SG - 467

Total No. of Pages : 3

Seat No.	

M.Sc. (Part - I) (Semester - II) Examination, March - 2023

CHEMISTRY (NEP-2020)

Analytical Chemistry-II

(Paper-VIII-CH-2.4,APCH 2.4, IND 2.4) (CBCS)

Sub. Code : 90166/90076

Day and Date : Tuesday, 20 - 06 - 2023 **Total Marks: 80**

Time : 10.30 a.m. to 01.30 p.m.

Instructions:
1) Attempt in all the five questions.
2) Question No.1 is compulsory.
3) Attempt any Two questions from Section-I and any two from Section-II.
4) Answers to all questions from should be writtem in one answer book.
5) All questions carry equal marks.
6) Figures to the right indicate full marks.

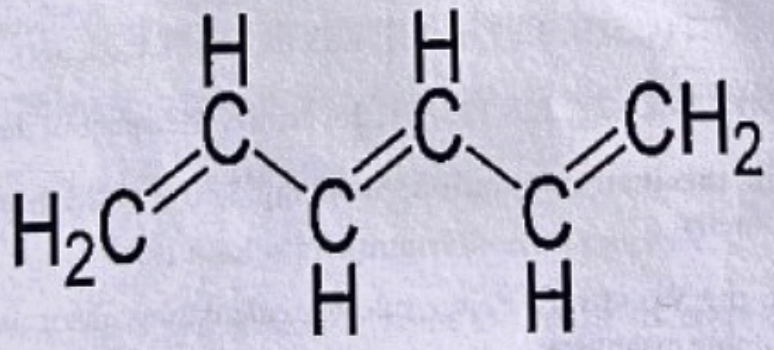
Q1) **Answer the following questions:** **[16]**

a) List the factors affecting chemical shift.

b) Differentiate between protonated ion and adduct ion.

c) How will you differentiate between organochlorine and organobromine compound using MS spectra.

d) Calculate the wavelength (λmax) of given examples 1,3,5-hexatriene



e) How many signals does the aldehyde $(CH_3)_3CCH_2CHO$ have in ^1H NMR and ^{13}C NMR spectra?

f) Define Beer's Lambert Law.

P.T.O.

g) How will you differentiate trans-stilbene and cis-stilbene using UV-Vis spectroscopy?

h) State the unique advantage of ASS in analysis of metals.

i) What is thermogravimetric analysis?

j) What is carrier gas in connection with thermal analysis and state its significance?

k) What are the criteria for selecting the sample holders used in TG analysis?

l) Compare between DSC and DTA.

m) Which technique is generally used to deal with solid samples in AAS?

n) Which of the following molecules will show IR spectrum HCl, CH_4, CO_2, H_2 and N_2O.

o) How is sample prepared for AAS/ICP-AES?

p) ICP-OES means

SECTION - I

Q2) a) What is spin-spin coupling? Explain with examples the types of spin-spin couplings. **[8]**

b) Deduce the structure from the given data: **[8]**

M.F. : $C_8H_{11}N$; IR : 3350, 1596, 1020, 761, 703 cm^{-1}.

PMR: δ 7.2 (s, 5H), 3.87 q, 1H), 1.83 (s, 2H), 1.2 (d, 3H).

^{13}C-NMR: 148, 128, 126 125, 51, 26. Justify the spectral data.

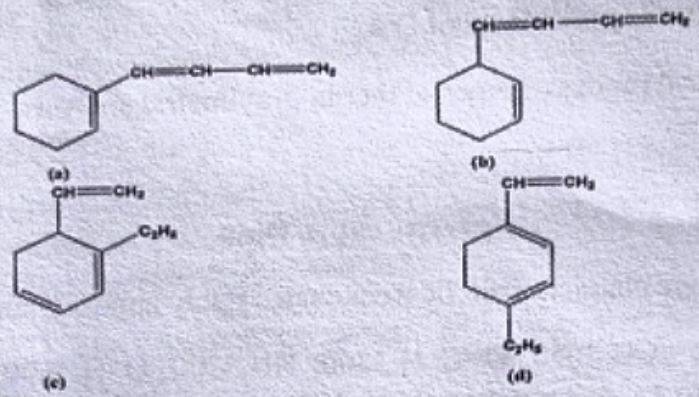
Q3) a) Explain the instrumentation, working and applications of mass spectrometry. **[8]**

b) Explain the Woodward-Feiser rule for calculating absorption maxima with suitable examples. **[4]**

c) State the applications of IR spectroscopy. How are primary, secondary and tertiary alcohols distinguished using IR spectroscopy? **[4]**

Q4) a) What is McLafferty rearrangement? Explain with suitable examples. **[8]**

b) Explain how the ultraviolet spectrum can be used to decide between the following isomeric systems. **[4]**



c) Compare between EI and CI mass spectrometry. **[4]**

SECTION -II

Q5) a) Write note on thermogravimetric analysis. State the factors affecting TGA thermogram. **[8]**

b) How is TG useful in characterizing the food materials and state its significance? **[4]**

c) Compare between TGA and DSC **[4]**

Q6) a) Ellaborate the significance of AAS, its instrumentation and applications in detail. **[8]**

b) Explain the reasons of spectral interferences in AAS and measures to reduce the same. **[4]**

c) Construction and working of Hollow Cathode Lamp in AAS. **[4]**

Q7. Write short note on **any four** of the following. [16]

a) State the advantages and disadvantages of AAS.

b) Explain the shielding and deshielding effects.

c) Compare between base peak and molecular ion peak

d) Industrial Applications of DSC

e) Different modes or types of thermogravimetric analysis.

Spectroscopic Data

Table: I Some characteristic IR frequencies (Only approximate values)

≡CH, 3300; =CH,3050; O=C–H,2800; NH,3300; O–H,3600; C≡N, 2200; C=C, 1620 to 1680; Aromatic, 1600-1500; C=N, 1660; Ketone, 1720; Ester, 1740; Saturated acids, 1720; Saturated aldehydes, 1730; Saturated amides, 1650; $CH=CH_2$,H (CIS), 690; C=H, 790-840; NO_2, 1530 and 1350; Monosubstituted aromatics 690-710 and 730 to 770; Disubstitued 735-770; Trisubstituted 750-810; Tetra substitued, 770, 800-860,: $–CO–CH_2–Cl$, 1745-1725 all values are in cm^{-1}

Table:II Approximate chemical shifts of $–CH_3$,$–CH_2$ and –CH protons in δ (ppm)

$C–CH_3$, 0.9; $O–CH_3$, 1.6; $Ar–CH_3$,2.2; $O=C–CH_3$,2.3 $N–CH_3$, 2.3; $O–CH_3$, 3.3;$C=CH_2$, 4.6; to 5.3; C=CH; Ar–H, 7 to 9;–CO–C=CH,6.2; C–CH–CO, 5.7.

Table:III Approximat^{13} C chemical shifts

$R-CH_3$, 530; $R-CH_2-R$, 25-55; R_3-CH, 35 to 70; R_4C, 30-50; R_3C-O, 57-80; R_3C-N, 60 to 75; C≡C, 75 to 105: C ≡N, 110 to 125; C=C, 100 to 140; Aromaics 115 to 145; $R-COOR/R-CONH_2$, 155-180; R-COOH, 165-185; R-CHO, 185-205; RCOR, 190-225

◆◆◆