



**NATIONAL OPEN UNIVERSITY OF NIGERIA**  
PLOT 91, CADASTRAL ZONE, NNAMDI AZIKIWE EXPRESSWAY, JABI - ABUJA  
**FACULTY OF SCIENCES**  
**DEPARTMENT OF PURE & APPLIED SCIENCES**  
**2021\_2 EXAMINATION**45078

**CHM409: ELECTROCHEMISTRY**

**CREDIT: 2 UNITS**

**TIME: 2 HOURS**

**INSTRUCTION: ANSWER QUESTION ONE AND ANY OTHER THREE (3) QUESTIONS.**

**Question 1**

- a). *What are the parameters that affects the structure of an electric double layer. ( 5 marks)*
- b) *What are the basic application of electric double layer in the industries ( 4 marks)*
- (c) *State Ohm's law ( 4 marks)*
- (d) *Write short note on a weak electrolyte ( 5 marks)*
- (e) *With relevant equations , describe Ostwald dilution law. (7 marks)*

**Question 2**

- 2.(a) *Write cathodic, anodic and overall cell equations for the Daniel cell (5 marks)*
- (b) *Show that for the Daniel cell, the Nernst equation can be written as,  $E_{cell} = E_{cell}^0 - \frac{0.059}{2} \log \left( \frac{[Zn^{2+}]}{[Cu^{2+}]} \right)$  (10 marks)*

**Question 3**

- 3(a) *Derive expressions for anodic and cathodic Tafel equations and explain graphical approach to the use of the equation in solving problem (7 marks)*
- (b) *Given that the change in standard change in free energy of an electrochemical cell is related to the reaction quotient, according to equation ,  $\Delta G = \Delta G^0 + RT \ln Q$ . Derive the Nernst equation for an electrochemical cell (i.e  $E = E^0 - (25.67 \text{ mV}) \ln Q$  (8 marks)*

**Question 4**

- 4 a) *What are the basic differences between polarizable and non polarizable electrodes?* 4 marks
- b) *Explain briefly the Significance of Tafel Plots* 6 marks
- c) *Describe the two main types of polarization in an electrochemical cell* 3 marks
- d) *Distinguish between over voltage arising from cathodic and anodic polarization respectively.* 2 marks

**Question 5**

- a) *Write brief notes on the following: i) Ion transport and ii) Mobility* 3 marks
- b) *What are the three basic means of ions transferred from solution to electrode in the absence of fluid turbulence?* 3 marks
- c) *With a general equation show how the three aspect in Q5b above are related to mass transport* 2 marks
- d) *Use the typical pattern of polarogram to describe the rudimentary principles of polarography.* 7 marks