



PA-003-001607

Seat No. _____

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

March / April – 2020

Chemistry : Paper - C - 602

(Organic Chemistry & Spectroscopy) (Old Course)

Faculty Code : 003

Subject Code : 001607

Time : $2\frac{1}{2}$ Hours]

[Total Marks : 70

Instructions :

- (1) Question 1 contains 20 short questions of 1 mark each. All are compulsory.
- (2) Questions 2 & 3 carry 25 marks, with internal options.
- (3) Write answers of all questions in main answer sheet.

1 Answer the following questions :

20

- (1) What is terpenoid ?
- (2) What is putrefaction of protein ?
- (3) Give use of PETN.
- (4) Write the product, obtained by sulphonation of diphenyl.
- (5) What are rotamers ?
- (6) Write the structure of musk-xylene.
- (7) What is the monomer of protein ?
- (8) Give the structure of Hydantoin.
- (9) Write the formula and name of the reagent, used in Millon's test.
- (10) Define : Polynuclear compounds.
- (11) Write structure of the compound, which gives only one PMR signal at 1.18, having MF : $C_8H_{18}O$.

- (12) Write full form of DBE.
- (13) Write formula of DBE.
- (14) Give the number of signals in acetone.
- (15) Write the full name and structure of TMS.
- (16) What information can we get from intensity (height) of signal ?
- (17) Define : Base Peak.
- (18) Which solvents are used in PMR ?
- (19) _____ rearrangement is seen in Mass Spectroscopy
 (a): McLafferty; (b) : J.M. Par; (c) A.M. Vir;
 (d) V.N. Patol
- (20) What information can we get from the number of signals in PMR spectrum ?

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

- (1) Prove : Citral has α, β unsaturation.
- (2) Give any one synthesis of α -amino acid.
- (3) Define : Explosive and Insecticide.
- (4) Write synthesis of naphthalene.
- (5) Anthracene + Br₂/CCl₄ → _____
- (6) What is conformational analysis ?

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

- (1) Describe oxidation of α -Terpineol.
- (2) Write synthesis and uses of Parathion.
- (3) Give chemical reactions of Anthracene.
- (4) Discuss Erlenmayer synthesis for amino acid.
- (5) Write chemical reactions of diphenylamine.
- (6) Explain the conformational analysis of n-butane.

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

- (1) Discuss the constitution of α -terpineol.
- (2) Give reactions of naphthalene.
- (3) Explain conformational analysis of cyclohexane.
- (4) Determine the constitution of Thyroxin by analysis method.
- (5) Give synthesis of polypeptides.

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

- (1) Give the number and splitting of signals for following compounds :
 - (a) CH_3OH
 - (b) $\text{CH}_3\text{--CH}_2\text{--OH}$
- (2) Define : Spin-spin coupling constant (J).
- (3) TMS is used as reference. ____ Why ?
- (4) What is chemical shift ?
- (5) Define : Parent peak and metastable ion.
- (6) Define : Equivalent and Non-equivalent protons.

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

- (1) Explain : Enantiomeric and diastereomeric protons.
- (2) Which nuclei will give NMR spectra ? Give examples.
- (3) Discuss : McLafferty rearrangement.
- (4) Describe the pmr spectrum of cyclohexane at RT°C , -70°C and -100°C .

- (5) Write a short note : FAB technique.
- (6) MF : C_8H_8O . The compound gives following pmr signals :
- a : singlet, 2.3 δ_{ppm} , 3H
- b : complex, 7.7 δ_{ppm} , 5H.

Derive the structure of compound.

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

- (1) Write a note on “Deuterim Labeling”.
- (2) Describe the mass spectra of alkanes.
- (3) Explain : Shielding and Deshielding effects.
- (4) Derive the structure from the following spectral data.

MF : C_9H_{10}

UV : $\lambda_{max} = 242 \text{ nm}$.

IR : 3090, 3030, 2970, 1625, 1570, 1500, 1445, 1380, 960, 760 and 690 cm^{-1}

1H NMR :

- (a) Singlet, 2.1 δ_{ppm} , 3H
 - (b) Doublet, 5.1 δ_{ppm} , 1H
 - (c) Doublet, 5.3 δ_{ppm} , 1H
 - (d) Complex, 7.3 δ_{ppm} , 5H
- (5) Explain any two factors, affecting the chemical shift in PMR.

Spectral Data

Infra-Red Data		$\nu^- \text{ cm}^{-1}$
Alkane (Stretching)	C-H	2850-2960 (v)
Alkane (bending)	-CH ₃	1370-1395 (cm)
		1430 - 1470 (sh)
	-CH ₂	1445-1485(sh)
Alkane gem dimethyl	-C(CH ₃) ₂	1430-1475 (m) &
		1375-1385(m)
	-C(CH ₃) ₃	1365 (s)
Alkene (stretching)	=C-H	3100-3200 (m)
Alkyene (st.)	C-H	3200-3300 (m)
Aromatic	C-H	3010-3100 (cm)
Aromatic ring st.	C=C	1500-1650 (m,v)
Alkene	>C=C<	1610-1650 (v)

Alkyene	$-C \equiv C-$	2100-2260(s)
Aldehyde (st)	$-C-H$	2820-2880 (w) & 2775-2700 (w)
Aldehyde	$C=O$	1740-1720 (s)
Ketone	$C=O$	1725-1710 (s)
Carboxylic acid	$C=O$	1725-1705(s)
Ester	$C=O$	1730-1750 (s)
Amide	$C=O$	1640-1670 (s)
Anhydride	$C=O$	1810-1860 (s) & 1740-1790 (s)
Acid chloride	$C=O$	1800(s)
Ether	$C-O-C$	1070-1150 (s)
Alcohol, ester, carboxylic acid, anhydride, phenol	$C-O$	1000-1280 (s)
Alcohol, Phenol (st.)	Free-OH	3600-3650 (sh)
	bonded $-OH$	3200-3500 (b)
Carboxylic Acid (st.)	Free $-OH$	3200-3400 (b)
	bonded $-OH$	2500- 3200 (b)
Amines (st.)	$N-H$	3330-3500 (doublet)
Bending	$-N-H$	1550-1640 (m)
Nitrile (st.)	$-C \equiv N$	2210-2280 (s)
Bending	$-C \equiv N$	1250-1340 (m)
Alkene monosubstituted (Vinyl gp.)	$CH_2=CH-$	985-995 _(s) & 905-915 _(w)
Alkene disubstituted	Cis	690(s)
Alkene disubstituted	Trans	970-980 (s)
Ar-C-H out of plane bending	Adjucent Atom	
	5	700 _(s) & 750 _(s, v)
	4	750 _(s)
	3	780 _(v)
	2	830 (s)
	1	850(v)
	6	

NMR Data : Chemical Shift :

Types of proton		Chemical shift in δ ppm.
Primary	$R-CH_3$	0.9
Secondary	R_2-CH_2	1.3
Tertiary	R_3-CH	1.5
Vinylic	$C=C-H$	4.6-5.9
Acetylinic	$C\equiv C-H$	2.3
Aromatic	$Ar-H$	6-8.5
Benzylic	$Ar-C-H$	2.2-3
Allylic	$C=C-CH_3$	1.7
Flourides	$HC-F$	4-4.5
Bromide	$HC-Br$	2.5-4
Iodides	$HC-I$	2-4
Alcohols	$HC-OH$	3.4-4
Ethers	$HC-OR$	3.3-4
Esters	$RCOO-CH$	3.7-4.1
Acids	$HC-COOH$	2-2.6
Carbonyl comp.	$HC-C=O$	2-2.7
Aldehydic	$RCHO$	9-10
Hydroxylic	ROH	1-5.5
Phenolic	$Ar-OH$	4-12
Carboxylic	$R-COOH$	10.5-12
Amino	$R-NH_2$	1-5