P-003-1103001   Seat No. _____

M. Sc. (Chemistry) (Sem. III) (CBCS) Examination

May / June – 2018

C-301 (Common) : Advance Chromatographic Techniques

(New Course)

Faculty Code : 003

Subject Code : 1103001

Time : $2\frac{1}{2}$ Hours]   [Total Marks : 70

Instructions :

   (1)   All questions are compulsory.

   (2)   All questions carry equal marks.

1   Answer the following questions : (any seven)   **14**

   (a)   Define ion exchange chromatography and give the characteristics of ion exchangers.

   (b)   Give the mechanism of ion exchange.

   (c)   Explain void volume (V_o) and elution volume (V_e).

   (d)   Discuss molecular weight determination of gel chromatography.

   (e)   What are bulk property and solute property detectors ? Give their name used in HPLC.

   (f)   Discuss the advantage of HPTLC over a TLC.

   (g)   List the applications of GC-MS and discuss any two of them.

   (h)   Give the principle of GSC and GLC.

(i) Explain :

    (i) R_{st} & hR_f

    (ii) Solvent frontline

    (iii) Elution

    (iv) Effluent.

(j) Why high purity gas is required in GC ?
What are the impurities are present in gases ?

2   Answer the following questions : (any three)   **14**

    (a) Discuss the spot verses band shape sample application in HPTLC.

    (b) What is super critical fluid chromatography ? Give the characteristics of supercritical fluid and discuss instruments of it with diagram.

    (c) Explain the principle of TCD, FID, ECD, PDA and RI detectors.

    (d) (i) What is guard column and why it used ?

       (ii) Why degassing is required for mobile phase ?

       (iii) What is C_8 and C_{18} column ? Why these columns used in HPLC ?

3   Answer the following questions :   **14**

    (a) Explain band broadening phenomena and van-deemter equation.

    (b) In a liquid column chromatography separation of two components A and B achieved. The following data are recorded :

       (i) Length of column packing = 25.7.

       (ii) Flow rate = 0.313 ml/min.

       (iii) V_m = 13.7 ml.

(iv) V_s = 0.164 ml.

(v) The retention time and peak width data are as under :

Sr. No.		Residence time (min.)	Peak width (sec.)
1	Unretained	3.1	–
2	A	5.4	24.6
3	B	14.1	69.6

Calculate :

(i) Number of plate from each peak,

(ii) Plate height for column,

(iii) Retention factor for A and B,

(iv) Resolution and Selectivity.

OR

3 Answer the following questions :   14

(a) What is flame ionization detector ? Give its principle and explain its functioning with diagram. Also list the characteristics gas used with this detector and what type of samples are used ?

(b) A two components pharmaceutical product was separated using 15.02 cm long HPLC column yielding following retention time and peak width data are as under;

Sr. No.	Component	Retention time	Peak-width	Half peak width
1	Paracetamol	7.33 min.	0.65 min.	0.3 min.
2	Analgin	8.63 min.	0.73 min.	0.34 min.

If the solvent showed up a peak at 1.37 min.,

Calculate :

(i) Capacity factors for each component.

(ii) Number of plates using peak width and half peak width.

(iii) The resolution of the two compounds using full peak width and half peak width.

4 Answer the following questions : (any two) **14**

    (a) Describe the types of matrix used in ion exchange chromatography in detail.

    (b) Give the name of different gel chromatographic techniques and describe the gel filtration chromatography.

    (c) Describe application of ion exchange chromatography.

5 Answer the following questions : (any two) **14**

    (a) Write note on gel matrix used in gel chromatography.

    (b) Explain the plate theory with example.

    (c) Discuss the general characteristics of stationary phase for planner chromatography.

    (d) What are the difficulty arise in coupling of LC with MS ? Discuss the particle beam (PB), interface device of LC-MS.

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