

**POST GRADUATE DIPLOMA IN
ANALYTICAL CHEMISTRY (PGDAC)
Term-End Examination
June, 2025**

MCH-002 : SEPARATION METHODS

Time : 3 Hours

Maximum Marks : 75

Note : Answer any *five* questions. All questions carry equal marks. Marks allotted to parts are indicated in R.H.S.

1. (a) Define the terms thermodynamic partition coefficient and distribution ratio. State the conditions when the values of the two are same. 5
- (b) The distribution ratio of iodine between carbon tetrachloride and water at a certain temperature is 85. What percentage of iodine dissolved in 100 mL of water will remain in aqueous phase when it is in equilibrium with 50 mL of CCl_4 ? 5

- (c) Explain the role of a masking agent. How may these help in achieving selectivity in metal ion extraction ? 5
2. (a) What is separation coefficient or factor β ? How is it related to the individual distribution ratios of two solutes A and B in solution to be separated ? Explain, giving suitable example. 5
- (b) Write the names and structures of two chelating agents which are used for metal ion extraction. 5
- (c) Why alkyl phosphorus acids are generally preferred over alkyl carboxylic acids for the extraction of metal ions ? Explain. 5
3. (a) Explain briefly the principle of separation of compounds by Thin Layer Chromatography (TLC). 5
- (b) State whether the following statements are correct or incorrect : 5
- (i) Van Deemter equation can be applied to TLC.
- (ii) Br_2 can be used for detection of organic compounds similar to iodine used for detection in TLC.

- (iii) R_f value is different from t_r (retention time).
 - (iv) GLC technique is more frequently used than GSC.
 - (v) R_f values obtained from PC and TLC have same accuracy.
- (c) State the requirements of a good detector for liquid chromatographic set-up. 5
4. (a) Explain briefly the merits of Thin Layer Chromatography over other chromatographic techniques. 5
- (b) Explain the basic principle of reverse phase chromatography. Comment on its applicability in paper chromatography and TLC. 5
- (c) Give details of various types of columns used in gas chromatography. 5
5. (a) Explain the applications of liquid column chromatography in the analysis of pollutants in environment. 5
- (b) How can zone broadening be reduced in column chromatography ? 5
- (c) Explain how the technique of TLC can be used in the quantitative analysis of the solutes. 5

6. (a) The values of which constants should be higher for a higher metal chelate extraction ? 5
- (b) List the criteria for the selection of a separation method. 5
- (c) What do you mean by development in a chromatography ? List different ways of achieving it. 5
7. (a) Explain why GC-MS technique in stead of GC technique only is recommended for the identification of components present in a mixture. 5
- (b) Draw the block diagram of a HPLC instrument. State the function of various components of the instrument. 5
- (c) Write the factors on which the selectivity of an ion exchanger for an ion depends. 5
8. (a) What is size exclusion chromatography ? Give its *three* advantages. 5
- (b) Write *five* characteristics which are important for a gel to be useful for chromatographic work. 5
- (c) Explain the techniques of Osmosis and Reverse Osmosis. 5

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