00333

P.G. DIPLOMA IN ANALYTICAL CHEMISTRY

Term-End Examination

June, 2012

MCH-002 : SEPARATION METHODS

Time : 3 hours   *Maximum Marks : 75*

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

1. (a) What is the scope of separation methods in   5
        our daily life ? How chromatographic
        methods evolved starting from the
        seperation of pigments to the present day
        separation of complex mixtures ?

    (b) What are the various chromatographic   5
        methods based on different stationary and
        mobile phases ? Explain any one method
        briefly.

    (c) Explain why and when the speed of   5
        seperation becomes essential ? What are the
        different parameters used for plant
        production ?

2. (a) Discuss the role of chelating agents in metal ion extraction. Give names and draw structures of any four chelating agents. **5**

   (b) Explain how extraction is facilitated by solvation. What are the various steps in the extraction of Fe (III) by solvation ? **5**

   (c) Define distribution ratio and percent extraction. Derive an expression for distrubution ratio of benzoic acid between benzene and water. **5**

3. (a) How gas-liquid chromatography differs from gas-solid chromatography? Draw a labelled sketch of complete gas chromatograph. **5**

   (b) In a typical separation of two components A and B, first solvent eluted at 1.32 min. Whereas the two components exhibited elution at 2.13 and 3.57 min with peak widths 0.73 and 0.95 min respectively. Draw the nature of chromatogram and calculate resolution and retention factors. **5**

   (c) In what respects TLC is different from PC. What are the different criteria adopted for mobile phases in TLC ? **5**

4. (a) Define and differentiate between diluent and modifier in extraction. Give two examples for each and write their common requirements. **5**

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(b) Explain how band broadening affects 5 resolution in chromatography and what are the reasons for the same? How plate height in a gas-liquid system can be represented by a mathematical eqn. explaining all the terms ?

(c) Draw a labelled diagram of gas 5 chromatogram. Explain how column efficiency increases using different solvents?

5. (a) Explain briefly any two applications of 5 HPLC.

(b) In a 17.5cm long column solvent peak was observed at 1.5 min and two components A and B shown up at 11.3 and 15.7 min with widths 0.85 and 097min respectively. Calculate the number of plates for both the components, seperation factor and solvent efficiency. 3+1+1=5

(c) Compare HPLC techniques with Gas 5 chromatography.

6. (a) How ion exchangers are classified ? Discuss the applications of ion exchange resins. 2+3=5

(b) What are synthetic inorganic ion exchangers ? 5 Explain their different types, characteristics and special properties briefly.

(c) What is size exclusion chromatography ? 5 Explain its basic principle and describe determination of molecular mass.

7. (a) What are the various mechanisms of 5 separation through membranes ? Explain any two with the help of a suitable example/illustration.

(b) Explain the osmotic phenomenon. Derive an expression for van't Hoff factor **1+4=5**

(c) What is electroosmotic flow ? Explain its basic principle and operation. **2+2+1=5**

8. (a) What are the various applications of membrane processes ? Explain any two processes in detail . **2+4=6**

(b) Write brief notes on any three of the following. **3x3=9**
   (i) Masking agents
   (ii) Retention factor
   (iii) Polyacrylamide gels
   (iv) Capillary electropheresis
   (v) Specific cation exchangers

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