NATIONAL OPEN UNVERSITY OF NIGERIA
PLOT 91, CADASTRAL ZONE, NNAMDI AZIKIWE EXPRESSWAY, JABI - ABUJA
FACULTY OF SCIENCES
DEPARTMENT OF PURE & APPLIED SCIENCES
2020_2 EXAMINATION

CHM409: ELECTROCHEMISTRY
CREDIT: 2
TIME: 2 HOURS
INSTRUCTION: ANSWER QUESTION ONE & ANY OTHER THREE QUESTIONS.

Question 1

1(a)(i) Explain (with the aid of suitable equation) why ion pair (i.e association of water molecules with ion) can affect conductivity of an electrolyte (4 marks)

(ii) Explain the different classes of iron pair (4 marks)

(b)(i) What is electrodics? (1 mark)

(ii) Explain electrode with respect to their made up (materials used) and positioning in the electrochemical cell. (3 marks)

(iii) What are the two major energy interconversion in electrochemistry? (2 marks)

(iv) What are the basic components of electrochemical cell? (2 marks)

(c) What are the factors that accounts for the difference in potentials in an electrochemical cell? (3 marks)

(d)(i) Explain the process that affects the movement of electrons in electrochemical cell. Use the reaction of H_2 and Cl_2 to explain the concept (6 marks)

Question 2

2.(a) With the aid of a diagram, describe significant in a galvanic cell? (5 marks)

(ii) Consider a cell consisting of Zn and copper electrodes. Describe how each metal would form the different electrodes and how electrons will flow. Hence write the half cell equations and comments on them (7 marks)

(iii) Write the overall cell reaction and cell ntation for the above electrochemical cell (3 marks)

Question 3

3(a)(i) What is electrode potential? (1 mark)

(ii) Use the IUPAC convention (under stated condition) to define electrode potential of a cell and write the formular for calculating electrode potential of a cell when the potentials at the cathode and anode are known and also when one of the electrode is hydrogen electrode (6 marks)

(iii) Write the cell notation for a cell use in measuring the standard (i.e using hydrogen electrode) electrode potential of zinc. Write the half cell reactions and the overall cell reaction (8 marks)

Question 4

4.(a) Calculate the force between two charges of magnitude, 1.2 and 1.6 C separated by a distant of 0.8 m in a medium whose relative permittivity is 78.54 at 298 K (3 marks)

(b) Highlight the different processes that can create a difference in potential in an electrochemical system. (3 marks)

(c) List the three major electrochemical interphases that you know (3 marks)

(d) What is the factor that control the direction and rate of charge transfer? (1 mark)

(e) Why is the study of electrochemical interphase necessary? (2 mark)

(f). State three factors that are responsible for a complex distribution of charge within the interphase region of an electrochemical system? (3 marks)

Question 5

5.(a) Consider the following cell diagram and answer the questions that follow

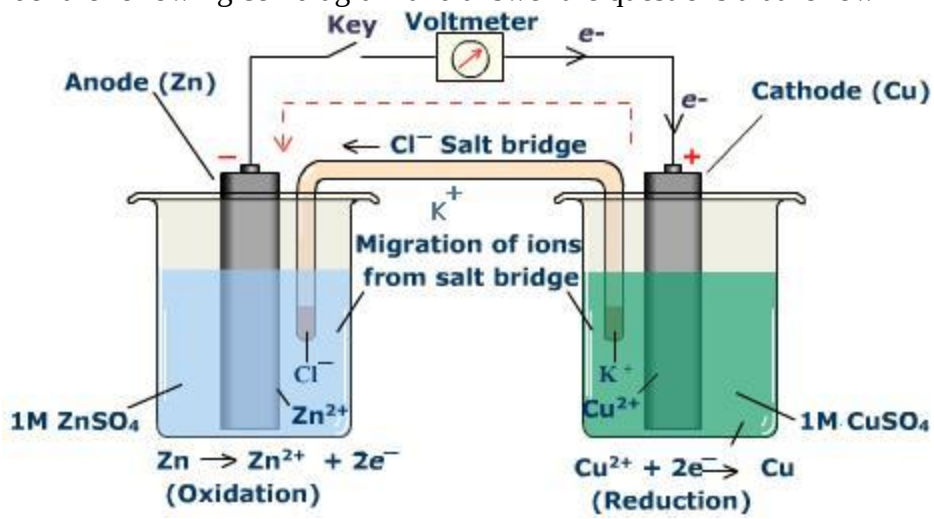

Fig. 1.12: Zinc- copper electrochemical cell

(i) Calculate the standard electrode potential of the cell; E_{cu} = 0.34 V, E_{Zn} = -0.76 V (3 marks)

(ii) Is the cell reaction spontaneous. Give reason for your answer (6 marks)

(b) What are the factors that affect the structure and capacity of an electric double layer (6 marks)