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

Department	: Chemistry
Level	: 5
Name of the Examination	: Final Examination
Course Code and Title	**: CYU5303 Organic Chemistry II**
Academic Year	: 2024/2025
Date	: 20.11.2024
Time	: 1.30 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.
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 is a weaker base than piperidine.

Pyridine Piperidine

(25 marks)

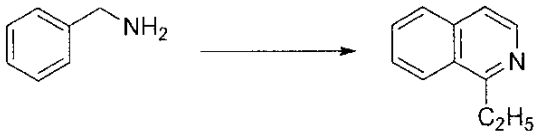
b) Explain why pyridine undergoes nucleophilic substitution readily at positions 2 and 4.
(Hint: Consider the resonance structures of pyridine)

(25 marks)

c) Explain why electrophilic substitution occurs in the 2 and 3 positions in pyridine.

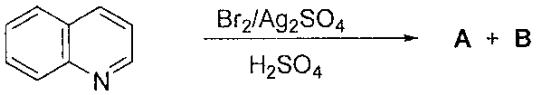
(25 marks)

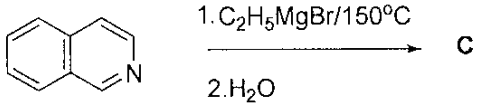
d) Giving necessary reagents indicate how you perform the following conversion. Give the mechanism for the reaction.

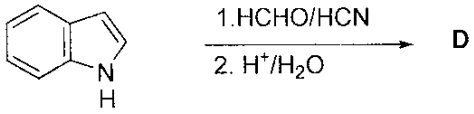


(25 marks)

e) Predict the products **A**, **B**, **C** and **D** of the following reactions.

(i) 

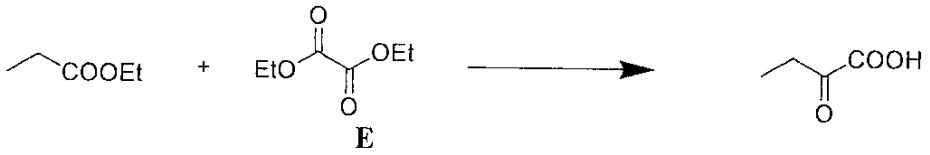
(ii) 

(iii) 

(25 marks)

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

a) i) Show how you would do the following conversion with the diethyl oxalate (**E**). Give all the reagents and conditions and intermediate products.

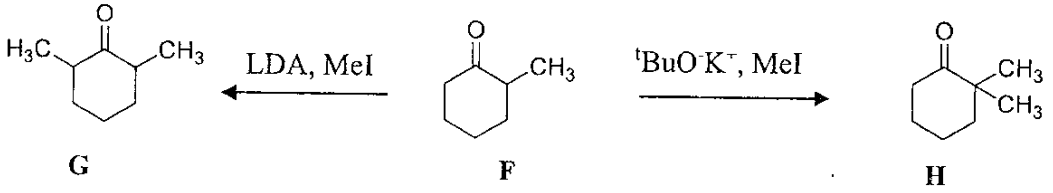


E

ii) Explain why diethyl oxalate (E) is considered a more reactive carbonyl compound.

(25 marks)

b) Consider the methylation of 2-methylcyclohexanone (**F**) with two different bases, lithium diisopropylamide (LDA) and *tert*-butoxide anion ($^tBuO^-$), producing two different products, **G** and **H**, respectively.

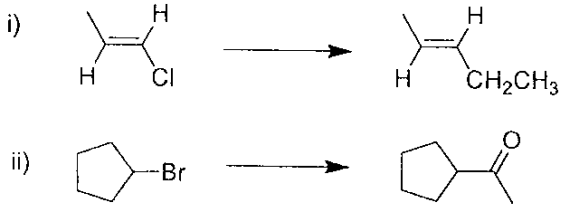


G **F** **H**

Explain the above observation using proper resonance structures.

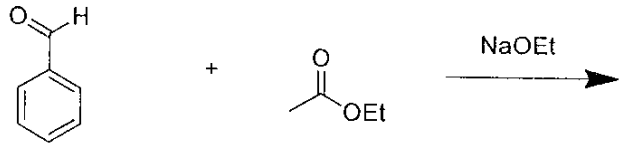
(25 marks)

c) Show how you would carry out the following syntheses using **organometallic reagents**.



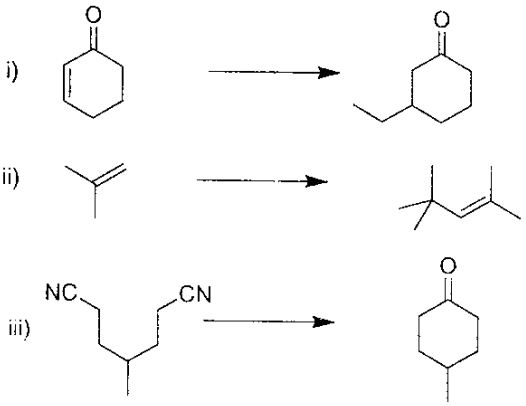
(25 marks)

d) Give the product and the mechanism of the following reaction.



(25 marks)

e) Give the necessary reagents and/or conditions for the following conversions.



(25 marks)

3) a) Consider the Grignard reaction with cyclohexanone given below. The product indicates that the Grignard approach is not suitable for the following conversion.

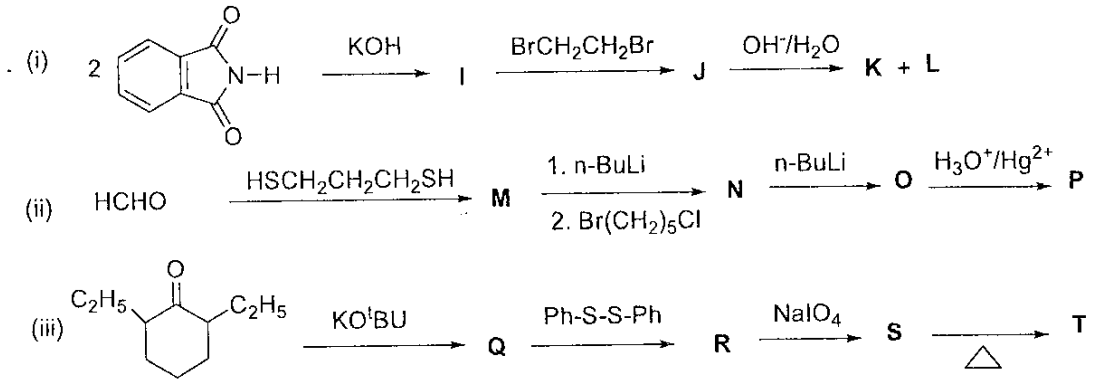
How would you effect this conversion? Give the essential conditions, reagents, and mechanism for this conversion.

(30 marks)

b) Giving the mechanism, explain how you would carry out the following conversion.

(30 marks)

c) Give the structures of the compounds **I-T** in any **two (02)** of the following reactions.

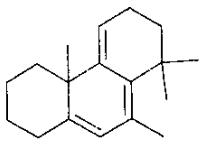


(40 marks)

4) a) Briefly explain why the carbonyl stretching frequency (1690 cm^{-1}) of an amide is lower than the carbonyl stretching frequency of an aldehyde (1715 cm^{-1})?

(20 marks)

b) Using Woodward Fieser rules, calculate the λ_{max} of compound **U**.

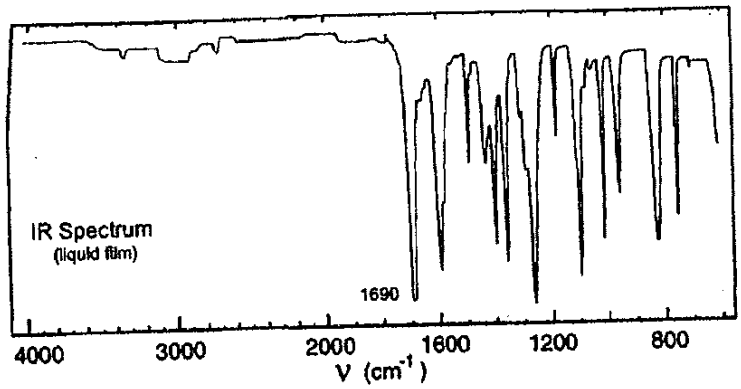


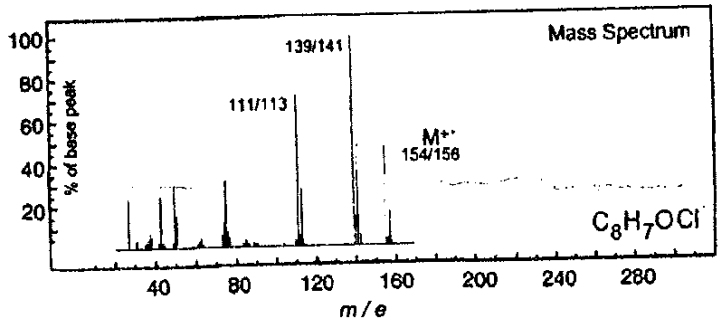
Compound **U**

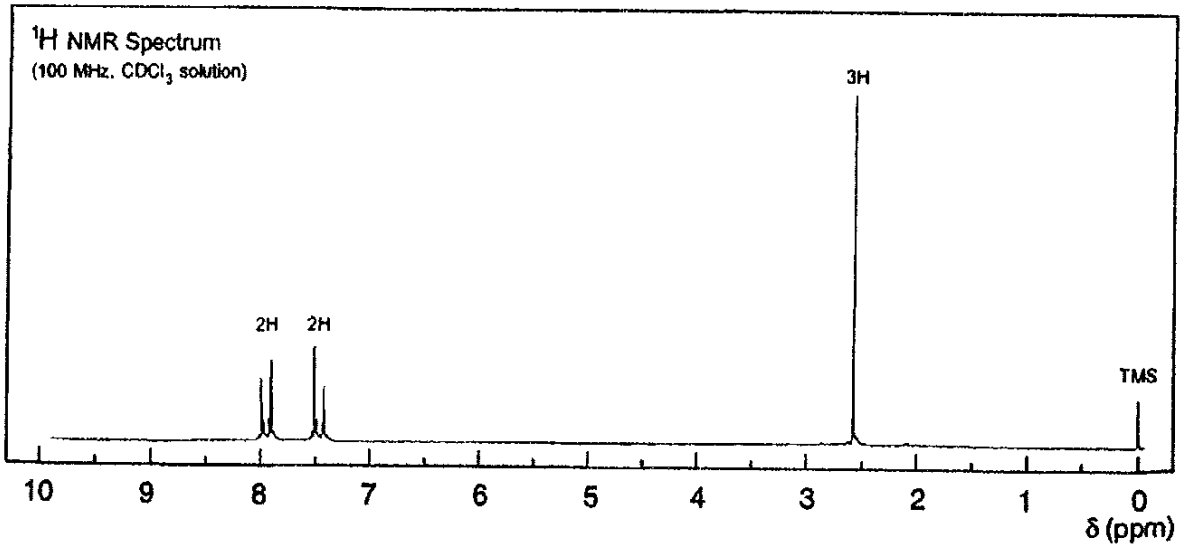
Base value for **heteroannular** or transoid diene	**214 nm**
Base value for **homoannular** or cisoid diene	**253 nm**
Increments for	
Double bond extending conjugation	**+30**
Alkyl substituent or ring residue	**+ 5**
Exocyclic double bond	**+ 5**
Polar groupings: **OAc**	**+ 0**
OAlk	**+ 6**
SAlk	**+30**
Cl, Br	**+ 5**
N(Alk)$_2$	**+60**
Solvent correction*	**+ 0**

(20 marks)

c) Given below are IR, Mass and ^{1}H NMR spectra of compound **V** (C_8H_7OCl). (Hint- atomic weight of ^{35}Cl=35.0 amu and ^{37}Cl=37.0 amu)







(i) What are the functional groups present in **V**?

(ii) Calculate the degree of unsaturation for compound **V**.

(iii) Explain how many different types of protons are present in compound **V**?

(iv) Deduce the structure of compound **V**.

(v) Give the structure of the ion at m/e=154 and show the fragmentation pathway leading to the ion giving the peak at m/e=111 for compound **V**.

(60 marks)