



HA-003-001506

Seat No. _____

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

May / June – 2017

C-502 : Organic Chemistry & Spectroscopy
(New Course)

Faculty Code : 003

Subject Code : 001506

Time : $2\frac{1}{2}$ Hours]

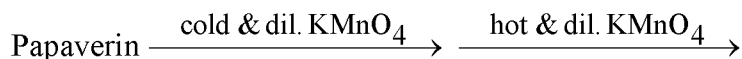
[Total Marks : 70

- Instructions :** (1) Total three questions; all questions are compulsory.
(2) The figures written at the right side, indicate the marks of the question/subquestion.

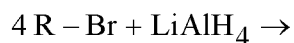
1 Answer the following : 20

(1) Give synthesis of Thiazole.

(2) Complete the following reaction.



(3) Complete the following reaction.



(4) Give the reaction of maleic anhydride reacts with hydrazine hydrate.

(5) Give structure and use of Ibuprofen.

(6) Give structure and use of Chrysodine - G.

(7) Complete the following reaction.



(8) Give synthesis of Isoxazole.

- (9) Give the reaction of coniine react with HI at 300°C temp.
- (10) Complete the following reaction.
Fructose + HCN →
- (11) What is Hyperchromic effect ?
- (12) Define proper rotational axis.
- (13) Give characteristic infra red absorption frequencies of the Anhydride compound.
- (14) Define : symmetry element.
- (15) What is Bathochromic shift ?
- (16) Give symmetry elements of compound having D_{4h} point group.
- (17) What is Inversion centre ?
- (18) Give point group of H_3BO_3 .
- (19) Give the structure of the molecule having D_{2h} point group.
- (20) Arrange the following carbonyl compounds in the decreasing order of their λ_{max} . $PhCOCH_3$, $PhCHO$, $PhCOOH$.

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

6

- (i) Give synthesis and use of Orange - II.
- (ii) Explain Zeisel method.
- (iii) Write step down reaction.
- (iv) Give two synthetic uses of Arndt - Eistert reaction.
- (v) Give synthesis of Thiazine.
- (vi) Give any two method of preparation of Triphenyl phosphine.

- (b) Answer the following : (any **three**) **9**
- (i) Explain Killani reaction with a suitable example.
 - (ii) Give the reaction mechanism of Bischler Napierski reaction.
 - (iii) Give synthesis of Pyrimidine.
 - (iv) Explain. Mutarotation.
 - (v) Explain epimerization with a suitable reaction.
 - (vi) Give synthesis of Saccharin.

- (c) Answer the following : (any **two**) **10**
- (i) Explain Hoffmann rearrangement with mechanism.
 - (ii) Give synthesis and uses of :
 - (a) Auramine - O
 - (b) Adrenaline.
 - (iii) Give synthesis :
 - (a) Nicotine
 - (b) Coniine.
 - (iv) Prove that D(+) Glucose contain pyranose ring system.
 - (v) Explain Hoffmann's exhaustive methylation method. Give its limitation.

- 3** (a) Answer the following : (any **three**) **6**
- (i) Give the type of bending vibration.
 - (ii) Give characteristic infra red absorption frequencies of the Nitrile and Ketone compound
 - (iii) Give point group of CO₂ and p-Dichlorobenzene.

- (iv) Give structure of the molecule having C_{3h} point group. Give its symmetry elements.
- (v) Define : Improper rotational axis.
- (vi) How will you distinguish cis and trans isomers with the help of UV spectra ?

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

- (i) Construct multiplication table for C_{2v} point group.
- (ii) Prove that $S_n^{2n} = E$ in eclipsed ethane.
- (iii) Explain : Finger print region.
- (iv) Write difference between C_n and S_n .
- (v) Assign the structure to a compound having following characteristics.

M.F.: C_9H_8

I R : 3050, 2930, 2890, 2210, 1595, 1490, 1450,
1380, 1020, 750, 700 cm^{-1}

- (vi) Assign the structure to a compound having following characteristics.

M.F.: C_9H_8

I R : 3310, 3045, 2940, 2890, 2190, 1595, 1500,
1455, 1360, 1010, 830 cm^{-1}

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

- (i) Explain the effect of polar solvent on $\pi \rightarrow \pi^*$ and $n \rightarrow \pi^*$ transition band of carbonyl group.
- (ii) What is plain of symmetry ? Explain different types of plain of symmetry.

(iii) Explain :

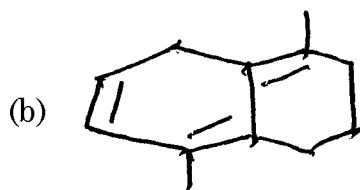
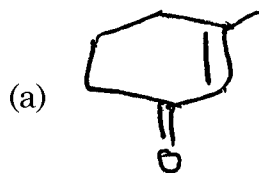
(a) Vibration coupling

(b) Overtone

(c) Fermi resonance.

(iv) Construct the multiplication table for point group of NH_3 .

(v) Calculate λ_{max} for following compound.



Spectral Data

U.V. :

Empirical rules for Dienes :

(A) Homoannular (b) Heteroannular
 $\lambda = 253 \text{ nm.}$ $\lambda = 215 \text{ nm.}$

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 $\lambda = 217 \text{ nm.}$

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 :

(a) Z = C	λ
(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	.	.

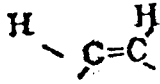
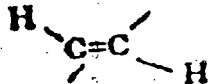
(e) Empirical Rules for Benzoyl Derivative :

Parent Chromophor :	mm
Z = alkyl or ring residue	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 (stretching)	-C-H	2850-2960(v)
Alkene	=C-H	3100-3200(m)
Alkyene	\equiv 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 ₂ H ₃) ₃	1430-1470(m) & 1380-1385(s)
	-C(CH ₂) ₃	1365 (s)
Aldehyde	-C-H	2820-2000(w)&2650 2760(s)
Aldehyde	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		-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