

(A-g) Seat NO: \_\_\_\_\_

No. of Printed Pages : 3

# Sardar Patel University

B. Sc. ( Semester – V ) Examination (NC)

Date: 9<sup>TH</sup> MAY 2016

Time: 10:30<sup>am</sup> to 01:30pm

Industrial Chemistry

COURSE NO: US05CICH01 (Organic Chemistry - II)

Notes: Figures to the right indicate full marks.

Total marks: 70

Q.1 Answer the following Multiple Choice Questions. (All are compulsory) (10)

- Pyridine reacts with HCl to form
  - Pyridinium chloride
  - 2-Chloropyridine
  - 3-Chloropyridine
  - All of these
- Pyridine reacts with a mixture of  $\text{KNO}_3$  and  $\text{H}_2\text{SO}_4$  at  $300^\circ\text{C}$  to give
  - 1-Nitropyridine
  - 2-Nitropyridine
  - 3-Nitropyridine
  - 4-Nitropyridine
- Pyridine undergoes electrophilic substitution with fuming  $\text{H}_2\text{SO}_4$  at  $350^\circ\text{C}$  to
  - 2-Pyridinesulphonic acid
  - 4-Pyridinesulphonic acid
  - 3-Pyridinesulphonic acid
  - None of these
- All carbon atoms in naphthalene are
  - $sp$  hybridized
  - $sp^3$  hybridised
  - $sp^2$  hybridised
  - None of these
- Naphthalene undergoes reduction with  $\text{H}_2$ , in the presence of Nicatalyst at high temperature and pressure to give...
  - Phthalic acid
  - Decalin
  - Benzoic acid
  - Tetralin
- Anthracene undergoes electrophilic substitution reactions mainly at...
  - C-1
  - C-2
  - C-9
  - C-1 and C-2
- Which of the following carbocation has the least stability?
  - Methyl
  - Ethyl
  - Tert-butyl
  - isopropyl
- Aluminum isopropoxide is an important \_\_\_\_ reagent.
  - Reducing
  - Oxidizing
  - Brominating
  - Methylating
- Number of NMR signals obtained in case of Acetone and Acetic acid respectively...
  - 1 & 1
  - 1 & 2
  - 1 & 3
  - None of these
- The DBE value for the MF  $\text{C}_{15}\text{H}_{14}\text{O}$ 
  - 01
  - 02
  - 05
  - None of these

①

(P.T.O.)

- Q.2 Answer the following short questions (Any Ten) (20)
1. What mean by heterocyclic compound? Enlist various heterocyclic compounds with their names.
  2. Discuss the rule for naming mono heterocyclic compound with suitable examples.
  3. Predict the relative basicity of amines ( $\text{RCH}_2\text{NH}_2$ ), Imines ( $\text{RCH}=\text{NH}$ ) and Nitriles ( $\text{RC}\equiv\text{N}$ )
  4. Give synthesis of  $\alpha$ - and  $\beta$ -Naphthol from Naphthalene.
  5. Give resonating structures of Phenanthrene.
  6. Write the resonance structures of Anthracene and Naphthalene.
  7. What are nucleophile? Give an example.
  8. What are free radicals?
  9. What are carbanions?
  10. Write about information obtained from IR Spectroscopy.
  11. Predict the signal pattern of the  $-\text{CH}_3$  protons in the NMR spectra of the  $\text{CH}_3\text{CHBr}_2$ .
  12. The NMR spectrum of compound  $\text{C}_2\text{H}_6\text{O}$ , shows one signal only, a singlet. Deduce the structure of it.

Q.3 Discuss the structure of Pyridine and Pyrrole. (10)  
OR

Q.3 Discuss the following. (10)  
A. Nucleophilic substitution in Pyridine.  
B. Electrophilic substitution in Thiophene.

Q.4 Write notes on following: (10)  
A. Electrophilic substitution reaction in Phenanthrene.  
B. Synthesis of Naphthalene.

OR  
Q.4 Discuss the structure of Naphthalene. (10)

Q.5 Describe the mechanism and important application of the following reaction. (10)  
A. Meerwein-Ponndorf-Verley Reduction  
B. Aldol condensation  
C. Diels-Alder Reaction.

OR  
Q.5 Write notes on Pinacol-Pinacolone Rearrangement and N- Bromosuccinimide. (10)

Q.6 From the following sets of N.M.R., IR and UV data, give a structure consistent with each of the following: (10)

1. Molecular weight: 264 gm/mol; %age: C=36.30%, H=3.1% and Br=60.6%; UV:  $\lambda_{\text{max}}$ : 210nm; NMR:  $\delta$  4.65 (singlet, 20.0sq) and 7.30 (singlet, 20.0sq).
2. Molecular weight: 130gm/mol; %age: C=73.84%, H=13.84% and O=12.34%; UV:  $\lambda_{\text{max}}$ : 200nm; NMR:  $\delta$  1.1 (singlet for all protons).

OR

1. Molecular weight: 100 gm/mol; %age: C=72.00%, H=12.0%; UV:  $\lambda_{\text{max}}$ : 292nm; IR: 2930, 1712, 1261 $\text{cm}^{-1}$ ; NMR:  $\delta$  1.60 (singlet, 23.20sq),  $\delta$  1.45 (doublet, 15.00sq),  $\delta$  1.25 (multiplet, 7.50sq) and  $\delta$  0.92 (doublet, 45.00sq).
2. Molecular weight: 56gm/mol; %age: C=85.7%, H=14.3%; UV:  $\lambda_{\text{max}}$ : 210nm; NMR:  $\delta$  1.6 (doublet 30.0sq)  $\delta$  5.6 (quartate 10.0sq).

### Characteristic Infrared Absorption Frequencies.

Bond	Compound type	Frequency range $\text{cm}^{-1}$
C-H	Alkanes.	2850-2960, 1350-1470.
C-H	Alkenes.	3020-3080 ( <i>m</i> ), 675-1000.
C-H	Aromatic rings.	3000-3100 ( <i>m</i> ), 675-870.
C-H	Alkynes.	3300
C=C	Alkenes.	1640-1680 ( $\nu$ )
C $\equiv$ C	Alkynes.	2100-2260 ( $\nu$ )
C=C	Aromatic rings.	1500, 1600 ( $\nu$ )
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 ( $\nu$ )
	Hydrogen bonded alcohols, Phenols.	3200-3600 ( <i>broad</i> )
	Carboxylic acids.	2500-3000 ( <i>broad</i> )
N-H	Amines.	3300-3500 ( <i>m</i> )
C-N	Amines.	1180-1360.
C $\equiv$ N	Nitriles.	2210-2260 ( $\nu$ )
-NO <sub>2</sub>	Nitro compounds	1515-1560, 1345-1385

Double Bonds	
Structure unit	Frequency $\text{cm}^{-1}$
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 $\delta$ , ppm	Type of Proton	Chemical shift $\delta$ , ppm	
Cyclopropane	0.2	Alcohols	H-C-OH	3.4 - 4
Primary	R-CH <sub>3</sub>	Ethers	H-C-OR	3.3 - 4
Secondary	R <sub>2</sub> CH <sub>2</sub>	Esters	RCOO-C-H	3.7 - 4.1
Tertiary	R <sub>3</sub> CH	Esters	H-C-COOR	2 - 2.2
Vinyllic	C=C-H	Acids	H-C-COOH	2 - 2.6
Acetylenic	C $\equiv$ C-H	Carbonyl compounds	H-C-C=O	2 - 2.7
Aromatic	Ar-H	Aldehydic	RCH=O	9 - 10
Benzylic	Ar-C-H	Hydroxylic	RO-H	1 - 5.5
Allylic	C=C-C-H	Phenolic	ArO-H	4 - 12
Fluorides	H-C-F	Enolic	C=C-O-H	15 - 17
Chlorides	H-C-Cl	Carboxylic	RCOO-H	10.5 - 12
Bromides	H-C-Br	Amino	R-NH <sub>2</sub>	1 - 5
Iodides	H-C-I			