[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. The 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. **12**

(i) A separation method based on gravity is -------- .
(a) distillation (b) centrifugation (c) electrophoresis

(ii) Electrophoretic separation can be performed for -------- substances.
(a) charged (b) uncharged (c) both charged and uncharged

(iii) Solvent extraction is applicable for extraction of …….amount of solute.
(a) trace (b) large (c) both trace and large

(iv) The mechanism of separation in paper chromatography is ------.
(a) adsorption (b) partition (c) neither adsorption nor partition

(v) Saturated calomel electrode is used as a ------ electrode in potentiometric titrations.
(a) indicator (b) reference (c) counter

(vi) When a strong acid like HCl is added to the solution of strong base pH gradually ------.
(a) increases (b) decreases (c) remains constant

(vii) In conductometric titrations of strong acid vs. strong base initially acid solution has -------- conductance.
(a) zero (b) low (c) high

(viii) The unit of conductance is -------
(a) volt (b) ampere (c) siemen

(ix) The shape of Gaussian distribution curve indicates ……. of measurements.
(a) precision (b) accuracy (c) uncertainty

(x) The most frequently obtained observation from the given set is known as ----
(a) mean (b) mode (c) median

(xi) Variance ratio test is known as-------.
(a) Q -test (b) test for significance (c) F-test

(xii) A strong positive linear relationship indicates the value of correlation coefficient (r) = --------
(a) -1 (b) +1 (c) 0

(B) State whether the following statements are true or false. **3**

(i) The distribution ratio (D) has no units.

(ii) In acid-base potentiometric titrations quinhydrone electrode is used as reference electrode.

(iii) Coefficient variance is relative standard deviation expressed in percentage.

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

(i)	Confidence limit	(a)	2.5 d rule
(ii)	DNA analysis	(b)	Liquid
(iii)	Buffer solution of pH = 4, 7 & 9.2	(c)	$\pm C_n R$
(iv)	Rejection of doubtful result	(d)	electrophoresis
(v)	Stationary phase in TLC	(e)	Standardisation of glass electrode
		(f)	Solid

2. (A) (i) 100 cm^3 of an aqueous solution containing 0.1 g of iodine is shaken with 75 cm^3 of CCl_4, the distribution ratio of iodine between CCl_4 and water is 85 in favour of CCl_4. Calculate the amount of iodine extracted after single extraction. **5**

(ii) Name the separation methods based on solubility and explain any one in brief. **3**

OR

(A) (i) What is 'separation factor'? How does it affect the efficiency of separation? Give Bush-Densen equation used for best separation. **5**

(ii) Give applications of electrophoresis. **3**

(B) (i) The distribution ratio is 8, in favour of organic solvent for a certain system. Calculate the percentage extraction for a volume ratio **5**

(i) $V_o/V_w = 1$, for a single extraction and

(ii) $V_o/V_w = 5$, for two successive extractions.

(ii) Describe ascending development in paper chromatography. **3**

OR

(B) (i) What is meant by 'retardation factor'? With respect to paper chromatography explain selection of mobile phase. **5**

(ii) What is electrophoresis? Discuss its working. **3**

(C) Give the classification of chromatographic techniques on the basis of phases involved. **4**

OR

(C) Write a note on estimation of analyte without effecting separation. **4**

3. (A) (i) Discuss the following graphical methods of determination of equivalence point in potentiometric titration. **5**
a] E_{cell} vs. Volume of titrant added and
b] $\Delta E/\Delta V$ vs. Volume of titrant added

(ii) Describe the experimental procedure for carrying out potentiometric titrations. **3**

OR

(A) (i) Explain the basic principles of 'conductometric titrations'. **4**

(ii) Discuss the conductometric titration curve of a strong acid against a weak base. **4**

(B) (i) Describe the applications and any one limitation of potentiometric titrations. **5**

(ii) Explain in brief the different types of pH meters. **3**

OR

(B) (i) Draw a neat labelled diagram of 'conductivity cell' and explain its construction. **4**

(ii) Give the applications of pH-metry in biological and environmental analysis. **4**

(C) Explain the term 'indicator electrode' and 'reference electrode' used in potentiometric titrations with a suitable example. **4**

OR

(C) Discuss the conductometric titration curve of a weak acid against a strong base. **4**

4. (A) (i) Four replicate analysis of silver coin gave following percentage of silver. **5**

Sample No	1	2	3	4
% of silver	15.52	15.54	15.61	15.57

Calculate: (i) mean (ii) median (iii) standard deviation.

(ii) Explain 2.5d rulefor the rejection of doubtful result. **3**

OR

(A) (i) Explain 'Q-test' for the rejection of doubtful measurement **4**

(ii) Explain the method of least square used for a straight line passing through origin. **4**

(B) (i) Explain what is meant by confidence limit. How is it calculated using student's-t and range? **5**

(ii) What is Gaussian distribution curve? Draw any two ways of presenting it. **3**

OR

(B) (i) Copper alloy analysed for Cu content, gave the following results:- **5**
% of Cu : 42.44, 42.48, 42.58, 42.50 and 42.55
Calculate 90% confidence limit for the mean if (i) σ is not known and (ii) σ = 0.025
(Given: t = 2.02, z = 1.64 for 90% confidence limit)

(ii) Explain 'Null hypothesis'. **3**

(C) Replicate measurements of pH of a buffer solution gave following results: 2.33, 2.38, 2.34, 2.37, and 2.36. Calculate (i) average deviation from the mean and (ii) relative average deviation. **4**

OR

(C) Describe the salient features of Gaussian distribution curve. **4**

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

(A) State: Nernst Distribution law. **5**
Describe the continuous solvent extraction of an aqueous solution using an organic solvent lighter than water.

(B) Give applications of thin layer chromatography. **5**

(C) Mention any thee applications and two limitations of conductometric titrations? **5**

(D) With the help of a neat labelled diagram explain the principle of combined glass electrode. **5**

(E) Following are the results of percentage of gold obtained from same sample. From the data given in two sets, verify weather two standard deviations are same or different. **5**

Set-I: 15.72 15.68 15.76
Set-II: 15.62 15.80 15.67

(F) The following table gives dependence of y on x. **5**

x	0	1	2	3	4	5
y	0.0	2.4	4.7	7.3	9.8	11.8

Assuming a linear relationship between the variables derive an equation of the type y = mx by the method of averages.

== **XXXXXX** ==