[This question paper contains 4 printed pages.]

5141 *Your Roll No.* .....

B.Sc. Prog. / II **B**

AC-201 : Basic Principles & 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.)

Attempt **FIVE** *questions in all.*
All *questions carry equal marks.*

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)

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.

P.T.O.

(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+1+6+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 100mL of about 0.5M 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 1.88g/cm^3 are required to prepare one litre of 0.500M solution ? Give the steps involved in detail. (2+5+8)

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

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

(b) What is the purpose of a) the 0% T adjustment and b) 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 × 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)

P.T.O.

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 32.0g are dissolved in water and diluted to 0.500L ? (6+4+2+3)

	Values of students' t		
	Confidence level %		
Degree of freedom	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