Multiple Choice Questions

Electric conduction, conductivity and Kohlrausch's law

[MHT-CET 2006]

1. The ionic conductances of Ba^{2+} and Cl^- are respectively 127 and 76 ohm^{-1} cm^2 at infinite dilution. The equivalent conductance (in ohm^{-1} cm^2) of $BaCl_2$ at infinite dilution will be
   a) 139.5 b) 203 c) 279 d) 101.5

[MHT-CET 2013]

2. At 25°C molar conductance of 0.1 molar aqueous solution of ammonium hydroxide is 9.54 ohm^{-1} cm^2 mol^{-1} and at infinite dilution its molar conductance is 238 ohm^{-1} cm^2 mol. The degree of ionization of ammonium hydroxide at the same concentration and temperature is
   a) 2.080% b) 20.80% c) 4.008% d) 40.80%

[MHT-CET 2014]

3. How is electrical conductance of a conductor related with length and area of cross section of the conductor ?
   a) $G = l.a.k^{-1}$ b) $G = k.l.a^{-1}$ c) $G = k.a.l^{-1}$ d) $G = k.l.a^{-2}$

[MHT-CET 2015]

4. Which of the following complexes has lowest molar conductance ?
   a) $CoCl_3 \cdot 3NH_3$ b) $CoCl_3 \cdot 4NH_3$ c) $CoCl_3 \cdot 5NH_3$ d) $CoCl_3 \cdot 6NH_3$

[MHT-CET 2017]

5. What is the SI unit of conductivity ?
   a) S m b) S m^{-1} c) S m^2 d) S m^{-2}

[MHT-CET 2019]

6. The conductivity of an electrolytic solution decreases on dilution due to
   a) increase in number of ions per unit volume
   b) increase in percentage ionization
   c) increase in ionic mobility of ions
   d) decrease in number of ions per unit volume

7. The resistance of $\frac{1}{10}$ M solution is 2.5×10^3 ohm. What is the molar conductivity of solution ? (Cell constant = 1.25 cm^{-1})
   a) 2.5 ohm^{-1} cm^2 mol^{-1} b) 5.0 ohm^{-1} cm^2 mol^{-1}
   c) 2.0 ohm^{-1} cm^2 mol^{-1} d) 3.5 ohm^{-1} cm^2 mol^{-1}

8. The molar conductivities at infinite dilution for sodium acetate, HCl and NaCl are 91 S cm^2 mol^{-1}, 425.9 S cm^2 mol^{-1} and 126.4 S cm^2 mol^{-1} respectively. The molar conductivity of acetic acid at infinite dilution is
   a) 530.9 S cm^2 mol^{-1} b) 390.5 S cm^2 mol^{-1}
   c) 930.5 S cm^2 mol^{-1} d) 300.5 S cm^2 mol^{-1}

9. The molar conductivity of 0.05 M HCl solution is 163.3 Ω^{-1} cm^2 mol^{-1} at 298 K. What is the conductivity of the solution at the same temperature ?
   a) 0.08165 Ω^{-1} cm^{-1} b) 0.8165 Ω^{-1} cm^{-1}
   c) 0.008165 Ω^{-1} cm^{-1} d) 8.165 Ω^{-1} cm^{-1}

[MHT-CET 2020]

10. If the resistivity of 0.1 M KCl solution is 50 Ω cm, what is its molar conductivity ?
a) 160 Ω^{-1} cm^2 mol^{-1} b) 240 Ω^{-1} cm^2 mol^{-1}
c) 290 Ω^{-1} cm^2 mol^{-1} d) 200 Ω^{-1} cm^2 mol^{-1}

11. If the molar conductivities at infinite dilution for NaCl, KCl and KBr are 126, 150 and 152 S cm^2 mol^{-1} respectively, the molar conductivity at infinite dilution for NaBr is
a) 303 S cm^2 mol^{-1} b) 176 S cm^2 mol^{-1} c) 128 S cm^2 mol^{-1} d) 278 S cm^2 mol^{-1}

12. What is the value of cell constant if conductance and conductivity of a solution are same?
a) 10.0 cm^{-1} b) 1.0 cm^{-1} c) 0.5 cm^{-1} d) 0.1 cm^{-1}

13. Which among the following electrical properties has SI unit Siemens per meter ?
a) Conductance b) Resistivity c) Resistance d) Conductivity

14. The conductivity of NaI solution is 6.0×10^{-4} Ω^{-1} cm^{-1} and molar conductivity is 120 Ω^{-1} cm^{-1} mol^{-1}. Calculate the concentration of NaI solution.
a) 0.05 M b) 7.2×10^{-3} M c) 0.005 M d) 2×10^{-2} M

15. The resistance of 0.01 M solution of an electrolyte is 100 Ω at 298 K. What is the conductivity of solution ? (Given : b = 1 cm^{-1})
a) 10^3 ohm^{-1} cm^{-1} b) 10^{-3} ohm^{-1} cm^{-1}
c) 10^{-2} ohm^{-1} cm^{-1} d) 10^2 ohm^{-1} cm^{-1}

16. Resistance of 0.1 M KCl solution in a conductivity cell is 300 ohm and conductivity is 0.013 S cm^{-1}. What is cell constant ?
a) 3.0 cm^{-1} b) 1.5 cm^{-1} c) 4.5 cm^{-1} d) 3.9 cm^{-1}

17. The conductivity of 0.01 M salt solution is 1.061×10^{-4} S cm^{-1}. What is molar conductivity of the solution ?
a) 10.61 Ω^{-1} cm^2 mol^{-1} b) 1.061 Ω^{-1} cm^2 mol^{-1}
c) 106.1 Ω^{-1} cm^2 mol^{-1} d) 1.061×10^{-4} Ω^{-1} cm^2 mol^{-1}

18. What is the unit of electrical conductance ?
a) Ohm b) Siemens c) $Siemens^{-1}$ d) Volt

19. What is the common unit of conductivity if the dimensions are expressed in centimeter?
a) Ω^{-1} cm b) Ω cm^{-1} c) Ω^{-1} cm^{-1} d) Ω cm

20. What is the molar conductivity of 0.1 M NaCl if its conductivity is 1.06×10^{-2} Ω^{-1} cm^{-1}?
a) 1.06×10^2 Ω^{-1} cm^2 mol^{-1} b) 5.3×10^3 Ω^{-1} cm^2 mol^{-1}
c) 1.06×10^{-2} Ω^{-1} cm^2 mol^{-1} d) 9.4×10^{-2} Ω^{-1} cm^2 mol^{-1}

21. What is the conductivity of 0.01 M NaCl solution if resistance and cell constant of NaCl solution are 375 ohms and 0.5 cm^{-1} respectively at 298 K ?
a) 1.333×10^{-4} Ω^{-1} cm^{-1} b) 7.50×10^{-3} Ω^{-1} cm^{-1}
c) 1.875×10^{-3} Ω^{-1} cm^{-1} d) 1.333×10^{-3} Ω^{-1} cm^{-1}

22. Conductivity cell filled with 0.01 M KCl gives a resistance of 484 Ω and conductivity of 0.00141 Ω^{-1} cm^{-1} at 25°C. What is cell constant ?
a) 0.682 cm^{-1} b) 0.751 cm^{-1} c) 0.510 cm^{-1} d) 0.341 cm^{-1}

23. What is the cell constant of $\frac{N}{10}$ KCl solution at 25°C, if conductivity and resistance of the solution are 0.0112 Ω^{-1} cm^{-1} and 55.0 Ω respectively ?
a) 0.616 cm^{-1} b) 0.2 cm^{-1} c) 0.491 cm^{-1} d) 2.0 cm^{-1}

24. What is the molar conductivity at infinite dilution of $CaCl_2$, if the molar conductivity of Ca^{2+} ion and Cl^- ion at infinite dilution is 119 and 71 Ω^{-1} cm^2 mol^{-1} ?
a) 126.0 Ω^{-1} cm^2 mol^{-1} b) 261.0 Ω^{-1} cm^2 mol^{-1}
c) 341.0 Ω^{-1} cm^2 mol^{-1} d) 431.0 Ω^{-1} cm^2 mol^{-1}

25. If the conductivity of 0.08 M KCl solution is 2×10^{-2} Ω^{-1}, what is the molar conductivity of the solution ?
a) 350 Ω^{-1} cm^2 mol^{-1} b) 25.0 Ω^{-1} cm^2 mol^{-1}
c) 250 Ω^{-1} cm^2 mol^{-1} d) 0.25 Ω^{-1} cm^2 mol^{-1}

26. What is the relation between cell constant, conductivity and electrical resistance ?
a) $k = \frac{b}{R}$ b) $k = R.b$ c) $k = \frac{R}{b}$ d) $k = \frac{1}{R.b}$

27. What will be the concentration of NaCl solution, if the molar conductivity and conductivity of NaCl solution are 124.3 Ω^{-1} cm^2 mol^{-1} and 1.243×10^{-4} Ω^{-1} cm^{-1} respectively ?
a) 0.01 mol L^{-1} b) 0.02 mol L^{-1} c) 0.1 mol L^{-1} d) 0.001 mol L^{-1}

28. The distance between electrodes of a conductivity cell is 0.98 cm and area of cross section is 1.96 cm^2. What is the cell constant ?
a) 2 cm^{-1} b) 1.5 cm^{-1} c) 0.5 cm^{-1} d) 1 cm^{-1}

29. Molar conductivity of 0.01 M HCl solution is 400.0 Ω^{-1} cm^2 mol^{-1}. Calculate the conductivity of HCl solution.
a) 2.5×10^{-2} Ω^{-1} cm^{-1} b) 4.0×10^{-3} Ω^{-1} cm^{-1}
c) 8.0×10^{-2} Ω^{-1} cm^{-1} d) 4.0×10^{-4} Ω^{-1} cm^{-1}

30. Conductivity of a conductor is
a) inverse of resistance b) inverse of conductance
c) inverse of resistivity d) equal to resistivity

31. What is the molar conductivity of 0.4 M solution of KCl if its resistivity is 2.5×10^{-3} Ω cm ?
a) 2.1×10^3 Ω^{-1} cm^2 mol^{-1} b) 1.0×10^5 Ω^{-1} cm^2 mol^{-1}
c) 1.0×10^6 Ω^{-1} cm^2 mol^{-1} d) 2.1×10^4 Ω^{-1} cm^2 mol^{-1}

32. What is the molar conductivity of 0.1 M NaCl solution if its conductivity is 1.01×10^{-2} Ω^{-1} cm^{-1} ?
a) 1.01×10^{-2} Ω^{-1} cm^2 mol^{-1} b) 1.01×10^{-4} Ω^{-1} cm^2 mol^{-1}
c) 1.01×10^4 Ω^{-1} cm^2 mol^{-1} d) 1.01×10^2 Ω^{-1} cm^2 mol^{-1}

33. A conductivity cell dipped in 0.5 M KCl gives a resistance of 250 ohms. If the conductivity of KCl solution is 6.68×10^{-3} S cm^{-1}, what is the cell constant ?
a) 1.67 cm^{-1} b) 0.364 cm^{-1} c) 0.810 cm^{-1} d) 0.270 cm^{-1}

34. A conductivity cell dipped in 0.01 M $AgNO_3$ solution gives a resistance of 3160 ohms. If cell constant is 0.47 cm^{-1}, what is the conductivity of $AgNO_3$ solution ?
a) 6.723×10^{-2} Ω^{-1} cm^{-1} b) 1.487×10^{-2} Ω^{-1} cm^{-1}
c) 1.487×10^{-4} Ω^{-1} cm^{-1} d) 7.10×10^{-2} Ω^{-1} cm^{-1}

35. The conductivity of 0.02 M NaCl solution is 2.04×10^{-4} Ω^{-1} cm^{-1}. What is its molar conductivity ? **[MHT-CET 2021]**
a) 8.16 Ω^{-1} cm^2 mol^{-1} b) 10.22 Ω^{-1} cm^2 mol^{-1}
c) 12.24 Ω^{-1} cm^2 mol^{-1} d) 4.08 Ω^{-1} cm^2 mol^{-1}

62. What is the conductivity of 0.02 M HCl solution if molar conductivity of the solution at 25°C is 412.3 Ω^{-1} cm^{-1} mol^{-1} ?

a) 8.880×10^{-3} Ω^{-1} cm^{-1} b) 8.414×10^{-3} Ω^{-1} cm^{-1}

c) 8.624×10^{-3} Ω^{-1} cm^{-1} d) 8.246×10^{-3} Ω^{-1} cm^{-1}

[MHT-CET 2022]

63. What is the change in potential of following cell $Zn_{(s)} \mid Zn^{2+}(1M) \mid\mid Pb^{2+}(1M) \mid Pb_{(s)}$ if concentration of ions at anode is increased 10 times ?

a) Decreases by 0.0296 volt b) Increases by 0.0296 volt

c) Increases by 10 volt d) Decreases by 10 volt

64. What is the SI unit of molar conductivity ?

a) S dm^3 mol^{-1} b) S m^2 mol^{-1} c) S cm^2 mol^{-1} d) S m^2

65. Which among the following concentrations of KCl solution is not used to determine cell constant of conductivity cell ?

a) 1.0 M KCl b) 0.01 M KCl c) 0.1 M KCl d) saturated KCl

66. The conductivity of 0.20 M KCl solution at 300 K is 0.0248 Ω^{-1} cm^{-1}. What is its molar conductivity ?

a) 62 Ω^{-1} cm^2 mol^{-1} b) 186 Ω^{-1} cm^2 mol^{-1}

c) 124 Ω^{-1} cm^2 mol^{-1} d) 93 Ω^{-1} cm^2 mol^{-1}

67. Calculate molar conductivity at infinite dilution for NaBr if molar conductivities at infinite dilution for NaCl, KBr and KCl are 126, 152 and 150 Ω^{-1} cm^2 mol^{-1}.

a) 128 Ω^{-1} cm^2 mol^{-1} b) 176 Ω^{-1} cm^2 mol^{-1}

c) 278 Ω^{-1} cm^2 mol^{-1} d) 302 Ω^{-1} cm^2 mol^{-1}

68. For which of the following electrolytes, Kohlrausch law of independent migration of ions is used to calculate molar conductivity at zero concentration ?

a) Na_2SO_4 b) NH_4OH c) KCl d) $NaNO_3$

69. The resistance of a conductivity cell containing 0.001 M KCl solution at 300 K is 150 Ω. What is the cell constant if conductivity of KCl solution is 1.5×10^{-3} Ω^{-1} cm^{-1} ?

a) 0.337 cm^{-1} b) 0.225 cm^{-1} c) 0.112 cm^{-1} d) 0.450 cm^{-1}

70. A conductivity cell has two electrodes 18 mm apart and having cross sectional area 2.0 cm^2. What is the value of cell constant ?

a) 3.6 cm^{-1} b) 0.2 cm^{-1} c) 0.18 cm^{-1} d) 0.9 cm^{-1}

71. What is the SI unit of conductivity ?

a) Ω^{-1} cm b) Ω^{-1} cm^{-1} c) Ω cm^{-1} d) Ω^{-1} cm^2 mol^{-1}

72. What is the value of conductivity of 0.01 M solution of an electrolyte having molar conductivity 141 Ω^{-1} cm^2 mol^{-1} ?

a) 7.09×10^{-3} Ω^{-1} cm^{-1} b) 4.23×10^{-3} Ω^{-1} cm^{-1}

c) 1.41×10^{-3} Ω^{-1} cm^{-1} d) 5.64×10^{-3} Ω^{-1} cm^{-1}

73. Molar conductivity of 0.01 M CH_3COOH is 19.5 Ω^{-1} cm^2 mol^{-1}. Calculate the degree of dissociation if molar conductivity at zero concentration is 390 Ω^{-1} cm^2 mol^{-1}.

a) 0.08 b) 0.2 c) 0.6 d) 0.05

74. Calculate the molar conductivity of $CH_2ClCOOH$ at zero concentration if molar conductivities of HCl, KCl and $CH_2ClCOOK$ at zero concentration are 4.2, 1.4 and 1.1 Ω^{-1} cm^2 mol^{-1} respectively

a) 1.1 Ω^{-1} cm^2 mol^{-1} b) 4.5 Ω^{-1} cm^2 mol^{-1}

c) 3.9 Ω^{-1} cm^2 mol^{-1} d) 6.6 Ω^{-1} cm^2 mol^{-1}

86. What is the conductivity of 0.01 M KCl solution if its resistance is 600 ohm and cell constant is 0.9 cm^{-1} ?

a) $1.5 \times 10^{-3}\ \Omega^{-1}\ cm^{-1}$ b) $1.2 \times 10^{-3}\ \Omega^{-1}\ cm^{-1}$

c) $1.0 \times 10^{-3}\ \Omega^{-1}\ cm^{-1}$ d) $1.8 \times 10^{-3}\ \Omega^{-1}\ cm^{-1}$

87. If k_{KCl} is conductivity of standard KCl solution and R_{KCl} is its resistance then cell constant is given by

a) Cell constant = $\frac{R_{KCl}}{k_{KCl}}$ b) Cell constant = $k_{KCl} \times R_{KCl}$

c) Cell constant = $\frac{k_{KCl}}{R_{KCl}}$ d) Cell constant = $\frac{R_{KCl} + k_{KCl}}{2}$

88. The molar conductivity of 0.2 M $BaCl_2$ solution at 25°C is 124 $\Omega^{-1}\ cm^2\ mol^{-1}$. What is its conductivity ?

a) $2.24 \times 10^{-2}\ \Omega^{-1}\ cm^{-1}$ b) $2.48 \times 10^{-2}\ \Omega^{-1}\ cm^{-1}$

c) $3.72 \times 10^{-2}\ \Omega^{-1}\ cm^{-1}$ d) $1.24 \times 10^{-2}\ \Omega^{-1}\ cm^{-1}$

Electrolytic cells and quantitative aspects of electrolysis

[MHT-CET 2015]

89. The overall reaction taking place at anode during electrolysis of fused sodium chloride using suitable electrode is

a) Oxidation of chlorine b) Reduction of sodium ions

c) Reduction of chlorine d) Oxidation of sodium atoms

[MHT-CET 2016]

90. How many faradays of electricity are required to deposit 10 g of calcium from molten calcium chloride using inert electrodes ? (Molar mass of calcium = 40 g mol^{-1})

a) 0.5 F b) 1 F c) 0.25 F d) 2 F

91. In the cell represented by $Pb_{(s)} | Pb^{2+}_{(1M)} || Ag^{+}_{(1M)} | Ag_{(s)}$, the reducing agent is

a) Pb b) Pb^{2+} c) Ag d) Ag^{+}

92. In dry cell, what acts as negative electrode ?

a) Zinc b) Graphite

c) Ammonium chloride d) Manganese dioxide

[MHT-CET 2017]

93. Which among the following equations represents the reduction reaction taking place in lead accumulator at positive electrode, while it is being used as a source of electrical energy ?

a) $Pb \rightarrow Pb^{2+}$ b) $Pb^{4+} \rightarrow Pb$ c) $Pb^{2+} \rightarrow Pb$ d) $Pb^{4+} \rightarrow Pb^{2+}$

[MHT-CET 2018]

94. The number of moles of electrons passed when current of 2 A is passed through a solution of electrolyte for 20 minutes is

a) 4.1×10^{-4} mol e^- b) 1.24×10^{-2} mol e^-

c) 2.487×10^{-2} mol e^- d) 2.487×10^{-1} mol e^-

95. What is the density of solution of sulphuric acid used as an electrolyte in lead accumulator ?

a) 1.5 g mL^{-1} b) 1.2 g mL^{-1} c) 1.8 g mL^{-1} d) 2.0 g mL^{-1}