

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

Term-End Examination

December, 2022

MCH-002 : SEPARATION METHODS

Time : 3 Hours

Maximum Marks : 75

Note : (i) *Answer any **five** questions.*

(ii) *Marks are indicated against each question.*

1. (a) Illustrate the importance of separation processes giving suitable examples from daily life. 5
- (b) What do you understand by the term retention factor ? What happens if the retention factor is too large or too small ? 5
- (c) What is a macro-microreticular gel ? Explain its need and special advantage for chromatographic work. 5

2. (a) Name the methods of separation based on molecular geometry. Write the names of different types of membranes. What are the applications of these membranes in different separation techniques ? 5
- (b) Which class of inorganic ion exchangers has been most thoroughly studied ? Illustrate. Which particular compound has received the maximum attention and why ? 5
- (c) What is electro-osmotic flow ? Why does the internal wall of the capillary tube attract positively charged ions ? 5
3. (a) Discuss the principle of paper chromatography. What is the possible mechanism of separation in this technique ? 5
- (b) List the requirements of a detector used in HPLC. 5
- (c) Briefly explain the desirable properties of semipermeable membranes for use in reverse osmosis process. 5
4. (a) For the extraction of a metal ion, why is an alkyl phosphorus acid preferred over a carboxylic acid ? 5

- (b) In gas chromatography, what are mobile and stationary phases ? Also list their important characteristics. 5
- (c) What is the principle of SDS-PAGE gel electrophoresis ? How are polyacrylamide gels formed and why is ammonium per sulphate used ? 5
5. (a) What is the role of $pH_{1/2}$ in the metal ion separations ? Explain with example. How can the $pH_{1/2}$ of extraction of a metal chelate be altered ? 5
- (b) What are the requirements of a column used in liquid chromatography ? Give various techniques of column packing. 5
- (c) What is meant by detector sensitivity of a detector in gas chromatography ? Which type of detector can be used for the analysis of the following by gas chromatography ? 5
- (i) Organochlorine pesticides
 - (ii) Inorganic gaseous pollutants in air
 - (iii) Organophosphorus pesticides
6. (a) What are masking agents ? How do their presence affect the separation by extraction ? Illustrate giving an example. 5

- (b) Explain the concept of theoretical plates in a chromatogram. How is the number of the theoretical plates related to retention time and bandwidth ? 5
- (c) How do the cross linkages affect the properties of a resin ? Explain. 5
7. (a) Write the expression for distribution ratio. Under what conditions, the distribution coefficient, thermodynamic distribution coefficient and distribution ratio are the same ? 5
- (b) What is meant by development of a column ? Briefly explain various ways of achieving it. 5
- (c) Discuss the unique features of the size exclusion chromatography in about **250** words. 5
8. (a) Briefly explain various types of detection methods used in paper chromatography. 5
- (b) What are chelating resins ? Give their **two** main limitations. 5
- (c) What are the various synonyms used for HPLC ? Briefly explain the principle of HPLC. 5