B.Sc. 5th Semester (Honours) Examination, 2023 (CBCS)

Subject : Chemistry

Course : DSE-2 (OR)

Time: 2 Hours **Full Marks: 40**

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

1. Answer *any five* questions from the following: 2×5=10

(a) Explain with suitable example of propagation of error.

(b) Why R_f value is important in chromatographic method?

(c) Write down the structural formula of a reagent for gravimetric estimation of Ni^{2+}-ion and indicate the pH of medium.

(d) Write down the limitations of Lambert-Beer's law.

(e) What is chromatogram?

(f) Write down the Nernst distribution law, and give its application(s).

(g) How many significant figures are in the number 0·00150?

(h) Differentiate between absolute error and relative errors.

2. Answer *any two* questions from the following: 5×2=10

(a) State the normal law of distribution in statistical analysis. Draw its probability curve and give its equation with mentioning all the terms. 2+3

(b) (i) Express the actual differences between the end-point and equivalence point in a titration.

(ii) What are the basic criteria for metal ion extractions by chelation method. 2+3

(c) (i) Write briefly about the principles and applications of thin layer chromatography (TLC).

(ii) Give two important differences between liquid chromatography (LC) and gas-chromatography (GC). (2+1)+2

(d) (i) Mention two interferences in AAS analysis. How they interfere in this analysis?

(ii) Write two important limitations of thermogravimetric techniques. 3+2

3. Answer *any two* questions from the following: 10×2=20

(a) (i) Explain the role of pH in solvent extraction method.

(ii) Name two stationary phases and two mobile phases that are used in chromatography. How chromatographic separation is influenced by solvent polarity?

(iii) "The concentration of Ni^{2+}-ion can be measured by gravimetry and electrogravimetry"— Which one does give better result and why? 3+(1+1+2)+(1+2)

(b) (i) Briefly describe with suitable example of the chiral chromatographic technique using HPLC column.

(ii) Write the differences between precision and accuracy.

(iii) The analysis of a calcite sample yielded CaO percentage of 55·95, 56·00, 56·04, 56·08 and 56·23. The last value appears anomalous; should it be retained or rejected at the 95% confidence level? (Q_{crit} = 0·71 at 95% confidence level for five measurements)

4+3+3

(c) (i) What is Infrared (I.R.) spectroscopy? Write the different types of samples and their preparation method used in I.R. spectroscopic technique.

(ii) Define molar extinction co-efficient and give its unit. (2+1½+4½)+2

(d) (i) How much of each enantiomer is present if the enantiomeric excess is 90?

(ii) What is the use of Chiral Shift reagent?

(iii) How do you determine optical rotation by polarimeter?

(iv) What is the principle of Chiral Separation in HPLC? 2+2+3+3