

**M.Sc. IV Semester Degree Examination, October - 2023****CHEMISTRY****DSC and DSE : A. Advanced Chromatography and Microscopic Techniques****(NEP)**

Time : 3 Hours

Maximum Marks : 70

Note : Answer **any five** of the following questions with Question No. 1 (Q1) **compulsory**, each question carries **equal** marks.

1. (a) Describe the detectors used in gas chromatography. **5+5+4=14**
(b) Discuss the plate theory of chromatography.
(c) Write a note on pumping system used in HPLC.
2. (a) Explain the different types of fragmentation processes in mass spectrometry with the help of appropriate example. **5+5+4=14**
(b) With the help of suitable examples explain Mc-Lafferty rearrangement and Nitrogen rule.
(c) Deduce the structure of organic compound from the following data and assign the values;
Molecular formula : $C_4H_6O_2$
UV(λ_{max}) : 218 nm;
IR(cm^{-1}) : 3400-2800(M, br), 1719, 1641 and 1111
 ^{13}C NMR (δ ppm) : 172.4, 147.6, 122.4 and 18.00
3. (a) Write the principle and applications of Chemiluminescence. **5+5+4=14**
(b) Draw schematic diagram of Fluorimetry and its working.
(c) Explain the cotton effect.
4. (a) Discuss theory and applications of NQR spectroscopy. **5+5+4=14**
(b) Explain the factors affecting the 'g' value in ESR.
(c) How Mossbauer spectroscopy is useful in the identification of oxidation states of metal ?



5. (a) Write the principle, instrumentation and applications of capillary electrophoresis. **5+5+4=14**
- (b) Discuss the principle and applications of supercritical fluid chromatography.
- (c) Describe the separation mechanism in fluid flow fractions.
6. (a) Write a note on : **5+5+4=14**
- (i) Retro Diels-Alder fragmentation.
- (ii) Fragmentation pattern of glucose.
- (b) Illustrate the applications of polarimetry.
- (c) Draw schematic diagram of ORD instrument and its working.
7. (a) Illustrate with examples the origin and importance of zero field splitting and Kramer's degeneracy. **5+5+4=14**
- (b) Write a note on principle and application of electro-osmosis.
- (c) How the member and position of ^{13}C NMR signals can help in the identification of the four isomeric butyl alcohol $\text{C}_4\text{H}_{10}\text{O}$?
8. (a) Calculate the energies of all the quadruple energy state for a nucleus with I value $3/2$ in an auxiliary symmetric field. Express the energies of NQR transition as function of eQq and predict the number of transitions. **5+5+4=14**
- (b) Write various fragmentation modes of 1-Hexanol and 4-Octanol.
- (c) Write the principles of fluorescence and phosphorescence.

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