MCH-002

P.G. DIPLOMA IN ANALYTICAL CHEMISTRY (PGDAC)

Term-End Examination

June, 2021

MCH-002 : SEPARATION METHODS

Time : 3 hours *Maximum Marks : 75*

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

1. (a) Give one example each of the following : *5*

   (i) A solid adsorbent used in liquid chromatography

   (ii) Stationary phase used in TLC

   (iii) Stationary support used in paper chromatography

   (iv) Material support plate in TLC

   (v) Development reagent for identifying a divalent transition metal ion

(b) State Nernst distribution law and its limitations. *5*

(c) How does presence of salting out agents affect solvent extraction ? Explain giving suitable examples. *5*

2. (a) What is Chromatography ? Briefly give the main processes responsible for separations by chromatography. *5*

(b) What is Column Efficiency ? How can it be measured ? Explain. *5*

(c) Explain the process of stripping, giving suitable examples. *5*

3. (a) What are different ways of affecting separation by precipitation ? Give one example of each type. *5*

(b) Why is alkyl phosphorus acid generally preferred to a carboxylic acid for extraction of a metal ion ? Explain. *5*

(c) What is Dialysis ? Briefly explain its limitations. *5*

4. (a) Write a short note on SDS-PAGE Gel Electrophoresis. *5*

(b) Briefly describe the separation of lanthanides and actinides using ion exchange chromatography. *5*

(c) List important characteristics of supports for liquid-liquid partition chromatography. *5*

5. (a) What do you understand by the term 'Theoretical Plate' as encountered in chromatography ? How is it calculated using bandwidth and retention time ? *5*

(b) Explain the term R_f value, highlighting its importance. Which of the following is its ideal range ?

(i) 0·0 to 0·90

(ii) 0·05 to 0·95

(iii) 0·1 to 0·90

(iv) 0·5 to 1·0

How much minimum difference is necessary between R_f values of two components so that the two are easily separated ? Give two factors which can affect R_f. *5*

(c) Explain the terms Activation and Regeneration of adsorbent in liquid column chromatography. *5*

6. (a) Explain the interaction forces that can aid in separations. *5*

(b) Explain the technique of reverse osmosis. What are the desirable properties of semipermeable membrane for use in RO ? *5*

(c) Why does the internal wall of the silicate glass capillary tube in the electrophoresis unit attract positively charged ions ? Explain giving suitable diagram. *5*

7. (a) Briefly explain various shapes of stationary phase packings used in HPLC. *5*

(b) What are Crown Ethers ? Give one example and mention their use. *5*

(c) List any five general criteria for selection of a mobile phase in HPLC. *5*

8. (a) Explain the principle of reverse phase chromatography. How is it similar to liquid-liquid extraction ? *5*

(b) State the advantages and disadvantages of using insoluble ion exchangers as catalysts. *5*

(c) Discuss the important features of bio gels, giving suitable examples. *5*

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