LOYOLA COLLEGE (AUTONOMOUS) CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – **CHEMISTRY**

FIRST SEMESTER – **APRIL 2025**

PCH1MC04 – ANALYTICAL CHEMISTRY

Date: 30-04-2025   Dept. No.   Max. : 100 Marks
Time: 09:00 AM - 12:00 PM

SECTION A – K1 (CO1)		
Answer ALL the questions		**(5 x 1 = 5)**
1	**Fill in the blanks**	
a)	The normal distribution is ----------------------- around its mean.	
b)	Separation of particles based on their charge and size is known as ------------------------	
c)	The principle involved in coulometry is the measurement of the quantity of the -------------.	
d)	Parts per million (ppm) means -----------------.	
e)	The equation of Beer-Lambert's law is -------------------.	
SECTION A – K2 (CO1)		
Answer ALL the questions		**(5 x 1 = 5)**
2	**Answer the following**	
a)	Highlight the significances of correlation coefficient.	
b)	Differentiate split and splitless injection in GC.	
c)	Give any two applications of DTG.	
d)	Define auto-protolysis constant	
e)	Name any two luminescent indicators.	
SECTION B – K3 (CO2)		
Answer any THREE of the following		**(3 x 10 = 30)**

3	(i) The results obtained in a gravimetric determination of Pb (%) in an alloy sample is given below:
	        37.21, 36.92, 37.05, 37.41, 37.01
	   Calculate the 99% confidence interval of the mean. (t = 4.604).
	(ii) Apply the *Q*-test to the following data set to determine whether the outlying result should be retained or rejected at the 95% confidence level. 0.403, 0.410, 0.401, 0.380. (Q_{cri} = 0.829). (8+2)		

4	(i) Describe the working principle of the flame ionization detector (FID) in gas chromatography and discuss its advantages and limitations. (ii) Explain the following terms: (a) retention volume (b) retention time. (8+2)		
5	Discuss in detail the entropymetry for the state of health of batteries.		
6	Explain in detail the principle and titration curves of weak dibasic acid versus strong base.		
7	Describe the principle, instrumentation and applications of flame emission spectrometry.		

	Answer any TWO of the following	**(2 x 12.5 = 25)**

8	(i) The polyaromatic hydrocarbons in soils were done analysis by two methods and the data obtained are given below
	   No. of determinations by each method: 10
	   UV spectrophotometry: $\bar{x} = 28.00$ mg kg^{-1} s = 0.30 mg kg^{-1}
	   Fluorimetry: $\bar{y} = 26.25$ mg kg^{-1} s = 0.23 mg kg^{-1}
	   Is there a statistically significant difference between x and y? (t = 2.262)
	(ii) How is lead content in petrol determined by AAS? (7.5+5)	

9	(i) Discuss the principle, instrumentation and applications of capillary electrophoresis. (ii) Calculate the retention factor for butyric acid if it elutes with a retention time of 7.63 min and the column's void time is 0.31 min. (10+2.5)	
10	(i) Explain in detail the thermometric titrations and its advantages. (ii) Discuss the thermogravimetric analysis of copper sulphate pentahydrate. (7.5+5)	
11	(i) Highlight the principle and the classification of acid-base titrations in non-aqueous solvents. (ii) What are the factors affecting the fluorescence spectra? (8+4.5)	

SECTION D – K5 (CO4)

	Answer any ONE of the following	**(1 x 15 = 15)**
12	(i) Compare correlation and regression. (ii) How do eddy diffusion and longitudinal diffusion affect peak broadening in rate theory? (iii) Write a short note on evolved gas analysis of TG-MS. (5+5+5)	
13	(i) Discuss in detail the formal and standard potentials of redox titrations in various media. (ii) Explain the principle of turbidimetry and nephlometry. (10+5)	

SECTION E – K6 (CO5)

	Answer any ONE of the following	**(1 x 20 = 20)**

14	(i)The amount of ferric ion was estimated by two different methods and the data is given below.
	   Assess the precision of the two methods applying F-test. (F_{cri} = 4.28)
	     Method A 13.30, 13.43, 13.56, 13.53, 13.36, 13.32
	     Method B 13.80, 13.89, 13.89, 13.91, 13.86, 13.99
	(ii) Discuss the role and working of a fluorescence detector in HPLC. Why is it more sensitive than a UV detector?
	(iii) Explain the principle of complexometric titrations with an example. (10+5+5)	

15	(i) Discuss in detail the important factors that affect TGA thermogram. (ii) Write a short note on spectrophotometric titrations. (iii) Discuss in detail the principle and instrumentation of fluorimetry. (8+6+6)	