Reg. No.									

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

VII SEMESTER B.TECH. (PROGRAMME ELECTIVE)

END SEMESTER EXAMINATIONS, MAR 2021

SUBJECT: ANALYTICAL TECHNIQUES AND INSTRUMENTATION [CHM 4001]

REVISED CREDIT SYSTEM

Time: 3 Hours **MAX. MARKS: 50**

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitably assumed.
- Draw diagrams and write equations wherever necessary.

1A. Give reason: Inert fluorescent indicators are added to the coating material during the preparation thin layer plates. Explain any one methods of preparation of thin layer on plates.

1B. Explain the nature of the graph for the precipitation titrations by conductometric method with an example. The resistance of 0.01 M solution of an electrolyte was found to be 250 ohm at 25 ºC. Calculate the molar conductance of the solution at 25 ºC. Given R= 250 ohm and l/a=0.85 cm^{-1}.

1C. Distinguish between adsorption and partition chromatography. Discuss two types of development techniques used in column chromatography. Mention any two advantages and applications of column chromatography. **(2+3+5)**

2A. Explain the redox potentiometric titration by taking an example.

2B. Discuss rate theory of chromatography. Explain the different factors that affecting column efficiency.

2C. What is the basic principle involved in HPLC? Describe the instrumentation and working procedure of gas chromatography. **(2+3+5)**

3A. How does the shielded proton differ in absorption of energy from a deshielded proton? Identify the shielded and deshielded protons in 1,1-dichloroethane

3B. The rotational spectra of HCl shows a series of lines separated by 20.6 cm^{-1}. Find the moment of inertia and internuclear distance. Atomic mass of hydrogen and chlorine are 1.008 g/mol and 35.45 g/mol respectively.

3C. Explain the Raman spectrum based on quantum theory. Give the applications of Raman spectroscopy. **(2+3+5)**

4A. Describe the principle of NMR spectroscopy with a schematic diagram of the instrumentation.

4B. If the wavenumber of the J = 3 ← 2 rotational transition of $^{1}H\ ^{35}Cl$ considered as a rigid rotor is 63.56 cm^{-1}, what is (a) the moment of inertia of the molecule, (b) the bond length?

4C. What are the reasons for considering the diatomic molecule as anharmonic oscillator? Write the expression for the energy of a vibrating diatomic molecule considering it as anharmonic oscillator.

(2+3+5)

5A. Calculate the energy in Joules of an electromagnetic radiation of wavelength 1 cm. Also calculate the corresponding frequency in Hz of the radiation.

5B. Explain with examples – a) bathochromic shift b) chromophores and c) auxochromes.

5C. i) Explain briefly the instrumentation of UV-VIS spectroscopy with a neat labelled diagram. ii) Which of the following compounds absorb UV radiation? Justify your answer.

a) Heptene, b) Chloropropane, c) N-butylamine, d) Benzoic acid

(2+3+5)

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