



NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY
DEPARTMENT OF APPLIED CHEMISTRY
BACHELOR OF SCIENCE HONOURS DEGREE
SUPPLEMENTARY EXAMINATIONS – AUGUST 2014
ANALYTICAL CHEMISTRY II – SCH 2106
TIME: 3 HOURS

INSTRUCTIONS TO CANDIDATES

Answer ***FOUR*** questions out of ***FIVE*** questions provided.
Requirements: Calculator, Graph Paper and Standard electrode tables.

1. (a) What do you understand by a liquid- junction potential? Explain how it develops? [5]
- (b) Calculate the equilibrium constant for the reaction
$$2\text{MnO}_4^- + 3\text{Mn}^{2+} + 2\text{H}_2\text{O} \Leftrightarrow 5\text{MnO}_2(\text{s}) + 4\text{H}^+$$
 [15]
- (c) Describe three mechanisms by which electricity is transported through an electrochemical cell. [5]
2. (a) Define the following
- (i) Absorbance [2]
- (ii) Transmittance [2]
- (iii) Beer Lambert's Law [2]
- (b) What are the limitations of Beer Lambert's Law? [10]
- (c) A solution containing a complex formed between Bi(III) and thiourea has a molar absorptivity of $9.32 \times 10^3 \text{ L.cm}^{-1}.\text{mol}^{-1}$ at 470nm.
- (i) What is the absorbance of a $6.24 \times 10^{-5} \text{ M}$ solution of the complex in a 1.00 cm cell?
- (ii) What is the percentage transmittance of the solution described in (i)?
- (iii) What is the molar concentration of the complex in a solution that has the absorbance described in (i) when measured at 470 nm in a 5.00 cm cell? [9]

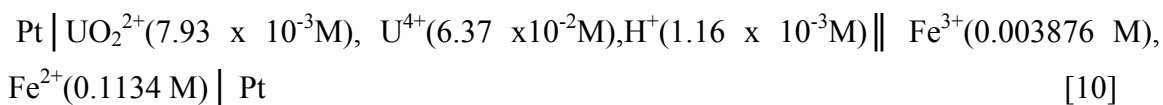
3. (a) Why is atomic emission more sensitive to flame instability than atomic absorption? [7]
- (b) Draw a diagram illustrating the main parts of an atomic absorption spectrophotometer. [8]
- (c) What processes occur to produce light emission from the flame when a solution containing sodium ions is presented to the instrument? [10]

4. (a) Briefly, but informatively define the following electrochemical terms;

- (i) Ohmic Potential
- (ii) Salt Bridge
- (iii) Electrolytic Cell
- (iv) Galvanic Cell
- (v) Electrode Potential [10]

(b) The molar extinction coefficient (ϵ) of compound riboflavin is 4.7×10^3 Litre/cm/Mole. If the absorbance reading (A) at 350 nm is 1.09 using a cell of 1.25 cm, what is the concentration of compound riboflavin in sample? [5]

(c) Calculate the thermodynamic cell potential for the following cell and indicate whether, as written, it is a galvanic or electrolytic cell.



5. (a) Define the following:

- (i) Ground state
- (ii) Continuous spectra
- (iii) Resonance fluorescence
- (iv) Molar absorptivity
- (v) Relaxation [10]

- (b) Describe in detail the transitions that are responsible for absorption by:
- (i) lanthanide and actinide. [5]
 - (ii) Elements of the first and second transition metal series. [5]
- (c) Using examples explain how conjugation affects absorption. [5]

End of question Paper!!!