

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

Term-End Examination

00794

December, 2015

MCH-002 : SEPARATION METHODS

Time : 3 hours

Maximum Marks : 75

Note : Attempt any *five* questions. All questions carry equal marks.

1. (a) Explain 'separation' and its objectives. Describe the scope and uses of separation methods. 5
- (b) Name any two extractants each containing C – O and P – O bonds. List the essential characteristics of diluents. 5
- (c) Discuss the role of masking agents in achieving selectivity. 5
2. (a) Name any two chelating agents (along with their structures) used in solvent extraction. Draw the plot between pH and log D. How will you determine the number of molecules of a chelating agent from this plot ? 5
- (b) Explain the terms distribution constant, retention time and retention factor. 5

- (c) Define selectivity, separation factor and resolution of two components with retention times t_x and t_y , respectively. Show a chromatogram with retention times for solvents and two components as 0.73, 1.89 and 2.76 min, respectively. Explain the role of peak width in resolution. 5
3. (a) Draw a sketch of gas chromatograph showing all the components. 5
- (b) List the various column development techniques and explain briefly any one of them. 5
- (c) What are the two planar chromatographic methods ? Explain their principle and the common parameter. In what respects do these differ from each other ? 1+2+2=5
4. (a) Compare the various forms of liquid chromatography i.e. classical column and HPLC using pellicular packing and microparticulate packing in terms of particle size, column diameter and its length. 5
- (b) What are the various criteria for the selection of mobile phase for HPLC ? Explain gradient elution. 5
- (c) Explain the autoradiography using radiotracers with a suitable example. What are its advantages and limitations ? 5

5. (a) What are the essential requirements of a detector in GC ? 5
- (b) Explain the basic features of ion exchange mechanism. What is the difference between adsorption and ion exchange ? 5
- (c) Define resin selectivity. What are the various factors on which selectivity depends ? 5
6. (a) What are gels ? Describe the various properties of gels which make them useful for chromatography. 5
- (b) What are polyacrylamide gels ? In what way are these different from Sephadex gels ? 5
- (c) Define the distribution ratio (D) and percent extraction E (%E) and show that

$$\%E = \frac{100 D}{D + 1} .$$
 5
7. (a) What do you understand by capillary electrophoresis ? Explain it schematically. 5
- (b) Explain the terms — Liquid-solid and gas-solid adsorption chromatography. 5
- (c) Explain dialysis and electrodialysis with an illustration for each. In what respects do these differ from each other ? 5

8. Write brief explanatory notes on any **three** of the following : **3×5=15**

- (a) Modifier
 - (b) Reverse Phase Chromatography
 - (c) DNA Gel Electrophoresis
 - (d) Donnan Effect
-