Date: 10.10.2019   **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/non programmable 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)   Microanalysis is refers to the sample size of _____.
(a) 100 mg   (b) 1mg to 10 mg   (c) less than 1mg

(ii)   In paper chromatography the mobile phase is _____.
(a) liquid   (b) solid   (c) gas

(iii)   By calibration of apparatus _____error can be minimized.
(a) personal   (b) instrumental   (c) operational

(iv)   Universe is also called as _____.
(a) increment   (b) population   (c) sample

(v)   In constant error _____error remains constant.
(a) absolute   (b) relative   (c) none of these

(vi)   _____is not the separation technique.
(a) chromatography   (b) solvent extraction   (c) spectroscopy

(vii)   During the titration of NaOH and HCl, the pH at equivalence point is _____
(a) equal to 7   (b) greater than 7   (c) less than 7

(viii) Iodometry is one of the most important _____titration method.
(a) redox   (b) complexometric   (c) acid-base

(ix)   In precipitation titration_____ indicators are used.
(a) weak acid   (b) adsorption   (c) weak base

(x) Ba^{+2} forms precipitate with _____.
(a) HNO_3 (b) H_2SO_4 (c) HCl

(xi)   The plot of pH vs Volume of titrant is known as _____.
(a) calibration curve   (b) neutralization curve   (c) pyrolysis curve

(xii)   Succinic acid is used as _____.
(a) primary standard   (b) secondary standard   (c) tertiary standard

(xiii) A spectrum is a plot of absorbance vs _____.
(a) wavelength   (b) frequency   (c) both a & b

(xiv)   Quartz cuvette is used in _____ spectroscopy.
(a) U.V.   (b) Visible   (c) I.R.

(xv)   Phototube is basically a _____cell.
(a) photo emissive   (b) photovoltaic   (c) none of these

(xvi)   Unit of absorbance is _____.
(a) cm^{-1} (b) mol^{-1} (c) nil

(xvii) ϵ is the symbol of _____.
(a) molar absorptivity   (b) absorptivity   (c) absorbance

(xviii) T is defined as _____.
(a) I_o/I_t (b) I_t/I_o (c) $\log I_t/I_o$

(B)   State whether the following statements are true or false. (any **three**)   **3**
   (i)   Colloidal precipitate is easily filterable.
   (ii)   Electrogrvimetry is optical method.
   (iii)   Ionic product should be more than solubility product is the essential condition for precipitation.
   (iv)   Error introduced by excessive indicator is methodic error.
   (v)   UV radiations are absorbed by only coloured solutions.
   (vi)   Monochromator is dispersing device.

(C)   Match the column. (any **five**)   **5**

(i)	Classical	(a)	Personal error
(ii)	Determination of Sulphate	(b)	Redox titration
(iii)	Photocell	(c)	Quantitative analysis
(iv)	Bias	(d)	Volumetry
(v)	Calibration curve method	(e)	Qualitative analysis
(vi)	Potassium dichromate	(f)	Precipitation titration
		(g)	Detector
		(h)	dispersion
		(i)	Operational error

2. Attempt any **four** of the following.   **20**
   (A)   i) What are different instrumental methods of analysis? Give their advantages.   **3**
         ii) Explain the term 'Proximate analysis'.   **2**
   (B)   i) Explain in brief the terms limit of detction and limit of quantification w.r.t. analytical method.   **3**
         ii) Define and explain the terms 'Universe'.   **2**
   (C)   i) What are determinate errors? How are they classified?   **3**
         ii) Define and explain the terms 'Relative average deviation'   **2**
   (D)   i) Write a note on Correction of determinate errors.   **3**
         ii) Giving suitable example explain Proportionate error.   **2**
   (E)   The following data were collected as part of a quality control study for the analysis of sodium in serum; results are concentrations of Na^+ in mmol/L.   **5**

   140 143 141 137 132 157 143 149 118 145

   Calculate the median and standard deviation for this data.

   (F)   i) Write notes on 'Random sampling'   **3**
         ii) Define the term accuracy. Explain ways to expressed it.   **2**

3. Attempt any **four** of the following.   **20**
   (A)   i) What are different classes of titration? Explain each class with suitable example.   **3**
         ii) Explain the shape of conductometric titration curve for the titration of Strong acid (T) vs strong base(A).   **2**
   (B)   What is meant by degree of supersaturation and relative supersaturation? Explain the effect of following experimental factors on particle size of precipitate: **5**
         i) rate and order of mixing of reagents ii) temperature iii) Concentration of reactants
   (C)   i) Explain the effect of Common ion effect on the completeness of precipitation.   **3**
         ii) What are the conditions to be satisfied by titrimetric reactions?   **2**
   (D)   i) Justify "More no. of washing with small volume of wash liquid is more efficient to remove impurities from ppt.   **3**
         ii) Define the terms: Titrand and Equivalence point.   **2**

   (E)   i) What is meant by co-precipitation? Explain contamination of precipitate by co-precipitation. **3**

          ii) Mention steps involved in gravimetric analysis and explain the step washing of precipitate. **2**

   (F)   i) What are different kinds of graphical methods to determine equivalence point in potentiometric titrations? **3**

          ii) Write a brief note on digestion of precipitate. **2**

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

   (A)   i) Explain the shape of Photometric titration curve if analyte and titrant are absorber, product is non-absorber. **3**

          ii) Define following terms: Absorbance and Radiant power. **2**

   (B)   i) Write a note on deviations from Beer - Lambert law. **3**

          ii) Explain the use of UV/Visible spectrophotometry for study of geometrical isomerism. **2**

   (C)   i) With neat lebelled diagram explain the construction and working of single beam spectrophotometer. **3**

          ii) Define following terms: Absorbance and Radiant power. **2**

   (D)   Sate Beer-Lambert's law. A solution containing 4.48 ppm $KMnO_4$ has a transmittance of 0.576 in a 1.00 cm cell at 520 nm. If the transmittance of an unknown solution is 0.735, what is the concentration of the unknown $KMnO_4$ solution in ppm? **5**

   (E)   i) Derive mathematical expressions for Beer's law with diagrammatic representation of intensity variation. **3**

          ii) Explain the calibration curve method for quantitative analysis. **2**

   (F)   Define the term λ max. A solution containing 3.75 mg/100 mL of X (M.W. 335 g/mol) has a transmittance of 39.6% in a 1.50-cm cell at 425 nm. Calculate the molar absorptivity of X at this wavelength. **5**

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

   (A)   i) Write brief notes on solvent extraction and chromatography. **3**

          ii) Define and explain in brief the term 'Gross sample'. **2**

   (B)   i) Explain different ways to express closeness of observed value with true value. **3**

          ii) Giving suitable example explain Operational error. **2**

   (C)   i) Giving suitable example explain the determination of correct drying and ignition temperature of precipitate. **3**

          ii) Explain the effect of solvent on the completeness of precipitation. **2**

   (D)   i) What is meant by co-precipitation? Explain different ways of contamination of ppt by co-precipitation. **3**

          ii) During the titration of 50 ml 0.1 N HCl (T) vs 0.1 N NaOH (A), calculate the pH at following stages of titration: 10ml , 25ml. **2**

   (E)   i) Write a note on determination of metal ions from their mixture using photometric titration. **3**

          ii) Give limitations of photometric titration. **2**

   (F)   i) Explain the construction and working of Photomultiplier tube. **3**

          ii) If absorbance of solution is 0.32, what is the %T? **2**

==   ***** ==