

**P.G. DIPLOMA IN ANALYTICAL CHEMISTRY
(PGDAC)**

Term-End Examination, 2019

MCH-002 : SEPARATION METHODS

Time : 3 Hours]

[Maximum Marks : 75

Note : Attempt any five questions. Marks are indicated against each question.

1. (a) List the properties which are generally used for achieving separations. [7]
- (b) What are masking agents ? How do they help in achieving selectivity in metal ion separations ? [8]
2. (a) Briefly explain natural and synthetic ion exchanges giving suitable examples. [7]
- (b) Differentiate between 'Retention time' and 'Retention factor'. [3]
- (c) Give Van Deemter equation. Identify the factors which contribute towards : [5]
 - (i) eddy diffusion and
 - (ii) longitudinal diffusion

3. (a) Define chromatography. Give one example each for a mobile phase and a stationary phase. [3]
- (b) Explain the influence of pH on the extraction of metal chelates. [5]
- (c) What is partition ? Briefly explain its role in various separation techniques. [5]
- (d) What is the role of ethidium bromide in DNA gel electrophoresis ? [2]
4. (a) Give the names of two diluents and two modifiers which are used in solvent extraction process. Explain their role in the extraction of the desired compound. [8]
- (b) What is the basic principle of electrophoresis ? Briefly discuss capillary electrophoresis. [7]
5. (a) Briefly explain the parameters which effect the column efficiency in a gas chromatograph. [6]
- (b) Choose the correct answer from the following :[3]
- (i) The appropriate particle size (in μm) for packing material in HPLC is :
- | | | | |
|-------|---------|------|---------|
| (I) | 1 - 5 | (II) | 3 - 5 |
| (III) | 10 - 20 | (IV) | 20 - 25 |

(ii) Average surface area (in m^2g^{-1}) of porous particles in HPLC column is :

- | | | | |
|-------|-----|------|-----|
| (I) | 100 | (II) | 300 |
| (III) | 400 | (IV) | 800 |

(iii) In case of normal phase packing, elution is carried out using :

- (I) alcohols
- (II) water
- (III) phosphatic solvents
- (IV) non-polar solvents

(c) Briefly describe use of size exclusion chromatography for diagnostic purpose. What are the unique features of this technique ? [6]

6. (a) What do you understand by 'number of plates' in a chromatographic column ? Draw a labelled chromatogram and give mathematical expression to calculate the value of N. [4]

(b) An unknown natural compound, known to contain tartaric acid gave three spots A, B and C having R_f values of 0.63, 0.72 and 0.79 respectively.

Tartaric acid, under identical conditions on TLC, moved a distance of 6.3 cm from the base line whereas the mobile phase moved to 8.6 cm during the same time. Identify which of the 3 spots. A, B or C corresponds to tartaric acid. [3]

- (c) Name any two adsorbents used in TLC/column chromatography. [2]
- (d) Explain Thermal Conductivity detector used in gas chromatography. [6]
7. (a) State and explain Nernst Distribution Law. Give expression to calculate distribution coefficient. [4]
- (b) Give a brief account of the detectors used in HPLC. [6]
- (c) What are the types of synthetic inorganic ion exchangers. [5]
8. (a) Explain the techniques of (i) dialysis and (ii) electro dialysis. In what respects do these differ from each other ? [10]
- (b) Explain the technique of TLC. What are its applications ? [5]