



# TECHNICAL UNIVERSITY OF MOMBASA

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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 15S<sub>2</sub> 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.**

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## Paper TWO

### QUESTION ONE

- A. State different method of preventing corrosion **5 Marks**
- B. Differentiate between EMF and Potential difference **5 marks**
- C. Write the cell reaction involved and an expression for calculating E cell for the cells  $\text{Cd} / \text{Cd}^{2+} \parallel \text{KCl} | \text{Hg}_2\text{Cl}_2 | \text{Hg}$  **5 marks**
- D. Calculate :-
- i. Potential at 25°C for the cell.  $\text{Cu} | \text{Cu}^{2+}(0.024 \text{ M}) | \text{Ag}^+(0.0048 \text{ M}) | \text{Ag}$   
 $\text{Cu} | \text{Cu}^{2+} \text{ E}^{\circ}_{\text{ox}} = -0.3402 \text{ V}$  and  $\text{Ag}^+ | \text{Ag} \text{ E}^{\circ}_{\text{red}} = 0.7996 \text{ V}$  **5 Marks**
- ii. The solubility product at 25°C for  $\text{Mg}(\text{OH})_2$ .  
 $\text{Mg}(\text{OH})_2 | \text{Mg} \text{ E}^{\circ}_{\text{red}} = -2.69 \text{ V}$   $\text{Mg}^{2+}(\text{aq}) | \text{Mg}(\text{s}) \text{ E}^{\circ}_{\text{red}} = -2.375 \text{ V}$  **5Marks**

- iii. Time it will take to electrolysis water so as to produce 22.4 mL H<sub>2</sub> at STP under a current of 1.00 A. **5 marks**

## QUESTION TWO

- A. Calculate:-
- EMF of the cell  $\text{Zn(s)} | \text{Zn}^{2+} (0.024 \text{ M}) || \text{Zn}^{2+} (2.4 \text{ M}) | \text{Zn(s)}$  **5 marks**
  - the time required to deposit 56g of silver from a silver nitrate solution using a current of 4.5A. *Reaction:  $\text{Ag}^+ + e \rightarrow \text{Ag(s)}$*  **5 marks.**
- B. Write reaction involved and expression for Calculate the EMF of Secondary battery. **5marks**
- C. Define the use of:-
- Coulometric techniques
  - Electrometallurgy **5 marks**

## QUESTION THREE

- A. With the help of chemical reactions Describe Zinc-carbon battery **9 marks**
- B. A voltaic cell consisting of a Ni|Ni<sup>2+</sup> and Co|Co<sup>2+</sup> half cell is constructed with initial concentration of Ni<sup>2+</sup> = 0.8M and [Co<sup>2+</sup> = 0.2M. Given E<sup>0</sup>cell as 0.03V Calculate value of E<sub>cell</sub> **6 marks**
- C. Sketch a well label diagram of phosphoric acid cell PAFC **5marks**

## QUESTION FOUR

- A. Outline different factors used to evaluate battery's performance **3 marks**
- B. Define the following
- Migration of ions
  - Fuel cell
  - self discharge **6 marks**
- C. Deduce and calculate solubility product for silver bromide in water at 25<sup>0</sup>C by considering the cell  $\text{Ag} | \text{Ag}^+ | \text{Br}^- | \text{AgBr(s)} | \text{Ag}$  and using standard emf given E<sup>0</sup> of  $\text{Ag} | \text{Ag}^+ = 0.7981$  and  $\text{Ag} | \text{AgBr} | \text{Br}^-$  as 0.0711 **6 marks**
- D. Outline importance of electrochemical processes **5 marks**

## QUESTION FIVE

- A. Define the following types of membrane Electrodes:-
- Gas Sensing Electrodes
  - Glass Membrane Electrodes **5 marks**
- B. Differentiate between electrowinning and Electrorefining **5 maks**
- C. Thirty minutes of electrolysis of CuSO<sub>4</sub> solution produced 3.175 g Copper at the cathode. Calculate amount of current passed **5 marks**
- D. Explain Limitations of Ostwald's dilution law **5 marks**