



THE OPEN UNIVERSITY OF SRI LANKA
B.Sc. DEGREE PROGRAMME /STAND ALONE COURSES - LEVEL 4

CHU 2125/CHE 4125 – ANALYTICAL CHEMISTRY I
ASSIGNMENT TEST I – NO BOOK TEST (2006/2007)
TIME : ONE AND HALF HOURS

Date: 27-07-2006 Time. 4.00 – 5.30 p.m.

Registration Number :

Question No.	Marks
1	
2	
Percentage	

Instructions to candidates:

This question paper contains 6 pages and two questions.
Answer all questions. Please use a pen (not a pencil) in answering. Write down the answers in the spaces provided. Attached sheets will not be graded.

01. Molarity of a solution is determined titrimetrically by doing six titrations, taking 15.00 cm^3 of sample at a time. Results in units of mol dm^{-3} are given below.

0.2014, 0.2049, 0.2039, 0.2043, 0.2016, 0.2035

- i. How do you report the molarity of this solution? Show all your calculation in detail

(30 marks)

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- ii. Calculate the coefficient of variation (as a percentage) using this data. (10 marks)

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iii. If there is an impurity (other than the analyte) in your sample solution which consumes certain amount of standard solution, while titrating, there will be a proportional systematic error involved in the six results given in this question.

Clearly explain what experimental procedure you can use to prove the presence or absence of such an impurity?

(30 marks)

- iv. If you don't detect the presence of proportional systematic error involved in these six results, what is the reason for the variation of results?

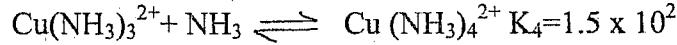
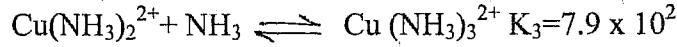
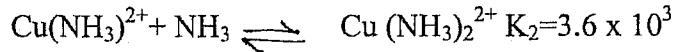
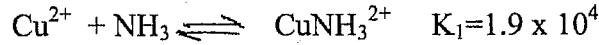
(10 marks)

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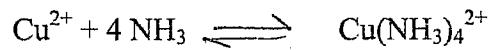
02. For the titration of a strong acid with ammonia.



The reaction of Cu^{2+} with ammonia proceeds stepwise as shown below.



For the overall reaction.



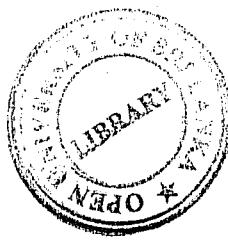
$$K_{\text{eq}} = \frac{[\text{Cu}(\text{NH}_3)_4^{2+}]}{[\text{Cu}^{2+}][\text{NH}_3]^4} = K_1 K_2 K_3 K_4 = 8.1 \times 10^{12}$$

The titration of a strong acid with NH_3 is feasible ($K_{\text{eq}} = 1.8 \times 10^9$).

However, the titration of a solution of Cu^{2+} , with ammonia is not feasible even though $K_{\text{eq}} = 8.1 \times 10^{12}$. Clearly explain why? It is not necessary to give calculations.

Hint. For a quantitative titration, there should be a large vertical portion in the titration curve i.e. p^{H} versus volume of ammonia or p^{Cu} versus volume of ammonia.

(20 marks)



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