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MCQ-003-001506 Seat No. _____

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

May / June - 2018

C-502 : Organic Chemistry & Spectroscopy

(New Course)

Faculty Code : 003

Subject Code : 001506

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

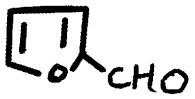
Instructions :

(1) Total three questions, all questions are compulsory.

(2) The figures to the right side indicate the marks of the questions.

(3) All questions of Q. No.-**1** carry **1** mark each.

1 Answer the following : **20**

(1) Complete  $\xrightarrow{HCOONH_4}$ .....

(2) Give IUPAC name of

(i) CH_3COCl

(ii) $ClCH_2COCl$

(3) Give conversion of conyrine from coniine.

(4) Write the structure of α-Picoline.

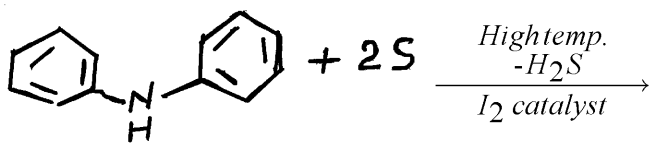
(5) Give the examples of Aldopentose.

(6) Write the structure of D(+) Mannose.

(7) Complete it : P-methoxy aniline $\xrightarrow[\Delta]{Urea}$ .....

(8) Complete it : Isobutyl benzene $\xrightarrow[CH_3COCl]{Anhy.AlCl_3}$ .....

(9) Complete it : β, β'-dichloro diethyl ether $\xrightarrow[Alkali]{}$ .....

(10) 

(11) Define Improper rotational axis.

(12) When molecule is rotated 792°, it gives equivalent orientation find out value of k + n in C_n^k.

(13) When molecule is Linear and symmetry element *i* present which point group obtain ?

(14) Give one example of D2d point group and its symmetry element.

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

(16) Define "Transmittance".

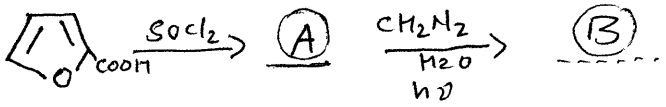
(17) Give the range of finger print region in cm^{-1} and μ.

(18) In IR spectra for pressed pallet technique which solid solvent is used ?

(19) Write approximately IR frequency of (i) acetic and anhydride.

(20) Which material is used for prism in IR spectra ?

2 (A) Answer the following : (any **three**) **6**

(1) 

(2) Explain reaction of fructose with HCl.

(3) Give one synthesis of Dulcin.

(4) D(–) Arabinose $\xrightarrow[H_2O]{Br_2}$ (A) $\xrightarrow[SOCl_2]{CH_3(CO)_2O}$ (B)

(5) Give synthesis of catachol from veratric acid.

(6) Give one synthesis of Dioxane.

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

(1) Give synthesis of Ibuprofen.

(2) Give synthesis of Nicotine.

(3) Give synthesis of Saccharin from anthanilic acid.

(4) Explain step-down reaction (Ruff's method).

(5) Give synthesis and uses of Orange-II dye.

(6) Explain reaction of fructose with H_2NOH *and* HCN.

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

(a) Explain Hoffmann rearrangement with example.

(b) Explain constitution of Papaverine.

(c) Explain configuration of D(+) Fructose.

(d) Give synthesis and uses of Chrysodine-G.

(e) Give synthesis of

(i) Pyrimidine

(ii) Thiazine.

3 (A) Answer the following : (any **three**) **6**

(i) Explain law of multiplication with example.

(ii) Give structure of the molecule having Doch Point group. Give its symmetry elements.

(iii) Calculate theoretical number of vibrational degree of freedom in HCN and Aniline.

(iv) Explain Auxochrome in U.V. Spectra.

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

(vi) Write the expected infrared peaks for Methyle benzoate.

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

(1) Explain plane of symmetry (σ_n, σ_v, σ_d) with example.

(2) Construct multiplication table for C_2V Point group.

(3) Explain finger print region in IR spectra.

(4) Distinguish, Ethenol and Acetone by IR Spectra.

(5) Explain steric hindrance in Dipheny compound.

(6) Assign the structure to a compound from the following spectral data.

M.F. = $C_8H_{11}N$

IR : 3105 – 3035 cm^{-1}, 2990 – 2805 cm^{-1}, 1590, 1545, 1509, 1348, 1230 – 1150 cm^{-1}.

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

(1) For AX_3 planner molecule prove that $S_3^3 \neq E$, but

$S_3^6 = E$ and $S_3^3 = \sigma_h$.

(2) What are P, Q, R Branches of Spectra ? Derive their equation.

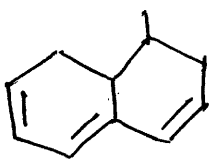
(3) Explain chemical shift (Absorption) shift in U.V. Spectra.

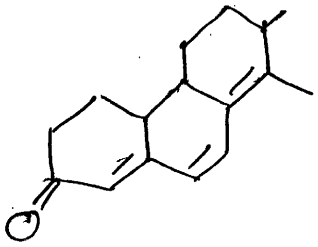
(4) Assign the structure to a compound from the following spectral result.

M.F. = $C_8H_8O_2$

IR : 3030 (m), 2980(m), 2750 & 2680 (sh), 1690(s), 1600, 1580(m), 1220(m) & 830 (S) cm^{-1}.

(5) Calculate λ_{max} for the following compound :

(i) 

(ii) 

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	-	-

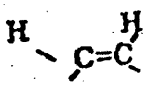
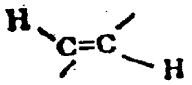
(e) Empirical Rules for Benzoyl Derivative :

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

IR : 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 (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		
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	Mono sub → **750(s) & 700(s)** Two bands
4	Ortho sub → **750** Single band
3	Meta sub → **780** Two band
2	
1	Pera → 800 – **850** Cm^{-1}