



EEF-143003

Seat No. _____

M. Sc. (Sem. III) Examination

November / December - 2021

MSC0C303 : Organic Chemistry

(Organic Spectroscopy)

Time : 3 Hours]

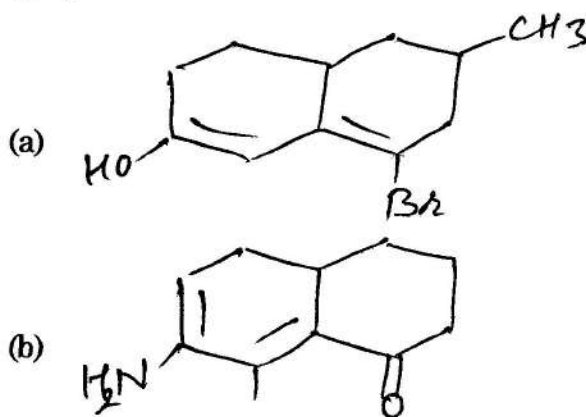
[Total Marks : 70

- Instructions :** (1) All questions are compulsory.
(2) Figures to the right indicate full marks.

- 1 (A) Explain different types of shifts in UV spectra. 7

OR

- (A) (1) Explain the effect of conjugation on UV spectra. 3
(2) Calculate the λ_{\max} values for the following compounds : 4



- (B) (1) Write a short note on various applications of IR spectroscopy. 4
(2) Discuss the effect of H-bonding on IR Spectra. 3

OR

- (B) (1) Explain : Overtones, Fermi resonance. 4
(2) How can you distinguish acetanilide and acetophenone by IR spectra ? 3

- 2 (A) Discuss spin-spin coupling of $\text{CH}_3 - \text{CH}$. 7
- OR
- (A) (1) Write a note on HECTOR 2D NMR spectroscopy. 4
 (2) Write a short note on coupling constant J. 3
- (B) Write a note on Factors affecting chemical shift. 7
- OR
- (1) Write a short note on spin decoupling. 4
 (2) How can you distinguish ethyl benzene and toluene by NMR spectra ? 3
- 3 (A) (1) Explain DEPT spectrum in ^{13}C -NMR. 4
 (2) How many signals you will get in ^1H -NMR and ^{13}C -NMR of $\text{CH}_3 - \text{CCl}_3$? 3
- OR
- (A) (1) Discuss isotope abundance with suitable examples. 4
 (2) Write a short note on ^{13}C -MNR applications. 3
- (B) (1) Explain factors controlling fragmentations. 3
 (2) Explain principle of mass spectroscopy. 4
- OR
- (B) (1) Explain : Metastable ion, Relative abundance. 4
 (2) Give names of various hyphenated techniques of mass spectroscopy. 3
- 4 (A) An organic compound with $\text{MFC}_8\text{H}_7\text{N}$ exhibits following spectral data. 7
- UV : λ_{max} 272 nm
- IR : 3034, 2910, 2210_(s), 817_(s) cm^{-1}
- $^1\text{HNMR}$: δ 2.32(S, 3H), 6.7(d, 2H), 6.9(d, 2H)
- $^{13}\text{CNMR}$: δ 21.5_(q), 119.1_(s), 125.2_(s), 128.1_(d), 130.9_(d), 138.2_(s)
- Deduce the structure of the compound with suitable explanation.

OR

- (A) An organic compound with a molecular formula C_9H_{12} exhibits the following spectral data :

UV : λ_{max} 262 nm

IR : 3067, 2907, 1608, 1473, 885_(s) cm^{-1}

^1H NMR : δ 2.26(s, 9H), 6.8(s, 3H)

^{13}C NMR : δ 21.9, 127.9, 138.2

HRMS : 120.1289

Deduce the structure of the compound with suitable explanation.

- (B) An organic compound having molecular formula C_6H_{12} exhibits the following spectral data : 7

UV : No strong band

IR : 3030, 2856, 970_(s) cm^{-1}

^1H NMR : δ 1.2(t, 6H), 2.3(m, 4H), 4.8(t, 2H)

^{13}C NMR : 29.5_(q), 32.5_(t), 128.9_(d)

Deduce the structure with suitable explanation.

OR

- (B) An organic compound having molecular formula $\text{C}_8\text{H}_{14}\text{O}_4$ exhibits the following spectral data :

UV : Transperent

IR : 2872, 1705_(s), 1322, 1150, 1058_(s) cm^{-1}

^1H NMR : δ 1.2(t, 6H), 2.7(s, 4H), 3.8(q, 4H)

^{13}C NMR : δ 21.2_(q), 30.3_(t), 52.1_(t), 172_(s)

HRMS : 174.123

Deduce the structure with suitable explanations.

5 Answer the following in brief :

14

- (1) How 2D correlation spectra can be useful ?
 - (2) Why samples of IR spectra must be dry ?
 - (3) What is the normal range of UV spectrum ?
 - (4) What is the Nernst Filament and a Globar in IR spectra ?
 - (5) Which types of lamps can be used in UV spectra ?
 - (6) Which shows higher T_{max} among naphthalene and anthracene ?
 - (7) What is combination band in IR spectra ?
 - (8) How many signals p-xylene gives in 1H NMR spectra ?
 - (9) How much intensity base peak has ?
 - (10) The mass spectrum is a plot of what ?
 - (11) Name two mulling agents used in IR spectra.
 - (12) What is the impact of ^{19}F in 1H NMR spectra ?
 - (13) What is frequency domain spectrum ?
 - (14) What is the relation between δ (Delta) and τ (Tau) in 1H NMR ?
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