

[Time: 2.30 Hours]

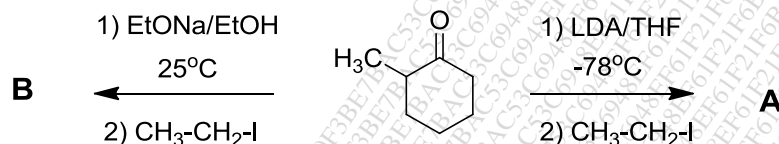
[Total Marks: 60]

Please check whether you have got the right question paper.

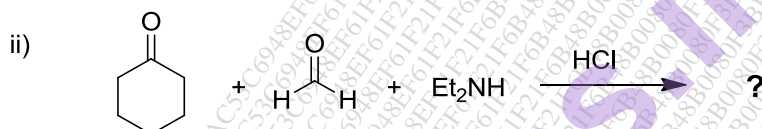
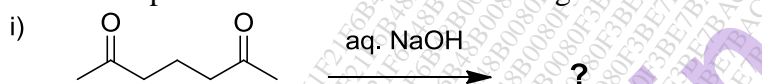
- NB: 1. All questions are compulsory.
2. Figures to the right indicate full marks.

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

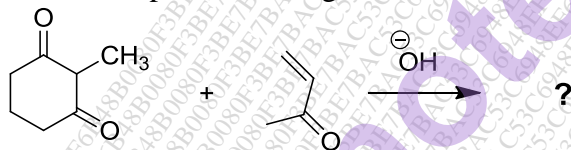
- (a) Write the major product A and B with explanation of its formation under given conditions. 4



- (b) Predict the products and name the following reactions. 4



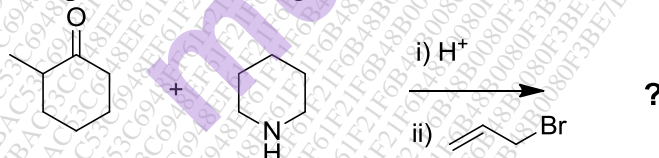
- (c) Predict the products and give the mechanism of the following reaction. 4



- (d) What are enamines? Explain with suitable example alkylation of enamines. 4

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

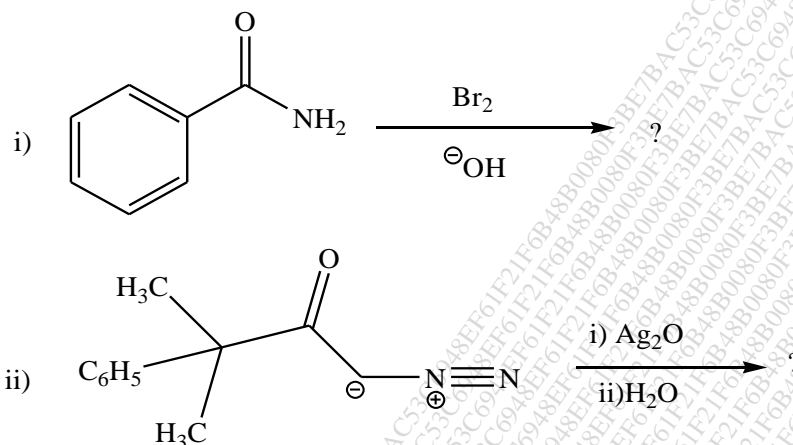
- (a) Complete the following reaction with its mechanism. 4



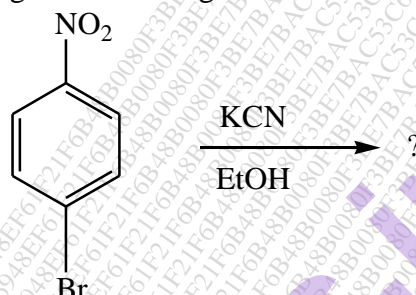
- (b) Explain Knoevenagel amine catalysed condensation and give its mechanism. 4

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

- (a) What is Baylis-Hilman reaction? Explain its mechanism. 4
(b) Explain Rupe rearrangement with its mechanism. 4
(c) Predict the product of the following reactions and give the name of the reactions. 4

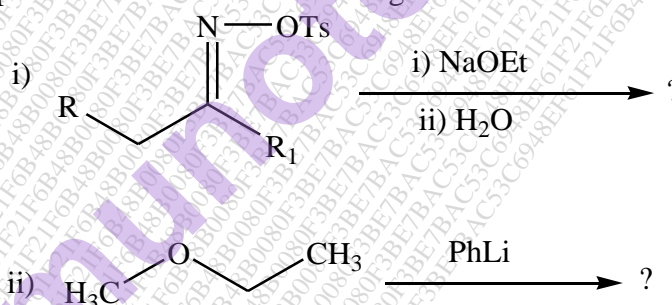


(d) Complete the following reaction and give its mechanism.



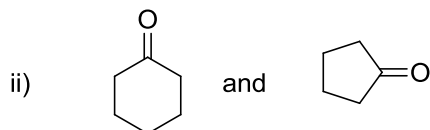
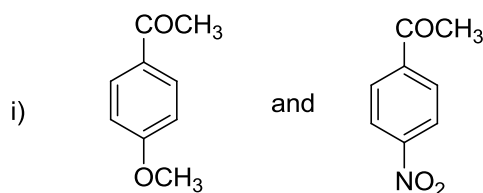
(B) Attempt any **one** of the following:

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

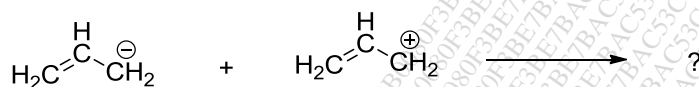


Q.3(A) Attempt any **two** of the following :

- (a) i) Explain the importance of the fingerprint region in IR Spectroscopy?
- ii) Explain λ_{max} of 1,3 butadiene is 217 nm while that of 1,3,5-hexatriene is 254 nm
- (b) Explain the addition of hydride to formaldehyde with the help of FMOs.
- (c) Which of the following compounds will show a lower >C=O stretching frequency in IR spectroscopy and why?



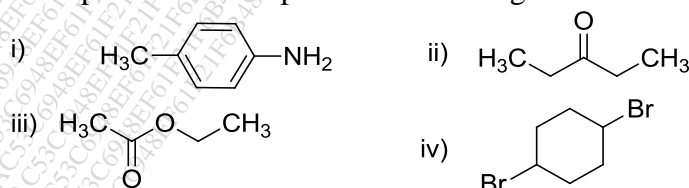
- (d) Complete the following reaction. Draw the π MOs diagram for the reactants. 4
Show the interaction of their FMOs.



- (B) Attempt any **one** of the following: 4
(a) Draw the π MOs of a diene and dienophile showing electron distribution. Label the FMO show their interaction in Diels-Alder reaction. 4
(b) Using IR Spectroscopy how can you distinguish between 4
i) Maleic acid and Fumaric acid
ii) o-hydroxy benzoic acid and m-hydroxy benzoic acid

- Q.4(A) Attempt any **two** of the following : 4
(a) An organic compound with M.F. $C_4H_8O_2$ having two isomers as **A** and **B** with I.R. stretching frequency 1745 cm^{-1} and 2960 cm^{-1} showed following NMR spectral data; 4
Isomer **A** = δ 0.9 (3H, t, $J = 7.5\text{ Hz}$), δ 4.5 (2H, q, $J = 7.5\text{ Hz}$), and δ 2.3 (3H, s).
Isomer **B** = δ 0.9 (3H, t, $J = 7.5\text{ Hz}$), δ 2.4 (2H, q, $J = 7.5\text{ Hz}$), and δ 4.3 (3H, s).
Deduce the structure of A and B isomer and justify your answer.
(b) Write the fragmentation pattern of the following molecules in Mass spectroscopy. 4
i) Benzoic acid ii) Ethyl acetate
(c) Explain the following terms in NMR spectroscopy. 4
i) First Order spectra ii) Karplus equation
(d) Explain the following in Mass spectroscopy with suitable example. 4
i) Nitrogen rule ii) Retro Diels Alder reaction

- (B) Attempt any **one** of the following: 4
(a) Write the number of signals in proton decoupled and off resonance proton decoupled ^{13}C NMR spectra of following molecules:



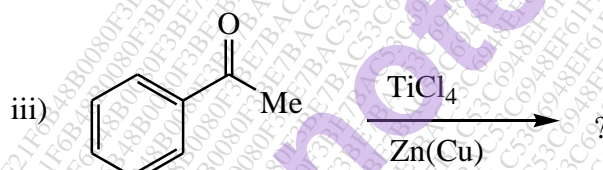
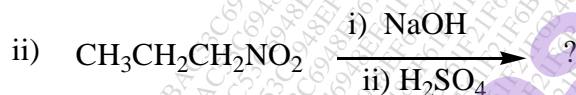
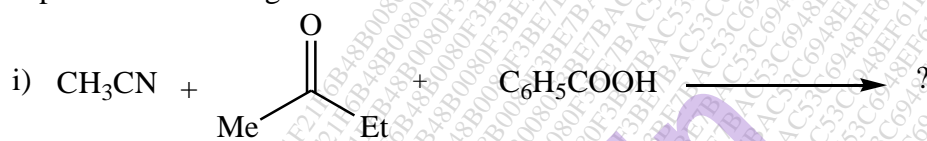
- (b) An Organic Compound having M.F. $C_6H_{13}ON$ showed following spectral data:
 I.R. = 3500 cm^{-1} , 2970 cm^{-1} , 1690 cm^{-1} , 1050 cm^{-1}
 $^1\text{H-NMR}$ = δ 0.9 (6H, d), δ 1.3 (1H, m), δ 2.4 (2H, d), 2.9 (3H, s) and δ 3.0 (1H, bs, D_2O exchange).

Q.5 Attempt any **four** of the following :

- A Explain how solvent polarity affects the rate of alkylation of enolates. 3
 B Predict the products and give the mechanism of the following reaction. 3

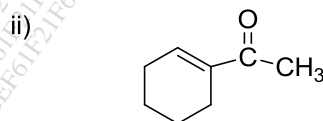
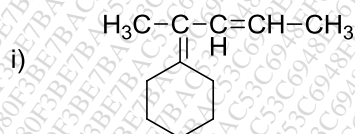


- C Explain Tiffeneau-Demjanov rearrangement with a suitable example. 3
 D Complete the following reactions. 3



- E What are hard and soft reactive sites? Give one example of each. 3

- F Calculate the λ_{max} of the following compounds 3



- G How will you distinguish between 2-pentanone and 3-pentanone by Mass Spectroscopy? 3

- H Explain the magnetic anisotropy with example as benzaldehyde. 3