



TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF APPLIED AND HEALTH SCIENCES

DEPARTMENT OF PURE AND APPLIED SCIENCES

UNIVERSITY EXAMINATION FOR:

BACHELOR OF TECHNOLOGY IN APPLIED CHEMISTRY (INDUSTRIAL OPTION)

BTAC 14S SEPT 2014

BTAC 15S₂ SEPT 2015

ELECTROCHEMISTRY ACH 4314

END OF SEMESTER EXAMINATION

SERIES: DEC 2016

TIME: 2 HOURS

DATE:

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

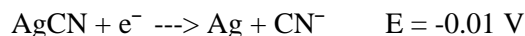
This paper consists of FIVE questions. Attempt Question one compulsory and any other two question

Do not write on the question paper.

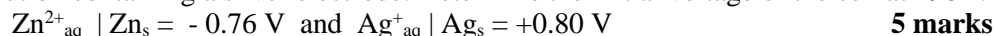
Paper one

QUESTION ONE

- A. Outline different application of electroplating of process **3 marks**
- B. Define Electrosynthesis and explain the basic setup of Electrosynthesis cell **5 marks**
- C. Define Electrochemical biosensors and Outline its application **4 marks**
- D. Explain with the help of reaction, Rusting of iron **6 marks**
- E. Write the cell reaction involved and an expression for calculating EMF for the cells Cd / Cd²⁺ || KCl | Hg₂Cl₂ | Hg **3 marks**
- F. calculate the solubility product K_{sp} for AgCN at 298 Kelvin **4 marks**
- $$\text{Ag}^+ + \text{e}^- \rightarrow \text{Ag} \quad E^0 = 0.80 \text{ V}$$



- G. A zinc electrode is submerged in 0.80 M Zn^{2+} solution connected by a salt bridge to a 1.30 M Ag^+ solution containing a silver electrode. Determine the initial voltage of the cell at 298K.



QUESTION TWO

- A. State characteristics of Superconductivity **4 marks**
- B. At 20°C the standard EMF of the cell $\text{Hg}, \text{Hg}_2\text{Cl}_2(\text{s}) | \text{HCl}(\text{aq}) | \text{H}_2(\text{g}) | \text{Pt}$ is 0.2692V. Find the values of ΔG and hence ΔS .
- cell reaction is $0.5\text{Hg}_2\text{Cl}_2(\text{s}) + 0.5\text{H}_2(\text{g}) \leftrightarrow \text{Hg}(\text{l}) + \text{HCl}(\text{aq})$* **6 marks**
- C. State different :-
- Modification techniques on Zinc Carbon battery
 - Methods of preventing corrosion **6 marks**
- D. Explain briefly principle of Polarography **4 marks**

QUESTION THREE

- A. Calculate :-
- Volume of chlorine gas liberated at S.T.P. when 40 Amperes of current flows through molten FeCl_3 for ten hours. **6 marks**
 - voltage of cell with concentration potential of 0.004V and resistance of 6.42Ω when 28.3mA flow through the cell with E_{Nernst} of 0.764V **4 marks**
- B. Discuss
- principle of Cell balancing **5 marks**
 - mechanism and prevention of electrolyte loss in alkaline fuel cell **5 marks**

QUESTION FOUR

- A. Define strike **2 marks**
- B. Define electrocatalyst and explain hydrogen oxidation reaction (HOR) **5 marks**
- C. With the help of a diagram explain Operation and Advantages of Molten Carbonate fuel cells. **7 mark**
- D. Calculate
- Mass of copper deposited if 0.22Amps flows through the cell for 910 minutes. When a metal to be plated with copper was dipped in copper sulphate solution **6 marks**

QUESTION FIVE

- A. Differentiate between self discharge rate and side reactions as used in batteries **3 marks**
- B. Define the Glass Membrane Electrodes **2 marks**
- C. With the help of diagram explain the working of a the alkaline fuel cell (AFC). **7 marks**
- D. with the help of reaction explain hydrodimerisation of acrylonitrile to adiponitrile by electro-hydrodimerization **8 marks**