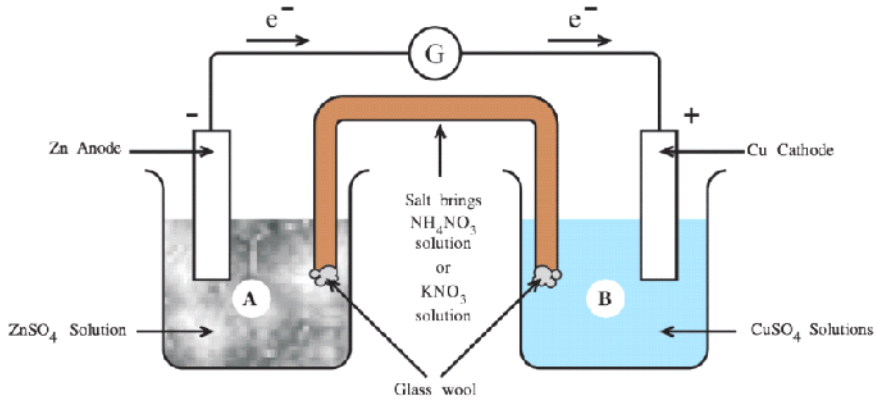
UNIT : 8 REDOX REACTIONS & ELECTROCHEMISTY

Important Points

The device which transforms the chemical energy into electrical energy is called electrochemical cell. In the electrochemica cell, the energy producer in chemical reaction is transformed into electrical energy.



the salt bridge joins the two solutions and keeps the neutrality ofelectrical charge.

The cell in which the "concentration of the ions associated with the reaction of the cell are 1 more litre^{-1} and if any gas is associated with the reaction , than its pressure equal to 1 bar and if tempreture is 298 k, is called syanderd cell.

The relative intesity of tendency of receiving the electron is called reduction potential E_{red} or E^0_{red} the relative intensity of electrodes for releasing electron is called oxidation potential

E_{oxi} or E^0_{oxi}

Nernst Equation

$$M^{n+}(aq) + ne^- \rightleftharpoons M(s) \quad E_{(M^{n+}/M)} - \frac{RT}{nF}\ln\frac{1}{[M^{n+}]}$$

we can write the conoentrations of Cu^{2+} and Zn^{2+} ions in Daniell cell, in the given electrod potential.

$$E_{cell} = E^0_{cell} - \frac{RT}{2F}\ln\frac{[Zn^{2+}]}{[Cu^{2+}]}$$

Concentration Cell :

If the two electrodes of the electrochemical cell are same but the Concentration of the solution of the electrolyte are different, than it is called concentration cell. viz

$$Cu_{(s)}\left|Cu^{2+}{}_{(c_1)}\right|\left|Cu^{2+}{}_{(c_2)}\right|Cu_{(s)}$$

Cell reaction: $Cu^{2+}(C_2) \rightleftharpoons Cu^{2+}(C_1)$ $\qquad E_{Cell} = E^0_{Cell} - \frac{0.059}{n}\log\frac{[C_1]}{[C_2]}$

at equilibrium $E_{cell} = -\frac{0.059}{n} \log \frac{C_1}{C_2}$ $T = 298K$ $E_{cell} = \frac{0.059}{n} \log K_C$

$$\log K_C = \frac{nFE^0_{Cell}}{2.303RT}$$

Faraday's laws of Electrolysis:

(i) **First law:** The amount of products produced at the electrodes by electroysis are directly proportional to the quntity of the electricity passed through the electroytic cell. if **w** is the mass of the product produced and **Q** is value of the quntity of electricity passed, than **W** α **Q**

(ii) **Second law :** If the different electroytic cells, containing different electrolysis are joined in series and same quntity of electricity os passed through them, than the amount of products obtained at the electrodes are directly proportional to thier equivalent weight.

Wα **Eq,** where **W**= Mass of product obtained and Eq = Equivalent weifht of product. the modern presentation of Faraday's law was made as follows:

"The products, obtained at the electrodes by oxidation and reduction half– reactions have the relation with the moles of the products and stoichiometry of the reaction and the quntity of electricity." " The products, obtained at the electrodes by oxidation and reduction half– reactions have the relation with the moles of the products and stoichiometry of the reaction and the qunantity of electricity."

The quantity of electricity passed by 1 more electrons is called one Faraday.

$$1 \text{ Faraday } (F) = 1.602 \times 10^{-19} \times 6.022 \times 10^{23} \text{ electron mole}^{-1}$$

$$= 96487 \ (\cong 96500) \text{Coulomb mole}^{-1} \text{(electron)}$$

$$F = \frac{I \times t}{96500}$$

$$\text{Efficiency of cell}(\%) = \frac{\text{Emperimental value of product}}{\text{Theoretical value of product}} \times 100$$

Gibbs Free Energy and cell Potential

$\Delta G^0 = -nFE^0_{Cell}$ $\Delta G = W_{electrical} = -nFE_{Cell}$

The resistance of a uniform counductor is directly proportional to its lengh (l) and inversely proportions to its area of cross section (A)

$R = p\frac{l}{A}$ where, R = Resitance, A= Area of cross section, l= Lengh, p = proportionality constant.

Conductivity: The inverse of resistance R is called conductivity G

$$G = \frac{1}{R} - \frac{A}{p \cdot l} K \frac{A}{l} \text{ where } K = \frac{1}{p} \quad K = G \cdot \frac{l}{A}$$

Specific conductivity K = observed conductivity G x cell constant

$$\text{Molar conductivity } \wedge_M = \frac{K \times 1000}{C}$$

Where, K = (Kappa) specific conductivity, c = concentration if solutin in unit of molarity.

Conductivity of strong electrolytes :

Molar conductivity of a strong ionic electrolyte $\wedge_M = \wedge_M - AC^{\frac{1}{2}}$

The value of degree of dissociation for such an electrolyte at the given concentratin will be as below.

$$\text{Degree of dissociation } (\alpha) = \frac{\text{Molar conductivity of the solution of a given concentration } \wedge_m}{\text{Molar conductivity of the solution at infinite diletion } \wedge_m^0}$$

$$Ka = \frac{C\alpha^2}{(1-\alpha)}$$ where, Ka = Dissociation constanto of weak electrolyte,

C = concentration of solution, α = degree of dissociation of weak electrolyte

Kohlrausch's law " The morar conductivity of an electroyte at infinite dilution $\lambda^0{}_m{}^+$ is the sum if the values of the molar conductivities of positive ion an negative ion present in them $\lambda^o m^+$ and $\lambda^o m^-$ $\wedge m = v_+\lambda_m{}^+ + v_-\lambda_m{}^-$ (where $\lambda^0{}_m{}^+$ and $\lambda^0{}_{m^-}$ respectively are ionic molar conductivity of positive and negative ion.)

(1) Primary cell: The cell which is dead after a long use and which cannot be regenerated i.e. which cannot be reproduced, is called primary cell. e.g. Dry cell.

(2) Secondary cell : The cell which can be regenerated or reproduced is called secondary cell. e.g lead storage cell and Ni–Cd storage cell.

Dry cell:

Reaction at cathode: $2MnO_2 + 2NH_4^+ + 2e^- \rightarrow M_{n_2}O_3 + 2NH_3 + H_2O$

Reaction at anode : $Zn(s) \rightarrow Zn(ag) + 2\bar{e}$

The potential of this cell is about 1.5 volt.

Mercury cell :

Reaction at cathode: $HgO + H_2O + 2e^- \rightarrow Hg_{(e)} + 2OH^-$

Reaction at anode : $Zn(Hg) + 2OH^- \rightarrow ZnO(s) + H_2O + 2e^-$

The complete equation of these reactions is as follows: $Zn(Hg) + MgO \rightarrow ZnO(s) + Hg(l)$

The cell potential of this cell is about 1.35 volt and during the whole life of this cell, no ions an produced in the complate reaction.

Lead storage cell.

The discharging rections taking place in lead storage cell are as follows :

Reaction at cathode: $PbO_2(s) + 4H^+(aq) + SO_4^{2-}(aq) + 2e^- \rightarrow PbSO_4(s) + 2H_2O(l)$

Reaction at anode : $Pb(s) + SO_4^{2-}(aq) \rightarrow PbSO_4(s) + 2e^-$

The discharging reactions taking place in lead storage cell are as follows:

Cathode: $PbSO_2(s) + 2e^- \rightarrow Pb(s) + SO_4^{2-}(ad)$

Anode : $PbSO_4(s) + 2H_2O(l) \rightarrow PbO_2(s) + 2H^+(aq) + SO_4^2(aq) + 2e^-$

The cell potential of this cell is about 2 volt.

Ni–Cd storage cell: $Cd(s) + 2Ni(OH)_3(s) \rightarrow CdO(s) + 2Ni(OH)_2(s) + H_2O(l)$

Hydrogen Fuel cell

Cathode : $O_2(g) + 2H_2O(l) + 4e^- \rightarrow 4OH^-(aq)$

Anode : $2H_2(g) + 4OH^-(aq) \rightarrow 4H_2O(l) + 4e^-$

Cell reaction : $2H_2(g) + O_2(g) \rightarrow 2H_2O(l) + 571.7\ kj$

M.C.Q.

1. Reduction reaction means _____

   (a) a process of adding oxygen (b) a process of removing hydrogen

   (c) a process of adding electron (d) a process of removing electrons

2. Which substance is oxidizing agent ?

   (a) a substance donates hydrogen or accepts oxygen

   (b) a substance donates oxygen or accepts hydrogen

   (c) a substance experience oxidation

   (d) a substance donates electron

3. Which substance is called reducing agent ?

   (a) a substance donates hydrogen or accepts oxygen

   (b) a substance accepts hydrogen or donates oxygen

   (c) a substance expereince reduction (d) a substance gains electron

4. Oxidation reaction means _____

   (a) a process of removing electron (b) a process of adding hydrogen

   (c) a process of removel of oxygen (d) a process of adding electrons

5. Which of the following is the characterictic of reducing agent ?

   (a) it experience oxidation. (b) it experience reduction

   (c) it gains electrons (d) it gives oxygen

6. Which of the following is the characteristic of oxidizing agent ?

   (a) it experience oxidation. (b) it experience reduction

   (c) it gains oxygen (d) it donates electrons

7. Which of the following statement is true ?

   (a) there is always reduction occur of oxidizing agent

   (b) there is always oxidation occur of reducing agent

   (c) oxidation and reduction are supplimentary processes

   (d) Given three statements are wrong.

8. Which of the following statement is wrong ?

   (a) there is always reduction occur of oxidizing agent

   (b) there is always oxidation occur of reducing agent

   (c) oxidation and reduction are supplimentary processes

   (d) Given three statements are wrong.

9. Which of the following does not occur, when a rod of Zn metal is dipped in an aqueous solution of $CuSO_4$?

   (a) blue colour of the oxygen fades gradually. (b) weight of Zn–metal rod decreases.

   (c) weight of metal strip of zinc increases.

   (d) colour of the surface of Zn road become saffron–red.

10. Which of the following observation obtained, when rod of Cu metal is dipped in an aqueous solution of $AgNO_3$?

(a) No change in the weight of metal rod of Cu occurs.

(b) weight of rod of copper metal decreases

(c) solution become bluish gradually

(d) colour of the surface of rod of Cu metal does not change

11. Which substance get oxidized in the reaction : $2Al + Cr_2O_3 \rightarrow Al_2O_3 + 2Cr$?

(a) Al (b) Cr_2O_3 (c) Al_2O_3 (d) Cr

12. Which substance is a reducting agent in the following reaction ?

Reaction : $2Al + Cr_2O_3 \rightarrow Al_2O_3 + 2Cr$

(a) Al (b) Cr_2O_3 (c) Al_2O_3 (d) Cr

13. In the reaction, $2Na + S \rightarrow Na_2S$, which sustance acts as oxidizing agent ?

(a) Na (b) S (c) Na_2S (d) None of these.

14. Which of following elements does not possess positive oxidation no. in any of its compound ?

(a) O (b) F (c) Cl (d) I

15. Which of the following oxidation no. does not possess by Cl, Br and I, when they conbines with oxygen forming chemical bond ?

(a) +1 (b) +3 (c) +5 (d) –1

16. Oxygen conbines with which of the element by forming chemical bond, then it possesses posi tive oxidation no. ?

(a) F (b) Cl (c) Br (d) given all

17. Which of the following element always possesses +1 oxidation state in any of its compound ?

(a) F (b) Ca (c) Cs (d) O

18. Which of the following oxidation no. does not possess by oxygen in any of its compound ?

(a) –2 (b) –1 (c) $-\frac{1}{2}$ (d) $+\frac{1}{2}$

19. Which of the following oxidation no. does not possess by carbon in any of its compound ?

(a) –2 (b) 0 (c) –4 (d) +5

20. Which of the following oxidation no. does not possess by nitrogen in any of its compound ?

(a) $-\frac{1}{3}$ (b) –3 (c) –4 (d) +5

21. Which of the following oxidation no. possesses by oxygen in its compounds ?

(a) –1 (b) +3 (c) –4 (d) +5

22. Which type of metal compounds are nomenclate according to stock notation nomenclature method ?

(a) Metal compound having fixed oxidation no. (b) Comppounds of alkali metals.

(c) Metallic compounds having more than one oxidation no.

(d) Compounds of non–metal.

23. Molecular fromula of sodium chromate (VI) is _____

(a) $Na_2Cr_2O_7$ (b) $Na_2Cr_2O_4$ (c) Na_2CrO_4 (d) $NaCrO_4$

24. What is the name of $K_2Cr_2O_7$ according to stock notation nomenclature method ?

(a) Potassium dichromate (VI) (b) Potassium chromate (VI)

(c) Potassium dichromate (III) (d) Potassium dichromate (IV)

25. What is the name of TiO_2, according to stock notation nomenclature method ?

(a) Titanium (II) oxide (b) Titanium oxide (IV)

(c) Titanium (IV) oxide (d) Titanium (V) oxide

26. Which of the following is the true for Fe_3O_4 ?

(a) oxidation no. of each Fe atom in Fe_3O_4 is +3.

(b) oxidation no. of each Fe atom in Fe_3O_4 is +2.

(c) The no. of atoms having oxidation no. +2 and +3 is 1:2 in Fe_3O_4.

(d) oxidation no. of each Fe atom in Fe_3O_4 is $+\frac{8}{3}$

27. Which of the following is the wrong for Fe_3O_4 ?

(a) it is a combination of FeO and Fe_2O_3.

(b) Oxidation no. of each Fe atom in Fe_3O_4 is not $+\frac{8}{3}$

(c) The no. of atoms havinf oxidation no. +2 and +3 is 1 : 2 in Fe_3O_4.

(d) The proportion of FeO and Fe_2O_3 is 1 : 2

28. The no. of peroxy ring in CrO_5 is

(a) 1 (b) 2 (c) 3 (d) None of these

29. Which of the following compound possesses peroxide (O_2^{2-} or $[-O-O-]^{2-}$) in?

(a) kO_2 (b) TiO_2 (c) BaO_2 (d) SiO_2

30. Which of the following compound possesses super oxide (O_2^{1-}) ion ?

(a) kO_2 (b) TiO_2 (c) BaO_2 (d) SiO_2

31. The oxidation no. of sulphur in H_2SO_3, H_2SO_4, H_2SO_5 or sulphuric acid, Caro's acid (permono sulphuric acid) is respectively_____

(a) +4, +6, +7 (b) +3, +6, +6 (c) +4, +6, +6 (d) +5,+6, +6

32. The oxidation no. of sulphur in $H_2S_2O_8$, $H_2S_2O_3$, $H_2S_2O_7$, $H_2S_2O_6$ or marshal acid (perdisulphuric acid), thiosulphuric acid, oleum, Dithianic acid is respectively

(a) +6, +3, +6, +7 (b) +7, +2, +6, +5 (c) +6, +2, +6, +5 (d) +6. +3, +7, +5

33. What is the oxidation No. of Cr in CrO_5, $K_2Cr_2O_7$, K_2CrO_4 or in chromium pentoxide, potassium dichromate, potassiam chromate respectively

(a) +4, +5, +6 (b) +5, +6, +6 (c) +4, +6, +6 (d) +6, +6, +6

34. What is the oxidation no. of phosphorus in H_3PO_3, H_3PO_4, H_3PO_2 or phosphorus, acid, Phosphoric acid, phosphinic acid respectively ?

(a) +3, +5, +1 (b) +3, +5, +2 (c) +4, +5, +1 (d) +2, +5, +1

35. What is the oxidation no. of phosphorus in $H_4P_2O_7$, $H_5P_3O_{10}$, $(HPO_3)_3$ or pyrophosphoric acid, penta phosphoric acid, triphosphoric acid respectively ?

(a) +4, +5, +3 (b) +6, +5, +5 (c) +5. +5, +5 (d) +4, +5, +5

36. The oxidation no. of chlorine in $HClO$, $HClO_2$, $HClO_3$, $HClO_4$ or Hypochlorus acid, chloric acid, chloric acid and perchloric acid respectively are

(a) +1, +3, +5, +7 (b)+1, +2, +3, +4 (c) +1, +2, +4, +5 (d) +4, +3, +2, +1

37. What is the oxidation no. of iodine in ICl_3, CsI_3 respectively ?

(a) +3, –1 (b) +1, –1 (c) +1/3, –1 (d)+3, –1/3

38. What is the maximum positive oxidation state of halogen element in any of it's compound ?

(a) +1 (b) +3 (c) +7 (d) +5

39. What is the maximum positive oxidation state of chalcogen element in it's compound ?

(a) +6 (b) +3 (c) +7 (d) +5

40. What is the the oxidation no. of nitrogen in N_3H, $H_2N_2O_2$, HNO_3 or hydrazoic acid, hyponitrons acid, nitrus acid, nitric acid respectively ?

(a) –1, +1, +3, +5 (b) –1/3, +1, +3, +5 (c) +1, +1, +3, +5 (d) +1/3, +2, +2, +5

41. What is the oxidation no. of silicon in zeolite ($Na_2Al_2Si_4O_{12}$) and tremolite [$(Ca_2Mg_5(OH)_2(Si_4O_{11})_2$] respectively ?

(a) +4, +3 (b) +4, 4 (c) +2, +2 (d) +3, +4

42. The value of n in AlF_xOy^n is—

(a) +3 –x–y (b) +3–x–2y (c) +3+x+2y (d) +3+x–y

43. The value of n in $AlF_XO_y^n$, if x=1 and y=1 ?

(a) +1 (b) +2 (c) 0 (d) +3

44. The value of n in $AlF_XO_y^n$, if x=2 and y=3 ?

(a) –2 (b) 0 (c) –5 (d) –4

45. What will be the value of x and y respectively in AlF_XOy^{6-} ?

(a) 1, 4 (b) 3, 2 (c) 2, 2 (d) 4, 3

46. How many moles of elements are added when 2.5 mole $Cr_2O_7^{2-}$ reduced in Cr^{3+} ?

(a) 12.5 (b) 15 (c) 7.5 (d) 10

47. What moles of $Cr_2O_7^{2-}$ reduced in Cr^{3+} by the addition of 12 moles of electrons ?

(a) 6, (b) 5 (c) 2 (d) 12

48. How many mole ferrous (Fe^{2+}) ion oxidized in ferric (Fe^{3+}) ion by the required no. of electrons the oretically to reduced 4 mole $Cr_2O_7^{2-}$ in to Cr^{3+} ?

(a) 8 (b) 24 (c) 48 (d) 12

49. Theoretically what gram ferrous (Fe^{2+}) ion oxidized in to ferric (Fe^{3+}) ion by passing 2.4125×10^5 coulomb electric charge ? (Atomic mass of Fe=56 gram/mole)

(a) 70 gram (b) 140 gram (c) 14 gram (d) 280 gram

50. What mole of MnO_4^- reduced in Mn^{2+} by the addition of 7.5 mole electrons in MnO_4^-?

(a) 2.5 (b) 5 (c) 1.5 (d) 7.5

51. How many electrons required to add for the reduction of one mole of MnO_4^- in Mn^{2+} ?

(a) 1.8066×10^{24} (b) 3.011×10^{24} (c) 6.022×10^{24} (d) 1.2044×10^{24}

52. When 3.11×10^{24} $Cr_2O_7^{2-}$ ion reduced in Cr^{3+}, then how many ferrous (Fe^{2+}) ionoxidised in ferric (Fe^{3+}) ion ?

(a) 1.8066 x 1024 (b) 1.2044 x 1024 (c) 6.022 x 1025 (d) 1.8066 x 1025

53. Theoretically, how many moles of iodide (I^-) ion oxidized into iodate (IO_3^-) in using the no of electrons required for the reduction of 24 moles of MnO_4^- ion into Mn^{2+} ion ?

(a) 30 (b) 60 (c) 40 (d) 20

54. What is the oxidation no. of underlined C in H<u>C</u>HO, CH_3<u>C</u>HO, CH_3<u>C</u>OOCH_3 or formalehyde acetaldehyde, acetone respectively ?

(a) 0, +1, +2 (b) 0, +1, +3 (c) +1, 0, +3 (d) 0, +2, +1

55. What is the oxidation no. of underlined C in H<u>C</u>HO, CH_3<u>C</u>HO, CH_3<u>C</u>OOCH_3 or methanol, acetic acid and methyl acetate respectively ?

(a) +2, +3, +3 (b) –2, +3, +3 (c) +2, +3, +4 (d) –2, +3, +4

56. What is the oxidation no. of underlined C in <u>C</u>H_3<u>C</u>OO<u>C</u>H_3 respectively ?

(a) –3, +3, –3 (b) –3, +3, –2 (c) +3, +3, +3 (d) –2, +3, –2

57. In which of the following compound, oxidation no of all C atoms are same ?

(a) ethane (b) cyclohexane (c) benzene (d) given three compounds

58. What are the values of b, d and f in the balanced state of the following reaction?
Reaction : $aMnO_4^- + bAs_2O_3 + cH_2O \rightarrow dMn^{2+} + eASO_4^{3-} + fH^+ (P^H<7)$

(a) 4, 5, 18 (b) 4, 10, 9 (c) 5, 4, 18 (d) 5, 4, 9

59. In the balanced state of reaction, $aBr_2 + bOH^- + CH_2O \rightarrow dBrO_4^- + eHBr$ (basic medium), if c=9, then what will be the change in oxidation no. (change in no. of electrons).

(a) 21 (b) 7 (c) 14 (d) 9

60. What will be the chage in the oxidation no. (change in no. of electrons) inbalanced eqation given below ? Reaction : $2S + bHNO_3 \rightarrow CH_2SO_4 + dNO$ (acidic medium)

(a) 6 (b) 3 (c) 12 (d) 9

61. What will be the chage in the oxidation no. (change in no. of electrons), if no. of $e^- = 10$ in balanced eqation given below ? Reaction : $aP_4 + bNO_3^- + cH^+ \rightarrow dPO_4^{3-} + eNO_2 + fH_2O$ (acidic medium)

(a) 20 (b) 10 (c) 5 (d) 15

62. What is the ratio of value of b and c in the balanced equation given below ?

Reaction: $aP_4 + bNO_3^- + CH^+ \rightarrow dPO_4^{3-} + eNO_2 + fH_2O$ (acidic medium)

(a) 5 : 2 (b) 10 : 3 (c) 2 : 5 (d) 1 : 1

63. In the reaction, $R-CHO + 2cuO \rightarrow R-COOH + Cu_2O$ which substance is oxidising agent? And which substance is oxidizes ? (mention it respectively)

(a) CuO, R–COOH (b) R–CHO, CuO (c) CuO, R–CHO (d) Cu_2O, R–CHO

64. In which of the following reaction, H_2O_2 acts as oxidizing agent ?

(a) $HOCl + H_2O_2 \rightarrow H_3O^+ + Cl^- + O_2$ (b) $I_2 + H_2O_2 + 2OH^- \rightarrow 2I^- + 2H_2O + O_2$

(c) $PbS + 4H_2O_2 \rightarrow PbSO_4 + 4H_2O$ (d) In given all three.

65. In which of the following reaction, H_2O_2 as reducing agent ?

(a) $HNO_2 + H_2O \rightarrow HNO_3 + H_2O$

(b) $2KMnO_4 + 2H_2O_2 \rightarrow 2MnO_2 + 2KOH + 2H_2O + 3O_2$

(c) $H_2SO_3 + H_2O_2 \rightarrow H_2SO_4 + H_2O$

(d) $2Fe^{2+} + H^+ + H_2O_2 \rightarrow 2Fe^{3+} + H^+ + H_2O$

66. Which of the following is a redox reaction ?

(a) $As_2O_3 + 3H_2S \rightarrow As_2S_3 + 3H_2O$ (b) $2NH_3 + H_2O + CO_2 \rightarrow (NH_4)_2CO_3$

(c) $CaO + 3C \rightarrow CO + CaC_2$ (d) $Be(OH)_2 + 2HCl \rightarrow BeCl_2 + 2H_2O$

67. Which of the following is a correct ascending order, when oxidation no. of sulphur of H_2SO_3, $H_2S_2O_3$, $H_2S_2O_7$, $H_2S_2O_8$ or sulphurus acid, thio sulphuric acid, oleum, dithianic acid is arranged in ascending order ?

(a) $H_2SO_3 < H_2S_2O_3 < H_2S_2O_7 < H_2S_2O_6$ (b) $H_2SO_3 < H_2S_2O_3 < H_2S_2O_6 < H_2S_2O_7$

(c) $H_2S_2O_3 < H_2SO_3 < H_2S_2O_7 < H_2S_2O_6$ (d) $H_2S_2O_3 < H_2SO_3 < H_2S_2O_6 < H_2S_2O_7$

68. When 0.25 mole I^- oxidised in IO_3^- then what coulomb of electric charge relates with the reaction theoretically ?

(a) 5.79×10^5 C (b) 4.82500×10^5 C (c) 2.895×10^5 C (d) 1.4475×10^5 C

69. In the sample of ironoxide, the no. of Fe^{2+} ion is 90% and no. of is 10% then what is the molecular formula ?

(a) $Fe_{0.905}O$ (b) $Fe_{0.952}O$ (c) $Fe_{0.825}O$ (d) $Fe_{0.857}O$

70. In a balanced equation, $aLiH + bH_2O_2 \rightarrow CLi_2O + dH_2O$ (acidic medium), if d=6 then, what would be the change in no. of electrons and the value of a, b & c respectively

(a) 8, 4, 4, 2 (b) 4, 2, 2, 1 (c)4, 2, 1, 2 (d) 4, 4, 4, 2

71. The oxidation no. of sulphur in $Al_2(SO_4)_3$ is

(a) +8 (b) +7 (c) +5 (d) +6

72. In a balanced equation, $aP_{(S)} + bH_2O + CO_2 \rightarrow dH_3PO_4 + CO_2$, oxidation no. of oxygen decreases 30, then c–e=—

(a) 3 (b) 1 (c) 2 (d) 4

73. Zn rod is dipped in a 1.5 litre aqueous solution of 0.1 M $CuSO_4$;then choose the correct alternate for given statements bassed on theoretical calculations. (Atomic weight of Zn = 65 gram – mole^{-1}, Cu = 63.5 gram – mole^{-1}) T= correct statement and F = false statement.

(i) 0.3 gram wt. of Zn rod decreases, then 13 gm Zn metals in the solution

(ii) 1.95 gram Zn metal dissolve in the solution, then concentration of Cu^{2+} ion is 0.08 M.

(iii) when molarity of Cu^{2+} and Zn^{2+} becomes equal in the solutoion then no. of Zn^{2+} ions in the solution is 4.5165×10^{24}.

(iv) when 3.6132×10^{22} atoms of Cu deposited then concentration of Zn^{2+} ions in the solution becomes 0.04 M

(a) TTTF (b) FFFT (c) TTFT (d) FFTT

74. In balanced equation, $aCu_2S + bNO_3^- cH^+ \rightarrow 12Cu^{2+} + eSO_4^{2-} + fNO + gH_2O$ then what will be the change in oxidation no. and the value of b and g respectively ?

(a) 30, 10, 8 (b) 121, 20, 16 (c) 24, 10, 8 (d) 60, 20, 16

75. $Mg|Mg^{2+}_{(c_1)}\ P\ Ag^{+}_{(C_2)}|Ag$ which of the following Nernst equation is correct for the given electrochemical cell ?

(a) $E^{\circ}cell = Ecell - \frac{RT}{2F}.\ln\frac{[Mg^{2+}]}{[Ag^{+}]^2}$ (b) $E^{\circ}cell = Ecell - \frac{RT}{F}.\ln\frac{[Mg^{2+}]^{\frac{1}{2}}}{[Ag^{+}]}$

(c) $E^{\circ}cell = Ecell - \frac{RT}{2F}.\ln\frac{[Mg^{2+}]}{[Ag^{+}]}$ (d) $E^{\circ}cell = Ecell - \frac{RT}{2F}.\ln\frac{[Ag^{+}]^2}{[Mg^{2+}]}$

76. For an electro chemical cell, $Zn|Zn^{2+}_{(C_1)}||Cu^{2+}_{(0.5m)}|Cu$, at constant temperature, reducing the concentrations of both the solutions, then value of cell potential increases, then, what would be the value of C_1 ?

(a) 0.7 M (b) 0.5 M (c) 0.4 M (d) None of these

77. $\frac{E^{\circ}Cu}{Cu^{2+}} = -0.34$ volt and $\frac{E^{\circ}Cu^{2+}}{Cu^{+}} = +0.16$ volt, then the value of $\frac{E^{\circ}Cu}{Cu^{+}}$ is ___.

(a) –0.12v (b) –0.48v (c) +0.48v (d) –0.52v

78. What will be the oxidation potential of $Pt|H_{2(a)\ (1bar)}|H^{+}(P^{\circ H}=11)$ half cell $25^{\circ}C$ temperature ?

(a) 0.177v (b) 0.649v (c) 0.282v (d) 0.616v

79. For an electrochemical cell, $Mg|Mg^{2+}(C1)||Br^{-}(C_2)|Br_{2(l)}|Pt$, what will be the change in cell potential, when conc of solution of cathode increase at constant temperature ?

(a) increases (b) decreases (c) No change occurs (d) E cell=E° cell

80. Aqueous solution of salt of metal B is stored in a vessel of metal A and aqueous solution of solt of metal c can be stored in the vessel of metal B, then, which of the following is the correct descending order of their strength of reducing agent of A, B and c ?

(a) A > B > C (b) A > C > B (c) C > B > A (d) C > A > B

81. Standard oxidation potential of half cells of A/A^{2+}, B/B^{2+}, C/C^{2+} and D/D^{2+} are in increasing order, then which of the following statement is correct ?

(a) solution of salt of A^{2+} can be stored in the vessel of metal B.

(b) solution of salt of D^{2+} can't be stored in the vessel of metal C.

(c) solution of salt of D^{2+} can be stored in the vessel of metal B.

(d) given all three statements are wrong.

82. For which of the following compound, a graph of mular conductivity and $(molarity)^{1/2}$ is obtained straight line ?

(a) CsCl (b) NH_4OH (c) HCOOH (d) given all three

83. Electrolytic cells having molten NaCl, $CaCl_2$ and $AlCl_3$ solutions are connected in series and same electricity is passed then, which of the following ratio of moles of metal obtained at cathode is correct ?

(a) 1:2:3 (b) 3:2:1 (c) 6:2:3 (d) 6:3:2

84. E^ored for Fe/Fe^{2+} and Fe^{2+}/Fe^{3+} half cells are –0.44volt and +0.77volt respectively then what will be the value of E^oox for Fe/Fe^{3+} half cell ?

(a) 0.037v (b) 0.33v (c) –0.33v (d) –o.11v

85. 5 faraday electric charge is passed during electrolysis of molten $cacl_2$ solution, then what moles of Ca obtained at cathode experimentally ?

(a) 2.5 mole (b) less then 2.5 mole (c) more then 2.5 mole (d) 5 mole

86. When same electric charge is passed through electrolytic cells containing aqueous solutions of $CuSO_4$, $AgNO_3$ and $NiSO_4$, then what would be prportion of moles of metal obtained at different cathodes respectively ?

(a) 2:1:2 (b) 2:2:1 (c) 1:1:2 (d) 1:2:1

87. What would be the change in P^H of the solution, when electrolysis of aqueous solution of $CuSO_4$ is carried out in presence of inert electrodes ?

(a) P^H increasses (b) P^H decreases (c) no change in P^H (d) can't be predicted

88. Which of the following formula is true to calculate the molar conductivity in conventional symbols ?

(a) $\wedge_m = \frac{1000 \times R \times l}{C \times A}$ (b) $\wedge_m = \frac{1000 \times G \times A}{C \times l}$

(c) $\wedge_m = \frac{1000 \times G \times l}{C \times A}$ (d) $\wedge_m = \frac{1000 \times C \times l}{R \times A}$

89. $\overset{o}{\wedge}_{KCl} - \overset{o}{\wedge}_{NaCl} = 23.4\ Mho\,(cm)^2 mole^{-1}$ and $\overset{o}{\wedge}_{NaSr} - \overset{o}{\wedge}_{NaCl} = 1.8\ Mho\text{-}(cm)^2\text{-}mole^{-1}$ then, which of the following is the correct order of molar conductivity at intimite dilution in an ascending pattern?

(a) NaCl < KCl < NaBr < KBr (b) NaCl < NaBr < KCl < KBr

(b) KBr < NaCl < NaBr < KCl (d) KCl < NaCl < NaBr < KBr

90. In an experiment of electroplating, 4 ampere electric current is passed for 2 minutes. Hence, m gram Ag is deposited at cathode. If 6 ampere current is passed for 40 second, then what amount Ag is deposited at cathode ?

(a) 2m (b) 4m (c) m/2 (d) m/4

91. Which of the following is correct form of the nernst equation to determine the oxidation potential of Cu/Cu^{2+} half cell ?

(a) $E^{\circ}Cu|Cu^{2+} = E^{\circ}Cu|Cu^{2+} - \frac{RT}{2F} \times \ln[Cu^{2+}]$

(b) $E^{\circ}Cu|Cu^{2+} = E^{\circ}Cu|Cu^{2+} + \frac{RT}{2F} \times \ln[Cu^{2+}]$

(c) $E^{\circ}Cu|Cu^{2+} = E\,Cu|Cu^{2+} + \frac{RT}{2F} \times \ln[Cu^{2+}]$

(d) $E^{\circ}Cu|Cu^{2+} - E\,Cu|Cu^{2+} = \frac{RT}{2F} \times \ln \times \frac{1}{[Cu^{2+}]}$

92. The values of for $\hat{\Lambda}_m$ A_2B, X_3Y_2 and A_3Y are 2.4, 1.5 and 1.8 respectively. Then what will be the value of $\hat{\Lambda}_m$ for XB ?

(a) 1.7 mho – $(cm)^2$ – $mole^{-1}$ (b) 8.1 mho – $(cm)^2$ – $mole^{-1}$

(c) 2.1 mho – $(cm)^2$ – $mole^{-1}$ (d) 0.7 mho – $(cm)^2$ – $mole^{-1}$

93. What amount of electric charge required for the reduction of 1 mole Cr_2O7^{2-} into Cr^{3+} theoretically ?

(a) 6 (b) 3 (c) 1 (d) 4

94. What does the potential of the electrochemical cell become zero ?

(a) Eox of anode and Ered of cathode become equal

(b) E^{o}red of anode and E^{o}red of cathode become equal

(c) Ered of anode and Ered of cathode become equal

(d) Concentration of both the half cell become same

95. In an electrochemical cell for which of the following alternative shows Ecell = E^{o}cell ?

(a) k = 1, then... (b) cell reaction is in equilibrium, then

(c) concentration of both the half cells become equal, then

(d) None of these

96. For the electrochemical cell, $Mg|Mg^{2+}(0.04m)||Ag^{+}_{(C_2)}|Ag$; Ecell = E^{o}cell, then what will be the value of C_2 ?

(a) 0.04 M (b) 0.02 M (c) 0.2 M (d) 0.0016M

97. In an electrochemical cell, $Fe|Fe^{2+}_{(C_1)}||Cu^{2+}_{(0.4m)}|Cu$, at constant temperature, concentration of both the solutions increases equally, then cell potential increases. Thus which od the following will be the value of C_1 ?

(a) 0.8 M (b) 0.1 M (c) 0.4 M (d) None of these

98. Which of the following possesses maximum equivalent conductance at infinite dilution?

(a) $K^+_{(aq)}$ (b) $Na^+_{(aq)}$ (c) $Cs^+_{(aq)}$ (d) $Rb^+_{(aq)}$

99. The potential of a cell is 2.0 volt. change in free energy (SG) occur for the reaction of cell is –50k.cal then what coulomb electric charge obtained from the cell?

(a) 1.08 c (b) 104600 c (c) 25000 c (d) 0.26 c

100. A+ 25° c temperature and 1 bar pressure, oxidation potential of hydrogen half cell is 0.118 volt, then what would be the P^{OH} of the solution?

(a) 2 (b) 3 (c) 5 (d) 12

101. For the electrochemical cell, $Zn|Zn^{2+}_{(C_1)}||Cu^{2+}_{(C_2)}|Cu$, $C_2 > C_1$, then what change occurs in cell potential when concentration of solutions of both the half cells increases equally ?

(a) increases (b) decreases (c) No change occurs (d) Ecell=E°cell

102. What will be the oxidation potential of $Pt \mid \underset{(1\ bar)}{H_2(g)} \mid \underset{(P^H=4)}{H^+_{(aq)}}$ half cell at 25°C temperature ?

(a) 0.118 (b) 0.649 v (c) 0.236 v (d) –0.118v

103. For the electrochemical cell, $Zn|Zn^{2+}_{(C_1)}||Cu^{2+}_{(C_2)}|Cu$; Ecell > E°Cell then., what change occurs in the value of cell potential, when concentration of both the solution decreased equally ?

(a) Increases (b) decreases

(c) no change occurs (d) can't be predicted

104. Which equation is suitable to calculate the value of E°cell ?

(a) $E^\circ cell = E^\circ red_{(anode)} + E^\circ red_{(cathode)}$ (b) $E^\circ cell = E^\circ oxi_{(cathode)} + E^\circ oxi_{(anode)}$

(c) $E^\circ cell = E^\circ oxi_{(anode)} - E^\circ oxi_{(anode)}$ (d) $E^\circ cell = E^\circ oxi_{(anode)} + E^\circ red_{(cathode)}$

105. At 25°c temperature, potential of $Mg^{2+}_{(xM)} \mid Mg$ and $Cu^{2+}_{(yM)} \mid Cu$ and half cells are 2.365 v and 0.3415 v respectively. What will be the cell potential of the cell formed by these two half cells at 250 c temperature ?

(a) 2.0235 v (b) –2.0235 v (c) 2.7065 v (d) –2.7065 v

(106) Cell potential of the cell formed by connecting half cells Fe $|Fe^{2+}_{(x\,M)}$ and Ag $|Ag^{+}_{(y\,M)}$ is 1.295 V. if at 25⁰C potential of the | Ag is 0.84 V. then what is the potential of the | at C?

(a) 0.455 V. (b) – 2.135 V. (c) 2.135 V. (d) " 0.455 V.

(107) IF $E_{Co^{2+}_{(x\,M)}|Co} < E^{0}_{Co^{2+}|Co}$ then which value of x is possible?

(a) 1.2 M (b) 0.2 M (c)1.0 M (d) can not be decided

(108) If cell potential of standard cell is 0.59 V then equilibrium constant for the cell reaction occuring in the cell at 25^0 C is _____. (n = 1)

(a) 1.0 (b) 10.0 (c) 10^{10} (d) $\frac{1}{10}$

(109) Which of the following cell is different?

(a) Daniel cell (b) lead storage cell (c) laclanche cell (d) electrolytic cell

(110) If equilibrium constant of a cell for reaction occuring in the electrochemical cell is 1.9413×10^{37} at 25⁰C then what is the std. cell potential of the cell (n=2)

(a) 2.2 V. (b) 1.1 V. (c) 0.0085 V. (d) 0.013 V.

(111) On which of the following cell potential of the cell does not depend?

(a) temperature (b) concentration fo the solution of salt bridge

(c) concentration of the solutioin related with cell reaction

(d) nature of electrodes

(112) What is the value of term $\frac{2.303RT}{F}$ in nernst equation at 80⁰C ?

(a) 0.007 V. (b) 0.01587 V. (c) 0.01857 V. (d) 0.07 V.

(113) Select correct option for the statements given with reference to electrochemical cell (where T= true and F = false)

(i) in external circuit e flow from cathode to anode.

(ii) in solution electricity conducted through ions.

(iii) in external circuit electric current flow from anode to cathode.

(iv) anions move from anode to cathode through salt bridge.

(a) TFTF (b) FTFF (c) FFFT (d) FTTF

(114) Mention n and Q for the cell reaction taking place in the Pt | $Cl_{2(g,1.0\,bar)}$ | $Cl^{-}_{(C_1)}$ ‖ $Au^{3+}_{(C_2)}$ | Au cell.

(a) n = 6 , $Q = \frac{[Cl^-]^6}{[Au^{3+}]^2}$ (b) n = 3 , $Q = [Au^{3+}]^2 \cdot [Cl^-]^6$

(c) n = 3 , $Q = [Au^{3+}] \cdot [Cl^-]^3$ (d) n = 6 , $Q = \frac{1}{[Au^{3+}]^2[Cl^-]^6}$

(115) Mention the oxidation reaction takes place in half cell Pt | $H_{2(g,1.0\,bar)}$ | $OH^{-}_{(aq)}$.

(a) $H_{2(g)} + 2OH^{-}_{(aq)} \rightleftharpoons 2H_2O_{(l)} + 2e^-$ (b) $2OH^{-}_{(aq)} \rightleftharpoons H_{2(g)} + O_{2(g)} + 2e^-$

(c) $2H_2O_{(l)} + 2OH^{-}_{(aq)} \rightleftharpoons 3H_{2(g)} + 2e^-$ (d) $H_{2(g)} + 2OH^{-}_{(aq)} \rightleftharpoons 2H_2O_{(l)} + O_{2(g)} + 2e^-$

(116) Which of the following relation is correct for Faradays 2nd law? where and is quanitity of substance while and are equivalent mass of the substance.

(a) $m_1E_1 = m_2E_2$ (b) $m_1E_2 = m_2E_1$ (c) $m_1 + m_2 = E_1 + E_2$ (d) $E_1E_2 = m_1m_2$

(117) Which of the following cell representation is in correct with reference to cell reaction taking place in the cell at 25^0C ? ($E^0_{Pb^{2+}|Pb} = -0.13$ V., $E^0_{Sn^{2+}|Sn} = -0.14$ V.)

(a) $Sn \mid Sn^{2+}_{(0.1\,M)} \parallel Pb^{2+}_{(0.01\,M)} \mid Pb$
(b) $Sn \mid Sn^{2+}_{(0.02\,M)} \parallel Pb^{2+}_{(0.2\,M)} \mid Pb$
(c) $Pb \mid Pb^{2+}_{(0.01\,M)} \parallel Sn^{2+}_{(0.1\,M)} \mid Sn$
(d) $Sn \mid Sn^{2+}_{(0.05\,M)} \parallel Pb^{2+}_{(0.5\,M)} \mid Pb$

(118) $A^{2+} \mid A$, $B^{2+} \mid B$, $C^{2+} \mid D$ is increasing order of std. reduction potential then choose correct option for the given state ments. (T = true and F = false)

(i) rod of metal A dissolve in the solution of metal B^{2+}

(ii) solution of A^{2+} ion can not be filled in the container of the metal C.

(iii) reaction $D_{(s)} + B^{2+}_{(aq\ 1.0\,M)} \rightleftharpoons D^{2+}_{(aq\ 1.0\,M)} + B_{(s)}$ spontaneously in forward direction.

(iv) atoms of metal C can not displace B^{2+} ioin from its solution.

(a) TFFT (b) FTTF (c) FTFT (d) TFTF

(119) Select correct option in reference to e.m.f. series .

(a) from top to bottom tendency to accept e increases .

(b) from bottom to top strngth as oxidising agent decreases

(c) top to bottom temdency to get oxidised increases .

(d) if rod of the metal present at lower positon is the series is dipped in the solution of the metal ion present in the upper part of the solution then rod does not get dissolve

(120) What is the value of $E_{Mg \mid Mg^{2+}_{(0.5\,M)}}$ *at* 25^0C ? ($E^0_{Mg|Mg^{2+}} = 2.36$ V.)

(a) 2.3689 V. (b) – 2.3689 V. (c) 2.88 V. (d) –2.38 V.

(122) If potential of the cell formed by connecting half cell $Ag \mid Ag^{+}_{(0.4M)}$ and $Al \mid Al^{3+}_{(0.1\,M)}$ is 2.546V then what is the std. cell potential of the cell at 25^0C?

(a) 1.46 V. (b) 2.46 V. (c) 2.64 V. (d) 2.76 V.

(123) What is the unit of constant 0.059 in Nernst equation?

(a) colulomb (b) volt (c) faraday (d) no unit

(124) If n = 3 is taken for the cell $Al \mid Al^{3+}_{(0.02\,M)} \parallel Pb^{2+}_{(0.2\,M)} \mid Pb$ then what is the value of Q ?

(a) 0.05 M^{-1} (b) 0.2247 $M^{-1/2}$ (c) 0.01 M (d) 0.05 $M^{-1/2}$

(125) For cell $Mg \mid Mg^{2+}_{(0.005\,M)} \parallel Ag^{+}_{(0.04\,M)} \mid Ag$ which of the following option is correct for the value of Q related to n ?

(a) n = 1, Q = 3.125 $M^{1/2}$
(b) n = 2, Q = 1.7677 M
(c) n = 3, Q = 5.5243 $M^{3/2}$
(d) n = 4, Q = 0.156 M^2

(126) For the cell $Co \mid Co^{2+}_{(0.04\,M)} \mid Cl^{-}_{(0.1\,M)} \mid Cl_{2(g,1.0\,bar)} \mid Pt$ which of the following option is correct for the value of Q related to the value of n?

(a) n = 1	(1) $Q = 4.0\times 10^{-4}\ M^3$	(5) $Q = 4\ M^{-1}$
(b) n = 2	(2) $Q = 8\ M^{-\frac{3}{2}}$	(6) $Q = 1.6\times 10^{-7}\ M^6$
(c) n = 3	(3) $Q = 8.0\times 10^{-6}\ M^{\frac{9}{2}}$	(7) $Q = 0.02\ M^{\frac{3}{2}}$
(d) n = 4	(4) $Q = 2\ M^{-\frac{1}{2}}$	(8) $Q = 16\ M^{-2}$

(a) a – 4, b – 5, c – 2, d – 8
(b) a – 7, b – 5, c – 2, d – 6
(c) a – 7, b – 1, c – 3, d – 6
(d) a – 4, b – 8, c – 7, d – 1

(127) For the cell Pt | $Br_{2(g,1.0\ bar)}$ | $Br^-_{(0.5\ M)}$ || $Au^{3+}_{(0.4\ M)}$ | Au value of Q = $20M^{-4}$ then what is the appropriate value of n?

(a) n = 6 (b) n = 2 (c) n = 3 (d) n = 4

(128) If temperature of the cell Mg | $Mg^{2+}_{(0.005\ M)}$ || $Ag^+_{(0.04\ M)}$ | Ag increases then what changes observed in the cell potential of the cell?

(a) increases (b) decreases (c) do not change (d) cannot predict

(129) If temperature of the cell Ni | $Ni^{2+}_{(0.05\ M)}$ || $Cu^{2+}_{(0.08\ M)}$ | Cu increases then what changes observed in the cell potential of the cell?

(a) increases (b)decreases (c) do not change (d) cannot predict

(130) If temperature of the cell Fe | $Fe^{2+}_{(x\ M)}$ || $Cu^{2+}_{(0.08\ M)}$ | Cu decreases then theoritically cell potential of the cell increases then which value of x is possible?

(a) x = 0.5 (b) x = 0.02 (c) x = 0.05 (d) x = 0.04

(131) If temperature of the cell Zn | $Zn^{2+}_{(C_1)}$ || $Sn^{2+}_{(C_2)}$ | Sn ($C_1 < C_2$) decreases then theoritically cell potential what changes are observed in the cell potential of the cell?

(a) increases (b)decreases (c) do not change (d) cannot predict

(132) What is the equilibrium constant of the reaction taking place in the cell Zn | $Zn^{2+}_{(C_1)}$ || $Cu^{2+}_{(C_2)}$ | Cu at 25°C? ($E^0_{Zn^{2+}|Zn} = -0.76$ V., $E^0_{Cu^{2+}|Cu} = 0.34$ V.)

(a) 3.3791 (b) 1.9413×10^{37} (c) 4.406×10^{18} (d) 5.15×10^{-38}

(133) If for the reaction taking place in one electrochemical cell Kc = 1.3141×10^{107} M^{-1} and n = 2 then for that cell value of E^0_{Cell} is _____.

(a) 6.32 V. (b) 0.1186 V. (c) 0.32 V. (d) 3.16 V.

(134) If for the reaction taking place in an electrochemical cell Kc = 1.3141×10^{307} and n = 6. if standard reduction potential of the cathode is 1.36 V then what is the standard oxidation potential of the anode?

(a) 6.32 V. (b) 1.66 V. (c) 2.71 V. (d) 3.16 V.

(135) What is the pH of the solution of HCl if cell potentila of the cell

Pt | $H_{2(g,1.0\ ઘલ્ર)}$ | $HCl_{(X\ M)}$ || $Au^{3+}_{(0.001\ M)}$ | Au is 1.6655 V ? ($E^0_{Au^{3+}|Au}$ = 1.4 V.)

(a) 3.5 (b) 4.17 (c) 5.5 (d) 4.83

(136) Mention the value of n for the reaction taking place in the cell if its cell potential is 3.16V and equilibrium constant is 1.727×10^{214} M^{-2} at 25^0C temperature.

(a) 1 (b) 2 (c) 3 (d) 4

(137) If for the cell Mg | $Mg^{2+}_{(0.2\ M)}$ || $H^+_{(X\ M)}$| $H_{2(g,1.0\ bar)}$|Pt values of E_{Cell} and E^0_{Cell} are 2.3629 V. and 2.36 V. respectively at 25°C temperature then value of x is _____.

(a) 0.4 M (b) 0.5 M (c) 0.1 M (d) 0.25 M

(138) If standard potential of the reaction $2H_2O_{(l)} \rightleftharpoons O_{2(g,1\ bar)} + 4H^+_{(aq)} + 4e^-$ is -1.23V and $[H^+] = 10^{-7}$ at 25°C temperature then what is the value of potential for the reaction? OR What is the oxidation potential of the pure water?

(a) – 0.41 V. (b) – 2.62 V. (c) – 0.817 V. (d) 0.41 V.

(139) If for the reaction $2H_2O_{(l)} + 2e^- \rightleftharpoons H_{2(g,1\,bar)} + 2OH^-_{(aq,10^{-7}\,M)}$ E = – 0.417 V at 25^0C temperature what is the value of E^0 for the reaction? OR what is the standard reduction potential of the pure water at 25^0C if potential is – 0.417 V.

(a) – 0.83 V. (b) – 2.62 V. (c) – 0.817 V. (d) 0.41 V.

(140) If $Co \mid Co^{3+}$, $Co^{2+} \mid Co^{3+}$, $Fe \mid Fe^{3+}$, $Fe^{2+} \mid Fe^{3+}$ std. oxidation potential are – 0.4167 V., – 1.81 V., 0.0367 V., – 0.77 V. respectively then what is the std. potential of the cell $Fe \mid Fe^{2+} \parallel Co^{2+} \mid Co$?

(a) 0.72 V. (b) – 0.11 V. (c) 1.0 V. (d) 0.16 V.

(141) If cell potentisl of the cell $Pt \mid H_{2(g,1.0\,bar)} \mid HCl_{(X\,M)} \parallel Cu^{2+}_{(0.01\,M)} \mid Cu$ 0.635 V. at 25^0C then what is the pH of the HCl solution? ($E^0_{Cu^{2+}|Cu}$ = 0.34 V.)

(a) 2.0 (b) 5.0 (c) 6.0 (d) 4

(142) If cell potentisl of the cell $Mg \mid Mg^{2+}_{(0.01\,M)} \parallel HCl_{(X\,M)} \mid H_{2(g,1.0\,\text{વાર})} \mid Pt$ 2.09V. at 25^0C then what is the pH of the HCl solution? ($E^0_{Mg^{2+}|Mg} = -2.36\,V$.)

(a) 6.58 (b) 5.58 (c) 3.58 (d) 4.58

(143) What is the value of E_{cell} and equilibrium constant respectively for the reaction at 25^0C $Fe_{(s)} + 2Ag^+_{(aq,0.5\,M)} \rightleftharpoons Fe^{2+}_{(aq,0.1\,M)} + 2Ag_{(s)}$?

(a) 1.25 V., $1.04 \times 10^{21}\ M^{-1}$ (b) 1.23 V., $1.507 \times 10^{12}\ M^{-1}$

(c) 1.23 V., $1.264 \times 10^{6}\ M^{-1}$ (d) 1.25 V., $1.081 \times 10^{42}\ M^{-1}$

(144) Which reaction would takes place spontaneously in forward direction at 25^0C if standard oxidation potenitials of $Pt \mid I_{2(s)} \mid I^-$, $Cu \mid Cu^{2+}$, $Cr \mid Cr^{3+}$, $Zn \mid Zn^{2+}$, $Sn \mid Sn^{2+}$, $Pb \mid Pb^{2+}$, $Ag \mid Ag^+$, $Fe \mid Fe^{2+}$ are 0.54 V., – 0.34 V., 0.74 V., 0.76 V., 0.14 V., 0.13 V., – 0.80 V., 0.77 V. respectively.

(a) $I_{2(s)} + Cu_{(s)} \rightleftharpoons 2I^-_{(aq,0.1\,M)} + Cu^{2+}_{(aq,0.05\,M)}$

(b) $2Cr^{3+}_{(aq,0.001\,M)} + 3Zn_{(s)} \rightleftharpoons 2Cr_{(s)} + Zn^{2+}_{(aq,0.1\,M)}$

(c) $Pb^{2+}_{(aq,0.02\,M)} + Sn_{(s)} \rightleftharpoons Pb_{(s)} + Sn^{2+}_{(aq,0.2\,M)}$

(d) $3Ag^+_{(aq,0.1\,M)} + Fe_{(s)} \rightleftharpoons 3Ag_{(s)} + Fe^{3+}_{(aq,0.01\,M)}$

(145) How many gram of Ag will be obtained if 5.0 F quantity of electricity is passed through aqueous solution of $AgNO_3$?

(a) 270 g (b) 540 g (c) 180 g (d) 135 g

(146) If 15 Faraday quantity of electricity is passed through $Al^{3+}_{(l)}$ solution then how many gram of Al metal will be obtained ? (cell efficiency is 80 % .) (At.wt Al = 27 gm mol^{-1})

(a) 135 gm (b) 121.5 gm (c) 108 gm (d) 94.5 gm

(147) If 10 Faraday quantity of electricity is passed through molten NaCl during electrolysis 84 L of Cl_2 gas is obtained at STP then what is the efficiency of the cell?

(a) 80 % (b) 75 % (c) 50 % (d) 90 %

(148) During electrolysis oif acqueous solution of NaCl with inert electrodes then at cathode instead of $Na^+_{(aq)}$ reduction of H_2O takes place because .....

(a) Compare to H_2O std. reduction potential of $Na^+_{(aq)}$ is more

(b) Standard oxidation potential of H_2O is very high

(c) of inert electrodes

(d) reduction potential of $Na^+_{(aq)}$ is very less

(149) Select correct option for the given statements (where T = true anf F= false)

i) if electrolysis of aqueous solution of $CuSO_4$ is done with inert electrodes then blue colour of solution become faint.

ii) if electrolysis of aqueous solution of $CuSO_4$ is done with inert electrodes then pH of the solution increases.

iii) if electrolysis of aqueous solution of $CuSO_4$ is done with active electrodes of Cu then weight of anode decreases.

iv) if electrolysis of aqueous solution of $CuSO_4$ is done with active electrodes of Cu then precious metals release from cathode.

(a) FTFT (b) TFFF (c) TFTT (d) TFTF

(150) On passing necessary quantiy of elecricity through $Al^{3+}_{(l)}$ solution 4.5 g Al deposited then on passing same quantity of electricity through the solution of $H^{+}_{(aq)}$ having sufficient concentration then what volume of hydrogen gas will be obtained at STP.? (at.wt Al = 27 g mol^{-1})

(a) 44.4 L (b) 222.4 L (c) 11.2 L (d) 5.6 L

(151) Select correct option for the given statements (where T = true anf F= false)

i) if electrolysis of dilute aqueous solution of NaCl is done with inert electrodes then pH of the solution increases.

ii) if electrolysis of concentrated aqueous solution of NaCl is done with inert electrodes then at anode chloricne gas is obtained.

iii) if electrolysis of dilute aqueous solution of NaCl is done with inert electrodes at cathode hydrogen gas is obtain.

iv) if electrolysis of concentrated aqueous solution of NaCl is done with inert electrodes then on adding phenolphthalien to the solution becomes pink.

(a) TFTT (b) FTTT (c) FFTT (d) TFTF

(152) Select correct option for the given statements (where T = true anf F= false)

i) if electrolysis of dilute aqueous solution of NaCl is done with inert electrodes then pH of the solution increases.

ii) if electrolysis of dilute aqueous solution of NaCl is done with inert electrodes then on adding methyl orange to the solution it becomes orange coloured.

iii) if electrolysis of concentrated aqueous solution of NaCl is done with inert electrodes pOH of the solution increases.

iv) if electrolysis of concentrated aqueous solution of NaCl is done with inert electrodes then the solution obtained turns red litmus to blue.

(a) TFTF (b) FTTT (c) FTFT (d) FFTT

(153) If at 50^0C temperature value of E^0_{ox} is + 0.83 V for the half cell Pt | $H_{2(g,1.0bar)}$ | $OH^-_{(aq)}$ then what is the value of ionic product of water at 50^0C ?

(a) 1.12×10^{-13} (b) 1.102×10^{-12} (c) 1.105×10^{-12} (d) 1.0×10^{-14}

(155) What quantity of electricity is required for complerte reduction of all Ag^+ from 1.0 M $AgNO_3$ is 250 ml aqueous solution ?

(a) 2412.5 C. (b) 24125 C. (c) 4825 C. (d) 25250 C.

(156) Using 2 g Hg cathode Cd-Hg amalgam is obtained by electrolysis of $CdCl_2$ then how much ampere electric current should be passed for 100 seconds to obtain Cd-Hg having 20% Cd ? (At.wt Cd = 112.5 g mol^{-1})

(a) 34.32 A (b) 17.16 A (c) 4.29 A (d) 8.58 A

(157) On passing 5 amp current for 2.15 hours through unknown solutiion of the salt of the Pd metal theoritically 10.64 g of Pd metal get deposited then what is the oxidation state of the Pd in that salt? (At.wt Pd = 106.4 g mol^{-1})

(a) +2 (b) + 3 (c) + 4 (d) + 1

(158) Preparation of MnO_2 from aqueous solution of MnSO4 is done as per the reaction $Mn^{2+}_{(aq)} + H_2O_{(l)} \rightarrow MnO_{2(s)} + 2H^+_{(aq)} + H_{2(g)}$ done then on passing 25A current for 30 hours if 1.0 kg of MnO_2 is obtained then what is the efficiency of the current? (molecular mass of MnO_2 = 87 g / mol)

(a) 82.16 % (b) 20.54 % (c) 25 % (d) 49.2 %

(159) If electrochemical equivalent of the metal is 4.0×10^{-4} g /coulomb then how much metal will be deposited at cathode on passing 15 amp current for 2 hours where current efficiency is 75 %.

(a) 32.4 g (b) 43.2 g (c) 57.6 g (d) 16.2 g

(160) Theoritically how much quanitiy of electricity is required to obtained 112ml of hydrogen gas at STP by electrolysisi of acididc water?

(a) 965 C. (b) 1.0 F (c) 0.1 F (d) 96.5 C.

(161) For how much time 0.5 A current should be passed throuch aqueous solution of $CuSO_4$ to deposite 2 g of Cu by electrolysis? (At.wt Cu = 63.5 g mol^{-1})

(a) 12157.48 S (b) 102 S (c) 510 S (d) 642 S

(162) When aqueous solution of $AgNO_3$ is electrolysed with platinum electrodes its concentration decreases from 4M to 3M. if same solution is electrolysed with Ag electrode then which of the following observation will be observed?

(a) result will be same (b) concentration of solution increases

(c) decrease in concentration will be less

(d) no change in the concentration of the solution

(163) If 0.5 L 2.0 M aqueous solution of $Ni(NO_3)_2$ is electrolysed between graphite anode and nickel cathode by passing 9.65 A current for 3 hours then what will be the concentration of $Ni(NO_3)_2$ solution?

(a) 0.46 M (b) 1.46 M (c) 0.92 M (d) 0.36 M

(164) If 4 L 0.8M aqueous solution of $AgNO_3$ is electrolysed between inert electrodes by passing 5A current for 10 hours then what will be the decrease in the concentration of $Ag^+_{(aq)}$ in the solution? (efficiency of current 80 %)

(a) 0.466 M (b) 1.865 M (c) 1.492 M (d) 0.373 M

(165) To produce 100 ml O_2 gas per minute at 25^0C temperature and 1 bar pressure by elecrolysis of water how much electric current should be passed through the water? efficiency of current is 90 % .

(a) 23.16 A (b) 14.35 A (c) 28.69 A (d) 31.88 A

(166) For how much time 10 A current should be passed through the molten NaCl to obtain 36.47 g of sodium metal at cathode? efficiency of current is 85%. (At. wt Na = 23 g mol^{-1})

(a) 4.25 hrs (b) 3.6 hrs (c) 5 hrs (d) 4 hrs

(167) When 5L aqueous solution of $CuSO_4$ is electrolysed between inert electrodes by passing 25A current its concentration decreases from 2.0 M to 1.2 M then theoritically for how much time current would have been passed?

(a) 1.716 hrs (b) 8.58 hrs (c) 17.16 hrs (d) 4.29 hrs

(168) What is the correct order of specific conductance of given metals?

(a) Cu > Ag > Au > Na > Fe (b) Ag > Cu > Au > Fe > Na

(c) Ag > Cu > Au > Na > Fe (d) Ag > Au > Cu > Fe > Na

(169) When 10 L aqueous solution of $CuSO_4$ is electrolysed between inert electrodes by passing electric current for 20 hours its concentration decreases from 0.7 M to 0.2 M then how much electric current would have been passed?

(a) 13.4 A (b) 1.34 A (c) 6.7 A (d) 26.8 A

(170) On the basis of given data match the compounds of group 1 with values of molar conductivity at infinite dilution $\lambda^0_{mMg^{2+}} = 106\ S \cdot cm^2 \cdot mol^{-1}$, $\lambda^0_{mCa^{2+}} = 119\ S \cdot cm^2 \cdot mol^{-1}$, $\lambda^0_{mCl^-} = 76.3\ S \cdot cm^2 \cdot mol^{-1}$, $\lambda^0_{mSO_4^{2-}} = 160\ S \cdot cm^2 \cdot mol^{-1}$

group 1 compounds	group 2 $\Lambda^0_m\ S \cdot cm^2 \cdot mol^{-1}$
(i) $MgSO_4$	(A) 195.3 (E) 182.3
(ii) $CaCl_2$	(B) 279 (F) 266
(iii) $MgCl_2$	(C) 186 (G) 219.5
(iv) $CaSO_4$	(D) 271.6 (H) 258.6

(a) i – C, ii – D, iii – H, iv – B (b) i – F, ii - A , iii – E, iv – G

(c) i – F, ii – D, iii – H, iv – B (d) i – C, ii – G, iii – A, iv – E

(171) On the basis of given data match the compounds of group 1 with values of molar conductivity at infinite dilution $\frac{1}{3}\lambda^0_{mAl^{3+}} = 63\ S \cdot cm^2 \cdot mol^{-1}$, $\frac{1}{2}\lambda^0_{mMg^{2+}} = 53\ S \cdot cm^2 \cdot mol^{-1}$, $\lambda^0_{mOH^-} = 199.1\ S \cdot cm^2 \cdot mol^{-1}$, $\frac{1}{2}\lambda^0_{mSO_4^{2-}} = 80\ S \cdot cm^2 \cdot mol^{-1}$

group-1 compounds	group-2 $\Lambda^0_m\ S \cdot cm^2 \cdot mol^{-1}$
(i) $MgSO_4$	(A) 504.2 (E) 786.3
(ii) $Al_2(SO_4)_3$	(B) 133 (F) 451.2
(iii) $Mg(OH)_2$	(C) 266 (G) 858
(iv) $Al(HO)_3$	(D) 660.3 (H) 366

(a) i – C, ii – D, iii – H, iv – B (b) i – F, ii - A , iii – E, iv – G

(c) i – F, ii – D, iii – H, iv – B (d) i – C, ii – G, iii – A, iv – E

(172) If at constant temperature specific conductance of aqueous solution of KCl is x mho·$(cm.)^{-1}$ and on measuring its resistance it is found to be y Ω, with the same instrument if resistance of aqueous solution of NaCl is found to be z Ω then what will be its specific conductance?

(a) $\frac{yz}{x}$ mho·$(cm.)^{-1}$ (b) $\frac{xy}{z}$ mho·$(cm.)^{-1}$ (c) $\frac{xz}{y}$ mho·$(cm.)^{-1}$ (d) $\frac{x}{yz}$ mho·$(cm.)^{-1}$

(173) Using 2 g Hg cathode Cd-Hg amalgam is obtained by electrolysis of $CdCl_2$ then how much ampere electric current should be passed for 1000 seconds to obtain Cd-Hg having 20% Cd ? (At.wt Cd = 112.5 g mol^{-1})

(a) 34.32 A (b) 17.16 A (c) 4.29 A (d)13.72 A

(174) $\Lambda_m = \Lambda^0_m - A \cdot C^{\frac{1}{2}}$ is related to which compound?

(a) NaCl (b) NH_4OH (c) HCOOH (d) HCN

(175) $\Lambda_m = \Lambda^0_m - A \cdot C^{\frac{1}{2}}$ is not related to which compound?

(a) KCl (b) HCl (c) CH_3COONa (d) H_3PO_4

(176) For a strong electrolyte when C = 0.04 M then $\Lambda_m = 250\ S \cdot cm^2 \cdot mol^{-1}$ and when C = 0.09 M then $\Lambda_m = 200\ S \cdot cm^2 mol^{-1} \cdot$ then for that electrolyte what is the value of Λ_m and Λ^0_m are respectively ?

(a) 550, 265 $S \cdot cm^2 \cdot mol^{-1}$ (b) 450, 365 $S \cdot cm^2 \cdot mol^{-1}$

(c) 500, 350 $S \cdot cm^2 \cdot mol^{-1}$ (d) 340, 450 $S \cdot cm^2 \cdot mol^{-1}$

(177) For a strong electrolyte when C = 0.01 M then $\Lambda_m = 255\ S \cdot cm^2 \cdot mol^{-1}$ and when C = 0.04 M then $\Lambda_m = 200\ S \cdot cm^2 mol^{-1}$ · then when C = 0.09 M what is the value of for that electrolyte what is the value of Λ_m^0 ?

(a) $400\ S \cdot cm^2 \cdot mol^{-1}$ (b) $145\ S \cdot cm^2 \cdot mol^{-1}$

(c) $150\ S \cdot cm^2 \cdot mol^{-1}$ (d) $250\ S \cdot cm^2 \cdot mol^{-1}$

(178) What is the correct increasing order of molar conductivity at infinite dilution for LiCl, NaCl and KCl ?

(a) KCl < NaCl < LiCl (b) LiCl < NaCl < KCl

(c) LiCl < KCl < NaCl (d) NaCl < KCl < LiCl

(179) Resistance and specific conductance of the cell having N/50 KCl solution is 400 Ω and $0.002765\ S \cdot cm^{-1}$ respectively then what is the cell constant of the cell?

(a) $6.91\ cm^{-1}$ (b) $1.106\ cm^{-1}$ (c) $14.46\ cm^{-1}$ (d) $2.212\ cm^{-1}$

(180) If resistance of the decinormal solution of one salt is 32 Ω when it is placed between two Pt electrodes kept at 1.8 cm distance and having 5.4 cm^2 surface area then what is the equivalent conductance of the solution?

(a) $104.17\ S \cdot m^2 \cdot g\ equivalent^{-1}$ (b) $10.41\ S \cdot m^2 \cdot g\ equivalent^{-1}$

(c) $1.041\ S \cdot m^2 \cdot g\ equivalent^{-1}$ (d) $1041.0\ S \cdot m^2 . g\ equivalent^{-1}$

(181) At 298K temperature resistance of the 0.05M KOH solution is 3.16 Ω. What will be the equivalent conductance of the same if cell constant is $0.367\ cm^{-1}$?

(a) $0.2322\ S \cdot cm^2 \cdot g\ equivalent^{-1}$ (b) $2.322\ S \cdot cm^2 \cdot g\ equivalent^{-1}$

(c) $23.22\ S \cdot cm^2 \cdot g\ equivalent^{-1}$ (d) $232.28\ S \cdot cm^2 \cdot g\ equivalent^{-1}$

(182) Resistance of the 0.05M solution placed between two Pt electrodes havning surface area 10 cm^2 at 1.5cm distance is 50 Ω, what is its molar conductance?

(a) $66.6\ S \cdot cm^2 \cdot mol^{-1}$ (b) $15\ S \cdot cm^2 \cdot mol^{-1}$

(c) $60\ S \cdot cm^2 \cdot mol^{-1}$ (d) $6.66\ S \cdot cm^2 \cdot mol^{-1}$

(183) If $\lambda^0_{mAg^+} = 5.0 \times 10^{-3}\ S \cdot cm^2 \cdot mol^{-1}$ then at infinte dilution ioinic mobility of Ag^+ ion is _____.

(a) $5.2 \times 10^{-8} \frac{cm \cdot sec^{-1}}{Volt \cdot cm^{-1}}$ (b) $2.4 \times 10^{-8} \frac{cm \cdot sec^{-1}}{Volt \cdot cm^{-1}}$

(c) $1.52 \times 10^{-8} \frac{cm \cdot sec^{-1}}{Volt \cdot cm^{-1}}$ (d) $8.25 \times 10^{-8} \frac{cm \cdot sec^{-1}}{Volt \cdot cm^{-1}}$

(184) $\lambda^0_{ClCH_2COONa} = 2.24\ S \cdot m^2 \cdot mol^{-1}$, $\lambda^0_{NaCl} = 38.2\ S \cdot m^2 \cdot mol^{-1}$ and $\lambda^0_{HCl} = 203\ S \cdot m^2 \cdot mol^{-1}$, then what is the value of $\lambda^0_{ClCH_2COOH}$?

(a) $288.5\ S \cdot cm^2 \cdot gm\ equi^{-1}$ (b) $289.5\ S \cdot cm^2 \cdot gm\ equi^{-1}$

(c) $388.8\ S \cdot cm^2 \cdot gm\ equi^{-1}$ (d) $59.5\ S \cdot cm^2 \cdot gm\ equi^{-1}$

(185) On applying potential difference of 20V for 2 minute to the electric wire having 10 Ω how much quantity of electricity will passed through it?

(a) 120 C. (b) 240 C. (c) 20 C. (d) 4 C.

(186) Specific conductance of two solution A and B are found to be K_1 and K_2 respectiveluy on measuring by the same conductivity cell. if same volume of both solution are taken in a conductivity cell having cell constant x then what will be the resistance of the mixture? (consider that there is no difference in the degree of dissociatioin of solutions on mixing)

(a) $R = \frac{K_1 + K_2}{2x}$ (b) $R = \frac{2(K_1 + K_2)}{x}$ (c) $2x(K_1 + K_2)$ (d) $R = \frac{2x}{K_1 + K_2}$

(187) What is the molar conductiviy at infinite dilution of the solution having concentration 0.01M and molar conductivity is $19.6\ S \cdot cm^2 \cdot mol^{-1}$? at 298K temp dissociation constant of weak electrolyte is 2.5×10^{-5}.

(a) $250\ S \cdot cm^2 \cdot mol^{-1}$ (b) $196\ S \cdot cm^2 \cdot mol^{-1}$ (c) $392\ S \cdot cm^2 \cdot mol^{-1}$ (d) $384\ S \cdot cm^2 \cdot mol^{-1}$

(188) At 300 K temperature specific conductance and limiting conductance of the 0.7 M aqueous solution of acetic acid are 0.01365 $S \cdot cm^{-1}$ and 390 $S \cdot cm^2 \cdot mol^{-1}$ respectively then what is the dissociation constant of the acetic acid?

(a) 1.75×10^{-6} M (b) 1.75×10^{-5} M (c) 3.5×10^{-4} M (d) 3.5×10^{-6} M

(189) If concentration of the $Cu^{2+}_{(aq)}$ is made double then what change is observed in the E^0_{Cell}

$Cu_{(s)} + 2Ag^{2+}_{(aq)} \rightleftharpoons Cu^{2+}_{(aq)} + 2Ag_{(s)}$ E^0_{Cell}= 0.48 Volt for the reaction

(a) doubled (b) halve (c) no change (d) little less thandouble

(190) Which one of the following has highes t conductivity at room temperature?

(a) 0.1 M HCl (b) 0.1M NaCl (c) graphite (d) glass

(191) What changes are observed in the specific conductance and molar conductacne on diluting the solution of electrolyte respectively? (a) both increase (b) both decrease (c) decrease and increase (d) increase and decrease

(192) What is the value of ΔH for the reaction $4H_{2(g)} + 2O_{2(g)} \rightleftharpoons 4H_2O_{(l)}$ ΔH taking place in H_2 fuelcell?

(a) 571.7 KJ (b) 1503.4 KJ (c) 157. 5 KJ (d) 1143.4 KJ

(193) Which catalyst are used in fuel cell at anode and cathode respectively?

(a) Ag_2O and Pt (b) Pt and mixture of Pt and powder of Ag_2O

(c) mix of Pt adn Ag_2O powder and Pt

(d) graphite and Pt

(194) 2.5 $S \cdot m^{-1}$ = ... $S \cdot cm^{-1}$

(a) 250 (b) 25 (c) 0.025 (d) 0.25

(195) What changes takes place in the E^0_{Cell} of electrochemical cell if cell reactions are taking place at electrodes are multiplied by n?

(a)no changes (b) n times (c) become nth part (d) 2n

(196) Group -1 cell and in group 2 potentials are given then match the correct options

group -1	group -2		
(i) laclanche cell	(A) 1.23 V	(E) 1.32 V.	(a) i- C, ii- D, iii - F, iv - A
(ii) lead storage cell	(B) 2.35 V.	(F) 1.35 V.	(b) i- H, ii- D, iii - B, iv - G
(iii) mercury cell	(C) 1.53 V.	(G) 1.75 V.	(c) i- E, ii- D, iii - F, iv - A
(iv) fuel cell	(D) 2.0 V.	(H) 1.5 V.	(d) i- H, ii- D, iii- F, iv- A

(197) According to authentic symbol system $\frac{l}{AR}$ = ...

(a) ρ (b) K·G (c) G (d) $\frac{1}{\rho}$

(198) Which of the following is semiconductor ?

(a) teflon (b) CuO (c) glass (d) Cu_2O

(199) Which subsance is present as electrolyte in mercury cell?

(a) paste of NH_4Cl and $ZnCl_2$ (b) paste of KOH and HgO

(c) paste of KOH and ZnO (d) paste of HgO and graphite

(200) Select correct option for the given statements (where T = true and F= false)

(i) by conductance of electricity temperature of metal increases and no changes are observed in the solution of electrolyte

(ii) by conductance of electricity metal experience chemical reaction and changes are observed in the solution of electrolyte.

(iii) by conductance of electricity no changes are observed in metal and solution of electrolyte

(iv) by conductance of electricity temperature of metal increases and changes are observed in the solution of electrolyte

(a) FFFT (b) TFTF (c) TTFF (d) FFTF

(201) Dissociation constant of one weak electrolyte is 1.77×10^{-5} . If its Λ_m^0 390.5 $S \cdot cm^2 \cdot mol^{-1}$ then what is the molar conductance of its 0.01M aqueous solution?

(a) $4.53\ S \cdot cm^2 \cdot mol^{-1}$ (b) $16.43\ S \cdot cm^2 \cdot mol^{-1}$

(c) $45.3\ S \cdot cm^2 \cdot mol^{-1}$ (d) $164.3\ S \cdot cm^2 \cdot mol^{-1}$

(202) Which metals are used as sacrifical anode to stop the corrosion of the iron in steamer?

(a) Sn and Mg (b) Zn and Co (c) Ni and Cu (d) Zn and Mg

(203) In group – 1 , 2 and 3 electrolyte and products at anode and cathode are mentioned respectively match them appropriately.

group -1	group - 2	group – 3
(1) NaCl (molten)	(A) $O_{2(g)}$	(P) Al metal
(2) NaCl (conc. aqueous)	(B) $O_{2(g)}$, $CO_{2(g)}$	(Q) $Cl_{2(g)}$
(3) NaCl (dilute aqeous)	(C) $Cl_{2(g)}$	(R) Na metal
(4) Al_2O_3 ($+Na_3AlF_6$)	(D) $F_{2(g)}$	(S) $H_{2(g)}$ and in solution NaOH
(5) KHF_2 anhydrous HF	(E) $H_{2(g)}$	(T) $H_{2(g)}$

(a) (1) – (C) – (R), (2) – (C) – (T), (3) – (A) – (T), (4) – (B) – (P), (5) – (D) – (T)

(b) (1) – (C) – (R), (2) – (C) – (S), (3) – (A) – (T), (4) – (B) – (P), (5) – (D) – (T)

(c) (1) – (C) – (R), (2) – (C) – (S), (3) – (A) – (Q), (4) – (B) – (P), (5) – (D) – (T)

(d) (1) – (C) – (R), (2) – (C) – (S), (3) – (C) – (T), (4) – (B) – (P), (5) – (D) – (T)

(204) Potential of a Std. half cell is measured by potentiometer connecting it with S.H.E. here S.H.E. act as anode then potential of half cell would be equals to _____.

(a) E_{ox}^0 of the other electrode (b) E_{red}^0 of the other electrode

(c) E_{ox} of the other electrode (d) E_{red} of the other electrode

(205) What will be the pOH of the HCl solution at 25^0C if cell potential of the cell is 1.6655 V $Pt \mid H_{2(g,1.0\ bar)} \mid HCl_{(X\ M)} \parallel Au^{3+}_{(0.001\ M)} \mid Au$?

(a) 7.5 (b) 9.17 (c) 5.5 (d) 8.5

(206) What will be the decrease in the concentration of $Ni^{2+}_{(aq)}$ when the reaction $Co_{(s)} + Ni^{2+}_{(aq,0.1\ M)} \rightleftharpoons Co^{2+}_{(aq,0.01\ M)} + Ni_{(s)}$ reaches the equilibrium?

$E^0_{Co^{2+}|Co} = -0.28$ V. and $E^0_{Ni^{2+}|Ni} = -0.23$ V.

(a) 9.78 % (b) 8.74 % (c) 95.4 % (d) 92.5 %

ANSWER KEY

1	c	50	c	99	b	148	d	197	d
2	b	51	b	100	d	149	d	198	b
3	a	52	d	101	b	150	d	199	c
4	a	53	d	102	c	151	b	200	a
5	a	54	a	103	a	152	c	201	b
6	b	55	b	104	d	153	a	202	d
7	d	56	b	105	c	154	a	203	b
8	d	57	d	106	d	155	b	204	b
9	c	58	c	107	a	156	d	205	d
10	c	59	a	108	c	157	c	206	a
11	a	60	c	109	d	158	a		
12	a	61	a	110	b	159	a		
13	b	62	b	111	b	160	a		
14	b	63	c	112	a	161	a		
15	d	64	c	113	d	162	d		
16	a	65	b	114	d	163	c		
17	c	66	c	115	a	164	d		
18	d	67	d	116	b	165	c		
19	d	68	d	117	a	166	c		
20	c	69	b	118	a	167	b		
21	a	70	a	119	c	168	c		
22	c	71	d	120	a	169	a		
23	c	72	a	121	d	170	c		
24	a	73	c	122	b	171	d		
25	c	74	d	123	b	172	b		
26	c	75	b	124	b	173	d		
27	d	76	c	125	c	174	a		
28	b	77	d	126	c	175	d		
29	c	78	a	127	c	176	c		
30	a	79	b	128	b	177	b		
31	c	80	c	129	a	178	b		
32	c	81	c	130	a	179	b		
33	d	82	a	131	b	180	a		
34	a	83	d	132	b	181	d		
35	c	84	a	133	d	182	c		
36	a	85	b	134	b	183	a		
37	d	86	d	135	c	184	c		
38	c	87	b	136	a	185	b		
39	a	88	c	137	b	186	d		
40	b	89	b	138	c	187	c		
41	b	90	c	139	a	188	b		
42	b	91	c	140	d	189	c		
43	c	92	a	141	c	190	a		
44	c	93	a	142	b	191	c		
45	a	94	c	143	d	192	d		
46	b	95	d	144	a	193	b		
47	c	96	c	145	b	194	c		
48	b	97	a	146	c	195	a		
49	a	98	c	147	b	196	d		