Roll No. : Time -
Date : MM - 41

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1. Define specific conductivity (specific conductance). 1

2. Complete: $\Lambda°$ $Na_2SO_4$ = 1

3. What is meant by cell constant? 1

4. The conductivity of 0.20 M KCl at 298 K is 0.025 S $cm^{-1}$. Calculate its molar conductivity. 2

5. The conductivity of 0.001 M acetic acid is $4 \times 10^{-5}$ S $cm^{-1}$. Calculate the dissociation constant of an acid, if molar conductivity at infinite dilution for acetic acid is 390 S $cm^2$ $mol^{-1}$. 2

6. The molar conductivity of 1.5 M solution of an electrolyte is found to be 138.9 S $cm^2$ $mol^{-1}$. Calculate the conductivity of this solution. 2

7. The specific conductivity of 0.40 M solution of KCl at 258 K in $4.96 \times 10^{-2}$ $Scm^{-1}$. Calculate its molar conductivity. 2

8. Conductivity of $2.5 \times 10^{-4}$ M methanoic acid is $5.25 \times 10^{-5}$ S $cm^{-1}$. Calculate its molar conductivity and degree of dissociation. 3
   Given: $\lambda_0(H^+)$ = 349.5 S $cm^2$ $mol^{-1}$ and $\lambda_0(HCOO^-)$ = 50.5 S $cm_2$ $mol^{-1}$.

9. The resistance of 0.01 M KCl solution is 200 ohms. Calculate the specific conductivity and molar conductivity if cell constant is equal to unity. 3

10. When a certain electrolytic cell was filled with 0.1 M KCl, it has resistance of 85 ohms at 25 °C. When the same cell was filled with an aqueous solution of 0.052 M unknown electrolyte, the resistance was 96 ohms. Calculate the molar conductance of the electrolyte at this concentration. 3
    [Specific conductance of 0.1 M KCl = $1.29 \times 10^{-2}$ $ohm^{-1}$ $cm^{-1}$]

11. The electrical resistance of a column of 0.05 mol $L^{-1}$ NaOH solution of diameter 1 cm and length 50 cm is $5.55 \times 10^3$ ohm. Calculate its resistivity, conductivity and molar conductivity. 3

12. A conductivity cell was filled with 0.1 M NaCl solution at 25 °C. Its resistance was found to be 176.6 ohms. The conductivity of the solution is $9.2 \times 10^{-3}$ S $cm^{-1}$. The cross-sectional area of the electrode used was 4 $cm^2$. What must be distance between the electrodes and calculate molar conductivity. 3

13. (a) Define the following terms: 5
    (i) Limiting molar conductivity (ii) Fuel cell
    (b) Resistance of a conductivity cell filled with 0.1 mol $L^{-1}$ KCl solution is 100 Ω. If the resistance of the same cell when filled with 0.02 mol $L^{-1}$ KCl solution is 520 Ω, calculate the conductivity and molar conductivity of 0.02 mol $L^{-1}$ KCl solution. The conductivity of 0.1 mol $L^{-1}$ KCl solution is $1.29 \times 10^{-2}$ $\Omega^{-1}$ $cm^{-1}$.

14. (a) State Kohlrausch law of independent migration of ions. Write an expression for the molar conductivity of acetic acid at infinite dilution according to Kohlrausch law. 5
    (b) Calculate $\Lambda_m^\circ$ for acetic acid.
    Given that $\Lambda_m^\circ$ (HCl) = 426 S $cm^2$ $mol^{-1}$
    $\Lambda_m^\circ$ (NaCl) = 126 S $cm^2$ $mol^{-1}$
    $\Lambda_m^\circ$ ($CH_3COONa$) = 91 S $cm^2$ $mol^{-1}$

15. (a) Define the term conductivity and molar conductivity of the solution of an electrolyte. Comment on its variation with temperature. 5

(b) The measured resistance of conductivity cell was 100 ohms. If 7.45 g of KCl is dissolved per litre of solution. Calculate (i) specific conductance (ii) molar conductance. [ $\frac{l}{A}$ = 1.25 $cm^{-1}$, Molar mass of KCl is 74.5 g $mol^{-1}$]