

No. of Printed Pages : 5

**MCH-002**

**POST-GRADUATE DIPLOMA IN  
ANALYTICAL CHEMISTRY (PGDAC)**

**Term-End Examination**

**June, 2024**

**MCH-002 : SEPARATION METHODS**

*Time : 3 Hours*

*Maximum Marks : 75*

- Note :** (i) Attempt any *five* questions. All questions carry equal marks.
- (ii) Marks allotted in parts are indicated on RHS.

**Note :** Attempt any *five* questions of the following :

- (a) Name all the criteria for selection of separation methods. 3
- (b) Draw the nature of plot between pH and log D where D represents distribution coefficient in extraction by metal chelate. 3
- (c) Write the criteria used for the selection of stationary phase. Mention any *two* adsorbents. 3

**P.T.O.**

[ 2 ]

**MCH-002**

- (d) Classify ion exchanger broadly with an example for each type. 3
  - (e) Explain osmotic phenomenon with the help of an illustration. 3
- (a) Define Chromatography. Who discovered it ? Name Nobel laureates and year of award. 2+1+1+1
  - (b) State distribution law and derive an expression for % extraction. 2+3
  - (c) Enlist any *two* factors affecting extraction of metal ions. Discuss the role of masking agents in extraction equilibria. 2+3
- (a) Spell out various criteria for the choice of organic phase in extraction process. Which of these are most essential ? 4½+½
  - (b) What do you understand by the term synergism in extraction ? Explain with a suitable example. What generalizations can be drawn about adduct formation ? 1+2+2
  - (c) Explain two approaches to improve binary separation by increase in band separation and decrease in bandwidth. Draw illustration. 5

[ 3 ]

MCH-002

4. (a) Explain the concept of theoretical plates with an illustration. Calculate no. of plates if  $t_k = 7.8$  min and half width ( $w_{1/2}$ ) = 1.25 min. 3+2
- (b) Draw a schematic diagram of liquid chromatography setup showing all the components. Enlist all the components and write the names of detectors. 4+1
- (c) Explain the basic principle of paper chromatography. Give the detection methods. 2½+2½
5. (a) How is plate concept applied to thin layer chromatography (TLC) ? Explain two-dimensional TLC and compare it with one-dimensional TLC. 2½+2½
- (b) Explain the term 'resolution' in chromatography. Write the expression for resolution (R) involving separation factor ( $\alpha$ ) and number of plates (N). 3+2
- (c) Write three principal contributions to broadening of a band in chromatogram from these, derive a basic equation for plate height (H) and then write expanded version of Deemter equation explaining all the terms. 3+1+1

P.T.O.

[ 4 ]

MCH-002

6. (a) What are the requirements of a detector used in gas chromatography ? Suggest the names of any two detectors showing linear range. 4+1
- (b) Which column packing material is generally used in adsorption chromatography ? Draw its structure of packing material indicating type of OH groups and variation in their activity. 1½+2½+1
- (c) Write an expression for number of plates for obtaining required resolution, explaining all the terms. If solvent was retained at 12 min and two substances at 15 and 18 min with resolution of 1.5 column. Calculate no. of required plates. Draw chromatogram. 3+2
7. (a) What are different types of synthetic inorganic ion exchanges ? Explain any *one* of them.
- (b) Explain the basic principle of size exclusion chromatography with illustration. 3+2
- (c) Classify different types of gels. What are weak points of chemical attack on Sephadex and Biogels ? 2½+2½

[ 5 ]

MCH-002

8. (a) Explain Coulomb efficiency in electro dialysis and mention factors contributing in its decrease. 2+3
- (b) Classify different forms of electrophoresis and explain any one of them with suitable illustration.  
1+2+2
- (c) Explain the separation by capillary electrochromatography. Discuss its advantages over the parent technique. 2+3

\*\*\*