

**M.Sc. Chemistry**  
**SCLS, JAMIA HAMDARD**  
**SEMESTER IV EXAMINATION 2019**  
**Paper Code: MCHC 204 (BACKLOG)**  
**Paper Title: Analytical Chemistry**

Time : 3 Hours

Max Marks: 75

*(Write your roll no. on the top on immediately on the receipt of this question paper)*

Answer briefly (ANY FIVE):

1x5 = 5

- Q1A** (i) Name two materials other than silica gel, that are used as stationary phases in normal-phase liquid adsorption chromatography
- (ii) Give two examples of functional groups used in weakly basic anion-exchangers.
- (iii) Name the stationary phase used in paper chromatography?
- (iv) What does Retention factor,  $k'$ , describe?
- (v) Which type of column has the greater efficiency and resolution, packed or capillary?
- (vi) Which is the most commonly used mode of HPLC analysis.
- (vii) Why the developing solvent mixture is prepared fresh before use?

**Q1B Fill in the blanks with appropriate answers**

1x5 = 5

- (i) Higher the ----- to the stationary phase, the ----- the molecule will move through the column.
- (ii) The compound eluted last and retained more in Normal and Reversed phase are ----- and -----
- (iii) If  $k'_A < 1$ , the elution is too ----- for accurate determination of -----
- (iv) The number of theoretical plates can be determined by ----- and -----
- (v) In HPLC ----- is delivered from the reservoir to the pump by means of teflon tubing called -----

**Q1C. State True or False.**

1x5 = 5

- (i) The partition coefficient ( $K$ ) is constant and is independent of solute concentration in the stationary phase ( $C_s$ ) and the mobile phase ( $C_m$ ).
- (ii) In open tubular columns, Eddy's diffusion varies from 0-10.
- (iii) When the solvents are pumped independently and then mixed, the process is called low pressure mixing.
- (iv) The efficiency of a gas-chromatographic column increases rapidly with decreasing particle diameter of the packing.

- (v) In chromatography the equilibrium governs the separation, but the component's affinity to the stationary phase versus the mobile phase determines the equilibrium.

- Q2** (i) Explain briefly thin layer chromatography. Describe the methods for the location of separated substances in thin layer chromatography. **10**  
(ii) Suppose we have a mixture of two molecules A and B, where 'A' is a protein and 'B' is a lipid. We have a column which is packed with silica and our mobile phase is hexane. What do you think will happen when we load this mixture of A and B onto this column? How will A separate from B? Justify your answer appropriate illustration. **05**

OR

- Q2'** (i) How is the phenomenon of 'adsorption' and 'partition' applied in the separation of compounds by chromatography? **10**  
(ii) A chromatographic analysis for the chlorinated pesticide Dieldrin gives a peak with a retention time of 8.68 min and a baseline width of 0.29 min. What is the number of theoretical plates? Given that the column is 2.0 m long, what is the height of a theoretical plate in mm? **05**

- Q3** (i) Discuss the principle and process of separation of components in a mixture by HPLC? **05**  
(ii) Explain the working of either UV detector or ECD detector in HPLC? **05**

OR

- Q3'** (i) Describe the principle and process of gas chromatography. Compare packed and capillary columns in respect of their efficiency. Discuss WCOT, SCOT and PLOT columns. **10**  
(ii) Describe the isothermal and program modes of GC operation. Which mode better and why? **05**

- Q4.** (i) Explain how size exclusion chromatography can be used in the separation of various components in a given mixture. **7½**  
(ii) Write an explanatory note on cation exchange resins and their applications. **7½**

OR

- Q4'.** (i) Describe the principle and process of separation in gel permeation chromatography. **10**  
(ii) Discuss briefly various kinds of gels used in gel permeation chromatography and highlight the characteristics of an ideal gel. **05**

- Q5.** (i) Discuss the interpretation of TGA and DTA curves of magnesium oxalate monohydrate. **7½**  
(ii) Give the principle of DTA. Draw a schematic diagram of typical instrument of DTA and explain the working of each component. **7½**

OR

- Q5'.** (i) What are gas filled detectors. How are they different from solid detectors? Explain with suitable examples. **7½**  
(ii) Write short note on ANY TWO of the following: **05**  
a) Nuclear fission and nuclear fusion  
b) Ionization chamber  
c) Semiconductor detector

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