CARMEL COLLEGE OF ARTS, SCIENCE & COMMERCE FOR WOMEN, NUVEM-GOA

Semester End Examination, January 2021

Semester: V of B.Sc.

Course name & Code: Organic Chemistry CHC107

Total marks:80 **Duration:2 hours** **Total No of pages:6**

Instructions: 1) Answers to the two sections should be written on separate books.
2) All questions are compulsory
3) Figures to the right indicate full marks
4) For questions 2,3,5 & 6 there is choice for question A

Section A

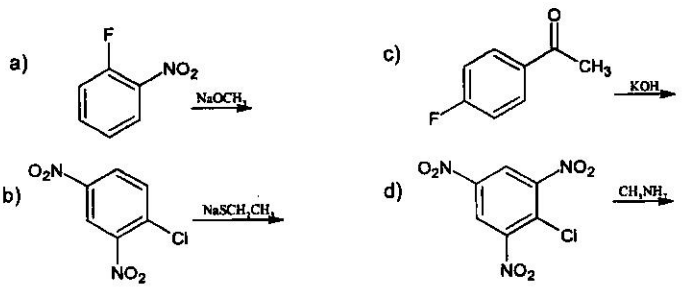
Q1) Answer **Any four** of the following. (4 x 4 = 16 marks)

i) What is Herzig Meyer's method? How is this method used in the structure elucidation of Hygrine?

ii) Define the following terms:

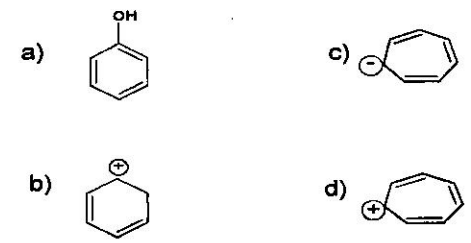
a) Base peak b) Molecular ion

iii) Provide the major product of the reactions shown below



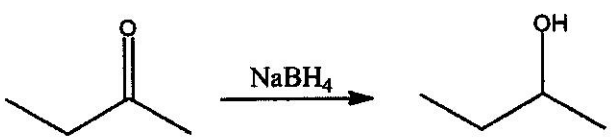
iv) How could you distinguish between ethanol and acetone using IR spectroscopy?

v) Identify the following molecules as Aromatic, Antiaromatic or Nonaromatic.



vi) Explain anisotropic effect in aldehydes and aromatic compounds.

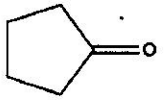
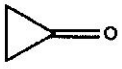
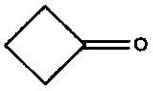
Q2) A) i) How can Infra-red spectroscopy be used to study progress of the following reaction? (4 marks)



ii) Provide a detailed, stepwise mechanism for the reaction of phenol with fuming sulphuric acid. (2 marks)

OR

A) iii) Arrange the following molecules in the order of increasing frequency of carbonyl absorption, giving reasons. (4 marks)

a)  b)  c) 

iv) Explain the following: (2 marks)

a) Effect of methoxy group on electrophilic aromatic substitution
b) Effect of deactivating groups on SNAr reaction

B) i) Give the synthetic scheme for the preparation of hygrine from pyrrole. (4 marks)

ii) What is the importance of functional group region in IR spectroscopy? (2 marks)

Q3) A) i) A compound $C_9H_{10}O$ shows the following data in its ^{1}HNMR spectrum: δ 2.09, singlet, 3H; δ 3.62, singlet, 2H and δ 7.25, singlet, 5H. Suggest a probable structure of a compound and assign the peaks. (4 marks)

ii) Give analytical evidence to show the presence of pyridine nucleus in nicotine. (2 marks)

OR

A) iii) A compound $C_{10}H_{13}Cl$ shows the following data in its ^{1}HNMR spectrum: δ 1.57, singlet, 6H; δ 3.07, singlet, 2H and δ 7.27, singlet, 5H. Suggest a probable structure of a compound and assign the peaks. (4 marks)

iv) How is Ziesel's method used in the structure elucidation of alkaloids? (2 marks)

B) i) What is McLafferty rearrangement? Explain the mechanism of cleavage using 2-pentanone as an example. (4 marks)

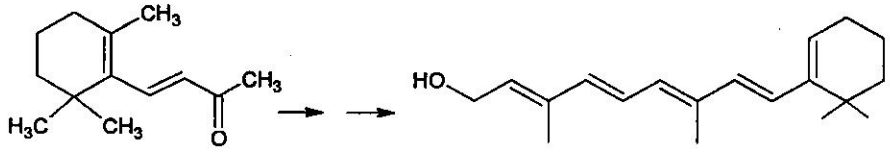
ii) List the properties of TMS, which makes it an ideal reference for NMR spectroscopy. (2 marks)

Section B

Q4) Answer **Any four** of the following. (4 x 4 = 16 marks)

i. Give analytical evidence for the presence of lactone ring in ascorbic acid

ii. Complete the following synthetic scheme:



iii. Define Acidic dye. Give one example with structure

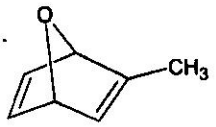
iv. Provide a detailed mechanism for Skraup synthesis

v. Outline the synthesis of congo red dye

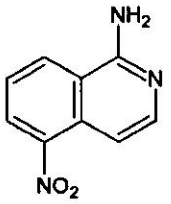
vi. Electrophilic aromatic substitution on pyridine takes place at position 3. Explain.

Q5) A) i) Provide a synthetic route towards the following compounds. (4 marks)

a)



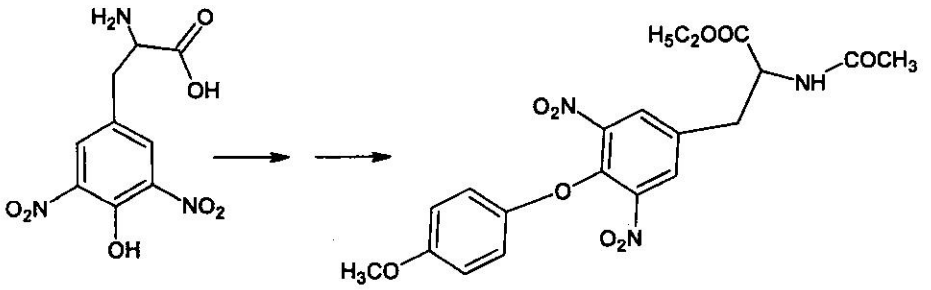
b)



ii) Give the structure of Phenolphthalein in basic medium. What is the reason for the color change? (2 marks)

OR

A) iii) Complete the following synthetic scheme (4 marks)



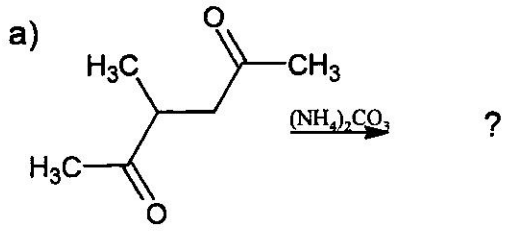
iii) Why does p-nitroaniline exhibit dark yellow color whereas nitrobenzene is pale yellow? (2 marks)

B) i) Give analytical evidence for the presence and position of iodo atoms in the thyroxine. (4 marks)

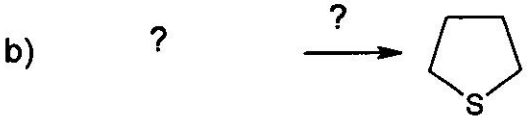
ii) Explain the reaction and mechanism involved in Chichibabin's reaction. (2 marks)

Q6) A) i) Complete the following: (4 marks)

a)



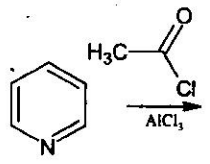
b)

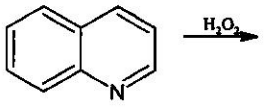


ii) Write a note on classification of vitamins (2 marks)

OR

A) iii) Complete the following: (4 marks)

a) 

b) 

iv) Outline the synthesis of Adrenaline (2 marks)

B) i) Provide a detailed mechanism for Fischer-indole synthesis of 2-methylindole (4 marks)

ii) Give only the reaction involved in Hantzsch Synthesis of substituted dihydropyridine (2 marks)

TABLE – 1

Characteristic Infrared Absorptions of Functional Groups

GROUP		FREQUENCY RANGE cm^{-1}	INTENSITY
A. Alkyl			
C–H (stretching)		2853 – 2962	(m – s)
Isopropyl – $CH(CH_3)_2$		1380 – 1385	(s)
		and 1365 – 1370	(s)
tert – Butyl – $C(CH_3)_3$		1385 – 1395	(m)
		and – 1365	(s)
B. Alkenyl			
C–H (stretching)		3010 – 3095	(m)
C = C (stretching)		1620 – 1680	(v)
R–CH = CH_2		985 – 1000	(s)
		and 905 – 920	(s)
$R_2C = CH_2$	(out of plane C–H bending)	880 – 900	(s)
cis – RCH = CHR		675 – 730	(s)
trans – RCH = CHR		960 – 975	(s)
C. Alkynyl			
≡ C–H (stretching)		3300	(s)
C ≡ C (stretching)		2100 – 2260	(v)
D. Aromatic			
Ar – H (stretching)		3030	(v)
Aromatic substitution type (C–H out-of-plane bendings)			
Monosubstituted		690 – 710	(very s)
		and 730 – 770	(very s)
o – Disubstituted		735 – 770	(s)
m – Disubstituted		680 – 725	(s)
		and 750 – 810	(very s)
p – Disubstituted		800 – 840	(very s)
E. Alcohols, Phenols, Carboxylic Acids			
OH (alcohols, phenols, dilute solutions)		3590 – 3650	(sharp v)
OH (alcohols, phenols, hydrogen bonded)		3200 – 3550	(broad s)
OH (carboxylic acids, hydrogen bonded)		2500 – 3000	(broad v)
F. Aldehydes, Ketones, Esters and Carboxylic Acids			
C = O stretch		1630 – 1760	(s)
aldehydes		1690 – 1740	(s)
ketones		1680 – 1750	(s)
esters		1735 – 1750	(s)
carboxylic acids		1710 – 1780	(s)
amides		1630 – 1690	(s)
G. Amines			
N – H		3300 – 3500	(m)
H. Nitriles			
C ≡ N		2220 – 2260	(m)