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Vallabh Vidyanagar

B. Sc. (Fifth Semester)

Subject : ORGANIC CHEMISTRY

Subject code : US05CCHE01

Date : 29-09-2018

INTERNAL EXAMINATION - 2018

Marks : 50

Day : Saturday

Time : 10.00 to 12.00

Note: (i) All questions are to be attempted. (ii) Figures to the right indicate marks.

Q.1 Choose the correct option for the following : [8]

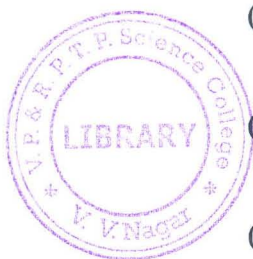
- (i) The correct relative basicity order of (i) Pyridine (ii) Pyrrolidine (iii) Pyrrole and (iv) RCH_2NH_2 is:
(a) $\text{ii} > \text{iv} > \text{i} > \text{iii}$ (b) $\text{iii} > \text{i} > \text{ii} > \text{iv}$ (c) $\text{iv} > \text{i} > \text{ii} > \text{iii}$ (d) $\text{iii} > \text{ii} > \text{i} > \text{iv}$.
- (ii) What will be product during Chichibabin reaction ?
(a) 4-aminopyridine (b) 2-aminopyridine
(c) 2-aminopyrrole (d) 4-aminopyrrole
- (iii) The correct relative chemical shift order for ^{13}C of (i) alkane (ii) alkyne (iii) alkene and (iv) carbonyl compound is :
(a) $\text{iv} > \text{iii} > \text{ii} > \text{i}$ (b) $\text{iii} > \text{i} > \text{ii} > \text{iv}$ (c) $\text{i} > \text{ii} > \text{iii} > \text{iv}$ (d) $\text{iii} > \text{iv} > \text{i} > \text{ii}$.
- (iv) Which of the following compound exhibit splitting ?
(a) 1,2-dichloroethane (b) 1,2-dibromo-2-methylpropane
(c) Isobutylene (d) 1,2-dichloro-1,1-difluoroethane.
- (v) Which of the following is not an example of conjugated diene ?
(a) 1,3-butadiene (b) 1,3-pentadiene (c) 1,3-hexadiene (d) 1,4-pentadiene.
- (vi) Elastomers can be stretched to times from its original length.
(a) 100 (b) 8 (c) 10 (d) 20
- (vii) Which of the following is used with the detergent as an anti redosition agent for soil on the washed garments?
(a) CMC (b) Sodium bicarbonate (c) Sodium sulphate (d) Tinopol RBX.
- (viii) Which of the following class of insecticide makes food unattractive for insects ?
(a) repellants (b) internal insecticides (c) fumigants (d) attractants.

Q.2 Answer the following (Attempt any five) : [10]

- (i) Catalytic hydrogenation of pyridine increase the basic strength by a factor of 10^6 .
- (ii) Write synthesis of 2-acetylfuran from pentosan.
- (iii) Give structure and label each kinds of protons for the compound having molecular formula $\text{C}_3\text{H}_5\text{ClF}_2$, consisting with the following NMR data.
NMR (d, ppm) : (a) 1.75, 3H, Triplet (b) 3.63, 2H, Triplet.
- (iv) What is chemical shift? Sketch NMR spectrum of p-xylene with respect to δ - value.
- (v) Explain : Cis-1,4-polyisoprene is an elastomeric while trans-1,4-polyisoprene is non-elastic.
- (vi) Give the synthesis of bisphenol - A from phenol.
- (vii) What are the characteristics of good vehicle ?
- (viii) Give the synthesis and applications of compound used to impart sweet hay like odour.

Q.3 [08]

- [A] Discuss the orbital picture of furan. Why electrophilic substitution reaction occurs at α -position and not at β -position in furan ?



- [B] Outline synthesis of Hygrinic acid ($C_6H_{11}O_2N$) using 1,3-dibromopropane followed by $CH(COOC_2H_5)_2^- Na / Br_2 / CH_3NH_2 / aq. Ba(OH)_2 / heat / HCl / heat$.

OR

Q.3 [08]

- [A] Why nucleophilic substitution reaction in pyridine is preferred at the 2- and 4-positions and not at 3-position ?
- [B] Write synthesis of 3-carbethoxy-2,4-dimethyl furan from α -chloroacetone and acetoacetic ester by Feist-Benary synthesis route.

Q.4 [08]

- [A] Deduce the structure of compound having following spectral data. Label all kind of carbons / protons and give appropriate explanation for the same.

(i) Molecular formula : C_9H_{10}

IR (CM^{-1}) : 3100, 2950, 1650, 1600, 1500, 1450, 1375, 890, 760-770.

NMR (δ , ppm) : (a) 7.5, 5H, Complex (b) 5.35, 1H, Singlet
(c) 5.1, 1H, Singlet (d) 2.10, 3H, Singlet.

(ii) Molecular formula : C_4H_6O

CMR (δ , ppm) : (a) 74.4, Triplet (b) 126.4, Doublet.

- [B] How will you assign the configuration of geometric isomers by using CMR Spectroscopy ? Explain using suitable example.

OR

Q.4 Deduce the structure of compound having following spectral data. Label all kind of carbons / protons and give appropriate explanation for the same. [08]

[A] (i) Molecular formula : $C_4H_6O_2$

CMR (δ , ppm) : (a) 22.3, Triplet (b) 27.9, Triplet (c) 68.9, Triplet (d) 178.2, Singlet.

(ii) Molecular formula : $C_9H_{10}O_2$

NMR (δ , ppm) : (a) 7.5, 4H, Quartet (b) 3.9, 3H, Singlet (c) 2.5, 3H, Singlet.

IR (CM^{-1}) : 3000, 2900, 1670, 1600, 1500, 1375, 1258, 1021, 833.

[B] Molecular formula : $C_4H_6O_2$

CMR (δ , ppm) : (a) 22.3, triplet (b) 27.9, triplet (c) 68.9, triplet (d) 178.2, singlet.

Q.5 [8]

- [A] Explain : Addition of HBr to 1,3-butadiene at higher temperature yields 1-bromo-2-butene as a major product while at lower temperature it becomes a minor product.

[B] (i) What are plastics ? Give classification of plastics.

(ii) Give name and structure of the monomer for following polymers. Also discuss uses for the following polymers. (a) Duprene (b) Vulcanized rubber.

OR

Q.5 [8]

- [A] What is coordination polymerization ? Give the mechanism of coordination polymerization. Discuss advantages of coordination polymerization over free-radical polymerization for the preparation of polyethylene.

[B] List the name of methods of polymerization techniques based on phase systems and discuss in detail any one.

Q.6 [8]

- [A] Define Detergent. Give the principal of cleansing action of detergent.



- [B] Define Insecticide. Give the classification of Insecticide using suitable illustration.
OR

- Q.6 [8]
[A] What are detergent builders? Give list of inorganic and organic substances used as builders and discuss about any one.
[B] Define Perfume. Give the synthesis and applications of compound, which occurs in the essential oils of bergamot.

CHARACTERISTIC PROTON CHEMICAL SHIFTS

Type of proton	Chemical shift, ppm
Cyclopropane	0.2
Primary	0.9
Secondary	1.3
Tertiary	1.5
Vinyl	4.6-5.9
Acetylenic	2-3
Aromatic	6-8.5
Benzylic	2.2-3
Allylic	1.7
Fluorides	4-4.5
Chlorides	3-4
Bromides	2.5-4
Iodides	2-4
Alcohols	3.4-4
Ethers	3.3-4
Esters	3.7-4.1
Esters	2-2.2
Acids	2-2.6
Carbonyl compounds	2-2.7
Aldehydic	9-10
Hydroxylic	1-5.5
Phenolic	4-12
Enolic	15-17
Carboxylic	10.5-12
Amino	1-5

¹³C Shifts for some linear and branched chain alkanes

Compound	C-1	C-2	C-3	C-4	C-5
Methane	-2.3				
Ethane	5.7				
Propane	15.8	16.3	15.8		
Butane	13.4	25.2	25.2		
Pentane	13.9	22.8	34.7	22.8	13.9
Hexane	14.1	23.1	32.2	32.2	23.1
Heptane	14.1	23.2	32.6	29.7	32.6
Octane	14.2	23.2	32.6	29.9	29.9
Nonane	14.2	23.3	32.6	30.0	30.3
Decane	14.2	23.2	32.6	31.1	30.5
Isobutane	24.5	25.4			
Isopentane	22.2	31.1	32.0	11.7	
Isobutane	22.7	28.0	42.0	20.9	14.3
Neopentane	31.7	28.1			
2,2-Dimethylbutane	29.1	30.6	36.9	8.9	
3-Methylpentane	11.5	29.5	36.9	(18.8, 3-CH ₃)	
2,3-Dimethylbutane	19.5	34.3			
2,2,3-Trimethylbutane	27.4	33.1	38.3	16.1	
2,3-Dimethylpentane	7.0	25.3	36.3	(14.6, 3-CH ₃)	

Characteristic Infrared Absorption Frequencies

Bond	Compound type	Frequency range, cm ⁻¹
C-H	Alkanes	2850-2960 1350-1470
C-H	Alkenes	3020-3080 (m) 675-1000
C-H	Aromatic rings	3000-3100 (m) 675-870
C-H	Alkynes	3300
C=C	Alkenes	1640-1680 (v)
C≡C	Alkynes	2100-2260 (v)
C=C	Aromatic rings	1500, 1600 (v)
C-O	Alcohols, ethers, carboxylic acids, esters	1080-1300
C=O	Aldehydes, ketones, carboxylic acids, esters	1690-1760
O-H	Monomeric alcohols, phenols	3610-3640 (v)
	Hydrogen bonded alcohols, phenols	3200-3600 (broad)
	Carboxylic acids	2500-3000 (broad)
N-H	Amines	3300-3500 (m)
C-N	Amines	1180-1360
C≡N	Nitriles	2210-2260 (v)
NO ₂	Nitro compounds	1515-1560 1345-1385

