



NATIONAL OPEN UNIVERSITY OF NIGERIA
PLOT 91, CADASTRAL ZONE, NNAMDI AZIKIWE EXPRESSWAY, JABI - ABUJA
FACULTY OF SCIENCES
DEPARTMENT OF PURE & APPLIED SCIENCES
2023_2 EXAMINATIONS

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