AAH-003-001607 Seat No. _____

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

April/May - 2016

C-602 : Organic Chemistry & Spectroscopy

(New Course)

Faculty Code : 003
Subject Code : 001607

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

Instructions : (1) All questions are compulsory.
(2) Answer of Q. 1 (MCQ) should be written in the answer book.

1 Answer the following : **20**

(1) Citral is extracted from

(A) lemon grass oil (B) jasmine oil

(C) camphor oil (D) peppermint oil

(2) Biuret test is utilised in the identification of

(A) terpenoid (B) protein

(C) alkaloid (D) dyes

(3) Citral on heating with $KHSO_4$ gives

(A) p-Cymene (B) Geraniol

(C) Geranic acid (D) Laevulic acid

(4) Chlorination of diphenylmethane in presence of sunlight gives

(A) 4,4' –Dichloro diphenylmethane

(B) Diphenyldichbro methane

(C) Chlorobiphenyl methane

(D) None of these

(5) Staggered conformer of ethane is having energy

(A) Lower than eclipsed conformer

(B) Higher than eclipsed conformer

(C) Equal to eclipsed conformer

(D) Both (A) and (B)

(6) Citral is oxidised with silver oxide to obtain

(A) Laevullinic acid (B) Geraniol

(C) Geranic acid (D) p-Cymene

(7) Baygon is used as

(A) Perfume (B) Explosive

(C) Insecticide (D) Protien

(8) Diphenylmethane is oxidised with chromic acid to yield

(A) Benzhydrol (B) Dibenzyl

(C) Benzophenone (D) Fluorene

(9) α –Terpeniol reacts with Tilden's reagent to give compound molecular formula is

(A) $C_{10}H_{17}O_2NCl$ (B) $C_9H_{17}O_2NCl$

(C) $C_{10}H_{18}O_2NCl$ (D) $C_9H_{18}O_2NCl$

(10) In n-Butane conformation analysis after the rotation of 180^o to obtain the form of

(A) Eclipsed (B) Gauche - staggered

(C) Antistaggered (D) None of these

(11) How many signals in NMR spectra will be obtained from the following compounds respectively?

(1) $CH_3CH_2CHBr_2$ - 1, 1 - Dibromopropane

(2) $CH_3CHBrCH_2Br$ - 1, 2 - Dibromopropane

(3) $CH_3CBr_2CH_3$ - 2, 2 - Dibromopropane

(4) $CH_2BrCH_2CH_2Br$ - 1, 3 - Dibromopropane

(A) (3), (4), (1), (2) (B) (3), (4), (2), (1)

(C) (3), (2), (1), (4) (D) (4), (3), (1), (2)

(12) In mass spectroscopy, the stability of removed cation is

(A) $3° > 2° > 1°$ (B) $1° > 2° > 3°$

(C) $1° = 2° = 3°$ (D) $1° = 2° > 3°$

(13) Analysis of an organic compound shows it to be 64.3% carbon. It displays a molecular ion at m/z = 112 amu in the mass spectrum. Which of the following is plausible molecular formula for this compound ?Which factor can affect chemical shift ?

(A) C_8H_{16} (B) $C_7H_{12}O$

(C) $C_6H_8O_2$ (D) $C_5H_4O_3$

(14) Nitrile group peak is identified from

(A) NMR spectra (B) IR spectra

(C) UV spectra (B) TLC

(15) How Many types of hydrogen are present in the 1-Bromopropane ?

(A) Two (B) Three

(C) Four (D) One

(16) Mc – Lafferty rearrangement requires

(A) Minimum three carbon in chain

(B) Minimum two carbon in chain

(C) Minimum one carbon in chain

(D) None of these

(17) In mass spectroscopy, all fragment possess

(A) Same m/e value (B) Different M/e value

(C) Equal mass value (D) Equal δ value

(18) The peak having highest intensity is known as

(A) Metastable ion peak (B) Parent peak

(C) Molecular ion peak (D) Base peak

(19) The NMR spectrum of diethyl ether shows

(A) Two Peaks, both quartet

(B) Two Peaks, one a triplet, the other a quartet

(C) Two Peaks, both triplet

(D) Two Peaks, one a triplet, the other a doublet

(20) Carbonyl group peak is identified from

(A) TLC (B) NMR spectra

(C) UV spectra (D) IR spectra

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

(i) Give the synthesis of Naphthalene by Haworth method.

(ii) Define :

(1) Proteins

(2) Polynuclear hydrocarbons

(iii) Give the synthesis of Citral from Geranic acid.

(iv) How will you determine the presence of > C = O group in terpenoids ?

(v) Give synthesis and use of P.E.T.N.

(vi) Give synthesis and use of Musk ketone.

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

(i) Write a short note on classification of proteins.

(ii) Give synthesis methods of Biphenyl.

(iii) Prove that : Citral is an unsaturated aldehyde.

(iv) Prove that : α – terpineol contains –OH alcoholic group at the 8^{th} position.

(v) Discuss the isoelectric point of an amino acid.

(vi) Give synthesis of α – terpineol.

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

(i) Give synthesis and uses of :

(1) RDX

(2) Carbendazin.

(ii) Explain chemical properties of Anthracene.

(iii) Discuss conformation of n-butane with energy diagram.

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

(v) Explain relative energies and the stability of the various conformations of cyclohexane.

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

(i) Define Equivalent and Non-equivalent protons.

(ii) Define Base peak and Molecular ion peak.

(iii) Give the structure for the compound $C_4H_6O_3$ giving only one NMR signal.

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

(v) Give the structure for the compound $C_8H_{18}O$ giving only one NMR signal.

(vi) How will you distinguish the phenyl acetic acid and methyl benzoate with the help of NMR spectrum?

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

(i) Discuss importance of TMS in NMR spectroscopy.

(ii) Explain shortly : "Principle of mass spectroscopy".

(iii) How many kinds of hydrogen are present in the following compound ?

(A) $C_6H_5--CH_3$

(B) $CH_2=CH_2$

(C) $CH_3-CH=CH_2$

(iv) Sketch the NMR spectrum of Ethyl benzoate.

(v) Explain Mc-Lafferty rearrangement.

(vi) Assign the structure to a compound having following characteristics.

M.F. : $C_5H_6O_3$

IR : 2965, 1825, 1780,1280 cm^{-1}

NMR : (a) Quintet 2H δppm = 1.8

(B) Triplet 4H δppm = 2.4

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

(i) Explain the factors affecting chemical shift in NMR Spctrum.

(ii) Explain characteristics of Mass spectra of alkane.

(iii) Explain with suitable example" Enantiomeric proton and Diastereomeric proton".

(iv) Assign the structure to a compound from the following spectral results with explanation.

M.F. : $C_8H_{14}O_4$

IR : 2990, 2885, 1730, 1035 cm^{-1}

NMR : (a) Triplet 6H δppm=1.85

(B) Singlet 4H δppm=2.0

(C) Quartet 4H δppm=4.3

(v) Assign the structure to a compound from the following spectral results with explanation.

Molecular weight : 199 gm/mol [C=54.27%, H=5.53%, Br=40.2% (At. Wt. of Br=80 gm/mol)]

IR : 3025, 2910, 1600, 1580, 1505, 1440, 750, 710 cm^{-1}

NMR : (a) Singlet 5H δppm=7.22

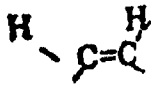
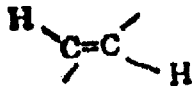
(B) Triplet 2H δppm=2.74

(C) Triplet 2H δppm=3.38

(D) Quintet 2H δppm=1.85

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 (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