3 Yr. Degree/4 Yr. Honours 2nd Semester Examination, 2025 (CCFUP)

Subject : Chemistry

Course: CHEM2051 (SEC)

(Basic Analytical Chemistry)

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

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

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

(a) Why sample preparation is important before chemical analysis?

(b) Solve the following with correct number of significant figures:

(i) $\log 1{\cdot}4 \times 10^4$

(ii) $102{\cdot}8 + 13{\cdot}8056 + 3{\cdot}04$

(c) Write the names of two metal ion indicators.

(d) Write two important applications of thin layer chromatography.

(e) Name four simple methods for water purification.

(f) Mention the major composition of soil with their regular percentage.

(g) "Paper chromatography is one kind of liquid-liquid chromatography". —Justify.

(h) How can you separate Zn^{2+} and Mg^{2+} by strongly basic anion exchange resins?

2. Answer *any four* questions: 5×4=20

(a) (i) Define accuracy and precision in the context of analytical measurements.

(ii) "High accuracy always means high precision but high precision does not always mean high accuracy". —Justify. 2+3

(b) (i) In a particular TLC experiment, solvent front moves to 34 cm whereas compounds A, B and C in a mixture moves up to 24, 28 and 30 cm respectively. R_f of the desired compound is 0·82. Identify the compound.

(ii) Name two stationary phases and two mobile phases in the context of column chromatography. 3+2

(c) (i) A certain cation exchange column is saturated with Fe^{3+}. It is desired to recover Fe^{3+} and convert the resin to its original form. Which acid would you use to wash the column: 12 M H_2SO_4 or 6 M HCl? —Justify.

(ii) Write the functions of boric acid, ZnO and sodium lauryl sulfate (SLS) used in cosmetics. 2+3

(d) (i) Why buffer solution is used in complexometric titration?

(ii) Why EDTA is widely used as chelator(s)?

(iii) Mention one important function of aluminium compounds in deodorants. 2+2+1

(e) (i) Define food additives and adulterants with one example of each.

(ii) Cite one chemical compound that is used to enhance the flavour of food materials. Mention its harmful effects. 3+2

(f) (i) What are the major groups of nutrients found in different types of foods?

(ii) What do you mean by food value?

(iii) How does heat affect the loss of nutrients in food? 2+2+1

3. Answer *any one* question: 10×1=10

(a) (i) Calculate standard deviation, variance and coefficient of variance for the following data: 18·30, 17·38, 17·87, 16·54, 16·04, 17·93.

(ii) What do you mean by chromatogram? What is its significance?

(iii) Write the necessary steps to minimise the systematic errors in a quantitative analysis. 4·5+2·5+3

(b) (i) Define COD and BOD in the context of water quality index. Between COD and BOD, which one is higher and why?

(ii) Describe the different types of food preservation techniques with example.

(iii) How can you measure the ion exchange capacity of an anion exchange resin? 5+3+2