B.Sc. 5th Semester (Honours) Examination, 2022 (CBCS)

Subject : Chemistry

Course : DSE-2 (OR)

(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

(a) How will you distinguish between CH_3CONH_2 and $CH_3CH_2NH_2$ by FTIR?

(b) Define 'R_f value' in case of TLC.

(c) What are the sources of radiation in fluorescence spectrophotometer?

(d) What do you mean by signal to noise ratio (S/N) in a spectrometer?

(e) Which of the following diatomic molecules do not absorb in the Infra-red region : HCl, ClBr, N_2, O_2 and H_2?

(f) What do you mean by the base peak in mass spectrometry?

(g) Which electrode is used in potentiometry?

(h) What are the information could you obtain from the XPS spectra?

2. Answer *any two* questions from the following: 5×2=10

(a) Explain the factors that influence 'chemical shift' in NMR spectroscopy. What is the function of 'Chopper' in UV-VIS spectrometer? 3+2=5

(b) Which of the following compounds would be suitable as a solvent for use in recording UV spectra of an organic compound?

(i) Iodoethane, (ii) Diethyl ether, (iii) Benzene, (iv) Cyclohexane and (v) DMSO

(c) Why KBr is used to make sample in FTIR? Using FTIR spectroscopy, how can you characterize the following: 1+4=5

O – H, C – O, C = O and C = C

(d) Explain the various types of electronic transition. Name the fuels used in flame photometry. 1+4=5

3. Answer *any two* questions from the following: 10×2=20

(a) (i) What are the differences between single and double beam spectrophotometer?

(ii) Draw a block diagram of a double beam UV-VIS spectrophotometer.

(iii) What are the sources of radiation in UV-VIS spectrophotometer? 3+5+2=10

(b) (i) Why TMS is employed as internal standard in NMR spectroscopy?

(ii) How would you distinguish the following pair by ^1H NMR spectroscopy? $CH_3 - CH_2 - C \equiv C - H$ and $CH_3 - C \equiv C - CH_3$.

(iii) Why is deuterated solvent used in proton NMR? Give two examples. 3+4+3=10

(c) (i) What are the essential components of a mass spectrometer? Mention the function of the components.

(ii) What is molecular ion peak in mass spectrometry? 2+6+2=10

(d) (i) Describe the principle of Atomic Absorption Spectoscopy (AAS). Draw a schematic diagram of AAS.

(ii) What is flame-less atomisation? When this technique is used? (4+3)+3=10
