Exercise - I (Conceptual Questions) Build Up Your Understanding

ELECTROLYTIC CONDUCTANCE

1. Strong electrolytes are those which :
(1) Dissolve readily in water
(2) Conduct electricity
(3) Dissociate into ions even at high concentration
(4) Dissociate into ions at high dilution.

CEL001

2. Molten sodium chloride conducts electricity due to the presence of :
(1) Free electrons
(2) Free ions
(3) Free molecules
(4) free atoms of Na and Cl

CEL002

3. Electrolytic conduction is due to the movement of:
(1) Molecules (2) Atoms
(3) Ions (4) Electrons

CEL003

4. Which of the following solutions of KCl has the lowest value of equivalent conductance ?
(1) 1 M (2) 0.1 M
(3) 0.01 M (4) 0.001 M

CEL004

5. If the specific resistance of a solution of concentration C geq L^{-1} is R, then its equivalent conductance is :
(1) $\frac{100R}{C}$ (2) $\frac{RC}{1000}$
(3) $\frac{1000}{RC}$ (4) $\frac{C}{1000R}$

CEL005

6. The specific conductances in ohm^{-1} cm^{-1} of four electrolytes P, Q, R and S are given in brackets:
P (5.0×10^{-5}) Q (7.0×10^{-8})
R (1.0×10^{-10}) S (9.2×10^{-3})
The one that offers highest resistance to the passage of electric current is
(1) P (2) S
(3) R (4) Q

CEL006

7. The specific conductance of a salt of 0.01M concentration is 1.061×10^{-4} S cm^{-1}. Molar conductance of the same solution will be :
(1) 1.061×10^{-4} S cm^2 mol^{-1}
(2) 1.061 S cm^2 mol^{-1}
(3) 10.61 S cm^2 mol^{-1}
(4) 106.1 S cm^2 mol^{-1}

CEL007

8. Which statement is not correct :–
(1) Conductance of an electrolytic solution increases with dilution
(2) Conductance of an electrolytic solution decreases with dilution
(3) Specific conductance of an electrolytic solution decreases with dilution
(4) Equivalent conductance of an electrolytic solution increases with dilution.

CEL008

9. The resistance of 0.01 N solution of an electrolyte was found to be 210 ohm at 298 K using a conductivity cell of cell constant 0.66 cm^{-1}. The equivalent conductance of solution is :–
(1) 314.28 mho cm^2 eq^{-1}
(2) 3.14 mho cm^2 eq^{-1}
(3) 314.28 mho^{-1} cm^2 eq^{-1}
(4) 3.14 mho^{-1} cm^2 eq^{-1}

CEL009

10. Electrolytic conduction differs from metallic conduction from the fact that in the former
(1) The resistance increases with increasing temperature
(2) The resistance decreases with increasing temperature
(3) The resistance remains constant with increasing temperature
(4) The resistance is independent of the length of the conductor

CEL010

11. The specific conductance of a 0.01 M solution of KCl is 0.0014 ohm^{-1} cm^{-1}at 25° C. Its equivalent conductance (cm^2 ohm^{-1} eq^{-1}) is :–

(1) 140 (2) 14 (3) 1.4 (4) 0.14

CEL011

12. Which one of the following is wrong :–

(1) Specific conductance increases on dilution.

(2) Specific conductance decreases on dilution.

(3) Equivalent conductance increases on dilution.

(4) Molar conductance increases on dilution.

CEL012

KOHLRAUSCH LAW

13. At infinite dilution, the equivalent conductances of CH_3COONa, HCl and CH_3COOH are 91, 426 and 391 mho cm^2 eq^{-1} respectively at 25°C. The eq. conductance of NaCl at infinite dilution will be :

(1) 126 (2) 209 (3) 391 (4) 908

CEL013

14. For HCl solution at 25°C, equivalent conductance at infinite dilution is 425 ohm^{-1} cm^2 eq^{-1}. The specific conductance of a solution of HCl is 3.825 ohm^{-1} cm^{-1}. If the degree of dissociation is 90%, the normality of the solution is :-

(1) 0.90 N (2) 1.0 N (3) 10 N (4) 1.2 N

CEL014

15. The molar conductivities $\wedge^0_{NaOAc}$ and $\wedge^0_{HCl}$ at infinite dilution in water at 25°C are 91.0 and 426.2 S cm^2 mol^{-1} respectively. To calculate $\wedge^0_{HOAc}$ the additional value required is :

(1) $\wedge^0_{NaCl}$ (2) $\wedge^0_{H_2O}$

(3) $\wedge^0_{KCl}$ (4) $\wedge^0_{NaOH}$

CEL015

16. The molar conductance of $AgNO_3$, AgCl and NaCl at infinite dilution are 116.5, 121.6 and 110.3 S cm^2 mol^{-1} respectively. The molar conductance of $NaNO_3$ is :

(1) 111.4 S cm^2 mol^{-1} (2) 105.2 S cm^2 mol^{-1}

(3) 130.6 S cm^2 mol^{-1} (4) 150.2 S cm^2 mol^{-1}

CEL016

17. The conductivity of a saturated solution of $BaSO_4$ is 3.06×10^{-6} ohm^{-1} $cm^{-1}$and its molar conductance is 1.53 ohm^{-1} cm^2 mol^{-1}. The K_{sp} of $BaSO_4$ will be

(1) 4×10^{-12} (2) 2.5×10^{-9}

(3) 2.5×10^{-13} (4) 4×10^{-6}

CEL017

18. Kohlrausch's law states that at :-

(1) Infinite dilution, each ion makes definite contribution to conductance of an electrolyte whatever be the nature of the other ion of the electrolyte.

(2) Infinite dilution, each ion makes definite contribution to equivalent conductance of an electrolyte whatever be the nature of the other ion of the electrolyte.

(3) Finite dilution, each ion makes definite contribution to equivalent conductance of an electrolyte whatever be the nature of the other ion of the electrolyte.

(4) Infinite dilution, each ion makes definite contribution to equivalent conductance of an electrolyte depending on the nature of the other ion of electrolyte.

CEL018

GALVANIC CELL

19. In the galvanic cell

$Cu(s)\,|Cu^{2+}\,(1\,M)\,||\,Ag^{+}\,(1\,M)\,|\,Ag(s)$; the electrons will travel in the external circuit :

(1) From Ag to Cu

(2) From Cu to Ag

(3) Electrons do not travel in the external circuit

(4) In any direction

CEL019

20. The direction of current in the Daniell cell when Zn and Cu electrodes are connected is :

(1) From Cu to Zn in the cell

(2) From Cu to Zn outside the cell

(3) From Zn to Cu outside the cell

(4) In any direction in the cell

CEL020

21. The equation representing the process by which standard reduction potential of zinc can be defined is
(1) $Zn^{2+}(s) + 2e^- \longrightarrow Zn(s)$
(2) $Zn(g) \longrightarrow Zn^{2+}(g) + 2e^-$
(3) $Zn^{2+}(g) + 2e^- \longrightarrow Zn(s)$
(4) $Zn^{2+}(aq.) + 2e^- \longrightarrow Zn(s)$
CEL021

22. A standard hydrogen electrode has zero electrode potential because :
(1) Hydrogen is easiest to oxidize.
(2) This electrode potential is assumed to be zero.
(3) Hydrogen atom has only one electron.
(4) Hydrogen is the lightest element.
CEL022

23. Which is not true for a standard hydrogen electrode ?
(1) The hydrogen ion concentration is 1 M.
(2) Temperature is 25°C.
(3) Pressure of hydrogen is 1 bar.
(4) It contains a metallic conductor which does not adsorb hydrogen.
CEL023

24. E° for the half cell
Zn^{2+} | Zn is –0.76 V. E.M.F. of the cell
Zn | Zn^{2+} (1M) || H^+ (1M) | H_2 (1 atm) is :
(1) –0.76 V (2) +0.76 V
(3) –0.38 V (4) + 0.38 V
CEL024

25. $Cu(s)|Cu^{+2}(1\ M)|Zn^{+2}(1\ M)|Zn(s)$
A cell represented above should have emf.
(1) Positive
(2) Negative
(3) Zero
(4) Cannot be predicted
CEL025

26. Given electrode potentials :
$Fe^{3+} + e \longrightarrow Fe^{2+}$; E° = 0.771 V
$I_2 + 2e \longrightarrow 2I^-$; E° = 0.536 V
$E°_{cell}$ for the cell reaction
$2Fe^{3+} + 2I^- \rightarrow 2Fe^{2+} + I_2$ is -
(1) (2 × 0.771 – 0.536) = 1.006 V
(2) (0.771 – 0.5 × 0.536) = 0.503 V
(3) 0.771 – 0.536 = 0.235 V
(4) 0.536 – 0.771 = –0.235 V
CEL026

27. Which of the following is not an anodic half reaction:-
(1) $Ag^+ \rightarrow Ag - e^-$
(2) $Cu \rightarrow Cu^{2+} + 2e^-$
(3) $Fe^{2+} \rightarrow Fe^{3+} + e^-$
(4) $4OH^- \rightarrow 2H_2O + O_2 + 4e^-$
CEL027

28. Which of the following statements is correct :–
(1) Oxidation occurs at anode in both galvanic and electrolytic cell.
(2) Reduction occurs at anode in both galvanic and electrolytic cell
(3) Reduction occurs at anode in electrolytic cell whereas oxidation occurs at cathode in galvanic cell
(4) Oxidation occurs at anode in electrolytic cell whereas reduction occurs at anode in a galvanic cell,
CEL028

29. Other things being equal, the life of a Daniell cell may be increased by :–
(1) Keeping low temperature
(2) Using large copper electrode
(3) Decreasing concentration of copper ions
(4) Using large zinc electrodes
CEL029

ELECTROCHEMICAL SERIES

30. Zn can not displace following ions from their aqueous solution :-
(1) Ag^+ (2) Cu^{2+} (3) Fe^{2+} (4) Na^+
CEL030

31. The standard reduction potentials at 25 °C for the following half reactions are given against each :-
$Zn^{2+}(aq) + 2e^- \rightarrow Zn(s)$, –0.762 V
$Cr^{3+}(aq) + 3e^- \rightarrow Cr(s)$, –0.740 V
$2H^+ + 2e^- \rightarrow H_2(g)$, 0.00 V
$Fe^{3+} + 2e^- \rightarrow Fe^{2+}$, 0.77 V
Which is the strongest reducing agent ?
(1) Zn (2) Cr
(3) $H_2(g)$ (4) $Fe^{2+}(aq)$
CEL031

32. Using the standard electrode potential values given below, decide which of the statements, I, II, III and IV are correct. Choose the right answer from (1), (2), (3) and (4).

$Fe^{2+} + 2e^- \rightarrow Fe$; $E° = -0.44$ V

$Cu^{2+} + 2e^- \rightarrow Cu$; $E° = +0.34$ V

$Ag^+ + e^- \rightarrow Ag$; $E° = +0.80$ V

I. Copper can displace iron from $FeSO_4$ solution.

II. Iron can displace copper from $CuSO_4$ solution.

III. Silver can displace copper from $CuSO_4$ solution.

IV. Iron can displace silver from $AgNO_3$ solution.

(1) I and II (2) II and III

(3) II and IV (4) I and IV

CEL032

33. The standard electrode potentials for the elements A, B and C are 0.68, –2.50 and 0.50 V respectively. The order of their reducing power is :

(1) A > B > C (2) A > C > B

(3) C > B > A (4) B > C > A

CEL033

34. The oxidation potential of Zn, Cu, Ag, H_2 and Ni electrodes are 0.76 V, –0.34 V, –0.80 V, 0 V, 0.55 V respectively. Which of the following reaction will provide maximum voltage ?

(1) $Zn + Cu^{2+} \longrightarrow Cu + Zn^{2+}$

(2) $Zn + 2Ag^+ \longrightarrow 2Ag + Zn^{2+}$

(3) $H_2 + Cu^{2+} \longrightarrow 2H^+ + Cu$

(4) $H_2 + Ni^{2+} \longrightarrow 2H^+ + Ni$

CEL034

35. The standard reduction potential at 25°C of Li^+/Li, Ba^{2+}/Ba, Na^+/Na and Mg^{2+}/Mg are –3.05V, –2.73V, –2.71V and –2.37V respectively. Which one of the following is the strongest oxidising agent ?

(1) Na^+ (2) Li^+

(3) Ba^{2+} (4) Mg^{2+}

CEL035

36. A gas X at 1 atm is bubbled through a solution containing a mixture of 1 M Y^- and 1 M Z^- at 25°C. If the reduction potential of $(Z/Z^-) > (Y/Y^-) > (X/X^-)$ then :

(1) Y will oxidise X^- and not Z^-

(2) Y will oxidise Z^- and not X^-

(3) Y will oxidise both X^- and Z^-

(4) Y will reduce both X^- and Z^-

CEL036

37. The standard electrode potential of Zn, Ag and Cu electrodes are –0.76 V, 0.80 V and 0.34 V respectively, then :

(1) Ag can oxidise Zn and Cu

(2) Ag can reduce Zn^{2+} and Cu^{2+}

(3) Zn can reduce Ag^+ and Cu^{2+}

(4) Cu can oxidise Zn and Ag

CEL037

38. Standard reduction potentials of four metal electrodes are

A = – 0.250 V, B = – 0.140 V

C = – 0.126 V, D = – 0.402 V

The metal that displaces A from aqueous solution of its compounds is :-

(1) B (2) C

(3) D (4) None of the above

CEL038

39. The following four colourless salt solutions are placed in separate test tubes and a strip of Cu is placed in each solution. Which solution finally turns blue :–

(1) $Zn(NO_3)_2$ (2) $Mg(NO_3)_2$

(3) KNO_3 (4) $AgNO_3$

CEL039

40. Which of the following displacement does not occur

(1) $Zn + 2H^+ \rightarrow Zn^{2+} + H_2 \uparrow$

(2) $Fe + 2Ag^+ \rightarrow Fe^{2+} + Ag \downarrow$

(3) $Cu + Fe^{2+} \rightarrow Cu^{2+} + Fe \downarrow$

(4) $Zn + Pb^{2+} \rightarrow Zn^{2+} + Pb \downarrow$

CEL040

41. On the basis of the following E° values, the strongest oxidizing agent is :-
$[Fe(CN)_6]^{4-} \rightarrow [Fe(CN)_6]^{3-} + e^-$, E° = –0.35 V
$Fe^{2+} \rightarrow Fe^{3+} + e^-$; E° = –0.77 V
(1) Fe^{3+} (2) $[Fe(CN)_6]^{3-}$
(3) $[Fe(CN)_6]^{4-}$ (4) Fe^{2+}

CEL041

NERNST EQUATION

42. $E°(Ni^{2+}/Ni)$ = –0.25 V
$E°(Au^{3+} / Au)$ = 1.50 V
The emf of the voltaic cell.
$Ni \mid Ni^{2+}$ (1.0 M) || Au^{3+} (1.0 M) | Au is :
(1) 1.25 V (2) –1.75 V
(3) 1.75 V (4) 4.0 V

CEL042

43. The emf of the cell Tl(s) | Tl^+ (0.0001 M) || Cu^{2+} (0.01M) | Cu(s) is 0.83 V. The emf of this cell will be increased by :–
(1) Increasing the concentration of Cu^{+2} ions
(2) Decreasing the concentration of Tl^+
(3) Increasing the concentration of both
(4) (1) & (2) both

CEL043

44. Which of the following represents the electrode potential of silver electrode dipped into 0.1 M $AgNO_3$ solution at 25° C ?
(1) $E°_{red}$ (2) $(E°_{red} + 0.059)$
(3) $(E°_{ox} - 0.059)$ (4) $(E°_{red} - 0.059)$

CEL044

45. The electrode potential of a hydrogen electrode dipped in solution of pH = 1 is
(1) 0.059 V (2) 0.00 V
(3) –0.059 V (4) 0.59 V

CEL045

46. Consider the reaction
$Cl_2(g) + 2Br^-(aq) \longrightarrow 2Cl^-(aq) + Br_2(\ell)$
The emf of the cell when
$[Cl^-] = [Br^-]$ = 0.01 M and Cl_2 gas at 0.25 atm pressure will be (E° for the above reaction is = 0.29 V)
(1) 0.54 V (2) 0.272 V
(3) 0.29 V (4) –0.29 V

CEL046

47. The standard emf for the cell reaction
$Zn + Cu^{2+} \longrightarrow Zn^{2+} + Cu$ is 1.10 V at 25°C. The emf for the cell reaction when 0.1 M Cu^{2+} and 0.1 M Zn^{2+} solution are used at 25°C is :
(1) 1.10 V (2) 0.110 V
(3) –1.10 V (4) –0.110 V

CEL047

48. E° for $F_2 + 2e^- \rightarrow 2F^-$ is 2.8 V,
E° for $\frac{1}{2}F_2 + e^- \rightarrow F^-$ is ?
(1) 2.8 V (2) 1.4 V
(3) –2.8 V (4) –1.4 V

CEL048

49. How much will the potential of Zn | Zn^{2+} change if the solution of Zn^{2+} is diluted 10 times
(1) Increases by 0.03 V
(2) Decreases by 0.03 V
(3) Increases by 0.059 V
(4) Decreases by 0.059 V

CEL049

50. How much will the potential of a hydrogen electrode change when its solution initially at pH = 0 is neutralised to pH = 7 ?
(1) Increases by 0.059 V
(2) Decreases by 0.059 V
(3) Increases by 0.41 V
(4) Decreases by 0.41 V

CEL050

51. Which of the following will increase the voltage of the cell with following cell reaction
$Sn(s) + 2Ag^+(aq) \rightarrow Sn^{+2}(aq) + 2Ag(s)$
(1) Increase in the size of silver rod
(2) Increase in the concentration of Sn^{+2} ions
(3) Increase in the concentration of Ag^+ ions
(4) Decrease in the concentration of Ag^+ ions

CEL051

52. E° for the reaction $Fe + Zn^{2+} \rightarrow Zn + Fe^{2+}$ is –0.35 V. The given cell reaction is :
(1) Spontaneous
(2) Non-spontaneous
(3) In equilibrium
(4) Can't say anything

CEL052

53. For a reaction – $A(s) + 2B^+ \rightleftharpoons A^{2+} + 2B(s)$; K_C has been found to be 10^{12}. The $E°_{cell}$ is:
(1) 0.354 V (2) 0.708 V
(3) 0.0098 V (4) 1.36 V
CEL053

54. The standard electrode potential (E°) for OCl^-/Cl^- and $Cl^- / ½\ Cl_2$ respectively are 0.94 V and –1.36 V. The E° value of $OCl^- / ½\ Cl_2$ will be :
(1) –2.20 V (2) –0.42 V
(3) 0.52 V (4) 1.04 V
CEL054

55. The hydrogen electrode is dipped in a solution of pH = 3 at 25°C. The electrode potential of the half cell would be :
(1) 0.177 V (2) – 0.177 V
(3) 0.087 V (4) 0.059 V
CEL055

56. What is the potential of the cell containing two hydrogen electrodes as represented below
$Pt, H_2(g) \mid H^+(10^{-8}\ M) \parallel H^+(0.001\ M) \mid H_2(g), Pt;$
(1) – 0.295 V (2) – 0.0591 V
(3) 0.295 V (4) 0.0591 V
CEL056

57. Consider the cell $Cu|Cu^{+2} \parallel Ag^+|Ag$. If the concentration of Cu^{+2} and Ag^+ ions becomes ten times, then the emf of the cell will :–
(1) Becomes 10 times
(2) Remains same
(3) Increases by 0.0295 V
(4) Decreases by 0.0295 V
CEL057

58. The emf of the cell
$Ni|Ni^{+2}\ (1.0\ M) \mid\mid Au^{+3}\ (0.1M) |Au$
[$E°$ for $Ni^{+2}|Ni = –0.25$ V,
$E°$ for $Au^{+3}|Au = 1.50$ V] is given as:-
(1) 1.25 V (2) – 1.75 V
(3) 1.78 V (4) 1.73 V
CEL058

59. The equilibrium constant (in approx) of the cell reaction :
$Cu(s) + 2Ag^+(aq.) \rightleftharpoons Cu^{+2}(aq.) + 2Ag(s)$
if $E°_{cell} = 0.465$ V at 298 K is :-
(1) 2.0×10^{10} (2) 3.16×10^{12}
(3) 3.16×10^{15} (4) 4×10^{10}
CEL059

60. The emf of the cell in which the following reaction
$Zn(s) + Ni^{2+}\ (a = 0.1) \rightleftharpoons Zn^{2+}(a = 1.0) + Ni(s)$
occurs, is found to be 0.5105 V at 298 K. The standard e.m.f. of the cell is :-
(1) –0.5105 V (2) 0.5400 V
(3) 0.4810 V (4) 0.5696 V
CEL060

61. If $E^o_{Fe^{+2}/Fe} = -0.441$V and $E^o_{Fe^{+3}/Fe^{+2}} = 0.771$V the standard EMF of the reaction $Fe + 2Fe^{+3} \rightarrow 3Fe^{+2}$ will be :
(1) 0.330 V (2) 1.653 V
(3) 1.212 V (4) 0.111 V
CEL061

ELECTROLYSIS

62. When an electric current is passed through acidified water, 112 mL of hydrogen gas at STP collects at the cathode in 965 s. The current passed in ampere is :
(1) 1.0 (2) 0.5 (3) 0.1 (4) 2.0
CEL062

63. Two electrolytic cells one containing acidified ferrous chloride and another acidified ferric chloride are connected in series. The ratio of iron deposited at cathodes in the two cells when electricity is passed through the cells will be :
(1) 3 :1 (2) 2 : 1 (3) 1 : 1 (4) 3 : 2
CEL063

64. A current of 9.65 A flowing for 10 minute deposits 3.0 g of a metal. The equivalent weight of the metal is :
(1) 10 (2) 30 (3) 50 (4) 96.5
CEL064

65. How many coulombs of electric charge are required for the oxidation of 1 mol of H_2O to O_2 ?
(1) 9.65×10^4 C (2) 4.825×10^5 C
(3) 1.93×10^5 C (4) 1.93×10^4 C
CEL065

66. On passing 10800 C through electrolytic solution, 2.977 g of metal (atomic mass 106.4 g mol^{-1}) was deposited, the charge on the metal cation is -
(1) +4 (2) +3 (3) +2 (4) +1
CEL066

67. On passing electricity through dilute H_2SO_4 solution the amount of substance liberated at the cathode and anode are in the ratio :
(1) 1 : 8 (2) 8 : 1
(3) 16 : 1 (4) 1 : 16
CEL067

68. During electrolysis of fused calcium hydride, the hydrogen is produced at :
(1) Cathode
(2) Anode
(3) Hydrogen is not liberated at all
(4) H_2 produced reacts with oxygen to form water
CEL068

69. A silver cup is plated with silver by passing 965 A current for one second, the mass of Ag deposited is :– (At. wt. of Ag = 107.87)
(1) 9.89 g. (2) 107.87 g.
(3) 1.0787 g. (4) 100.2 g.
CEL069

70. When electricity is passed through molten $AlCl_3$, 13.5 g Al is deposited. The number of Faradays must be :–
(1) 5.0 (2) 1.0 (3) 1.5 (4) 3.0
CEL070

71. A solution of sodium sulphate in water is electrolysed using inert electrodes. The product at the cathode and anode are respectively :–
(1) H_2, SO_2 (2) O_2, H_2
(3) O_2, Na (4) H_2, O_2
CEL071

72. One Faraday of electricity will liberate one mole of the metal from the solution of
(1) Auric chloride ($AuCl_3$)
(2) Silver nitrate
(3) Calcium chloride
(4) Copper sulphate
CEL072

73. When 96500 C of electricity are passed through molten barium chloride solution, the amount of barium deposited will be :-
(1) 0.5 mol (2) 1.0 mol
(3) 1.5 mol (4) 2.0 mol
CEL073

74. A factory produces 40 kg of calcium in two hours by electrolysis. How much aluminium can be produced by the same current in two hours :–
(1) 22 kg (2) 18 kg
(3) 9 kg (4) 27 kg
CEL074

75. What would be the ratio of moles of Ag, Cu, Fe that would be deposited by passage of same quantity of electricity through solutions of salts containing Ag^+, Cu^{+2}, Fe^{+3} :-
(1) 1 : 1 : 1 (2) $1 : \frac{1}{2} : \frac{1}{3}$
(3) $\frac{1}{3} : \frac{1}{2} : 1$ (4) 1 : 2 : 3
CEL075

76. Electrolysis of aq. $CuSO_4$ causes :–
(1) An increase in pH
(2) A decrease in pH
(3) Either decrease or increase in pH
(4) None
CEL076

77. The passage of current liberates H_2 at cathode and Cl_2 at anode. The solution is :–
(1) $CuSO_4$ (aq) (2) $CuCl_2$ (aq.)
(3) NaCl (aq.) (4) Water
CEL077

COMMERCIAL CELLS

78. When lead accumulator is charged, it acts as :
(1) an electrolytic cell
(2) a galvanic cell
(3) a Daniel cell
(4) none of the above
CEL078

79. The thermodynamic efficiency of cell is given by -
(1) $\frac{\Delta H}{\Delta G} \times 100$ (2) $\frac{nFE}{\Delta G} \times 100$
(3) $-\frac{nFE}{\Delta H} \times 100$ (4) Zero
CEL079

EXERCISE-I (Conceptual Questions) ANSWER KEY

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Answer	3	2	3	1	3	3	3	2	1	2	1	1	1	3	1
Question	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Answer	2	4	2	2	2	4	2	4	2	2	3	1	1	4	4
Question	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Answer	1	3	4	2	4	1	3	3	4	3	1	3	4	4	3
Question	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Answer	2	1	1	1	4	3	2	1	3	2	3	3	4	3	2
Question	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Answer	3	1	4	3	3	1	1	2	3	3	4	2	1	2	2
Question	76	77	78	79											
Answer	2	3	1	3											

Exercise - II (Previous Year Questions) AIPMT/NEET

AIPMT 2014

1. When 0.1 mol MnO_4^{2-} is oxidised the quantity of electricity required to completely oxidise MnO_4^{2-} to MnO_4^- is :-
(1) 96500 C (2) 2 × 96500 C
(3) 9650 C (4) 96.50 C
CEL097

2. The weight of silver (at wt. = 108) displaced by a quantity of electricity which displaces 5600 mL of O_2 at STP will be :-
(1) 5.4 g (2) 10.8 g
(3) 54.0 g (4) 108.0 g
CEL098

AIPMT 2015

3. A device that converts energy of combustion of fuels like hydrogen and methane, directly into electrical energy is known as :-
(1) Electrolytic cell (2) Dynamo
(3) Ni-Cd cell (4) Fuel Cell
CEL099

NEET-I 2016

4. The pressure of H_2 required to make the potential of H_2-electrode zero in pure water at 298 K is :-
(1) 10^{-14} atm (2) 10^{-12} atm
(3) 10^{-10} atm (4) 10^{-4} atm
CEL100

NEET-II 2016

5. The molar conductivity of a 0.5 mol/dm^3 solution of $AgNO_3$ with electrolytic conductivity of 5.76×10^{-3} S cm^{-1} at 298 K is
(1) 0.086 S cm^2/mol (2) 28.8 S cm^2/mol
(3) 2.88 S cm^2/mol (4) 11.52 S cm^2/mol
CEL101

6. During the electrolysis of molten sodium chloride, the time required to produce 0.10 mol of chlorine gas using a current of 3 A is
(1) 220 minutes (2) 330 minutes
(3) 55 minutes (4) 110 minutes
CEL102

7. If the $E°_{cell}$ for a given reaction has a negative value, which of the following gives the **correct** relationships for the values of $\Delta G°$ and K_{eq} ?
(1) $\Delta G° < 0$; $K_{eq} > 1$ (2) $\Delta G° < 0$; $K_{eq} < 1$
(3) $\Delta G° > 0$; $K_{eq} < 1$ (4) $\Delta G° > 0$; $K_{eq} > 1$
CEL103

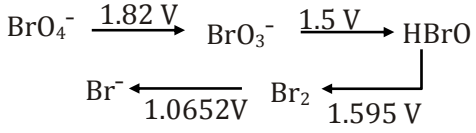
8. The number of electrons delivered at the cathode during electrolysis by a current of 1 A in 60 s is (charge on electron = 1.60×10^{-19} C)
(1) 3.75×10^{20} (2) 7.48×10^{23}
(3) 6×10^{23} (4) 6×10^{20}
CEL104

NEET(UG) 2017

9. In the electrochemical cell :-
Zn | $ZnSO_4$(0.01M) || $CuSO_4$(1.0 M) | Cu, the emf of this Daniel cell is E_1. When the concentration of $ZnSO_4$ is changed to 1.0M and that of $CuSO_4$ changed to 0.01M, the emf changes to E_2.
Which one of the relationship is correct between E_1 and E_2? (Given, $\frac{RT}{F} = 0.059$)
(1) $E_1 < E_2$ (2) $E_1 > E_2$
(3) $E_2 = 0 \neq E_1$ (4) $E_1 = E_2$ **CEL105**

NEET(UG) 2018

10. Consider the change in oxidation state of Bromine corresponding to different EMF values as shown in the diagram below:



Then the species undergoing disproportionation is:-
(1) BrO_3^- (2) BrO_4^- (3) Br_2 (4) HBrO
CEL106

NEET(UG) 2019

11. For a cell involving one electron $E°_{cell} = 0.59$V at 298 K, the equilibrium constant for the cell reaction is :-
$\left[\text{Given that } \frac{2.303RT}{F} = 0.059\text{V at T} = 298\text{K}\right]$
(1) 1.0×10^2 (2) 1.0×10^5
(3) 1.0×10^{10} (4) 1.0×10^{30}
CEL107

12. For the cell reaction
$2Fe^{3+}(aq) + 2I^-(aq) \rightarrow 2Fe^{2+}(aq) + I_2(aq)$
$E°_{cell} = 0.24$V at 298 K. The standard Gibbs energy $(\Delta_r G°)$ of the cell reaction is :
[Given that Faraday constant F = 96500 C mol^{-1}]
(1) – 46.32 kJ mol^{-1} (2) – 23.16 kJ mol^{-1}
(3) 46.32 kJ mol^{-1} (4) 23.16 kJ mol^{-1}
CEL108

NEET(UG) (Odisha) 2019

13. Following limiting molar conductivities are given as $\lambda^0_{m(H_2SO_4)} = x\ S cm^2\ mol^{-1}$

$\lambda^0_{m(K_2SO_4)} = y\ S cm^2\ mol^{-1}$

$\lambda^0_{m(CH_3COOK)} = z\ S cm^2\ mol^{-1}$

λ^0_m (in S cm^2 mol^{-1}) for CH_3COOH will be-

(1) x – y + 2 z (2) x + y – z

(3) x – y + z (4) $\frac{(x-y)}{2}+z$

CEL109

14. The standard electrode potential (E°) values of $Al^{3+}|Al$, $Ag^+|Ag$, $K^+|K$ and $Cr^{3+}|Cr$ are –1.66 V, 0.80 V, –2.93 V and –0.74 V respectively. The correct decreasing order of reducing power of the metal is :

(1) Ag > Cr > Al > K (2) K > Al > Cr > Ag

(3) K > Al > Ag > Cr (4) Al > K > Ag > Cr

CEL110

NEET (UG) 2020

15. The number of Faradays(F) required to produce 20 g of calcium from molten $CaCl_2$ (Atomic mass of Ca = 40 g mol^{-1}) is :

(1) 4 (2) 1 (3) 2 (4) 3

CEL111

16. On electrolysis of dil. sulphuric acid using Platinum (Pt) electrode, the product obtained at anode will be:

(1) SO_2 gas (2) Hydrogen gas

(3) Oxygen gas (4) H_2S gas

CEL112

NEET (UG) 2020 (COVID-19)

17. Identify the reaction from following having top position in EMF series (Std. red. potential) according to their electrode potential at 298 K.

(1) $Mg^{2+} + 2e^- \rightarrow Mg(s)$ (2) $Fe^{2+} + 2e^- \rightarrow Fe(s)$

(3) $Au^{3+} + 3e^- \rightarrow Au(s)$ (4) $K^+ + 1e^- \rightarrow K(s)$

CEL113

18. In a typical fuel cell, the reactants (R) and product (P) are :-

(1) R = $H_{2(g)}$, $O_{2(g)}$; P = $H_2O_{2(\ell)}$

(2) R = $H_{2(g)}$, $O_{2(g)}$; P = $H_2O_{(\ell)}$

(3) R = $H_{2(g)}$, $O_{2(g)}$, $Cl_{2(g)}$; P = $HClO_{4(aq)}$

(4) R = $H_{2(g)}$, $N_{2(g)}$; P = $NH_{3(aq)}$

CEL114

NEET (UG) 2021

19. The molar conductance of NaCl, HCl and CH_3COONa at infinite dilution are 126.45, 426.16 and 91.0 S cm^2 mol^{-1} respectively. The molar conductance of CH_3COOH at infinite dilution is. Choose the right option for your answer.

(1) 201.28 S cm^2 mol^{-1} (2) 390.71 S cm^2 mol^{-1}

(3) 698.28 S cm^2 mol^{-1} (4) 540.48 S cm^2 mol^{-1}

CEL115

20. The molar conductivity of 0.007 M acetic acid is 20 S cm^2 mol^{-1}. What is the dissociation constant of acetic acid ? Choose the correct option.

$$\left[\begin{array}{l}\Lambda^o_{H^+} = 350\ S cm^2 mol^{-1} \\ \Lambda^o_{CH_3COO^-} = 50\ S cm^2 mol^{-1}\end{array}\right]$$

(1) 1.75×10^{-4} mol L^{-1} (2) 2.50×10^{-4} mol L^{-1}

(3) 1.75×10^{-5} mol L^{-1} (4) 2.50×10^{-5} mol L^{-1}

CEL116

NEET (UG) 2022

21. At 298 K, the standard electrode potentials of Cu^{2+}/Cu, Zn^{2+}/Zn, Fe^{2+}/Fe and Ag^+/Ag are 0.34V, –0.76V, –0.44V and 0.80V, respectively. On the basis of standard electrode potential, predict which of the following reaction can not occur ?

(1) $CuSO_4(aq) + Fe(s) \rightarrow FeSO_4(aq) + Cu(s)$

(2) $FeSO_4(aq) + Zn(s) \rightarrow ZnSO_4(aq) + Fe(s)$

(3) $2CuSO_4(aq) + 2Ag(s) \rightarrow 2Cu(s) + Ag_2SO_4(aq)$

(4) $CuSO_4(aq) + Zn(s) \rightarrow ZnSO_4(aq) + Cu(s)$

CEL117

22. Given below are half cell reactions :

$MnO_4^- + 8H^+ + 5e^- \rightarrow Mn^{2+} + 4H_2O$,

$E^\circ_{Mn^{2+}/MnO_4^-} = -1.510V$

$\frac{1}{2}O_2 + 2H^+ + 2e^- \rightarrow H_2O$, $E^\circ_{O_2/H_2O} = +1.223V$

Will the permanganate ion, MnO_4^- liberate O_2 from water in the presence of an acid ?

(1) No, because E°_{cell} = –0.287 V

(2) Yes, because E°_{cell} = +2.733 V

(3) No, because E°_{cell} = –2.733 V

(4) Yes, because E°_{cell} = +0.287 V

CEL118

23. Two half cell reactions are given below :

$Co^{3+} + e^- \rightarrow Co^{2+}$, $E^o_{Co^{2+}/Co^{3+}} = -1.81\ V$

$2Al^{3+} + 6e^- \rightarrow 2\ Al(s)$, $E^o_{Al/Al^{3+}} = +1.66\ V$

The standard EMF of a cell with feasible redox reaction will be :

(1) +7.09 V (2) +0.15 V

(3) +3.47 V (4) –3.47 V

CEL119

24. Standard electrode potential for the cell with cell reaction
$Zn(s) + Cu^{2+}(aq) \rightarrow Zn^{2+}(aq) + Cu(s)$ is 1.1 V. Calculate the standard gibbs energy change for the cell reaction. (Given F = 96487 C mol^{-1})
(1) –200.27 kJ mol^{-1} (2) –212.27 kJ mol^{-1}
(3) –212.27 J mol^{-1} (4) –200.27 J mol^{-1}
CEL120

NEET (UG) 2023

25. The conductivity of centimolar solution of KCl at 25°C is 0.0210 ohm^{-1} cm^{-1} and the resistance of the cell containing the solution at 25°C is 60 ohm. The value of cell constant is-
(1) 3.28 cm^{-1}
(2) 1.26 cm^{-1}
(3) 3.34 cm^{-1}
(4) 1.34 cm^{-1}
CEL141

26. Given below are two statements : one is labelled as **Assertion A** and the other is labelled as **Reason R :**
Assertion A : In equation $\Delta_r G = -nFE_{cell}$, value of $\Delta_r G$ depends on n.
Reasons R : E_{cell} is an intensive property and $\Delta_r G$ is an extensive property.
In the light of the above statements, choose the **correct** answer from the options given below :
(1) Both **A** and **R** are true and **R** is **NOT** the correct explanation of **A**.
(2) **A** is true but **R** is false
(3) **A** is false but R is true
(4) Both **A** and **R** are true and **R** is the correct explanation of **A.**
CEL142

NEET (UG) 2024

27. Match List-I with List-II.

List-I (Conversion)	List-II (Number of Faraday required)
(A) 1 mol of H_2O to O_2	(I) 3F
(B) 1 mol of MnO_4^- to Mn^{2+}	(II) 2F
(C) 1.5 mole of Ca from molten $CaCl_2$	(III) 1F
(D) 1 mol of FeO to Fe_2O_3	(IV) 5F

(1) A-II, B-IV, C-I, D-III (2) A-III, B-IV, C-I, D-II
(3) A-II, B-III, C-I, D-IV (4) A-III, B-IV, C-II, D-I
CEL159

28. Mass in grams of copper deposited by passing 9.6487 A current through a voltmeter containing copper sulphate solution for 100 seconds is:
(Given : Molar mass of Cu : 63 g mol^{-1}, 1F = 96487 C)
(1) 3.15 g (2) 0.315 g
(3) 31.5 g (4) 0.0315 g
CEL160

NEET (UG) 2024 (Re-examination)

29. From the following select the one which is **not** an example of corrosion.
(1) Rusting of iron object
(2) Production of hydrogen by electrolysis of water
(3) Tarnishing of silver
(4) Development of green coating on copper and bronze ornaments
CEL161

30. The standard cell potential of the following cell
$Zn|Zn^{2+}(aq)||Fe^{2+}(aq)|Fe$
is 0.32 V. Calculate the standard Gibbs energy change for the reaction :
$Zn(s) + Fe^{2+}(aq) \rightarrow Zn^{2+}(aq) + Fe(s)$
(Given : 1 F = 96487C)
(1) –61.75 kJ mol^{-1} (2) +5.006 kJ mol^{-1}
(3) –5.006 kJ mol^{-1} (4) +61.75 kJ mol^{-1}
CEL162

EXERCISE-II (Previous Year Questions) ANSWER KEY

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Answer	3	4	4	1	4	4	3	1	2	4	3	1	4	2	2
Question	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Answer	3	3	2	2	3	3	4	3	2	2	4	1	2	2	1

Exercise - III (Analytical Questions) Master Your Understanding

1. Given below are two statements:
Statement-I : In electrochemical cells, Gibbs energy of spontaneous redox reaction is converted into electrical work.
Statement-II : Gibb's energy can be calculated by using $\Delta G = -nFE$ & it is an intensive property.
In the light of the above statements, choose the most appropriate answer from the options given below:
(1) Both statement-I and II are incorrect.
(2) Both statement-I and II are correct.
(3) Statement-I is incorrect but statement-II is correct.
(4) Statement-I is correct but statement-II is incorrect

CEL121

2. Given below are two statements:
Statement-I : Sodium can be obtained by the electrolysis of aqueous solution NaCl using platinum electrodes.
Statement-II : Copper metal can not reduce iron(II) ions in acidic solutions.
In the light of the above statements, choose the most appropriate answer from the options given below:
(1) Both statement-I and II are incorrect.
(2) Both statement-I and II are correct.
(3) Statement-I is incorrect but statement-II is correct.
(4) Statement-I is correct but statement-II is incorrect

CEL124

3. Given below are two statements:
Statement-I : The cell potential becomes half if the cell reaction is divided by 2 throughout.
Statement-II : Cell voltage is an extensive quantity.
In the light of the above statements, choose the most appropriate answer from the options given below:
(1) Both statement-I and II are incorrect.
(2) Both statement-I and II are correct.
(3) Statement-I is incorrect but statement-II is correct.
(4) Statement-I is correct but statement-II is incorrect

CEL128

4. Given below are two statements:
Statement-I : Cathode is negative terminal in an electrolytic cell where as anode is negative terminal in a galvanic cell.
Statement-II : In a Daniel cell, electrons flow from zinc electrode to copper electrode in outer circuit.
In the light of the above statements, choose the most appropriate answer from the options given below:
(1) Both statement-I and II are incorrect.
(2) Both statement-I and II are correct.
(3) Statement-I is incorrect but statement-II is correct.
(4) Statement-I is correct but statement-II is incorrect

CEL129

5. Given below are two statements:
Statement-I : The electrolysis of molten sodium hydride liberates H_2 gas at the anode.
Statement-II : In electrolytic refining of an impure metal, the pure metal is obtained at anode.
In the light of the above statements, choose the most appropriate answer from the options given below:
(1) Both statement-I and II are incorrect.
(2) Statement-I is incorrect but statement-II is correct.
(3) Statement-I is correct but statement-II is incorrect
(4) Both statement-I and II are correct.

CEL130

6. Given below are two statements. Identify the correct choice from the following.

Statement-I : Molar conductivity increases with decreases in concentration for weak electrolytes.

Statement-II : Number of ions increases and number of ions per unit volume decreases due to dilution.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

(1) Statement-I is correct and Statement-II is correct and is the correct explanation of Statement-I.

(2) Statement-I is correct and Statement-II is correct but not the correct explanation of Statement-I.

(3) Statement-I is correct and Statement-II is incorrect.

(4) Statement-I is incorrect and Statement-II is correct.

CEL132

7. Given below are two statements. Identify the correct choice from the following.

Statement-I : Increasing the concentration of Cu^{+2} ions increases the emf of Daniel cell.

Statement-II : According to the Nernst equation

$$\text{EMF of cell} = E^0_{Cell} + \frac{0.059}{2}\log\frac{[Cu^{2+}]}{[Zn^{2+}]}$$

In the light of the above statements, choose the **most appropriate** answer from the options given below :

(1) Statement-I is correct and Statement-II is correct and is the correct explanation of Statement-I.

(2) Statement-I is correct and Statement-II is correct but not the correct explanation of Statement-I.

(3) Statement-I is correct and Statement-II is incorrect.

(4) Statement-I is incorrect and Statement-II is correct.

CEL133

8. Given below are two statements. Identify the correct choice from the following.

Statement-I : The cell constant of a cell depends upon the nature of material of the electrodes.

Statement-II : The observed conductance depends upon the nature of the electrolyte and the concentration of the solution.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

(1) Statement-I is correct and Statement-II is correct and is the correct explanation of Statement-I.

(2) Statement-I is correct and Statement-II is correct but not the correct explanation of Statement-I.

(3) Statement-I is correct and Statement-II is incorrect.

(4) Statement-I is incorrect and Statement-II is correct.

CEL134

9. Given :

$E^0_{Ag^+|Ag} = 0.80V$, $E^0_{Mg^{2+}|Mg} = -2.73V$,

$E^0_{Cu^{2+}|Cu} = 0.34V$, $E^0_{Hg^{2+}|Hg} = 0.79V$

Which of the following statements are correct.

(a) $AgNO_3$ can be stored in copper vessel.

(b) $Mg(NO_3)_2$ can be stored in copper vessel.

(c) $CuCl_2$ can be stored in silver vessel.

(d) $HgCl_2$ can be stored in copper vessel.

(1) a, b are correct

(2) b, c are correct

(3) a, b, d are correct

(4) a, d are correct

CEL138

10. Any redox reaction would occur spontaneously, if

(a) the free energy change (ΔG) is negative.

(b) the ΔG° is positive.

(c) the cell EMF is negative.

(d) the cell EMF is positive.

(1) a, b are correct

(2) b, c, d are correct

(3) a, d are correct

(4) a, b & c are correct

CEL139

11. Mark out the correct statement(s) regarding electrolytic molar conductivity.

(a) It increases as temperature increases.

(b) It experiences resistance due to vibration of ion at the mean position.

(c) It decreases as concentration increases.

(d) It increases with increase in polarity of solvent.

(1) a, b, c, d are correct

(2) a, b, c are correct

(3) a, c, d are correct

(4) a, b, d are correct

CEL140

EXERCISE-III (Analytical Questions) ANSWER KEY

Question	1	2	3	4	5	6	7	8	9	10	11
Answer	4	3	1	2	3	2	1	4	2	3	3