QP CODE :**53763** Date 29-03-2019

[Time : 3 Hours **[Total Marks : 100**

Please check whether you have got the right question paper.

N.B. : 1. All Questions are compulsory.

2. Figures to the right indicate full marks.

3. Use of log-table/nonprogrammable calculator is allowed.

4. Answers for the same question as far as possible should be written together.

1.	(A)	Select the correct option and complete the following sentences. (any **twelve**)				**12**
		(i)	b) methodic			
		(ii)	b) less than 10 mg,			
		(iii)	a) unbiased sampling			
		(iv)	c) subsample			
		(v)	b) deviation			
		(vi)	b) instrumental			
		(vii)	a) potassium			
		(viii)	b) neutralisation curve			
		(ix)	c) titrand			
		(x)	a) EDTA			
		(xi)	c) moderately alkalline			
		(xii)	b) digestion			
		(xiii)	a) colorimeter			
		(xiv)	b) concentration of solution			
		(xv)	c) detector			
		(xvi)	a) colored as well as colorless			
		(xvii)	b) 180 to 400 nm			
		(xviii)	c) none of these			
	(B)	State whether the following statements are true or false. (any **three**)				**3**
		(i)	F			
		(ii)	T			
		(iii)	F			
		(iv)	F			
		(v)	F			
		(vi)	T			
	(C)	Match the column. (any **five**)				**5**
		(i)	Methyl orange	(a)	Indicator of acid base titration	
		(ii)	Eriochrome black T	(b)	Indicator of complexometric	

		(iii)	Drying of precipitate		titration	
		(iv)	ignition of precipitate	(c)	373K	
		(v)	Grating	(d)	500 to 1500K	
		(vi)	Photo emissive cell	(e)	Monochromator	
				(f)	Detector	

2. Attempt any **four** of the following. **20**

(A) Any five points (5 marks)

(B) One mark each

(C) Purpose of sampling (1 mark)
Compact solids (2 marks)
Particulate solids (2 marks)

(D) Enlist **(1 mark)**
Advantages **(1 mark)**
Any one method **(3 marks)**

(E)

Mass (tin in mg.) mg	x_i	T = 0.8 x mass	abolute error = xi- T	relative error = (xi- T) /T	relative error *pph*
100	88	80	+8	+0.1	10%
200	168	160	+8	+0.05	5 %
300	248	240	+8	+0.033	3.3%
		(1 mark)	(1 mark)	(1 mark)	(1 mark)

Since absolute error remain constant and independent of sample size, it is constant error **(1 mark)**

(F)

Hb x_i	T	absolute error = xi- T	relative error = (xi- T) /T	relative error *pph*	relative error *ppt*
15.08		+0.01	+ 0.000666	0.0666	0.666
15.05		-0.02	- 0.00132	0.132	1.32
15.01	15.07	-0.06	- 0.00398	0.398	3.98
15.11		+0.04	+0.00265	0.265	2.65
15.06		-0.01	- 0.000666	0.0666	0.666
15.10		+0.03	+ 0.00199	0.199	1.99
		(1.5 mark)	(1.5 mark)	(1 mark)	(1 mark)

3. Attempt any **four** of the following. **20**

(A) Definition of secondary standard (1 mark)
Conditions (2 marks)
Two examples acid base (1 mark)
Two examples redox (1 mark)

(B) Estimation of Ni in Ni-Cu alloy
Removal of Cu (1 mark)
Estimation of Ni (4 mark)

(C) Methods of calibration
i) burette (2.5 marks)
ii) pipette (2.5 marks)

(D) 10 cm^3 of HCl added

		[salt] = (10 x0.1)/20 = 0.05 M , **(1 mark)** pH can be calculated by considering hydrolysis, $NH_4Cl + H_2O = NH_4OH + HCl$ $K_h = [NH_4OH].[H^+]/[NH_4^+]$ **(1 mark)** Kh can be calculated from following terms, Dissociation of weak base: $NH_4OH = NH_4^+ + OH^-$, $K_b = [NH_4^+].[OH^-]/ [NH_4OH]$ Dissociation Of Water: $H_2O = H^+ + OH^-$, $K_w = [H^+].[OH^-]$ Therefore $K_w/K_b = K_h$ **(1 mark)** If h is degree of hydrolysis, $K_h = h^2.C$ i.e. $h = \sqrt{Kh/C}$ $[H^+] = h.C = \sqrt{Kh.C} = \sqrt{Kw.C/Kb}$ $pH = \frac{1}{2}$ pKw - $\frac{1}{2}$ pKb - $\frac{1}{2}$ Log C **(1 mark)** pH= 5.28 **(1 mark)**	
	(E)	Difference between end point and equivalence point with suitable example **(2.5 marks)** ii) one colour and two colour indicator **(2.5 marks)**	
	(F)	Gravimetric operations i) digestion **(2.5 marks)** ii) washing **(2.5 marks)**	
4.	Attempt any **four** of the following.		**20**
	(A)	Double beam photometer Neat and labelled diagram**(2 marks)** Construction**(1.5 marks)** working**(1.5 marks)**	
	(B)	Compare photometer and spectrophotometer Five points each **(5 marks)**	
	(C)	Lambert's law Statement **(1 mark)** Derivation **(4 marks)**	
	(D)	Photo emissive cell Neat and labelled diagram**(1.5 marks)** Construction**(1.5 marks)** working**(2 marks)**	
	(E)	$A = \epsilon x C x l$ $0.456 = \epsilon \times 3.2 \times 10^{-4} \times 2$ $\epsilon = 712.5$ dm^3 mol^{-1} cm^{-1}**(1 mark)** i) Since the cell length is doubled, absorbance also gets doubled=2 x 0.456=0.912 **(1.5 mark)** ii) for cell length of 4 cm. A = - Log(T) T = Anti log (-A)= Anti log(- 0.912) = 0.122 **(1.5 mark)** iii) % T = 100 x T = 100 x 0.122 = 12.2 % **(1 mark)**	
	(F)	i) if the concentration is doubled with the same cell length, absorbance is also doubled = 2x 0.202 = 0.404 **(1 mark)**	

		ii) if the concentration is halved with the same cell length , absorbance is also halved = $\frac{1}{2}$ x 0.202 = 0.101 **(1 mark)** iii) when solution in (i) is placed in cell length of 4 cm., absorbance increases fourfold (2x2) i.e. = 4 x 0.202 = 0.808 **(1.5 marks)** iv) when solution in (ii) is placed in cell length of 4 cm., absorbance increases singlefold ($\frac{1}{2}$ x 2) i.e it remains same = 0.202 **(1.5 marks)**	
5.	Attempt any **four** of the following.		**20**
	(A)	Sampling of flowing liquids Diagram **(1.5 marks)** Discussion **(3.5 marks)**	
	(B)	Minimisation of determinate errors Any 5 methods **(5 marks)**	
	(C)	i) Complexometric titrations **(2.5 marks)** ii) precipitation titrations **(2.5 marks)**	
	(D)	i) pH**(2.5 marks)** ii) common ion effect **(2.5 marks)**	
	(E)	Single beam spectrophotometer Neat and labelled diagram**(1.5 marks)** Construction**(1.5 marks)** working**(2 marks)**	
	(F)	Photometric titrations Advantages**(2.5 marks)** Limitations **(2.5 marks)**	

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