



**S-303003**

Seat No. \_\_\_\_\_

**M. Sc. (Sem. III) Examination**

**November / December - 2020**

**MSCIC-303 : Organic Spectroscopy  
(New Course)**

**Time : 2 Hours]**

**[Total Marks : 50**

- Instructions :** (1) Answer only **three (3)** questions.  
(2) The examination will be for **two (02)** hours.  
(3) Q. No. **9** is **compulsory** and carries **14** marks.  
(4) Answer any **two** questions from questions  
No. 1 to 8. Each question carries **18** marks.

- 1 (a) Write a short note on basic components of UV instrument.  
(b) Write a short note on basic components of IR instrument.
- 2 (a) Write a note on effect of conjugation in polyene system in UV spectroscopy with suitable example.  
(b) Explain different modes of vibration in linear and non linear poly atomic molecules in IR spectroscopy.
- 3 (a) Explain spin-spin coupling with suitable example.  
(b) Write a short note on long range coupling.
- 4 (a) Discuss factors affecting chemical shift in NMR spectroscopy.  
(b) Write a note on  $^2\text{D}$  NMR spectroscopy.
- 5 (a) What is the effect of hybridization on chemical shift in  $^{13}\text{C}$  NMR. Explain it with suitable example.  
(b) Draw schematic diagram of mass spectroscopy instruments.
- 6 (a) Compare  $^{13}\text{C}$  NMR signals of n-pentane and 1-chloropentane. Explain effect of chlorine on  $\alpha$ ,  $\beta$  and  $\gamma$  carbon's signals.  
(b) Explain : Molecular ion peak, Base peak, metastable ion.
- 7 (a) An organic compound having molecular formula  $\text{C}_6\text{H}_{12}\text{O}_2$  shows following spectral data. Assign the structure to the compound.  
IR : 2950, 2850, 1730, 1480, 1460, 1400  $\text{cm}^{-1}$   
 $^1\text{H}$  NMR :  $\delta$  1.20 (9H, S), 3.70 (3H, S).

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**[ Contd...**

- (b) An organic compound with a MF:  $C_5H_8O_2$  exhibits the following spectral data.  
 IR : 1724, 1150  $cm^{-1}$ .  
 $^1H$  NMR :  $\delta$  2.7 (4H, t), 4.1 (4H, t)  
 $^{13}C$  NMR :  $\delta$  42.9, 68.8, 208.6  
 HRMS : 100.1156  
 Deduce the structure of the compound with suitable explanation.
- 8 (a) An organic compound with a MW:116 exhibits the following spectral data.  
 UV :  $\lambda_{max}$  285 nm  
 IR : 3000-2500 (b), 1760(s), 1720(s), 1342  $cm^{-1}$   
 $^1H$  NMR :  $\delta$  2.18 (3H, s) 2.25 (2H, t), 2.6 (2H, t), 11.1 (1H, S)  
 $^{13}C$  NMR :  $\delta$  29.0, 30.15, 37.3, 177.3, 207.7,  
 Deduce the structure with suitable explanation of the compound.
- (b) An organic compound with a MW:135 exhibits the following spectral data.  
 UV :  $\lambda_{max}$  273 nm  
 IR : 3410, 2829, 1698, 1642, 1578, 1237, 737, 698  $cm^{-1}$ .  
 $^1H$  NMR :  $\delta$  1.6 (1H, s) 2.26 (3H, S), 6.98 (5H, S)  
 $^{13}C$  NMR :  $\delta$  28.0, 126.0, 128.1, 130.2, 130.5, 207.5  
 Deduce the structure with suitable explanation.
- 9 Answer the following in brief :
- (1) What is Nernst Glower ?
  - (2) Why Anilium cation exhibits UV spectrum almost similar to benzene ?
  - (3) Why the detectors used in UV spectrometer are not used in IR spectrometer ?
  - (4) Name any two IR inactive substances.
  - (5) Mention the name of any two mass analysers.
  - (6) What is Nujol ?
  - (7) Why IR spectra called band spectra ?
  - (8) Name any three types of NMR spectra.
  - (9) What is CSCM ?
  - (10) What is INADEQUATE ?
  - (11) What is the blue shift in UV spectra ?
  - (12) What is the relation between  $\delta$  (delta) and  $\tau$  (tau) in  $^1H$  NMR ?
  - (13) The mass spectrum is a plot of what ?
  - (14) Which shows higher  $\lambda_{max}$  among naphthalene and anthracene ?