

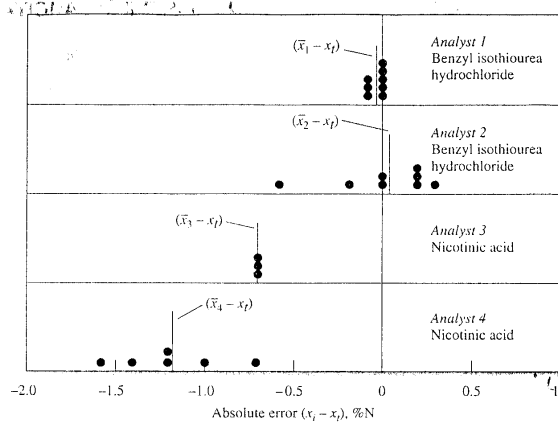
NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY
DEPARTMENT OF APPLIED CHEMISTRY
END OF SEMESTER EXAMINATIONS – MAY 2002
GENERAL CHEMISTRY FOR BIOLOGY AND ENVIRONMENTAL SCIENCE –
SCH 1217
TIME – (3) THREE HOURS

INSTRUCTIONS TO CANDIDATES

Answer **ANY FOUR** questions. Each question carries 25 marks.

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- LIBRARY USE ONLY**
1. (a) Explain the difference between:
- (i) a colloidal and a crystalline precipitate (2 marks)
 - (ii) precipitation and co-precipitation (2 marks)
 - (iii) specific and selective precipitating reagents (2 marks)
- (b) An aqueous solution contains NaNO_3 and KSCN . The thiocyanate ion is precipitated as AgSCN by addition of AgNO_3 . After an excess of the precipitating reagent has been added,
- (i) What is the charge on the surface of the coagulated colloidal particles? (3 marks)
 - (ii) What is the source of the charge? (3 marks)
 - (iii) What ions predominate in the counter-ion layer. (3 marks)
- (c) A 0.6407g sample containing chloride and iodine ions gave a silver halide precipitate weighing 0.4430g. This precipitate was then strongly heated in a stream of Cl_2 gas to convert the AgI to AgCl ; upon completion of this treatment, the precipitate weighed 0.3181g. Calculate the percentage of chloride and iodine in the sample. (10 marks)
2. (a) Name **three** types of systematic errors and in each case discuss the causes of such errors. (9 marks)
- (b) A loss of 0.4mg of Zn occurs in the course of an analysis for that element. Calculate the percent relative error due to this loss if the weight of Zn in the sample is:
- (i) 40mg (2 marks)
 - (ii) 175mg (2 marks)
 - (iii) 400mg (2 marks)
 - (iv) 600mg (2 marks)

2. (c)



The diagram shows the Absolute Error in the determination of nitrogen in two pure compounds. The dots show the Absolute Errors of replicate results obtained by four analysts. Each vertical line labelled $(\bar{x}_i - x_t)$ is the Absolute Average Deviation from the true value.

Comment on the data presented by each analyst in terms of accuracy, precision, random and systematic errors. (8 marks)

3. (a) (i) What is a primary standard? (2 marks)
- (ii) List the desirable properties of standard solutions. (4 marks)
- (iii) Define molarity and normality. (4 marks)
- (b) Calculate the molar concentration of ethanol in an aqueous solution that contains 2.30g of C_2H_5OH (FW = 46.07) in 3.50L of solution. (5 marks)
- (c) Describe the preparation of:
- (i) 500mL of 0.0750M $AgNO_3$ from the solid reagent.
- (ii) 1.00L of 0.315M HCl, starting with a 6.00M solution of the reagent.
- (iii) 2.00L of 0.120M $HClO_4$ from the commercial reagent [60% $HClO_4$ (w/w), sp gr 1.60].
- (iv) 2.00L of 0.108M $BaCl_2$ from $BaCl_2 \cdot 2H_2O$ (FW 244.3)
- (v) 500mL 0.0740M Cl⁻ solution of solid $BaCl_2 \cdot 2H_2O$ (FW 244.3g) (10 marks)