

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 : 2025/2026
Date : 14.01.2026
Time : 1.30 p.m.- 03.30 p.m.
Duration : 2 hours
Index number :

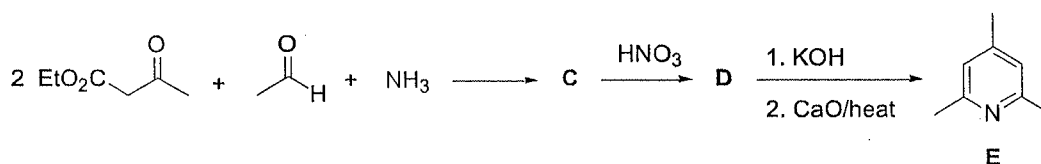
2. This question paper consists of **Four** questions in **six** pages.
 3. **Answer All FOUR (04) questions. All questions carry equal marks.**
 4. **Answer for each question should commence from a new page.**
 5. Draw fully labelled diagrams where necessary.
 6. Having any unauthorized documents/ mobile 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
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1) a) Give explanations for **any two (02)** of the statement given below.

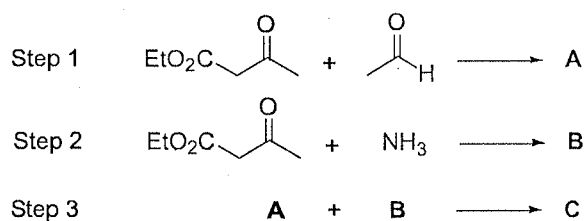
- Pyrrole undergoes nitration more readily than benzene, with substitution mainly taking place at the 2-position.
- In pyrrole, the direction of the dipole moment is opposite to that observed in its saturated analogue.
- Pyridine N-oxides exhibit greater reactivity toward both electrophilic and nucleophilic reagents compared to pyridine.

(50 marks)

b) The pyridine derivative **E** can be synthesized in the laboratory *via* the Hantzsch synthesis which is believed to proceed through the following sequence of reactions.



- Identify **C** and **D**.
- The formation of **C** can be proceeded through the following sequence of reactions. Identify the end products **A** (an unsaturated beta keto ester) and **B** (an enamine derivative).

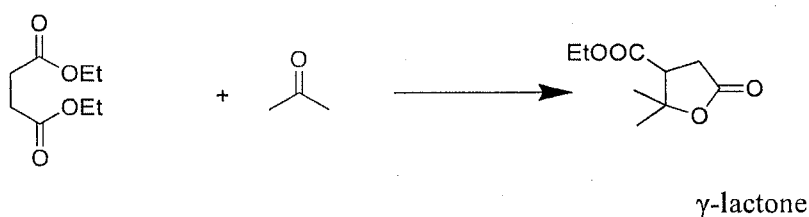


iii) Give the detailed mechanism of formation of **C** from **A** and **B**.

(50 marks)

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

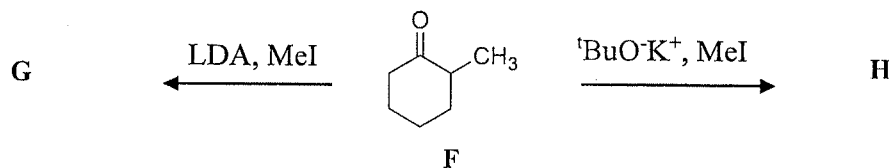
- a) i) Ketones react with diethylsuccinates in the Stobbe condensation, forming γ -lactones in the presence of strong bases ($^t\text{BuOK}/^t\text{BuOH}$) as given below. Give the mechanism of the following reaction.



- ii) Give the final structure if the formed lactone undergoes ring opening along with elimination.

(25 marks)

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

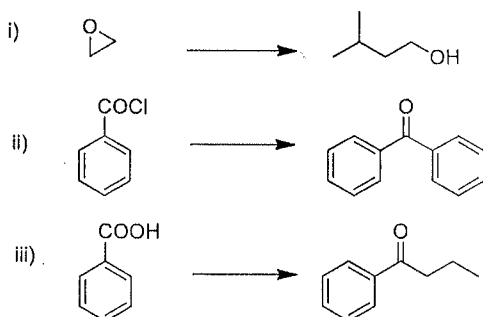


i) Draw the chemical structures of **G** and **H**.

ii) Explain why the structure **F** gives two different products, **G** and **H**, with two different bases, lithium diisopropylamide (LDA) and *tert*-butoxide anion ($^t\text{BuO}^-$), with the proper resonance structures.

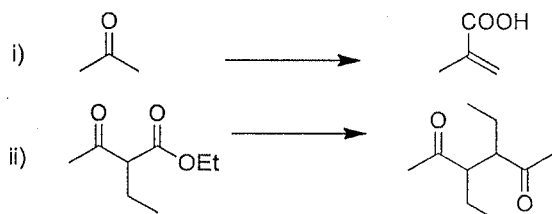
(25 marks)

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



(25 marks)

d) Show how you would carry out the following syntheses.



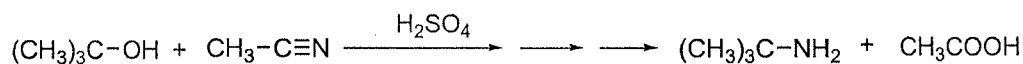
(25 marks)

e) i) Give the mechanism for the aldol formation from acetone in the presence of NaOH.

ii) Identify the rate-determining step of the part (i) above.

(25 marks)

3) a) Using the Ritter reaction, tertiary butanol is converted to a substituted amine.

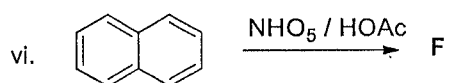
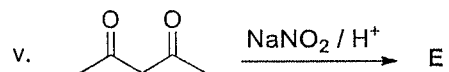
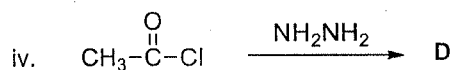
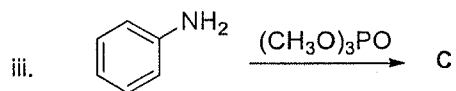
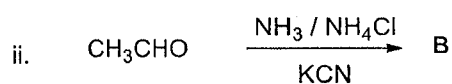
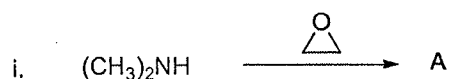


i) Write the mechanism of the formation of the intermediate amide from tertiary butanol.

ii) Show how the final product, amine, is formed from the amide intermediate.

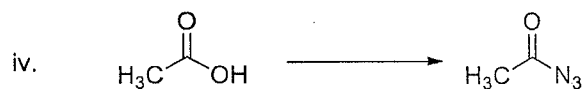
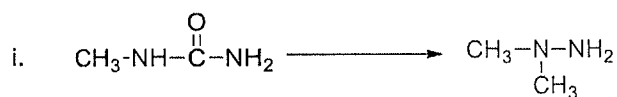
(25 marks)

b) Give the structures of the final products (A - F) of the following reactions.



(30 marks)

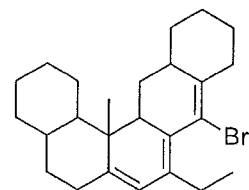
c) Show how **any three (03)** of the following transformations can be carried out.



(45 marks)

- 4) a) i) Define the terms **Chromophore**, **Bathochromic shift**, and **Hypochromic effect**.
 ii) Ethylene exhibits a UV absorption maximum at 175 nm, whereas 1,3-butadiene absorbs at 217 nm. Explain the reason for this difference.

(20 marks)

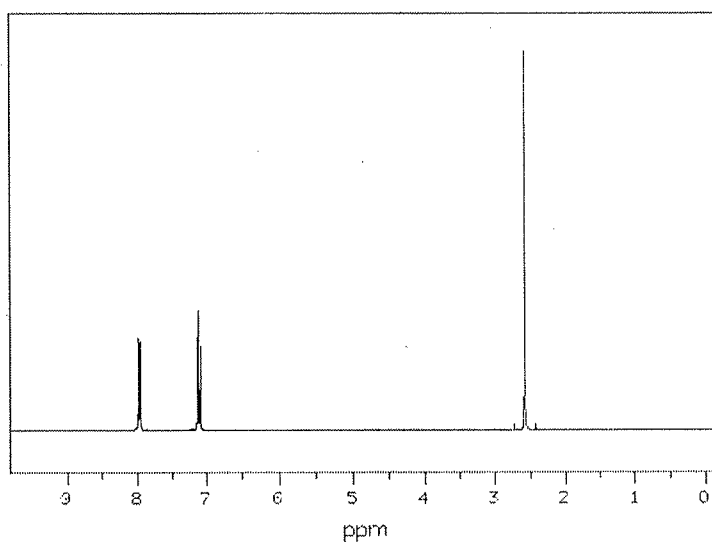
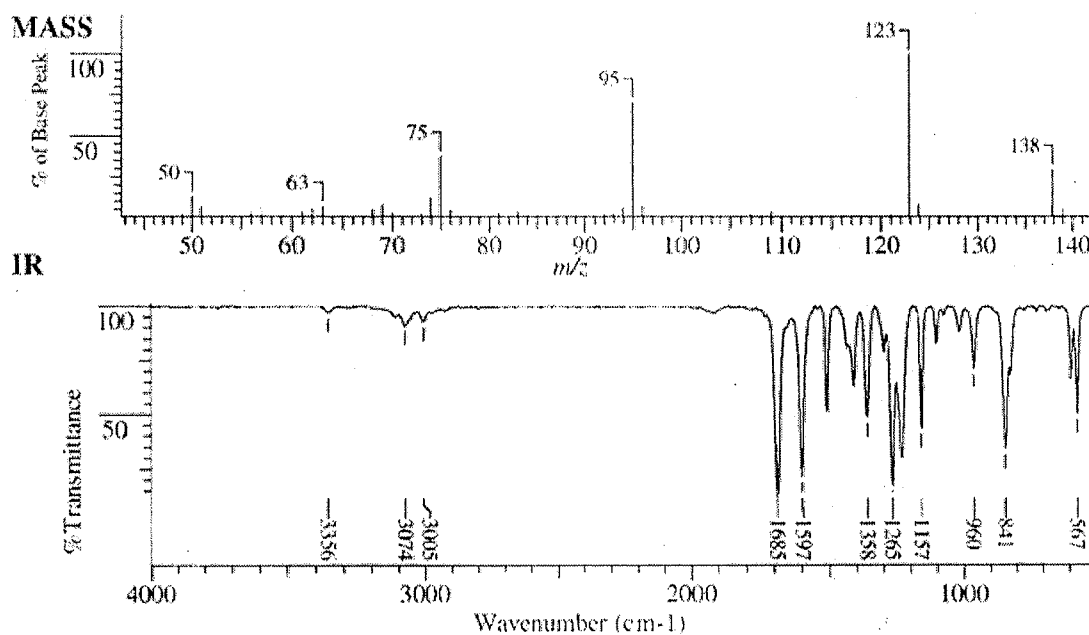


Compound U

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 Mass, IR and ^1H NMR spectra of compound **V** ($\text{C}_8\text{H}_7\text{FO}$). (Hint- atomic weight of ^{19}F =19 amu)



Peak at 2.5 ppm – singlet, three protons

Peak at 7.1 ppm – doublet, two protons

Peak at 8.0 ppm – doublet, two protons

- What are the functional groups present in **V**?
- Calculate the degree of unsaturation for compound **V**.
- Explain how many different types of protons are present in compound **V**?
- Deduce the structure of compound **V**.
- Give the structure of the ion at $m/e=138$ and show the fragmentation pathway leading to the ion giving the peak at $m/e=123$ for compound **V**.

(60 marks)

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