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RY-003-001607 Seat No. _____

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

March - 2019

Chemistry : Paper - 602

(Organic Chemistry & Spectroscopy)

(Old Course)

Faculty Code : 003

Subject Code : 001607

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

Instructions : (1) Total five questions, all are compulsory.

(2) The figure to the right side indicate the marks of the sub-question.

1 Answer the following questions : **20**

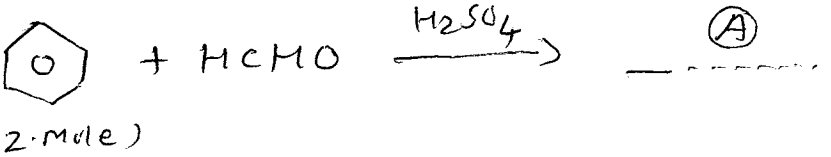
(1) Complite the reaction : $C_9H_{15}CHO + Ag_2O \rightarrow$ (A)

(2) Write the structure of Musk xylene

(3) Complite the reaction

α- Amino acid + Nitrous acid → (A)

(4) Write the structure of Ninhudrin.

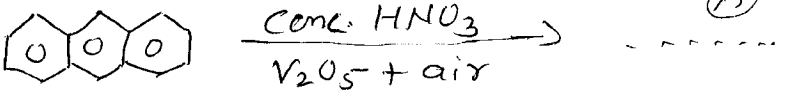
(5) 

(2 mole)

(6) Give structure and uses of PARATHION.

(7) Write structure of hippuric acid.

(8) Write Ninhudrine test.

(9) 

(10) Draw Sawhorse and New mann projection structure of Ethane.

(11) Define equivalent and non-equivalent protons.

(12) In IR spectra aldehyde (–CHO group), CH stretching frequency in cm^{-1} observel approximetly at.....

(13) How many NMR signals would you expect in Neo pentane.

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

(15) Give structure formula of following compound which give rise only Two NMR signal (i) $C_4H_6O_4$.

(16) Which information we get from IR - spectra.

(17) In NMR spectra which information we get from Intensity of signal.

(18) Define Base Peak in Mass Spectra.

(19) Give No. of Signal in the compound

$CH_3 \cdot CH = CH_2$

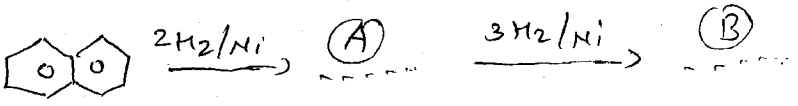
(20) Predict the number of NMR signals in Cis – 1, 2 cyclopropane.

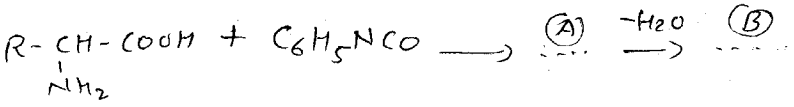
2 (a) Answer the following : (any three) **6**

(1) Give structure and uses of carbendazine.

(2) Give synthesis of Geranic acid.

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

(4) 

(5) 

(6) Give Nitration reaction of Diphenyl.

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

(1) Give synthesis and uses of Baygon.

(2) Give synthesis of Glycyl alanine from Phthalic Anhydride.

(3) Explain physical properties of Amino acid.

(4) Give synthesis of Naphthaline by Hawarth method.

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

(6) Explain conformations of cyclopantane.

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

(1) Explain constitution of Thyronine.

(2) Give synthes of α – Terpinol from P – Toluic acid.

(3) Explain constitution of Citral.

(4) Explain chemical properties of Anthracene.

(5) Give synthesis of (i) RDX (ii) TNT.

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

(1) Explain principle of Mass Spectroscopy.

(2) Define Equivalent and Non equivalent protons.

(3) Define : Geminal proton and Vicinal proton.

(4) Give No. of Signal, Splitting of each signal and δ_{ppm} value of the compound.

$CH_3 \cdot CBr \cdot CH_2$

(5) Give the structure for the compound $C_8H_{18}O$ giving only <u>one</u> NMR signal.

(6) Give structure formula of compounds which give rise to only <u>two</u> NMR signal

(i) C_3H_6O

(ii) $C_4H_{10}O_2$

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

(1) Distinguish the following compound by NMR spectra.

n-Propyl benzene and isopropyl benzene.

(2) Discuss importance of TMS in NMR spectroscopy

(3) Explain Mc Lafferty rearrangement.

(4) How will you distinguish the sterioisomers of 1,3 dibremo. 1, 3 - dimethyl cyclo butane with the help of NMR spectra.

(5) Explain deuterium labelling.

(6) Assign the structure from the following spectral data.

M.F. = $C_8H_{14}O_3$ NMR =

a septet $\delta = 2.73_{ppm}$ 2H

b doublet $\delta = 1.2_{ppm}$ 12H

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

(1) Explain Enantiometric and Diastereomeric protons.

(2) Explain spin-spin coupling win example.

(3) Assign the structure to a compound from the following spectral data.

M.F. = $C_5H_{10}O_4$

NMR	Signal	Splitting	δ_{ppm}	Intensity
	a	Singlet	$\delta = 4.8$ ppm	4.3 squares
	b	Singlet	$\delta = 3.8$ ppm	13.2 squares
	c	Singlet	$\delta = 3.7$ ppm	25. 8 squares

(4) Assign the structure from the following data.

IR = 1745, 1240, 1045, 749 and 697 cm^{-1}

M.F. = $C_9H_{10}O_2$

NMR

a Singlet $\tau = 2.72$ ppm 5H

b Singlet $\tau = 7.00$ ppm 2H

c Singlet $\tau = 6.3$ ppm 3H

(5) 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 $\delta_{ppm} = 1.0$ 3H

b Singlet $\delta_{ppm} = 2.1$ 3H

c Quartet $\delta_{ppm} = 2.5$ 2H

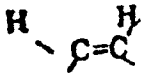
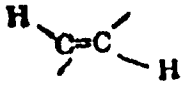
d Singlet $\delta_{ppm} = 2.4$ 1H

e Singlet $\delta_{ppm} = 3.2$ 1H

NMR-Data : Chemical Shift

Type	Type of Proton	Chemical Shifts in δ p.p.m.
Primary	R- $C\underline{H}_3$	0.9 (1.0)
Secondary	R_2 - $C\underline{H}_2$	1.3 (1.5)
Tertiary	R_2 - $C\underline{H}$	1.5 (1.8)
Vinylic	C = C - $\underline{H}$	4.6 - 5.9
Acetytinic	C≡C - $\underline{H}$	2-3
Aromatic	Ar - $\underline{H}$	7-8
Benzylic	 C - $\underline{H}$ → Ar - C - H	2.2-3
Allylic	C = C - $C\underline{H}_3$	1.7
Flourides	$\underline{H}C$ - F	4-4.5
Chlorides	$\underline{H}C$ - Cl	3-4
Bromides	$\underline{H}C$ - Br	2.5-4
Iodides	$\underline{H}C$ - I	2-4
	H - C - X	2-4.5
Alcohols	$\underline{H}C$ - OH	3.4-4
Ethers	$\underline{H}C$ - OR	3.3-4
	H - C - OR(H)	
Esters	R -  - OCH_3 → $RCOO \cdot C\underline{H}_3$	3.7-4.1
Acids	$\underline{H}C$ - COOH	2.6-3
Carbonyl compounds	$\underline{H}C$ - C = O	2-2.7
Carboxylic	R - $COO\underline{H}$	10-12
Aldehyde	R - $C\underline{H}O$	9-10
Hydroxylic	R - $O\underline{H}$	1-5.5 (depend on H-bond)
Phenolic	Ar - $O\underline{H}$	4-12
Enolic	C = C - $O\underline{H}$	15-17
Amino	R - $N\underline{H}_2$	1-5
CYN.	$C\underline{H}$ - CN	2.7

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 bends) → 710 & 750
1	Para sub. → 820 ± 20