

B.Sc. Semester - 5 (Remedial) (CBCS) Examination

February/March. -2020

ORGANIC CHEMISTRY AND SPECTROSCOPY(CORE)

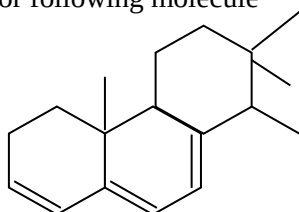
Time: 2:30 Hours

Marks: 70

Instructions:

1. All questions are compulsory.
2. Figures to the right indicate marks.

- Q : 1 (a) **Answer the following question** (04)
Determine the ring size in glucose by methylation method
- Q : 1 (b) **Answer any two questions out of three** (10)
- (1) Give the conversion of aldo hexose to keto hexose and keto hexose to aldohexose
 - (2) What is carbohydrates ? Give the classification of carbohydrates
 - (3) (i) Give Kiliani synthesis
(ii) Explain mutarotation in glucose
- Q : 2 (a) **Answer the following question** (04)
Prove the following in eclipsed ethane
 $S_3^2 = C_3^2$ and $S_3^6 = E$
- Q : 2 (b) **Answer any two questions out of three** (10)
- (1) Give the symmetry elements and point group with structure for following molecules
 H_2O_2 (cis, planner), $[Pt(Cl)_4]^{-2}$
 - (2) Construct multiplication table for C_{2h} point group
 - (3) (i) Write difference between C_n and S_n
(ii) Write difference between σ_h and σ_v
- Q : 3 (a) **Answer the following question** (04)
What is drugs ? Give the synthesis and use of veronal
- (b) **Answer any two question out of three** (10)
- (1) Give the synthesis of Alizarin and Dulcin
 - (2) Write the reaction equation of pyridine with n-BuLi, $NaNH_2$,
Con. HNO_3 + Con. H_2SO_4 , Con. H_2SO_4 and $AlCl_3 + Cl_2$
 - (3) Discuss the aromaticity of pyrrole and give any two synthesis of pyrrole
- Q : 4 (a) **Answer the following question** (04)
Explain Arndt – Eistert reaction with mechanism and give applications
- (b) **Answer any two questions out of three** (10)
- (1) Explain fundamental vibrations in I.R. spectroscopy
 - (2) An organic molecule has molecular formula $C_8H_{11}N$ and shows following I.R. data, Derive the structure and write IUPAC name
 $3105 - 3035\text{ cm}^{-1}$, $2990 - 2805\text{ cm}^{-1}$, $1604 - 1509\text{ cm}^{-1}$, 1348 cm^{-1} ,
 $1230 - 1165\text{ cm}^{-1}$, $747 - 688\text{ cm}^{-1}$
 - (3) Give the preparation of $LiAlH_4$ and write it's applications
- Q : 5 (a) **Answer the following Questions** (04)
Explain Hofmann's methylation method with limitation
- (b) **Answer any two questions out of three** (10)
- (1) Prove that nicotine is β -pyridyl- α -pyrrolidine derivative
 - (2) Calculate λ_{max} for following molecule



- (3) What is red shift and blue shift in u.v. spectroscopy ?

U.V. :

Empirical rules for Dienes :

	(A) Homoannular $\lambda = 253 \text{ nm.}$	(B) Heteroannular $\lambda = 215 \text{ nm.}$
Increments for double bond extending conjugation	30 nm.	30nm.
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

	γ or higher	
Exocyclic double bond position		18
Homocyclic diene component		5
		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 :

Z = alkyl or ring residue

Z = H

Z = OH or OR

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	0
–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(a)	
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 (Bonding)	-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)	
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)	
Free	O-H	8650-8600(sh)	
bonded	O-H	8500-8200(b)	
Carboxylic acids free			
Free	O-H	3500-3650(m)	
H-bonded	O-H	2500-3200(b)	
amines (stretch)	N-H	3330-3500(m)	
Banding	-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	