* P G - 0 0 3 - 0 0 1 6 0 7 - 7 6 0 - 7 *

PG-003-001607 Seat No. _____

B. Sc. (Sem. VI) (CBCS) Examination

July - 2018

Chemistry : C - 602

(Organic Chemistry & Spectroscopy)

(New Course)

Faculty Code : 003
Subject Code : 001607

Time : $2\frac{1}{2}$ Hours] [Total Marks : **70**

Instructions : (1) Paper contains **three** questions and all are **compulsory**.

(2) Question **1** carries **20** marks.

(3) Question **2** and **3** carries **25** marks each.

1 Answer the following questions : **20**

(1) Define Isoprene rule.

(2) Give ninhydrin test for protein.

(3) Give structure of Thyroxin.

(4) Define explosive.

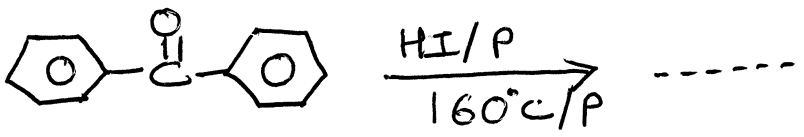
(5) Give structure of Baygon.

(6) Complete the reaction :

$$\text{Citral} \xrightarrow[\text{heating}]{KHSO_4} \text{.....}$$

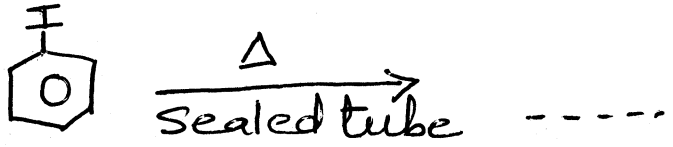
(7) Give examples of simple protein.

(8) Complete the reaction :



(9) Define angle strain.

(10) Complete the reaction :



(11) Define mass spectroscopy.

(12) What is long range coupling ?

(13) What is base peak ?

(14) How many type of hydrogen are present in $CH_3CH_2OCH_2CH_3$ compound ?

(15) What is shielding in NMR ?

(16) Define coupling constant J.

(17) How many signals are expected in PMR spectrum of methyl cyclohexane ?

(18) Predict the NMR spectrum for tertiary butyl chloride.

(19) Give the number of PMR signals and their multiplicity in acetone.

(20) Which group indicate singlet at δ 11.5 ppm in NMR spectra ?

2 (a) Answer any **three** of the following : **6**

(1) State the different methods for the isolation of essential oils from plant materials.

(2) Explain isoelectric point.

(3) Give synthesis of Carbendazin.

(4) Give synthesis of Musk Ambrette.

(5) Explain Nitration of Diphenyl.

(6) Explain Wedge-Dash projection.

(b) Answer any **three** of the following : **9**

(1) Give synthesis of α-Terpineol from P. Toluic acid.

(2) Explain Gabriel Phthalamide synthesis of α-amino acid.

(3) Discuss the reactions due to carboxylic group in amino acid.

(4) Describe TNT with synthesis and uses.

(5) Give any two synthesis method of Anthracene.

(6) Explain conformation analysis of ethane.

(c) Answer any **two** of the following : **10**

(1) Give oxidation and reduction reactions of Naphthalene.

(2) Discuss different form of cyclohexane.

(3) Give synthesis and uses of :

(i) Musk ketone

(ii) RDX.

(4) Give any two synthesis method of Glycyl alanine.

(5) Give general methods for the determinating the structure of Terpenoids.

3 (a) Answer any **three** of the following : **6**

(1) What is parent peak ?

(2) Explain importance of mass spectra.

(3) Define equivalent - non-equivalent proton.

(4) What is magnetic anisotropy ?

(5) What is the characteristics of proton on nitrogen ?

(6) Which information is obtained from the intensity of a signal in NMR spectrum ?

(b) Answer any **three** of the following : **9**

(1) Discuss deuterium labelling.

(2) State importance of NMR spectroscopy.

(3) Give the difference between chemical shift and spin-spin coupling.

(4) Discuss Mc Laffery Rearrangement.

(5) Explain principles of Mass spectrometry.

(6) Assign the structure to a compound having following characteristics :

M. F. : $C_4H_8O_2$

IR : 2840, 1740, 1373, 1239, 1049, 847 cm^{-1}

NMR :

(a) Triplet δ 2.25 (3 H)

(b) Quartet δ 4.5 (3 H)

(c) Singlet δ 3.02 (3 H)

(c) Answer any **two** of the following : **10**

(1) Discuss Mass Instrumentation.

(2) State characteristic features of mass spectra of n-alkane.

(3) Assign the structure to a compound from the following spectral results with explanation :

Mol. wt. 222 gm/mole, C = 64.86%, H = 6.31%

M.F. $C_{12}H_{14}O_4$.

U.V. : λ_{max} 278 nm

IR : 3030, 2965, 2890, 1725, 1600, 1570, 1505, 1450, 835 cm^{-1}.

NMR : (a) Triplet 6 H 1.4 δ_{ppm}

(b) Quartet 4 H 3.1 δ_{ppm}

(c) Singlet 4 H 7.8 δ_{ppm}

(4) Determine the molecular structure for the following from the data :

M.F. : $C_7H_{12}O_4$

IR : 2990, 2885, 1730, 1035 cm^{-1}.

NMR : (a) Triplet δ 1.28 (6 H)

(b) Quartet δ 2.10 (2 H)

(c) Singlet δ 4.26 (4 H)

(5) Derive the structure of compound with molecular weight 164 gm/mole contains 73.17% carbon, 7.32% hydrogen and 19.5% oxygen.

IR : 3050, 2960, 1735, 1605, 1575, 1470, 1440, 1100, 835 cm^{-1}.

NMR : (a) Singlet 2.5 δ_{ppm} 3 H

(b) Triplet 1.2 δ_{ppm} 3 H

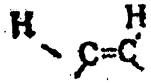
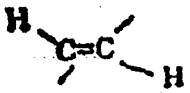
(c) Quartet 2.7 δ_{ppm} 2 H

(d) Doublet 7.3 δ_{ppm} 2 H

(e) Doublet 7.7 δ_{ppm} 2 H

Spectral Data -

Infra - Red Data

Alkene (strcteching)	-C-H	2850-2960(v)
Alkene	=C-H	3100-3200(m)
Alkyene	=C-H	3200-3300(s)
Aromatic	ArC-H	3010-3100(m)
Aromatic ring	C=C	1500-1600(v) (two to three)
Alkene	>C=C<	1610-1680(v)
Alkyene	-C=C-	2100-2260(s)
Alkene (Bending)	-C-H	1340(w)
	$-C(C_2H_3)_3$	1430-1470(m) & 1380-1385(s)
	$-C(CH_2)_3$	1365 (s)
Aldehyde	-C-H	2820-2000(w)&2650 2760(s)
Adehyde	C=O	1740-1720(s)
Ketone	C=O	1725-1710(s)
Carboxylic acid	C=O	1725-1705(s)
Ester	C=O	1750-1730(s)
Amide	C=O	1670-1640(s)
Anhydride	C=O	1810-1860(s)&1740-1790
Alecohols, Ethers, esters Carboxylic acids, Anhydride	C-O	1300-1000(s)
Alcohols, phenols		
Free	O-H	3650-3600(sh)
bonded	O-H	3500-3200(b)
Carboxylic acids free		
Free	O-H	3500-3650(m)
H-bonded	O-H	2500-3200(b)
amines (stretch)	N-H	3330-3500(m)
Bnding	-N-H	1640-1550(m)
Nitrile	-C≡N	2210-2280(s)
Ether	-O-	1070-1150(s)
Alkene bending disulstituted Cis.		-690(s)
disulstituted Trans.		960-970(s)

Aromatic substitution :

Type C-H out of plane bending No. of adjacent H atom.	range cm
5	750(s) & 700(s)
4	750
3	780
2	830
1	850

NMR Data : Chemical Shift

Types of proton		Chemical shift in δ_{ppm}
Primary	$R\text{-}CH_3$	0.9
Secondary	$R_2\text{-}CH_3$	1.3
Tertiary	$R_3\text{-}CH$	1.5
Vinylic	C=C-H	4.6-5.9
Acetylinic	Cr-C-H	2.3
Aromatic	Ar-H	6-8.5
Benzylic	Ar-C-H	2.2-3
Allylic	$C=C\text{-}CH_3$	1.7
Florides	H-C-F	4-4.5
Chlorides	HC-Cl	3.4
Bromides	HC-Br	2.5-4
Iodides	HC-I	2.4
Alcohols	HC-OH	3.4-4
Ethers	HC-OR	3.3-4
Esters	R-COO-CH	3.7-4.1
Acids	HC-COOH	2-2.6
Carbonyl comp.	HC-C=O	2-2.7
Adehyde	R-CHO	9-10
Hydroxylic	R-OH	1-5.5
Phenolic	Ar-OH	4-12
Carboxylic	R-COOH	10.5-12
Amino	$R\text{-}NH_2$	1.5