

NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY
DEPARTMENT OF APPLIED CHEMISTRY
BACHELOR OF SCIENCE HONOURS DEGREE
END OF SECOND SEMESTER EXAMINATIONS – JANUARY 2011
ANALYTICAL CHEMISTRY II – SCH 2106
TIME: 3 HOURS

INSTRUCTIONS TO CANDIDATES

Answer **FOUR** questions out of **FIVE** questions provided.

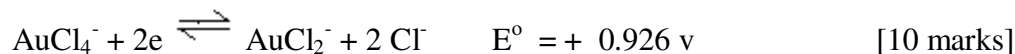
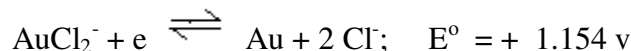
Requirements: Graph Paper and standard electrode tables.

1. (a) With the aid of a diagram describe an electro chemical cell. [5 marks]

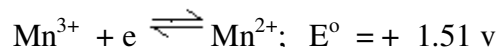
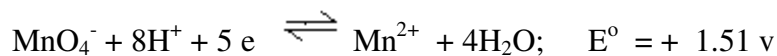
(b) Compute the equilibrium constant for the reaction



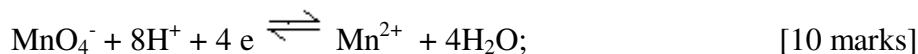
from the standard potentials for the following half-reactions:



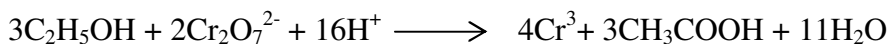
(c) Given the following data:



Calculate the standard potential (E°) for



2. (a) A 5.00-mL sample of brandy was diluted to 1.000 L in a volumetric flask. The ethanol ($\text{C}_2\text{H}_5\text{OH}$) in a 25.00-mL aliquot of the diluted solution was distilled into 50.00mL of 0.02000 M $\text{K}_2\text{Cr}_2\text{O}_7$ and oxidized to acetic acid with heating. The reaction is:



After cooling, 20.00 mL of 0.1253 M Fe^{2+} were pipette into the flask. The excess Fe^{2+} was then titrated with 7.46mL of the standard $\text{K}_2\text{Cr}_2\text{O}_7$ to a diphenylamine sulfonic acid end point. Calculate the percent (w/v) $\text{C}_2\text{H}_5\text{OH}$ (46.07 g.mol) in the brandy.

[15 marks]

(b) Titration of 0.1467g of primary standard $\text{Na}_2\text{C}_2\text{O}_4$ required 28.85mL of a potassium pemanganate solution. Calculate the molar concentration of KMnO_4 in this solution.

[10 marks]

3. Describe the differences between the following and list any particular advantages possessed by one over the other:

(a) spectrophotometers and photometers. [8 marks]

(b) single-beam and double-beam instruments for absorbance measurements. [8 marks]

(c) conventional and diode-array spectrophotometers. [9 marks]

4. Define the following terms:

(a) resonance fluorescence. [5 marks]

(b) vibrational relaxation. [5 marks]

(c) internal conversion. [5 marks]

(d) quantum yield. [5 marks]

(e) Why are most fluorescence instruments double beam in design? [5 marks]

5. (a) Describe the basic differences between atomic emission and atomic absorption spectroscopy. [10 marks]

(b) Why is atomic emission more sensitive to flame instability than atomic absorption or fluorescence? [10 marks]

(d) What is the purpose of an internal standard in flame emission methods? [5 marks]

End of question Paper!!!