This question paper contains **4+2** printed pages]

Your Roll No. ....

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B.Sc. Prog./II   C

AC-201 : Basic Principles and Lab. Operations

(Admissions of 2005 & onwards)

Time : 3 *Hours*   *Maximum Marks* : 75

(*Write your Roll No. on the top immediately on receipt of this question paper*)

Answer any *five* questions. *All* questions carry

equal marks. Calculators are not permitted.

1. (*a*) Explain what is meant by determinate errors and indeterminate errors giving examples for each.

    (*b*) Define absolute error and relative error. Can the relative error be negative ? Explain.

    (*c*) Calculate the relative error in terms of percentage and in terms of parts per thousand for an iron analysis that gives a value 115 ppm Fe content when the true value. in fact. is 110 ppm.   5-5-5

P.T.O.

2.   (*a*)   What do you understand by the term confidence limit ? Explain.

      (*b*)   Write a short note on a test that can be used for rejecting suspect outliners.

      (*c*)   For the numbers 116.0, 97.9, 114.2, 106,8 and 108.3, find the mean. standard deviation and 90% confidence interval for the mean. Using the Q test, decide whether the number 97.9 should be discarded.   2+7+6

3.   (*a*)   Describe a burette in detail with the help of a diagram.

      (*b*)   What is a meniscus reader ? Give the stepwise procedure for calibration of a burette.

      (*c*)   Give at least *three* rules that one must observe while weighing with any type of analytical balance.   5+7+3

4.   (*a*)   What do you understand by the term 'weighing by difference' ?

(b) Describe how you will weigh NaCl using this method to prepare 100 mL of about 0.5 M NaCl. Given that the weight of the weighing bottle is 20.35 gms.

(c) How many milliliters of concentrated sulphuric acid, 37.0% (g 100g) solution, density 1.88 cm³ are required to prepare one litre of 0.500 M solution ? Give the steps involved in detail. $2+5+8$

5. (a) Give a flow diagram showing steps in quantitative analaysis.

(b) Explain with the help of an example how a constant error will become serious as the size of the quantity measured decreases.

(c) Can the effect of a constant error be minimized ? Give reasons to support your answer.

(d) Describe a sintered glass crucible. $6+4+1+4$

6. (a) Calculate the p-value for each ion in a solution that is :

    (i) 8×10^{-8} M in $Zn(NO_3)_2$ and 5.6×10^{-7} M in Cd $(NO_3)_2$.

    (ii)   0.0335 M in NaCl and 0.0503 M in NaOH.

  (b) What is the purpose of :

    (i)   the 0% T adjustment and

    (ii)   the 100% T adjustment

    in a colorimeter ?

  (c) Write each answer with the correct number of digits :

    (i) $1.021 + 2.69 = 3.711$

    (ii) $12.3 - 1.63 = 10.67$

    (iii) $4.34 \times 9.2 = 39.928$

  (d) A method of analysis yields weights for gold that are low by 0.4 mg. Calculate the percent relative error caused by this uncertainty if the weight of the gold sample is :

    (i)   700 mg

    (ii)   250 mg.   6+2+3+4

7. (*a*) Define precision and accuracy. Explain with the help of a
          diagram.

    (*b*) What is the purpose of a calibration curve ?

    (*c*) What is the difference between a qualitative and quantitative
          analysis ?

    (*d*) What is the formal concentration of NaCl when 32.0 g are
          dissolved in water and diluted to 0.500 L ?   6+4+2+3

Values of Students' *t*

Degree of freedom	Confidence level %		
	50	90	95
1	1.000	6.314	12.706
2	0.816	2.920	4.303
3	0.765	2.353	3.182
4	0.741	2.132	2.776
5	0.727	2.015	2.571

Q test table

No. of Replicate Measurements	Reject with 90% confidence	Reject with 95% confidence	Reject with 99% confidence
3	0.941	0.970	0.994
4	0.765	0.829	0.926
5	0.642	0.710	0.821
6	0.560	0.625	0.740
7	0.507	0.568	0.680
8	0.468	0.526	0.634
9	0.437	0.493	0.598
10	0.412	0.466	0.568