DBK-003-2015006 Seat No. _____

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

June - 2022

Chemistry : C-502

(Organic Chemistry & Spectroscopy) (New Course)

Faculty Code : 003
Subject Code : 2015006

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

Instructions :
(1) Answer any five out of ten questions.
(2) All questions carry equal marks.
(3) Figure written at the right side, indicate marks of the question / sub question.

1 (a) Answer the questions : **4**
(1) Which reaction gives Isoquinoline compounds ?
(2) Give principle of Arndt-Eistert synthesis with reaction.
(3) Which substance is obtained by the oxidation of conyrine with $KMnO_4$?
(4) Write the structure of Veratric acid.

(b) Answer the question : **2**
Give reaction of Papavarine with cold $KMnO_4$.

(c) Answer the question : **3**
Explain Perkin reaction with example.

(d) Answer the question : **5**
Prove the constitution of Coiine.

2 (a) Answer the questions : **4**
(1) Name peracids used as reagent in Bayer Villiger oxidation.
(2) _____ reaction is useful for conversion of carbonyl compound into β-hydroxy ester compound.
(3) Which alkaloid compounds are present in Opium ?
(4) Give structure of Papavarine.

(b) Answer the question : **2**
Give principle of Oppenauer oxidation reaction with example.

(c) Answer the question : **3**
Give synthesis of Nicotine.

(d) Answer the question : **5**
Explain Curtius rearrangement reaction.

3 (a) Answer the questions : **4**
(1) Define isolated polynuclear hydrocarbon and give examples.
(2) Anthracene oxidized with V_2O_5 in presence of air to form _____.
(3) Give reaction of glucose with NH_2OH.
(4) On oxidation with Br_2 water, glucose gives _____ acid.

(b) Answer the question : **2**
Give conversion of Glucose into Fructose.

(c) Answer the question : **3**
Give Haworth synthesis reaction for Naphthalene.

(d) Answer the question : **5**
Explain Methylation method for determination of ring size of D-Glucose.

4 (a) Answer the questions : **4**
(1) _____ is obtained by the oxidation of Naphthalene with acidic $KMnO_4$.
(2) Give uses of Diphenyl.
(3) Give structure of Glucosazone.
(4) Which two substances are produced by Killiani synthesis of D-Arabinose ?

(b) Answer the question : **2**
Write Fittig reaction for synthesis of Anthracene.

(c) Answer the question : **3**
Conversion : Mannose from D(+) glucose.

(d) Answer the question : **5**
Discuss synthesis method and chemical properties of Diphenyl methane.

5 (a) Answer the questions : **4**
(1) What is Hypochromic shift ?
(2) Draw chair and boat conformer of cyclohexane.
(3) Give structure and uses of p.Anisyl urea.
(4) Give structure and uses of Ibuprofen.

(b) Answer the question : **2**
Explain Lambert's Law.

(c) Answer the question : **3**
Explain conformational analysis of mono substituted cyclohexane.

(d) Answer the question : **5**
Discuss synthesis and uses of Atenlol and Adrenaline.

6 (a) Answer the questions : **4**
(1) Define Beer's law.
(2) Write structure of Auramine O.
(3) Give structure of Aspartame.
(4) Which conformer of cyclohexane is least stable ?

(b) Answer the question : **2**
Give synthesis of Orange II

(c) Answer the question : **3**
Explain different types of Transition.

(d) Answer the question : **5**
Describe UV spectrophotometer with function of each component.

7 (a) Answer the questions : **4**
(1) Define law of identity.
(2) Give examples of molecules having D_{2h} point group.
(3) Write the types of symmetry elements.
(4) Which point group is present in HCN ?

(b) Answer the question : **2**
Explain proper rotational axis.

(c) Answer the question : **3**
Explain Law of Association.

(d) Answer the question : **5**
Discuss different types of plane of symmetry.

8 (a) Answer the questions : **4**
(1) Define symmetry operation.
(2) _____ point group is present into H_2B_2 cisplaner molecule.
(3) Which point group is present in $CHCl_3$ and CH_3Cl ?
(4) Define : Law of Closure.

(b) Answer the question : **2**
Give point group and symmetry elements of BF_3 and CO_2.

(c) Answer the question : **3**
Construct multiplication table for C_{2h} point group.

(d) Answer the question : **5**
Prove the following in eclipsed ethane :
$S_3^2 = C_3^2, S_3^3 = \sigma h \; \& \; S_3^6 = \in$

9 (a) Answer the question : **4**
(1) Define Vibration energy.
(2) Give range of IR region – in both units.
(3) Which solid substances are used for pressed pallet technique in IR spectra ?
(4) What is fermi resonance ?

(b) Answer the question : **2**
Explain Overtone.

(c) Answer the question : **3**
Write a note on Finger Print Region.

(d) Answer the question : **5**
Discuss factors affecting in IR spectrum.

10 (a) Answer the questions : **4**
(1) Define stretching vibration.
(2) _____ compound is required for prism in IR spectra.
(3) Which bond generally absorbs in the region 3600-3200 cm^{-1} ?
(4) What is symmetrical stretching vibration ?

(b) Answer the question : **2**
Write IR stretching frequencies for Benzyl alcohol.

(c) Answer the question : **3**
Explain bending vibration.

(d) Answer the question : **5**
(i) Distinguish the following compound by IR spectra.
CH_3CH_2OH and CH_3COCH_3
(ii) Assign the structure to a compound having following characteristics :
MF : C_9H_8
IR : 3310, 3040, 2910, 2895, 2205, 1590, 1490, 1445, 1385, 1030, 750, 700 cm^{-1}.

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 :	
	Double 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	.	.

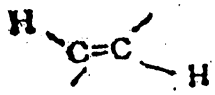
(e) Empirical Rules for Benzoyl Derivative :

Parent Chromophor :	mm
Z = alkyl or ring residule	246
Z = H	250
Z = -OH or -OR	230

Increment for each substituent :	O	m	P
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	$-C\equiv C^2-$	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 (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	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		-690(s)
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