



BCG-003-001506

Seat No. _____

B. Sc. (Sem. V) (W.E.F. 2012) Examination

August - 2021

C - 502 : Chemistry

(Organic Chemistry and Spectroscopy)

(Old Course)

Faculty Code : 003

Subject Code : 001506

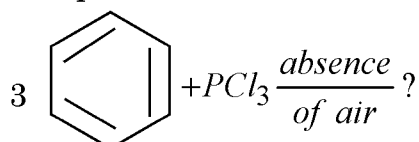
Time : $2\frac{1}{2}$ Hours]

[Total Marks : 70

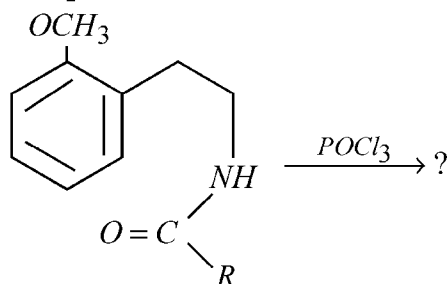
- Instructions :** (1) All questions are compulsory.
(2) Question 1 carries 20 marks.
(3) Question 2 and 3 carries 25 marks each.

1 Answer the following : 20

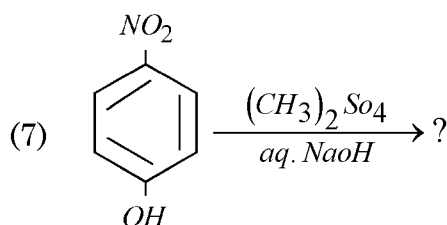
(1) Complete it :



(2) Complete it :

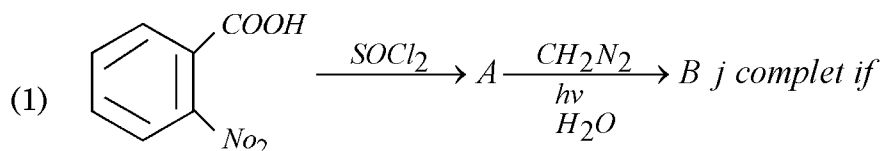


- (3) Give conversion of conyryne from coniine.
(4) Give the structure of veratric acid.
(5) Give the open chain structure of D(+) glucose.
(6) Complete it $6CO_2 + 6H_2O \xrightarrow{H\nu} A + B$



- (8) Give the structure of saccharine.
- (9) Give the structure of crysoidine-G.
- (10) Complete it :
 $\beta - \beta' - \text{dichloro-diethyl ether} \xrightarrow{\text{alkali}}$
- (11) Give the structure of imidazole.
- (12) Complete it :
 $\text{Maleic anhydride} + \text{NH}_2 - \text{NH}_2 \rightarrow$
- (13) Define plane of symmetry.
- (14) Give the point group of CO_2 .
- (15) Vertical plane of symmetry is designated by _____.
- (16) What is bathochromic shift ?
- (17) Define frequency.
- (18) Define symmetrical stretching.
- (19) Which material is used for prism in IR spectrophotometer.
- (20) Give the range of finger print region in cm^{-1} .

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



- (2) Give the synthesis of coniine.
- (3) Explain the oxidation reaction of $D(+)$ glucose with Br_2 water.
- (4) Give any one synthesis of saccharin.
- (5) Give the synthesis of P-anisyl urea.
- (6) Give the synthesis of dioxane.

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

- (1) Give the synthesis of Ibuprofen.
- (2) Give the synthesis of Nicotine.
- (3) Explain step-up reaction (Kiliani method)
- (4) Give the synthesis of atenolol.
- (5) Give synthesis of pyrazole.
- (6) Explain epimerization of $D(+)$ glucose.

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

- (1) Explain Bischler-Napierski reaction with example.
- (2) Explain constitution of papaverine.
- (3) Explain Ruff's method.
- (4) Explain synthesis and uses of Auramine-O.
- (5) Give synthesis of
 - (i) Isoxazole
 - (ii) Pyrimidine

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

- (1) Define : Improper rotational axis.
- (2) When molecule is rotated 810° it gives equivalent orientation. Find out value of n and k in C_n^k .
- (3) Give details of Anochrome.
- (4) State and explain Lambert Beer's law.
- (5) Explain Fermi resonance.
- (6) Explain the source of Radiation.

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

- (1) Explain plane of symmetry ($\sigma_n, \sigma_v, \sigma_d$) with example.
- (2) Construct multiplication table for C_{2v} point group.
- (3) Explain finger print region in IR spectra.
- (4) Explain fundamental vibration of IR spectroscopy.
- (5) Aniline is colourless but o/m/p nitroaniline is coloured. Explain it.
- (6) Assign the structure to a compound from the following data :

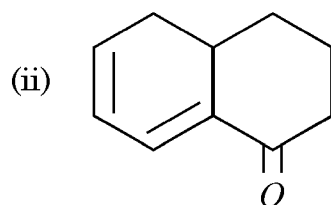
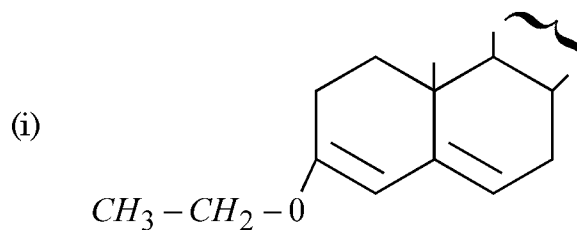
M.F. C_9H_8

IR : 3310 (m), 3020 (m), 2960, 2140, 1605, 1580, 1510, 1450, 4030, 755, 710 cm^{-1} .

(C) Answer the following : (any two)

10

- (1) Explain chemical shift in U.V. spectra.
- (2) Construct the multiplication table for point group of NH_3 .
- (3) Explain instrumentation of IR spectro photometer.
- (4) Find out structure of the compound contain
M.F. : $C_{14}H_{12}$ and
IR : 3100-3000 (m), 1620-1590 (s), 1500-1400 (s),
990, 770, 690 cm^{-1} .
- (5) Calculate λ_{max} for the following compounds :



Spectral Data

U.V. :

Empirical rules for Dienes :

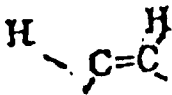
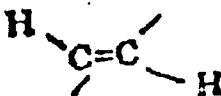
	(A) Homoannular $\lambda = 253 \text{ nm.}$	(b) Heteroannular $\lambda = 215 \text{ nm.}$
Increments for double bond extending conjugation	30 nm.	30 nm.
Exocyclic double bond	5	5
Alkyl substitution or ring residue	5	5
Homocyclic Diene components	39	39
Polar groups :		
- OCOCH ₃	0	0
- OR	6	6
- Cl, -Br	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	50	50
-OH	35	30	17	31
-OR	35	30	.	.
-NR ₂	.	93	.	.
-O	.	75	.	.
-NHCOR	.	95	.	6
-OCOCH ₂	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	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	1750-1780(s)
Amide	C=O	1670-1640(s)
Anhydride	C=O	1810-1860(s)&1740-1790
Alcohols, Ethers, esters	C-O	1300-1000(s)
Carboxylic acids, Anhydride	C-O	

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)
disubstituted Cis.		
disubstituted 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)
4	ortho sub	750
3	meta sub	780 & 750
2		830
1	para sub	(860)