Name: **Enrolment No:**	

UPES

End Semester Examination, May 2024

Course: Advance Instrumental Analysis-I

Semester: VI

Program: Int. B.Sc. M.Sc. Chemistry **Time : 03 hrs.**

Course Code: CHEM3035 **Max. Marks: 100**

Instructions:

- Write your name and enrolment no. at the top of the question paper.
- Do not write anything else on the question paper except your name and roll number.
- Attempt all the parts of a question at one place only.
- Schematic representations are highly encouraged during answering the questions.
- In Section B and C, there are separate internal options provided for questions 9 and 11 respectively. Please ensure that you answer either the main question or the internal options, but not a combination of both. Kindly avoid any mixing up of answers between the main question and the internal options.
- "CO" in the last column stands for course outcomes and it is for official use only.

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	A compound absorbs light at a wavelength of 450 nm with an absorbance (A) of 0.6 in a 1 cm cuvette. Calculate the molar absorptivity (ε) of the compound if its concentration is 0.02 M.	**4**	**CO1**
Q 2	Schematically represent the instrumentation and working principle of UV-Vis absorption spectroscopy.	**4**	**CO 1**
Q 3	Predict, whether following nuclides will be stable or radioactive? $^{9}B_{5}$, $^{25}Mg_{12}$, $^{29}Si_{14}$, $^{57}Mn_{25}$	**4**	**CO1**
Q 4	Which one of the radioisotopes of manganese (^{54}Mn, $t½$ = 312 d; ^{56}Mn, $t½$ = 2.56 h) should be used as radiotracer for the determination of manganese in a steel sample in a chemical laboratory? Explain the reason.	**4**	**CO1**
Q 5	State the practical applications of ESR spectroscopy in chemistry and biology.	**4**	**CO 3**
	SECTION B **(4Qx10M= 40 Marks)**		
Q 6	How do specific functional groups in molecules affect their UV-Vis absorption spectra? Provide examples of functional groups and describe the plausible electronic transitions responsible for their absorption properties.	**10**	**CO1**

Q 7	Describe the basic principle of neutron activation analysis (NAA) and its application areas (with schematic representation).	**10**	**CO1**
Q 8	Correlate among the thin layer chromatography (TLC), column chromatography, and high-performance liquid chromatography techniques used for purification of organic molecules (with examples and schematic representation).	**10**	**CO2**
Q 9	Differentiate between the NMR and ESR spectroscopic techniques. **OR** Schematically represent the instrumentation details of both the NMR and ESR spectroscopic techniques.	**10**	**CO3**
SECTION-C (2Qx20M=40 Marks)			
Q 10	Discuss the theory, separation modes, and applications of High-Performance Liquid Chromatography (HPLC) in detail. Compare the principles and applications of different separation modes, such as reverse-phase, normal-phase, and chiral HPLC.	**20**	**CO2**
Q 11	State the fundamental principles underlying NMR spectroscopy, including the interaction of nuclei with an external magnetic field, nuclear spin, resonance absorption of electromagnetic radiation, chemical shift, and coupling. **OR** How does C-NMR spectroscopy function, and how does it differ from H-NMR spectroscopy? Additionally, what information can be obtained from C-NMR spectra, and what are its applications in determining the structure of organic compounds and identifying them?	**20**	**CO3**