



H-303003

Seat No. _____

M. Sc. (Sem. III) Examination

November - 2022

MSC1C303 : Organic Spectroscopy

(New Course)

Time : 3 Hours]

[Total Marks : 70

Instructions :

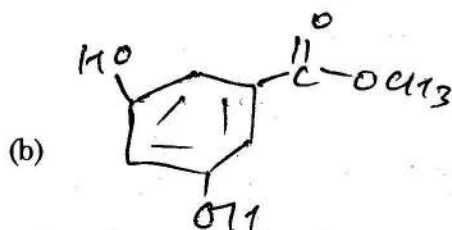
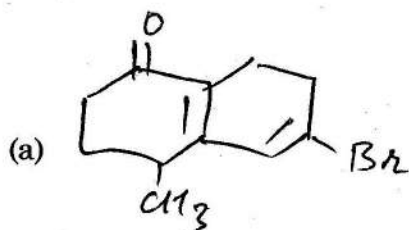
- (1) All questions are compulsory.
- (2) Figures to the right indicates full marks.

1 (A) (1) Explain the effect of conjugation on UV spectra. 7

OR

(1) Explain different types of shifts in UV spectra. 3

(2) Calculate the λ_{\max} for the following : 4



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

OR

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

- 2 (A) (1) Write a short note on coupling constant J. 4
 (2) Write a note on HECTOR 2D NMR spectroscopy. 3

OR

Discuss spin-spin coupling of $\text{CH}_3 - \text{CH}_2$. 7

- (B) (1) Write a short note on spin decoupling. 4
 (2) How can you distinguish ethanal and ethanol by NMR spectra ? 3

- 3 (A) (1) Write a short note on ^{13}C -NMR applications. 4
 (2) Discuss isotope abundance with suitable example. 3

OR

- (1) Explain DEPT spectrum in ^{13}C NMR. 4
 (2) How many signals you will get in ^1H NMR and ^{13}C NMR of $\text{CH}_3 - \text{COOCH}_2 - \text{CH}_3$? 3

- (B) (1) Explain : Relative abundance Metastable ion. 4
 (2) Give names of various hyphenated techniques of mass spectroscopy. 3

OR

- (1) Explain principles of mass spectra. 4
 (2) Explain factors controlling fragmentation. 3

- 4 (A) An organic compound having MF $C_8H_{14}O_4$ exhibits 7
the following spectral data :

UV : Transparent

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 explanation.

OR

- An organic compound having MF C_6H_{12} exhibits 7
the following spectral data :

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.

- (B) An organic compound with a MF C_9H_{12} exhibits 7
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 with suitable explanation.

OR

An organic compound with MF C_8H_7N exhibits the following spectral data :

7

UV : λ_{\max} 272 nm

IR : 3034, 2910, 2210(s), 817(s) cm^{-1} .

1H NMR : δ 2.32 (s, 3H), 6.7 (d, 2H), 6.9 (d, 2H)

^{13}C NMR : δ 21.5(q), 119.1(s), 125.2(s), 128.1(d), 130.9(d), 138.2(s).

Deduce the structure with suitable explanation.

5 Answer the following in brief :

14

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