

B.Sc. 5th Semester (Honours) Examination, 2023 (CBCS)**Subject : Chemistry****Course : DSE-2****(Instrumental methods of Chemical Analysis)****Time: 2 Hours****Full Marks: 40***The figures in the margin indicate full marks.**Candidates are required to give their answers in their own words as far as practicable.*

1. Answer *any five* questions from the following: 2×5=10
- What are the light sources used in UV-vis spectrophotometer?
 - Why is quartz cuvette used to measure spectra in UV-vis and fluorescence spectrophotometer?
 - Why tetramethyl silane (TMS) is used as an internal standard in NMR spectroscopy?
 - What are the light sources used in spectrofluorometer?
 - Define 'ionization chamber' in mass spectrometry.
 - Which of ^{13}C and ^{12}C is NMR active? State reason.
 - Define signal to noise ratio (S/N) in spectroscopic technique.
 - What type of cell is used to measure IR spectra of hygroscopic liquid/aqueous samples?
2. Answer *any two* questions from the following: 5×2=10
- Draw a block diagram of double beam UV spectrophotometer. Explain the monochromator device. 4+1
 - Write down the differences between liquid and gas chromatography? What is the difference between (+) and (-) mode of ionisation in mass chamber? 3+2
 - Draw the various fragmented patterns of *n*-butyl alcohol and *sec*-butyl alcohol. 5
 - What are the functions of using external standard in NMR? What are the advantages of Fourier Transform in Infrared Spectroscopy? 3+2
3. Answer *any two* questions from the following: 10×2=20
- Write down the block diagram of instrumentation of mass spectrometer. Define the term 'chemical shift'. Which one of 'mass spectrometer' and 'mass spectroscopy' is correct? Defend your answer. 4+3+1+2
 - Describe the principle of Atomic Absorption Spectroscopy (AAS)? Which gases are used in AAS? What are the differences between single and double beam spectrophotometer? 5+2+3

- (c) Name the fuels used in flame photometry. Discuss briefly about the columns used in liquid chromatographic analysis. Define R_f value in chromatographic analysis. What is the sampling procedure in IR spectrophotometer? 2+5+2+1
- (d) 'Increase in polarity of the solvent shifts $n \rightarrow \pi^*$ and $n \rightarrow \sigma^*$ bands to shorter wavelength'—comment on the statement. Briefly describe the spin-spin splitting in NMR spectroscopy. 'FT-IR is plotted against wavenumber instead of wavelength'—explain. 4+4+2
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