Seat No. _____

HA-003-2016007

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

(W.E.F. 2019) Examination

April - 2023

C:602 : Organic Chemistry & Spectroscopy

Faculty Code : 003
Subject Code : 2016007

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

Instructions : (1) This question paper contains five questions.
(2) Figures to the right indicate full marks.

1 (a) Write in short : **4**
(1) Write structure of Thiazole.
(2) Which heteroatom is present in Oxazine ?
(3) Molecular formula of pyrazole is _____.
(4) Dioxane is commonly used as _____.

(b) Write any one in short : **2**
(1) Give one synthesis of Isoxazole.
(2) Phenyl amine + 2S I_2 ———

(c) Write any one in brief : **3**
(1) Give two synthesis of α-pyridazine.
(2) α position is more reactive than β in pyrole. Give reason.

(d) Write any one short note : **5**
(1) Write Nitration, Sulphonation, Acetylation reaction for Pyrole, Furan and Thiophine.
(2) Give synthesis of Pyrimidine and Thiazole.

2 (a) Write in short : **4**
(1) Molecular formula of Thyroxin is _____.
(2) Define α-amino acid.
(3) Write the full form of PETN.
(4) Musk Ketone and Musk xylene is synthesized from _____.

(b) Answer any one in brief : **2**

(1) Write the preparation of α-amino acid by Hydantoin Method.

(2) Give use of Parathion and Carbendazim.

(c) Answer any one in detail : **3**

(1) Explain Bergman method.

(2) Give the classification of Explosive.

(d) Answer any one in detail : **5**

(1) Give synthesis of Thyroxin.

(2) Give the synthesis and uses of TNT.

3 (a) Answer the following : **4**

(1) Citral is an _____ mono terpene.

(2) Which Terpinoids occurring from sandal wood ?

(3) What is Base peak ?

(4) What is radical ion ?

(b) Answer any one in brief : **2**

(1) How can detected –COCH3 group in Terpinoids ?

(2) Give uses of mass spectroscopy.

(c) Answer any one in detail : **3**

(1) Explain $\alpha - \beta$ unsaturation in citral.

(2) Discuss : Mclafferty rearrangement.

(d) Write any one short notes : **5**

(1) Give synthesis of α Terpineol.

(2) Write note on : Mass fragmentation.

4 (a) Answer the following : **4**

(1) Give full name of NMR.

(2) Which type of radiation is used in NMR ?

(3) What is coupling constant ?

(4) Why $_{12}C$, $_{16}O$, $_{32}S$ do not show NMR spectra ?

(b) Answer any one in brief : **2**

(1) Define equivalent protons and non equivalent protons.

(2) "C^{13} is NMR active while C^{12} is NMR inactive" Why ?

(c) Answer any one in detail : **3**

(1) Why TMS is used as a reference compound ?

(2) Sketch the NMR spectra of Ethyl Benzoate.

(d) Answer any one in detail : **5**

(1) Explain the factors affecting chemical shift in NMR spectra.

(2) Derive the difference between chemical shift and coupling constant.

5 (a) Answer the following : **4**

(1) Give full name of DEB.

(2) How many types of proton present in Propane ?

(3) Give structural formula of compound which gives rise to only one NMR signal.

(4) Which type of solvent used in NMR spectroscopy ? Give one example.

(b) Answer any one in brief : **2**

(1) Distinguish the stereoisomers of 1,3-dibromo-1,3-dimethyl cyclobutane with the help of NMR.

(2) Give structural formula of compound which gives rise to only two NMR signals.

(a) C_3H_6O (b) $C_4H_6O_4$

(c) Answer any one in detail : **3**

(1) A compound gives peak at 1250 Hz. If NMR spectra taken in 100 MHz calculate value of chemical shift in both unit.

(2) Derive structural formula fray the data :

M.F. $C_6H_{12}O$

NMR : a singlet 2.2§ ppm 3H

b singlet 1.1§ ppm 9 H

(d) Answer any one in detail : **5**

(1) Derive structure of $C_8H_8Br_2$

I R 3080, 1640, 1580, 1510, 1405, 1215, 980, 760, 710 Cm^{-1}

^1H NMR : a Doublet 4.0§ ppm 1H

b Doublet 4.1§ ppm 1H

c Pair of Doublet 5.1§ ppm 1H

d Singlet 7.4§ ppm 5H

(2) Assign the structural formula from the spectral information given below :

Molecular weight = 102 gm/mole.

C = 70.5% H = 13.72 %

IR : 3445, 2915, 2870, 1475, 1415, 1390, 1310 and 1060 Cm

^1H NMR : a Triplet 1.2§ 6H

b Quinlet 1.8§ 4H

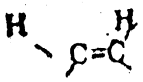
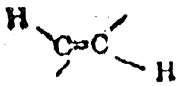
c Doublet 2.2§ 1H

d Doublet 4.2§ 2 H

e Singlet 3.2§ 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=C2.	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 (8)
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	—— Mono Substi ——→	750(s) & 700(s)
4	ortho " ——→	750 ± 20
3		
2		
1	Mete (two bands) → 710 ± 750	
	Para sub. ——→	820 ± 20

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