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# MCH–002

## 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 $\beta$ ? 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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