Total Printed pages 02 + 01 pages of spectroscopy data sheet = 03 Pages

V. P. & R. P. T. P. Science College
Vallabh Vidyanagar
B. Sc. Internal Examination – October 2019 (Vth Semester)
Subject: Organic Chemistry :: Course Code: US05CCHE01

Date: 01/10/2019 **Time: 11:00 AM to 12:15 PM**

Day: Monday **Total Marks: 25**

Que. 1 Choose the correct option for the following. **05**

1. Which of the following compound have the properties of secondary aliphatic amine?
   (a) Pyridine (b) Furan (c) Pyrrolidine (d) Thiophene
2. The 'N' atom in pyridine is
   (a) Sp^3 hybridised (b) Sp^2 hybridised (c) sp hybridised (d) cannot be predicted
3. How many CMR signals would you expect from m-xylene ?
   (a) 5 (b) 7 (c) 6 (d) 9
4. Which of the following is the example of isolated diene?
   (a) 1,3-butadiene (b) 1,3-pentadiene (c) 1,2-butadiene (d) 1,4-pentadiene.
5. Which of the following compound is the bicyclic halogenated hydrocarbon derivative?
   (a) Heptachlor (b) Linalool (c) Baygon (d) Heliotropin.

Que. 2 Answer the following **05**

a. Explain: electrophilic substitution reactions in five membered heterocycles exclusively occur on position-2 not at position-3.

b. Discuss the Chichibabin reaction.

OR

Que. 2 Answer the following **05**

a. Explain: Neucleophilic substitution reaction occurs chiefly at position-2 & 4 in pyridine.

b. Write synthesis of 2-acetylfuran from pentosan.

Que. 3 Answer the following **05**

a. Why TMS is use as a standard for reference point in NMR spectroscopy?

b. Deduce the structure using following data and give appropriate justification.

[P. T. O.]

Molecular formula: C_4H_6O

CMR (δ, ppm): (a) 3.4, Quartet (b) 50.8, Triplet (c) 77.9, Singlet (d) 81 .6, Singlet.

NMR (δ, ppm): (a) 2.0, 3H , Singlet (b) 1.8, 1H, Singlet (c) 4.1, 2H , Singlet.

OR

Que. 3 Answer the following **05**

a. Deduce the structure using following data and give appropriate justification.

Molecular formula: $C_9H_{13}N$

IR(cm^{-1}): 3400, 3000, 2900, 1600, 1500, 1450, 1375, 1140, 1030, 690, 7304

NMR (δ, ppm): (a) 7.3, 5H, Singlet (b) 3.7, 2H, Singlet (c) 2.5, 2H, Quartet

(d) 1.25, 1 H, Singlet (e) 1.1, 3H, Triplet.

b. Differentiate between Diastereotopic proton and Enantiotopic proton.

Que. 4 Answer the following **05**

a. What is coordination polymerization? Explain the importance of Ziegler-Natta catalyst in coordination polymerization and discuss its advantages over free-radical polymerization in the preparation of polyethylene.

OR

Que. 4 Answer the following **05**

a. Give detail discussion for the addition of HBr to 1, 3-butadiene at -80 °C and at 40°C temperature with potential energy diagram.

b. Explain: cis-1, 4-polyisoprene is an elastomeric while trans-1, 4-polyisoprene is non-elastic.

Que. 5 Answer the following **05**

a. Give the synthesis and applications of following.

(i) Insecticide of organophosphorus class.

(ii) Compound which used to impart hay like odour.

OR

Que. 5 Answer the following **05**

a. Give the synthesis and applications of following.

(i) Compound containing heterocyclic triazole moiety which is used as whitening agent.

(ii) Compound which occurs in the essential oils of bergamot.

Don't stress Do your best; Good Luck for Exam…

TABLE FOR

COURSE NO. US05CICH01 (ORGANIC CHEMISTRY-II). FOR QUESTION NO. ~~6~~

Characteristic Infrared Absorption Frequencies. IR

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	Aldehyde, 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

Double Bonds	
Structure unit	Frequency cm^{-1}
C=C	1620-1680
C=O	
Aldehydes and ketones	1710-1750
Carboxylic acids	1700-1725
Acid anhydrides	1800-1850 & 1740-1790
Acyl halides	1770-1815
Esters	1730-1750
Amides	1680-1700
Substituted derivatives of Benzene	
Mono substituted	730-770 & 690-710
Ortho-disubstituted	735-770
Meta-disubstituted	750-810 & 680-730
Para-disubstituted	790-840

CMR Chemical shifts

Type of carbon	Chemical shift (δ) ppm
RCH_3	0-35
R_2CH_2	15-40
R_3CH	25-50
RCH_2OH	50-65
$-C\equiv C-$	65-90
$>C=C<$	100-175
$>C=O$	190-220

Characteristic Proton Chemical Shift ^1H NMR

Type of Proton		Chemical shift δ, ppm	Type of Proton		Chemical shift δ, ppm
Cyclopropane		0.2	Alcohols	H-C-OH	3.4 – 4
Primary	$R-CH_3$	0.9 -1.8	Ethers	H-C-OR	3.3 – 4
Secondary	R_2CH_2	1.3	Esters	RCOO-C-H	3.7 – 4.1
Tertiary	R_3CH	1.5	Esters	H-C-COOR	2 – 2.2
Vinylic	C=C-H	4.6 -5.9	Acids	H-C-COOH	2 – 2.6
Acetylenic	C≡C-H	2 - 3	Carbonyl compounds	H-C-C=O	2 – 2.7
Aromatic	Ar-H	6 - 8.5	Aldehydic	RCH=O	9 – 10
Benzylic	Ar-C-H	2.2 - 3	Hydroxylic	RO-H	1 – 5.5
Allylic	C=C-C-H	1.7	Phenolic	ArO-H	4 – 12
Fluorides	H-C-F	4 - 4.5	Enolic	C=C-O-H	15 – 17
Chlorides	H-C-Cl	3 - 4	Carboxylic	RCOO-H	10.5 – 12
Bromides	H-C-Br	2.5 - 4	Amino	$R-NH_2$	1 – 5
Iodides	H-C-I	2 - 4			