PAQ-003-001506 Seat No. _____

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

October / November - 2018

C-502 : Organic Chemistry & Spectroscopy

(New Course)

Faculty Code : 003
Subject Code : 001506

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

Instructions : (1) Total three questions.
(2) All questions are compulsory.
(3) The figures written at the right side, indicate the marks of the question/sub-question.

1 Answer the following : **20**

(1) 3-amino pyridine is obtained from Nicotinamide by which reaction ?

(2) Give the reaction of conine distilled with Zn dust.

(3) Give structure of isoxazole.

(4) Which method is utilized for determination of ring size of glucose ?

(5) Which product is obtained when fructose reacts with HCN ?

(6) Complete the following reaction :

glucose $\xrightarrow{3C_6H_5NHNH_2}$

(7) Define epimerisation. Give example.

(8) Which drug is used as antihypertensive ?

(9) Give structure of Saccharin.

(10) Which heterocyclic ring is present in papaverine ?

(11) Which point group is present in $PtCl_4^{2-}$?

(12) Give example of two species belongs to the same point group.

(13) How many types of symmetry operations are possible on a molecule ?

(14) Define improper rotational axis.

(15) Give point group of H_3BO_3.

(16) What is Bathochromic shift ?

(17) Define hypochromic effect.

(18) Give regions of near IR, middle IR and far IR in cm^{-1}.

(19) Define transmittance.

(20) Give types of bending vibrations.

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

(1) Give synthesis and uses of $LiAlH_4$.

(2) Give synthesis of pyrimidine.

(3) Give reaction of Nicotine with CrO_3.

(4) Give synthesis of Chrysodine-G.

(5) Give synthesis of Thiazine.

(6) Explain reaction of glucose with NH_2OH.

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

(1) Give any two methods of preparation of Triphenyl phosphine.

(2) Explain Mutarotation.

(3) Give synthesis of Papaverine.

(4) Give any two synthesis method of dioxane.

(5) Give synthesis of Dulcin.

(6) Give synthesis and uses of Ibuprofen.

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

(1) Discuss pyranose structure of D(+) glucose.

(2) Explain constitution of conine.

(3) Explain Arndt Eistert reaction with mechanism.

(4) Give synthesis of (i) p-anisyl urea (ii) Orange II

(5) Give step up and step down reactions with example.

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

(1) Explain law of closure.

(2) Define symmetry elements and symmetry operations.

(3) Explain overtone in IR spectra.

(4) Explain chromophore and Auxochrome.

(5) Explain stretching vibrations.

(6) What is hypsochromic shift ?

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

(1) Write difference between C_n and S_n.

(2) Construct multiplication table for C_{2v} point group.

(3) How UV spectral study is useful to determine steric hindrance in diphenyl derivatives ?

(4) Explain fingerprint region in IR spectra.

(5) Write short note on Fermi-resonance.

(6) Write application of UV spectra.

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

(1) Construct multiplication table for C_{3v} point group.

(2) Prove in Eclipsed ethane $S_n^{2k} = E$ and $S_n^k = \sigma h$.

(3) Discuss types of electronic transition in ultraviolet spectroscopy.

(4) Explain chemical shift (Absorption shift) in U.V. spectra.

(5) Discuss the factors affecting the position of carbonyl group in infrared spectroscopy.

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	-	-

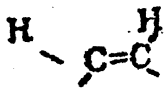
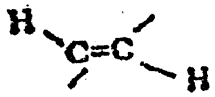
(e) Empirical Rules for Benzoyl Derivative :

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

IR : **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	$-C\equiv C-$	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 (s)
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
Alcohols, 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		
Free	O-H	3500-3650(m)
H-bonded	O-H	2500-3200(b)
amines (stretch)	N-H	3330-3500(m)
Bnding	-N-H	1640-1550(m)
Nitrile	-C=N	2210-2280(s)
Ether	-O-	1070-1150(s)
Alkene bending disulstituted Cis.		-690(s)
disulstituted Trans.		960-970(s)

Aromatic substitution :

Type C-H out of plane bending

No. of adjacent H atom.	range cm
5	Mono sub → **750(s) & 700(s)** Two bands
4	Ortho sub → **750** Single band
3	Meta sub → **780** Two band
2	
1	Pera → 800 – **850** Cm^{-1}