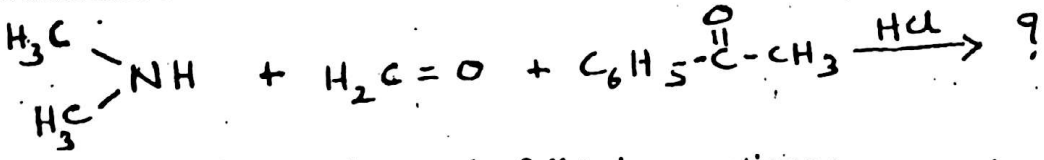
(2½ Hours) [Total Marks : 60

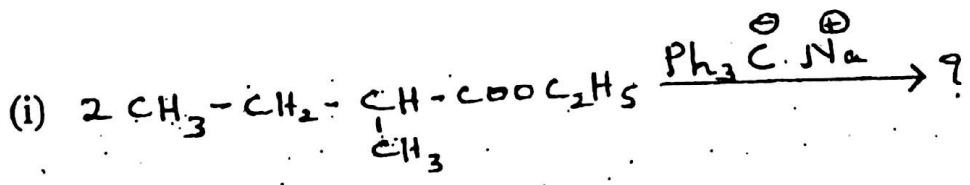
N.B. : (1) **All questions are compulsory.**
(2) **Figures to the right indicate full marks.**

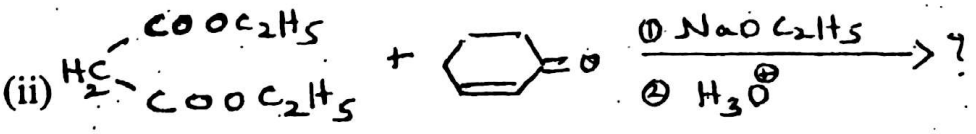
1. (A) Attempt **any two** of the following :-

(a) Complete the following reaction, name it and explain its mechanism :- 4



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

(i) 

(ii) 

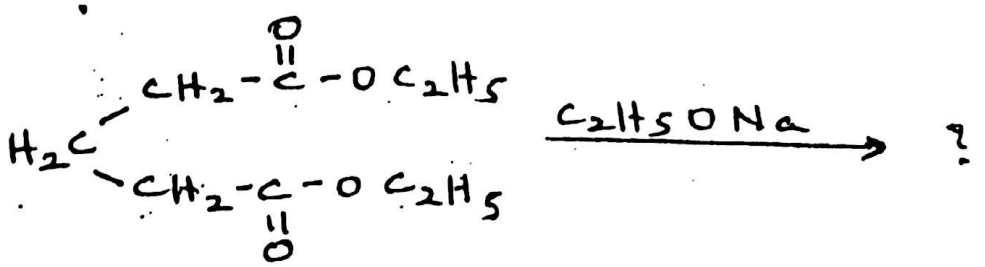
(c) Explain giving reasons which enolate is formed when 2-heptanone is treated with 4
(i) LDA, THF, -78° C
(ii) $NaOCH_3/CH_3OH$,25°C.

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

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

(a) What is Robinson's annulation ? Explain its mechanism. 4

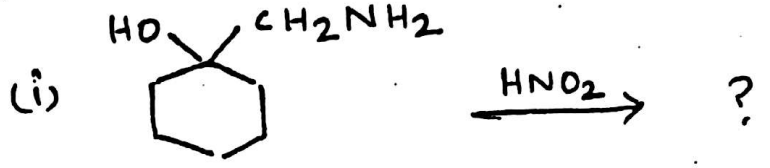
(b) Complete the following reaction and explain its mechanism. 4

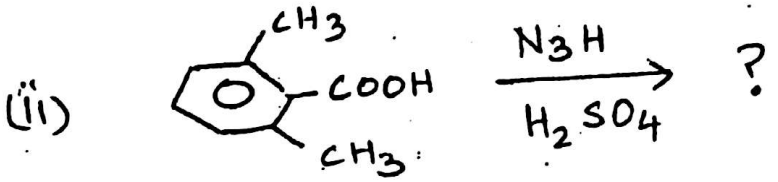


2. (A) Attempt **any two** of the following :-

(a) Explain the mechanism of von Richter rearrangement. 4

(b) Complete the following reactions and name them :- 4

(i) 

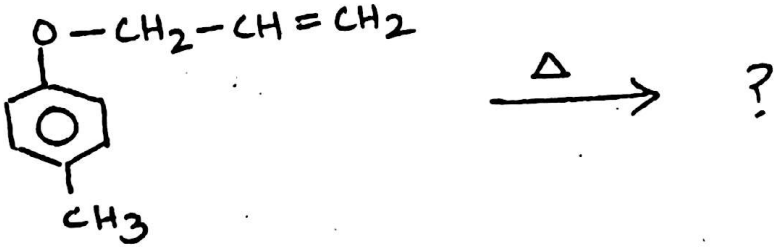
(ii) 

(c) Give the mechanism for the following conversions :- 4

(i) α - diazoketone → ketene

(ii) O - acylhydroxamic acid → isocyanate

(d) Complete the following reaction and give its mechanism :- 4



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

(a) Give complete equations for the following rearrangements:- 4

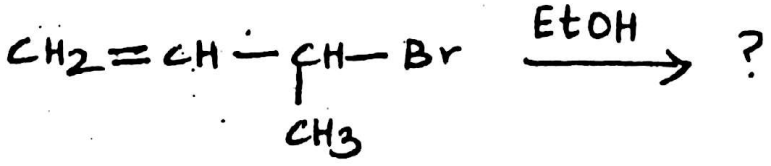
(i) Neber (ii) Pummerer

(b) Giving suitable examples, compare Cope and oxy-Cope rearrangement with respect to the following :- 4

(i) Substrate used (ii) Product formed

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

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



(b) Explain the mechanism of nucleophilic substitution on p-nitrochlorobenzene. Give an evidence in support of the mechanism. 4

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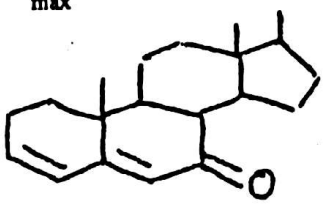
(c) Answer the following :- 4

(i) Calculate λ_{max} for the following compound :-



(ii) How will you distinguish between the following pairs of compounds using IR spectroscopy ?

(X) CH_3-CH_2-OH and CH_3-O-CH_3

(Y) Cyclohexanone and Cyclobutanone

(d) Explain the following :- 4

(i) cis 1,2 -dichloroethene is IR active while the trans isomer is inactive.

(ii) λ_{max} of 1,3 - butadiene is 217 nm while that of 1,3,5 - hexatriene is 254 nm.

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

(a) Give the $B_{Ac}2$ mechanism of ester hydrolysis. Comment on its utility. 4

(b) Explain the following :- 4

(i) Vibrational coupling

(ii) Finger print region

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

(a) Explain the following with respect to NMR spectroscopy : 4

(i) Spin-spin coupling

(ii) Karplus curve and its significance

(b) Explain the fragmentation pattern of the following in mass spectrometry :- 4

(i) pentanal

(ii) n-butyl benzene

(c) On the basis of NMR spectroscopy, how will you distinguish between 4

(i) cis and trans alkene

(ii) inter and intramolecular H-bonding

(d) Explain the following in mass spectrometry :- 4

(i) Retro Diels Alder reaction

(ii) Nitrogen rule

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

(a) An organic compound having molecular formula C_7H_8O shows the following spectral data. 4

UV; λ_{max} :	255nm		
IR; ν cm^{-1} :	3402 (s,br)	3065 (w)	2888 (m)
	1499 (w, sh)	1455 (m)	
NMR;δ ppm :	7.26 (5H, s)	4.60 (1H,s)	3.9 (2H,s)
Mass; m/z :	106, 105, 107, 79, 77, 51		

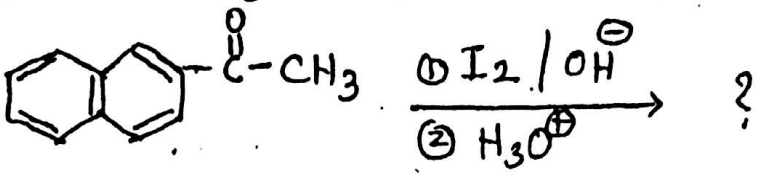
Deduce the structure of the given compound.

(b) (i) Explain McLafferty rearrangement with suitable example. 4

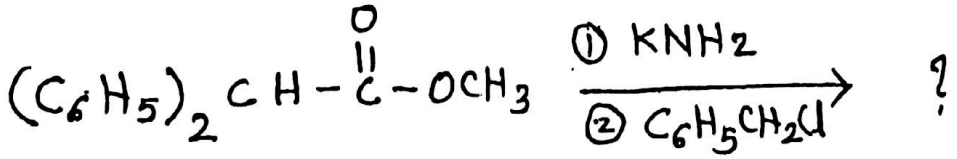
(ii) What is ortho effect in mass spectrometry?

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

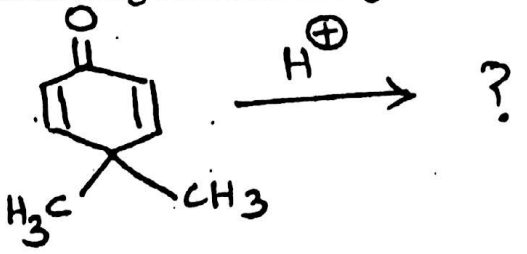
(A) Complete the following reaction, name it and explain its mechanism.



(B) Predict the product and give the mechanism of the following reaction :-



(C) Complete the following reaction and give its mechanism :



(D) What is Brook rearrangement? Give an equation to represent the reaction. Comment on the stereochemistry of the reaction.

(E) Using IR spectroscopy, how can you distinguish between o-nitrophenol and p-nitrophenol?

(F) Compare the basicity and nucleophilicity of :
t-butoxide ion and OH^- ion

(G) Explain the term 'long range coupling' with respect to NMR spectrum giving an example.

(H) How will you distinguish between 3-methyl and 4-methlycyclohexene on the basis of mass spectrometry?
