NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY
DEPARTMENT OF APPLIED CHEMISTRY
BACHELOR OF SCIENCE HONOURS DEGREE
END OF SECOND SEMESTER EXAMINATIONS – FEBRUARY 2010
ANALYTICAL CHEMISTRY II – SCH 2106
TIME: 3 HOURS

INSTRUCTIONS TO CANDIDATES

Answer **_FOUR_** questions out of **_FIVE_** questions provided.

Requirements: Graph Paper and standard electrode tables.

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1.   (a)   Describe three mechanisms responsible for the transport of dissolved species to and from an electrode surface.   [6 marks]

   (b)   What experimental variables affect concentration polarization in an electrochemical cell?   [7 marks]

   (c)   Calculate the thermodynamic potential for that following cell:
   $Cu \mid Cu^{2+}$ (0.0200M) $\parallel Ag^+$ (0.0200M)/Ag

[12 marks]

2.   (i)   Define or explain each of the following terms in relation to molecular spectroscopy:

   (a) ground plate

   (b) excited electronic state

   (c) absorbance

   (d) band spectra

   (e) scattering   [15 marks]

   (ii)   A spectrophotometric analysis was performed with a manual instrument that exhibited an absolute standard deviation of ± 0.003 T throughout its transmittance scale. Calculate the relative standard deviation in concentration that results from this uncertainty when the analyte solution has an absorbance of (a) 1.000 and (b) 2.000.

[10 marks]

3   (i)   Using diagrams, explain the difference between molecular absorption and fluorescence.

[10 marks]

(ii)   The following volumes of a solution containing 1.10ppm of Zn^{2+} were pipetted into separatory funnels each containing 5.00mL of an unknown zinc solution:0.00, 1.00, 4.00, 7.00, and 11.00. Each was extracted with three 5mL aliquots of carbon tetrachloride containing an excess of 8-hydroxy-quinoline. The extracts were then diluted to 25.0mL and their fluorescence measured with a fluorometer. The results were:

mL Std Zn^{2+}	Fluorometer Reading
0.00	6.12
4.00	11.16
8.00	15.68
12.00	20.64

(a) Plot the data.

(b) Calculate the concentration of zinc in the sample.

(c) What are possible sources of error in this statement and how were they minimized?

[15 marks]

4.   (a)   Describe and give example of the three sample preparation techniques used in Infrared Spectroscopy.

[10 marks]

(b)   Infrared Spectroscopy can be used for both quantitative and qualitative analysis. Explain why it is mainly used in qualitative analysis.   [15 marks]

5.   (a)   Describe any three errors that affect pH measurements with the glass electrode.
[10 marks]

(b)   Explain the following terms in relation to the reactant transportation to an electrode:

(i)	Diffusion	[5 marks]
(ii)	Migration	[5 marks]
(iii)	Convention	[5 marks]

End of question Paper!!!