

BACHELOR OF SCIENCE (CBCS - 2016 COURSE)
T. Y. B Sc. Sem-VI :SUMMER- 2022
SUBJECT : CHEMISTRY : ORGANIC CHEMISTRY-II

Day : Thursday
Date : 7/7/2022

S-15052-2022

Time : 11:00 AM-02:00 PM
Max. Marks : 60

N.B.:

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.

Q.1 Attempt **ANY TWO** of the following: **[12]**

- a) What is Wittig reaction? Discuss its mechanism and application.
- b) Explain the following:
 - i) Ethylene shows λ_{\max} at 171 nm whereas 1, 3-butadiene shows at 217 nm.
 - ii) Phenol shows bathochromic shift in presence of alkali.
- c) How will you distinguish the following pairs by IR Spectroscopy?
 - i) $\text{CH}_3 - \text{CH}_2 - \text{OH}$ and $\text{CH}_3 - \overset{\text{O}}{\underset{\text{||}}{\text{C}}} - \text{CH}_3$
 - ii) $\text{Ph} - \text{CH}_2 - \text{C} \equiv \text{N}$ and $\text{Ph} - \text{C} \equiv \text{C} - \text{H}$

Q.2 Attempt **ANY TWO** of the following: **[12]**

- a) What is Aldol condensation? Discuss the mechanism of simple and crossed Aldol condensation.
- b) Explain the following:
 - i) Bands in UV spectrum are very broad.
 - ii) Ethanol can be used as solvent in UV but acetone can't be used.
- c) Write a note on : Shielding and deshielding of protons.

Q.3 Attempt **ANY TWO** of the following: **[12]**

- a) What are carbanions? Discuss their formations and stability.
- b) Discuss the applications of IR spectroscopy.
- c) Write a note on : Chemical shift.

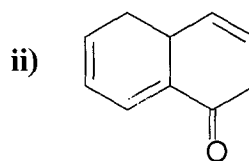
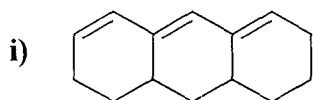
P.T.O.

Q.4 Assign the structure **ANY THREE** of the following using spectral data: [12]

- a) MF : C_4H_8O
IR : 1715 cm^{-1}
PMR : $1.07\ \delta$ (t, 3H)
 : $2.12\ \delta$ (s, 3H)
 : $2.48\ \delta$ (q, 2H)
- b) MF : $C_9H_{11}Br$
PMR : $7.2\ \delta$ (s, 15 mm)
 : $2.4\ \delta$ (d, 6 mm)
 : $3.5\ \delta$ (m, 3 mm)
 : $1.1\ \delta$ (d, 9 mm)
- c) MF : C_7H_8O
IR : $3350, 1600$ and 1500 cm^{-1}
PMR : $3.8\ \delta$ (s, 1H) exchangeable with D_2O
 : $4.3\ \delta$ (s, 2H)
 : $7.2\ \delta$ (s, 5H)
- d) MF : C_3H_6O
IR : 1725 and 2725 cm^{-1}
PMR : $9.77\ \delta$ (s, $J = 2\text{Hz}$, 2 mm)
 : $2.50\ \delta$ (q, $J = 6\text{Hz}$, 4 mm)
 : $1.20\ \delta$ (t, $J = 6\text{Hz}$, 6 mm)

Q.5 Attempt **ANY FOUR** of the following: [12]

- a) What is spectroscopy? What are advantages of spectroscopic methods?
- b) Explain the terms:
i) Chromophores ii) Auxochromes
- c) Calculate fundamental modes of vibration for :
i) CO_2 ii) NH_3 iii) H_2S
- d) Discuss coupling constant.
- e) Calculate λ_{max} for the following compound:



- f) A compound $C_6H_{10}O$ shows positive iodoform test. It shows IR peak at 1690 cm^{-1} and UV absorption at 240 nm . Suggest the structural formula of compound.

* * * *

TABLE : 1
Characteristic Infrared Absorptions of Functional Groups

Group	Frequency Range cm^{-1}	Intensity
A. Alkyl		
C-H (stretching)	2853 – 2962	(m-s)
Isopropyl – CH (CH_3) ₂	1380 – 1385	(s)
	and 1365 – 1370	(s)
	1385 – 1395	(m)
tert-Butyl – C (CH_3) ₃	and – 1365	(s)
B. Alkenyl		
C-H (stretching)	3010 – 3095	(m)
C=C (stretching)	1620 – 1680	(v)
R-CH=CH ₂	985 – 1000	(s)
	and 905 – 920	(s)
R ₂ C=CH ₂ (out-of-plane	880 – 900	(s)
cis-RCH=CHR C-H bendings)	675 – 730	(s)
trans-RCH=CHR	960 – 965	(s)
C. Alkynyl		
≡ C-H (stretching)	3300	(s)
C=C (stretching)	2100 – 2260	(v)
C≡N (stretching)	2210 – 2260	(v)
D. Aromatic		
Ar-H (stretching)	3030	(v)
Aromatic substitution type		
(C-H out-of-plane bendings)		
Monoasubstituted	690 – 710	(very s)
	and 730 – 770	(very s)
o-Disubstituted	735 – 770	(s)
m-Disubstituted	680 – 725	(s)
	and 750 – 810	(very s)
p-Disubstituted	800 – 840	(very s)
E. Alcohols, Phenols, Carboxylic Acids		
OH (alcohols, phenols, dilute solns)	3590 – 3650	(sharp v)
OH (alcohols, phenols, hydrogen bonded)	3200 – 3550	(broad, s)
OH (carboxylic acids, hydrogen bonded)	2500 – 3000	(broad, v)
F. Aldehydes, Ketones, Esters and Carboxylic Acids		
C=O stretch	1630 – 1780	(s)
Aldehydes	1690 – 1740	(s)
Ketones	1680 – 1750	(s)
Esters	1735 – 1750	(s)
Carboxylic acids	1710 – 1780	(s)
Amides	1630 – 1690	(s)
G. Amies	3300 – 3500	(m)
N-H		
H. Nitriles	2220 – 2260	(m)
C≡N		

TABLE : 2

Approximate Proton Chemical Shifts in N M R

Type of Proton	Chemical Shift, Delta, PPM (δ)
1° Alkyl, RCH ₃	0.8 - 1.0
2° Alkyl, RCH ₂ R	1.2 - 1.4
3° Alkyl R ₂ CH	1.4 - 1.7
Alkyllic, R ₂ C = C - CH ₃ R	1.6 - 1.9
Benzylic, ArCH ₃	2.2 - 2.5
Alkyl chloride, RCH ₂ Cl	3.6 - 3.8
Alkyl bromide, RCH ₂ Br	3.4 - 3.6
Alkyl iodide, RCH ₂ I	3.1 - 3.3
Ether, ROCH ₂ R	3.3 - 3.9
Alcohol, HOCH ₂ R	3.3 - 4.0
Ketone, RCCH ₃ O	2.1 - 2.6
Aldehyde, RCH O O	9.5 - 9.6
Vinylic, R ₂ C = CH ₂	4.6 - 5.0
Vinylic, R ₂ C = CH R	5.2 - 5.7
Aromatic, ArH	6.0 - 9.5
Acetylenic, RC \equiv CH	2.5 - 3.1
Alcohol hydroxyl, ROH	0.5 - 6.0 ^a
Carboxylic, RCOH O	10 - 13 ^a
Phenolic, ArOH	4.5 - 7.7 ^a
Amino R - NH ₂	1.0 - 5.0

^a The chemical shifts of these groups vary in different solvents and with temperature concentration.

TABLE : 3

U. V. Absorption rules for diene chromophores		U.V. Absorption rules for Enone System	
1) Parent	215 nm	1) Parent	215 nm
2) Each extra conjugation	30 nm	2) Each extra conjugation	30 nm
3) Homoannular	39 nm	3) Homoannular	39 nm
4) Exocyclic double bond	05 nm	4) Substituents	
5) Each alkyl (R) substituent directly attached to double bonded carbon	05 nm	a) Alkyl group at α	10 nm
		b) Alkyl group at β	12 nm
		c) Alkyl group at γ, δ	18 nm