

[Time: 2.30 Hours]

[Total Marks: 60]

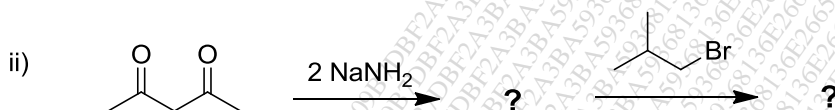
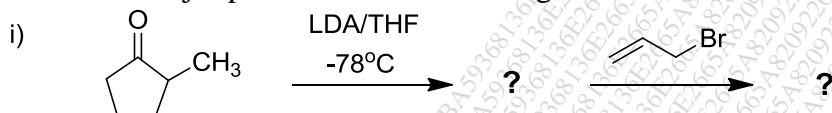
Please check whether you have got the right question paper.

NB:1. All questions are compulsory.

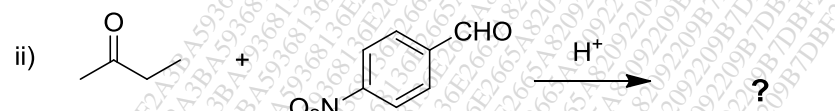
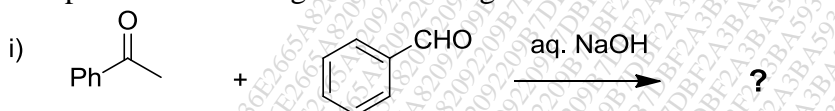
2. Figures to the right indicate full marks.

Q.1(A) Attempt any **two** of the following :

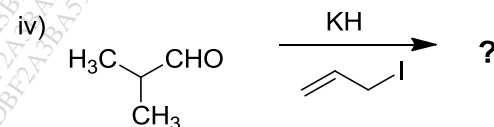
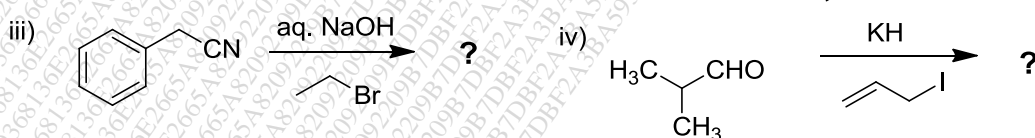
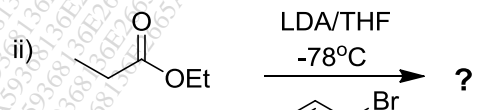
(a) Predict the major products of the following reactions. 4



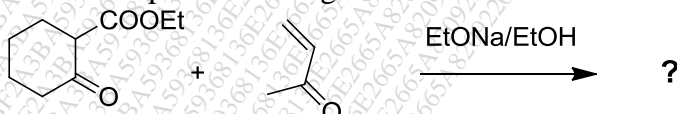
(b) Complete the following reaction and give its mechanism. 4



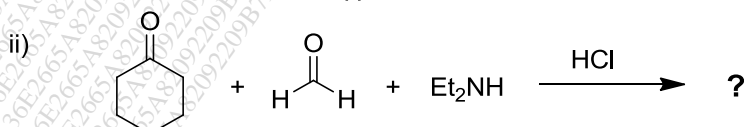
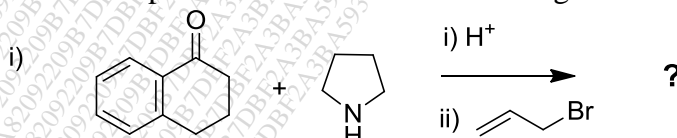
(c) Complete the following reactions with suitable products. 4



(d) Predict the products and give the mechanism of the following reaction. 4

(B) Attempt any **one** of the following:

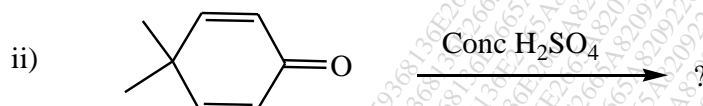
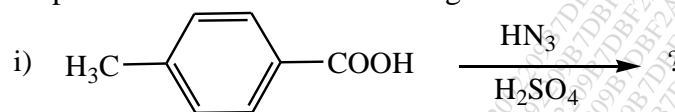
(a) Predict the products and name the following reactions. 4



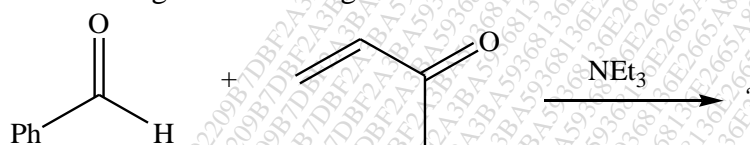
(b) Explain Michael addition reaction and its mechanism. 4

Q.2(A) Attempt any **two** of the following :

- (a) Explain Von Richter rearrangement with its mechanism. 4
 (b) What is Pummerer rearrangement? Explain its mechanism. 4
 (c) Predict the product and name the following reactions. 4

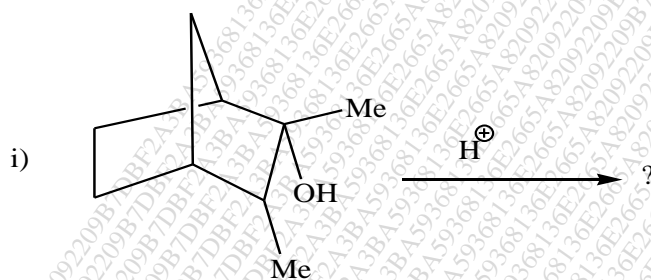


(d) Complete the following reaction and give the name. Write its mechanism. 4



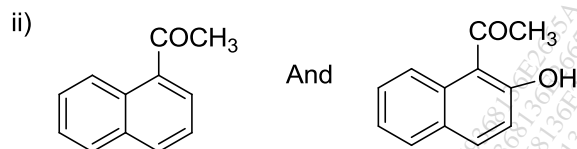
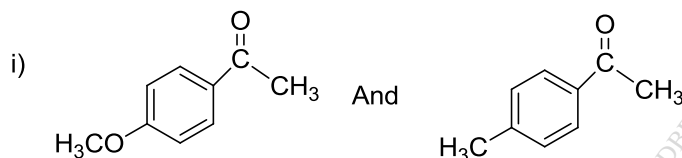
(B) Attempt any **one** of the following:

- (a) Explain Boulton - Katritzky rearrangement with its mechanism. 4
 (b) Predict the product and name the following reactions. 4



Q.3(A) Attempt any **two** of the following :

- (a) Explain the following in IR Spectroscopy: 4
 i) Vibrational Coupling
 ii) Study of hydrogen bonding
 (b) Explain 'donor-acceptor' interaction in nucleophilic addition reaction on formaldehyde using FMO method. 4
 (c) Which of the following compounds will show a lower >C=O stretching frequency in IR spectroscopy and why? 4



(d) 'Dimerization of ethane takes place via photochemical pathway'. Explain on the basis of HOMO-LUMO interaction using π MOs. 4

(B) Attempt any **one** of the following:

(a) Draw the π MO diagram for the allyl anion and allyl cation. Show the interaction of their FMOs and predict the product of the reaction between the two ions. 4

(b) Using IR Spectroscopy how can you distinguish between 4

- i) Phenol and Cyclohexanol
- ii) Ethylbenzene and o-xylene

Q.4(A) Attempt any **two** of the following :

(a) Write the fragmentation pattern of the following molecules in Mass spectroscopy; 4

- i) Ethyl benzene
- ii) 3-pentanone

(b) Explain the following terms in NMR spectroscopy with suitable example. 4

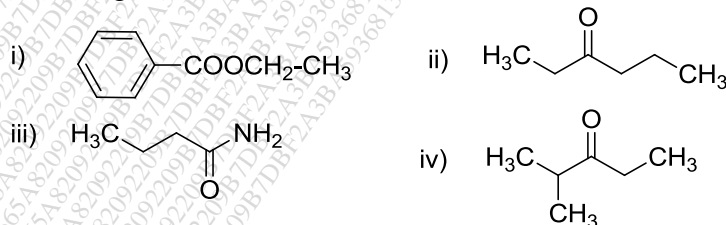
- i) Long range coupling
- ii) Coupling constant

(c) An Organic Compound having M.F. $C_4H_8O_2$ showed following spectral data: 4
 I.R. = 2970 cm^{-1} , 1745 cm^{-1} , 1200 cm^{-1} .

^{13}C NMR = δ 14 (q), δ 32 (q), δ 82 (t) and δ 185 (s).

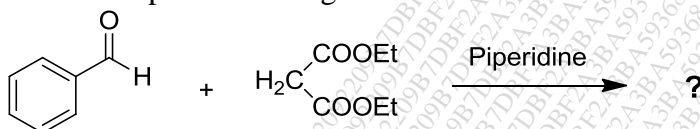
Deduce the structure of the compound and justify your answer.

(d) Write the number of signals and splitting pattern observed in the NMR spectra of following molecules: 4

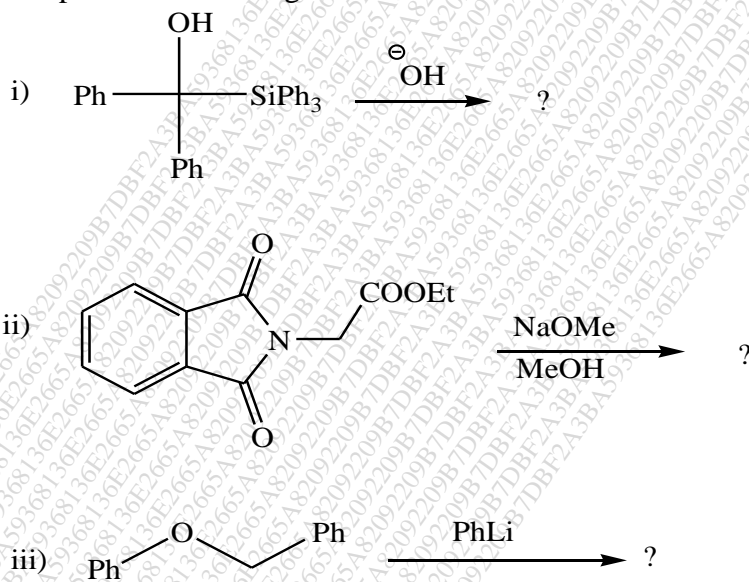


- (B) Attempt any **one** of the following:
- (a) An Organic Compound having M.F. $C_{10}H_{12}O$ showed following spectral data: 4
I.R. = 3090 cm^{-1} , 2970 cm^{-1} , 1700 cm^{-1} , 850 cm^{-1} .
 $^1\text{H-NMR}$ = δ 0.9 (3H, t), δ 4.3 (2H, q), δ 7.3 (2H, d, 7.5Hz), δ 7.6 (2H, d, J = 7.5Hz) and δ 2.3 (3H, s).
 $^{13}\text{CNMR}$ = δ 15, δ 30, δ 35, δ 110, δ 120, δ 135, δ 140 and δ 210.
 Deduce the structure of the compound and justify your answer.
- (b) Explain the following in Mass spectroscopy with suitable example; 4
 i) McLafferty rearrangement ii) Ortho effect

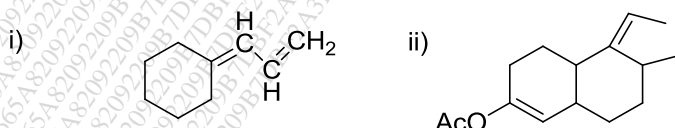
- Q.5 Attempt any **four** of the following :
- A What is Tandem alkylation ? Explain with suitable example. 3
 B Predict the products and give the mechanism of the following reaction. 3



- C Explain Passerini reaction with its mechanism. 3
 D Complete the following reactions. 3



- E Discuss hard and soft electrophiles? Give one example of each. Comment on the relative energies of their LUMOs. 3
 F Calculate the λ_{max} of the following compounds 3



- G Explain the term D_2O exchange and its application in NMR spectroscopy. 3
 H Explain the term isotopic abundance and Molecular ion peak in Mass Spectroscopy. 3