

**National Open University of Nigeria**

**Plot 91, Cadastral Zone, Nnamdi Azikiwe Expressway, Jabi - Abuja**

**Faculty of Science**

**NOVEMBER, 2018 EXAMINATIONS**

**COURSE CODE: CHM409**

**COURSE TITLE: ELECTROCHEMISTRY**

**CREDIT: 2 Units**

**TIME ALLOWED: 2 Hours**

**INSTRUCTION:** **Answer Question ONE (1) and any other THREE (3) Questions**

**QUESTION 1**

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(a) What is an electric double layer **(1 marks)**

(b) Write an equation that relates flux to Fick’s law and define all terms used **(3 marks)**

(c) List the three parameter\in which conductivity of an electrolyte relates proportionally **(3 marks)**

(d) Draw a block and labeled diagram (flow chart) of a measuring instrument and explain how signal is transmitted and read out **(6 marks)**

(e) State the three major electrochemical interface that you know and give the order of their relative strength. **(4 marks)**

(f) Highlight the two types of transport process that can be encountered in an electrolytic cell **(2 marks)**

(g) In an electrochemical cell, the anodic Tafel constant is 0.1 when the anodic current is 10 V and the exchange current density is 1 V. Calculate the anodic polarization **(3 marks)**

(h) Highlight the principle behind the Guao Chapman theory of electric double layer

**(3 mark)**

**QUESTION 2**

.(a) Define the terms oxidation and reduction and state the electrodes that favour each of the processes **(2 marks)**

Consider the Figures given below.



(b) Which of them represent anodic and cathodic reactions? **(2 mark)**

(c) What is the significant of E and e in the diagrams? **(2 marks)**

(d) Define polarization with respect to the diagram **(2 marks)**

(e) Define (using suitable equation) overvoltage with respect to the diagram. **(2 marks)**

(f) If the values of E and e for one electrode are 12 and 4.5 V and 3 and 4.5 V for the other electrode. Calculate the over potentials and state the electrodes each calculated value belongs. Give reason for your answer **(5 marks)**

**QUESTION 3**

(a) Use suitable equations or notations to explain what exchange current density is **(3 marks)**

(b) With reference to a polarography cell, discuss the effect of temperature coefficient of the half wave on reversible and irreversible reaction **(3 marks)**

(c) Explain what reversible and irreversible electrode reactions is  **(5 marks)**

**(d)** Calculate the force between two charges of magnitude, 1.2 and 1.6 C separated by a distant of 0.8 m in a medium whose relative permittivity is 78.54 at 298 K **(4 marks)**

**QUESTION 4**

(a) Draw a labeled diagram to show different zones in an electrochemical cell (also name the zone **(6 marks)**

(b) From the diagram, explain the transfer process that occurs in each zone **(3 marks)**

(c) What accounts for differences in ionic concentration and what is the effect of such differences? : **(3 mark)**

(d) Highlight the three different sections in a typical electric double layer **(3 marks)**

**QUESTION 5**

(a) Highlight the three major contributors to mass transport and write an equation that incorporate the three contributors (5 marks)

(b) Define the term, transport number of ion (2 mark)

(c) Define the term, ionic mobility and show that mobility of ion can be represented as (8 marks)