[46]   SEAT No.________   No. of Printed Pages : 3

SARDAR PATEL UNIVERSITY
B.Sc. Industrial Chemistry
(Semester – 5^{TH}) EXAMINATION
11^{th} November 2019,Monday
Course No. : US05CICH01
(Organic Chemistry-II)

Total Marks: 70 **Time:10.00am to 1.00pm**

Q.1 Answer the given multiple choice questions. **[10]**

1. The Nitrogen atom in pyridine is__________ hybridized.
   a)SP^3 b)SP^2
   c)SP d)can not be predicted.
2. Which of the following heterocyclic compound is not aromatic ?
   a)Pyridine b)Furan
   c)Piperidine d)Thiophene
3. Furan reacts with Ammonia in presence of alumina at 400°C to give
   a)Pyridine b)Pyrrole
   c)Furfural d) Furoic acid
4. Anthracene undergoes electrophilic substitution reaction mainly at
   a)C-1 b)C-2
   c)C-9 d)C-1 and C-2
5. Napthalene undergoes reduction with H_2 ,in the presence of Ni catalyst at high temperature and pressure to give
   a)Phthalic acid b) Decalin
   c)Benzoic acid d) Tetralin
6. A free radical is
   a)Neutral in character b) Paramagnetic
   c)Short lived d)All of these
7. Selenium dioxide is an important __________reagent.
   a)Reducing b)Brominating
   c)Oxidizing d)Methylating
8. A nucleophile is
   a)Lewis acid b)Electron reach species
   c)Electron deficient species d)None of these
9. How many NMR signals do you expect from acetone?
   a)Two b)One
   c)Three d)Zero
10. The multiplicity of CH_3 signal in CH_3CH_2Br is
    a)Quartet b)Singlet
    c)Doublet d)Triplet

Q.2 Attempt any Ten. **[20]**

i. What is heterocyclic compound? Enlist any four N-containing five membered heterocyclic compound.
ii. Why pyrrole is considered extremely weak base.
iii Draw the structures of purine and carbazole
iv. Draw resonating structures of Anthracene.
v. Write a reaction for the preparation of α-naphthoic acid from naphthalene.

(P.T.O)

vi. Which product is obtained when Anthracene is reacted with Oxygen in presence of Vanadium Pentoxide.

vii. What is hemolytic fission?

viii. Differentiate Carbocations and Carbanions.

ix. Define a term: Rearrangement.

x. The NMR spectrum of compound C_2H_6O shows one signal, only a singlet. Deduce the structure of it.

xi What do number, intensity, splitting and position of signals in NMR spectra tells us about?

xii. Explain about equivalent and non equivalent protons.

Q.3 a) Discuss the structure of Pyrrole,Furan and Thiophene [10]

OR

Q.3 a) Discuss about Nucleophilic substitution in Pyridine and Electrophilic substitution in Furan. [10]

Q.4 a) Write a note on: Synthesis of Anthracene. [05]

b) Discuss the Haworth's synthesis of Napthalene. [05]

OR

Q.4 a) Explain: Electrophilic aromatic substitution reaction takes place predominantly at α-position in Napthalene. [05]

b) What happens when Phenanthrene reacts with i) Br_2 ii)CrO_3/AcOH [05]

Q.5 a) Discuss about [10]

i)Aluminium Isopropoxide ii)Lead tetra acetate

OR

Q.5 a) Discuss about Pinacol-Pinacolone Rearrangement. [05]

b) Write a note on: Aldol Condensation. [05]

Q.6 a) Discuss the principle and applications of NMR and IR spectroscopy in structure determination of organic compounds. [10]

OR

Q.6 a) From the following sets of NMR,IR and UV data give a structure consistent with each of the following: [10]

1.Molecular weight:264 gm/mole, %age :C=36.30%,H=3.1% and Br=60.6% UV :λ max:210 nm
NMR:δ 4.65(singlet,20.0sq) and 7.30(singlet,20.0sq)
2.Molecular weight :130 gm/mole; %ageC=73.84%,H=13.84%,O=12.34%
UV: λmax 200nm
NMR:δ 1.1(singlet for all protons).

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)
$C\equiv C$	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.
$C\equiv N$	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

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 $C\equiv C-H$	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		

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