M. Sc. Chemistry Examination, 2022

(4th Semester, CBCS)

Analytical Chemistry Special

Paper – XIII-A

Time : Two hours　　　　　　　　　　　　Full Marks : 40

(20 marks for each unit)

Use a separate answer script for each Unit.

UNIT: 4131a & 4131b

1. Answer *any four* questions :　　　　　　$4 \times 2\frac{1}{2}$

   a) How can method error be detected and corrected, if required? Discuss in details.

   b) Consider the following set of data and calculate (a) variance, (b) coefficient of variation and (c) spread.

   70.63, 70.65, 70.54 and 70.41

   c) The standard deviation in measuring the diameter d of a sphere is ± 0.02 cm. What is the standard deviation in the calculated volume V of the sphere if $d = 2.15$ cm?

   d) What is confidence interval? Describe in your own words why the confidence interval for the mean of five measurements is smaller than that for a single result.

[Turn over

e) The analysis of a city drinking water for arsenic yielded values of 5·60, 5·64, 5·70, 5·69 and 5·81 ppm. The last value appears anomalous; should it be rejected at the 95% confidence level? (Given: for five measurements, Q_{crit} at the 95% confidence level is 0·71)

2. Answer *any four* questions : $\qquad 4 \times 2\frac{1}{2}$

a) How does analyte participate in the redox-exchange process on an electrode surface? How would diffusion condition be maintained? $\qquad 1\frac{1}{2} \times 1$

b) Using Ilkovic equation of diffusion current (i_d) establish the Nernst Equation of EMF. $i_d=706nD^{1/2} m^{2/3} t_1^{1/6}C$. (Symbols have their usual meaning)

c) Using Fick's laws distinguish Planar disc electrode and Rotating disc electrode.

d) Define Impedance. How does it control cell potential and is useful in Electrochemical Impedance Spectroscopy?

e) Distinguish polarography and cyclic voltammetry. Draw a polarogram and a cyclic voltammogram and assign important analytical parameters.

f) Write a short note on AC polarography or spectroelectrochemistry.

UNIT: 4132a & 4132b

1. a) Discuss the method of synthesis and the structure of any of the resins used in ion exchange chromatography. $\qquad 3$

b) What is the role of stationary phase in partition chromatography? $\qquad 3$

c) Write a short note on adsorption chromatography. 4

2. a) What is the basic principle that governs continuous extraction in the solvent extraction technique? How is it different from continuous counter current extraction? Describe the general methods of the continuous extraction. $\qquad 1+1\frac{1}{2}+2\frac{1}{2}$

b) What do you mean mean by solid-liquid extraction? Give one example, where solid liquid extractions are used in an application. $\qquad 2+1$

c) How is synergic agent related to solvent extraction? How is the efficiency of the synergic extraction dependent on the pH of the medium? $\qquad 1+2$