



# KENYATTA UNIVERSITY

## UNIVERSITY EXAMINATIONS 2009/2010

### INSTITUTIONAL BASED EXAMINATION FOR THE DEGREE OF

### BACHELOR OF SCIENCE EDUCATION

### SCH 401: ELECTROCHEMISTRY

**DATE:** Wednesday 28<sup>th</sup> April, 2010

**TIME:** 8.00 a.m. – 10.00 a.m.

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#### **INSTRUCTIONS**

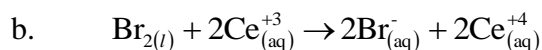
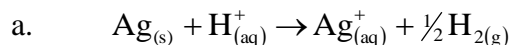
*Attempt ALL questions.*

1. With detailed diagram, explain the products obtained during electrolysis of 0.2 M  $\text{CuSO}_4$  solution using
  - a. Copper Electrodes
  - b. Graphite Electrodes[10 marks]
2. Study the cell below and answer questions (a) to (e)  
 $\text{Ag}/\text{Ag}^+_{(\text{aq})}/\text{Cl}^-/\text{AgCl}, \text{Ag}$ 
  - a. Write the half reactions of the cell [4 marks]
  - b. Write the full reaction of the cell [1 mark]
  - c. Write the Nernst equation for the electrochemical reaction above in terms of the activities of the species involved. [2 marks]
  - d. Derive the relationship between the concentration of the species present (in molalities) and the cell emf. [8 marks]
  - e. Sketch a suitable curve for the relationship in equations above (d) and indicate the important information from the y-intercept. [6 marks]
3. Explain how a fourth year chemistry student would be able to determine the transference number of  $\text{H}^+$  in aqueous solution of  $\text{HCl}$  using boundary method. Include diagrams and equations where necessary. [8 marks]

4. A sample with water having specific conductance of  $1.12 \times 10^{-6} \text{ohm}^{-1} \text{cm}^{-1}$  was saturated with silver chloride, where upon the specific conductance rose to  $2.85 \times 10^{-6} \text{ohm}^{-1} \text{cm}^{-1}$ . Find the solubility of silver chloride, a strong electrolyte.

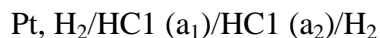
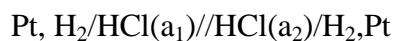
[6 marks]

5. Formulate the galvanic cell corresponding to the following reactions



[6 marks]

6. Given the following cells



- a. Draw a sketch for a similar cell without transference. [3 marks]

- b. For each of the cells above, write the overall cell equations.

[6 marks]

- c. Write down the Nernst equations for the emf's of each cell.

[4 marks]

- d. Write down the expression for the liquid junction in terms of the mean activities of the HCl and the transference numbers of the chloride and hydrogen ions.

[6 marks]

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