MASTER OF SCIENCE (CHEMISTRY) (CBCS - 2018 COURSE)
M.Sc. (Chemistry) Sem-IV AC : WINTER- 2022
SUBJECT : RECENT SEPARATION TECHNIQUES

Day : Thursday | Time : 10:00 AM-01:00 PM

Date : 29-12-2022 | **W-20180-2022** | 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) Draw neat and labelled diagrams **WHEREVER** necessary.
5) Use of non-programmable calculator is **ALLOWED**.

SECTION – I

Q. 1 Attempt **ANY THREE** of the following: **(15)**

a) Write the different types of solvent extraction methods. Explain in detail Batch extraction method.

b) Define chromatography. What do you mean by liquid –liquid chromatography? Discuss in brief paper chromatography.

c) Outline the experimental method for quantitative determination of Fe(III) from the given sample of blood by using solvent extraction technique.

d) Define following terms:

i) Column resolution
ii) Volume distribution coefficient
iii) Elusion constant
iv) Free column volume
v) Average number of plates

e) Define K_D and D. Explain them in brief. Derive a relation between K_D and D.

Q. 2 **A)** Attempt **ANY TWO** of the following: **(10)**

i) Write different types of chromatography. Explain each in brief.

ii) Define separation efficiency (β). Explain it using a suitable example.

iii) Write a note on – "Deionisation of Hard water".

B) Attempt **ANY ONE** of the following: **(05)**

i) Solute A was extracted to 60 % in chloroform while solute B was extracted to 10 % in the same solvent. Find out the separation factor β considering the volume ratio ½.

ii) The compounds C and D had retention time (t_R) 15.0 min and 12.0 min respectively on a 30 cm column. The peak widths were 1.1 mm and 1.3 mm respectively.
Calculate the column resolution (R_c), Number of plates (N), Average number of plates (N_{Avg}) and plate height (H) in this experiment.

P. T. O.

SECTION – II

Q. 3 Attempt **ANY THREE** of the following: **(15)**

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

b) Give a brief account of GC-MS hyphenated technique with applications.

c) Describe online mass detector used in HPLC.

d) Explain ultracentrifugation and describe its use in synthesis of nano materials.

e) Define SFC. Describe CO_2 is used as SFC.

Q. 4 **A)** Attempt **ANY TWO** of the following: **(10)**

i) Explain FID and TCD detectors used in GC.

ii) Give brief account of principles and migrational parameters in chromatography.

iii) Explain UV-VIS detector in HPLC with suitable diagram.

B) Attempt **ANY ONE** of the following: **(05)**

i) 6.5 mg sample gave the following peaks with area under the curve as :

a) MIBK - 30 cm^2
b) 2 – pentanol - 40 cm^2
c) Hexane - 30 cm^2
d) Toluene - 35 cm^2

Calculate the percentage of the given mixture.

ii) Compound A and B are separated on a column with retention time 10.60 min and 11.2 min respectively having base width as 0.5 mm and 0.62 mm. respectively. Calculate the selectivity factor and resolution to both A and B.

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