M. SC. (ANALYTICAL CHEMISTRY) SEM-IV (CHOICE BASED CREDIT & GRADE SYSTEM) : SUMMER - 2018
SUBJECT : RECENT SEPARATION TECHNIQUES

Day :	**Tuesday**	Time :	**03.00 PM TO 06.00 PM**
Date :	**24/04/2018**	**S-2018-0887**	Max. Marks : 60

N.B.
1) All questions are **COMPULSORY.**
2) Figures to the right indicate **FULL** marks.
3) Answers to both the sections should be written in **SEPARATE** answer books.
4) Neat diagrams must be drawn wherever necessary.
5) Use of non-programmable **CALCULATOR** is allowed.

SECTION – I

Q.1 Answer any **THREE** of the following: (15)

i) What is solvent extraction? Define Distribution Coefficient and Distribution ratio. Derive a relation between them.

ii) Define chromatography. Discuss in detail different types of chromatography with suitable examples.

iii) Name different solvent extraction techniques. Discuss in detail continuous solvent extraction technique.

iv) Define the following terms and explain them in brief:
   a) Free column volume   b) Column resolution
   c) Average Number of plates   d) Volume distribution coefficient
   e) Elusion constant

v) Discuss the analytical method for estimation of Fe(III) from given blood sample by using solvent extraction technique.

Q.2 A) Answer any **TWO** of the following: (10)

i) What do you mean by solid-liquid chromatography? Discuss in detail column chromatography technique.

ii) Explain in detail the principle of solvent extraction technique.

iii) Write a note on : "Demineralisation of Hard Water".

B) Solve any **ONE** of the following: (05)

i) In a solvent extraction of a metal ion, the volumes of aqueous phase and organic phase were 30 ml each. The observed % E was 82%. Calculate the Distribution Ratio (D) of the solute.

ii) Calculate the weight to volume distribution coefficient Dw of resin when the length (l) of the column is 20.0 cm, peak elusion volume is 50 ml while the free column volume is 25 ml. The density of the resin is 0.750 gm/ml. (Given – Activity coefficient of the resin A = 7.52)

P.T.O.

SECTION – II

Q.3 Answer any **THREE** of the following: **(15)**

i) Give the principle of HPLC and explain normal and reverse phase chromatography.

ii) What is SFC? Explain it with the help of CO_2 gas and properties of this mobile phase.

iii) Give a brief account of LC-MS chromatography technique.

iv) Define gel filtration and gel permeation. Explain in brief use of gel permeation for rapid determination of molecular mass of large polymers.

v) Explain the methodology of ultracentrifugation and describe its applications in nano science.

Q.4 A) Answer any **TWO** of the following: **(10)**

i) Draw a flow sheet diagram of GC and explain its components.

ii) Give the advantages of SFC over other column chromatographic methods.

iii) Describe the electronic capture detector used in GC.

B) Solve any **ONE** of the following: **(05)**

i) Calculate the selectivity factor and resolution of compounds A and B having retention time 11.6 and 12.2 minutes respectively and having base width as 0.4 and 0.5 mm respectively.

ii) A 20 cm long column showed retention time of 10 and 10.9 minutes respectively for methyl cyclohexane and methyl cyclohexene. Calculate the number of theoretical plates and height equivalent to theoretical plate (H), if the peak width was found to be 0.76 and 0.82 mm for methyl cyclohexane and methyl cyclohexene respectively.

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