



NATIONAL OPEN UNIVERSITY OF NIGERIA
UNIVERSITY VILLAGE, PLOT 91 CADASTRAL ZONE, NNAMDI AZIKIWE
EXPRESS WAY,
JABI - ABUJA.
FACULTY OF SCIENCES
DEPARTMENT OF CHEMISTRY
2024 1 EXAMINATION

COURSE CODE: CHM 409
COURSE TITLE: Electrochemistry
COURSE UNIT: 2
TIME: 2 HOURS
INSTRUCTION: Answer question one and any other two questions.

Question 1 30 marks

- a. i. Present the IUPAC definition of electrode potential (3 marks)
(ii) In an electrochemical cell, what is the expected direction of flow of electron. (3 marks)
(iii) State one major difference between ionics and electroductics concerning electrochemistry (3 marks)
- b(i). State the meaning of Galvanic potential, Volta potential and Surface potential (6 marks)
b(ii) Given that an electrode potential is denoted by E and the equilibrium electrode potential by e , define polarization and overpotential and show the expected values for the anodic and cathodic polarization (6 marks)
- c(i). State two differences between polarizable and non-polarizable interfaces. Hence state how a non-polarizable interface can be made polarizable (5 mark)
- c(ii) State Oswald Dilution Law (2 marks)
c(iii) What type of relationship does Butler Volmer equation describe? (2 marks)

Question 2 20 marks

- a. State four factors that are responsible for a complex distribution of charge within the interphase region of an electrochemical system. (4 marks)
- b Write the half cell reactions for the Daniel cell. Hence show that for the Daniel cell, the Nernst equation can be written as, $E_{cell} = E_{cell}^0 - \frac{0.059}{2} \log \left(\frac{[Zn^{2+}]}{[Cu^{2+}]} \right)$ (12 mark)
- c. Based on the derive equation (in a(ii)) above, calculate the emf of the Daniel cell if the concentration of zinc and copper ions are 0.04 and 0.004 M respectively. ($E_{cell}^0 = 2.0 V$).
(4 marks)

Question 3 20 marks