



NATIONAL OPEN UNIVERSITY OF NIGERIA
Plot 91, Cadastral Zone, Nnamdi Azikiwe Expressway, Jabi, Abuja
FACULTY OF SCIENCE

OCTOBER NOVEMBER 2016 EXAMINATION

COURSE CODE: CHM409

COURSE TITLE: ELECTROCHEMISTRY

CREDIT UNIT : 2

DURATION: 2 HOURS

INSTRUCTION: Answer question 1 and any other three (3) questions

Question 1

a) Briefly describe the Stern model on the existent of an electric double layer (Use suitable diagram to support your answer) (10 marks)

b) illustrate the classical model on the existent of an electric double layer (Use suitable

diagram to support your answer)

(10 marks)

c) What is the difference between over voltage arising from cathodic and anodic polarization -

respectively. (2 marks)

Question 2

a) Demonstrate the basic differences between polarizable and non polarizable electrode

5 marks

b) Elucidate the Significance of Tafel Plots

6 marks

c) Enumerate and give details the two main types of polarization in an electrochemical cell.

3 mark

3 a) **State** Fick's first law of diffusion 2 marks

b) Derive an expression that relates cathodic over potential to the cathodic current (i_C) and

the limiting current (i_L). From the expression, state what will happened to the

overpotential if $i_C < i_L$ and $C = i_L$.

12 marks

Question 4

a) What is meant by Polarography? (3 marks)

b) Explain the basic principle of Polarography (8 marks)

c) What is the significant of half wave potential in polarography? (3 marks)

Question 5

a) Define the following terms in respect to a transducer: sensitivity and selectivity

2 marks (1 marks each)

b) List and explain three principal ways by which ions are transferred in solution in the absence of fluid turbulence.

(3 marks)

c) Outline the five (5) Factors which affect the half-wave Potentials (5 marks)

d)

A sheet of BCC Fe 1.0 mm thick is exposed to a carburizing gas on one side and a decarburizing gas on the other at 725°C. After reaching steady state, the Fe membrane is quenched to room temperature, and the C concentrations at each side of the membrane are 0.270 kg/m^3 and $1.6880.270 \text{ kg/m}^3$. Calculate the diffusion coefficient if the diffusion flux is $1.4 \times 10^{-8} \text{ kg/m}^2 \text{ sec}$. (4 marks)

Q6.

a) Explain these terms and give examples where necessary (9 marks)

i) electronics

ii) electric circuit

iii) A transducer

iv) exchange current density

b) Illustrate with a block diagram the principal components of an electrochemical measuring instrument (5 marks)