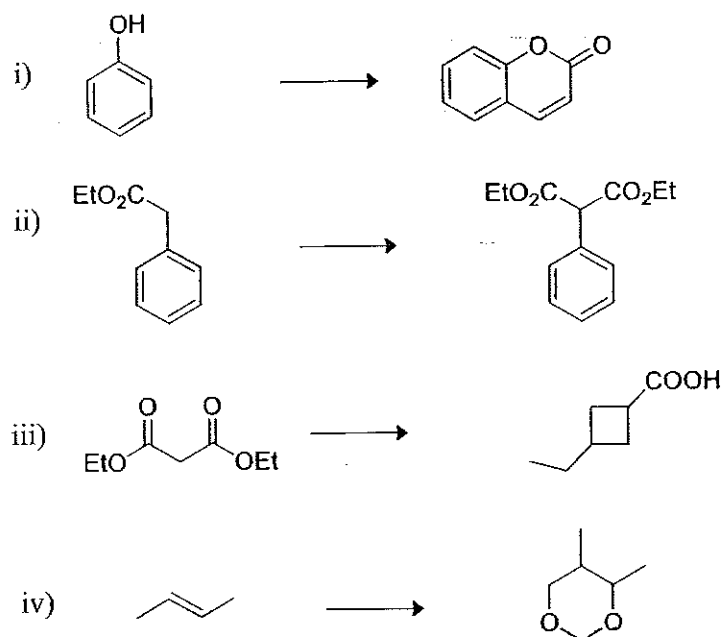
(25 x 4 = 100 Marks)

2. (a) Show how would you carry out the following syntheses using **organometallic reagents**.



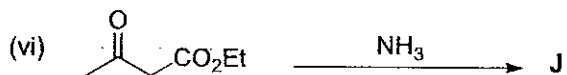
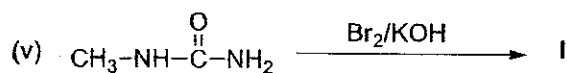
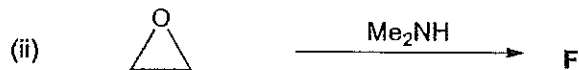
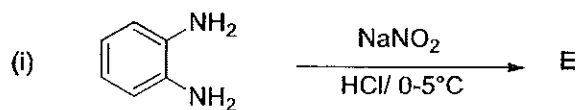
(40 Marks)

(b) Giving necessary reagents and conditions show how would you carry out any **three (03)** of the following syntheses.



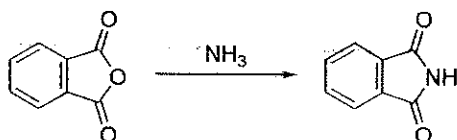
(60 Marks)

3. (a) Predict the final products (E- J) of the following reactions.



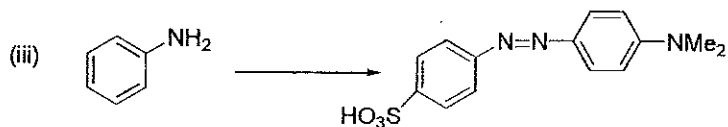
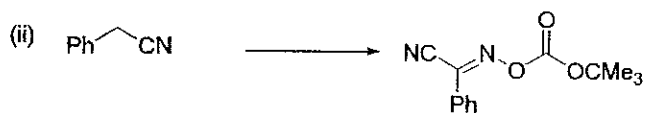
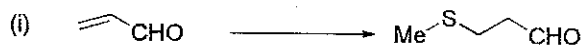
(30 marks)

(b) Write the mechanism for the following reaction.



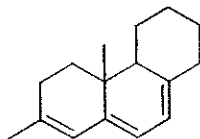
(30 marks)

(c) Show how can you carry out any two of the following transformations.



(40 marks)

4. a) Using Woodward Fieser rules calculate the  $\lambda_{\text{max}}$  of compound K.

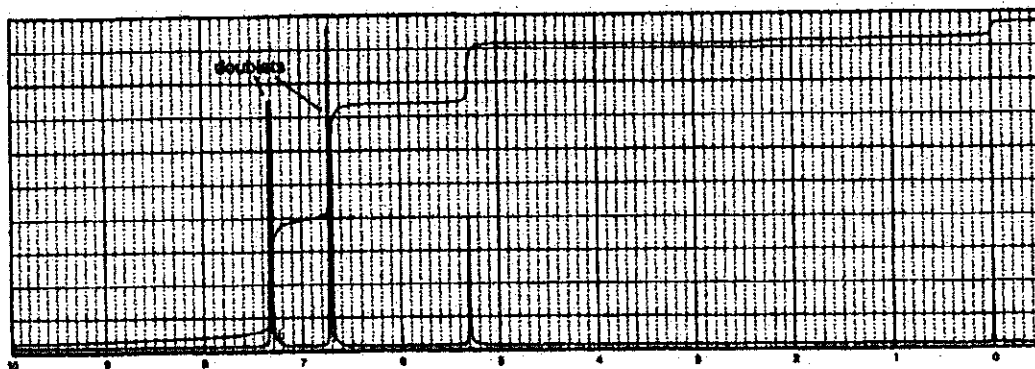


Compound K

(30 marks)

Base value for <b>heteroannular</b> or transoid diene	<b>214 nm</b>
Base value for <b>homoannular</b> or cisoid diene	<b>253 nm</b>
Increments for	
Double bond extending conjugation	<b>+30</b>
Alkyl substituent or ring residue	<b>+5</b>
Exocyclic double bond	<b>+5</b>
Polar groupings:	
<b>OAc</b>	<b>+0</b>
<b>OAlk</b>	<b>+6</b>
<b>SAlk</b>	<b>+30</b>
<b>Cl, Br</b>	<b>+5</b>
<b>N(Alk)<sub>2</sub></b>	<b>+60</b>
Solvent correction*	<b>+0</b>

b) The molecule L has a formula of  $\text{C}_6\text{H}_5\text{OX}$ . X is a halogen (The atomic weight of  $\text{Cl}=35.5$ ,  $\text{Br}=79$ , and  $\text{I}=127$  g respectively). The Mass spectrum shows an intense molecular ion at 172 m/e and an  $\text{M}+2$  peak of approximately same size. The NMR spectrum of L is given below.



- i) Calculate the degree of unsaturation of molecule L.
- ii) Identify the number of signals, area ratios and multiplicities of the signals in the  $^1\text{H-NMR}$  spectrum of molecule L.
- iii) Determine the structure of L.

(35 marks)

c) Calculate the number of fundamental modes of vibration of the molecules given below.

i)  $\text{H}_2\text{O}$

ii)  $\text{NH}_3$

iii)  $\text{HCl}$

iv)  $\text{C}_6\text{H}_6$

(20 marks)

d) Show the fragmentation pattern of  $\text{C}_6\text{H}_5\text{CH}_2\text{CH}_2\text{CH}_3$ , which gives rise to the peaks at  $m/z=120$ ,  $m/z=92$  and  $m/z=91$  in its mass spectrum.

(15 marks)

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