

FOURTH SEMESTER M.Sc. DEGREE EXAMINATION, APRIL 2024
(Regular/Improvement/Supplementary)

CHEMISTRY
FCHE4C12 - INSTRUMENTAL METHODS OF ANALYSIS

Time: 3 Hours

Maximum Weightage: 30

Section A: Short answer questions. Answer any *eight* questions. Each carries *one* weightage.

1. What is the purpose of using confidence limits in testing a hypothesis?
2. Provide an example that illustrates how absolute and relative errors are influenced by measurement precision.
3. What are the assumptions underlying linear regression?
4. Explain the use of oxine as an organic precipitant.
5. Describe the chemical reaction that occurs between a redox indicator and a titrant in a redox titration.
6. Explain back, and replacement complexometric titrations.
7. What are the advantages of performing titrations in non-aqueous media?
8. Explain biamperometry.
9. Discuss Auger electron spectroscopy.
10. Explain the principle of isotope dilution method.
11. Compare TCD, FID detectors used in gas chromatography.
12. What is Gel Permeation Chromatography?

(8 × 1 = 8 weightage)

Section B: Short essay questions. Answer any *four* questions. Each carries *three* weightage.

13. A student is performing an experiment to compare the yield of two different chemical reactions. In reaction A, 5 g of starting material is used while in reaction B, 7 g of starting material is used. The student repeats each reaction three times and obtains the following yield.

Reaction A: 4.2 g, 4.4 g, 4.1 g

Reaction B: 5.1 g, 4.9 g, 5.0 g

(P.T.O.)

Is there any significant difference in the yields between the two reactions? Use a student's t test to analyze the data and determine if there is any statistically significant difference between the two reactions. Use a significance level of 0.05. The critical t -value for a two-tailed test with 4 degrees of freedom and a significance level of 0.05 is 2.78.

14. Illustrate different types of adsorption indicators.
15. Explain biological and biocatalytic electrodes.
16. Illustrate the principles of Anodic Stripping Voltammetry.
17. Discuss the advantages of coulometric titrations.
18. Explain the differences between single and double beam instruments for UV- visible spectrophotometry.
19. Discuss the basic instrumental set up of gas chromatography.

(4 × 3 = 12 weightage)

Section C: Essay questions. Answer any *two* questions. Each carries *five* weightage.

20. What are the main limitations of detection limit at lower concentration in polarography? Discuss different techniques of improving detection limit.
21. Compare different excitation sources in atomic emission spectrometry.
22. Illustrate and explain the instrumentation for TEM.
23. Compare the instrumentation for Differential Thermal Analysis and Differential Scanning Calorimetry

(2 × 5 = 10 weightage)