AU–241

M.Sc. (Part–I) Semester–I (C.B.C.S. Scheme) Examination

CHEMISTRY (New)

(Modern Methods of Separation)

Paper—IV

Time : Three Hours] [Maximum Marks : 80

Note :— (1) All questions are compulsory and carry equal marks.

(2) Use of scientific calculator is permitted.

1. (a) Describe the principle and operation of an analytical balance. 5

(b) Explain the terms :

(i) Gross sample

(ii) Sampling unit

(iii) Increment

(iv) Coning and quartering. 6

(c) Describe the methods for sampling of gases and particulates. 5

OR

(p) Explain how solids are sampled by a split tube and concentric tube thief. 5

(q) Discuss the safety aspects while handling hazardous materials. 5

(r) What are the different techniques used for the purification of liquids ? 6

2. (a) What are significant figures ? What are the rules of computation of significant figures ? Find the number of significant figures in the following :

(i) 0.0607 (ii) 9996 (iii) 7.3×10^{-9}

(iv) 3×10^{5} (v) 1.00120 (vi) 0.0003643 5

(b) Write a note on rejection of data based on Q test. 5

(c) A large number of measurements for the estimation of traces of titanium in several samples from the same source, gave a standard aeiration of 0.1 ppm of titanium. If a single measurement of a particular sample gave 7.85 ppm titanium, calculate the true mean with 95% confidence limit. ($Z = \pm 1.96$) 6

OR

(p) Differentiate between determinate and indeterminate errors. What steps will you take to minimise determinate errors ? 6

(q) Give a brief account of :

(i) Least square method

(ii) Correlation coefficient. 5

(r) In the analysis of Sulphur Content of a sample, the following values were reported :

Sulphur content (%) : 0.47, 0.48, 0.47 and 0.50

Find whether the value 0.50 can be retained on the basis of the Q-test (Q (90%) = 0.76). 5

3. (a) Discuss the various types of ion association complexes employed in the solvent extraction system. 5

(b) What are the different types of cation exchange resins ? How are they prepared ? 5

(c) In the extraction of Ce(iv) with 2-thenoyl trifluoroacetone in benzene, the distribution ratio was 999.0. If the volume of organic phase was 10 cm^3 and that of aqueous phase 25 cm^3, what was the percentage extraction ? 6

OR

(p) Discuss the factors that affect ion exchange equilibria. 5

(q) Write notes on :

(i) Counter current extraction

(ii) Solid-liquid extraction. 6

(r) Explain the theory and action of ion exchange resins. 5

4. (a) Explain the different types of detectors used in Gas Chromatography. 5

(b) Give an account of :

(i) Plate theory for Gas Chromatography.

(ii) Column packing in HPLC. 6

(c) What are the common interfaces for LC-MS ? 5

OR

(p) Discuss the application of Gas Chromatography in the determination of elements C, H, N and S in organic and organometallic samples. 5

(q) Explain the solvent delivery system and sample injection system in HPLC. 6

(r) What do you understand by isocratic and gradient elution in HPLC ? 5

5. (a) Explain the explosive characteristics of high explosives. 5

(b) What measures must be taken to make the environment safe and protective while working in a laboratory ? 5

(c) Write short notes on :

(i) Disposal of waste chemicals in drainage

(ii) Chemical weapons. 6

OR

(p) Give the classification of chemical warfare agents. 5

(q) What are hazardous chemicals ? What precautions must be taken to work with hazardous chemicals ? 5

(r) Give an account of :

(i) Explosive properties of picric acid

(ii) Transportation of hazardous chemicals. 6