



NATIONAL OPEN UNIVERSITY OF NIGERIA PLOT 91, CADASTRAL ZONE,
NNAMDI AZIKIWE EXPRESSWAY, JABI – ABUJA
FACULTY OF SCIENCES
DEPARTMENT OF CHEMISTRY
2023_1 POP EXAMINATION

COURSE CODE: CHM 409

COURSE TITLE: ELECTROCHEMISTRY

COURSE UNIT: 2

INSTRUCTION: Answer question 1 and any other two questions

Time: 2 hours

QUESTION 1

1. (a)(i) What is meant by over voltage? Mention any **three (3)** important application of this

Phenomenon (**6 marks**)

(ii) Given an electrochemical cell, identify the **three (3)** major zones that exist between an electrode and electrolyte and explain why the concentration of ions in each of the zone is expected to differ (**8 marks**)

(b) Sketch a typical nature of a polarogram and explain the significant of half wave potential in polarography (**6 marks**)

(c) The current flowing through a Pt / H₂(g) / H⁺(aq) electrode of area 5.0 cm² and over potential +0.005V was found to be 0.75 mA. Calculate the exchange current density of this electrode at 25 °C. (**10 marks**)

QUESTION 2

2. (a) Highlight any **three (3)** processes that can create a difference in potential in an electrochemical system (**7½ marks**)

(b) Calculate the average current that would be expected from the reduction of 2 x 10⁻⁴ M Pb²⁺, using the dropping mercury electrode with a flow rate of 2.0 mg/s and drop time of 4 seconds. The diffusion coefficient of Pb²⁺ is 1.01 x 10⁻⁵ cm²/s. (**12½ marks**)

QUESTION 3

3. (a) What are the **three (3)** major aspect of mass transport in electrochemistry? Write a general equation to show how these three aspects are related to mass transport. (**14 marks**)

(b) Discuss what each of the **three (3)** major aspect of mass transport listed in (5a) above depends on. (**6 marks**)

QUESTION 4

4. (a) Define electric double layer. How is it formed? (7 marks)
(b) Highlight any five (5) parameters that affects the structure of an electric double layer (10 marks)
(c) What is the basic application of electric double layer in the industries (3 marks)

QUESTION 5

5. (a) Enumerate any five (5) factors that affect the half – way potential in polarography (15 marks)
(b) Why is the study of charge transfer at the interphase in an electrochemical system significant (5 marks)