D 121210 **(Pages : 2)** **Name.....**

Reg. No.....

FOURTH SEMESTER M.Sc. DEGREE (REGULAR/SUPPLEMENTARY) EXAMINATION, APRIL 2025

(CBCSS)

Chemistry

CHE 4C 12—INSTRUMENTAL METHODS OF ANALYSIS

(2019 Admission onwards)

Time : Three Hours Maximum : 30 Weightage

Section A

Answer any **eight** *questions.*
Each question carries a weightage of 1.

1. The concentration of iron in a given sample was found to be 20.17 ppm. Taking the accepted value as 20.00 ppm, calculate the absolute error as well as the relative error as percentage and as parts per thousand.
2. Explain the term 'indicator range', giving a suitable example.
3. How does calomel electrode function as a reference electrode ? Explain.
4. Give two reasons for using a supporting electrolyte in voltammetry.
5. A sample in a cell of 1.0 cm, is determined with a spectrometer to transmit 80 % of light at a wave length of 480nm. If the absorptivity of the sample is 2.0, what is the concentration of the sample.
6. What is the principle involved in X-ray diffraction study of crystalline materials ? How this technique can be used to calculate the particle size of such materials ?
7. 'TG and DTA are complementary techniques'. Justify this statement with an example.
8. How will you measure the column efficiency in HPLC ? Mention any *two* detectors used in HPLC.
9. What is an Atomizer ? Explain its function in AAS.
10. Explain the principle involved in AFM.

(8 × 1 = 8 weightage)

Turn over

Section B

Answer any **six** *questions.*
Each question carries a weightage of 2.

11. Give a brief account of the classification of errors.
12. Compare EDTA titration curve with acid-base titration curve.
13. How polarographic technique can be used for quantitative analysis ? Explain.
14. What is meant by coulometric titration ? Explain its advantages over volumetric titration.
15. Write a note on spectrophotometric titrations.
16. Discuss the principle and applications of SEM.
17. Describe the principle involved in TG. What are the parameters which affect the TG curve ?
18. Discuss the principle of ion-exchange chromatography.

(6 × 2 = 12 weightage)

Section C

Answer any **two** *questions.*
Each question carries a weightage of 5.

19. Discuss the theory of complexometric titration using EDTA. Give a critical review of the different types of complexometric titrations using EDTA. How will you determine the hardness of water using EDTA titration ?
20. Discuss the theory, experimental setup and important applications of atomic absorption spectrometry. What are the major differences between atomic absorption spectrometry and atomic emission spectrometry ?
21. Outline the principle of neutron activation analysis. Give a brief account of the experimental setup of this technique. Comment on its merits and demerits.
22. Write notes :
    a) Amperometric titrations ;
    b) Auger electron spectroscopy ; and
    c) Gel permeation chromatography.

(2 × 5 = 10 weightage)