



RO-003-1015006

Seat No. _____

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

February - 2019

Chemistry : Paper - C - 502

(Organic Chemistry & Spectroscopy) (New Course)

Faculty Code : 003

Subject Code : 1015006

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

[Total Marks : 70

- Instructions :** (1) This question paper contains five questions. All questions are compulsory.
(2) All the questions carry equal weightage
(3) Figures to the right indicate marks of the question

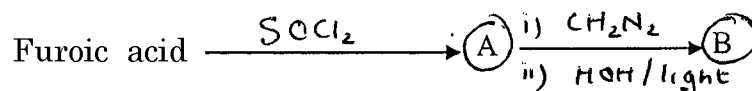
1 (A) Answer the following : 4

- (1) Write a chemical reaction for the synthetic application of Beckmann rearrangement.
- (2) Write one reaction for the synthesis of Lithium aluminium hydride.
- (3) The presence of which functional group can be detected by Zeisel reaction ?

(4) Complete : Conyryne $\xrightarrow{\text{KMnO}_4}$

(B) Answer any **one** : 2

- (1) Write the synthesis of Hygrinic acid
- (2) Complete :



(C) Answer any **one** : 3

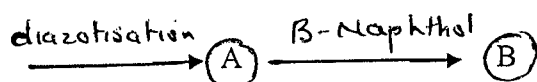
- (1) Write any one method for the synthesis of nicotine.
- (2) Explain with reaction mechanism Bischler Napieralski reaction.

(D) Answer any **one** : 5

- (1) Answer the following:
 - (i) Give an example of Baeyer -Villiger Oxidation.
 - (ii) Give the synthesis of Papavarine from homoveratrylamine and homoveratroylchloride.
- (2) Write the chemical equations for the following reactions:
 - (i) Coniine with zinc dust.
 - (ii) Nicotine with HI at 150° C.
 - (iii) Papaverine on fusion with KOH.
 - (iv) 2-acetyl furan with hydrazine and KOH.
 - (v) Phenyl magnesium bromide with phosphorous trichloride.

2 (A) Answer the following : 4

- (1) Define Epimers. Give an example.
- (2) Why do D(+) Glucose and D (-) Fructose form the same osazone on reaction with phenylhydrazine ?
- (3) Write the structure of: Ibuprofen.
- (4) Complete: Sulphanilic acid



(B) Answer any **one** : 2

- (1) Write a short note on mutarotation.
- (2) Write the chemical reaction for the synthesis of Dulcin.

(C) Answer any **one** : 3

- (1) Explain with chemical reactions the synthesis and uses of Atenolol.
- (2) Explain with chemical reaction synthesis and uses of: Chrysodine-G.

(D) Answer any **one** : 5

- (1) Explain by methylation method that Glucose possesses the pyranose ring structure.
- (2) Give the chemical reactions for the following inter-conversions :
 - (i) D (-)Arabinose to D (+) Glucose by Swoden reaction.
 - (ii) D (+) Glucose to D (-) Arabinose by Ruff's Method.

3 (A) Answer the following : 4

- (1) Write the structure of Oxazine and Imidazole.
- (2) Complete: Acetylene + diazomethane \rightarrow .
- (3) Explain: β - carotene is coloured.
- (4) Explain: Benzene is colourless while nitrobenzene is yellow in colour.

(B) Answer any **one** : 2

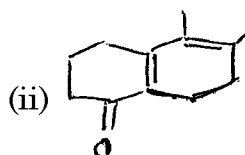
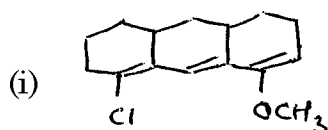
- (1) Write any one reaction for the synthesis of thiazole.
- (2) Write the chemical equation for the synthesis of phenothiazine from diphenylamine.

(C) Answer any **one** : 3

- (1) Explain the effect of polar solvent on $n \rightarrow \pi^*$ and $\pi \rightarrow \pi^*$ transitions.
- (2) Write the chemical equation for the synthesis of pyridazine from maleic anhydride.

(D) Answer any **one** : 5

- (1) Explain in detail the various types of electronic transitions.
- (2) Calculate λ_{\max} for the following :



4 (A) Answer the following : 4

- (1) Define : Centre of inversion.
- (2) Give one example of a molecule belonging to C_s point group.
- (3) Give the elements of symmetry of molecules belonging to C_i point group.
- (4) Give the point group of a linear molecule possess the centre of inversion as a symmetry element.

- (B) Answer any **one** : 2
- (1) If for a molecule C_n^k is C_6^{13} , by how many degrees should a molecule be rotated to get an equivalent structure ?
 - (2) Explain the law of multiplication with the example of H_2O .
- (C) Answer any **one** : 3
- (1) Give three points of difference between C_n and S_n .
 - (2) For eclipsed ethane show that $S_3^3 \neq E$ but $S_3^6 = E$.
- (D) Answer any **one** : 5
- (1) Explain with examples the various planes of symmetry.
 - (2) Classify the following into symmetry point group : $[PtCl_4]^{2-}$, H_3BO_3 , HCl , $XeOFa_4$, Allene.
- 5 (A) Answer the following : 4
- (1) How will you distinguish by IR CH_3CHO and CH_3COCH_3 , by a single character peak ?
 - (2) Give two points to distinguish between aromatic and aliphatic compounds by IR.
 - (3) What is fermi resonance ?
 - (4) Where does the $-CN$ group absorb in IR ?
- (B) Answer any **one** : 2
- (1) Write the approximate IR stretching frequencies for Methyl benzoate.
 - (2) The IR stretching frequency for HCl is 2950 cm^{-1} ; calculate the value of k .
- (C) Answer any **one** : 3
- (1) Write short note: Finger print region.
 - (2) Explain fundamental vibration of IR spectroscopy.
- (D) Answer any **one** : 5
- (1) Deduce the structure for the following compound C_7H_7NO . IR : $3450(d)$, 3030 , 2850 , 2750 , 1690 , 1600 , 1530 , 1500 , 830 cm^{-1} .
 - (2) State and explain the main components of an IR spectrophotometer.

Spectral Data

U.V. :

Empirical rules for Dienes :

(A) Homoannular $\lambda = 253$ nm. (b) Heteroannular $\lambda = 215$ 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 $\lambda = 217$ 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 :

(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


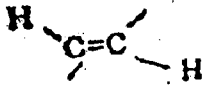
Polar groups	α	β	γ	δ	other
-Cl	15	12	.	.	.
-OH	35	30	50	50	.
-OR	35	30	17	31	.
-NR ₂	.	93	.	.	.
-O	.	75	.	.	.
-NHCOR	.	95	.	.	.
-OCOCH ₂	6	6	.	6	.
-SR	.	85	.	.	.
-Br	25	30	.	.	.
-NO ₂	.	95	.	.	.

(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 :	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 (stretching)	-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	1600-1600(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 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) & 1740-1730
Alcohols, Ethers, esters		
Carboxylic acids, Anhydride	C-O	1800-1000(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	3300-3500(m)
Bnding	N-H	1640-1550(m)
Nitrile	C≡N	2210-2280(s)
Ether	O	1070-1150(s)
Alkene bending		-690(s)
disubstituted Cis.		
		
disubstituted Trans.		960-970(s)
		
Aromatic substitution :		
Type C-H out of plane bending		range cm
No. of adjacent H atom.		750(s) & 700(s)
5		750
4		780
3		830
2		850
1		