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MCH-002

P.G. DIPLOMA IN ANALYTICAL CHEMISTRY (PGDAC)

Term-End Examination

00062

December, 2018

MCH-002 : SEPARATION METHODS

Time : 3 hours *Maximum Marks : 75*

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

1. (a) Explain the evolution of chromatography. Describe the principle involved in the chromatographic separations. 5

(b) Name the separation methods based on
(i) volatility,
(ii) solubility, and
(iii) ion exchange phenomena.
Give principle of any one of them. 5

(c) Discuss the principle of paper chromatography. 5

2. (a) Explain multiple extractions with successive equal portions of the extractant and derive expression for weight of solute after n extractions. 5

(b) Briefly discuss extraction by solvation. Explain the formation of $FeCl_4^-$ anion in the aqueous phase during extraction of Fe (III) by this process. 5

(c) What is a diluent ? Give reasons for its use during solvent extraction. 5

3. (a) Explain (i) retention time (t_R), and (ii) retention factor (k'_X). How does too small k'_X value affect the elution ? 5

(b) Explain the concept of theoretical plates in column chromatography. Calculate the number of theoretical plates if retention time (t_R) = 4·37 min and half peak width ($W_{1/2}$) = 0·63 min. 5

(c) Explain the term resolution of a chromatogram with the help of a suitable illustration. Calculate resolution if t_x = 5·83 min, t_y = 7·25 min, $W_{x/2}$ = 0·57 min and $W_{y/2}$ = 0·71 min. 5

4. (a) What are the various methods of chromatographic development ? Explain any one of these methods with an example. 5

(b) Explain the methodology of sample application and detection in HPTLC. 5

(c) Explain the term solvent efficiency or column efficiency with the help of suitable illustration and give its mathematical expression. 5

5. (a) What are the essential requirements of a good detector in gas chromatography ? 5

(b) Explain the principle of high performance liquid chromatography (HPLC). 5

(c) Explain basic principle and operation of gel electrophoresis. 5

6. (a) Discuss unique features of size exclusion chromatography. 5

(b) Explain thermospray method of interfacing of HPLC with mass spectrometry. 5

(c) What are the various resin properties ? Explain any one of these. 5

7. (a) Define gels and describe their important properties. *5*

(b) What are synthetic inorganic ion exchangers ? Give their different types. *5*

(c) Briefly explain capillary electrophoresis giving a schematic diagram. *5*

8. Write notes on any ***three*** of the following with suitable illustrations or examples wherever possible : *3×5=15*

(a) Desalination and Water Treatment

(b) Ion Selective Membrane Electrode

(c) Electrodialysis

(d) Membrane Separation Process