* J W - 0 0 3 - 1 0 1 5 0 0 6 *

JW-003-1015006 **Seat No. _____**

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

October - 2019

Chemistry : 502

[Organic Chemistry & Spectroscopy]

(New Course)

Faculty Code : 003

Subject Code : 1015006

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

Instructions :

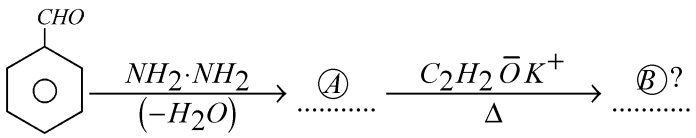
(1) All questions are compulsory.

(2) Figures given in right side are total marks of that questions.

UNIT - I

1 (a) Answer the following questions : **4**

(1) Write the structure of 2-furyl acetic acid.

(2) 

(3) Acetone $\xrightarrow{Per\ acid}$ Ⓐ .....

(4) Write the structure of conyrine.

(b) Answer the following : (any one) **2**

(1) Give Pinner bromination reaction of Nicotine.

(2) Give synthesis of veratric acid from p-Hydroxy benzoic acid.

(c) Answer in brief : (any one out of two) **3**

(1) Write two application of $LiAlH_4$.

(2) Give synthesis of Nicotine.

(d) Answer in detail : (any one) **5**

(1) Explain Beakmann rearrangement.

(2) Explain constitution of Papaverine.

UNIT - II

2 (a) Answer the following : **4**

(1) Give the examples of Aldopentose.

(2) Complete the following reaction :

$$\text{Glucose} \xrightarrow[\text{Reduction}]{Ni/H_2} \text{(A)} \ldots\ldots\ldots$$

(3) Write the structure of Orange II.

(4) Write the structure of Saccharin.

(b) Answer the following : (any one) **2**

(1) Write the structure of

α-(D) glucopyranoze and

β-(D) glucopyranoze

(2) Write the reaction of glucose with H_2NOH.

(c) Answer in brief : (any one) **3**

(1) Explain step-down reaction (Ruff's method)

(2) Give synthesis of Ibuprofen.

(d) Answer in detail : (any one) **5**

(1) Give synthesis of

(i) Dulcin

(ii) Atenolol

(2) Explain configuration of D(+) fructose.

UNIT - III

3 (a) Answer the following : **4**

(1) Give IUPAC name of

(i) $CH_3COCH_2CH_3$ and

(ii) $CH \equiv CH$

(2) $OH - CH_2 - CH_2 - OH$

$$+Br \cdot CH_2 \cdot CH_2 \cdot Br \xrightarrow[-HBr]{} \overset{(A)}{\cdots\cdots\cdots}$$

(3) Define "Transmittance".

(4) Give possible transition in Aniline in U.V. Spectra.

(b) Answer the following : (any one) **2**

(1) Give synthesis of Morpholine from Ethylene oxide.

(2) Give synthesis of 2-Aminothiozole from 2-chloroethanol.

(c) Answer in brief : (any one) **3**

(1) Explain Benzene is colourless while pentacene is coloured.

(2) Explain $\pi \rightarrow \pi^*$ and $n \rightarrow \pi^*$ transition in ultra violet spectra.

(d) Answer in detail : (any one) **5**

(1) Explain absorption shift in U.V. Spectra (all four types)

(2) Give synthesis of Imidazole and Pyrimidine.

UNIT - IV

4 (a) Answer the following : **4**

(1) Give one example of only C_3 point group.

(2) Find out point group of PCl_5.

(3) Define improper rotational axis.

(4) When molecule is rotated 1170, it gives an equivalent configuration it is denoted by the symbol C_n^K. Find out the value of n and K.

(b) Answer the following : (any one) **2**

(1) Explain Law of Multiplication with example.

(2) In NH_3 prove that $C_3 \times \sigma v_a \neq \sigma v_a \times C_3$.

(c) Answer the following : (any one) **3**

(1) Find out point group of Cis planner H_2O_2 and construct multiplication table for it.

(2) Explain C_1, C_2 and C_3 point group with example.

(d) Answer the following : (any one) **5**

(1) Prove that in staggered ethen $S_n^n \neq E$ but $S_n^{zn} = E$ and $S_n^n = \sigma_n$.

(2) Explain all types of symmetry plane with example.

UNIT - V

5 (a) Answer the following : **4**

(1) Give IR range of fingerprint region in cm^{-1} and μ both.

(2) Write approximately IR frequency of Acetic anhydride.

(3) Write expected IR peaks in methyl ester.

(4) In $C \equiv C - H$ group, C-H stretching vibration is observed at ____?____ cm^{-1}.

(b) Answer the following : (any one) **2**

(1) Explain overtone in IR spectra.

(2) The force constant for C=C bond is 10×10^5 dynes/cm. Calculate C=C bond stretching frequency.

(c) Answer the following : (any one) **3**

(1) Explain fingerprint region.

(2) Distinguish by IR : Phenyl acetic acid and p-Toluec acid.

(d) Answer the following : (any one) **5**

(1) Assign the structure to a compound having following characteristics :
M.F. = $C_8H_8O_2$
IR : 3030, 2980, 2750 & 2680 (sh), 1690, 1600, 1580, 1220 and 830 cm^{-1}.

(2) M.F. : $C_5H_7NO_2$
IR : 2990, 2840, 2250, 1735, 1465, 1455, 1240 and 1010 cm^{-1}.
Find out structural formula of compound.

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

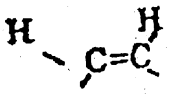
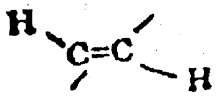
Z = H 250

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		
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)**
4 — ortho sub.	**750**
3 — meta sub. →	**780 & 750**
2 — para sub.	**830**
1	**~~860~~**