Old Course

(3 Hours) Total Marks: 100

N.B: (1) **All** questions are **compulsory**

(2) **Figures** to the **right** indicate **full marks**

(3) Use of Log tables/Non-programmable calculator is **permitted**

1. (a) In the gravimetric estimation of calcium as calcium sulphate the following results were obtained: 5

Sample No.	Weight of sample in grams	Weight of $CaSO_4$ in grams
1	1	0.219
2	2	0.439
3	3	0.659

If the sample contained 10% calcium, calculate the absolute and relative error in ppt.

OR

(a) The replicate analysis of metallic ore gave the following results: 5

Sample	1	2	3	4	5	6
% of metal	60.24	60.28	60.25	60.29	60.26	60.30

Calculate (i) mean (ii) median and (iii) standard deviation of the set

Attempt **any three** of the following:-

(b) i) Describe stack sampling. 3

ii) Write the precautions to be taken while sampling gaseous material. 2

(c) What are complexometric titrations? Explain any two techniques used to increase the selectivity of EDTA. 5

(d) Explain Volhard's method for determination of the end point in precipitation titration. 5

(e) Write the relations used to determine the potential of the system during titration of Fe^{+2} solution with $Cr_2O_7^{-2}$ solution. 5

2. (a) i) Explain the term distribution ratio. 1

ii) The distribution ratio of iodine between an organic solvent and water is 80. $0.5\ dm^3$ of 0.1 M aqueous iodine solution is shaken with $0.1\ dm^3$ of this organic solvent until equilibrium is reached. Determine the amount of iodine remaining unextracted. 4

OR

(a) In a certain solvent extraction the distribution ratio of the solvent in favour of the organic solvent is 25. Calculate the percentage extraction if a single extraction is carried out using volume ratio (i) $v_o/v_w = 0.5$ (ii) $v_o/v_w = 8$ 5

Attempt **any three** of the following:-

(b) With the help of a neat labelled diagram, explain the working of AAS. 5

(c) Explain the standard addition method and internal standard method for quantitative analysis by flame photometry. 5

(d) With the help of neat labelled diagram explain the working of single beam spectrophotometer. 5

(e) Explain (i) Ascending (ii) Descending chromatographic techniques in paper chromatography. 5

3. (a) Explain the term : Polarizable electrode 2

In a certain polarographic experiment , a series of standard solution containing a Cu(II) ions were prepared and their wave heights were measured 3

Concentration of Cu(II) ion in mM	0.4	0.8	1.2	1.6	unknown
Wave height in mm	30.5	62.0	92.5	124.5	78.0

Calculate the concentration of Cu (II) ions in the unknown solution.

OR

(a) Explain the role of gelatin in polarographic analysis. 2

A 7.25×10^{-3} M solution of Pb(II) ions in 0.1 M KCl as a supporting electrolyte gave a diffusion current of 22.5 μA. If the capillary characteristics ($m^{2/3} t^{1/6}$) is 1.83, calculate the diffusion coefficient of Pb(II) ions. 3

Attempt **any three** of the following:-

(b) Name various detectors used in HPLC and explain any one of them in detail. 5

(c) Discuss the factors affecting the distribution of ions between ion exchange resin and the solution. 5

(d) State Van Deemter equation, and explain the terms involved. 5

(e) i) What are the two important reasons for acid base titrations to be performed in non aqueous solvents? 2

ii) Name the ion selective electrode used in acid base titrations. What are the advantages of this electrode? 3

4. (a) In the chemical analysis of a sample for its arsenic content, the following results were reported in ppm : 5.6, 5.7, 5.5 and 5.9. On the basis of 2.5d rule, find whether the value 5.9 can be retained or rejected. 5

OR

(a) The estimation of mercury in water samples for six replicate measurements gave the following results in ppm: 0.172, 0.151, 0.170, 0.163, 0.173, and 0.156. Calculate the 95% confidence interval for the mean. The value of student's t for six measurements at 95% confidence level is 2.57. 5

Attempt **any three** of the following:-

(b) Discuss briefly GLP 5

(c) Discuss the basic principle of thermogravimetry. What are the instrumental factors that affect the shape of TG curve? 5

(d) i) What is meant by partial and total validation? State the conditions under which it is applied. 3

ii) State the types of noise that frequently occur. 2

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(e) i) Discuss the use of turbidity measurements in the determination of molecular weight of a polymer. 3
ii) State any two applications of NAA 2

5. (a) Explain the use of concentric tube thief in sampling of solids. 3

OR

(a) Define: (i) Gross sample (ii) sub-sample (iii) increment 3

(b) Write the factors that affect the intensity of fluorescent radiations. 3

OR

(b) List any three limitations of Atomic Absorption Spectrophotometry. 3

(c) Write three applications of amperometric titrations. 3

(d) What are acid- base indicators? Write an example each of any suitable indicator used in the titration of 3

(i) weak base with a strong acid

(ii) weak acid with a strong base

(e) Explain the term: Retention volume. 2

(f) Describe the method of preparation of plates for thin layer chromatography. 2

(g) Discuss briefly non aqueous titrations using ethylene diamine 2

OR

(g) Draw a neat labeled diagram of a glass electrode. 2

(h) Enlist the steps involved in the evaluation of the uncertainty of a measurement. 2

OR

(h) Name the hardware methods used for enhancement of S/N ratio. 2

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