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MAN-003-001607

Seat No. _____

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

March / April - 2018

Chemistry : 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) The figures to the right side indicate the marks of the sub-question.

1 Answer the following questions : (in short) **20**

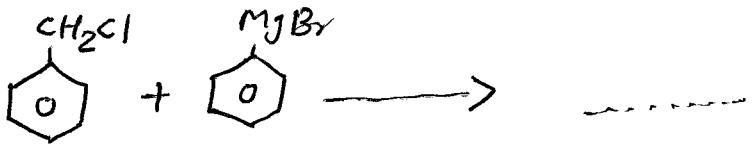
(1) Write the structure of Acidic amino acid.

(2) Write ninhydrine test for proteins.

(3) Write structure of Hippuric acid.

(4) Write the structure of P.E.T.N.

(5) Complete the reaction :



(6) Complete the reaction (Sulphonation)

(7) Complete the reaction

(8) Write structure of twisted boat form of cyclo hexane.

(9) α-amino acid + $Cu^{+2} \xrightarrow{\Delta}$

(10) Give reaction when Diphenyl methane heated through red hot iron.

(11) Which Nuclei will give NMR spectra ?

(12) Give structural formula of compound which give rise to only two NMR signal.

(i) C_3H_6O

(ii) $C_{10}H_{10}O_4$

(13) How many signals are obtained from cis-1,3 dibromo 1,3-dimethyl cyclobutane in NMR spectra.

(14) Which type of solvent is used for taking NMR spectra ? Give two names.

(15) Arrange chemical shift δ_{ppm} in ascending order. Benzene, Methane, Ethylene, Cyclopropane.

(16) Why ^{13}C shows NMR spectra ?

(17) Which information we get from IR, NMR and Mass spectroscopy individually ?

(18) How can we predict whether the given compound is aromatic or not by PMR-spectra ?

(19) What is parent peak in mass spectra ?

(20) How many minimum carbons are required for Mc-Lafferty rearrangement ?

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

(1) Give synthesis of oxalic acid from citral.

(2) Define isoelectric point.

(3) Give synthesis of terabic acid.

(4) What is amino acid ? Give reaction of amino acid with sodalime.

(5) Explain Friedel-Crafts alkylation and acylation of naphthalene.

(6) Write the structure of Baygon and Cyclonite.

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

(1) Give synthesis of phthalic acid from potassium phthalate.

(2) Give synthesis of carbendazin from o-phenylenediamine.

(3) Give synthesis of parathion.

(4) Give synthesis of anthra quinone from 1,3-butadine.

(5) Explain conformations of cyclopentane.

(6) Explain synthesis of naphthalene by Haworth reaction.

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

(1) Explain synthesis of anthracene.

(2) Give synthesis of musk xylene and musk ketone and give its uses.

(3) Explain chemical properties of amino acid (any five)

(4) Write any three methods for preparation of polypeptides.

(5) Give constitution of 3,7-dimethyl 2,6-diene octanal.

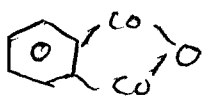
3 (a) Answer any three from the following : **6**

(1) Define equivalent and non-equivalent protons.

(2) Give principle of mass spectroscopy.

(3) How many kinds of hydrogen are present in the following compounds ?

(i) $CH_2–CH=CH_2$

(ii) 

(4) Explain Geminal proton and Vicinal proton.

(5) Which information is obtained from the splitting of signal ? Give one example.

(6) How will you distinguish methyl benzoate and phenyl acetic acid with the help of NMR spectra (only signal and δ value).

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

(1) Give possible isomers of dibromo propane and give no. of NMR signals.

(2) Distinguish the compound by NMR spectra :

n-propyl benzene and isopropyl benzene.

(3) Explain Mc. Lafferty rearrangement.

(4) Explain shielding and deshielding effect in NMR spectra.

(5) Discuss importance of TMS in NMR spectra.

(6) Find out structural formula from following NMR data :

M.F. = $C_4H_8O_2$ NMR a triplet δ = 1.05 3H

b triplet δ = 4.15 2H

c multiplet δ = 1.80 1H

d singlet δ = 9.1 1H

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

(1) Explain factor affecting on chemical shift.

(2) Explain Enantiomeric and Diastereomeric protons.

(3) Assign the structure from the following data :

Molecular Formula = $C_{10}H_{12}O_2$

IR = 3077, 2976, 1745, 1608, 1490 and 1450 cm^{-1}

NMR = a $\tau_{ppm} = 2.7$ singlet (16.50 sq.)

b $\tau_{ppm} = 5.7$ triplet (6.20 sq.)

c $\tau_{ppm} = 7.07$ triplet (6.7 sq.)

d $\tau_{ppm} = 7.98$ singlet (10.20 sq.)

(4) Assign the structure from the following data :

M.F. = $C_8H_8Br_2$

IR = 3080, 1640, 1580, 1405, 1215, 930, 720 and 690 cm^{-1}

NMR = a doublet δ_{ppm} = 4.0 1H

b doublet δ_{ppm} = 4.1 1H

c doublet of doublet δ_{ppm} = 5.1 1H

d Singlet δ_{ppm} = 7.4 5H

(5) Assign the structure from the following data :

Mole. wt. = 240 gram/mol.

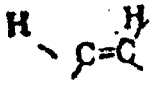
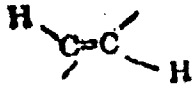
C = 80%, H = 8.34 %, N = 11.66%

IR = 3010, 2955, 1610, 1585, 1330, 1305, 1230, 1180, 1100 and 830 cm^{-1}

NMR = a singlet δ_{ppm} = 3.1 12 H

b complex δ_{ppm} = 7.5 8H

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 (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	Meta (two bands) -> 710 & 750	
1	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