



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – CHEMISTRY

FIRST SEMESTER – NOVEMBER 2023

PCH1MC04 – ANALYTICAL CHEMISTRY

Date: 08-11-2023

Dept. No.

Max. : 100 Marks

Time: 01:00 PM - 04:00 PM

SECTION A – K1 (CO1)

Answer ALL the questions

(5 x 1 = 5)

1 Fill in the blanks

- a) The formula for the chi-square test is -----
- b) ----- is the carrier gas used in GC.
- c) DTA is used to determine ----- of the substance.
- d) Example of protic solvent -----
- e) ----- gas is used in Flame emission spectroscopy.

SECTION A – K2 (CO1)

Answer ALL the questions

(5 x 1 = 5)

2 Answer the following

- a) Write the significance of Q-test.
- b) Define retention volume.
- c) Give an application of TGA.
- d) What is an acid according to Lowry Bronsted Theory?
- e) State Beer-Lambert's law.

SECTION B – K3 (CO2)

Answer any THREE of the following

(3 x 10 = 30)

- 3 Explain the different types of sampling with suitable examples.
- 4 Discuss the principle, instrumentation and applications of capillary electrophoresis.
- 5 Derive an expression for pH for the hydrolysis of salt of strong acid and weak base.
- 6 i) Explain the principle of inductively coupled plasma spectrometry. (7)
ii) Calculate the degree of hydrolysis of ammonium acetate. The dissociation constant for NH_4OH is 4.0×10^{-5} M and that of CH_3COOH is 1.8×10^{-6} M. Calculate its pH value. (3)
- 7 i) Explain the principle involved in complexometric titrations. (6)
ii) Describe the thermal behavior of $\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$ in DTA. (4)

SECTION C – K4 (CO3)

Answer any TWO of the following

(2 x 12.5 = 25)

- 8 i) The results obtained in the replicate determination of Pb (ppm) in a sample is given below 0.752, 0.756, 0.752, 0.751 and 0.760 ppm Pb. Calculate the 99% confidence interval of the mean. ($t = 4.604$)
ii) Write a short note on Normal distribution curve. (8+4.5)
- 9 i) What are the important characteristics of a good detector in GC? Explain the working principle of flame ionization detector with a neat diagram.

	ii) Discuss briefly the types of pumps used in HPLC .	(7+5.5)
10	i) Explain the effect of autoprotolysis constant and dielectric constant on solvent behavior. ii) Write the factors that influence fluorescence emission.	(8) (4.5)
11	i) List out the various thermo analytical methods along with the properties measured and instruments used in each type. ii) How is copper estimated in electrogravimetry?	(7) (5.5)
SECTION D – K5 (CO4)		
	Answer any ONE of the following	(1 x 15 = 15)
12	i) Explain how student's t-test is used to test the significance of the difference between the means of the sample. ii) A chromatographic analysis for a component gives a peak with a retention time of 8.68 min and a baseline width of 0.29 min on a 2.0 m column. Calculate the number of theoretical plates and height of a theoretical plate in mm? iii) What are the factors affecting thermogram.	(6) (4) (5)
13	i) Draw and interpret the thermogram of copper sulphate pentahydrate obtained in thermogravimetric analysis. ii) Explain the principle and applications of flame emission spectroscopy.	(8) (7)
SECTION E – K6 (CO5)		
	Answer any ONE of the following	(1 x 20 = 20)
14	i) The iron content of a silicate rock was determined by two different methods by the same analyst and the data obtained are given below. Assess the precision of the two methods applying F-test. Method I ($\mu\text{g/L}$) - 2.01, 2.10, 1.86, 1.92, 1.94 Method II ($\mu\text{g/L}$) - 1.38, 1.92, 1.90, 1.97, 1.94 ii) How are C, H, N and S determined using GC? iii) What are the principles of nephelometry and turbidimetry?	(10) (5) (5)
15	i) What is spectrophotometric titration? How is Fe(III) determined using UV-Vis spectrophotometry? ii) Describe any two applications of differential scanning colorimetry? iii) Highlight the applications of non-aqueous solvents.	(10) (5) (5)

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