No. of Printed Pages : 5

MCHE–012

MASTER OF SCIENCE IN CHEMISTRY

(MSCCHEM)

Term-End Examination

December, 2025

MCHE-012 : SPECTROSCOPIC IDENTIFICATION OF ORGANIC COMPOUNDS

Time : 2 Hours *Maximum Marks : 50*

Note : *Attempt any* ***five*** *questions. All questions carry equal marks.*

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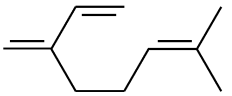
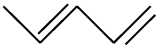
1. (a) Why is UV-Vis spectroscopy called the electronic spectroscopy ? Explain and illustrate your answer. 5

(b) Using Woodward-Fieser's rules, calculate λ_{max} for any *two* of the following : 5

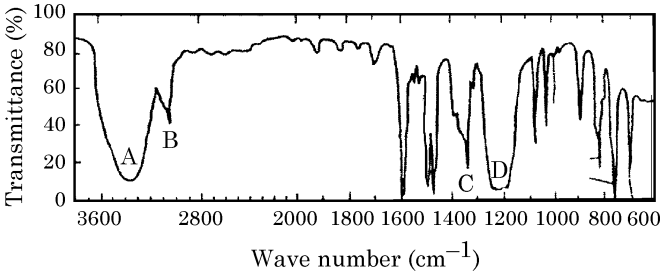
(i) $H_2C = \underset{\underset{CH_3}{|}}{C} - \underset{\underset{CH_3}{|}}{C} - CH_2$

(ii) 

(iii) 

2. (a) With the help an example, explain the fingerprint region in an IR spectrum. 5

(b) Given below is the IR spectrum of an organic compound having molecular formula C_6H_6O. Identify the peaks marked A, B, C, D in the spectrum and write the structure of the compound : 5



3. (a) What is the effect of hydrogen bonding on the absorption frequency in IR spectroscopy ? Explain. 5

   (b) Write the full form of TMS. Give any *four* advantages of using TMS as a good reference compound in NMR spectroscopy. 5

4. (a) With the help of an example, explain enantiotopic and diastereotopic protons. 5

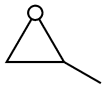
   (b) Write the structure of the compound having molecular formula, $BrCH_2CH_2COCH_3$ following NMR peaks : 5

   δ2.11, 3H, singlet

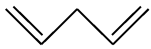
   δ3.52, 2H, triplet, J = 6 Hz

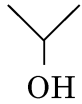
   δ4.40, 2H, triplet, J = 6 Hz

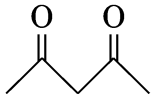
5. (a) Predict the number of signals expected to appear in the ^{13}C-NMR spectrum of the following compounds : 5

(i) 

(ii) 

(iii) 

(iv) 

(v) 

(b) How will you distinguish between different isomers of dimethoxybenzene on the basis of their ^{13}C-NMR spectra ? 5

6. (a) What is DEPT ? Give its full form and application. 5

(b) Compare the chemical ionization and electrospray ionization methods in terms of the nature, the size and the amount of the sample subjected to mass spectrometry. 5

7. (a) Describe in brief the process of electrospray ionization in mass spectrometry. 5

(b) Predict the important spectral signals which are expected in the IR and mass spectra of benzoic acid. 5

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