



NATIONAL OPEN UNIVERSITY OF NIGERIA
PLOT 91, CADASTRAL ZONE, NNAMDI AZIKIWE EXPRESSWAY, JABI - ABUJA
FACULTY OF SCIENCES
DEPARTMENT OF PURE & APPLIED SCIENCES
2021_2 EXAMINATION⁴⁵⁶⁷⁸

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