Chapter 03

Electro Chemistry

JEE –RANKER'S STUFF

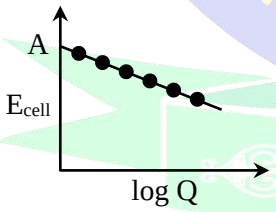
SINGLE CORRECT QUESTIONS

Q.1 During electrolysis of an aqueous solution of Cu^{2+} sulphate, 0.635g of copper was deposited at cathode. The amount of electricity consumed in coulomb is-
(1) 1930 (2) 3860 (3) 9650 (4) 4825

Q.2 The reduction potential of the two half cell reactions (occurring in an electrochemical cell) are
$PbSO_4 + 2e^- \rightarrow Pb + SO_4^{2-}$ ($E^o = -0.31V$)
$Ag^+(aq) + e^- \rightarrow Ag(s)$ ($E^o = +0.80V$)
The feasible reaction will be –
(1) $Pb + SO_4^{2-} + 2Ag^+(aq) \rightarrow 2Ag(s) + PbSO_4$
(2) $PbSO_4 + 2Ag^+(aq) \rightarrow Pb + SO_4^{2-} + 2Ag(s)$
(3) $Pb + SO_4^{2-} + Ag(s) \rightarrow Ag^+(aq) + PbSO_4$
(4) $PbSO_4 + Ag(s) \rightarrow Ag^+(aq) + Pb + SO_4^{-2}$

Q.3 $Zn + Cu^{2+}(aq) \rightleftharpoons Cu + Zn^{2+}(aq)$

Reaction quotient is $Q = \frac{[Zn^{2+}]}{[Cu^{2+}]}$.



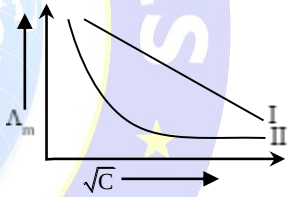
Variation of E_{cell} with log Q is of the type with OA = 1.10 V. E_{cell} will be 1.1591 V when:

(1) $\frac{[Cu^{2+}]}{[Zn^{2+}]} = 0.01$ (2) $\frac{[Zn^{2+}]}{[Cu^{2+}]} = 0.01$

(3) $\frac{[Zn^{2+}]}{[Cu^{2+}]} = 0.1$ (4) $\frac{[Zn^{2+}]}{[Cu^{2+}]} = 1$

Q.4 For $I_2 + 2e^- \rightarrow 2I^-$, standard reduction potential = + 0.54 volt. For $2Br^- \rightarrow Br_2 + 2e^-$ standard oxidation potential = + 1.09 volt. For $Fe \rightarrow Fe^{+2} + 2e^-$, Standard oxidation potential = +0.44 volt. Which of the following reactions is non-spontaneous –
(1) $Br_2 + 2I^- \rightarrow 2Br^- + I_2$
(2) $Fe + Br_2 \rightarrow Fe^{2+} + 3Br^-$
(3) $Fe + I_2 \rightarrow Fe^{2+} 2I^-$
(4) $I_2 + 2Br^- \rightarrow 2I^- + Br_2$

Q.5 Below plot represents the variation of molar conductance against $\sqrt{C}$ (where C = molar concentration of the electrolyte). Select the correct option among following –



(1) Both I and II are for strong electrolyte
(2) Both I and II are for weak electrolyte
(3) I is for strong electrolyte and II for weak electrolyte
(4) I is for weak electrolyte and II for strong electrolyte

Q.6 $Zn \mid Zn^{2+}(c_1) \parallel Zn^{2+}(c_2) \mid Zn$ for this cell ΔG is negative if -
(1) $C_1 = C_2$ (2) $C_1 > C_2$ (3) $C_2 > C_1$
(4) None

Q.7 Equivalent conductance of saturated $BaSO_4$ is 400 $ohm^{-1}cm^2equi^{-1}$ and specific conductance is 8×10^{-5} $ohm^{-1}cm^{-1}$. Hence K_{sp} of $BaSO_4$ is –
(1) $4 \times 10^{-8} M^2$ (2) $1 \times 10^{-8} M^2$
(3) $2 \times 10^{-4} M^2$ (4) $1 \times 10^{-4} M^2$

Q.8 The ionic conductance of X^{2+} and Y^- are 100 and 200 Ω^{-1} cm^2 eqv^{-1} respectively. The equivalent pconductance of XY_2 at infinite dilution is (in ohm^{-1} cm^2 eqv^{-1})

(1) 300 (2) 150 (3) 600 (4) 250

Q.9 Which of the following reaction is possible at anode ?

(1) $F_2 + 2e^- \longrightarrow 2F^-$

(2) $2H^+ + \frac{1}{2}O_2 + 2e^- \longrightarrow H_2O$

(3) $2Cr^{3+} + 7H_2O \longrightarrow Cr_2O_7^{2-} + 14H^+ + 6e^-$

(4) $Fe^{2+} \longrightarrow Fe^{3+} + e^-$

Q.10 For a cell reaction involving a two-electron change the standard e.m.f. of the cell is found to be 0.295 V at 25°C. The equilibrium constant of the reaction of 25°C will be –

(1) 10 (2) 1×10^{10}

(3) 1×10^{-10} (4) 29.5×10^{-2}

Q.11 In a cell that utilises the reaction

$$Zn_{(s)} + 2H^+_{(aq)} \rightleftharpoons Zn^{2+}_{(aq)} + H_{2(g)}$$

addition of H_2SO_4 to cathode compartment, will–

(1) lower the E and shift equilibrium to the left

(2) lower the E and shift equilibrium right

(3) increase the E and shift equilibrium to the right

(4) increase the E and shift equilibrium to the left

Q.12 The correct order of equivalent conductance at infinite dilution of LiCl, NaCl and KCl is

(1) LiCl > NaCl > KCl

(2) KCl > NaCl > LiCl

(3) NaCl > KCl > LiCl

(4) LiCl > KCl > NaCl

Q.13 If x is specific resistance of the electrolyte solution and y is the molarity of the solution, then Λ_m is given by

(1) $\frac{1000x}{y}$ (2) $1000\frac{y}{x}$

(3) $\frac{1000}{xy}$ (4) $\frac{xy}{100}$

Q.14 Aluminium oxide may be electrolysed at 1000°C to furnish aluminium metal (At. Mass = 27 amu ; 1 Faraday = 96,500 Coulombs). The cathode reaction is $Al^{3+} + 3e^- \longrightarrow Al$

To prepare 5.12 kg of aluminium metal by this method would require –

(1) 1.83×10^7 C of electricity

(2) 5.49×10^7 C of electricity

(3) 5.49×10^1 C of electricity

(4) 5.49×10^4 C of electricity

Q.15 For a spontaneous reaction the ΔG, equilibrium constant (K) and E_{cell} will be respectively –

(1) +ve, > 1, –ve (2) –ve, > 1, +ve

(3) –ve, > 1, –ve (4) –ve, < 1, –ve

Q.16 A solution of copper sulphate ($CuSO_4$) is electrolysed for 10 minutes with a current of 1.5 amperes. The mass of copper deposites at the cathode (at. mass of Cu = 63 u) is –

(1) 0.3892 g (2) 0.2938 g

(3) 0.2398 g (4) 0.3928 g

Q.17 A current of 10.0 A flows for 2.00 h through an electrolytic cell containing a molten salt of metal X. This results in the decomposition of 0.250 mol or metal X at the cathode. The oxidation state of X in the molten salt is :

(F = 96, 500 C)

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

Q.18

Electrolyte:	KCl	KNO_3	HCl	NaOAc	NaCl
λ^∞ ($S\,cm^2\,mol^{-1}$)	149.9	145	426.2	91	126.5

Calculate Λ^∞_{HOAc} using appropriate molar conductances of the electrolytes listed above the infinite dilution in H_2O at 25°C

(1) 217.5 (2) 390.7

(3) 552.7 (4) 517.2

Q.19 Which of the following expressions correctly represents the equivalent conductance at infinite dilution of $Al_2(SO_4)_3$, Given that $\Lambda^\circ_{Al^{3+}}$ and $\Lambda^\circ_{SO_4^{2-}}$ are the equivalent conductances at infinite dilution of the respective ions?

(1) $\frac{1}{3}\Lambda^\circ_{Al^{3+}} + \frac{1}{2}\Lambda^\circ_{SO_4^{2-}}$ (2) $2\Lambda^\circ_{Al^{3+}} + 3\Lambda^\circ_{SO_4^{2-}}$

(3) $\Lambda^\circ_{Al^{3+}} + \Lambda^\circ_{SO_4^{2-}}$ (4) $\left(\Lambda^\circ_{Al^{3+}} + \Lambda^\circ_{SO_4^{2-}}\right) \times 6$

Q.20 $\Lambda_{ClCH_2COONa} = 224\ ohm^{-1}\,cm^2\,gm\,eq^{-1}$,

Λ_{NaCl} = 38.2 ohm^{-1} cm^2 gm eq^{-1},
Λ_{HCl} = 203 ohm^{-1} cm^2 gm eq^{-1},
What is the value of Λ_{ClCH_2COOH}

(1) 288.5 ohm^{-1} cm^2 gm eq^{-1}
(2) 289.5 ohm^{-1} cm^2 gm eq^{-1}
(3) 388.8 ohm^{-1} cm^2 gm eq^{-1}
(4) 59.5 ohm^{-1} cm^2 gm eq^{-1}

Q.21 What will be the emf for the given cell
$Pt|H_2(P_1)|H^+(aq)||H_2(P_2)|Pt$

(1) $\frac{RT}{F}\log_e\frac{P_1}{P_2}$ (2) $\frac{RT}{2F}\log_e\frac{P_1}{P_2}$

(3) $\frac{RT}{F}\log_e\frac{P_2}{P_1}$ (4) None of these

Q.22 Specific conductance of 0.1 M HNO_3 is 6.3 × 10^{-2} ohm^{-1} cm^{-1}. The molar conductance of the solution is
(1) 100 ohm^{-1} cm^2 mol^{-1}
(2) 515 ohm^{-1} cm^2 mol^{-1}
(3) 630 ohm^{-1} cm^2 mol^{-1}
(4) 6300 ohm^{-1} cm^2 mol^{-1}

Q.23 Consider the following four electrodes:
P = Cu^{2+} (0.0001 M)/Cu(s)
Q = Cu^{2+} (0.1 M)/Cu(s)
R = Cu^{2+} (0.01 M)/Cu(s)
S = Cu^{2+} (0.001 M)/Cu(s)
If the standard reduction potential of Cu^{2+}/Cu is +0.34 V, the reduction potentials in volts of the above electrodes follow the order.
(1) P > S > R > Q (2) S > R > Q > P
(3) R > S > Q > P (4) Q > R > S > P

Q.24 What is the amount of chlorine evolved when 2 amperes of current is passed for 30 minutes in an aqueous solution of NaCl ?
(1) 66 g (2) 1.32 g (3) 33 g (4) 99 g

Q.25 In the electrochemical reaction
$2Fe^{3+} + Zn \longrightarrow Zn^{2+} + 2Fe^{2+}$,
on increasing the concentration of Fe^{2+}
(1) increases cell emf
(2) increases the current flow
(3) decreases the cell emf
(4) alters the pH of the solution

Q.26 Co | Co^{2+} (C_2) || Co^{2+} (C_1) | Co for this cell, ΔG is negative if :
(1) $C_2 > C_1$ (2) $C_1 > C_2$
(3) $C_1 = C_2$ (4) unpredictable

Q.27 Which represent a concentration cell ?
(1) Pt | H_2 | HCl | | HCl | Pt | H_2
(2) Pt | H_2 | HCl | Cl_2 | Pt
(3) Zn | Zn^{2+} || Cu^{2+} | Cu
(4) Fe | Fe^{+2} || Cu^{2+} | Cu

Q.28 By the electrolysis of aqueous solution of $CuSO_4$, the products obtained at both the electrodes are
(1) O_2 at anode and H_2 at cathode
(2) H_2 at anode and Cu at cathode
(3) O_2 at anode and Cu at cathode
(4) $H_2S_2O_8$ at anode and O_2 at cathode

Q.29 For a cell reaction involving a two electron change, the standard emf of the cell is found to be 0.295 V at 25°C. The equilibrium constant of the reaction at 25°C will be:
(1) 1 × 10^{-10} (2) 29.5 × 10^{-2}
(3) 10 (4) 1 × 10^{10}

Q.30 Consider the following E^0values :
$E^0_{Fe^{3+}/Fe^{2+}}$ = + 0.77 V ; $E^0_{Sn^{2+}/Sn}$ = – 0.14 V
Under standard conditions, the cell potential for the reaction given below is :
$Sn_{(s)} + 2Fe^{3+}_{(aq)} \rightarrow 2Fe^{2+}_{(aq)} + Sn^{2+}_{(aq)}$
(1) 1.68 V (2) 1.40 V
(3) 0.91 V (4) 0.63 V

Q.31 The molar conductivities Λ^0_{NaOAc} and Λ^0_{HCl} at infinite dilution in water at 25°C are 91.0 and 426.2 S cm^2/mol respectively. To calculate Λ^0_{HOAc}, the additional value required is :
(1) $\Lambda^0_{H_2O}$ (2) Λ^0_{KCl}
(3) Λ^0_{NaOH} (4) Λ^0_{NaCl}

Q.32 The cell Zn | Zn^{2+} (1M) || Cu^{2+}(1M) | Cu : ($E°_{cell}$ = 1.10 V) was allowed to completely discharge at 298 K. The relative concentration of Zn^{2+} to $Cu^{2+}\left(\frac{[Zn^{2+}]}{[Cu^{2+}]}\right)$ is : (Take $\frac{1.1}{0.059}$ = 18.65)
(1) $10^{37.3}$ (2) 9.65 × 10^4
(3) antilog (24.08) (4) 37.3

Q.33 Resistance of 0.2 M solution of an electrolyte is 50 Ω. The specific conductance of the solution is 1.4 S m^{-1}. The resistance of 0.5 M solution of the same electrolyte is 280 Ω. The molar conductivity of 0.5 M solution of the electrolyte in S m^2 mol^{-1} is :

(1) 5.6×10^{-4} (2) 5.6×10^{-3}

(3) 5.6×10^{3} (4) 5.6×10^{2}

Q.34 The equivalent conductance of NaCl at concentration C and at infinite dilution are Λ_C and Λ_∞, respectively. The correct relationship between Λ_C and Λ_∞ is given as : (where the constant B is positive)

(1) $\Lambda_C = \Lambda_\infty + (b)C$ (2) $\Lambda_C = \Lambda_\infty - (b)C$

(3) $\Lambda_C = \Lambda_\infty - (b)\sqrt{C}$ (4) $\Lambda_C = \Lambda_\infty + (b)\sqrt{C}$

Q.35 The metal that cannot be obtained by electrolysis of an aqueous solution of its salts is:

(1) Ag (2) Ca (3) Cu (4) Cr

Q.36 The standard electrode potentials $\left(E^{\circ}_{M^+/M}\right)$ of four metals A, B, C and D are –1.2 V, 0.6 V, 0.85 V and –0.76 V, respectively. The sequence of deposition of metals on applying potential is :

(1) A, C, B, D (2) B, D, C, A

(3) C, B, D, A (4) D, A, B, C

Q.37 Which of the statements about solutions of electrolytes is not correct?

(1) Conductivity of solution depends upon size of ions

(2) Conductivity depends upon viscosity of solution

(3) Conductivity does not depend upon solvation of ions present in solution

(4) Conductivity of solution increases with temperature

Q.38 The $E^0_{M^{3+}/M^{2+}}$ values for Cr, Mn, Fe and Co are – 0.41, + 1.57, +0.77 and + 1.97 V respectively. For which one of these metals the change in oxidation state from +2 to +3 is easiest?

(1) Fe (2) Mn (3) Cr (4) Co

Q.39 The chemical reaction,

$2AgCl(s) + H_2(g) \longrightarrow 2HCl\ (aq) + 2Ag(s)$

taking place in a galvanic cell is represented by the notation.

(1) $Pt(s)\left|H_2(g).1bar\right|1MKCl(aq)\left|AgCl(s)\right|Ag(s).$

(2) $Pt(s)\left|H_2(g).1bar\right|1MHCl(aq)\left|1M\,Ag(aq)\right|Ag(s).$

(3) $Pt(s)\left|H_2(g).1bar\right|1MHCl(aq)\left|AgCl(s)\right|Ag(s).$

(4) $Pt(s)\left|H_2(g).1bar\right|1MHCl(aq)\left|Ag(s)\right|AgCl(s).$

Q.40 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 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) $\wedge^0_{NaOH}$

Q.41 Resistance of 0.2 M solution of an electrolyte is 50 Ω. The specific conductance of the solution is 1.3 S m^{-1}. If resistance of the 0.4M solution of the same electrolyte is 260 Ω, its molar conductivity is :-

(1) 6250 S m^2 mol^{-1}

(2) 6.25×10^{-4} S m^2 mol^{-1}

(3) 625×10^{-4} S m^2 mol^{-1}

(4) 62.5 S m^2 mol^{-1}

Q.42 Given the data at 25°C,

$Ag + I^- \rightarrow AgI + e^-$, $E^\circ = 0.152$ V

$Ag \rightarrow Ag^+ + e^-$, $E^\circ = -0.800$ V

What is the value of log Ksp for AgI?

$\left(2.303\frac{RT}{F} = 0.059V\right)$

(1) –8.12 (2) +8.612 (3) –37.83 (4) –16.13

Q.43 Equal volumes of 0.015 M CH_3COOH & 0.015 M NaOH are mixed together. What would be molar conductivity of mixture if conductivity of CH_3COONa is 6.3×10^{-4} S cm^{-1}.

(1) 8.4 S cm^2 mol^{-1} (2) 84 S cm^2 mol^{-1}

(3) 4.2 S cm^2 mol^{-1} (4) 42 S cm^2 mol^{-1}

Q.44 The dissociation constant of n-butyric acid is 1.6×10^{-5} and the molar conductivity at infinite

dilution is 380×10^{-4} S m^2 mol^{-1}. The specific conductance of the 0.01 M acid solution is
(1) 1.52×10^{-5} S m^{-1} (2) 1.52×10^{-2} S m^{-1}
(3) 1.52×10^{35} S m^{-1} (4) None

Q.45 The conductivity of a saturated solution of Ag_3PO_4 is 9×10^{-6} S m^{-1} and its equivalent conductivity is 1.50×10^{-4} S m^2 equivalent^{-1}. The K_{sp} of Ag_3PO_4 is
(1) 4.32×10^{-18} (2) 1.18×10^{-9}
(3) 8.64×10^{-13} (4) None of these

Q.46 Given standard electrode potentials
$Fe^{3+} + 3e^- \longrightarrow Fe$; E° = –0.036 Volt
$Fe^{2+} + 2e^- \longrightarrow Fe$; E° = –0.440 Volt
The standard electrode potential E° for
$Fe^{3+} + e^- \longrightarrow Fe^{2+}$ is :
(1) –0.476 volt (2) –0.404 volt
(3) 0.440 volt (4) +0.772 volt

Q.47 Cu^+ ion is not stable in aqueous solution because of disproportionation reaction. E° value for disproportionation of Cu^+ is
(given E° Cu^{2+}/Cu^+ = 0.15 V; E° Cu^{2+}/Cu = 0.34 V)
(1) –0.19 V (2) 0.49 V
(3) –0.38V (4) 0.38 V

Q.48 The standard electrode potential (E°) for OCl^-/Cl^- and Cl^- / ½ Cl_2 respectively are 0.94 V and –1.36V. 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

Q.49 Calculate cell potential at 298 K for following galvanic cell
$Cd(s)|Cd^{+2}(aq.)M(0.1M)||H^+_{(aq)}(0.1M)|H_2(g,0.5atm)|Pt$ $E^\circ_{Cd^{+2}/Cd} = -0.40V$
(1) 0.38 (2) –0.38 (3) 0.36 (4) –0.36

Q.50 A current of i ampere was passed for t sec. through three cells P, Q and R connected in series. These contain respectively silver nitrate, mercuric nitrate and mercurous nitrate. At the cathode of the cell P, 0.216 g of Ag was deposited. The weights of mercury deposited in the cathode of Q and R respectively are : (at. wt. of Hg = 200.59)
(1) 0.4012 and 0.8024 g
(2) 0.4012 and 0.2006 g
(3) 0.2006 and 0.4012 g
(4) 0.1003 and 0.2006 g

Q.51 A galvanic cell is set up from a zinc bar weighing 100 g and 1.0 litre of 1.0 M $CuSO_4$ solution. How long would the cell run if it is assumed to deliver a steady current of 1.0 amp. (Atomic mass of Zn = 65)
(1) 1.1 hr. (2) 46 hr.
(3) 53.6 hr. (4) 24.00 hr.

Q.52 The efficiency of an hypothetical cell is about 84% which involves the following reaction:
$A(s) + B^{2+}(aq) \rightarrow A^{2+}(aq) + B(s)$: ΔH° = –285 kJ
Then, the standard electrode potential of the cell will be (Assume as ΔS° = 0) :
(1) 1.20 V (2) 2.40 V
(3) 1.10 V (4) 1.24 V

Q.53 Consider the following cell reaction :
$MnO_4^- + 8H^+ + 5e^- \rightarrow Mn^{2+} + 4H_2O$,
If H^+ concentration is decreased from 1M to 10^{-4} M at 25°C, where as concentration of Mn^{2+} and MnO_4^- remain 1M :
(1) The potential decreases by 0.38 V with decrease in oxidising power
(2) The potential increases by 0.38 V with increase in oxidising power
(3) The potential decreases by 0.25 V with decrease in oxidising power
(4) The potential decreases by 0.38 V without affecting oxidising power.

Q.54 In a fuel cell methanol is used as fuel and oxygen gas is used as an oxidizer. The reaction is

$$CH_3OH(\ell) + \frac{3}{2}O_2(g) \longrightarrow CO_2(g) + 2H_2O(\ell)$$

At 298 K standard Gibb's energies of formation for $CH_3OH(\ell)$, $H_2O(\ell)$ and $CO_2(g)$ are –166.2, –237.2 and –394.4 kJ mol^{-1} respectively. If standard enthalpy of combustion of methanol is –726 kJ mol–1, efficiency of the fuel cell will be
(1) 90% (2) 97%
(3) 80% (4) 87%

NUMERICAL VALUE TYPE QUESTIONS

Q.55 How many faradays are required for reduction of 1 mol $C_6H_5NO_2$ into $C_6H_5NH_2$?

Q.56 If K_C for the reaction

$Cu^{2+}(aq) + Sn^{2+}(aq) \longrightarrow Sn^{4+}(aq) + Cu(s)$

at 25° C is represented as 2.6×10^{y} then find the value of y.

(Given: $E°_{Cu^{2+}|Cu} = 0.34$ V; $E°_{Sn^{4+}|Sn^{2+}} = 0.15$ V)

Q.57 At what pH oxidation potential of water is –0.81V?

Q.58 Molar conductivity of aqueous solution of HA is 200 $Scm^2\ mol^{-1}$, pH of this solution is 4. Calculate the value of pK_a (HA) at 25°C

Given:

$\Lambda_M^\infty(NaA) = 100\ Sm^2mol^{-1}$; $\Lambda_M^\infty(HCl) = 425\ Sm^2mol^{-1}$;

$\Lambda_M^\infty(NaCl) = 125\ Sm^2mol^{-1}$

Q.59 The resistance of conductivity cell containing 0.001 M KCl solution at 298 K is 1500 Ω what is the cell constant (in mm^{-1}) if the conductivity of 0.001 M KCl solution is 2×10^{-3} S mm^{-1}.

Q.60 When a molten salt was electrolyzed for 5 min with 9.65 A current 0.18 g of the metal was deposited. Calculate the Eq. mass of metal.

Q.61 If ΔG^0 for the half cell $MnO_4^-|MnO_2$ in an acid solution is –xF then find the value of x.

(Given: $E^0_{cu^{2+}|cu} = 0.34V$; $E^0_{Sn^{4+}|sn^{2+}} = 0.15V$)

Q.62 Molar conductivities at infinite dilution of KCl, HCl and CH_3COOK are 0.013, 0.038 and 0.009 $Sm^2\ mol^{-1}$ respectively at 291K. If conductivity of 0.001 M CH_3COOH is 2.72×10^{-3} S m^{-1} then find % degree of dissociation of CH_3COOH.

STATEMENT TYPE QUESTIONS

Examine the statements carefully and mark the correct answer according to the instructions given below

(A) If both the statements are correct and STATEMENT-2 is the correct explanation of STATEMENT-1.

(B) If both the statements are correct but STATEMENT-2 is NOT the correct explanation of STATEMENT-1.

(C) If STATEMENT-1 is correct and STATEMENT-2 is incorrect.

(D) If STATEMENT-1 is incorrect and STATEMENT-2 is correct.

Q.63 **STATEMENT-1 :** Electrolysis of $CuCl_2$(aq) gives 1 mole of Cu and 1 mole of Cl_2 by the passage of suitable charge.

STATEMENT-2: Equal equivalents of Cu and Cl_2 are formed during the passage of same charge.

(1) A (2) B (3) C (4) D

Q.64 **STATEMENT-1 :** In an electrochemical cell, anode and cathode are, respectively, negative and positive electrode.

STATEMENT-2 : At anode, oxidation takes place and at cathode reduction takes place.

(1) A (2) B (3) C (4) D

Q.65 **STATEMENT-1 :** In the Daniel cell, if concentrations of Cu^{2+} and Zn^{2+} ions are doubled, the EMF of cell does not change.

STATEMENT-2 : If the concentration of ions in contact with the metal is doubled. the electrode potential will be doubled.

(1) A (2) B (3) C (4) D

Q.66 **STATEMENT-1:** KCl, NaCl, NH_4Cl, etc. cannot be used in the salt bridge of a cell containing silver ion.

STATEMENT-2: A salt bridge contains concentrated solution of an inert electrolyte like KCl, KNO_3, K_2SO_4 etc. in agar -agar.

(1) A (2) B (3) C (4) D

Q.67 **STATEMENT-1:** The conductivity of solutions of different electrolysis in the same solvent and at a given temperature is same.

STATEMENT-2: The conductivity depends on the charge and size of the ions. The concentrations of ions and ease with which the ions move under potential gradient.

(1) A (2) B (3) C (4) D

Q.68 **STATEMENT-1**: A metal having negative reduction potential when dipped in the solution of its own ions has a tendency to pass into the solution.

STATEMENT-2: Metals having negative reduction potentials have large hydration energy.

(1) A (2) B (3) C (4) D

MORE THAN ONE CORRECT TYPE QUESTIONS

Q.69 If the half-cell reaction $A + e^- \longrightarrow A^-$ has a large negative reduction potentials, it follows that:

(1) A is readily reduced
(2) A is readily oxidised
(3) A^- is readily reduced
(4) A^- is readily oxidised

Q.70 The oxidation potential of hydrogen half-cell will be negative if:

(1) $p(H_2)$ =1 atm and $[H^+]$ = 1 M
(2) $p(H_2)$ = 1 atm and $[H^+]$ = 2M
(3) $p(H_2)$ = 0.2 atm and $[H^+]$= 1m
(4) $p(H_2)$ = 0.2 atm and $[H^+]$ = 0.2M

Q.71 Which of the following arrangement will produce oxygen at anode, during electrolysis?

(1) Dilute H_2SO_4 with Pt electrodes
(2) Fused NaOH with inert electrodes
(3) Dilute H_2SO_4 with Cu electrodes
(4) Concentrated aq. NaCl with Pt electrodes

Q.72 When a lead storage battery is discharged:

(1) SO_2 is evolved
(2) Lead sulphate is produced at both electrodes
(3) Sulphuric acid is consumed
(4) water is formed

Q.73 For a reaction in a galvanic cell the value of $-\Delta G°$ at certain temperature is not necessarily equal to:

(1) nFE^0 (2) RT In K
(3) T. $\Delta S° - \Delta H°$ (4) zero

COMPREHENSION TYPE QUESTIONS

Q.74 The standard reduction potential of the $Ag^+|Ag$ electrode at 298 K is 0.80 V. The solubility product of AgCl is 6.4×10^{-17} at 298 K (2.303 RT/F = 0.06, log 2 = 0.3)

(i) the potential of $Ag^+|$ Ag electrode in a saturated solution of Agl at 298 K is

(1) –0.314 V (2) +0.314 V
(3) –0.172 V (4) +0.172 V

(ii) The standard reduction potential of $I^-|Agl|Ag$ electrode at 298 K is

(1) –0.314 V (2) +0.314 V
(3) –0.172 V (4) +0.172 V

(iii) The potential of I^- (0.04 M) |Agl| Ag electrode at 198 K is

(1) –0.088 V (2) +0.088 V
(3) –0.172 V (4) +0.172 V

Q.75 A current of 15.0 A is employed to plate nickel in a $NiSO_4$ solution. Both Ni and H_2 are formed at the cathode. The current efficiency with respect to formation of Ni is 60%. The density of nickel = 8.9 g/ml. (Ni = 58.7)

(i) How much of nickel is plated on the cathode per hour?

(1) 16.43 g (2) 32.85 g
(3) 19.7 g (4) 9.85 g

(ii) What is the thickness of the planting if the cathode consists of a sheet of metal 4.0 cm^2, which is to be coated on both sides?

(1) 1.38 mm (2) 2.76 mm
(3) 0.69 mm (4) 23.0 mm

(iii) What volume of H_2 at 0°C and 1 atm is formed per hour?

(1) 6.27 L (2) 3.76 L (3) 2.5 L (4) 5.01 L

(iv) At the end of the electrolysis, how many grams of the gaseous product appear at the anode?

(1) 4.48 g (2) 1.796 g
(3) 2.69 g (4)7.46 g

MATCH THE COLUMN TYPE QUESTIONS

Q.76

	Column-I		Column-II
(A)	Dilute solution of HCl	(P)	O_2 evolved at anode
(B)	Dilute solution of NaCl	(Q)	H_2 evolved at cathode
(C)	Concentrated solution of NaCl	(R)	Cl_2 evolved at anode
(D)	$AgNO_3$ solution	(S)	Ag deposited at cathode

(1) A → R, P; B → S, Q; C → Q, R; D → P, S;
(2) A → Q, S; B → Q, P; C → Q, R; D → P, S;
(3) A → P, Q; B → P, Q; C → S, P; D → Q, R;
(4) A → P, Q; B → P, Q; C → Q, R; D → P, S;

Q.77 The standard reduction potential data at 25°C is given below:

$E° (Fe^{3+}, Fe^{2+}) = +0.77V$
$E° (Fe^{2+}, Fe) = -0.44V$
$E° (Cu^{2+}, Cu) = +0.34V$
$E° (Cu^{+}, Cu) = +0.52V$
$E° [O_2(g) + 4H^+ + 4e^- \rightarrow 2H_2O] = +1.23V$
$E°[O_2(g) + 2H_2O + 4e^- \rightarrow 4OH^-] = +0.40V$
$E°(Cr^{3+}, Cr) = -0.74V$

$E°(Cr^{2+},Cr) = -0.91V$

Match E° of the redox pair in **Column-I** with the values given in **Column-II**

	Column-I		**Column-II**
(A)	E° (Fe^{3+},Fe)	(P)	–0.70V
(B)	E° $(4H_2O \rightarrow 4H^+ + 4\ OH^-)$	(Q)	–0.4V
(C)	E° $(Cu^{2+}, Cu \rightarrow 2Cu^+)$	(R)	–0.04V
(D)	E° (Cr^{3+}, Cr^{2+})	(S)	–0.83V

(1) A → P; B → Q; C → S; D → R;

(2) A → S; B → P; C → Q; D → R;

(3) A → R; B → S; C → P; D → Q;

(4) A → Q; B → S; C → P; D → R;

ANSWER KEY

JEE-RANKER'S STUFF

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