

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

Term-End Examination

June, 2022

MCH-002 : SEPARATION METHODS

Time : 3 hours

Maximum Marks : 75

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

1. (a) List main applications of separation. Illustrate any one of them, giving suitable examples. 5
- (b) Explain the term chromatography. What particular property of the gel is responsible for separations in gel chromatography? 5
- (c) What is linear detector range? What is the minimum detectable quantity of a detector? How is it affected with the noise level of the detector? 5

2. (a) Name the methods of separation based on surface activity. Briefly explain the principle of these methods. 5
- (b) Briefly explain the factors on which the resolution of peaks in a gas chromatography depends. 5
- (c) What are liquid ion exchangers ? Explain with examples. Why are these included as a distinct category of ion exchangers ? 5
3. (a) State Nernst distribution and discuss its limitations. 5
- (b) What is R_f value ? Explain. List the factors which can influence it. 5
- (c) What are inorganic ion exchangers ? Give any two examples. What are the main advantages of majority of such exchangers over their organic counterparts ? 5
4. (a) Explain the term Retention time. How does the length of the column affect the retention time ? Explain. 5
- (b) The partition coefficient of iodine between chloroform and water is 132. What percentage of iodine dissolved in 100 mL of water will remain in aqueous phase if it is contacted to equilibrium with 25 mL of CHCl_3 ? 5

- (c) Give example of the application of size exclusion chromatography for its use for
- (i) diagnostic purposes, and
 - (ii) purification of a medicine and a vaccine. 5
- 5.** (a) Why should column temperature be maintained in a chromatographic set-up ? Briefly explain the applications of liquid column chromatography. 5
- (b) Compare the techniques of gas chromatography and HPLC. 5
- (c) Discuss the basic principle and operation of gel electrophoresis using a suitable diagram. 5
- 6.** (a) Explain the extraction of metal ions by synergism. 5
- (b) What is meant by solvent strength of a mobile phase ? Why is a binary solvent mixture used as a mobile phase in LSC ? 5
- (c) Explain the technique of DNA gel electrophoresis, giving the apparatus and reagents involved. 5
- 7.** (a) How does nature of a solvent influence the development of paper chromatography ? Give any three criteria to be adopted for the choice of a solvent for paper chromatography. 5

- (b) What is dialysis ? Explain briefly. What are the limitations of this process ? 5
- (c) How does the presence of salting-out agents affect the extraction ? Illustrate. 5
8. (a) Explain the role of guard column in HPLC. How is particle size related to efficiency in HPLC ? 5
- (b) Name two types of gels. Which property of a gel is responsible for fractionation of solutes of different molecular weights by size exclusion chromatography ? What are the values of distribution coefficient, if
- (i) solute molecules do not enter the gel matrix ?
- (ii) solute molecules enter the gel matrix ? 5
- (c) Explain reverse osmosis. What is the importance of surface pore size for separation of salt and water by reverse osmosis process in the context of preferential sorption-capillary flow mechanism ? 5
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