

Seat No. : \_\_\_\_\_

**DR-106**

**December-2013**

**M. Sc. Semester I Examination**

**CHE 404 : CHEMISTRY**

**(Analytical Chemistry)**

**Time : 3 Hours]**

**[Max. Marks : 70**

1. Answer any **two** of the following : **14**

- (a) Describe in brief the scope of Analytical Science and its Literature.
- (b) Write a short note on control charts, confidence interval and confidence limits.
- (c) What are the ways to express accuracy and precision ? Discuss in brief types of errors.
- (d) Discuss the importance of F-test and Q-test in statistical treatment.

The following set of data was obtained for the analyses of chloride on separate aliquots of a pooled serum samples : 103, 114, 106 and 107 meq/L.

- (i) Which of these is a questionable value ?
- (ii) Evaluate the results using the Q-test and predict acceptance or rejection of the questionable value if any. (The Q-value for rejection at 95% confidence is 0.829)

2. Answer any **two** of the following : **14**

- (a) Explain in brief the procedure to find the 'best straight line' using least square regression.
- (b) Define molarity and molality. Calculate the molality of 11.3 M solution of HCl. [mol. mass. of HCl, 36.5 gm/mol; density 1.18 gm/cc; assay, 35%].
- (c) What is sampling and sample preparation ? Discuss the general steps involved in chemical analysis.
- (d) Discuss the significance of internal standard and standard addition technique in quantitative analysis.

3. Answer any **two** of the following : **14**

- (a) Explain in brief Circular Dichroism and Optical Rotatory Dispersion.
- (b) Describe in detail the instrumentation of a UV-Visible Spectrophotometer.
- (c) Derive Beer's Law in chemical analysis and give an explanation for the logarithmic relation between transmittance and concentration.
- (d) Write a short note on Derivative Spectrophotometry.

4. Answer any **two** of the following : **14**
- (a) Explain the analysis of a mixture with resolved and unresolved UV spectra.
  - (b) Describe in detail the method used for measurement of equilibrium constant.
  - (c) How photometric titrations are helpful in locating the equivalence point ? And discuss its types.
  - (d) Write a short note on the Job's method of continuous variation.
5. Answer in brief : (1 mark each) **14**
- (1) Define significant figures. Indicate which zeros are significant in the following value : 0.060700.
  - (2) Define mole fraction.
  - (3) Distinguish between standard deviation and variance.
  - (4) What is the difference between limit of detection and limit of quantitation ?
  - (5) Define sensitivity and selectivity.
  - (6) What is signified by 'residues' in a calibration plot ?
  - (7) What does the value of correlation coefficient,  $r = 1$  suggest ?
  - (8) Define : Auxochrome and chromophore.
  - (9) Explain in brief 'vibrational spectra.'
  - (10) Give the wavelength region for UV radiation.
  - (11) Give units for absorbance and molar absorptivity.
  - (12) Define wavenumber and wavelength.
  - (13) What is the function of monochromator ?
  - (14) Define Lambert's law.
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