

M.Sc. CHEMISTRY EXAMINATION, 2017

(4th Semester)

ANALYTICAL CHEMISTRY SPECIAL

PAPER-XIII-A

Time: Two Hours

(25 marks for each Unit)

Full Marks: 50

Use a separate answerscript for each Unit.

UNIT-A-4131

1. Answer any *four* questions 4 X 3
- (a) Compare Accuracy with Precision. Give one example each for instrumental error and personal error.
- (b) How does population standard deviation differ from sample standard deviation? Mention the significance of the number of degrees of freedom in relation to sample standard deviation.
- (c) Calculate the standard deviation of the following:
- (i) $y = a (\pm s_a) \times a (\pm s_a)$
- (ii) $y = \{a(\pm s_a)\}^2$
- where, $a = 4$ and $s_a = \pm 0.2$
- Give reason in support of the difference in results, if any.
- (d) What do you mean by confidence interval, confidence level and significance level? Cite examples.
- (e) A new procedure for the rapid determination of the percentage of sulphur in kerosene was tested on a sample, known from the method of preparation, to contain 0.123%. The results were %S = 0.112, 0.118, 0.115 and 0.119. Do the data indicate that there is a bias in the method at 95% confidence level? (Given: Critical value of t for 3 degrees of freedom and 95% confidence level is 3.18).
2. (a) Briefly enumerate the basic principle of High Frequency Titration. Mention its advantage(s) and disadvantage(s). Provide two examples of this titration. 3+2+1
- (b) Citing at least one example for each case, discuss about the role of 'Cathodic depolarizer' and 'Anodic depolarizer' in electrogravimetry. 2+2
- (c) Write a short note on 'Ellipsometry'. 3

[Turn over

Unit – A –4132

3. (a) What is a liquid-liquid chromatography? Derive the relation $\log K_D = \log V_a + \alpha' (S^0 - \epsilon^0 A_s)$; where all the terms have their usual meaning. 3½
- (b) What is high performance size-exclusion chromatography? How would you explain the separation of fullerenes C₆₀ and C₇₀ by size exclusion chromatography? 3
- (c) Derive the relation: $T_m R^B = H/u \{16R_s^2 [\alpha/(1-\alpha)]^2 [(1+k_B')^3 / k_B'^2]\}$; where all the terms have their usual meaning. 3
- (d) What are the different types of detectors used in Gas Chromatography? Give the construction of FID detector? Why it is called Universal detector? 3

OR

Describe the construction of Latex-agglomerated anion exchangers. What are the advantages of it over silica based anion exchangers? 3

4. (a) What stands for the “equilibrium” in solvent extraction process? What is ion pair and ion pair extraction? Give one example of ion pair extraction with the number of equilibrium involved. 1+2+2½
- (b) What is continuous extraction and continuous counter current extraction? Describe two different methods which are utilized for continuous extraction. 1+1+2
- (c) What do you mean by solid-liquid extraction? How the Calcium, Strontium and Barium salts can be separated using the solvent extraction technique? 2+1