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**University Examinations 2015/2016**

FOURTH YEAR, FIRST SEMESTER EXAMINATION FOR BACHELOR OF SCIENCE CHEMISTRY

**SCH 2401: ELECTROCHEMISTRY**

**DATE: NOVEMBER, 2015 TIME: HOURS**

**INSTRUCTIONS:** *Answer question* ***one*** *and any other* ***two*** *questions.*

**QUESTION ONE – (30 MARKS)**

1. Define the following terms;
2. Transport number of ions (2 Marks)
3. Electrolytic polarization (2 Marks)
4. Coulometer (2 Marks)
5. Sketch the shape of the graph that would be obtained in a conductiometric titration when weak acid is titrated against strong base. Explain the shape of the graph. (5 Marks)
6. Explain the following observations.
7. Electrolytic conductance increases with increase in concentration of an electrolyte while molar conductance decreases. (3 Marks)
8. An increase in field strength or frequency of an alternating current (A.C) cause an increase in the observed conductance decrease. (2 Marks)
9. At 250Ca solution of KCl having conductivity of cm exhibited a resistance of 122.6𝛺 at a particular cell. In the same cell a solution containing 0.05M NaCl has a resistance of 0.002619𝛺. Calculate the;
10. cell constant of for the cell (2 Marks)
11. Electrolytic conductivity of NaCl solution. (2 Marks)
12. Molar conductance of NaCl (2 Marks)
13. (i) State Kohlrausch’s law of independent migration of ions. (2 Marks)

(ii) The molar conductance at infinite dilution for CH3COONa, HCl and NaCl are 91, 426.2 and , respectively. Calculate the molar conductance of acetic acid at infinite dilution. (2 Marks)

1. Distinguish between;
2. Electronic and electrolytic conduction (2 Marks)
3. Strong and weak electrolyte (2 Marks)

**QUESTION TWO (20 MARKS)**

a) Name and give examples of any three types of electrodes. (3 Marks)

b) Describe the experimental method of measuring electrolytic conductivity. (5 Marks)

c) Sketch and discuss a graph showing the variations of conductivity with concentration of ;

1. Strong electrolyte (2 Marks)
2. Weak electrolyte (2 Marks)

d) In a conductivity cell, 0.01N KCl solution gave a resistance of 225.0𝛺 while a 0.01N solution of HCl gave a resistance of 77.1𝛺 .Conductivity of KCl solution is 0.0141. Calculate the;

1. Conductance of HCl (1 Mark)
2. Cell constant (2 Marks)
3. Conductivity of HCl solution (2 Marks)
4. Equivalent conductance and molar conductance of HCl (3 Marks)

**QUESTION THREE (20 MARKS)**

a) Distinguish between voltammetry and potentiometry. (2 Marks)

b) The conductivity of a saturated solution of BaSO4 is 3.06 x cm. The equivalence conductance of BaSO4 at infinite dilution is 146. What is the solubility of BaSO4 at 250C in ;

1. mole per litre (1 Mark)
2. Gram equivalent per litre (2 Marks)
3. Gram per litre (2 Marks)
4. Calculate the solubility product of BaSO4 [BaSO4 =233] (2 Marks)

c) Molar conductance of 0.1M CH3COOH if the molar conductance at infinite dilution is 390.7 S cm2 (3 Marks)

d) (i) Discuss Arrhenius theory of dissociation on molar conductance and its discrepancies.

(8 Marks)

**QUESTION FOUR (20 MARKS)**

1. (i) State two factors influencing transport number. (2 Marks)

(ii) Equivalent conductance of AgNO3 at 250C for infinite dilution is 133.3𝛺. The transport number of Ag+ ion is 0.464 . Calculate the equivalent ionic conductance of Ag+ and at infinite dilution. (4 Marks)

1. State two applications of transport number. (2 Marks)
2. Discuss Debye-Huckel theory of interionic attraction on the variation of conductance.

(7 Marks)

1. (i) What is overpotential? (1 Mark)

(ii) Explain the causes of overpotential. (4 Marks)