JBA-003-010315 Seat No. _____

M. Sc. (Sem. III) (CBCS) Examination

December - 2019

C (PM) - 304 : Physical and Material Chemistry

(Electrochemistry) (Elective - II)

(Old Course)

Faculty Code : 003
Subject Code : 010315

Time : $2\frac{1}{2}$ Hours]   [Total Marks : **70**

Instructions : (1) All questions are compulsory.

(2) All questions carry equal marks.

1   Answer the following : (Any **Seven**)

(a) Define: Conductance, Ampholyte, Aprotic solvent, Transference number.

(b) What is polarization ? Give the causes of polarization.

(c) Discuss the evidences of ionic theory.

(d) What are super conductors ? State the applications of super conductors.

(e) Explain acidity function.

(f) Write Tafel equation and give the significance of all the terms involved in it.

(g) Explain validity of Debye-Huckel-Onsagar equation.

(h) Calculate the ionic mobilities of silver and calcium ions. [Given : $F = 96500$, $\lambda°$ of silver $= 61.92 \times 10^{-4}$ mho m^2 mol^{-1} and $\lambda°$ of calcium $= 119.00 \times 10^{-4}$ mho m^2 mol^{-1}]

(i) Discuss Abnormal transference number.

(j) Explain ionic product of water.

2   Write notes on : (Any **Three**)

(a)   Faraday's laws of electrolysis

(b)   Thickness of diffusion layer in overvoltage.

(c)   Evidences of dipolar ions

(d)   Determination of transference number by moving boundary method.

3   Answer the following :

(a)   Describe the determination of dissociation constant by calorimetric method.

(b)   Discuss the relation between ionic mobility and equivalent conductance. Calculate the ionic mobilities of K^+ and OH^- ions at infinite dilutions.

[Given   : $\lambda^0_{K+} = 73.5 \times 10^{-4}$ mho m^2 mol^{-1} and $\lambda^0_{OH-} = 197.6 \times 10^{-4}$ mho m^2 mol^{-1}]

OR

(a)   Describe the properties of superconductors in detail.

(b)   Explain :

(i)   Different types of solvents and

(ii)   Hydrogen overvoltage

4   Answer the following : (Any **Three**)

(a)   Explain the mechanism of electrolysis.

(b)   Discuss the determination of dissociation constant of ampholytes by approximate method.

(c)   Calculate the molar conductance of HIO_4 at infinite dilution from the following observation data at $25°C$.

[Given   : $\lambda^0_{KIO_4} = 127.92 \times 10^{-4}$ mho $m^2 mol^{-1}$,

$\lambda^0_{HCl} = 426.16 \times 10^{-4}$ mho $m^2 mol^{-1}$ and

$\lambda^0_{KCl} = 149.86 \times 10^{-4}$ mho $m^2 mol^{-1}$]

(d)   Explain Electrolysis of water.

5 Answer the following : (Any **Two**)

(a) Explain the ionic diffusion as slow process in overvoltage.

(b) Explain neutralization curve in detail.

(c) Discuss the effect of solvent on dissociation constant.

(d) Describe the determination of ionic product of water by emf method.

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