



**DEPARTMENT OF CHEMISTRY
FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA
SECOND SEMESTER EXAMINATION 2018/2019 SESSION**

COURSE CODE: CHM 321

UNITS: 2

COURSE TITLE: ELECTROCHEMISTRY

TIME ALLOWED: 2 HOURS

INSTRUCTION: ANSWER ANY THREE (3) QUESTIONS

1. (a) (i) Explain the term *Transport Number*. (4 Marks)
(ii) State two methods employed in the determination of Transport Number. (2 Marks)
- (b) (i) Explain briefly the procedure for the measurement of conductance of a cell. (6 Marks)
(ii) State four applications of conductance measurements. (4 Marks)
- (c) Calculate the resistance (R) of a solution whose electrolytic conductivity (K) is $5.0 \times 10^{-7} \text{ Sm}^{-1}$ and cell constant is 5.0×10^{-5} . (4 marks)
2. (a) Explain the term *overvoltage*. (4 Marks)
(b) Describe briefly the *overvoltage* exhibited in the deposition of hydrogen. (5 Marks)
(c) What are the consequences of *overvoltage*? (2 Marks)
(d) Consider the cell; $\text{Zn}_{(s)}/\text{H}_2\text{SO}_4 (1\text{M}), \text{ZnSO}_4 (1\text{M})/\text{Zn}_{(s)}$ ($E^\circ_{\text{Zn}} = 0.76\text{V}$, $E^\circ_{\text{H}_2} = 0.00\text{V}$).
Explain why a simultaneous deposition of hydrogen and zinc occurs. (5 Marks)
(e) State four factors which affect hydrogen overvoltage. (4 Marks)
3. (a) Explain the following terms in relation to Debye-Huckel Theory:
(i) Electrophoretic Effect (ii) Asymmetric Effect (6 Marks)
(b) (i) Differentiate between a chemical cell and a concentration cell.
(ii) Draw a diagram representing a chemical cell without transference. (6 Marks)
(c) (i) Define the term *Molar Conductivity* (2 Marks)
(ii) State two factors which determine the quantity of electricity carried by the ions in

solution (2 Marks)

(d) Explain the effect of dilution on the conductivity of
(i) strong electrolyte (ii) weak electrolyte (4 Marks)

4. (a) Explain each of the following types of polarization and ways of minimizing each of them.

(i) Chemical Polarization

(ii) Concentration Polarization (10 Marks)

(b) (i) State Kohlrausch's Law of independent migration/ionic mobility. (2 Marks)

(ii) State four applications of conductance measurements. (2 Marks)

(c) Explain briefly why a voltmeter is unsuitable for the measurement of e.m.f of a cell. (2 marks)

(d) Draw the diagram of the cell represented by the line notation;



(4 Marks)