(2 ½ Hours) [Total Marks :60

N.B. : (1) **All** questions are **compulsory**
(2) Figures to the **right** indicate **full** marks.

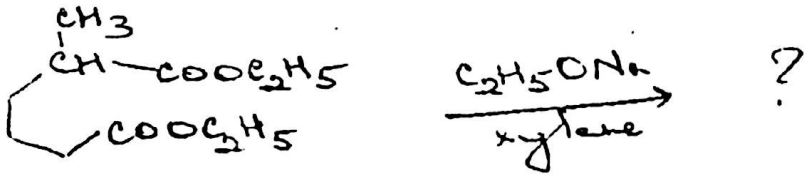
1 (A) Answer **any two** of the following :-

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

i) $CH_3-\underset{\underset{CH_3}{|}}{C}=CH-\overset{\overset{O}{||}}{C}-OC_2H_5 + CH_2(COOC_2H_5)_2 \xrightarrow{C_2H_5ONa}$?

ii)  $+ CH_3COOC_2H_5 \xrightarrow{C_2H_5ONa}$?

(b) Complete the following reaction, name it and explain its mechanism 4



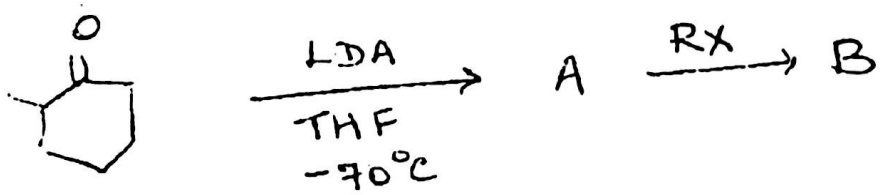
(c) Explain the mechanism of the reaction of phenylacetic acid with Br_2 and PBr_3 followed by hydrolysis and name the reaction. 4

(d) Write the mechanism of Mannich reaction and give one additional example of the reaction. 4

(B) Answer **any one** of the following :-

(a) Explain the mechanism of Robinson annulation. 4

(b) Predict the major products A and B and explain their formation. 4



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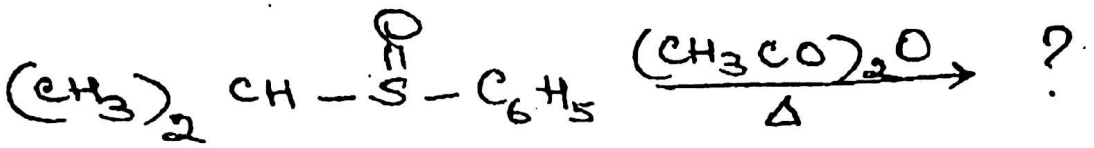
2. (A) Answer any **two** of the following :-

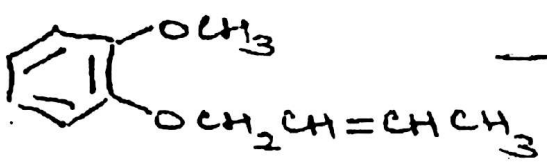
(a) Complete the following reaction and give its mechanism. 4



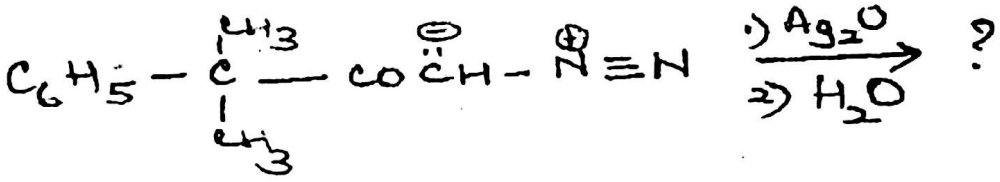
(b) What is Von Richter rearrangement? Explain its mechanism. 4

(c) Name the following reactions and predict the products. 4

i)

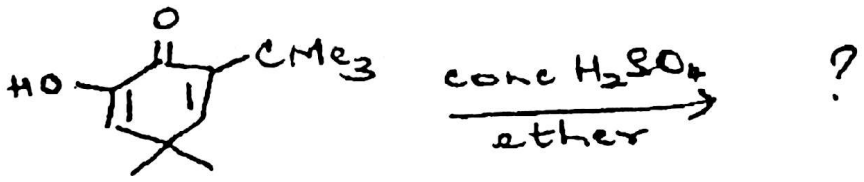


ii)

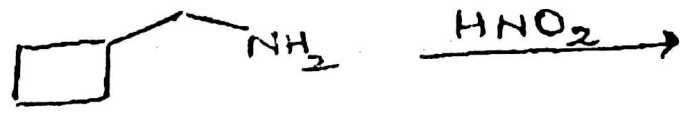


(d) Name the following reactions and predict the major products 4

i)



ii)



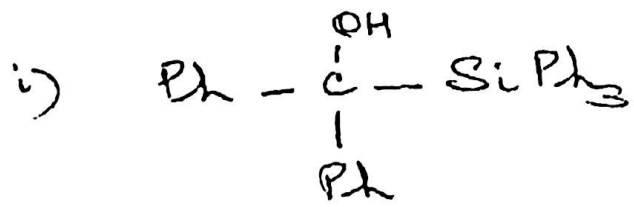
(B) Answer **any one** the following :- 4

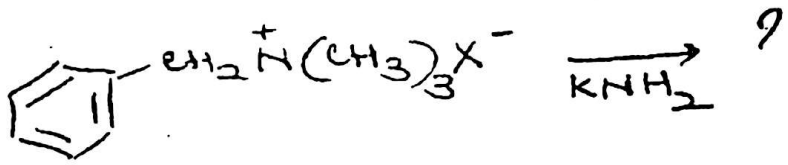
(a) Explain the following rearrangments with one example each.

(i) Cope

(ii) Curtius

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

i) 

ii)  4

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

(a) Explain the UV spectral data of 4- methylpent-3-en-2-one taken in different solvents as follows :

λ_{max} (nm) : 230, 327 in n-hexane

245, 305 in water 4

(b) How are the following compounds distinguished using IR spectroscopy

(i) $(C_6H_5CO)_2O$, C_6H_5COOH and $C_6H_5COCH_3$

(ii) ortho and para hydroxyacetophenones? 4

(c) Explain the following mechanisms with suitable examples.

(i) S_NcA

(ii) S_Ni2' 4

(d) Explain the following statements :

(i) Ethyl iodide reacts with hydroxide ion faster in dimethyl sulfoxide than in water.

(ii) Iodide ion is a good nucleophile and a good leaving group. 4

(B) Answer **any one** of the following :-

(a) (i) What are overtone and combination bands in IR spectra?

(ii) Explain the importance of the finger print region in IR spectroscopy. 4

(b) Explain the following with respect to S_Ni reactions.

(i) effect of NGP on stereochemistry

(ii) tele substitution.

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

(a) Explain the following in NMR spectroscopy **4**

(i) spin-spin coupling

(ii) first order spectra

(b) On the basis of NMR specroscopy how will you distinguish between **4**

(i) axial and equatorial protons in cyclohexane

(ii) inter and intramolecular hydrogen bonding?

(c) Explain the fragmentation pattern of the following in mass spectrometry **4**

(i) n- propylbenzene

(ii) benzyl alcohol

(d) Explain the following in mass spectrometry **4**

(i) McLafferty rearrangement

(ii) Nitrogen rule.

(B) Answer **any one** of the following: **4**

(a) A compound (MF = $C_8H_8O_2$) shows the following spectral data:

UV λ_{max} : 250 nm

IR $\bar{\gamma}$: 1670 cm^{-1}

PMR δ : 3.9 (s, 3H), 6.9 (d, J = 8 Hz, 2H), 7.8 (d, J = 8Hz, 2H), 9.8 (s, 1H) ppm.

Deduce the structure of the compound.

(b) Explain the following in mass spectrometry with one example each **4**

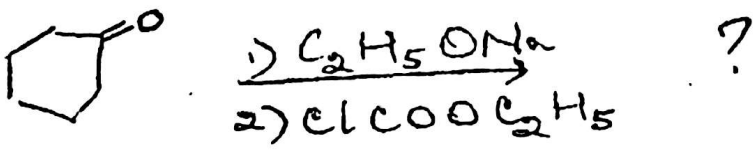
(i) retro Diels Alder reaction

(ii) ortho effect

5. Attempt **any four** of the following :- **12**

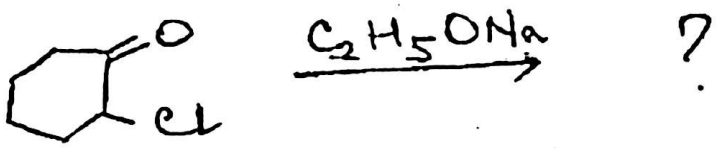
(a) Write the mechanism of the reaction between acetophenone and excess iodine in NaOH.

(b) Predict the product and write the mechanism of the following reaction.



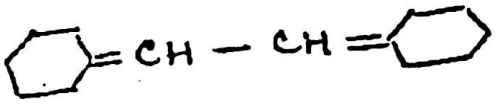
(c) Explain the mechanism of Lossen rearrangement.

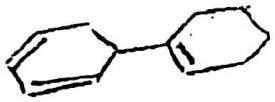
(d) Suggest a mechanism for the following reaction.



(e) Calculate the expected λ_{max} for the following :

i) 

ii) 

iii) 

(f) Explain the $A_{AL}1$ mechanism of ester hydroysis

(g) Define the following terms in mass spectrometry

(i) Parent ion

(ii) Metastable ion

(iii) Base peak

(h) Explain the Karplus curve and its significance in NMR spectroscopy

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