

B.Sc. Semester-VI Examination, 2022-23**CHEMISTRY [Honours]****Course ID : 61416 Course Code : SH/CHEM/603/DSE-3****Course Title : Analytical Methods in Chemistry**

Time : 1 Hour 15 Minutes

Full Marks : 25

*The figures in the right-hand margin indicate marks.**Candidates are required to give their answers in their own words as far as practicable.*

1. Answer any **five** questions: $1 \times 5 = 5$
- What are the two main techniques for thermal analysis?
 - Which indicators are used in a pH meter?
 - What types of solvents are generally employed in chromatography?
 - What is the origin of atomic spectra?
 - What is confidence interval?
 - Which lamp is used in UV spectroscopy?
 - What is elution?
 - What is the role of KBr in IR spectroscopy?

2. Answer any **two** questions: $5 \times 2 = 10$
- Which factors influence solvent extraction? What is the basic principle of UV-Visible Spectroscopy? $3 + 2 = 5$
 - Which factors are affecting thermogravimetric analysis? Write down the principle of conductometric titration. $3 + 2 = 5$
 - Differentiate between adsorption and partition chromatography. What is the role of HCl in extraction of Fe^{+3} with ether? What is 'random error'? $2 + 2 + 1 = 5$
 - What are the limitations of paper chromatography technique? What is the basic principle of gas chromatography? $3 + 2 = 5$
3. Answer any **one** question: $10 \times 1 = 10$
- Calculate the confidence interval (CI) of the mean value of 1100 of seven measurements at a 95.4% confidence level (CL). [Given: 95.4% confidence level at 2σ and $s = 19$ is a good estimate of σ]
 - Which type of systematic errors are detected by varying the sample size? Which detector is used in HPLC?

iii) Discuss the Role of computers in instrumental methods of analysis.

$$4+(2+1)+3=10$$

b) i) Regarding flame emission spectrometry, what will be the choice of flame, monochromator and detector?

ii) The distribution coefficient for iodine between an organic solvent and H₂O is 85. Find the concentration of I₂ remaining in the aqueous layer after extraction of 50.0 mL of 1.00×10⁻³ M I₂ with the following quantities of the organic solvent:

A) 50.0 mL;

B) two 25.0-mL portions;

C) five 10.0-mL portions.

iii) You are separating a mixture of (R)-2-butanol and (S)-2-butanol using chiral HPLC. You observed two peaks in the chromatogram with peak areas (in arbitrary units) of 167890 for the (S)-isomer and 8922 for the (R)-isomer. Calculate the enantiomeric excess of the mixture.

$$3+4+3=10$$