UNIVERSITY OF NORTH BENGAL
B.Sc. Honours 5th Semester Examination, 2023

DSE-P1-CHEMISTRY

ANALYTICAL METHODS IN CHEMISTRY

Time Allotted: 2 Hours

Full Marks: 40

The figures in the margin indicate full marks.

GROUP-A

1. Answer any *five* questions from the following: $1 \times 5 = 5$

  (a) Define Precision.   1

  (b) What is R_f value?   1

  (c) What is the detector used in UV-Visible Spectroscopy?   1

  (d) What is elute in chromatography?   1

  (e) Explain standard deviation.   1

  (f) What is the role of monochromator?   1

  (g) Define separation factor.   1

  (h) Define electromagnetic radiation.   1

GROUP-B

2. Answer any *three* questions from the following: $5 \times 3 = 15$

  (a) (i) What are the fundamental laws of spectroscopy?   2

      (ii) What is the main function of a detector?   1

      (iii) Name some of the thermal and photosensitive detectors that are used in FT-IR Spectrophotometer.   2

  (b) (i) What is potentiometry? Discuss its basic principle.   1+2

      (ii) How will you determine the equivalence point for strong acid vs strong base by conductometric titrations?   2

  (c) (i) What is the main role played by a masking agent in the extraction of metal ions?   2

      (ii) Write the principle of solvent extraction and explain the process with labelled diagram.   3

(d) Define ion exchange chromatography. What do you mean by cation exchangers and anion exchangers? Give one example in each case.   2+2+1

(e) (i) Calculate the number of significant figure in 1.040 g ; 0.00430 g and 46.50 ml.   3

(ii) A mixture of $CaCO_3$ and CaO is analysed using TGA technique. TG curve of the sample indicates that there is a mass change from 145.3 mg to 115.4 mg between 500-900°C. Calculate the % of $CaCO_3$ in the sample.   2

GROUP-C

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

(a) (i) Compare TLC and Paper Chromatography techniques.   3

(ii) Explain demineralization of water by ion exchange method.   3

(iii) Discuss the determination of composition of metal complexes using Job's method of continuous variation.   4

(b) (i) Discuss rejection data and confidence interval in analytical techniques.   3

(ii) Write down the theory of thermo gravimetry (TG).   4

(iii) What are the common sources of error in TG analysis? Explain.   3

(c) (i) Describe the different components of IR spectrophotometer.   3

(ii) What is Q-test?   2

(iii) Briefly discuss about deviation from Beer's Law.   3

(iv) Name the different components of a GC instrument.   2

(d) (i) Write down the principle involves in pH metric titration with suitable example.   3

(ii) What type of species can be separated by HPLC not by GC?   2

(iii) A loss of 0.4 mg of Ag occurs in the course of analysis of the element. Calculate the % of relative error due to the loss if the weight of Ag in the sample is 400 mg.   2

(iv) What is the physical significance of $R_f = 0$ and $R_f = 1$?   2

(v) What is the role of chopper in AAS?   1

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