ELECTROCHEMISTRY-II PUC

1. When 9.65 coulombs of electricity is passed through a solution of silver nitrate (At. Mass of Ag = 108), the amount of silver deposited is
   a) 10.8 mg b) 6.4 mg c) 16.2 mg d) 21.2 mg

2. Total charge on one mole of a monovalent ion is equal to
   a) 6.28×10^{18} coulomb b) 1.6×10^{-19} coulomb
   c) 9.35×10^{4} coulomb d) None of above

3. Which one of the following reactions occurs at the anode when $CuSO_4$ solution is electrolysed using platinum electrodes?
   a) $Cu \rightarrow Cu^2 + 2e^-$
   b) $2SO_4^{2-} + 2H_2O \rightarrow 2H_2SO_4 + O_2 + 4^{e-}$
   c) $2\ H_2O \rightarrow O_2 + 4H^+ + 4e^-$
   d) $SO_4^{2-} \rightarrow SO_2\ + O_2 + 2e^-$

4. Three Faradays of electricity are passed through molten Al_2O_3, aqueous solution of $CuSO_4$ and molten NaCl taken in different electrolytic cells. The amount of Al, Cu and Na deposited at the cathodes will be in the molar ratio of
   a) 1 : 2: 3 b) 3 : 2: 1 c) 2: 3: 6 d) 3 : 4: 6

5. Electrochemical equivalent of an element is
   a) $\frac{\text{Atomic weight} \times \text{Valency}}{96500}$
   b) $\frac{\text{Atomic weight} \times 96500}{\text{Valency}}$
   c) $\frac{\text{Atomic weight}}{\text{Valency} \times 96500}$
   d) $\frac{\text{Valency} \times 96500}{\text{Atomic weight}}$

6. A current of 2.0 A passed for 5 hours through a molten metal salt deposits 22.2 g of metal (At wt. = 177). The oxidation state of the metal in the metal salt is
   a) + 1 b) + 2 c) + 3 d) + 4

7. A cell constructed by coupling a standard copper electrode and a standard magnesium electrode has an e.m.f. of 2.7 volts. If the standard reduction potential of copper electrode is +0.34 volt, that of the magnesium electrode is
   a) +3.04 volts b) -3.04 volts c) +2.36 volts d) -2.36 volts

8. The standard emf of a galvanic cell involving 3 moles of electrons in its redox reaction is 0.59 V. The equilibrium constant for the reaction of the cell is …….
   a) 10^{20} b) 10^{25} c) 10^{30} d) 10^{15}

9. E_1, E_2 and E_3 are the emfs of the following three galvanic cells respectively:
   (i) Zn (s) $|Zn^{2+}$ (0.2 M)|| Cu^{2+} (2 M) | Cu (s)
   (ii) Zn (s) $|Zn^{2+}$ (2 M)|| Cu^{2+} (2 M) | Cu (s)
   (iii) Zn (s) $|Zn^{2+}$ (2 M)|| Cu^{2+} (0.2 M) | Cu (s)
   Which one of the following is true?
   a) $E_1 > E_2 > E_3$ b) $E_2 > E_1 > E_3$ c) $E_3 > E_2 > E_1$ d) $E_3 > E_1 > E_2$

10. The molar conductivities $\wedge^{o}_{NaOAc}$ and $\wedge^{o}_{HCl}$ at infinite dilution in water at 25° C are 91.0 and 426. 2 S cm^2/mol respectively. To calculate $\wedge^{o}_{NaAc}$ the additional value required is

a) $\wedge^{o}_{NaOH}$ b) $\wedge^{o}_{NaCl}$ c) $\wedge^{o}_{H_2O}$ d) $\wedge^{o}_{KCl}$

11. Given the data at 25° C,
$Ag + 1^- \rightarrow AgI + e^-$; $E^o = 0.152$ V
$Ag \rightarrow Ag^+ + e^-$; $E^o = -0.800$ V
What is the value of log K_{sp} for AgI? (2.303 RT/F = 0.059 V)
a) – 37.83 b) – 16.13 c) – 8.12 d) + 8.612

12. The efficiency of a fuel cell is given by
a) $\frac{\Delta S}{\Delta G}$ b) $\frac{\Delta H}{\Delta G}$ c) $\frac{\Delta G}{\Delta S}$ d) $\frac{\Delta G}{\Delta H}$

13. The reaction occurring at the anode during the recharging of lead storage battery is
a) $Pb + SO_4^{2-} \rightarrow PbSO_4 + 2\ e^-$
b) $Pb + PbO_2 + 2\ H_2SO_4 \rightarrow 2\ PbSO_4 + 2\ H_2O$
c) $PbSO_4 + 2\ e^- \rightarrow Pb + SO_4^{2-}$
d) $PbO_2 + 2\ H_2SO_4 \rightarrow PbSO_4 + 2\ H_2O + SO_4^{-2}$

14. Solubility of a sparingly soluble salt S, specific conductance, K and the equivalent conductance Λ_0 are related as

a) $S = \frac{1000\ \Lambda_0}{K}$ b) $S = K\ \Lambda_0$ c) $S = \frac{K}{1000\ \Lambda_0}$ d) $S = \frac{1000\ K}{\Lambda_0}$

15. In $H_2 - O_2$ fuel cell the reaction occurring at cathode is

a) $2H_2 + O_2 \rightarrow 2H_2O\ (\ell)$ b) $H^+ + OH^- \rightarrow H_2O$

c) $O_2 + 2H_2O + 4e^- \rightarrow 4OH^-$ d) $H^+ + e^- \rightarrow \frac{1}{2} H_2$

16. What is the single electrode potential of zinc electrode in 0.01 M $ZnSO_4$ solution at 25°C (E^o = -0.76 V)

a) – 0.82 V b) – 1.82 V c) – 2.82 V d) – 3.82 V

17. If Zn^{2+}/Zn electrode is diluted 100 times, then the change in emf is

a) increase of 59 mV b) decrease of 59 mV

c) increase of 29.5 mV d) decrease of 29.5 mV

18. The charge required for the reduction of one mole of $Cr_2O_7^{2-}$ ions to Cr^{3+} is
a) 96500 C b) 2 × 96500 C c) 3 × 96500 C d) 6 × 96500 C

19. A current of 9.65 A is drawn from a Daniell cell for exactly 1 hour. The loss in mass of anode and gain in the mass of eathode will be (Given molar masses: Cu = 63.5, Zn = 65.4 g mol^{-1})
a) 11.77 g, 11.43 g
b) 11.43 g, 11.77 g
c) 23.54 g, 22.86 g
d) 22.86 g, 23.54 g

20. A factory produces 40 kg of calcium in two hours by electrolysis. How much aluminium can be produced by the same current in two hours?
a) 22 kg
b) 18 kg
c) 9 kg
d) 27 kg

21. The resistance of 0.1 N solution of a salt is found to be 2.5×10^3 ohms. The equivalent conductance of the solution is (cell constant = 1.15 cm^{-1})
a) 4.6
b) 5.6
c) 6.6
d) 7.6

22. 0.1 M solution of an electrolyte $A^+ B^-$ placed in a conductivity cell with electrodes 4 cm apart and each with area of cross – section equal to 2 sq cm was found to have resistance of 200 Ω. The molar conductivity of the solution will be
a) 25 Ω^{-1} cm^2
b) 100 Ω^{-1} cm^2
c) 0.25 Ω^{-1} cm^2
d) 4000 Ω^{-1} cm^2

23.

Electrolyte	KCl	KNO_3	HCl	NaOAc	NaCl
$\wedge_\infty$ (S cm^2 mol^{-1})	149.9	145.0	426.2	91.0	126.5

Calculate $\wedge^\infty_{HOAC}$ using appropriate molar conductances of the electrolytes listed above at infinite dilution in H_2O at 25°C.
a) 517.2
b) 552.7
c) 390.7
d) 217.5

24. The conductivity of 0.01 mol/dm^3 aqueous acetic acid at 300 K is 19.5×10^{-5} ohm^{-1} cm^{-1} and the limiting molar conductivity of acetic acid at the same temperature is 390 ohm^{-1} cm^2 mol^{-1}. The degree of dissociation of acetic acid is
a) 0.5
b) 0.05
c) 5×10^{-3}
d) 5×10^{-7}

25. Given that the limiting molar conductances of $BA(oh)_2$, $BaCl_2$ and NH_4Cl and 523.28, 280.0 and 129.8 S cm^2 mol^{-1} respectively, the limiting molar conductance of NH_4OH (in S cm^2 mol^{-1}) will be
a) 251.44
b) 373.80
c) 543.68
d) 673.48

26. The e. m. f. of the cell
Pt, Cl_2 (g), P_1 atm 1 Cl^- (aq) (1M) 1 Cl_2 (g), Pt, P_2 atm will be positive if
a) $P_1 = P_2$
b) $P_1 < P_2$
c) $P_1 > P_2$
d) Given cell cannot have positive e. m. f

27. The logarithm of the equilibrium constant of the cell reaction corresponding to the cell X (s) | X^{2+}(aq) || Y^+ (aq) | Y (s) with standard cell potential, E^o_{cell} = 1.2 V is given by
a) 12.5
b) 21.5
c) 40.5
d) 47.2

28. The half cell reactions for rusting of iron are :
$2 H^+ + \frac{1}{2} O_2 + 2e^- \rightarrow H_2O$, E^o = + 1.23 V
$Fe^{2+} + 2e^- \rightarrow Fe(s)$, E^o = - 0.44 V
ΔG^o (in kJ) for the reaction is

a) – 76 b) – 322 c) -122 d) – 176

29. Resistance of a conductivity cell filled with a solution of an electrolyte of concentration 0.1 M is 100 Ω. The conductivity of this solution is 1.29 S m^{-1}. Resistance of the same cell when filled with 0.2 M of the same solution is 520 Ω. The molar conductivity of 0.02 M solution of the electrolyte will be

a) 1.24 x 10^{-4} S m^2 mol^{-1} b) 12.4 x 10^{-4} S m^2 mol^{-1}

c) 124 x 10^{-4} S m^2 mol^{-1} d) 1240 x 10^{-4} S m^2 mol^{-1}

30. If the oxidation potential be defined with reference to Ag/Ag^+ half cell (for which oxidation potential is taken to be zero), which of the following will give the correct value of oxidation potential of Cu/Cu^{2+} half cell (Given that Cu/Cu^{2+} = –0.34 V and Ag/Ag^+ = –0.80 V)

a) –0.46 volts b) –1.14 volts c) 1.14 volts d) 0.46 volts

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

a) $2\lambda^o_{Al^{3+}} + 3\lambda^o_{SO_4^{2-}}$ b) $\lambda^o_{Al^{3+}} + \lambda^o_{SO_4^{2-}}$

c) $(\lambda^o_{Al^{3+}} + \lambda^o_{SO_4^{2-}}) \times 6$ d) $\frac{1}{3}\lambda^o_{Al^{3+}} + \frac{1}{2}\lambda^o_{SO_4^{2-}}$

32. The number of electrons passing per second through a cross section of copper wire carrying 10^{-6} amperes of current per second is found to be

a) 1.6 x 10^{19} b) 6 x 10^{35} c) 6 x 10^{16} d) 6 x 10^{12}

33. The time required to coat a metal surface of 800 cm^2 with 5 x 10^{-3} mm thick layer of silver (density = 1.5 g cm^{-3}) with the passage of 3 A current through a silver nitrate solution is nearly

a) 1150 s b) 1250 s c) 1350 s d) 1450 s

34. The pH of 0.5 L of 1.0 M NaCl solution after electrolysis for 965 s using 5.0 A current, is

a) 1.0 b) 12.7 c) 13.0 d) 1.30

35. A galvanic cell is set up from a zinc bar weighing 100 g and 1.0 litre of 1.0 M $CuSO_4$ solution. How long would the cell run if it is assumed to deliver a steady current of 1.0 amp. (Atomic mass of Zn = 65)

a) 1.1 hr b) 46 hr c) 53.6 hr d) 24.00 hr

36. Salts of metals A, B and C are electrolysed under identical conditions using same quantity of electricity. It was observed that 4.2 g of A, 5.4 g of B and 19.2 g of C were deposited at respective cathodes. If the atomic weight of A, B and C are 7, 27 and 64 respectively, then the ratio of their valencies is

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

37. If the oxidation potential be defined with reference to Ag/Ag^+ half cell (for which oxidation potential is taken to be zero), which of the following will give the correct value of oxidation potential of Cu/Cu^{2+} half cell (Given that $Cu/Cu^{2+} = -0.34$ V and $Ag/Ag^+ = -0.80$ V)

a) -0.46 volts b) -1.14 volts c) 1.14 volts d) 0.46 volts

38. The emf of the cell $Zn|Zn^{2+}$ (0.01 M)$||Fe^{2+}$ (0.01 M) | Fe at 298 K is 0.2905 volt. Then the value of equilibrium constant for the cell reaction is

a) $e^{\frac{0.32}{0.0295}}$ b) $10^{\frac{0.32}{0.0295}}$ c) $10^{\frac{0.26}{0.0295}}$ d) $10^{\frac{0.32}{0.0591}}$

39. The cell, $Zn|Zn^{2+}$ (1 M) || Cu^{2+} (1 M) | Cu, (E_{cell} = 1.10 V), was allowed to be completely discharged at 298 K. The relative concentration of Zn^{2+} to Cu^{2+}, $\left(\frac{[Zn^{2+}]}{[Cu^{2+}]}\right)$ is

a) 9.65×10^4 b) antilog 24.08 c) 37.3 d) $10^{37.3}$

40. The e.m.f. of the cell

Pt, Cl_2 (g), P_1 atm | Cl^- (aq) (1 M) | Cl_2 (g), Pt, P_2 atm

will be positive if

a) $P_1 = P_2$ b) $P_1 < P_2$

c) $P_1 > P_2$ d) given cell cannot have positive e.m.f.

41. Iron can be protected by coating with zinc or tin. If coating is broken

a) iron will corrode faster if coated with zinc

b) iron will corrode faster if coated with tin

c) iron will corrode faster in both cases

d) iron will not undergo any corrosion in both cases

42. A cell contains two hydrogen electrodes. The negative electrode is in contact with a solution of 10^{-6} M Hydrogen ions .The EMF of the cell is 0.118V at 25^0 C. The concentration of hydrogen ions at the positive electrode is

a) 10^{-2} M b) 10^{-4} M c) 10^{-6} M d) 10^{-3} M

43. If Zn^{2+}/Zn electrode is diluted 100 times, then the change in emf is

a) increase of 59 mV b) decrease of 59 mV

c) increase of 29.5 mV d) decrease of 29.5 mV

44. If E^{o}_{cell} for a given reaction has a negative value, then which of the following gives the correct relationships for the values of ΔG^o and K_{eq}?

a) $\Delta G^o > 0$; $K_{eq} < 1$ b) $\Delta G^o > 0$; $K_{eq} > 1$ c) $\Delta G^o < 0$, $K_{eq} > 1$ d) $\Delta G^o > 0$; $K_{eq} < 1$

45. E^0 values of $Mg^{2+}|Mg$, $Fe^{2+}|Fe$ and $Zn^{2+}|Zn$ are – 2.37.V, - 0.44 V and – 0.76 V respectively. The correct statement is

a) Mg oxidizes Fe b) Zn oxidizes Fe

c) Zn reduces Mg^{2+} d) Zn reduces Fe^{2+}

46. The ionization constant of a weak electrolyte is 25 x 10^{-6} while the equivalent conductance of its 0.01 M solution is 19.6 S cm^2 eq^{-1}. The equivalent conductance of the electrolyte at infinite dilution (in S cm^2 eq^{-1}) will be
a) 250 b) 196 c) 392 d) 384

47. Electrolysis of dilute aqueous NaCl solution was carried out by passing 10 mA current. The time required to liberate 0.01 mole of H_2 gas at the cathode is (1 faraday = 96500 C mol^{-1})
a) 9.65 x 10^4 sec b) 19.3 x 10^4 sec
c) 28.95 x 10^4 sec d) 38.6 x 10^4 sec

48. The standard E.M.F. for the cell reaction $Zn + Cu^{2+} \leftrightarrows Cu + Zn^{2+}$ is 1.10 V at 25°c. The E. M. F. of the cell when 0.1 M Cu^{2+} and 0.1 M Zn^{2+} solutions are used at 25°C is
a) 1.10 V b) 0.110 V c) – 1.10 V d) – 0.110 V

49. In a cell that utilizes the reaction

$Zn(s) + 2H^+(aq) \rightarrow Zn^{2+}(aq) + H_2(g)$ addition of H_2SO_4 to the cathode compartment will

a) lower the E and shift the equilibrium to the left

b) lower the E and shift the equilibrium to the right

c) increase the E and shift equilibrium to the right

d) increase the E and shift the equilibrium to the left

50. A 100 watt, 110 volt incandescent lamp is connected in series with an electrolytic cell containing cadmium sulphate solution. The mass of cadmium will be deposited by the current flowing for 10 hours is

a) 28g b) 19g c) 45g d) 9g

ELECTROCHEMISTRY

1) The volume of chlorine at 300K and 1 atm pressure that produces during the electrolysis of fused magnesium chloride along with 6.0g of magnesium is

1) 615 ml 2) 5600 ml 3) 6153 ml 4) 560 ml

2) The standard reduction potential of Fe^{+2}/Fe and Sn^{+2}/Sn electrodes are - 0.44 V and -0.14 V respectively. For the cell reaction $Fe^{+2} + Sn \rightarrow Fe + Sn^{+2}$, the standard emf is

1) +0.30 V 2) –0.30 V 3) 0.58 V 4) –0.58 V

3) $10Cl^-(aq) + 2MnO_4^-(aq) + 16H^+(aq) \rightleftharpoons 5Cl_2(g) + 2Mn^{2+}(aq) + 8H_2O(l)$.

The value of E^0 for this reaction is 0.15V. What is the value of the equilibrium constant (K) for this reaction?

1) 3.4×10^2 2) 4.9×10^{12} 3) 2.4×10^{25} 4) 1.2×10^5

4) The equivalent conductance at infinite dilution of the MX is 160.84 $ohm^{-1}\ cm^2\ eq^{-1}$ If the transport number of M^+ is 0.40, the ionic mobility of X^- in $cm^2\ s^{-1}V^{-1}$ is

1) 3.9×10^{-5} 2) 1.0×10^{-3} 3) 2.5×10^{-3} 4) 6.7×10^{-4}

5) A current of 2.0 A passed for 5 hours through a molten metal salt deposits 22.2 g of metal (At wt.=177). The oxidation state of the metal in the metal salt is

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

6) The correct order of the mobility of the alkali metal ions in aqueous solution is

1) $K^+ > Rb^+ > Na^+ > Li^+$ 2) $Li^+ > Na^+ > K^+ > Rb^+$

3) $Na^+ > K^+ > Rb^+ > Li^+$ 4) $Rb^+ > K^+ > Na^+ > Li^+$

7) Consider the following four electrodes:

P=Cu^{2+}(0.0001 M)/Cu(s) Q = Cu^{2+}(0.1 M)/Cu(s)

R=Cu^{2+}(0.01 M)/Cu(s) S=Cu^{2+}(0.001 M)/Cu(s)

If the standard electrode potential of Cu^{2+}/Cu is +0.34V, the reduction potentials in volts of the above electrodes follow the order

1) P>S>R>Q 2) Q>R>S>P 3) R>S>Q>P 4) S>R>Q>P

8) Using the data given below find out the most stable oxidized species.

$E^0_{Cr_2O_7^{2-}}/Cr^{3+}$ = 1.33V $E^0_{Cl_2/Cl^-}$ = 1.36V $E^0{}_{MnO_4^-/Mn^{2+}}$= 1.51V
$E^0_{Cr^{3+}/Cr}$= - 0.74V

1) Cr^{3+} 2) Mn^{2+} 3) MnO_4^- 4) $Cr_2O_7^{2-}$

9) Zn gives H_2 gas with H_2SO_4 and HCl but not with HNO_3 because

1) HNO_3 is weaker acid than H_2SO_4 and HCl

2) Zn acts as oxidizing agent when reacts with HNO_3

3) In electrochemical series, Zn is above hydrogen

4)NO_3^- is reduced in preference to hydronium ion

10) During the electrolytic purification of nickel a current of 3.7A is passes for 6 hr in 0.5L of 2M solution of $Ni(NO_3)_2$ between two nickel electrodes. The molarity of the solution at the end is

1) 0.414 M 2) 1.589 M 3) 2 M 4) 1.414 M

11) When same quantity of electricity is passed for half an hour, the amount of Cu and Cr deposited are respectively 0.375 g and 0.30 g. Ratio of electro chemical equivalents of Cu and Cr is

1) 1.25 2) 0.8 3) 2.5 4) 1.62

12) Efficiency of the following cells is 84%. A(s) + B^{2+}(aq) ⇌ A^{2+}(aq) + B(s); ΔH = -285kJ

Then the standard electrode potential of the cell will be:

1) 2.40V 2) 1.24V 3) 1.10V 4) 1.20V

13) Using the data given below find out the strongest reducing agent

$E^0_{Cr_2O_7^{2-}}/Cr^{3+}$ = 1.33V $E^0_{Cl_2/Cl^-}$ = 1.36V $E^0{}_{MnO_4^-/Mn^{2+}}$= 1.51V
$E^0_{Cr^{3+}/Cr}$= - 0.74V

1) Cr 2) Cl^- 3) Cr^{3+} 4) Mn^{2+}

14) Molar conductivity of a solution is 1.26 x $10^2 \Omega^{-1}$ cm^2 mol^{-1}. Its molarity is 0.01. Its specific conductivity will be

1) 1.26 X 10^{-4} 2) 1.26 x 10^{-3} 3) 1.26 x 10^{-5} 4) 0.0063

15) Three iron sheets have been coated separately with three metals (A, B and C) whose standard electrode potentials are given below:

Metal	A	B	C	Iron
E° value	-0.46 V	-0.66 V	- 0.20 V	- 0.44 V

When coating is damaged, the rusting will take place faster in

1) Metal A 2) Metal B

3) Metal C 4) Unpredictable as data is insufficient

16) Equivalent conductance of an acid HA in is 0.1 M solution is 35 x 10^{-4} Sm^2 mol^{-1}. If the ionic conductance of H^+ and A^- ions are 350 x 10^{-4} and 50 x 10^{-4} Sm^2mol^{-1} respectively. Degree of dissociation of HA is

1) 6% 2) 12.3% 3) 4% 4) 8.7%

17) In a fuel cell, methanol is used as fuel and oxygen gas is used as an oxidizer. The reaction is

$CH_3OH(l) + \frac{3}{2}O_{2(g)} \rightarrow CO_{2(g)} + 2H_2O(l). At\ 298\ K$, standard Gibbs energies of formation for $CH_3OH(l)$, $H_2O(l)$ and $CO_{2(g)}$ are - 166.2, - 237.2 and – 394.4 kJ mol^{-1} respectively. If standard enthalpy of combustion of methanol is – 726 kJ mol^{-1}, efficiency of the fuel cell will be

1) 80% 2) 87% 3) 90% 4) 97%

18) The positive value of the standard electrode potential of Cu^{+2}/Cu indicates that

1) Cu cannot displace H_2 from acid.

2) Cu undergoes oxidation more readily than H_2.

3) Cu can displace H_2 from acid

4) Cu is a stronger reducing agent than H_2

19) The reaction occurring at the anode during the recharging of lead storage battery is

1) $PbSO_4 + 2e^- \rightarrow Pb + SO_4^{2-}$ 2) $Pb + PbO_2 + 2H_2SO_4 \rightarrow 2PbSO_4 + 2H_2O$

3) $Pb + SO_4^{2-} \rightarrow PbSO_3 + 2e^-$ 4) $PbSO_4 + 2H_2O \rightarrow PbO_2 + 4H^+ + SO_4^{2-} + 2e^-$

20) In the electrolysis of an aqueous solution of NaF, the product obtained at the cathode and anode respectively are

1) Na, F_2 2) H_2, O_2 3) H_2, F_2 4) Na, O_2

21) Resistance of a conductivity cell filled with a solution of an electrolyte of concentration 0.1 M is 100 **Ω**. The conductivity of this solution is 1.29 S m^{-1}. Resistance of the same cell when filled with 0.02 M of the same solution is 520 **Ω**. The molar conductivity of 0.02 M solution of the electrolyte will be

1) 1240 x 10^{-4} Sm^2 mol^{-1} 2) 124 x 10^{-4} Sm^2 mol^{-1}

3) 1.24 x 10^{-4} Sm^2 mol^{-1} 4) 12.4 x 10^{-4} Sm^2 mol^{-1}

22) Using the data given below find out which of the following is the strongest oxidising agent.

$E^0_{Cr_2O_7^{2-}}/Cr^{3+}$ = 1.33V $E^0_{Cl_2/Cl^-}$ = 1.36V $E^0{}_{MnO_4^-/Mn^{2+}}$ = 1.51V
$E^0_{Cr^{3+}/Cr}$ = - 0.74V

1) Cl^- 2) Cr^{3+} 3) Mn^{2+} 4) MnO_4^-

23) A hydrogen electrode contains HCl solution of pH3 at 298K. Its electrode potential is

1) –0.18 V 2) 3.8 V 3) +0.18V 4) $\frac{3.8}{0.059}$

24) An ammeter and copper votmameter are connected in series. The ammeter shows the reading of 0.5 A. If 1g of copper is deposited the percentage error of the ammeter is

1) 1 2) 2 3) 10 4) 20

25) Three Faradays of electricity are passed through molten Al_2O_3, aqueous solution of $CuSO_4$ and molten NaCl taken in different electrolytic cells. The amount of Al, Cu and Na deposited at the cathodes will be in the molar ratio of

1) 1:2:3 2) 3:4:6 3) 3:2:1 4) 2:3:6

26) In an electrolytic cell, one litre of a 1 M aqueous solution of MnO_4^- is reduced at the cathode. The quantity of electricity required so that the final solution is 0.1 M MnO_4^{2-} will be

1) 1 F 2) 10 F 3) 0.1 F 4) 100F

27) Mark the false statements:

1) A salt bridge is used to eliminate liquid junction potential

2) The efficiency of a hydrogen - oxygen fuel cell is greater than 60%.

3) The Gibbs free energy change, ΔG is related with electromotive force E as

ΔG = - nFE

4) Nernst equation for single electrode potential is $E = E^0 - \frac{RT}{nF} log\ M^{n+}$

28) While charging the lead storage battery

1) $PbSO_4$ anode is reduced to Pb 2) $PbSO_4$ cathode is reduced to Pb

3) $PbSO_4$ cathode is oxidised to Pb 4) $PbSO_4$ anode is oxidized to PbO_2

29) The passage of current liberates H_2 at cathode and Cl_2 at anode. The solution is

1) NaCl in water 2) $ZnCl_2$ in water 3) $SnCl_4$ in water 4) $FeCl_3$ in water

30) The specific conductance of four electrolytes in $ohm^{-1}\ cm^{-1}$ are given below. Which one offers highest resistance to the passage of electric current ?

1) 9.2×10^{-9} 2) 6.0×10^{-7} 3) 7.5×10^{-5} 4) 4.0×10^{-8}

31) The conductance of 0.1 M HCl solution is greater than that of 0.1 M NaCl. This is because

1) HCl is more ionized than NaCl

2) HCl is an acid whereas NaCl solution is neutral

3) H^+ ions have greater mobility than Na^+ ions

4) Interionic forces in HCl are weaker than those in NaCl

32) The number of coulombs of electricity required to oxidise one mole of H_2O to O_2 is

1) 1.93×10^5 2) 3.86×10^5 3) 4.825×10^4 4) 9.65×10^4

33) For a spontaneous reaction, ΔG, the equilibrium constant K and $E°_{cell}$ will be respectively

1) +ve, >1, - ve 2) – ve, >1, +ve 3) – ve, <1, - ve 4) -ve ,>1, - ve

34) Aluminium air battery is also called as

1) Dry cell 2) Fuel Cell 3) Galvanic cell 4) Flow battery

35) Using the data given below find out in which option the order of reducing power is correct.

$E^0_{Cr_2O_7^{2-}}/Cr^{3+}$ = 1.33V $E^0_{Cl_2/Cl^-}$ = 1.36V $E^0{}_{MnO_4^-/Mn^{2+}}$ = 1.51V
$E^0_{Cr^{3+}/Cr}$ = - 0.74V

1) $Mn^{2+} < Cl^- < Cr^{3+} < Cr$ 2) $Mn^{2+} < Cr^{3+} < Cl^- < Cr$

3) $Cr^{3+} < Cl^- < Cr_2O_7^{2-} < MnO_4^-$ 4) $Cr^{3+} < Cl^- < Mn^{2+} < Cr$

36) Salts of metals A, B, C are electrolysed under identical conditions using same quantity of electricity. It was observed that 4.2 g of A, 5.4 g of B and 19.2 g of C were deposited at respective cathodes. If the atomic weight of A, B and C are 7, 27 and 64 respectively, then the ratio of their valencies is

1) 1:2:3 2) 3:2:1 3) 1:3:2 4) 2:3:1

37) The equivalent conductance at infinite dilution of the salt MX is

160.84 $ohm^{-1}\ cm^2\ eq^{-1}$. If the transport number of M^+ is 0.40, the ionic mobility of X^- in $cm^2\ s^{-1}V^{-1}$ is

1) 1.0×10^{-3} 2) 3.9×10^{-5} 3) 2.5×10^{-3} 4) 6.7×10^{-4}

38) The emf of the cell H_2(1 atm) Pt|H^+(a=x) || H^+(a=1)|H_2(1 atm) Pt at 25° C is 0.59 V. The pH of the solution is

1) 10 2) 7 3) 5 4) 1

39) The quantity of charge required to obtain one mole of aluminium from Al_2O_3 is

1) 1F 2) 2F 3) 3F 4) 6F

40) The amount of Al deposited when 0.1 Faraday current is passed through $AlCl_3$ will be

1) 0.3g 2) 0.9g 3) 2.7g 4) 0.27g

41) For the cell reaction 2 $H_2(g) + O_2(g) \rightarrow 2H_2O(l)$, $\Delta_f S°_{298} = -0.32\ kJ\ K^{-1}$. What is the value of $\Delta_f H°(H_2O)$?

Given: $O_2(g) + 4H^+(aq) + 4e^- \rightarrow 2H_2O(l)$, E° =1.23 V

1) –189.71 kJ mol^{-1} 2) –285.08 Id mol^{-1}

3) –570.14 kJ mol^{-1} 4) –37942 kJ mol^{-1}

42) Zn | Zn^{+2}(a=0.1 M) || Fe^{+2}(a=0.01 M) | Fe. The emf of the above cell is 0.2905 V. Equilibrium constant of the reaction is

1) $10^{0.32/0.295}$ 2) $10^{0.32/0.0295}$ 3) $10^{0.26/0.0295}$ 4) $10^{0.32/0.0591}$

43) Using the data given below find out the most stable ion in its reduced form.

$E^0_{Cr_2O_7^{2-}}/Cr^{3+}$ = 1.33V $E^0_{Cl_2/Cl^-}$ = 1.36V $E^0{}_{MnO_4^-/Mn^{2+}}$ = 1.51V
$E^0_{Cr^{3+}/Cr}$ = - 0.74V

1) Cl^- 2) Cr 3) Cr^{3+} 4) Mn^{2+}

44) Aluminium displaces hydrogen from dilute HCl whereas silver does not. The e.m.f of a cell prepared by combining Al/Al^{3+} and Ag/Ag^{+} is 2.46 V. The reduction potential of silver electrode is +0.80 V. The reduction potential of aluminium electrode is

1) +1.66 V 2) –3.26 V 3) –1.66 V 4) 3.26 V

45) A 0.04 N solution of weak acid which has dissociated 6% has specific conductance of 4×10^{-4} S cm^{-1}. The equivalent conductance at infinite dilution in S. cm^2/g.eq is

1) 16 2) 1.66×10^{-2} 3) 166 4) 2.4×10^{-2}

46) Metal M_1 displaces metals M_2 and M_3 from their solutions. Metal M_4 displaces metal M_1 from its solution. Metal M_3 displaces hydrogen from dilute acids but M_2 does not. The increasing order of standard electrode potentials of the four metals is

1) $E^0_{M_4} < E^0_{M_3} < E^0_{M_3} < E^0_{M_1}$ 2) $E^0_{M_4} < E^0_{M_1} < E^0_{M_3} < E^0_{M_2}$

3) $E^0_{M_1} < E^0_{M_4} < E^0_{M_3} < E^0_{M_2}$ 4) $E^0_{M_4} < E^0_{M_1} < E^0_{M_2} < E^0_{M_3}$

47) Corrosion of iron is essentially an electrochemical phenomenon where the cell reactions are

1) Fe is oxidised to Fe^{2+} and H_2O is reduced to OH^- .

2) Fe is oxidised to Fe^{2+} and H_2O is reduced to O_2^-

3) Fe is oxidised to Fe^{2+} and H_2O is reduced to O_2

4) Fe is oxidised to Fe^{2+} and H_2O is reduced to $O^{2-}{}_2$.

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

1) $H^+(aq) + e^- \rightarrow \frac{1}{2H_2(g)}; E^o = 0.00V$

2) $Na^+(aq) + e^- \rightarrow Na(s); E^o = -2.71V$

3) $2H_2O(l) \rightarrow O_2(g) + 4H^+(aq) + 4e^-; E^o = 1.23V$

4) $CI^-(aq) \rightarrow \frac{1}{2}Cl_2(g) + e^-; E^o = 1.36V$

49) $E°_{M^{4+}/M^{+2}}$ values for four metals M_1, M_2, M_3 and M_4 are –0.62 V, 0.72 V, 1.44 V and –1.21 V, respectively. The change of oxidation state from +4 to +2 is easiest for

1)M_1 2)M_2 3) M_3 4) M_4

50) The conductivity of 0.01 mol/dm^3 aqueous acetic acid at 300K is 19.5 x 10^{-5} $ohm^{-1}cm^{-1}$ and limiting molar conductivity of acetic acid at the same temperature is

390 $ohm^{-1}cm^2mol^{-1}$. The degree of dissociation of acetic acid is

1) 0.05 2) 0.5 3) 5 x 10^{-3} 4) 5 x 10^{-7}