

Roll No. _____

M.Sc. CHEMISTRY
SCLS, JAMIA HAMDARD
SEMESTER IV EXAMINATION 2019
PAPER CODE: MCHCCO - 204
PAPER TITLE: ANALYTICAL CHEMISTRY

Time: 3 hr

Max Marks: 75

(Write your Roll No. at the top immediately after the receipt of this question paper)

Attempt all questions. Marks are mentioned against each question

Q1A. Answer briefly (ANY FIVE):

1 x 5 = 5

- (i) Define the term 'eluent' and 'eluate'.
- (ii) Name the scientist who introduced chromatographic technique?
- (iii) What is the basis (principle) of chromatographic process?
- (iv) Write the formula for the simplified "van Deemter equation" and name the terms in the equation.
- (v) Give one advantage for using thin layer chromatography over HPLC.
- (vi) A student measures the background activity in the classroom. The student records 45 counts in 60 seconds. What is the background activity in the room?
- (vii) Which type of column has the greater efficiency and resolution, packed or capillary?

Q1B. Fill in the blanks with appropriate answers:

1 x 5 = 5

- (i) Adsorption and solubility of a molecule can be manipulated by choosing the appropriate _____ and _____.
- (ii) The count rate in G M counter is often called the _____ and is given by the number of counts or disintegrations per second and is measured in units called _____.
- (iii) Higher the _____ in the mobile phase, the _____ the molecule will move through the column.
- (iv) The _____ character of the aluminium or silicon and the _____ oxygen create a very polar stationary phase.
- (v) Resolution is a measure of overlap between two peaks. The _____ the resolution, the _____ the overlap.

Q1C. State True or False:

1 x 5 = 5

- (i) Most commonly used HPLC columns are made with 316 grade stainless.
- (ii) The degree of band-broadening due to eddy diffusion and mobile phase mass transfer depends mainly on the size of the packing material and not on the diffusion rate of the solute.
- (iii) High boiling point compounds have lower vapour pressures requiring more energy to reach equilibrium vapour pressure
- (iv) Higher split ratios give sharper peaks
- (v) Magnesium oxalate dehydrate breaks down in two stages.

Q2. Attempt the following

- (i) Discuss the plate theory of chromatography **10**
- (ii) Briefly describe the factors that affect separation in TLC and column Chromatography. **05**

OR

- (i) Discuss the classification of chromatographic methods. **10**

- (ii) Write a note on TLC stationary phases and supports. 05

Q3. Attempt The following

- (i) What are the salient features of van Deemter theory? Explain the van Deemter equation and demonstrate how it explains the relative resolution in HPLC and GC. 10
- (ii) Give a brief account of GC injectors 05

OR

- (i) How is normal phase chromatography different from reverse phase chromatography? Justify with suitable example. Also outline the reaction in the preparation of C18 bonded packing material for HPLC from silica and the appropriate bonding agent. 7.5
- (iii) Draw a labelled block diagram of either a gas chromatograph or HPLC chromatograph and discuss the instrumentation. 7.5

Q4. Attempt the following

- (i) Describe the principle and the process of separation in size exclusion chromatography? Explain using a diagram how size exclusion chromatography separates analytes of differering size. 10
- (ii) What is a calibration curve? How is it plotted? What is its significance in size exclusion chromatography? 05

OR

- (i) Explain briefly the basis of separation in ion exchange chromatography. How ion exchange resins could be used to deionize water? 7.5
- (ii) Explain briefly the instrumentation of ion exchange chromatography 7.5

Q5. Attempt the following

- (i) Discuss the working of gas filled detectors explaining its six operating regions. Explain why gamma ray interaction first occurs with the outer cathode wall rather than the filled gas. 10
- (ii) The mass of a radioisotope falls from 1.6g to 0.1g in 2 hours. What is the half-life of this radioisotope? 05

OR

- (i) Describe the classification of TGA curves? Sketch and briefly discuss the TGA and DTA curves of calcium oxalate monohydrate. 10
- (ii) How will you apply thermogravimetry for quantitative analysis of a mixture of calcium, strontium and barium? 05

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