LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – **CHEMISTRY**

FIRST SEMESTER – **NOVEMBER 2022**

UCH 1502 – ANALYTICAL CHEMISTRY

Date: 03-12-2022 Dept. No. Max. : 100 Marks

Time: 01:00 PM - 04:00 PM

SECTION - A

Answer ALL the Questions

1.	**Define the following**	**(5 x 1 = 5)**	
a)	Universal antidote	K1	CO1
b)	Mole fraction	K1	CO1
c)	Gravimetric factor	K1	CO1
d)	Retention factor	K1	CO1
e)	Reaction interval	K1	CO1
2.	**Choose the correct the answer**	**(5 x 1 = 5)**	
a)	The median for 10.20,10.08,10.01,10.10 and 10.05 is (i) 10.20 (ii) 10.08 (iii) 10.01 (iv) 10.05	K1	CO1
b)	The pH of 0.001 N HCl is (i) 4 (ii) 3 (iii) 2 (iv) 1	K1	CO1
c)	Which of the following is an example of adsorption indicator? (i) eosin (ii) phenolphthalein (iii) methyl red (iv) ninhydrin	K1	CO1
d)	Select the correct statement from the following. a) Paper chromatography is a type of partition chromatography b) A special quality paper is used in paper chromatography c) Chromatography paper contains water trapped in it, which acts as a stationary phase d) All of the above	K1	CO1
e)	In thermogravimetric analysis, the property measured is (i) change in weight (ii) heat evolved (iii) heat absorbed (iv) change of temperature	K1	CO1
3.	**Match the following**	**(5 x 1 = 5)**	
a)	Indeterminate error ---- Alumina	K2	CO1
b)	Eriochrome black-T ---- Heat evolved or absorbed	K2	CO1
c)	Gravimetry ---- Random error	K2	CO1
d)	TLC ---- Zn^{2+} vs EDTA	K2	CO1
e)	DTA ---- Weight of precipitate	K2	CO1

4.	**State TRUE or FALSE**				**(5 x 1 = 5)**
a)	Accuracy represents the reproducibility of the measurements.			K2	CO1
b)	Potassium dichromate is a secondary standard.			K2	CO1
c)	In gravimetric analysis, the precipitate is digested with mother liquor to increase the particle size of the precipitate.			K2	CO1
d)	The principle involved in column chromatography is adsorption.			K2	CO1
e)	The reference material in DTA is alumina.			K2	CO1
	SECTION - B				
Answer any TWO of the following in 100 words					**(2 x 10 = 20)**
5.		Calculate the mean, median, standard deviation, average deviation and coefficient of variation for the following five titre values.19.6, 20.5, 19.2, 19.0, and 20.4 mL.	(10)	K3	CO2
6.	a.	Examine the acid-base theory of indicators.	(5)	K3	CO2
	b.	Explain a suitable titrimetric method for the estimation of Zn using EDTA as a titrant.	(5)		
7.	a.	Write any two organic precipitating agents with their structures. Mention the advantages and disadvantages of using organic precipitants in gravimetric analysis.	(5)	K3	CO2
	b.	Illustrate the various factors affecting the solubility of a compound.	(5)		
8	a.	Examine the column chromatographic technique for the separation of components in the mixture.	(5)	K3	CO2
	b.	Illustrate the factors that affect the TGA curves.	(5)		
	SECTION - C				
Answer any TWO of the following in 100 words					**(2 x 10 = 20)**
9.	a	What are the general rules to be followed in the storage and handling of acids?	(5)	K4	CO3
	b	Analyze the TGA curve of calcium oxalate monohydrate.	(5)		
10.	a.	25 mL of 0.2 N hydrochloric acid is exactly equivalent to 20 mL of NaOH solution. Determine the concentration of NaOH.	(3)	K4	CO3
	b.	Calculate the pH of the solution obtained by mixing 6.8 g of acetic acid and 8.2 g of sodium acetate and making the volume equal to 250 mL. The dissociation constant of acetic acid is 1.75×10^{-5} at 298 K.	(7)		
11.	a.	Infer the various mechanisms by which contamination by coprecipitation can occur during precipitation.	(5)	K4	CO3
	b.	Illustrate Von Weimarn ratio with an example.	(5)		
12.		Outline the principle, technique, and applications of ion-exchange chromatography.	(10)	K4	CO3

		SECTION - D			
Answer any ONE of the following in 250 words					**(1 x 20 = 20)**
13.	a.	Summarize the importance of MSDS of a chemical.	(10)	K5	CO4
	b.	Infer the different types of titrations with suitable examples.	(10)		
14.	a.	Determine the molar solubility of $PbSO_4$ if the solubility product is 1.6×10^{-8} mol^2 Lit^{-2}.	(3)	K5	CO4
	b.	Write and explain the principle involved in steam and fractional distillation techniques for the purification of liquids.	(12)		
	c.	Sketch and explain TGA curve of silver nitrate.	(5)		
		SECTION - E			
Answer any ONE of the following in 250 words					**(1 x 20 = 20)**
15.	a.	Explain the different types of errors and formulate various methods of minimizing errors.	(10)	K6	CO5
	b.	Distinguish molarity from molality. Calculate the normality and molarity of a solution containing 12.6 g of oxalic acid dihydrate crystals dissolved in 500 mL of water.	(10)		
16.	a.	Write the principle and procedure involved in the estimation of chloride ions by Volhard's method.	(10)	K6	CO5
	b.	Propose a suitable method to purify the crude sample of benzoic acid and explain the various steps involved in it.	(3)		
	c.	Summarise the principle and instrumentation involved in DTA technique.	(7)		

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