NAN-003-001607 Seat No. _____

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

March / April - 2017

C-602 : Organic Chemistry & Spectroscopy

(New Course)

Faculty Code : 003
Subject Code : 001607

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

Instructions : (1) Total three questions, all are compulsory.
(2) Q. 1 carries 20 marks, should be written in the answer book.

1 Answer the following questions : **20**

(1) Write the structure of Isoprene.

(2) Give full name of RDX and TNT.

(3) Define Amino acids.

(4) Write Ninhydrine Test.

(5) Draw chair form of Cyclohexane.

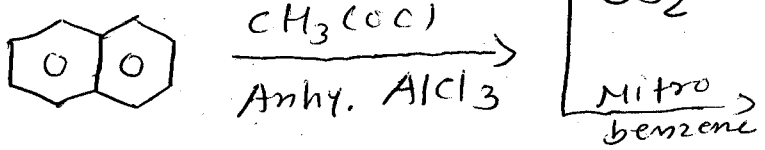
(6) Complete the reaction :

$$C_{10}H_{16}O \xrightarrow[(ii)\,CrO_4]{(i)\,KMNO_4}$$

(7) Give an example and structure of basic amino acid.

(8) Give structure and uses of PARATHION.

(9) Complete the reaction (Friedal Craft acylation)



(10) Give an example of Ullmann reaction.

(11) What is chemical shift in NMR ?

(12) Define equivalent and non-equivalent protons.

(13) How many types of Hydrogen are present in Methyl ethyl ether ?

(14) Give structure formula of compound which give rise only one NMR signal

(i) $C_5H_8Cl_4$

(15) Give structure formula which give only two NMR signal

(i) $C_3H_8O_2$

(16) >C = O group identify by which spectra ?

(17) Define Base Peak.

(18) How many minimum carbon required for Mc-Lafferty rearrangement ?

(19) Which information we get from IR and NMR spectra ?

(20) Give no. of signal and splitting of each signal of $CH_3–CH=CH_2$

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

(1) Give synthesis of Phenyl alanine from Benzaldehyde.

(2) Give synthesis of Geranic acid.

(3) Give synthesis of Glycylalanine by Bergman method.

(4) Complete the Anthrace reaction with H_2/Ni

(5) Give synthesis and uses of P.E.T.N.

(6) Give synthesis and use of Musk Ketone.

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

(1) Give synthesis and uses of Baygon and Biphenyl.

(2) Give synthesis and uses of RDX.

(3) Write a short note on classification of Proteins.

(4) Give conversion of Terebic acid from α-terpeniol.

(5) Give synthesis of Naphthalene by Haworth Reaction.

(6) Give synthesis of α-Terpineol.

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

(1) Explain constitution of Citral.

(2) Explain chemical properties of Antracene.

(3) What is Polypeptide ? Give synthesis of Thyroxine.

(4) Explain conformational analysis of cyclohexane.

(5) Give synthesis of :

(i) Baygon

(ii) Biphenyl.

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

(1) Why TMS is used as internal standard ?

(2) Give structure formula of following compound which give rise only two NMR signal.

(i) $C_4H_6O_4$

(ii) $C_2H_3F_3O$.

(3) Which Nuclei give NMR spectra ?

(4) A compound give peak at 1250 Hz. If NMR spectra taken in 100 MHz. Calculate chemical shift in δ_{ppm} and τ_{ppm}.

(5) Explain the principle of Mass spectroscopy.

(6) How many signals would you expect in NMR spectrum of Trans-1,2-Dimethyl cyclopropane ?

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

(1) Distinguish chemical shift δ and coupling constant "J".

(2) Give possible isomer of dibromo propane and give no. of NMR signals.

(3) Explain Deuterium labeling.

(4) What is isotropic and anisotropic proton ? Explain in short with example.

(5) Distinguish the following compound by NMR spectra : (i) $C_6H_5COCH_3$ and (ii) $C_6H_5CH_2CHO$

(6) Derive the structure and compound from given spectral information :

Mole. Formula : C_9H_{10}

NMR : a Quintet 2.04 δ_{ppm} 2H

b Triplet 2.91 δ_{ppm} 4H

c Singlet 7.17 δ_{ppm} 4H

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

(1) Explain Mass instrumentation with diagram.

(2) Explain factors Effecting on chemical shift.

(3) Assign the structure from the following data : M.F. = $C_6H_{10}O_3$.

IR = 3400-3500 cm^{-1}, 2990, 2810, 1725, 1025 cm^{-1}.

NMR = a Triplet δ_{ppm} = 1.0 3H

b Singlet δ_{ppm} = 2.1 3H

c Quartet δ_{ppm} = 2.5 2H

d Singlet δ_{ppm} = 2.4 1H

e Singlet δ_{ppm} = 3.2 1H

(4) Assign the structure from the following data with explanation.

(i) Molecular weight = 174 g/mole.

(ii) C = 55.1%, H = 8.0%

(iii) IR = 2941 cm^{-1}, 2850, 1740, 1450, 1020 cm^{-1}

(iv) NMR data

Signal	Splitting	δ_{ppm}	Intensity
a	Quartet	2.61	8.2 square
b	Singlet	4.14	8.1 square
c	Triplet	1.27	12.4 square

(5) Assign the structure formula from the spectral data.

(i) Vapour density : 51 gram/mole,

M.W. = 102 gram/mole

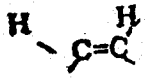
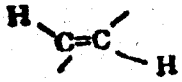
(ii) C = 70.5%, H = 13.72%

IR = 3500 (s), 2950(s), 2900(m), 2850(m), 1452(sh), 1385(sh), 1080(s) cm^{-1}.

NMR =	Signal	Splitting	τ_{ppm}	Intensity
	a	Triplet	8.8	6H
	b	Quintet	8.5	4H
	c	Multiplet	8.3	1H
	d	Doublet	6.1	2H
	e	Singlet	5.5	1H

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	$C\text{=}C\text{-}CH_3$	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