

U.G. 5th Semester Examination - 2024**CHEMISTRY****[HONOURS]****Discipline Specific Elective (DSE)****Course Code : CHEM-H-DSE-T-2B****Full Marks : 40****Time : 2½ Hours***The figures in the right-hand margin indicate marks.**Candidates are required to give their answers in their own words as far as practicable.*

1. Answer any five questions: 2×5=10
- a) State the principle of voltameter.
 - b) Which of the following molecule/molecules are IR active: CO₂, D₂, N₂, Ethylene?
 - c) Why the absorption peaks of UV Spectroscopy are broader in nature?
 - d) What is the importance of Neutron activation analysis?
 - e) Define R_f value in chromatography.
 - f) State the principle of atomic emission spectroscopy.
 - g) Define fluorescence spectroscopy.
 - h) KCl is used in a salt bridge instead of NaCl—Explain.

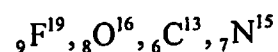
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2. Answer any two questions: $5 \times 2 = 10$

- a) Write two basic differences between single and double beam spectrophotometer. What are the advantages of FTIR over IR? $2+3=5$
- b) What are the differences between atomic and molecular spectroscopy? State the principle of atomic absorption spectroscopy. $2+3=5$
- c) What do you mean by Potentiometry? What are the advantages and disadvantages of this method? $2+3=5$
- d) What is chemical shift in NMR spectroscopy? How anisotropic effect influences chemical shift? $2+3=5$

3. Answer any two questions: $10 \times 2 = 20$

- a) i) Explain the term "Chemically equivalent protons and magnetically equivalent protons" in NMR spectroscopy.
- ii) How many peaks are shown in NMR spectra for N, N-dimethyl formamide. Explain with proper reason.
- iii) Which of the following atoms are NMR active?



$$2\frac{1}{2} + (2\frac{1}{2} + 3) + 2 = 10$$

- b) i) State the basic principle of X-ray diffraction technique. How will you determine the elemental composition of a compound by X-ray diffraction technique?
- ii) How the quantitative estimation is done by use of spectrophotometer?
- iii) What is the basic principle of gas Chromatography? $(2+3)+3+2=10$
- c) i) Define transmittance and absorbance?
- ii) State Beer's law. What are the limitations of the Law?
- iii) Explain the term 'elute' in chromatography.
- iv) Write down the basic principle of electron spectroscopy. $2+(2+2)+2+2=10$
- d) i) How does GCMS differ from GC (Gas Chromatography)?
- ii) What are the analytical techniques available for trace analysis?
- iii) An X-ray has wave length of $2.98 \text{ \AA}$. Calculate the energy of the photon (in ergs) associated with the X-ray.
- iv) Write three applications of atomic emission spectroscopy. $2+2+3+3=10$