



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 cm³ and over potential +0.005V was found to be 0.75 m A. 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**)