V.P. & R. P. T. P. Science College LIBRARY V. V. Nagar

V.P. & R. P. T. P. SCIENCE COLLEGE

B. Sc. (Semester - V) Examination

INDUSTRIAL CHEMISTRY

3rd October 2017, Tuesday

COURSE NO: US05CICH01 (ORGANIC CHEMISTRY - II)

TIME: 11.00 TO 12.30 PM. TOTAL MARKS – 25

Q.1 Answer the following MCQs. (03)

1. The 'N' atom in pyridine is
   A. sp^3 hybridised
   B. sp^2 hybridised
   C. *sp* hybridized
   D. Can't predicted
2. Anthracene undergoes electrophilic substitution reactions mainly at
   A. C-1
   B. C-2
   C. C-9
   D. C-1 and C-2
3. How many NMR signals do you expect from Acetone and Ethanol?
   A. 1 & 1 respectively
   B. 1 & 3 respectively
   C. 2 & 3 respectively
   D. None of these.

Q.2 Answer the following short questions (ANY TWO) (04)

1. What mean by heterocyclic compound? Enlist various heterocyclic compounds with their names.
2. Write a resonating structures of Phenanthrene.
3. Predict the signal pattern of the $-CH_3$ protons in the NMR spectra of the $CH_3CH_2Br_2$. Why?

Q.3 Discuss the structure of Thiophene. (06)

OR

Q.3 Giving suitable examples, explain electrophilic substitution in Pyridine. (06)

Q.4 How will you arrive at the structure of Naphthalene? Explain. (06)

OR

Q.4 Write synthesis of Anthracene. (06)

Q.5 Write the principle of IR spectroscopy and discuss the applications of IR-Spectroscopy. (06)

OR

Q.5 From the following sets of N.M.R., IR and UV data, give a structure consistent with each of the following: (06)

1. Molecular weight: 102gm/mol; %age: C=58.82%, H=9.80%, O=31.38%.; UV: 204nm, ε-max 60.; IR: 2950, 2840, 2660, 1720cm-1.; NMR: δ 10.92 (singlet, 3.2sq), δ 0.92 (singlet, 29.0sq).
2. Molecular weight: 90gm/mol; %age: C=53.31%, H=11.11%; UV: 200nm,; IR: 2960, 1165cm-1.; NMR: δ 3.75 (singlet, 9.6sq), δ 3.90 (singlet, 14.4sq).

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 (ν)
C≡C	Alkynes.	2100-2260 (ν)
C=C	Aromatic rings.	1500, 1600 (ν)
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 (ν)
	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 (ν)
$-NO_2$	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

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Characteristic Proton Chemical Shift

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			