JW-003-001506

JW-003-001506 **Seat No. _____**

B. Sc. (Chemistry) (Sem. V) (CBCS) Examination

October - 2019

Chemistry : C-502

[Organic Chemistry & Spectroscopy]

(Old Course)

Faculty Code : 003

Subject Code : 001506

Time : $2\frac{1}{2}$ Hours] [Total Marks : **70**

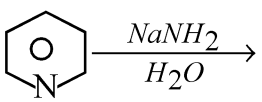
Instructions :

(1) All questions are compulsory.

(2) Total three questions. Q. 1 carries 20 marks, Q. 2 & 3 carry 25 marks each.

(3) Figures to the right side, indicate total marks of individual question.

1 Answer the following questions : **20**

(1) Complete the reaction :  _____.

(2) Define – Alkaloids.

(3) What are the uses of (–) adrenaline ?

(4) Give structure of tartaric acid.

(5) What is the molecular formula of isoxazole ?

(6) _____ reagent is used to convert acid chloride to amine, in Curtius rearrangement.

(7) Give structure of Xylose.

(8) What is Mayer's reagent ?

(9) Give structure of Piperidine.

(10) Give any one name of oligosaccharide.

(11) CO_2 belongs to which point group ?

(12) Define "Wave number".

(13) Draw the diagonal plane in $[PtCl_4]^{-2}$.

(14) Calculate the fundamental vibrations in CH_4.

(15) Give the types of stretching vibrations.

(16) Give point group of $XeOF_4$.

(17) Which section of IR radiation is called Finger Print Region?

(18) What is the mathematical presentation of Lambert-Beer Law ?

(19) UV-visible spectroscopy is also called _____ and _____ spectroscopy.

(20) Selection Rules were given by _____.

(Fernandes, Manu V Parsan, Milan S.V., Laporte)

2 (a) Answer any three : **6**

(1) Give any two applications of Leuckart-Wallach reaction.

(2) Write reactions to determine ester and amide.

(3) Give synthesis of Dulcin.

(4) Give synthesis of thiazine.

(5) Explain the reaction of glucose with NH_2OH.

(6) Give two reduction reactions of D(+) glucose.

(b) Answer any three : **9**

(1) Explain Hoffmann Rearrangement.

(2) Describe reactions to determine the side-chain of Coniine.

(3) Write any three reactions for oxidation of monosaccharides.

(4) Explain Epimerisation with mechanism.

(5) Give synthesis of Atenolol.

(6) Give synthesis of (i) Pyridazine (ii) Dioxane.

(c) Answer any two : **10**

(1) Explain constitution of papaverine.

(2) Discuss ring structure of D(+) glucose.

(3) Describe step-up reaction.

(4) Give synthesis and uses of Saccharin and Auramine-O.

(5) Discuss Amde's method to prove the constitution of alkaloid.

3 (a) Answer any three : **6**

(1) Define with example : Point of inversion.

(2) Explain : Bathochromic and Hypsochromic shift.

(3) Write a short note on : Law of closure.

(4) Explain : Fermi Resonance.

(5) Give the Ir region's range in cm^{-1} and μ.m.

(6) Predict the IR data for acetophenone.

(b) Answer any three : **9**

(1) Prove : $S_3^3 = \sigma_h$ and $S_3^6 = E$.

(2) Calculate the stretching frequency for C=C bond (K = 10 $\times 10^5$ dyne/cm^2).

(3) Discuss the UV spectrum of H_2O.

(4) Find out the point group of following compounds :

H_3BO_3 & BF_3.

(5) Explain : Chromophore and Auxochrome.

(6) Give difference between following pairs by IR spectra :

o-chlorotoluene & p-chlorotoluene.

(c) Answer any two : **10**

(1) Construct multiplication table of C_{2V} point group with operations.

(2) Write short note on : Polar solvent effect on carbonyl compounds.

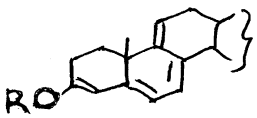
(3) Discuss the factors affecting the band of carbonyl group in IR spectra.

(4) In the compound having M.F. = C_3H_7NO, IR data is as under :

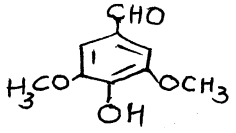
3413, 3226, 3030, 1700, 1630 and 1460 cm^{-1}.

Find out the structural formula.

(5) Calculate the λ_{max} for the following compounds :

(a) 

and

(b) 

Spectral Data

U.V. :

Empirical rules for Dienes :

	(A) Homoannular λ = 253 nm.	(b) Heteroanuular λ = 215 nm.
Increments for double bond extending conjugation	30 nm.	30 nm.
Exocyclic double bond	5	5
Alkyl substitution or ring residue	5	5
Homocyclic Diene components	39	39
Polar groups :		
– $OCOCH_3$	0	0
– OR	6	6
– Cl, -Br	5	5
– NR_2	60	60

(C) Simple Diene :

Parent λ = 217 nm.

Polar groups :

Alkyl subst for ring residue	5 nm
–Cl, -Br	17
–OH	5
–OR	5
–NR_2	60
–SR	30

(D) Empirical Rules for Enones and Dienones :

		λ
(a)	Z = C	
	(1) 6 membered ring or acyclic	215
	(2) 5 membered ring	202
(b)	Z = H	207
(c)	Z = OH or OR	193
(d)	Acyclic dienone	245
	Increment for :	
	Doyble bond extending conjugation	30
	Alkyl group of ring residue	α 10
		β 12
	γ or higher	18
	Exocyclic double bond position	5
	Homocyclic diene component	39

Polar groups	α	β	γ	δ' other
-Cl	15	12	-	-
-OH	35	30	50	50
-OR	35	30	17	31
$-NR_2$	-	93	-	-
-O	-	75	-	-
-NHCOR	-	95	-	-
$-OCOCH_2$	6	6	-	6
-SR	-	85	-	-
-Br	25	30	-	-
$-NO_2$	-	95	-	-

(e) Empirical Rules for Benzoyl Derivative :

Parent Chromophor : mm

Z = alkyl or ring residule 246

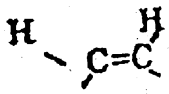
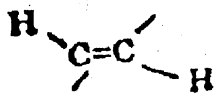
Z = H 250

Z = -OH or -OR 230

Increment for each substituent :	Q	M	R
Alkyl or ring residue	3	3	10
-OH; $-OCH_3$ -OR	7	7	25
-O	11	20	78
-Cl	0	0	10
-Br	2	2	15
$-NH_2$	13	13	58
$-NHCOCH_2$	20	20	45
$-NHCH_3$	-	-	73
$-N(CH_2)_3$	20	20	85

Infra - Red Data

Alkene (strcteching)	-C–H	2850-2960(v)
Alkene	=C–H	3100-3200(m)
Alkyene	=C–H	3200-3300(s)
Aromatic	ArC--H	3010-3100(m)
Aromatic ring	C=C	1500-1600(v) (two to three)
Alkene	>C=C<	1610-1680(v)
Alkyene	$-C=C^{2}-$	2100-2260(s)
Alkene (Bending)	-C-H	1340(w)
	$-C(C_2H_3)_3$	1430-1470(m) & 1380-1385(s)
	$-C(CH_2)_3$	1365 (8)
Aldehyde	-C–H	2820-2000(w)&2650 2760(s)
Adehyde	C=O	1740-1720(s)
Ketone	C=O	1725-1710(s)
Carboxylic acid	C=O	1725-1705(s)
Ester	C=O	1750-1730(s)
Amide	C=O	1670-1640(s)
Anhydride	C=O	1810-1860(s)&1740-1790
Alecohols, Ethers, esters Carboxylic acids, Anhydride	C-O	1300-1000(s)

Alcohols, phenols :		
Free	O-H	3650-3600(sh)
bonded	O-H	3500-3200(b)
Carboxylic acids free	O-H	3500-3650(m)
Free	O-H	2500-3200(b)
H-bonded	N-H	3330-3500(m)
amines (stretch)	-N-H	1640-1550(m)
Bnding	-C=N	2210-2280(s)
Nitrile	-O-	1070-1150(s)
Ether		-690(s)
Alkene bending		
disulstituted Cis.		
disulstituted Trans.		960-970(s)

Aromatic substitution :	
Type C-H out of plane bending	
No. of adjacent H atom.	range cm
5	750(s) & 700(s)
4	750
3	780
2	830
1	850