CHEMISTRY

BOOKS - KALYANI CHEMISTRY (ENGLISH)

ELECTROCHEMISTRY

Example

1. Write each half-cell reaction and also the net cell reaction for a cell.

$Cu|Cu^{2+}(aq)||Ag^{+}(aq)|Ag$

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2. Depict the galvanic cell in which the reaction

$Zn(s)+2Ag^{+}(aq)\rightarrow Zn^{2+}(aq)+2Ag(s)$ takes place. Further show:

(i) which of the electrode is negatively charged?

(ii). The carriers of the current in the cell.

(iii). Individual reaction at each electrode.

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3. Calculate the e.m.f. of a cell in which the following reactions take place at different electrodes.

$Zn^{2+} + 2e^- \rightarrow Zn, E^{\Theta} = -0.76V \quad ...(i)$

$Ag^+ + e^- \rightarrow Ag, E^{\Theta} = 0.79V \quad ...(ii)$

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4. Following cell is set up between copper and silver electrodes $Cu/Cu^{2+}(aq)||Ag^+/Ag$. If two half-cells work under standard conditions, calculate the e.m.f. of the cell. [Given $E^{\Theta}Cu^{2+}/Cu\left(E^{\Theta} \text{ reduction}\right) = +0.34\text{volt}.$ $E^{\Theta}Ag^+/Ag\left(E^{\Theta} \text{ reduc}\right.$

]

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5. Some standard electrode (or reduction) potentials in acidic solutions are as follows:

$Cu^{2+}/Cu = 0.34V, Ag^{+}/Ag = 0.80V$

Predict whether the following reactions occur:

(i) Will copper(s) reduce Ag^{+} ion in aq. solution ?

(ii) Will copper(s) dissolve in 1 MHCl?

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6. Using the standard electrode potentials given, predict if the reaction between the following is feasible:

$Fe^{3+}(aq)$ and $l^{-}(aq)$

Fe3+/Fe2+ : +0.77 V

I-/I2 : -0.54 V

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7. Two half-reactions of an electrochemical cell are given below:

$MnO_4^-(aq) + 8H^+(aq) + 5e^- \rightarrow Mn^{2+}(aq) + 4H_2O(l), E^\Theta = +1.51V$

$Sn^{2+}(aq) \rightarrow Sn^{4+}(aq) + 2e^-, E^\Theta = 0.15V$

Construct the redox reaction equation from the two half reactions and calculate the cell potential from the standard potentials and predict if the reaction is reactant or product favoured.

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8. The reduction potential of a metal X is - 0.76 volts while that of Y is - 2.38 volts. Which of the two metals is a stronger reducing agent ? Give reason for your answer.

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9. Knowing that

$Cu^{2+}(aq) + 2e^- \rightarrow Cu(s), E^\Theta = 0.34V$

$2Ag^+ + 2e^- \rightarrow 2Ag, E^\Theta = 0.79V$

reason out whether 1 M silver nitrate solution can be stored in copper vessel or 1 M copper sulfate solution can be stored in silver vessel.

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10. Write the Nernst equation and compute the e.m.f. of the following cell at 298K:

$Sn(s)|Sn^{2+}(0.05M)||H^{+}(0.02M)|H_2$, 1 atm Pt

[Given : $E^{\Theta}Sn^{2+}/Sn = -0.136V$]

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11. Calculate the potential for half-cell containing 0.10 $MK_2Cr_2O_7(aq)$, $0.20MCr^{3+}(aq)$ and $1.0 \times 10^{-4}MH^{+}(aq)$. The half-cell reaction is

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

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12. Calculate the emf of the cell in which the following reaction takes place :

$Ni(s) + 2Ag^{+}(0.002M) \rightarrow Ni^{2+}(0.160M) + 2Ag(s)$

Given that $E^{\Theta}_{\text{cell}} = 1.05V$

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13. A voltaic cell is set up at $25^{\circ}C$ with the following half cells :

$Ag^{+}(0.001M)$ | Ag and $Cu^{2+}(0.10M)$ | Cu

What would be the voltage of this cell ? $\left(E^{\circ}_{\text{cell}} = 0.46V\right)$

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14. The following chemical reaction is occurring in an electrochemical cell,

$Mg(s) + 2Ag^{+}(0.0001M) \rightarrow Mg^{2+}(0.10M) + 2Ag(s)$

$Mg^{2+}/Mg = -2.36V, Ag^{+}/Ag = 0.81V$

For this cell calculate/write

(a) (i) E^{Θ} value for the electrode $2Ag^{+}/2Ag$.

(ii) Standard cell potential E^{Θ}_{cell}

(b) Cell potential $(E)_{\text{cell}}$

(c) (i) Symbolic representation of the above cell.

(ii) Will the above cell reaction be spontaneous ?

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15. A copper - silver cell is set up . The copper ion concentration in it is 0.10 M. concetration of silver ion is not known . The cell potential measured 0.422 V. determine the concentration of silver ion in the cell.

Given : $E^{\circ}_{Ag+/Ag} = +0.80V, E^{\circ}_{Cu^{2+}/Cu} = +0.34V.$

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16. Calculate the pressure of H, gas taken in the form of gas electrode in a galvanic cell having 1.0 M HCl at $25^{\circ}C$. Other electrode is that of Ni dipped in 1.0 M Ni^{2+} solution. The observed e.m.f. of the cell is 0.245 V.

$E^{\Theta}_{Ni^{2+}/Ni} = -0.25V, E^{\Theta}_{2H^{+}/H_2} = 0.0V$

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17. The e.m.f of the following cell

$Pt|H_2(1 \text{ atm.})/H^+(aq||Ag^+(1M)1Ag(s) \text{ at } 25^\circ C$ is 0.87V.

Calculate the pH of the acid solution.

$E^\Theta_{Ag^+/Ag} = 0.80V, E_{2H^+/H_2} = 0.0V$

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18. Find the pH of the following acid solution:

$Pt|H_2(1 \text{ bar})|H^+(\text{aq. acid})||H^+(\text{aq. Acid})||H^+(1M)|H_2(g) \text{ 1 bar} | \text{Pt}$

. The measured e.m.f of the cell is 0.178 V.

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19. Calculate the potential of hydrogen electrode in contact with a solution whose pH is 10.

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20. Calculate the equilibrium constant for the reaction:

$Cd^{2+}(aq) + Zn(s) \Leftrightarrow Zn^{2+}(aq) + Cd(s)$

If $E^{\Theta}_{Cd^{2+}/Cd} = -0.403V$

$E^{\Theta}_{Zn^{2+}/Zn} = -0.763V$

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21. The E^{Θ} values at 298 K corresponding to the following two reduction electrode processes are:

$(i) Cu^{+}/Cu = 0.52V$

(ii) $Cu^{2+}/Cu^{+} = +0.16V$

Formulate the galvanic cell for their combination. What will be the cell potential ? Calculate the $\Delta_r G^{\Theta}$ for the cell reaction $(F = 96500 \ \text{C mol}^{-})$.

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22. The zinc/silver oxide cell is used in hearing aids and electric watches.

$Zn \rightarrow Zn^{2+} + 2e^{-}, E^{\Theta} = 0.76V$

$Ag_2O + H_2O + 2e^{-} \rightarrow Ag + 2OH^{-}, E^{\Theta} = 0.344V$

What is oxidised and reduced?

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$Ag_2O + H_2O + 2e^{-} \rightarrow Ag + 2OH^{-}, E^{\Theta} = 0.344V$

Find E^{Θ} of the cell and $\Delta_r G^{\Theta}$ in joules.

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24. Determine the values of equilibrium constant (K_C) and ΔG^o for the following reaction :

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25. The equilibrium constant at 25°C for the process

$Co^{3+}(aq) + 6NH_3(aq) \Leftrightarrow \left[Co(NH_3)_6\right]^{3+}(aq)$

is 2.0×10^7. Calculate the value of $\Delta_r G^{\Theta}$ at $25^{\circ} C$

$\left[R = 8314 JK^{-1}\text{mol}^{-1}\right]$

In which direction is the reaction spontaneous when reactants and products are under standard conditions ?

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26. The cell in which the following reaction occurs

$2Fe^{3+}(aq) + 2I^{-}(aq) \rightarrow 2Fe^{2+}(aq) + I_2(aq) + I_2(s)$ has

$E^0_{cell} = 0.236V$ at 298 K.

Calculate the stadard gibbs energy and the equilibrium constant of the cell reaction.

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27. Resistance of a conductivity cell filled with 0.1 mol L^{-1} KCl solution is 100Ω. If the resistance of the same cell when filled with 0.02 mol L^{-1} KCl solution is 520Ω, 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 $1.29 S/m$.

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28. The molar conductivity of a 1-5 M solution of an electrolyte is found to be $138.9 Scm^2 mol^{-1}$. Calculate the conductivity of this solution.

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29. The conductivity of a 0.20 M solution of KCl at 298 K is $0.0248 Scm^{-1}$. Calculate its molar conductivity .

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30. The resistace of a conductivity cell containing 0.001 M KCl solution at 298K is 1500Ω what is the cell constant if conductivity of 0.001M KCl solution at 298 K is $0.146 \times 10^{-3} S \quad cm^{-1}$

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31. When a solution having conductivity $1.342 \times 10^{-2} \quad \text{ohm}^{-1} cm^{-1}$ was placed in a cell with parallel electrodes, the resistance was found to be 170.5 ohms. If the area of the electrodes is 1.86 sq. cm., find the cell constant and the distance apart of the electrodes.

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32. The resistance of cell containing 0.1N KCl solution and 0.1N $AgNO_3$ solution was 337.62 and 362.65 ohms respectively at 298 K. The conductivity of 0.1 N KCl is 0.01286 $\text{ohm}^{-} cm^{-}$ at 298 K. Find the cell constant and equivalent conductance of 0.1 N $AgNO_3$ solution.

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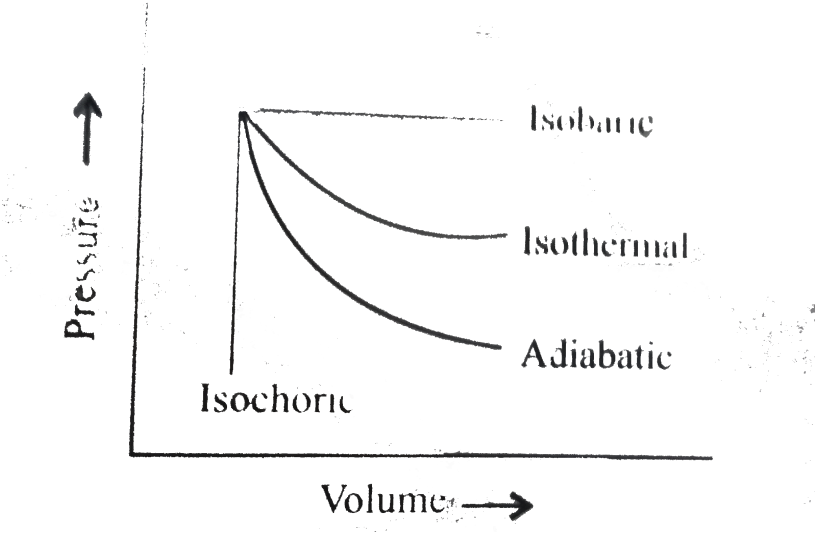
33. The pressure-volume of varies thermodynamic process is shown in graphs:



Work is the mole of transference of energy. It has been observed that reversible work done by the system is the maximum obtainable work.

$w_{rev} > w_{irr}$

The works of isothermal and adiabatic processes are different from each other.

$$w_{\text{isothermal reversible}} = -2.303nRT\log_{10}\left(\frac{V_2}{V_1}\right)$$

$$= 2.303nRT\log_{10}\left(\frac{P_2}{P_1}\right)$$

$$w_{\text{adiabatic reversible}} = C_V(T_1 - T_2)$$

Calculate work done when 1 mole of an ideal gas is expanded reversibly from $30L$ to $60L$ at a constant temperature of $300K$

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34. Calculate limiting molar conductivity of $CaSO_4$ (limiting molar conductivity of Calcium and sulfate ions are 119.0 and 160.0 $Scm^2\text{mol}^{-1}$ respectively.

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35. How can Kohlrausch's law of independent migration can be applied for calculating the degree of dissociation (α) of weak electrolytes ?

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36. The specific conductivity of CH_3COOH(0.001N) at 291 K is $4.09 \times 10^{-9}\Omega^{-1}m^{-1}$. Calculate its degree of dissociation if equivalent

conductivities at infinite dilution of KCl, HCl and CH_3COOK are 0.01301, 0.03794 and 0.00956 $\Omega^{-1}m^2g.\ eq^{-1}$ respectively at 291K.

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37. Conductivity of 0.00241 M acetic acid is $7.896 \times 10^{-5}S \quad cm^{-1}$. Calculate its molar conductivity. If $\wedge_m^\circ$ for acetic acid is $390.5S \quad cm^2 \quad mol^{-1}$, what is its dissociation constant?

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38. The molar conductivity of 0.025 mol L^{-1} methanoic acid is 46.1 S cm^2 mol^{-1}. Calculate its degree of dissociation and dissociation constant. Given

$v^0\left(H^+\right) = 349.6S \quad cm^2mol^{-1}$ and $\lambda^0\left(HCOO^-\right) = 54.6S \quad cm^2mol^{-1}$

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39. How many electrons will flow when a current of 5 amperes is passed through a solution for 200 seconds ?

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40. The same current was passed successively through the solutions of zinc sulfate and nickel ammonium sulfate (rendered alkaline with ammonia). The weights of zinc and nickel deposited in a certain time were found to be 0.531 and 0.477 g. respectively. Given that the equivalent weight of zinc is 32.7, calculate that of nickel.

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41. A current of 10 A is passed for 80 min and 27 seconds through a cell containing dilute sulfuric acid.

(1) How many moles of oxygen gas will be liberated at the anode ?

(2) Calculate the amount of zinc deposited at the cathode when another cell containing $ZnSO_4$ solution is connected in series.

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42. A current of 10 A is passed for 80 min and 27 seconds through a cell containing dilute sulfuric acid.

(1) How many moles of oxygen gas will be liberated at the anode ?

(2) Calculate the amount of zinc deposited at the cathode when another cell containing $ZnSO_4$ solution is connected in series.

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43. On electrolysis of an aqueous electrolyte between copper electrodes, it is observed that cuprous oxide (molecular weight 143) is formed at the anode. What will be the weight of the cuprous oxide formed if a current of 0.965 A is passed for 2000 sec ?

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44. How many coulombs are required for the following reductions?

1 mol of $C_6H_5NO_2$ to $C_6H_5NH_2$

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45. How many coulombs are required for the following reductions?

1 mol of MnO_4^- to Mn^{2+}.

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46. How many coulombs are required for the following oxidation?

1 mole of H_2O to O_2

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47. How many coulombs are required for the following oxidation?

one mole of FeO to Fe_2O_3

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48. How many coulombs are required to produce 20.0 g of calcium from molten $CaCl_2$.

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49. How many coulombs are required to produce 40.0 g of aluminium from molten Al_2O_3.

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50. Three electrolytic cells A,B,C containing solutions of $ZnSO_4$, $AgNO_3$ and $CuSO_4$, passed through them until 1.45g of silver deposited at the cathode of cell B. How long did the current flow? What mass of copper and zinc were deposited?

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Follow Up Problems

1. Write the cell reaction for the cell

$Zn|Zn^{2+}(IM)||Fe^{3+}(IM)Pt$

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2. Write the cell reaction for the cell

$Sn|Sn^{2+}||Au^{3+}|Au$

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3. Give the representation for the cell with cell reaction as :

$2Ag^{+} + Ni \rightarrow Ni^{2+} + 2Ag$

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4. Give the representation for the cell with cell reaction as :

$2Al + 3Zn^{2+} \rightarrow 2Al^{3+} + 3Zn$

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5. A conventional method of representing Daniell cell is:

$Zn(s), Zn^{2+}(aq)(1M)||Cu^{2+}(aq)(1M), Cu(s)$

(i) Draw a diagram of the cell and mark anode and cathode.

$Cu^{2+}/Cu = 0.34V, Zn^{2+}/Zn = -0.76V$

(ii) Give the net reaction as current is drawn.

(iii) What is the cell potential at 298 K?

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6. Calculate the voltage of following electrochemical cell under standard conditions. Name anode and cathode in each cell. (i) Zn - Ag (ii) Co - Ni. The standard reduction potentials of various half cells are:

$Zn^{2+}/Zn = -0.76V, Ag^{+}/Ag = +0.80V$

$Co^{2+}/Co = -0.28V, Ni^{2+}/Ni = -0.25V$

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7. In the Zn - Cu cell, standard reduction potential of Zn=-0.763 volt. Standard reduction potential of Cu=0.335 volt. Name the cathode and anode in this electrochemical cell.

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8. Predict the possibility of occurrence of the following reactions :

$(i)Zn + 2H^{+} \rightarrow Zn^{2+} + H_2, (ii)2Ag + 2H^{+} \rightarrow 2Ag^{+} + H_2$

Electrode	Standard reduction Potential $\left(E^{\Theta}\text{ in volts}\right)Zn$
Zn^{2+}/Zn	-0.76
Ag^{+}/Ag	$+0.80$
$2H^{+}/H_2$	0.00

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9. An iron wire is immersed in a solution containing $ZnSO_4$ and $NiSO_4$. When the concentration of each salt is 1 M, predict giving reactions which of the following reactions is likely to proceed : (i) Iron reduces Zn^+ ions (ii) Iron reduces Ni^{2+} ions.

Given

$E^{\Theta} = -0.76V$ for Zn^{2+}/Zn

$E^{\Theta} = -0.44V$ for Fe^{2+}/Fe

$E^{\Theta} = -0.25V$ for Ni^{2+}/Ni

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10. One plate of Cu and one plate of Ag are placed in a solution containing cupric and silver ions. What reactions would occur if the concentration of each species were 1 M ? Given that reduction potential of Cu^{2+}/Cu and Ag^+/Ag electrodes are +0.34 and + 0.80 volt respectively.

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11. Given the standard electrode potentials ,

$K^+/K = -2.93V, Ag^+/Ag = 0.80V, Hg^{2+}/Hg = 0.79V$

$Mg^{2+}/Mg = -2.37V. Cr^{3+}/Cr = -0.74V$

arrange these metals in their increasing order of the reducing power .

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12. Consult the table of standard electrode potentials and suggest three substances that can oxidise ferrous ions under suitable conditions.

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13. Given that the standard elctrode potentials $\left(E^{\Theta}\right)$ of metals are:

$K^+/K = -2.93V, Ag^+/g = 0.80V,$

$Cu^{2+}/Cu = 0.34V, Mg^{2+}/Mg = -2.37V,$

$Cr^{3+}/Cr = -0.74V, Fe^{2+}/Fe = -0.44V.$

Arrange these metals in an increasing order of their reducing power.

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14. Arrange the following metals in the order in which they displace each other from the solution of their salts.

Al, Cu, Fe, Mg and Zn

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15. Calculate the e.m.f. of the cell

$Zn / Zn^{2+}(0.1M)||Cu^{2+}(0.01M)|Cu$

$E^{\Theta}_{Zn^{2+}/Zn} = -0.76$ V and $E^{\Theta}_{Cu^{2+}/Cu} = 0.34V$

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16. If E^{Θ} for copper electrode is 0.34 V, how will you calculate its e.m.f. value when the solution in contact with it is 0.1M in copperions? How does e.m.f.for copper electrode changes when concentration of Cu^{2+} ions in the solution is decreased ?

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17. Calculate the e.m.f. of the following cell at 298 K

$Co/Co^{2+}(0.1M)||Ag^{+}(0.1M)/Ag$ Given

$E^{\Theta}_{Co^{2+}/Co} = -0.28V, E^{\Theta}_{Ag^{+}/Ag} = 0.8V$

$R = 8.31JK^{-1}\text{mol}^{-}, F = 96500$ coulombs.

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18. Calculate the E.M.F of the following cell at 298 K:

$Mg/Mg^{2+}(0.130M)||Ag^{+}\left(1.0\times10^{-4}M\right)|Ag$

Given that $E^{\Theta}_{(Mg^{2+}|Mg)} = -2.37V, E^{\circ}_{(Ag^{+}|Ag)} = 0.80V$

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19. Find the pH of the following acid solution

$Pt|H_2(1\ \text{bar})|H^{+}(\text{aq. acid})||H^{+}(1M)|H_2(g, 1\text{bar})|Pt$

The measured e.m.f. of the cell = 0.182 V.

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20. In the cell reaction,

$4Cr^{2+}(aq) + O_2(g) + 4H^+(aq) \Leftrightarrow 4Cr^{3+}(aq) + 2H_2O(I),$

the concentrations are :

$\left[Cr^{2+}\right] = 0.1M, \left[Cr^{3+}\right] = 0.082M, \left[H^+\right] = 0.01M.$ Find the partial pressure of O_2 gas at equilibrium at $25^\circ C.$

$\left[E^\Theta_{Cr^{3+}/Cr^{2+}} = -0.41V. E^\Theta_{O_2/H_2O} = 1.23V\right].$

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21. Calculate the equilibrium constant for the following cell reaction.

$\frac{1}{2}Cl_2(g) + Br^- \rightarrow \frac{1}{2}Br_2(l) + Cl^-, E^\Theta = 0.30V$

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22. Find the equilibrium constant of the following reaction

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

at $25^{\circ}C$, $E^{\Theta}_{Cu^{2+}/Cu} = 0.34V$, $E^{\Theta}_{Sn^{4+}/Sn^{2+}} = 0.155V$

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23. The e.m.f E^{Θ}_{cell} of the cell reaction $3Sn^{4+} + 2Cr \rightarrow 3Sn^{4+} + 2Cr^{3+}$ is 0.89 V. Calculate $\Delta_r G^{\Theta}$ for the reaction $\left(F = 96500\text{C mol}^{-1}\right)$.

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24. Calculate the maximum electrical work that can be obtained from the following cell under the standard conditions at $25^{\circ}C$.

$Zn/Zn^{2+}(aq)||Fe^{2+}(aq)/Fe$

Given that $E^{\Theta}_{Zn^{2+}(aq)/Zn} = -0.76V$

$E^{\Theta}Fe^{2+}(aq)/Fe = -0.44V$ and $F = 96500\text{C mol}^{-1}$

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25. For the following cell, calculate the emf:

$Al/Al^{3+}(0.01M)||Fe^{2+}(0.02M)|Fe$

Given: $E^{\Theta}_{Al^{3+}/Al} = -1.66V, E^{\Theta}_{Fe^{2+}/Fe} = -0.44V$

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26. The standard electrode potential for daniell cell is 1.1 V. calculate the standard gibbs energy for the reaction

$Zn(s) + Cu^{2+}(aq) \rightarrow Zn^{2+}(aq) + Cu(s)$

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27. Calculate ΔG^{Θ} and the equilibrium constant for the cell reaction :

$Cl_2 + 2I^- \rightarrow 2Cl^- + I_2$

Given that $E^{\Theta}(Cl_2, Cl^-) = 1.36V, E^{\Theta}(I_2 I^-) = 0.536V$

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28. Determine the equilibrium constant of the reaction at 298 K,

$2Fe^{3+} + Sn^{2+} \Leftrightarrow 2Fe^{2+} + Sn^{4+}$

From the obtained value of the equilibrium constant, predict whether Sn^{2+} ions can reduce Fe^{3+} to Fe^{2+} quantitatively or not.

Given: $E_{Fe^{3+}, Fe^{2+} / Pt} = 0.771V$. $E^{\Theta}_{Sn^{4+} / Sn^{2+} / Pt} = 0.150V$.

$\left[R = 8.314JK^{-1}\text{mol}^{-1}\right]$

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29. For the chemical equilibrium

$PCl_5(g) \Leftrightarrow PCl_3(g) + Cl_2(g) \quad \text{at} \quad 298K, K_c = 1.8 \times 10^{-7}$.

Calculate $\Delta_r G^{\Theta}$ for the forward reaction $R = 8.31JK^{-1}\text{mol}^{-1}$

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30. The resistace of a conductivity cell containing 0.001 M KCl solution at 298K is 1500Ω what is the cell constant if conductivity of 0.001M KCl solution at 298 K is $0.146 \times 10^{-3}S \quad cm^{-1}$

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

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32. The resistance of a cell (cell constant $= 1.1cm^{-1}$) containing $\frac{N}{50}$ KCl was found to be 400 ohms. Find the equivalent conductivity of KCl at this dilution.

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33. The conductivity of 0.01N KCl solution is 0.0014106 $\text{ohm}^{-}cm^{-}$ at 298 K. When a conductivity cell was filled up with the same solution, it offered a resistance of 484 ohms at 298 K. The same cell was then filled with 0.001 N solution of NaCl at the same temperature which gave a resistance of

5496 ohms. Calculate the value of equivalent conductivity of 0.001 N NaCI solution.

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34. 0.5N solution of a salt placed between two Pt electrodes 2.0 cm apart and having area of cross-section 2.5 cm^2 has resistance of 25 ohms. Calculate the conductance and cell constant.

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35. Conductivity of a solution containing one gram of anhydrous $BaCl_2$ in 200 mL of the solution has been found to be 0.00585 $\text{ohm}^{-} cm^{-}$. Calculate the equivalent as well as molar conductance.

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36. The electical resistance of a column of 0.05 M , NaOH solution of diameter 1 cm and length 50 cm is 5.55×10^3 ohm.

Calculate its resistivity , conductivity and molar conductivity .

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37. The resistance of 0.01 M CH_2COOH solution was found to be 2220 ohm in a conductivity cell having cell constant 0.366 cm^{-1}. Calculate:

(i) molar conductivity ($\wedge_m$) of $0.01MCH_3COOH$

(ii) $\wedge_m^\infty$

(iii) degree of dissociation, α and

(iv) dissociation constant of the acid.

$\left[\lambda^0\left(H^+\right) = 349.1\text{ohm}^{-1}cm^2\text{mol}^{-1}, \lambda^0\left(CH_3COO^-\right) = 40.9\text{ohm}^{-1}cm^2\text{m}\right.$

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38. The molar conductivity of NH_4Cl at infinite dilution is 149.7 $\text{ohm}^- cm^2\text{mol}^{-1}$ and ionic conductances of hydroxyl ions and chloride

ions are 198 and 76.3 respectively. Calculate the molar conductivity of NH_4OH at infinite dilution.

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39. Calculate the value of equivalent conductivity of $MgCl_2$ at infinite dilution if $\lambda^{\infty}\left(Mg^{2+}\right) = 106.12\text{ohm}^{-1}cm^{-2}\text{mol}^{-1}, \lambda^{\infty}\left(Cl^{-}\right) = 76.34\text{ohm}^{-1}cm^{2}\text{m}$.

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40. Calculate $\wedge_m^{\circ}$ for $CaCl_2$ an $MgSO_4$ from the data given in table

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41. The equivalent conductances at infinite dilution of NH_4Br, KOH and KBr at $25^{\circ}C$ are $271.52 \times 10^{-4}, 266.5 \times 10^{-4}$

and $1.51.66 \times 10^{-4}\Omega^{-1}m^2(\text{g. eq})^{-1}$ respectively. Calculate the degree of dissociation of 0.01 N NH_4OH at $25^\circ C$ if the equivalent conductance of 0.01 N NH_4OH solution is $16.28 \times 10^{-4}\Omega^{-1}m^2(\text{g eq})^{-1}$.

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42. The molar conductivity of KCl solutions at different concentration at 298K are given below :

$C/\text{mol L}^{-1}$	$\wedge_m / Scm^2\text{mol}^{-1}$
0.000198	148.61
0.000309	148.29
0.000521	147.81
0.000987	143.09

Show that a plot between $\wedge_m$ and $C^{1/2}$ is a straight line. Determine the values of $\wedge_m^0$ and $\wedge$ for KCl.

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43. What wil be the products of electrolysis of an aqueous solution of $AgNO_3$ with silver electrodes ?

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44. (a) Predict the products of electrolysis in each of the following :

(i) An aqueous solution of $AgNO_3$ with platinum electrodes

(ii) An aqueous solution of H_2SO_4 with platinum electrodes

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45. (a) Predict the products of electrolysis in each of the following :

(i) An aqueous solution of $AgNO_3$ with platinum electrodes

(ii) An aqueous solution of H_2SO_4 with platinum electrodes

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46. Predict the products of electrolysis in each of the following

(i) an aqueous solution of $AgNO_3$ with silver electrodes.

(ii). An aqueous solution of $AgNO_3$ with platinum electrodes.

(iii). A dilute solution of H_2SO_4 with platinum electrodes.

(iv). An aqueous solution of $CuCl_2$ with platinum electrodes.

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47. What will happen during the electrolysis of aqueous solution of $CuSO_4$ by using platinum electrodes?

Watch Video Solution

48. Why potassium cannot be obtained by the electrolysis of an aqueous solution of KCI?

Watch Video Solution

Exercise Part I Objective Questions

1. Fill in the blanks by choosing the appropriate word/words from those given in the brackets:

(ionic conduction, electronic conduction, anode, cathode, one coulomb, one faraday of their equivalent weights, of their molecular weights, decoration, Avogadro's number, proton number, loss of electrons, gain of electrons, can, cannot, e.m.f., negative, positive, greater, H_2, sodium, less, more, bad, good, increases, decreases electrode potential, negative, positive, greater, less, H_2, O_2, more).

The movement of ions towards oppositely charged electrode is called.....

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2. Fill in the blanks by choosing the appropriate word/words from those given in the brackets:

(ionic conduction, electronic conduction, anode, cathode, one coulomb, one faraday of their equivalent weights, of their molecular weights, decoration, Avogadro's number, proton number, loss of electrons, gain of electrons, can, cannot, e.m.f., negative, positive, greater, H_2, sodium, less,

more, bad, good, increases, decreases electrode potential, negative, positive, greater, less, H_2, O_2, more).

The cations on reaching.....gain electrons and form neutral atoms which get deposited on the cathode.

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3. Fill in the blanks by choosing the appropriate word/words from those given in the brackets:

(ionic conduction, electronic conduction, anode, cathode, one coulomb, one faraday of their equivalent weights, of their molecular weights, decoration, Avogadro's number, proton number, loss of electrons, gain of electrons, can, cannot, e.m.f., negative, positive, greater, H_2, sodium, less, more, bad, good, increases, decreases electrode potential, negative, positive, greater, less, H_2, O_2, more).

Electrochemical equivalent is the weight of substance liberated when ..... electricity is passed through the electrolyte.

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4. Fill in the blanks by choosing the appropriate word/words from those given in the brackets:

(ionic conduction, electronic conduction, anode, cathode, one coulomb, one faraday of their equivalent weights, of their molecular weights, decoration, Avogadro's number, proton number, loss of electrons, gain of electrons, can, cannot, e.m.f., negative, positive, greater, H_2, sodium, less, more, bad, good, increases, decreases electrode potential, negative, positive, greater, less, H_2, O_2, more).

The electrochemical equivalents of the two metals are in the ratio.....

Watch Video Solution

5. Fill in the blanks by choosing the appropriate word/words from those given in the brackets:

(ionic conduction, electronic conduction, anode, cathode, one coulomb, one faraday of their equivalent weights, of their molecular weights, decoration, Avogadro's number, proton number, loss of electrons, gain of electrons, can, cannot, e.m.f., negative, positive, greater, H_2, sodium, less,

more, bad, good, increases, decreases electrode potential, negative, positive, greater, less, H_2, O_2, more).

The process of electroplating is used for ..... and repairs.

Watch Video Solution

6. Fill in the blanks by choosing the appropriate word/words from those given in the brackets:

(ionic conduction, electronic conduction, anode, cathode, one coulomb, one faraday of their equivalent weights, of their molecular weights, decoration, Avogadro's number, proton number, loss of electrons, gain of electrons, can, cannot, e.m.f., negative, positive, greater, H_2, sodium, less, more, bad, good, increases, decreases electrode potential, negative, positive, greater, less, H_2, O_2, more).

When 96,500 coulombs is divided by the charge on the electron in coulomb, the answer is equal to.....

Watch Video Solution

7. Fill in the blanks by choosing the appropriate word/words from those given in the brackets:

(ionic conduction, electronic conduction, anode, cathode, one coulomb, one faraday of their equivalent weights, of their molecular weights, decoration, Avogadro's number, proton number, loss of electrons, gain of electrons, can, cannot, e.m.f., negative, positive, greater, H_2, sodium, less, more, bad, good, increases, decreases electrode potential, negative, positive, greater, less, H_2, O_2, more).

Oxidation is a process which involves.....

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8. Fill in the blanks by choosing the appropriate word/words from those given in the brackets:

(ionic conduction, electronic conduction, anode, cathode, one coulomb, one faraday of their equivalent weights, of their molecular weights, decoration, Avogadro's number, proton number, loss of electrons, gain of electrons, can, cannot, e.m.f., negative, positive, greater, H_2, sodium, less, more, bad, good, increases, decreases electrode potential, negative,

positive, greater, less, H_2, O_2, more).

Solid NaCl is a ..... conductor of electricity.

Watch Video Solution

9. Fill in the blanks by choosing the appropriate word/words from those given in the brackets:

(ionic conduction, electronic conduction, anode, cathode, one coulomb, one faraday of their equivalent weights, of their molecular weights, decoration, Avogadro's number, proton number, loss of electrons, gain of electrons, can, cannot, e.m.f., negative, positive, greater, H_2, sodium, less, more, bad, good, increases, decreases electrode potential, negative, positive, greater, less, H_2, O_2, more).

An aqueous solution of silver nitrate.....be stored in a copper vessel.

Watch Video Solution

10. Fill in the blanks by choosing the appropriate word/words from those given in the brackets:

(ionic conduction, electronic conduction, anode, cathode, one coulomb, one faraday of their equivalent weights, of their molecular weights, decoration, Avogadro's number, proton number, loss of electrons, gain of electrons, can, cannot, e.m.f., negative, positive, greater, H_2, sodium, less, more, bad, good, increases, decreases electrode potential, negative, positive, greater, less, H_2, O_2, more).

In a Daniell cell, the copper vessel serves as.....

Watch Video Solution

11. Fill in the blanks by choosing the appropriate word/words from those given in the brackets:

(ionic conduction, electronic conduction, anode, cathode, one coulomb, one faraday of their equivalent weights, of their molecular weights, decoration, Avogadro's number, proton number, loss of electrons, gain of electrons, can, cannot, e.m.f., negative, positive, greater, H_2, sodium, less, more, bad, good, increases, decreases electrode potential, negative, positive, greater, less, H_2, O_2, more).

The difference of the reduction potential of cathode and anode in a galvanic cell is known as.....

Watch Video Solution

12. Fill in the blanks by choosing the appropriate word/words from those given in the brackets:

(ionic conduction, electronic conduction, anode, cathode, one coulomb, one faraday of their equivalent weights, of their molecular weights, decoration, Avogadro's number, proton number, loss of electrons, gain of electrons, can, cannot, e.m.f., negative, positive, greater, H_2, sodium, less, more, bad, good, increases, decreases electrode potential, negative, positive, greater, less, H_2, O_2, more).

The more ..... the standard reduction potential of a metal the ..... is its ability to displace hydrogen from acids.

Watch Video Solution

13. Fill in the blanks by choosing the appropriate word/words from those given in the brackets:

(ionic conduction, electronic conduction, anode, cathode, one coulomb, one faraday of their equivalent weights, of their molecular weights, decoration, Avogadro's number, proton number, loss of electrons, gain of electrons, can, cannot, e.m.f., negative, positive, greater, H_2, sodium, less, more, bad, good, increases, decreases electrode potential, negative, positive, greater, less, H_2, O_2, more).

The electrolysis of molten sodium hydride liberates ..... gas at the .....

Watch Video Solution

14. Fill in the blanks by choosing the appropriate word/words from those given in the brackets:

(ionic conduction, electronic conduction, anode, cathode, one coulomb, one faraday of their equivalent weights, of their molecular weights, decoration, Avogadro's number, proton number, loss of electrons, gain of electrons, can, cannot, e.m.f., negative, positive, greater, H_2, sodium, less,

more, bad, good, increases, decreases electrode potential, negative, positive, greater, less, H_2, O_2, more).

Zinc is able to displace silver from $AgNO_3$ solution because its standard oxidation potential is ..... positive than that of silver.

Watch Video Solution

15. Correct the following statements by changing the underlined part of the sentence (Do not change the whole sentence)

A device in which energy liberated during a redox reaction is obtained in the form of electric current is known as an $\underline{\text{electrolytic cell}}$.

Watch Video Solution

16. Correct the following statements by changing the underlined part of the sentence (Do not change the whole sentence)

Electrode at which oxidation takes place is assigned $\underline{\text{positive polarity}}$.

Watch Video Solution

17. Correct the following statements by changing the underlined part of the sentence (Do not change the whole sentence)

In a Galvanic cell, electrons flow in the external circuit from cathode towards anode.

Watch Video Solution

18. Correct the following statements by changing the underlined part of the sentence (Do not change the whole sentence)

The electrode potential of standard hydrogen electrode is taken as one.

Watch Video Solution

19. Correct the following statements by changing the underlined part of the sentence (Do not change the whole sentence)

Absolute value of single electrode potential can be easily determined.

Watch Video Solution

20. Correct the following statements by changing the underlined part of the sentence (Do not change the whole sentence)

1M silver nitrate solution $\underline{\text{can be stored}}$ in a copper vessel.

Watch Video Solution

21. Correct the following statements by changing the underlined part of the sentence (Do not change the whole sentence)

Cells which do not have indefinite life and become dead over a period of time are called $\underline{\text{secondary cells}}$.

Watch Video Solution

22. Correct the following statements by changing the underlined part of the sentence (Do not change the whole sentence)

An ampere is a unit of $\underline{\text{quantity}}$ of electricity.

Watch Video Solution

Watch Video Solution

23. Correct the following statements by changing the underlined part of the sentence (Do not change the whole sentence)

When acidulated water is subjected to electrolysis, hydrogen gas is collected at the anode.

Watch Video Solution

24. Correct the following statements by changing the underlined part of the sentence (Do not change the whole sentence)

During electrolysis, cations move towards anode while anions move towards cathode.

Watch Video Solution

25. Correct the following statements by changing the underlined part of the sentence (Do not change the whole sentence)

In electroplating, the article to be electroplated is made the anode.

Watch Video Solution

26. Correct the following statements by changing the underlined part of the sentence (Do not change the whole sentence)

In silver electroplating, silver nitrate is used as an electrolyte.

Watch Video Solution

27. Match the following:

(*i*) Dry cell	(*a*) Depolarizer
(*ii*) Nickel cadmium storage cell	(*b*) Primary cell
(*iii*) MnO_2	(*c*) Secondary Cell
(*iv*) $H_2 - O_2$ fuel cell	(*d*) Most positive electrode potential
(*v*) F_2	(*e*) Galvanisation
(*vi*) Depositing a layer of zinc on iron sheets	(*f*) KOH

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28. Match the following:

(*i*) Electrical energy to chemical energy	(*a*) Electrochemical equivalent
(*ii*) Chemical energy to electrical energy	(*b*) Chemical equivalent
(*iii*) Amount deposited at an electrode by passing 1 coulomb of electricity	(*c*) Electrolytic cell (*d*) Electrochemical cell
(*iv*) Ampere	(*e*) 96500 coulombs
(*v*) One faraday	(*f*) Coulombs per second
(*vi*) Amount deposited at an electrode by passing 96500 coulombs of electricity	(*g*) Galvanic cell (*h*) Nernst equation
(*vii*) S.H.E.	(*i*) Volt
(*viii*) Oxidant	(*j*) Pt, H_2 (1 bar), H^+ (1 M)
(*ix*) Electrode potential	(*k*) Gain of electrons

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Exercise Part I Objective Questions Choose The Correct Alternative

1. Pure water does not conduct electricity because it :

A. has low boiling point

B. is almost unionized

C. is neutral

D. is readily decomposed.

Answer: B

2. 96500C of electricity liberates from $CuSO_4$ solution

A. 63.5 g of Cu

B. 31.75 g of Cu

C. 96500 g of Cu

D. 100 g of Cu.

Answer: B

3. Equivalent conductance of NaCl, HCl and C_2H_5COONa at infinite dilution are 126.45, 426.16 and 91 $\text{ohm}^{-1}\text{cm}^2$ respectively. The equivalent conductance of C_2H_5COOH is

A. $201.28\text{ohm}^{-1}/cm^{-2}$

B. $390.71/\text{ohm}^{-1}/cm^{-2}$

C. $698.28/\text{ohm cm}^2$

D. $540.48/\text{ohm cm}^2$

Answer: B

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4. The specific conductance of a 0.1 N KCl solution at $23^\circ C$ is 0.012 $\text{ohm}^{-1}\text{cm}^{-1}$. The resistance of the cell containing the solution at the same temperature was found to be 55 ohm. The cell constant will be

A. $0.142cm^{-1}$

B. $0.66cm^{-1}$

C. $0.918cm^{-1}$

D. $1.12cm^{-1}$

Answer: B

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5. The quantity of electricity needed to liberate 0.5 gram equivalent of an element, during electrolysis is

A. 48250 Faraday

B. 96500 Faraday

C. 48250 Coulomb

D. 193000 Coulomb.

Answer: C

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6. The correct order of equivalent conductance at infinite dilution of LiCI, NaCI and KCI is

A. $LiCl > NaCl > KCl$

B. $KCl > NaCl > LiCl$

C. $NaCl > KCl > LiCl$

D. $LiCl > KCl > NaCl.$

Answer: B

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7. The equivalent conductance of Ba^{2+} and Cl^{-} are respectively 127 and 76 $\text{ohm}^{-1}cm^{2}eq^{-1}$ at infinite dilution. What will be the equivalent conductance of $BaCl_2$ at infinite dilution ?

A. 203

B. 279

C. 101.5

D. 139.5.

Answer: D

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8. Which cell will measure standard electrode potential of copper electrode?

A. $Pt(s)|H_2(g, 0.1\text{bar})|H^+(aq.\ , 1M)||Cu^{2+}(aq.\ , 1M)|Cu$

B. $Pt(s)|H_2(g, 1\text{bar})|H^+(aq.\ , 1M)||Cu^{2+}(aq.\ , 2M)|Cu$

C. $Pt(s)|H_2(g, 1\text{bar})|H^+(aq.\ , 1M)||Cu^{2+}(aq.\ , 1M)|Cu$

D. $Pt(s)|H_2(g, 1\text{bar})|H^+(aq.\ , 0.1M)||Cu^{2+}(aq.\ , 1M)|Cu$

Answer: C

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9. Electrode potential for Mg electrode varies according to the equation

$$E_{Mg^{2+}/Mg} = E^{\Theta}_{Mg^{2+}/Mg} - \frac{0.059}{2}\log\frac{1}{[Mg^{2+}]}$$

The graph of $E_{Mg^{2+}/Mg} vs \log\left[Mg^{2+}\right]$ is

A. 

B. 

C. 

D. 

Answer: B

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10. Which of the following statement is correct ?

A. E_{cell} and $\Delta_r G$ of cell reaction both are extensive properties.

B. E_{cell} and $\Delta_r G$ of cell reaction both are intensive properties.

C. E_{cell} is an intensive property while $\Delta_r G$ of cell reaction is an extensive property.

D. E_{cell} is an extensive property while $\Delta_r G$ of cell reaction is an intensive property.

Answer: C

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11. The difference between the electrode potentials of two electrodes when no current is drawn through the cell is called _____

A. Cell potential

B. Cell emf

C. Potential difference

D. Cell voltage

Answer: B

Watch Video Solution

12. Which of the following statements is not correct about an inert electrode in a cell?

A. It does not participate in the cell reaction.

B. It provides surface either for oxidation or for reduction reaction.

C. It provides surface for conduction of electrons.

D. It provides surface for redox reaction.

Answer: D

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13. An electrochemical cell can behave like an electrolytic cell when _____

A. $E_{\text{cell}} = 0$

B. $E_{\text{cell}} > E_{\text{ext}}$

C. $E_{ext} > E_{cell}$

D. $E_{cell} = E_{ext}$

Answer: C

Watch Video Solution

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

A. Conductivity of solution depends upon size of ions.

B. Conductivity of solution depends upon viscosity of solution.

C. Conductivity does not depend upon solvation of ions present in solution.

D. Conductivity of solution increases with temperature.

Answer: C

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15. Using tha data given below find out the strongest reducing agent.

$E^{\circ}_{Cr_2O_7^{2-}/Cr^{3+}}$ =1.33 V , $E^{\circ}_{Cl_2/Cl^-}$ =1.36 V

$E^{\circ}_{MnO_4^-/Mn^{2+}}$ =1.51 V , $E^{\circ}_{Cr^{3+}/Cr}$ =- 0.74 V

A. Cl^-

B. Cr

C. Cr^{3+}

D. Mn^{2+}

Answer: B

Watch Video Solution

16. Using tha data given below is reducing potenial.

$E^{\circ}_{Cr_2O_7^{2-}/Cr^{3+}}$ =1.33 V , $E^{\circ}_{Cl_2/Cl^-}$ =1.36 V

$E^{\circ}_{MnO_4^-/Mn^{2+}}$ =1.51 V , $E^{\circ}_{Cr^{3+}/Cr}$ =- 0.74 V

find out which of the following is the strongest oxidising agent.

A. Cl^-

B. Mn^{2+}

C. MnO_4^-

D. Cr^{3+}

Answer: C

Watch Video Solution

17. Using tha data given below find out the strongest reducing agent.

$E^\circ_{Cr_2O_7^{2-}/Cr^{3+}}$ =1.33 V , $E^\circ_{Cl_2/Cl^-}$ =1.36 V

$E^\circ_{MnO_4^-/Mn^{2+}}$ =1.51 V , $E^\circ_{Cr^{3+}/Cr}$ =- 0.74 V

find out in which option the order of reducing power is correct.

A. $Cr^{3+} < Cl^- < Mn^{2+} < Cr$

B. $Mn^{2+} < Cl^- < Cr^{3+} < Cr$

C. $C^{3+} < Cl^- < Cr_2O_7^{2-} < MnO_4^-$

D. $Mn^{2+} < Cr^{3+} < Cl^- < Cr$

Answer: B

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18. Use the data given Q.8 find out the most stable ion in its reduced form.

A. Cl^-

B. Cr^{3+}

C. Cr

D. Mn^{2+}

Answer: D

Watch Video Solution

19. Using tha data given below find out the strongest reducing agent.

$E^\circ_{Cr_2O_7^{2-}/Cr^{3+}}$ =1.33 V , $E^\circ_{Cl_2/Cl^-}$ =1.36 V

$E^{\circ}_{MnO_4^-/Mn^{2+}}$ =1.51 V , $E^{\circ}_{Cr^{3+}/Cr}$ =- 0.74 V and find out the most stable oxidised species.

A. Cr^{3+}

B. MnO_4^-

C. $Cr_2O_7^{2-}$

D. Mn^{2+}

Answer: A

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20. The quantity of charge required to obtain one mole of aluminium from Al_2O_3 is.....

A. 1F

B. 6F

C. 3F

D. 2F

Answer: C

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21. The cell constant of a conductivity cell.....

A. changes with change of electrolyte

B. changes with change of concentration of electrolyte

C. changes with temperature of electrolyte

D. remains constant for a cell.

Answer: D

Watch Video Solution

22. While charging the lead storage battery _____

A. $PbSO_4$ anode is reduced to Pb.

B. $PbSO_4$ cathode is reduced to Pb.

C. $PbSO_4$ cathode is oxidised to Pb.

D. $PbSO_4$ anode is oxidised to PbO_2.

Answer: A

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23. $\Lambda^{\circ}_{m(NH_4OH)}$ is equal to

A. $\wedge^0_{m(NH_4OH)} + \wedge^0_{m(NH_4Cl)} - \wedge^0_{(HCl)}$

B. $\wedge^0_{m(NH_4Cl)} + \wedge^0_{m(NaOH)} - \wedge^0_{(NaCl)}$

C. $\wedge^0_{m(NH_4Cl)} + \wedge^0_{m(NaCl)} - \wedge^0_{(NaOH)}$

D. $\wedge^0_{m(NaOH)} + \wedge^0_{m(NaCl)} - \wedge^0_{(NH_4Cl)}$

Answer: B

Watch Video Solution

24. In the electrolysis of aqueous sodium chloride solution which of the half cell reaction will occur at anode?

A. $Na^+(aq) + e^- \rightarrow Na(s), E^{\Theta}_{\text{Cell}} = -2.71V$

B. $2H_2O(l) \rightarrow O_2(g) + 4H^+(aq) + 4e, E^{\Theta}_{\text{Cell}} = 1.23V$

C. $H^+(aq) + e^- \rightarrow \frac{1}{2}H_2(g), E^{\Theta}_{\text{Cell}} = 0.00V$

D. $Cl^-(aq) \rightarrow \frac{1}{2}Cl_2(g) + e^-, E^{\Theta}_{\text{Cell}} = 1.36V$

Answer: D

Watch Video Solution

25. Best way to prevent rusting of iron is by

A. making iron cathode greasy

B. putting in saline water

C. both of these

D. none of these.

Answer: A

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Exercise Part Ii Descriptive Questions

1. What is an electrochemical cell or galvanic cell?

Watch Video Solution

2. What is a redox couple?

Watch Video Solution

3. Name the reactions that take place at anode and cathode of the galvanic cell.

Watch Video Solution

4. Give two functions of salt bridge.

Watch Video Solution

5. Define electrode potential, oxidation potential and reduction potential. Why is it not possible to calculate the absolute value of electrode potential?

Watch Video Solution

6. Define standard electrode potential.

Watch Video Solution

7. Define standard electrode potential.

Watch Video Solution

8. What is standard hydrogen electrode ? Give the reaction that occurs at this electrode when it acts as a positive electrode in an electrochemical cell.

Watch Video Solution

9. Standard electrode potential of SHE at 298 K is :

Watch Video Solution

10. What is the emf of the cell when the cell reaction attains equilibrium ?

Watch Video Solution

11. What does the standard electrode potential of a metal being negative $\left(E^{\Theta}_{Zn^{2+}/Zn} = -0.7632\right)$ indicate ?

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12. In the operation of a galvanic cell, at one of the electrodes, oxidation takes place. What is the name of this electrode and what is its polarity?

Watch Video Solution

13. What is the representation of a Daniell cell ?

Watch Video Solution

14. What does the negative value of E^{Θ}_{cell} indicate?

Watch Video Solution

15. The standard reduction potential for Zn^{2+}/Zn is -0.76V. Write the reactions occurring at the electrodes when coupled with NHE or SHE.

Watch Video Solution

16. Write Nernst equation for the following cell reaction :

$Zn|Zn^{2+}(aq)||Cu^{2+}(aq)|Cu(s)$

Watch Video Solution

17. What is the effect of increase in concentration of zinc ions on the electrode potential of zinc electrode for which $E_{Zn^{2+}/Zn}$ equals - 0.76 V

Watch Video Solution

18. How can the reduction potential of an electrode increased ?

Watch Video Solution

19. Under what conditions will a galvanic cell send no current into outer circuit ?

Watch Video Solution

20. Electrochemical Series

Watch Video Solution

21. Write the symbolic notation for standard hydrogen electrode and its potential.

Watch Video Solution

22. Write Nernst equation for the electrode reaction:

$M^{n+} + ne^- \rightarrow M(s)$

Watch Video Solution

Watch Video Solution

23. Write Nernst equation for the reaction:

(i) $2Cr(s) + 3Cd^{2+}(aq) \rightarrow 2Cr^{3+}(aq) + 3Cd(s)$

Watch Video Solution

24. Discuss the relation between free energy and EMF.

Watch Video Solution

25. Why is equilibrium constant K related to only E^{Θ}_{cell} and not E_{cell}?

Watch Video Solution

26. What is the relationship between specific conductance and equivalent conductance ?

Watch Video Solution

27. The unit of equivalent conductance is :

Watch Video Solution

28. What is meant by cell constant ?

Watch Video Solution

29. Express mathematically relationship among the resistance (R), specific conductivity and cell constant.

Watch Video Solution

30. Define the term molar conductivity.

Watch Video Solution

31. How is the unit of molar conductivity arrived ?

Watch Video Solution

32. State Kohlrausch law for electrical conductance of an electrolyte at infinite dilution.

Watch Video Solution

33. What is the effect of decreasing concentration on the molar conductivity of a weak electrolyte?

Watch Video Solution

34. Express mathematically the relationship among the degree of dissociation of an electrolyte and its molar conductance.

Watch Video Solution

35. Write mathematical expression for Kohlrausch law.

Watch Video Solution

36. Write Debye-Huckel-Onsager equation. What do different symbols signify ?

Watch Video Solution

37. How does electrical conductivity of semiconductors vary with temperature?

Watch Video Solution

38. During electrolysis :

Watch Video Solution

39. State Faraday's first law of electrolysis.

Watch Video Solution

40. State Faraday's second law of electrolysis. How is the law helpful in determining the equivalent weight of a substance ?

Watch Video Solution

41. What is meant by electrochemical equivalent of a substance?

Watch Video Solution

42. What is meant by Faraday's constant?

Watch Video Solution

43. Which allotrope of carbon is used for making electrodes?

Watch Video Solution

44. Name the electrolyte (complex) used in electroplating objects by silver.

Watch Video Solution

45. How much charge is required for the reduction of 1 mole of Cu^{2+} to Cu?

Watch Video Solution

46. Following two reactions can occur at cathode in the electrolysis of aqueous sodium chloride

$Na^+ + e^- \rightarrow Na(s), E^{\Theta}_{\text{red}} = -2.71V$

Watch Video Solution

47. Which reaction takes place preferentially and why?

Watch Video Solution

48. Electrolysis of KBr (aq) gives br, at anode but of KF (aq) does not give F_2. Give reason for disparity in behaviour.

Watch Video Solution

49. Define the terms:

Specific conductance.

Watch Video Solution

50. Define the terms:

Equivalent conductance.

Watch Video Solution

51. What is a primary cell? Give an example.

Watch Video Solution

52. What is a secondary cell ? Name one such cell.

Watch Video Solution

53. When a lead storage battery is discharged:

Watch Video Solution

54. What is the underlying principle that a lead storage battery can be recharged ?

Watch Video Solution

55. From the given cells :

Answer the following :

(i) Which cell is used in hearing aids?

(ii) Which cell was used in Apollo Space Programme?

(iii) Which cell is used in automobiles and inverters?

(iv) Which cell does not have long life?

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56. How fluoride can be converted to fluorine?

Watch Video Solution

57. Galvanization is applying a coating of:

Watch Video Solution

58. What is the efficiency of a fuel cell? What is the use of fuel cell ?

Watch Video Solution

59. Write electrode reactions taking place in Ni-Cd cell. Is it primary or secondary cell?

Watch Video Solution

60. Name the electrolyte used in dry cell.

Watch Video Solution

61. The overall reactions of a hydrogen -oxygen fuel cell is

Watch Video Solution

62. Write the name of the electrolyte used in fuel cell.

Watch Video Solution

63. Write the name of the electrolyte used in mercury cell.

Watch Video Solution

64. Write the names of the electrodes used in fuel cell.

Watch Video Solution

65. Give an example of fuel cell.

Watch Video Solution

66. How does fuel cell operate?

Watch Video Solution

67. State two advantages of $H_2 - O_2$ fuel cell over ordinary cell.

Watch Video Solution

68. Define corrosion. What is the chemical formula of rust?

Watch Video Solution

69. How does cathodic protection of iron operate ?

Watch Video Solution

70. Which type of metal can be used in cathodic protection of iron against rusting.

Watch Video Solution

71. What would happen if the protective tin coating over an iron bucket is broken in some places ?

Watch Video Solution

72. State the factors that influence the value of cell potential of the following cell:

$Mg(s)|Mg^{2+}(aq)||Ag^{+}(aq)|Ag(s)$

Watch Video Solution

73. Why the cell stops working after some time?

Watch Video Solution

74. Rusting of iron is quicker in saline water than in ordinary water. Give reason.

Watch Video Solution

Exercise Part Ii Descriptive Questions Short Answer Questions

1. Give the construction of an electrochemical cell.

Watch Video Solution

2. What is salt bridge ? Give its two functions.

Watch Video Solution

3. Write the symbolic notation for standard hydrogen electrode and its potential.

Watch Video Solution

4. Define oxidation and reduction potentials.

Watch Video Solution

5. Give the difference between e.m.f. and potential difference.

Watch Video Solution

6. Write three differences between electrochemical cell and electrolytic cell.

Watch Video Solution

7. Write the cell reaction and cell notation for the Daniell cell. How can its life be increased ?

Watch Video Solution

8. What is meant by standard electrode potential ? How does it originate ?

Watch Video Solution

9. What is standard hydrogen electrode ? Give the reaction that occurs at this electrode when it acts as a positive electrode in an electrochemical cell.

Watch Video Solution

10. Define electrochemical series. How it helps to predict whether a given reaction is feasible in a given direction or not?

Watch Video Solution

11. Write three differences between electrochemical cell and electrolytic cell.

Watch Video Solution

12. Why electrochemical cell stops working after some time?

Watch Video Solution

13. Derive an expression relating standard e.m.f. of the cell with the equilibrium constant of the cell reaction.

Watch Video Solution

14. How Nernst equation can be applied in the calculation of equilibrium constant of any cell reaction ?

Watch Video Solution

15. Explain the terms conductivity and resistivity.

Watch Video Solution

16. State Faraday's first law of electrolysis.

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17. State Faraday's second law of electrolysis. How is the law helpful in determining the equivalent weight of a substance ?

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18. Explain the term cell constant.

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19. Define the following terms :

(i) Molar conductivity ($\wedge_m$)

(ii) Secondary batteries

(iii) Fuel cell

(b) State the following laws :

(i) Faraday first law of electrolysis

(ii) Kohlrausch's law of independent migration of ions.

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20. How can Kohlrausch's law of independent migration can be applied for calculating the degree of dissociation (α) of weak electrolytes ?

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21. The molar conductivity at infinite dilution of a strong electrolyte can be obtained by extrapolating the curve λ_m versus $\sqrt{c}$ but same cannot be done for a weak electrolyte. Explain.

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22. Describe what would happen to an acidic aqueous Na_2SO_4 solution at the standard state conditions during electrolysis between inert electrodes?

Watch Video Solution

23. What are primary cells? How does a dry cell function?

Watch Video Solution

24. What is meant by dry cell ? Give its working.

Watch Video Solution

25. Explain the working of lead storage battery.

Watch Video Solution

26. What do you mean by the term battery? What electrolyte is used in lead storage battery?

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27. Write the cell reaction of a lead storage battery when it is discharged. How does the density of the electrolyte change when the battery is discharged?

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28. Describe the composition of anode and cathode in a mercury cell. Write the electrode reaction for this cell.

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29. Write the cell reactions which occur in lead storage battery (i) when the battery is in use and (ii) when the battery is on charging.

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30. Write the overall reaction that occurs during use (discharging) of nickel-cadmium cell. Mention its one merit over the lead storage cell.

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31. What are fuel cells ? Write the electrode reactions of a fuel cell which uses the reaction of hydrogen with oxygen.

Watch Video Solution

32. How does rusting of iron take place ? Give its mechanism.

Watch Video Solution

33. Write chemical equations and steps involved in the rusting of iron.

Watch Video Solution

34. (a) Corrosion is essentially an electrochemical phenomenon. Explain the reactions occurring during corrosion of iron kept in an open atmosphere.

(b) Calculate the equilibrium constant for the equilibrium reaction

$Fe_{(s)} + Cd^{2+}_{(aq)} \Leftrightarrow Fe^{2+}_{(aq)} + Cd_{(s)}$

(Given : $E^{\circ}_{Cd^{2+}|Cd} = -0.40V$, $E^{\circ}_{Fe^{2+}|Fe} = -0.44V$).

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35. What is the main chemical constituent of rust? What are the controlling factors for the formation of rust?

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36. What is corrosion ? Describe the role of zinc in cathodic protection of iron. Can we use tin in place of zinc for this purpose. Give reason.

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37. What is corrosion ? How is cathodic protection of iron different from its galvanisation ?

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38. Why zinc coating protects iron more effectively than tin coating ?

Given $E^{\Theta}_{Zn^{2+}/Zn} = -0.76V$,

$E^{\Theta}_{Sn^{2+}/Sn} = -0.14V$, $E^{\Theta}_{Fe^{2+}/Fe} = -0.44V$

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Exercise Part Ii Descriptive Questions Long Answer Questions

1. What is salt bridge ? Give its two functions.

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2. What do you understand by a Galvanic cell ? Explain the working of one such cell in detail.

Watch Video Solution

3. Explain in detail the symbolic representation of electrochemical cells.

Watch Video Solution

4. Describe the following:

(i) Oxidation potential

(ii) Reduction potential

(iii) Normal hydrogen electrode

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5. Define electrochemical series. How it helps to predict whether a given reaction is feasible in a given direction or not?

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6. Electrochemical Series

Watch Video Solution

7. Draw the diagram a of galvanic cell involving following reactions :

$Zn + Cu^{+} \rightarrow Zn^{2+} + Cu$ and answer the following questions:

(i) Label the cathode and anode

(ii) How does the e.m.f. of the cell changes with the decrease in the concentration of Cu^{2+} ions ?

(iii) What is the function of salt bridge in it?

(iv) Name the salt to be used in salt bridge.

(v) Write the reactions occurring at each electrode.

(vi) In which direction the electrons would flow in the external circuit?

(vii) How electrical neutrality is maintained in both the half cells?

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8. What is Nernst equation ? Explain the significance of various terms used.

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9. Define electrode potential, oxidation potential and reduction potential. Why is it not possible to calculate the absolute value of electrode potential?

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10. Can we use a copper vessel to store 1 M $AgNO_3$ solution?

Given

$E^{\Theta}_{Cu^{2+}/Cu} = 0.34V$ $E^{\Theta}_{Ag^{+}/Ag} = 0.80$

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11. Why blue colour of $CuSO_4$ solution gets discharged when zinc rod is dipped in it ? Given, $E^{\circ}_{Cu^{+2}/Cu} = 0.34V$ and $E^{\circ}_{Zn^{+2}/Zn} = -0.76V$

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12. Can we store :

(i) Copper sulfate solution in zinc vessel ?

(ii) $FeSO_4$ solution in silver vessel ?

(iii) Copper sulfate solution in iron vessel?

(iv) 1 M $CuSO_4$ solution in Ni container ?

Give suitable explanation in support of your answer.

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13. The standard reduction potentials of magnesium and iron electrodes are -2.73 V and -0.44 V respectively. Which electrode will undergo oxidation and which electrode reduction ?

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14. Is it safe to stir 1M $AgNO_3$ solution with a copper spoon? Give suitable explanation in support of your answer ?

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15. Write points of difference between

(i) electrode potential and electromotive force

(ii) primary cells and secondary cells

(iii) electrolytic cell and electrochemical cells.

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16. How is concentration of an electrolyte related to molar conductivity ? How a weak and a strong electrolyte are based on their conductivity values ?

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17. Kohlrausch's law states that at

Watch Video Solution

18. Describe the characteristics of variation of molar conductivity with dilution for :

(a) a weak electrolyte (b) a strong electrolyte

How are these explained qualitatively?

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19. Differentiate between the terms strong electrolyte and weak electrolyte. (stating any two differences)

Watch Video Solution

20. Definie conductivity and molar conductivity for the solution of an electrolyte. Discuss their variation with concentration.

Watch Video Solution

21. Write points of difference between :

(i) conductance and conductivity

(ii) strong electrolytes and weak electrolytes.

Watch Video Solution

22. Explain the process of electrolysis.

Watch Video Solution

23. Discuss the electrolysis of water.

Watch Video Solution

24. Explain with a suitable example, the difference between the electrolysis of a molten electrolyte and clectrolysis of an aqueous solution of an electrolyte.

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25. Mention the Faraday's laws of electrolysis.

Watch Video Solution

26. Write a short note on electroplating.

Watch Video Solution

27. What do you understand by electrolysis ? What chemical processes occur during the electrolysis of aqueous solution of:

(i) $CuSO_4$ using platinum electrodes?

(ii) $CuSO_4$ using copper electrodes?

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28. Define electrolysis. What is the mechanism for the electrolysis of ?

(i) molten sodium chloride.

(ii) aqueous sodium chloride.

Watch Video Solution

29. State Faraday's second law of electrolysis. How is the law helpful in determining the equivalent weight of a substance ?

Watch Video Solution

30. What is meant by dry cell ? Give its working.

Watch Video Solution

31. What is lead storage battery ? Give its working.

Watch Video Solution

32. What are fuel cells ? Write the electrode reactions of a fuel cell which uses the reaction of hydrogen with oxygen.

Watch Video Solution

33. Define corrosion. What is the chemical formula of rust? Give the relationship between equivalent and molar conductance.

Watch Video Solution

Isc Examination Questions Part I Objective Questions Fill In The Blanks

1. Correct the following statements by changing the underlined part of a substance (Do not change the whole sentence):

On dilution of a solution, its equivalent conductance and its specific conductance increase.

Watch Video Solution

2. In a galvanic cell, the movement of electrons in the external circuit is from.....to.....

Watch Video Solution

3. Zinc can displace _____ from $CuSO_4$ solution, but cannot displace _____ from $MgSO_4$ solution.

Watch Video Solution

4. In a galvanic cell, electrons flow from .....to ..... through the connecting wires.

Watch Video Solution

5. An electrochemical cell converts _____ energy to ____ energy.

Watch Video Solution

6. The molar conductance of a solution ..... with dilution, while its specific conductance .....

Watch Video Solution

7. The more ..... the standard reduction potential of a metal, the ..... is its ability to displace hydrogen from acids.

Watch Video Solution

8. The unit of conductance is ..... and that of specific conductance is .....

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Isc Examination Questions Part I Objective Questions Choose The Correct Alternative

1. When a copper wire is dipped into silver nitrate solution, silver is precipitated because

A. both silver and copper have positive reduction potentials

B. reduction potential of silver is higher than that of copper

C. reduction potential of copper is higher than that of silver

D. both silver and copper have negative reduction potentials.

Answer: B

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2. The number of electrons involved in the reaction when one faraday of electricity is passed through an electrolyte is

A. 12×10^{46}

B. 8×10^{6}

C. 96500

D. 6×10^{23}

Answer: D

Watch Video Solution

3. The standard electrode potentials of four elements A,B,C,D are - 3.05,-1.66,-0.40 and 0.80 volts respectively. The highest chemical activity will be shown by:

A. A

B. B

C. C

D. D

Answer: A

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4. The number of faradays required to reduce one mole of Cu^{2+} to metallic copper is

A. one

B. two

C. three

D. four

Answer: B

Watch Video Solution

5. The unit of equivalent conductance is :

A. $\text{ohm}^{-1} cm^2 \text{equiv}^{-1}$

B. $\text{ohm}^{-1} cm^2 g^{-1}$

C. $\text{ohm cm}^2 \text{equiv}^{-1}$

D. $\text{ohm}^{-1} \text{mol}^{-1}$

Answer: A

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6. When zinc granule is dipped into copper sulphate solution, copper is precipitated because :

A. both copper and zinc have a positive reduction potential

B. reduction potential of copper is higher than that of zinc

C. reduction potential of zinc is higher than that of copper

D. both zinc and copper have a negative reduction potential.

Answer: B

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7. The quantity of electricity required to deposit $1 \cdot 15g$ of sodium from molten $NaCl(Na = 23, Cl = 35 \cdot 5)$ is

1) $1F$

2) $0 \cdot 5F$

3) $0 \cdot 05F$

4) : $1 \cdot 5F$

A. 1F

B. 0.5F

C. 0.05F

D. 1.5F

Answer: C

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8. A current liberates 0.50 8 of hydrogen in 2 hours. The weight of copper (At. wt. = 635) deposited at the same time by the same current through copper sulphate solution is :

A. 63.5 g

B. 31.8 g

C. 15.9 g

D. 15.5 g

Answer: C

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9. Electrochemical equivalent is the amount of substance which gets deposited from its solution on passing electrical charge equal to :

A. 96,500 coulomb

B. 1 coulomb

C. 60 coulomb

D. 965 coloumb

Answer: B

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Isc Examination Questions Part I Objective Questions

1. Correct the following statements by changing the underlined part of a substance (Do not change the whole sentence):

The weight of a metal deposited during electrolysis of the metal salt depends on the concentration of the electrolyte.

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2. Correct the following statements by changing the underlined part of a substance (Do not change the whole sentence):

Sodium chloride is a good conductor of electricity both in the solid as well as molten state.

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3. Correct the following statements by changing the underlined part of a substance (Do not change the whole sentence):

On dilution of a solution, its equivalent conductance and its specific conductance increase.

Watch Video Solution

4. Correct the following statements by changing the underlined part of a substance (Do not change the whole sentence):

For a strong electrolyte, the plot of equivalent conductance versus concentration of the solution is a straight line.

Watch Video Solution

5. Match the following:

(i)	Nernst equation	(a)	Faraday's Law
(ii)	Electrolysis	(b)	Electrode potential
		(c)	Electrochemical cell
(iii)	Kohlrausch law	(d)	Infinite dilution

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Isc Examination Questions Part Ii Descriptive Questions

1. What happens when a zinc rod is dipped in copper sulfate solution ? Give the reason for this observation.

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2. Explain the precipitation of silver when copper rod is dipped in silver nitrate solution.

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3. Give a reason for the following:

Specific conductance decreases with dilution whereas equivalent conductance increases with dilution.

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4. Explain the following : Zinc displaces hydrogen from acid solution.

$E^{\Theta}_{Zn^{2+}/Zn} = -0.76V$

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5. Mention any two factors affecting the electrode potential of a metal.

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6. What happens when a nickel rod is dipped into a copper sulphate solution ? Justify your answer.

$\left[E^{\circ}_{Ni^{+2}/Ni} = 0 \cdot 25V \text{ and } E^{\circ}_{Cu^{+2}/Cu} = +0 \cdot 34V\right]$

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7. State Kohlrausch's law and give its mathematical expression mentioning the terms involved.

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8. State Faraday's first law of electrolysis.

Watch Video Solution

9. Define molar conductance of a solution. State its unit. How is it related to the specific conductance of a solution ?

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10. Name the law or principle confirmed by the following observations :

When 96500 coulombs of electricity is passed through acidulated water, $5 \cdot 6$ litres of oxygen at s.l.p. is liberated at the anode.

Watch Video Solution

11. What happens when a nickel rod is dipped into a copper sulphate solution ? Justify your answer.

$\left[E^{\circ}_{Ni^{+2}/Ni} = 0 \cdot 25V \text{ and } E^{\circ}_{Cu^{+2}/Cu} = +0 \cdot 34V\right]$

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Isc Examination Questions Part Ii Numerical Problems

1. A cell is constructed by dipping a zinc rod in 0.1 M zinc nitrate solution and a lead rod in 0.2 M lead nitrate solution.

$E^{\Theta}_{Pb^{2+}/Pb} = -0.13V$ and $E^{\Theta}_{Zn^{2+}/Zn} = -0.76V$

(i) Write the spontaneous cell reaction.

(ii) Calculate standard emf and emf of the cell.

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2. For the cell : $Zn|Zn^{2+}(a=1)||Cu^{2+}(a=1)|Cu$

Given that $E_{Zn/Zn^{2+}} = 0.761V$, $E_{Cu^{2+}/Cu} = 0.339V$

(i) Write the cell reaction.

(ii) Calculate the emf and free energy change at 298 K involved in the cell.

[Faraday's constant F = 96500 coulomb eq^{-1}]

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3. Calculate the equivalent conductivity of $1MH_2SO_4$, whose specific conductivity is $26 \times 10^{-2}\text{ohm}^{-1}cm^{-1}$.

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4. A current of 10 A is passed for 80 min and 27 seconds through a cell containing dilute sulfuric acid.

(1) How many moles of oxygen gas will be liberated at the anode ?

(2) Calculate the amount of zinc deposited at the cathode when another cell containing $ZnSO_4$ solution is connected in series.

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5. Calculate E_{cell} at $25^\circ C$ for the reaction :

$Zn + Cu^{2+}(0.20M) \rightarrow Zn^{2+}(0.50M) + Cu$

Given $E^\Theta\left(Zn^{2+}/Zn\right) = -0.76V, E^\Theta\left(Cu^{2+}/Cu\right) = 0.34V.$

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6. A 0.05 M NaOH solution offered a resistance of 31.6 ohms in a conductivity cell. If the cell constant of the conductivity cell is 0.378 cm^{-1}, determine the molar conductivity of sodium hydroxide solution at this temperature.

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7. For the following cell, calculate the emf:

$Al / Al^{3+}(0.01M)||Fe^{2+}(0.02M)|Fe$

Given: $E^{\Theta}_{Al^{3+}/Al} = -1.66V$, $E^{\Theta}_{Fe^{2+}/Fe} = -0.44V$

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8. A solution of 0.1 N KCl offers a resistance of 245 ohms. Calculate the specific conductance and the equivalent conductance of the solution if the cell constant is 0.571 cm^{-1}.

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9. How many electrons will flow when a current of 5 amperes is passed through a solution for 200 seconds ?

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10. Consider the reaction $2Ag^{+} + Cd \rightarrow 2Ag \rightarrow 2Ag + Cd^{2+}$.

The standard reduction potentials of Ag^{+}/Ag and Cd^{2+}/Cd are + 0.80 volt and - 0.40, respectively.

(i) Give the cell representation.

(ii) What is the standard cell emf. E^{Θ} ?

(iii) What will the emf of the cell if concentration of Cd^{2+} is 0.1 M and Ag^{+} is 0.2 M?

(iv) Will the cell work spontaneously for the condition given in (ii) above ?

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11. Calculate the maximum work that can be obtained from the given electrochemical cell constructed with two metals M and N.

$\left[E^{\Theta}_{M^{2+}/M} = -0.76V, E^{\Theta}_{N^{2+}/N} = 0.34V\right]$

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12. Calculate the value of E_{cell} at 298 K for the following cell:

$Al/Al^{3+}(0.01M)||Sn^{2+}(0.015M)/Sn$

$\left[E^{\Theta}_{Al^{3+}/Al} = -1.66V \text{ and } E^{\Theta}_{Sn^{2+}/Sn} = -0.14V\right]$

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13. $0\cdot 05$ M $NaOH$ solution offered a resistance of $31\cdot 6$ ohm in a conductivity cell at 298 K. If the cell constant of the cell is $0\cdot 367cm^{-1}$ calculate the molar conductivity of the NaOH solution.

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14. $0\cdot 3605$ g of a metal is deposited on the electrode by passing $1\cdot 2$ amperes of current for 15 minutes through its salt solution. The atomic

weight of the metal is 96. What is the valency of the metal ?

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15. How many hours does it take to reduce 3 moles of Fe^{3+} to Fe^{2+} with 2A current intensity ?

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16. Calculate the emf of the following cell reaction at 298 K:

$Mg(s) + Cu^{2+}(0.0001M) \rightarrow Mg^{2+}(0.001M) + Cu(s)$

The standard potential $\left(E^{\Theta}\right)$ of the cell is 2.71 V.

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17. The specific conductance of a 0.01 M solution of acetic acid at 298 K is $1.65 \times 10^{-4} \text{ohm}^{-1} cm^{-1}$. The molar conductance at infinite dilution for H^+ ion and CH_3COO^- ion are 349.1 $\text{ohm}^{-1} cm^2 \text{mol}^{-1}$ and 40.9

$\text{ohm}^{-1}cm^2\text{mol}^{-1}$ respectively.

Calculate :

(i) Molar conductance of solution

(ii) Degree of dissociation of acetic acid

(iii) Dissociation constant for acetic acid.

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18. Calculate the number of coulombs required to deposit 5.4g of Al when the electrode reaction is :

$Al^{3+} + 3e^- \rightarrow Al$ [Atomic weight of Al = 27 g/mol]

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19. A 0.05 M NH OH solution offers the resistance of 50 ohms to a conductivity cell at 298 K. If the cell constant is 0.50 cm^{-1} and molar conductance of NH_4OH at infinite dilution is $471.4ohm^{-1}cm^2\text{mol}^{-1}$ calculate :

(i) Specific conductance

(ii) Molar conductance

(iii) Degree of dissociation.

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Multiple Choice Questions

1. Electrolysis involves oxidation and reduction respectively at:

A. Anode and cathode

B. Cathode and anode

C. At both the electrode

D. None of these

Answer: A

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2. All galvanic cell do not contain:

A. A cathode

B. An anode

C. Ions

D. A porous plate

Answer: D

View Text Solution

3. The unit of equivalent conductance is :

A. $\text{ohm}^{-1}\text{cm}^2\text{equiv}^{-1}$

B. $\text{ohm}^{-1}\text{cm}^2\text{gm}^{-1}$

C. $\text{ohm cm}^2\text{equiv}^{-1}$

D. $\text{ohm}^{-1}\text{mole}^{-1}$

Answer: A

View Text Solution

4. Conductivity of a solution is directly proportional to:

A. Dilution

B. Number of ions

C. Current density

D. Volume of the solution

Answer: B

View Text Solution

5. A current liberates 0.50 g of hydrogen in 2 hours. The weight of copper (at. wt. = 63.5) deposited at the same time by the same current through copper sulphate solution is:

A. $63.5g$

B. 31.8 g

C. 15.9 g

D. 15.5 g

Answer: C

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6. Electrochemical equivalent is the amount of substance which gets deposited from its solution on passing electrical charge equal to:

A. 96,500 coulomb

B. 1 coulomb

C. 60 coulomb

D. 965 coulomb

Answer: A

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7. Which of the following cells can convert chemical energy of Hand O_2 directly into electrical energy?

A. Mercury cell

B. Daniel cell

C. Fuel cell

D. Lead storage cell

Answer: C

View Text Solution

8. When lead storage battery discharges?

A. SO_2 is evolved

B. $PbSO_4$ is consumed

C. Lead is formed

D. Sulphuric acid is consumed

Answer: B

View Text Solution

9. When zinc granule is dipped into copper sulphate solution, copper is precipitated because:

A. Both, copper and zinchave a positive reduction potential

B. Reduction potential of copper is higher than that of zinc

C. Reduction potential of zinc is higher than that of copper

D. Both, zinc and copper have a negative reduction potential

Answer: B

View Text Solution

10. The reaction is spontaneous if the cell potential is:

A. Positive

B. Negative

C. Zero

D. Infinite

Answer: A

View Text Solution

11. The quantity of electricity required to deposit 1.15 g of sodium from molten Naçi (Na = 23, Cl = 35.5) is :

A. 1 F

B. 0.5 F

C. 0.05 F

D. 1.5 F

Answer: C

View Text Solution

12. Saturated solution of KNO_3 is used to make salt bridge because:

A. Velocity of K^+ is greater than that of NO_3^-

B. Velocity of NO_3^- is greater than that of K^+

C. Velocity of both K^+ and NO_3^- are nearly the same

D. KNO_3 is highly soluble in water

Answer: C

View Text Solution

13. The number of Faradays required to reduce one mol of Cu^{2+} to metallic copper is:

A. One

B. Two

C. Three

D. Four

Answer: B

View Text Solution

14. On electrolysis of dilute sulphuric acid using platinum electrodes, the product obtained at the anode will be

A. Hydrogen

B. Oxygen

C. Hydrogen sulphide

D. Sulphur dioxide

Answer: B

View Text Solution

15. When heating one end of a metal plate, the other end gets hot because of

A. The resistance of the metal

B. Mobility of atoms in the metal

C. Energised electrons moving to the other end

D. Minor perturbation in the energy of atoms.

Answer: C

View Text Solution

16. The weight of silver displaced by a quantity of electricity which displaces 5600ml of O_2 at STP will be:

A. 5.4g

B. 10.8g

C. 54.9g

D. 108.0g

Answer: D

View Text Solution

17. Which of the following statements regarding fuel cells is false?

A. Because of continuous supply, fuel cells never become dead

B. They do not cause pollution

C. Fuel cells have 100% efficiency practically

D. The cost of catalysts needed for the electrode

Answer: C

View Text Solution

18. The standard electrode potentials of four elements A, B, C and Dare -3.05, 1.66,-0.40 and 0.80 volts respectively. The highest chemical activity will be shown by :

A. A

B. B

C. C

D. D

Answer: A

View Text Solution

19. Galvanised iron sheets are coated with:

A. Carbon

B. Copper

C. Zinc

D. Nickel

Answer: C

View Text Solution

20. Which of the following element act as inert electrode

A. Cu

B. Ag

C. Pt

D. None

Answer: C

View Text Solution

21. On dilution, the specific conductance of a solution:

A. Remains unchanged

B. Increases

C. Decreases

D. First increases then decreases

Answer: A

View Text Solution

22. The standard reduction potential values of three metallic cations X, Y and Z are 0.52 V, - 3.03 V and - 1.18 V respectively. The order of reducing power of the orresponding metals is:

A. $Y > Z > X$

B. $X > Y > Z$

C. $Z > Y > X$

D. $Z > X > Y$

Answer: D

View Text Solution

23. When zinc granule is dipped into copper sulphate solution, copper is precipitated because:

A. Both copper and zinc have a positive reduction potential.

B. Both copper and zinchavea negative reduction potential

C. Reduction potential of zinc is higher than that of copper.

D. Reduction potential of copper is higher than that of zinc.

Answer: D

View Text Solution

Fill In The Blanks

1. The unit of conductance is ..... and that of specific conductance is ..... A galvanic cell stops after some time because .....

A. ohm^{-1}, $\mathrm{ohm}^{-1}cm^{-1}$, potential difference becomes zero ohm,

B. $\mathrm{ohm}^{-1}\mathrm{cm}^{-1}\mathrm{eq}^{-1}$ battery discharges

C. $\mathrm{ohm}^{-1}\mathrm{cm}^{-1}$, $\mathrm{ohm}^{-1}\mathrm{eq}^{-1}$, potential difference becomes zero

D. ohm^{-1}, $\mathrm{ohm}^{-1}eq^{-1}$, battery discharges

Answer: A

View Text Solution

2. Equivalent conductivity is the conducting power of all the ions furnished by one ..... of an electrolyte present in a definite ..... of the solution. In a Daniel cell the copper vessel serves as .....

A. Equivalent weight, concentration, anode

B. Gram equivalent, volume, cathode

C. Mole, volume, anode

D. Gram equivalent, Concentration, Pt electrode

Answer: B

View Text Solution

3. In a galvanic cell, electrons flow from ..... to ..... through the connecting wires. A device in which chemical energy of a fuel is directly converted into electrical energy is called .....

A. Anode, Pt electrode, galvanic cells

B. Pt electrode, cathode, fuel cells

C. Cathode, anode, Daniel cells

D. Anode, cathode, fuel cells

Answer: D

View Text Solution

4. The molar conductance of a solution ..... with dilution, while its specific conductance ..... with dilution. The electrode at which there is acceptance of electrons is called .....

A. Decreases, increases, anode

B. Remains same, decreases, Pt electrode

C. Increases, decreases, cathode

D. Decreases, remains same, anode

Answer: C

View Text Solution

5. The more ..... is standard reduction potential of a metal, the ..... is its ability to displace hydrogen from acids. In representation of an electrochemical cell, the cathode is written on .....

A. Positive, less, right hand side

B. Negative, greater, right hand side

C. Greater, less, left hand side

D. Positive, more, right hand side

Answer: B

View Text Solution

6. Zinc can displace ..... from $CuSO_4$ solution, but cannot displace ..... from $MgSO_4$ solution. The conductance of a solution placed between two opposite faces of a cm^3 is called

A. Copper, magnesium, specific conductance

B. Magnesium, zinc, conductance

C. Magnesium, copper, molar conductance

D. Copper, sulphate, molar conductance

Answer: A

View Text Solution

7. ..... the reduction potential ..... is the oxidizing agent. The molar conductance $\left(\bigwedge_m\right)$ of a solution is related to specific conductance (k) by the relation .....

A. Lower, higher, $R = \rho\frac{L}{A}$

B. Stronger, lower, $\mu = kV$

C. Stronger , lower, $\mu = kV$

D. Higher, stronger, $\wedge_m = \frac{k \times 10^3}{M}$

Answer: D

View Text Solution

8. The equivalent conductance of a solution ..... with decrease in concentration of the electrolyte in the solution. Specific conductance of

an electrolyte solution ..... with increase in dilution. The resistance of a solution is measured with the help of .....

A. Increases, remains same, multimeter

B. Decreases, Increases, ammeter

C. Increases, decreases, multimeter

D. Decreases, Increases, Ammeter

Answer: C

View Text Solution

9. Strong electrolytes give almost linear plot of $\wedge_m$ versus ..... The E° value of a NHE is .....

A. $\sqrt{C}$, Zero

B. Concentration, one

C. Time, two

D. Concentration, Three

Answer: A

View Text Solution

10. The solution of sugar in water is ..... conductor of electricity. In a galvanised iron, the iron is coated with a layer of ..... metal

A. Bad, zinc

B. Good, copper

C. Bad, less, chromium

D. Good, Silver

Answer: A

View Text Solution

11. Match the following

Column I	Column II
1 Molar conductivity	(p) Siemen cm^{-1}
2 Dry cell	(q) Nernst equation
3 Zn/Zn^{2+} (0·1M) $\|\|$ Zn^{2+} (0·5M)/Zn	(r) Maximum work obtainable from cell
4 Specific conductivity	(s) Electrochemical cells
5 $E = E^\circ + \frac{0\cdot59}{n}\log\frac{[M^{n+}]}{[M]}$	(t) $ohm^{-1}\,cm^2\,mol^{-1}$
6 Nernst Equation	(u) Primary cell
7 E° cell	(v) Concentration cell
8 96500 C mol^{-1}	(w) Faraday's constant

A. $1-(w), 2-(u), 3-(s), 4(q), 5-(p), 6-(v), 7-(r), 8-(t)$

B.

$1-(u), 2-(t), 3-(q), 4-(p), 5-(v), 6-(s), 7-(w), 8-(r)$

C.

$1-(s), 2-(w), 3-(q), 4-(p), 5-(q), 6-(t), 7-(v), 8-(u)$

D.

$1-(t), 2-(u), 3-(v), 4-(p), 5-(q), 6-(s), 7-(r), 8-(w)$

Answer: D

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12. Match the columns:

Column I	Column II
1 Dry cell	(p) Potassium hydroxide
2 Nickel-cadmium cell	(q) Aqueous H_2SO_4
3 Lead storage cell	(r) Zinc chloride

A. 1-(r), 2-(p), 3-(q)

B. 1-(q), 2-(r), 3-(p)

C. 1-(p), 2-(r), 3-(q)

D. 1-(p), 2-(q), 3-(r)

Answer: A

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Numerical Based Questions

1. The standard electrode potentials of $Pb|Pb^{+2}$ and $Pt|I^{-} \mid I_2$ are -0.126 and 0.536 volt respectively. When a galvanic cell is constructed using 0.1 molar concentrations of the respective ions Pt is found to be cathode. What is the voltage generated in the cell ?

A. 0.6505 V

B. 0.4505 V

C. 0.7505 V

D. 0.5505 V

Answer: C

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2. Calculate the standard cell potential of galvanic cell in which the following reaction takes place:

$2Cr(s) + 3Cd^{2+}_{(aq)} \rightarrow 2Cr^{3+}_{(aq)} + 3Cd_{(s)}$

Given : $E^{\circ}_{Cr^{3+}/Cr} = -0.74V$, $E^{\circ}_{Cd^{2+}/Cd} = -0.4V$

Also, calculate $\Delta_r G^{\circ}$ and Equilibrium constant of the reaction.

A. Antilog 24.5014

B. Antilog 34.5014

C. Antilog 54.5014

D. Antilog 36.5014

Answer: B

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3. A cell is constructed by dipping a zinc rod in 0.1 M zinc nitrate solution and a lead rod in 0.2 M lead nitrate solution.

$E^{\circ}_{Pb^{2+}/Pb} = -0.13V$ and $E^{\circ}_{zn^{2+}/Zn} = -0.76V$

(i) Write the spontaneous cell reaction.

(ii) Calculate standard emf and emf of the cell.

A. $Zn/Zn^{2+}\ ||\ Pb^{2+}/Pb, 0.638V$

B. $Cr|Cr^{3+}||Fe^{2+}|Fe, 0.611V$

C. $Zn/Zn^{2+}\ ||\ Pb^{2+}/Pb, 0.452V$

D. $Cr|Cr^{3}||Fe^{2+}|Fe, 0.821V$

Answer: A

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4. (i) Calculate the e.m.f., of the cell

$Cr(s)|Cr^{3+}(0.1M)||Fe^{2+}(0.01M)|Fe(s)$

$E^{\circ}_{Cr^{+3}/Cr} = -0.75, E^{\circ}_{Fe^{2+}/Fe} = -0.45V$

(ii) Calculate the emf:

$A1/A13 + (0-01M)/Fe2 + (0-02M)$

Given:

$E^{\circ}_{Al^{3+}/Al} = -1.66V$

$E^{\circ}_{Fe^{2+}/Fe} = -0.44V$

(iii) Calculate the e.m.f., of the following cell.

$Mg_{(s)}\left|Mg^{2+}(0.001M)\right|\left|Cu^{2+}(0.001M)\right|Cu_{(s)}$

$E^{\circ}_{Cu^{2+}/Cu} = 0.337V, E^{\circ}_{Mg^{2+}/Mg} = -2.37V$

A. $0.1607V, 1.309V, 2.5775V$

B. $0.6607V, 1.309V, 2.4775V$

C. $0.2607V, 1.209V, 2.6775V$

D. $0.2637V, 1.249V, 2.7875V$

Answer: C

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5. Consider the following cell reaction at 298 K:

$2Ag^{+} + Cd \rightarrow 2Ag + Cd^{2+}$

The standard reduction potential (E°) for Ag^{+}/Ag and $Cd^{2+}/Cd$are

0-80 Vand – 0.40 V respectively:

(i) Write the cell representation.

(ii) What will be the emf of the cell if the concentration of Cd^{2+} is 0.1 M and that of Ag^{+} is 0.2 M ?

(iii) Will the cell work spontaneously for the condition given in (ii) above ?

A. $Cd\left|Cd^{2+}_{(0.1M)}\right|2Ag, 1.1882177V, -229.32KJ$

B. $Cd\left|Cd^{2+}_{(0.1M)}\right| \mid 2Ag^{2+}_{(0.1M)}\left|2Ag, 2.188V, -329.32kJ\right.$

C. $Cd\left|Cd^{2+}_{(0.1M)}\right| \mid 2Ag^{2+}_{(0.2M)}\left|2Ag, 3.214V, -536.32kJ\right.$

D. $Cd\left|Cd^{2+}_{(0.1M)}\right| \mid 2Ag^{2+}_{(0.2M)}\left|2Ag, 5.188V, -389.32kJ\right.$

Answer: A

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6. Chromium metal can be plated out from an acidic solution containing CrO_3 , according to the following equation:

$$CrO_3(aq.) + 6H^+(aq.) + 6e^- \rightarrow Cr(s) + 3H_2O$$

(i) Calculate, how many gram of Cr (At. wt. 52) will be plated out by passing 24000 C of electricity?

(ii) If a current of 24 amp is being used, how long will it take to plate out the amount of Cr calculated in part (i).

A. 3.64 g of Cr, 100 sec

B. 5.15 g of Cr, 1000 sec

C. 2.155 g of Cr, 1000 sec

D. 6.155 g of Cr, 100 sec

Answer: C

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7. (i) Calculate the mass of silver deposited at cathode when a current of 2 amperes is passed through a solution of $AgNO_3$ for 15 minutes.(At. wt. of Ag=108, 1 F = 96,500 C)

(ii) Calculate thee. m.f. and AG for the cell reaction at 298 K:

$Mg_{(s)} / Mg^{2+}_{(0.1M)} / Cu^{2+}_{(0.01M)} / Cu_{(s)}$

Given $E^0_{\text{cell}} = 2.71V$

1 F = 96,500C

A. 6.14 g of Ag, $-417.36 \mathrm{kJ\ mol^{-1}}$

B. 3.214 g of Ag, $-417.226 \mathrm{kJ\ mol^{-1}}$

C. 3.14 g of Ag, $-317.26 \mathrm{kJ\ mol^{-1}}$

D. 2.014 g of Ag, $-517.326 \mathrm{kJ\ mol^{-1}}$

Answer: D

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8. (i) If a current of 0.5 ampere flows through metallic wire for two hours, then how many electrons flow through the wires ?

(ii) Consider the reaction:

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

What is the quantity of electricity in Coulomb's needed to reduce 1 mol of Cr_2O_7 ?

(iii) The conductivity of 0.20 M solution of KCI at 298 K is $0{\cdot}0248\ \mathrm{S\ cm^{-1}}$. Calculate its molar conductivity.

A. 5.464×10^{22} electrons, 248000 C, $224\ \mathrm{S\ cm^2 mol^{-1}}$

B. 4.466×10^{22} electrons, 478000 C, $324 \mathrm{S\ cm^2 mol^{-1}}$

C. 2.246×10^{22} electrons, 579000 C, $124\ \mathrm{S\ cm^2 mol^{-1}}$

D. 3.426×10^{22} electrons, 679000 C, $134\ \mathrm{S\ cm^2 mol^{-1}}$

Answer: C

View Text Solution

9. A 0.05 M NH_4 OH solution offers the resistance of 50 ohm to a conductivity cell at 298 K. If the cell constant is $0.50 \mathrm{cm^{-1}}$ and molar conductance of NH_4OH at infinite dilution is $471.4 \mathrm{ohm^{-1} cm^2 mol^{-1}}$, calculate :

(i) Specific conductance

(ii) Molar conductance

(iii) Degree of dissociation

A. $0.21 \mathrm{ohm^{-1} cm^{-1}}, 400 \mathrm{mol^{-1} ohm^{-1} cm^{-1}}, 0.524$

B. $0.01 \mathrm{ohm^{-1} cm^{-1}}, 200 \mathrm{mol^{-1} ohm^{-1} cm^{-1}}, 0.424$

C. $0.02 \text{ohm}^{-1}\text{cm}^{-1}$, $220 \text{mol}^{-1}\text{ohm}^{-1}\text{cm}^{-1}$, 0.224

D. $0.201 \text{ohm}^{-1}\text{cm}^{-1}$, $230 \text{mol}^{-1}\text{ohm}^{-1}\text{cm}^{-1}$, 0.334

Answer: B

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10. The specific conductance of a 0.01 M solution of acetic acid at 298K is $1.65 \times 10^{-4} \text{ohm}^{-1}\text{cm}^{-1}$. The molar conductance at infinite dilution for H^+ ion and CH_3COO^- ion are $349.1 \text{ohm}^{-1}\text{cm}^2\text{mol}^{-1}$ and $40.9 \text{ohm}^{-1} cm^2 \text{mol}^{-1}$ respectively. Calculate :

(i) Molar conductance of the solution.

(ii) Degree of dissociation of CH_3COOH.

(iii) Dissociation constant for acetic acid.

A. $16.5 \text{ohm}^{-1} cm^2 \text{mol}^{-1}$, 0.0423, 1.86×10^{-5}

B. $26.5 \text{ohm}^{-1} cm^2 \text{mol}^{-1}$, 0.0223, 1.76×10^{-5}

C. $15.5 \text{ohm}^{-1} cm^2 \text{mol}^{-1}$, 0.0323, 2.86×10^{-5}

D. $26.5 \text{ohm}^{-1} cm^2 \text{mol}^{-1}, 0.0523, 3.86 \times 10^{-5}$

Answer: A

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11. When two Faradays of electricity is passed through an aqueous solution of $CuSO_4$ and an aqueous solution of $AgNO_3$ (Atomic weight of $Cu = 63.5 \text{ g mol}^{-1}$, $Ag = 108 \text{ g mol}^{-1}$)

The mass of copper deposited at the node is :

A. 127.02 g

B. 63.50 g

C. 31.75 g

D. 15.87 g

Answer: B

View Text Solution

12. When two Faradays of electricity is passed through an aqueous solution of $CuSO_4$ and an aqueous solution of $AgNO_3$ (Atomic weight of $Cu = 63.5 \ \ \mathrm{g\,mol^{-1}}$, $Ag = 108 \ \ \mathrm{g\,mol^{-1}}$)

The mass of silver deposited at the cathode is :

A. 54 g

B. 108 g

C. 216 g

D. 270 g

Answer: C

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13. The limiting molar conductivities $\left(\overset{\infty}{\underset{m}{\Lambda}}\right)$ for NaCl, KBr and KCl are 126, 152 and 150 $\mathrm{ohm^{-1}cm^2mol^{-1}}$ respectively.

The molar conductivity at infinite dilution for NaBr is :

A. $128 \text{ohm}^{-1} cm^2 \text{mol}^{-1}$

B. $176 \text{ohm}^{-1} cm^2 \text{mol}^{-1}$

C. $278 \text{ohm}^{-1} cm^2 \text{mol}^{-1}$

D. $302 \text{ohm}^{-1} cm^2 \text{mol}^{-1}$

Answer: A

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14. The limiting molar conductivities $\left(\overset{\infty}{\underset{m}{\Lambda}}\right)$ for NaCl, KBr and KCl are 126, 152 and 150 $\text{ohm}^{-1}\text{cm}^2\text{mol}^{-1}$ respectively.

The law applied to determine the molar conductivity of infinite dilution is known as:

A. Faraday's Law

B. Avogadro's Law

C. Kohlrausch's Law

D. Ohm's Law

Answer: C

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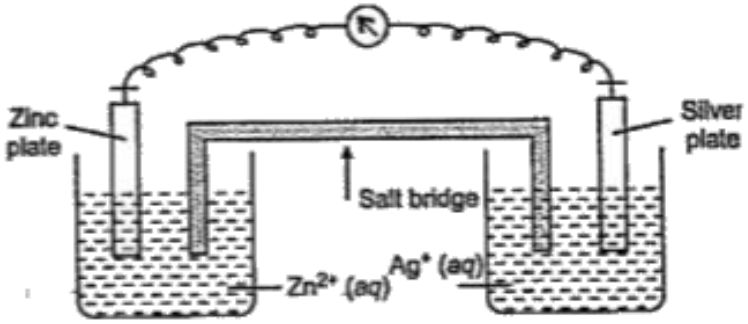
Structure Based Questions

1. Consider the figure given below and the answer the question (i) to (v).



(i) Write the direction of electron flow.

(ii) Is silver plate anode or cathode?

(iii) What will happen if salt bridge is removed ?

(iv)When will the cell stop functioning?

(v) How will concentration of Zn^{2+} ion and Ag^{+} ions be affected when the cell functions ?

A. Zn to Ag, cathode, stop functioning, $E_{\text{cell}} = 0$, Conc. of Zn^{2+} and Ag^{+} ions will increase and decrease respectively.

B. Ag to Zn, Anode, electrons will move at faster rate, $E_{\text{cell}} > 0$, Conc of Zn^{2+} and Ag^{+} ions will decrease and increase respectively

C. Anode to Cathode, Cathode, electrons will move at slower rate, $E_{\text{cell}} \neq 0$ Conc of Zn^{2+} and Ag+ will decrease remain same.

D. Zn to Ag, Cathode, electrons will move at faster rate, $E_{\text{cell}} > 0$, Conc. of Zn^{2+} will increase and Ag+ will remains same.

Answer: A

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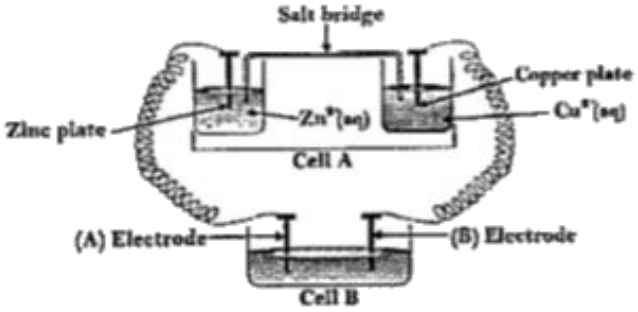
2. Consider the Fig. and answer the following questions.



(i) Cell 'A' has $E_{\text{Cell}} = 2V$ and 'B' has $E_{\text{Cell}} =$ 1.1V which of the two cells 'A' or 'B' will act as an electrolytic cell. Which electrode reactions will occur in this cell?

(ii) If cell 'A' has $E_{\text{cell}} = 0.5V$ and cell 'B' has $E_{\text{cell}} = 1.1V$ then what will be the reactions at anode and cathode?

(a) (i) At Cathode, $Zn^{2+} + 2e^- \rightarrow Zn(s)$

At Anode $Cu(s) \rightarrow Cu^{2+} 2e$

(ii) At Anode: $Zn(s) \rightarrow Zn^{2+} + 2e^-$

At Cathode: $Cu^{2+} + 2e^- \rightarrow Cu(s)$

(b) (i) At Anode, $Zn^{2+} + 2e^- \rightarrow Zn(s)$

At Cathode $Cu(s) \rightarrow Cu^{2+} + 2e$

(ii) At Cathode: $Zn(s) \rightarrow Zn^{2+} + 2e$

At Anode: $Cu^{2+} + 2e^- \rightarrow Cu(s)$

View Text Solution

3. Assertion, In cell, current stops flowing when $E_{\text{cell}} = 0$.

Reason: Equilibrium of the cell reaction is attained.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true, but reason is not the correct explanation of assertion.

C. If assertion is true, but reason is false.

D. If both assertion and reason are false

Answer: A

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4. Assertion: The rusting of iron, tarnishing of silver, development of green coating on copper and bronze are some of the examples of corrosion.

Reason: It causes enormous damage to buildings, bridges, ships and to all objects made of metals especially that of iron.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true, but reason is not the correct explanation of assertion.

C. If assertion is true, but reason is false.

D. If both assertion and reason are false

Answer: A

View Text Solution

5. Assertion: Molar conductivity increases with decrease in concentration of solution.

Reason: Conductivity always decreases with decrease in concentration of solution.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true, but reason is not the correct explanation of assertion.

C. If assertion is true, but reason is false.

D. If both assertion and reason are false

Answer: B

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6. Assertion: Zinc can be used while copper cannot be used in the recovery of Ag from the complex $\left[Ag(CN)_2\right]^-$

Reason: Zinc is a powerful reducing agent than copper.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true, but reason is not the correct explanation of assertion.

C. If assertion is true, but reason is false.

D. If both assertion and reason are false

Answer: A

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7. Assertion: The resistivity for a substance is its resistance when it is one meter long and its area of cross section is one square meter.

Reason: The SI units of resistivity is ohm metre (Ωm).

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true, but reason is not the correct explanation of assertion.

C. If assertion is true, but reason is false.

D. If both assertion and reason are false

Answer: B

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8. Assertion: On increasing dilution, the specific conductance keep on increasing.

Reason: On increasing dilution, degree of ionisation of weak electrolyte increases and molality of ions also increases.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true, but reason is not the correct explanation of assertion.

C. If assertion is true, but reason is false.

D. If both assertion and reason are false

Answer: B

View Text Solution

9. Assertion: The conductivity of electrolytic solutions increases with increase of temperature.

Reason: Electronic conductance of metals decreases with increase of temperature.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true, but reason is not the correct explanation of assertion.

C. If assertion is true, but reason is false.

D. If both assertion and reason are false

Answer: B

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10. Assertion: During electrolysis of $CuSO_4$ (aq) using copper electrodes, copper is dissolved at anode and deposited at cathode.

Reason: Oxidation takes place at anode and reduction at cathode.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true, but reason is not the correct explanation of assertion.

C. If assertion is true, but reason is false.

D. If both assertion and reason are false

Answer: A

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11. Assertion: To obtain maximum work from a galvanic cell charge has to be passed reversibly.

Reason: The reversible work done by a galvanic cell is equal to decrease in its Gibbs energy.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true, but reason is not the correct explanation of assertion.

C. If assertion is true, but reason is false.

D. If both assertion and reason are false

Answer: A

View Text Solution

12. Assertion: Conductivity of an electrolyte increases with decrease in concentration.

Reason: Number of ions per unit volume decreases on dilution.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true, but reason is not the correct explanation of assertion.

C. If assertion is true, but reason is false.

D. If both assertion and reason are false

Answer: A

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