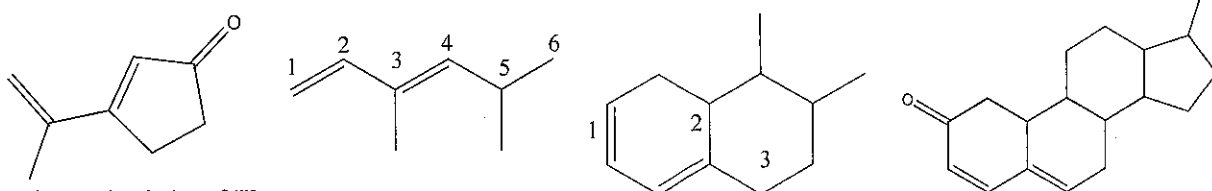


Q-1 Attempt following questions

14

- (a) Base values: 253 nm; 214 nm; 202 nm; 215 nm (other values are given as a supplementary tables)

Calculate Wavelength maximum for following four structures



- (b) Give principle of IR spectroscopy.
Give wavelength for Far IR, Mid IR and Near IR region. Explain $3N-6$ equation for calculating IR vibration.
- (c) Define Microwave spectroscopy. Give classification of molecule and explain linear molecule with suitable example.

OR

- (a) What are Rayleigh scattering and Raman scattering? Explain principle of Stokes and anti-Stokes lines with suitable example.
- (b) Explain the IR spectrum of carbon dioxide.
- (c) Explain the effect of instrumental factors on deviation from Beer's law.

Q-2 Attempt following questions

14

- (a) Explain the ^1H NMR spectrum of 1-chloroprop-1-ene, Phenol and Aniline.
- (b) Draw schematic diagram of continuous wave method used for taking NMR of a sample and explain its working.

OR

- (a) Give principle of NMR spectroscopy. Explain chemical shift and show its importance. Write a short note on TMS.
- (b) What is coupling constant? Explain each type of coupling constant with suitable example in details.

Q-3 Attempt following questions

14

- (a) The species, AlH_3^- , gives rise to a complex spectrum centered at 329.48 mT with microwave radiation of frequency 9.235 GHz. Compute the g-value for AlH_3^- . Given:
 $g = h\nu / \mu_B B$ where $h = 6.626 \times 10^{-34} \text{ Js}$, $\nu = 9.235 \text{ GHz}$, $\mu_B = 9.274 \times 10^{-24} \text{ J T}^{-1}$ and $B = 329.48 \text{ mT}$
- (b) How will you calibrate ESR spectrum using Mn^{+2} species. Calculate the ESR spectrum lines for AlH_3^- , CH_3^\bullet , and H^\bullet species.
- (c) Draw cross section of klystron with proper labeling.

Q-3 Attempt following questions

14

- (a) Draw schematic diagram of RF-pulse method with proper labeling and explain its working in brief.
- (b) What is principle of ESR spectroscopy? Explain electron spin without any additional environment.
- (c) Give comparison of NMR and ESR spectroscopy.

Q-4 Attempt following questions

14

- (a) Give an account of flame photometry with proper illustration.
 (b) Write a short note on flame atomizers with proper illustration.

OR

- (a) Explain various interferences occurred in the atomic absorption spectroscopy.
 (b) Give relationship of flame photometry and atomic absorption spectroscopy and explain working of pre-mix burner in details.

Q-5 Attempt following questions

14

- (a) Draw schematic diagram of electron impact ionization and explain its working.
 (b) Draw schematic diagram of quadrupole mass analyzer and explain its working.
 (c) Explain following terms with respect to mass spectrum: (i) homolytic cleavage (ii) heterolytic cleavage (iii) retro-Diels-Alder reaction (iv) α -cleavage of σ -bond rupture

OR

- (a) Draw schematic diagram of electron spray ionization and explain its working.
 (b) What is base peak in mass spectrum? Give suitable example for it with proper illustration.
 (c) How will you determine isotopes by using Mass spectrum?

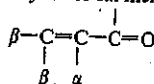
268 INTRODUCTION TO INSTRUMENTAL ANALYSIS**Table 9-4 The Woodward-Fieser rules for conjugated dienes**

Add the value for each auxochrome to that of the chromophore in order to estimate the wavelength of the absorptive maximum. R represents an alkyl or H

Chromophore	Wavelength, nm
$\text{H}_2\text{C}=\text{CHCH}=\text{CH}_2$ or heteroannular diene	214
Homoannular diene	253
Auxochrome	Wavelength, nm
Additional conjugated double bond	30
Exocyclic double bond	5
Alkyl	5
OCOCH_3	0
O-Alkyl	6
Cl or Br	5
SR	30
NR_1	60

Table 9-5 Rules for predicting the wavelength of the absorptive maxima of α , β -unsaturated carbonyls

Add the value for each auxochrome to 215 nm for acyclic or six-membered rings



Auxochrome	Wavelength, nm
Alpha substituents:	
Alkyl	10
OH	35
OCOCH_3	6
O-Alkyl	35
Cl	15
Br	25
Ring residue	10
Beta substituents:	
Alkyl	12
OH	30
OCOCH_3	6
O-Alkyl	30
Cl	12
Br	30
N-(Alkyl) ₂	95
S-Alkyl	85
Ring residue	12
Conjugated double bond	30
Five-membered ring ketone	-10
Aldehydes	-5
Acids, esters	-20