[This question paper contains 5 printed pages.]

3857 *Your Roll No.* .....

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

AC–201 : Basic Principles & Lab. Operations

(NC – 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) What is the purpose of

(i) the 0% T adjustment and

(ii) the 100% T adjustment in a colorimeter.

(b) Explain, the difference between :

(i) constant and proportional error

(ii) mean and median

(iii) absolute and relative error

P.T.O.

(c) Define precision and accuracy. Explain with the help of an example.

OR

Write each answer with correct number of digits :

(i) $1.021 + 2.69 = 3.711$

(ii) $12.3 - 1.63 = 10.67$

(iii) $4.34 \times 9.2 = 39.928$

2. Describe the preparation of :

(a) 1.50 L of 0.215 M NaOH from the concentrated commercial reagent

[50% NaOH (W/W), specific gravity 1.525]

(b) 1.00 L of 0.285 M HCl, starting with a 6.00 M solution of the reagent.

(c) 500 mL of 4.75% (W/V) aqueous ethanol (C_2H_5OH, 46.1 g/mol).

3. (a) Calculate the molar concentration of HNO_3 (63.0 g/mol) in a solution that has a specific gravity of 1.42 and is 70.5% HNO_3 (W/W).

(b) Calculate the pH-value for each ion in a solution that is

(i) 2×10^{-3}M in NaCl and 5.4×10^{-4}M HCl

(ii) $6.\times10^{-3}$M in $CaCl_2$ and 7.6×10^{-3} in $BaCl_2$

(iii) $4.\times10^{-8}$M in $Zn(NO_3)_2$ and 5.6×10^{-7}M $Cd(NO_3)_2$

(iv) 00335M in NaCl and 0.0503 in NaOH

4. (a) A patiological blood sample of blood contains 5.4 g of sdium chloride per decilitre. What is the molarity of sodium chloride in blood.

(b) Magnesium chloride has a typical concentration of 0.054M in the ocean. How many grams of magnesium chloride are present in 25 mL of sea water?

(c) Describe the preparation of 2.00L of 0.100M Na^+ from pure sodium carbonate.

5. (a) Name three types of systematic errors.

(b) Describe at least three ways in which a systematic error might occur while using a pipet to transfer a known volume of liquid.

P.T.O.

(c) What kind of systematic errors are detected by varying the sample size.

(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. (a) Enumerate the steps involved in the weighing process using a single pan balance

(b) What do you understand by buoyancy correction ?

(c) A thoughtless chemistry student does he following while weighing on an analytical balance. What, if anything, is wrong with each ? Also, state the effect on the weight obtained.

(i) Having mislaid the crucible tongs, handles the object to be weighed with fingers.

(ii) Leaves the hot object in the desiccator thirty minutes to cool, instead of forty five minutes to an hour.

(iii) Leaves the door of the weighing chamber open while weighing.

7. (a) The colour change of a chemical indicator requires an over titration of 0.04 mL. Calculate the percent relative error if the total volume of titrant is

(i) 50.00 mL

(ii) 25.00 mL

(b) Define spread or range, significant figures, accuracy and precision.

(c) Find the (i) mean (ii) median (iii) spread (iv) standard deviation and (iv) coefficient of variation for each of the following sets of data :

(i) 3.5, 3.1, 3.1, 3.3, 2.5

(ii) 70.65, 70.63, 70.64, 70.21