



BCG-003-1015006 Seat No. _____

B. Sc. (Sem. V) (W.E.F. 2016) Examination

August – 2021

C - 502 : Chemistry

(Organic Chemistry and Spectroscopy)

(New Course)

Faculty Code : 003

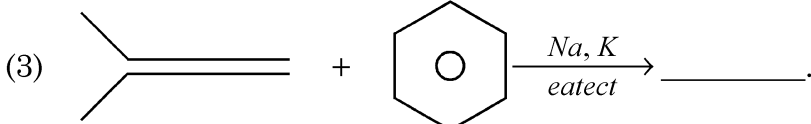
Subject Code : 1015006

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

[Total Marks : 70

- Instructions :** (1) There are ten questions.
(2) Answer any five questions.
(3) All questions carry equal marks.
(4) Figure to the right indicate full marks.

- 1 (A) Answer the following questions in short. 4
(1) Write structure of acetyl azide.
(2) Write structure of sodium azide.
(3) Write the structure of Nicotine.
(4) Write $CH_3I + AgNO_3 \rightarrow$ _____ ?
(B) Answer the following question in brief. 2
Nicotine react with CrO_3 .
(C) Answer the following question in detail. 3
Explain Emde's degradation method.
(D) Write notes on : 5
Explain Wolf-Kishner reaction with mechanism.
- 2 (A) Answer the following question in short : 4
(1) Uses of $LiAlH_4$.
(2) Write the structure of Diazo methane.
(3) Coniine $\xrightarrow[\Delta]{Zn\ dust}$ _____
(4) Which hetero cyclic ring present in papaverine ?
(B) Answer the following question in brief : 2
Give method of preparation of triphenyl phosphine.

- (C) Answer the following question in detail. 3
Write down only reaction application of Arndt Eistert Reaction.
- (D) Write notes on : 5
Explain constitution of Papaverine.
- 3 (A) Answer the following question in short : 4
(1) Write the structure of Glucose.
(2) Name of $D(-)$ Arabinose is _____.
- (3)  _____.
- (4) Structure of P-anisyl area.
- (B) Answer the following question in brief : 2
Write down synthesis of sqccarin.
- (C) Answer the following question in detail. 3
Write down synthesis of Orange II
- (D) Write notes on : 5
Conversion of Aldohexose from Ketohexose.
- 4 (A) Answer the following question in short : 4
(1) Complete reaction $C_{12}H_{22}O_{11} \xrightarrow[\text{Invert yeast}]{\text{Hyclrolysis}}$

- (2) How many chiral carbon present in a $D(+)$ glucose ?
- (3) Is Ibuprofen is anti inflammatory type drug Yes/No.
- (4) Is Orange II is mono-a-20 acidic duel. Yes/No
- (B) Answer the following question in brief : 2
Write the reaction of fructose with HCN.
- (C) Answer the following question in detail. 3
Write step up reaction (Hillani's Method)
- (D) Write notes on : 5
Write the uses of synthesis of
(1) Atenolol (2) Auramine-O
- 5 (A) Answer the following question in short : 4
(1) Write structure of ethylene oxide.
(2) Acetylone + Diazomethane _____ ?
(3) Define : Auxochrome.
(4) Which lamp is use for source of radiation in UV spectroscopy ?

- (B) Answer the following question in brief : 2
 Explain Bathochromic shift.
- (C) Answer the following question in detail. 3
 Explain : $\pi \rightarrow \pi^*$ transition.
- (D) Write notes on : 5
 Write down synthesis of
 (1) Dioxane
 (2) Thiazole
- 6** (A) Answer the following question in short : 4
 (1) Write the structure of Ethylene glucose.
 (2) 2 chloro ethanal + Thiourea _____
 (3) Define what is spectroscopy ?
 (4) Why B-Carotene is coloured ?
- (B) Answer the following question in brief : 2
 Write the synthesis of pyrimidine.
- (C) Answer the following question in detail. 3
 Write only two methods of preparation of pyrazole.
- (D) Write notes on : 5
 Write down instrumentation of UV.
- 7** (A) Answer the following question in short : 4
 (1) What is symmetry ?
 (2) Explain law of multiplication.
 (3) Point group of BF_3 .
 (4) Definition plane of symmetry.
- (B) Answer the following question in brief. 2
 Give the name of symmetry elements.
- (C) Answer the following question in detail : 3
 Prove that $S_3^3 = \sigma h$ but $S_3^3 \neq i$
- (D) Write notes on : 5
 Multiplication table for C_3V point group.
- 8** (A) Answer the following question in short : 4
 (1) What is point group ?
 (2) Point group of CO_2 .
 (3) One example of C_3V point group.
 (4) Definition improper rotational axis.
- (B) Answer the following question in brief : 2
 Explain law of Association.

- (C) Answer the following question in detail : 3
Write difference between C_n and S_n .
- (D) Write notes on : 5
Prove that in eclipsed ethane $S_3^2 = C_3^2$,, $S_3^3 = 6h$,, $S_3^6 = E$
- 9** (A) Answer the following questions in short: 4
- (1) Which two type detector is used in IR-spectrophotometry ?
 - (2) What is the range of middle infrared Region in cm^{-1} ?
 - (3) Type of screening vibration (name only).
 - (4) Give the range of finger print region in cm^{-1} and μm .
- (B) Answer the following question in brief. 2
Write the expected infrared peaks for acetophenone.
- (C) Answer the following question in detail. 3
Explain steric hindrance in IR spectroscopy.
- (D) Write notes on : 5
Explain different method used in IR spectroscopy for solid, liquid and gas sample.
- 10** (A) Answer the following question in short : 4
- (1) Give the type of bending vibration.
 - (2) Why methanol is not good solvent in IR ?
 - (3) IR spectroscopy used determine _____.
 - (a) Functional group
 - (b) different type of proton
 - (c) Unsaturation
 - (4) Give the equation for double bond equivalence DBE.
- (B) Answer the following question in brief : 2
Propanon with help of IR spectra.
- (C) Answer the following question in detail. 3
MF. C_7H_7 No determine structure -
IR : 670, 690, 1450 - 1550, 3000 - 3100, 1650 - 1680, 3400 & 3500 (d)
- (D) Write notes on : 5
Instrumentation of IR spectrophotometry.

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

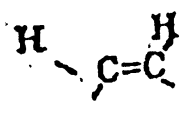
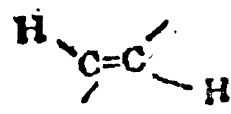
Polar groups	α	β	γ	δ' other
-Cl	15	12	50	50
-OH	35	30	17	31
-OR	35	30	.	.
-NR ₂	.	93	.	.
-O	.	75	.	.
-NHCOR	.	95	.	6
-OCOCH ₂	6	6	.	.
-SR	.	85	.	.
-Br	25	30	.	.
-NO ₂	.	95	.	.

(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

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=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		
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)
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