NATIONAL OPEN UNIVERSITY OF NIGERIA
PLOT 91, CADASTRAL ZONE, NNAMDI AZIKIWE EXPRESSWAY, JABI - ABUJA
FACULTY OF SCIENCES
DEPARTMENT OF PURE AND APPLIED SCIENCE
OCTOBER, 2019 EXAMINATION

COURSE CODE: CHM409
COURSE TITLE: ELECTROCHEMISTRY
CREDIT: 2 Units
TIME ALLOWED: 2 Hours
INSTRUCTION: Answer Question ONE (1) and any other THREE (3) Questions
In all calculations R = 8.314 J/mol/K

Question 1

1a. List the three major electrochemical interfaces you know.   **3 marks**

(b). The interface region between two bulk phases usually contains a complex distribution of electric charge. Give four causes or reasons to justify the phenomenon.

                                                                                                     2 marks

(c). Highlight three precautions that influence the conductivity of an electrolyte. **3 marks**

(d). Show how Ilkovic equation can be used for quantitative analysis.   **5 marks**

(e). List four parameters in pharmaceutical products which polarographic technique can be used for.   **2 marks**

(f). Draw a schematic diagram of the Randles circuit   **3marks**

g. Define the following terms: (i) Flux   **2 marks**

(ii) Indicator electrode   **1 mark**

(iii) Galvanic Potential   **2 marks**

h. State the Fick's law of diffusion   **2 marks**

                                                        TOTAL = 25 MARKS

Question 2

2a. State two major components of electrochemistry **2 marks**

2 b. Highlight three major ways by which difference in potential can arise in an electrochemical system **3marks**

2. c. What is 'electric double layer'? **3 marks**

d. Outline the three major subsets of electrochemical compartment **3 marks**

2.e. Given that the standard potential of a Daniel cell is -1.10 V, calculate the equilibrium constant for the cell reaction. **(4 marks)**

TOTAL MARKS =15 MARKS

Question 3

3(a). With the aid of a block diagram, give a brief description of a typical electrochemical instrument which is used for measurement in electrochemistry. **8 marks**

(b). What are the uses of half-wave potential? **3marks**

(c). Mention four essential elements of electrochemical analytical instruments **4marks**

TOTAL = 15 MARKS

Question 4

4 (a). Discuss four factors which affect the half-wave potential **4 marks**

(b). What is the mathematical implication of the Tafel equations if suitable plots are developed for anodic and cathodic polarization? **(3 marks)**

(c) A student passed a constant electric current of 0.15A through a solution of silver nitrate, using pure silver electrodes, for 45 minute exactly. The mass of the anode decreased by 0.45 g. Use this data to evaluate the charge on a mole of electrons, hence the Avogadro's number. [Ag] = 108), F =96485.3 Cmol^{-1}. **(5 marks)**

(d) Outline the two types of polarization and state the causes of the respective polarization. **(3 marks)**

TOTAL = 15 MARKS

Question 5

a) Give a brief description of how potential and current density, Tafel constant for anodic and cathodic polarization can be determined (Given that exchange current density, anodic current, cathodic current are provided) **(9 marks).**

b)   Draw suitable diagram to support your explanation   **(6 marks)**.

T**OTAL = 15 MARKS**