[Time: 2 ½ Hours] **[Marks: 60]**

Please check whether you have the right question paper.

N.B.: 1. All the questions are compulsory.

2. Figures to the right indicate full marks.

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

a Explain the mechanism of Robinson annulation reaction. 4

b Complete the following reaction and give its mechanism. 4

c Discuss the mechanism of Mannich reaction with a suitable example. 4

d Explain the formation of enolate, when 2-Heptanone is treated with the following reagents: 4

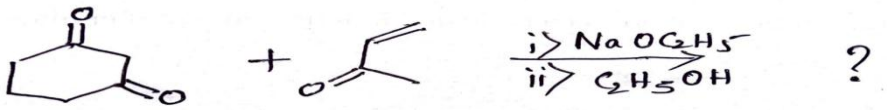
i)LDA, THF, -78°C

ii)$NaOCH_3/CH_3OH$,25°C

(B) Answer **any one** of the following;

a Discuss one method of preparation of enamines? Explain with suitable examples alkylation of enamines. 4

b Complete the following reaction, name the reaction, and discuss its mechanism: 4

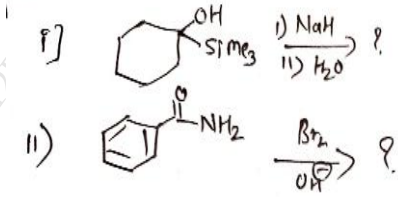


Q.2) (A) Answer **any two** questions out of the following

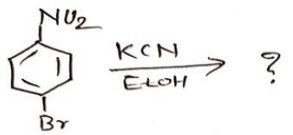
a What is Nef reaction? Explain its mechanism 4

b What is Wolff rearrangement? Explain its mechanism 4

c Predict the product of the following reactions and give the name of the reactions. 4



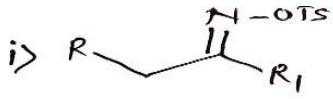
d Complete the following reaction and give its mechanism. 4



(B) Answer **any one** question out of the following

a What is Corey-Fuchs reaction? Explain its mechanism 4

b Predict the product and name the following reactions 4

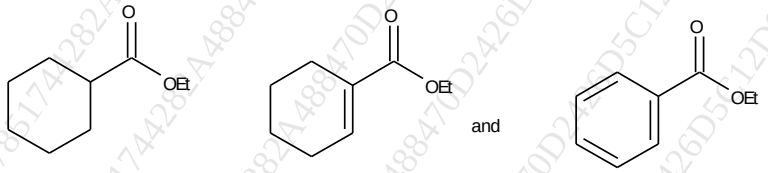
i) 

ii) 

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

a Draw the π − MO diagrams with distribution of electrons for the reactants of Diels-Alder reaction. Explain the interaction of FMOs. 4

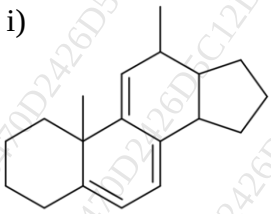
b How are the following compounds distinguished using IR spectroscopy? 4

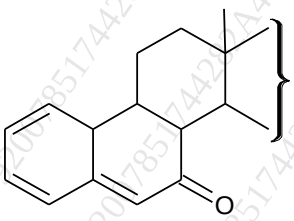
(i) 

(ii) $H_3C-CH_2-C\equiv CH$, $H_3C-C\equiv C-CH_3$ and $H_3C-C\equiv N$

c On the basis of HOMO – LUMO interaction using π − MO diagram, explain the reaction dimerization of ethylene to cyclobutadiene. 4

d Calculate the λmax of the following compounds: 4

i) 

ii) 

(B) Answer **any one** of the following;

a Explain the following in IR spectroscopy. 4

1) Finger print region
2) Combination bands

b Discuss the application of FMO concept in SN^2 reaction. Write the example of it. 4

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

a Write the fragmentation pattern of the following molecules in mass spectroscopy 4

i) 2-Methylbutane ii) Propanone

b Explain the following terms in 13 C NMR spectroscopy. 4

i) Any two factors influencing carbon shift

ii) Proton decoupled spectra

c An organic compound with molecular formula C_7H_8O shows the following spectral data .Determine its index of hydrogen deficiency and deduce its structural formula 4

IR: 3300 cm-1,3000-3100cm-1, 2910cm-1,1470cm-1,750cm-1,690cm-1.

NMR: δ 3.3 ppm (s) ,δ 4.4 ppm (s) . δ 7.8 ppm (m).

d Explain the following terms in Mass spectroscopy with suitable example. 4

i) McLafferty rearrangement.

ii) Retro-Diels-Alder reaction

(B) Answer any one of the following:

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

i) 4-Chloroanisol ii)Phenylpropanoate iii) 2-Aminopropane

ii) iv) 2-Methylpropanoic acid

b An organic compound with molecular formula $C_4H_8O_2$ shows the following spectral data : 4

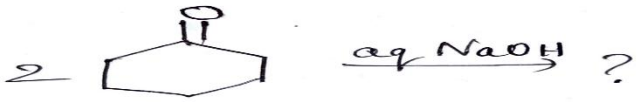
IR = 2970cm^{-1},1445cm^{-1},1200cm^{-1}

13CNMR = δ 14 (q) , δ32(q),δ 82 (t) , δ185(s).

Deduce the structure of the molecule and justify your answer.

Q.5) Answer **any four** of the following;

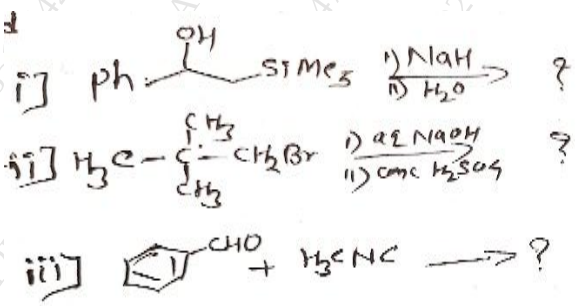
a Complete the following reaction and name the reaction: 3



b Explain in detail the reaction of acetophenone with excess iodine and NaOH. 3

c Explain Wagner-Meerwein rearrangement with a suitable example. 3

d Complete the following reactions 3



e Compare between hard and soft electrophiles, write one example of each. 3

f Why aniline shows absorption maxima at 280 nm (ε_{max} = 1430) whereas anilinium ion shows absorption maxima at 254 nm (ε_{max} = 160)? Justify your answer. 3

g Write the number of signals in proton decoupled and off resonance proton decoupled 13CNMR spectra of following molecule. 3

i) 4-Aminotoluene ii)Pentan-3-one

iii) Ethylethanoate iv) 1,4-Dibromocyclohexane

h What is anisotropic effect? Explain magnetic anisotropy with example as benzaldehyde., 3

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