[47] SEAT No._____ No. of Printed Pages : 3

Sardar Patel University

B. Sc. (Semester – V) Examination

Date: 11/11/2019, Monday Time: 10:00 to 01:00pm

Industrial Chemistry Vocational

US05CICV01 (Organic Chemistry)

Notes: Figures to the right indicate full marks. Total marks: 70

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

1. Heterolytic cleavage of a carbon-carbon bond produces ____
   A. Two carbonium ions
   B. Two free radicals
   C. One cation and one anion
   D. A free radical and carbanion
2. What is the state of hybridization of carbon in carbanion?
   A. sp
   B. sp2
   C. sp3
   D. sp3d
3. The decreasing order of the size of the three hybrid orbitals would be....
   A. sp>sp2>sp3
   B. sp2>sp>sp3
   C. sp3> sp2>sp
   D. None of these
4. Aldehydes having ά- hydrogen on warming with mild base to give β - hydroxy aldehyde called _____ reaction.
   A. Aldol
   B. Friedel – Craft
   C. Diels – Alder
   D. Fries rearrangement
5. For carrying out aldol condensation _____ reagent is used.
   A. Mild base
   B. AlCl3
   C. LiAlH4
   D. NBS
6. In a base catalyzed reaction, ά-diketones are converted to ά-hydroxy acids are called _____reaction.
   A. Diels–Alder Reaction.
   B. Pinacol–Pinacolone Rearrangement
   C. Benzilic Acid Rearrangement
   D. Fries Rearrangement
7. For carrying out Benzilic acid rearrangement reaction _____ reagent is used.
   A. Strong base
   B. $AlCl_3$
   C. LiAlH4
   D. NBS
8. What is used to cool the superconducting coil?
   A. Liquid helium
   B. Hydrogen
   C. Ice
   D. Dry ice
9. Better understanding of the nuclei is possible,_____
   A. With the help of a mathematical translator called the fourier transfer algorithm
   B. With the help of wavelength spectrum
   C. With the help of frequencies ranges
   D. None of the above
10. All hydrogen atoms under magnetic field _____.
    A. Have the same resonance frequency
    B. Are attached to carbon
    C. Resonate at different frequencies depending on their environment.
    D. Resonate at about the same frequency as carbon.

Q.2 Answer the following short questions. (Any Ten) (20)

1. Giving suitable examples, explain Carbanions.
2. Define term free radicals.
3. Define term Rearrangements.
4. Write a reaction and conditions for Friedel–Craft's Alkylation.
5. Give the name of by product obtained in Meerwein–Ponndorf–Verley Reduction reaction.
6. Outline a reaction of Cross Aldol condensation reaction.
7. Write a reaction for preparation of Aluminum isopropoxide.
8. Give a reaction for preparation of SeO_2 preparation.
9. Give preparation of preparation of Lead tetra acetate.
10. How many signals would you expect to see in the ^{1}H-NMR spectrum of the 1-(4-methylphenyl) ethanone
11. How many signals would you expect to see in the ^{1}H-NMR spectrum of the Ethyl methyl ether.
12. How many signals would you expect to see in the ^{1}H-NMR spectrum of the 4-Methoxytoluene

Q.3 Giving suitable examples, discuss Electrophilic and Nucleophilic substitution reactions. (10)

OR

Q.3 Write a notes on "Elimination reaction" and "Carbocations & Carbanions stability". (10)

Q.4 Write a notes on following. (10)

A. Friedel–Craft's Reaction,
B. Meerwein–Ponndorf–Verley Reduction.

OR

Q.4 Write a notes on following. (10)

A. Pinacol–Pinacolone Rearrangement.
B. Benzilic Acid Rearrangement

Q.5 Write properties and uses of following: (10)

A. Lead tetra acetate.
B. Aluminum isopropoxide

OR

Q.5 Write properties and uses of following: (10)

A. Selenium dioxide
B. Sodium borohydride
C. Osmium tetraoxide

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: 56gm/mol; %age: C=85.7%, H=14.3%; UV: λmax: 210nm; NMR: δ 1.6 (doublet 30.0sq) δ 5.6 (quatrate 10.0sq).
2. Molecular weight: 130gm/mol; %age: C=73.84%, H=13.84% and O=12.34%; UV: λmax: 200nm; NMR: δ 1.1 (singlet for all protons).

OR

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: 100 gm/mol; %age: C=72.00%, H=12.0%.; UV: λmax: 292nm; IR: 2930, 1712, 1261cm-1.; NMR: δ 1.60 (singlet, 23.20sq), δ 1.45 (doublet, 15.00sq), δ 1.25 (multiplate, 7.50sq) and δ 0.90 (doublet, 45.00sq).
2. Molecular weight: 88 gm/mol; %age: C=54.54%, H=13.64%, N=31.82%; UV: λmax: 220nm; IR: 2860, 1120cm-1.; NMR: δ 3.6 (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 (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

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			