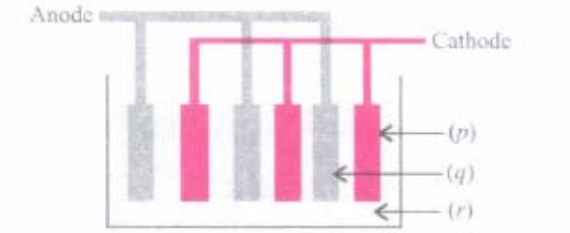
NEET CHEMISTRY PRACITCE PAPER

Time : 60 Mins **5 ELECTROCHEMISTRY 1** **Marks : 200**

1. Use the data of and find out the most stable oxidised species.
   a) Cr^{3+} b) MnO_4^- c) $Cr_2O_7^{2-}$ d) Mn^{2+}
2. In the cell, $Zn|Zn^{2+}||Cu^{2+}|Cu$, the negative terminal is
   a) Cu b) Cu^{2+} c) Zn d) Zn^{2+}
3. Label the given diagram showing lead storage battery:



a)

p	q	r
Pb	PbO_2	5M H_2SO_4

b)

p	q	r
PbO_2	Pb	conc.H_2SO_4

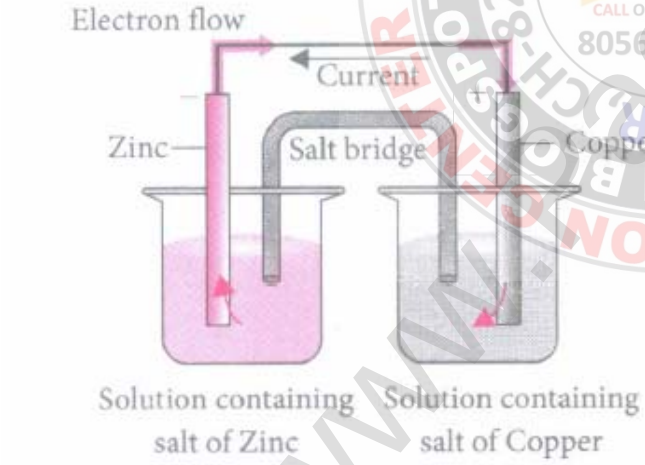
c)

p	q	r
Pb_3O_4	PbO_2	50% H_2SO_4

d)

p	q	r
PbO_2	Pb	dil.38% H_2SO_4

4. For the cell reaction $2Cu^+_{(aq)} \rightarrow Cu_{(s)} + Cu^{2+}_{(aq)}$ the standard cell potential is 0.36 V The equilibrium constant for the reaction is
   a) 1.2×10^6 b) 7.4×10^{12} c) 2.4×10^6 d) 5.5×10^8
5. Which of the following statements is correct about the given Daniell cell?



   a) This cell converts the electrical energy liberated during the redox reaction to chemical energy.
   b)
   This cell has an electrical potential greater that 1.1 V when concentration of Zn^{2+} and Cu^{2+} ions is unity (1 mol dm^{-3})
   c) In this cell, copper is acting as cathode and zinc is acting as anode.
   Redox reaction occurring in this cell is
   d) $Cu_{(s)} + Zn^{2+}_{(aq)} \longrightarrow Cu^{2+}_{(aq)} + Zn_{(s)}$
6. If the E^0_{cell} for a given reaction has a negative value, which of the following gives the correct relationships for the values of ΔG^0 and K_{eq}?
   a) $\Delta G^0 > 0$, $K_{eq} < 1$ b) $\Delta G^0 > 0$, $K_{eq} > 1$ c) $\Delta G^0 < 0$, $K_{eq} > 1$ d) $\Delta G^0 < 0$, $K_{eq} < 1$
7. An increase in equivalent conductance of a strong electrolyte with dilution is mainly due to :

a) increase in ionic mobility of ions b) 100% ionisation of electrolye at normal dilution
c) increase in both i.e. number of ions and ionic mobility of ions d) increase in number of ions

8. Zinc can be coated on iron to produce galvanized iron but the reverse is not possible. It is because:
   a) zinc is lighter than iron b) zinc has lower melting point than iron
   c) zinc has lower negative electrode potential than iron
   d) zinc has higher negative electrode potential than iron.
9. A hypothetical electrochemical cell is shown below $\mathrm{A}\left|\mathrm{A}^{+}(x\mathrm{M})\right\|\mathrm{B}^{+}(y\mathrm{M})\left|\mathrm{B}\right.$ The emf measured is +0.20. The cell reaction is
   a) $\mathrm{A}^{+}+\mathrm{e}^{-}\rightarrow\mathrm{A};\mathrm{B}^{+}+\mathrm{e}^{-}\rightarrow\mathrm{B}$ b) The cell reaction cannot be predicted c) $\mathrm{A}+\mathrm{B}^{+}\rightarrow\mathrm{A}^{+}+\mathrm{B}$
   d) $\mathrm{A}^{+}+\mathrm{B}^{+}\rightarrow\mathrm{A}+\mathrm{B}^{+}$
10. The weight of silver (atomic weight = 108), displaced by a quantity of electricity which displaces 5600 mL of O_2 at STP will be :
    a) 5.4 g b) 10.8 g c) 54.0 g d) 108.0 g
11. Galvanic cell has electrical potential of 1.1 V. If an opposing potential of 1.1 V is applied to this cell, what will happen to the cell reaction and current flowing through the cell?
    a) The reaction stops and no current flows through the cell
    b) The reaction continuous but current flows in opposite direction.
    c) The concentration of reactants becomes unity and current flows from cathode to anode.
    d) The cell does not function as a galvanic cell and zinc is deposited on zinc plate
12. A solution contains Fe^{2+}, Fe^{3+} and I ions. This solution was treated with iodine at 35°C. Eo for Fe^{3+}/Fe^{2+} is +0.77V and, E° for 0 $\mathrm{I}_2/2\mathrm{I}^{-}=0.536\ \mathrm{V}.1$. The favourable redox reaction is:
    a) I_2 will be reduced to I^- b) There will be no redox reaction c) I^- will be oxidised to I_2
    d) Fe^{2+} will be oxidised io F^{3+}
13. The molar conductivity is maximum for the solution of concentration
    a) 0.004 M b) 0.002 M c) 0.005 M d) 0.001 M
14. **Assertion:** A standard hydrogen electrode is also called reversible electrode.
    Reason: Standard hydrogen electrode can act both as anode as well as cathode in an electrochemical cell.
    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.
15. Same amount of electric current is passed through the solutions of $AgNO_3$ and HC!. If LOS g of silver is obtained from $AgNO_3$ solution, the amount of hydrogen liberated at STP will be
    a) 1.008 g b) 11.2 g c) 0.01 g d) 1.1 g
16. Kohlrauch's law states that at:
    a)
    finite dilution,each ion makes definite contribution to equivalent conductance of an electrolyte, whatever be the nature of the other ion of electrolyte.
    b)
    infinite diiution each ion makes definite contribution to equivalent conductance of an electrolyte depending on the nature of the other ion of the electrolyte.
    c)
    infinite dilution, each i.n makes. definite contribution to conductance of an electrolyte whatever be the nature of the other ion of the electrolyte
    d)
    infinite dilution, each ion makes definite contribution to equivalent conduction of an electrolyte whatever be the nature of the other ion of the electrolyte

17. **Assertion:** Molar conductivity increases with decrease in concentration.
Reason: Conductivity always decreases with decrease in concentration.
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.

18. Match the column I with column II and mark the appropriate choice.

	Column I		Column - II
(A)	A_m	(i)	I/A
(B)	G*	(ii)	pI/A
(C)	k	(iii)	k/C
(D)	R	(iv)	G*/R

a) (A) → (i), (B) → (iii), (C) → (ii), (D) → (iv) b) (A) → (iii), (B) → (i), (C)→ (iv), (D) → (ii)
c) (A) → (ii), (B) → (iv), (C) → (iii), (D) → (i) d) (A) → (iv), (B) → (ii), (C) → (i), (D) → (iii)

19. Use the data given in and find out the most stable ion in its reduced form.
$E^0_{Cr_2^{2-}/Cr^{3+}} = 1.33V; E^0_{Cl2/Cl^-} = 1.36V$
$E^0_{MnO_4^-/Mn^{2+}} = 1.51V; E^0_{Cr^{3+}/cr} = -0.74V$
a) Cl^- b) Cr^{3+} c) Cr d) Mn^{2+}

20. In a galvanic cell, the salt bridge
(i) does not participate chemically in the cell reaction
(ii) stops the diffusion of ions from one electrode to another
(iii) is necessary for the occurrence of the cell reaction
(iv) ensures mixing of the two electrolytic solutions.
a) (i) and (iii) only b) (i) and (ii) only c) (iii) and (iv) only d) all of these.

21. Use the data given in and find out which of the following is the strongest oxidising agent.
$E^0_{Cr_2^{2-}/Cr^{3+}} = 1.33V; E^0_{Cl2/Cl^-} = 1.36V$
$E^0_{MnO_4^-/Mn^{2+}} = 1.51V; E^0_{Cr^{3+}/cr} = -0.74V$
a) Cl^- b) Mn^{2+} c) MnO_4^- d) Cr^{3+}

22. An electric current is passed through silver nitrate solution using silver electrodes. 15.25 g of silver was found to be deposited on cathode. What will be the weight of copper deposited on cathode if same amount of electricity is passed through copper sulphate solution using copper electrodes?
a) 4.49 g b) 6.4 g c) 12.5 g d) 3.2 g

23. The pressure of H_2 required to make the potential of H_2 electrode zero in pure water at 298 K is :
a) 10^{-10} atm b) 10^{-4} atm c) 10^{-14} atm d) 10^{-12} atm

24. For the reaction, $Cu^{2+} + 2e^- \rightarrow Cu$; log[$Cu^{2+}$] vs E graph is of type as shown in figure where OA = 0.34 V, the electrode potential of the half-cell of
Cu|Cu^{2+}(0.1 M) will be
a) $-0.34 + \frac{0.0591}{2} V$ b) 0.34 + 0.0591 V c) 0.34 V d) none of these

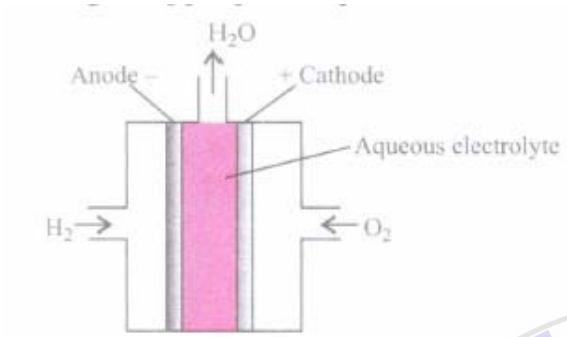
25. Which of the following statements is true?
a) When an aqueous solution of NaCl is electrolysed, sodium metal is deposited at cathode.
b) There is no difference between specific conductivity and molar conductivity.
c) Silver nitrate solution can be stored in a copper container.
d) The addition of liquid bromine to iodide solution turns it violet.

26. 4.5 g of aluminium (atomic mass 27u) is deposited at cathode from Al^{3+} solutions by a certain quantity of electric charge. The volume of hydrogen produced at STP from H^+ ions in solution by the same quantity of electric charge will be :
    a) 44.8 L b) 22.4 L c) 11.2 L d) 5.6 L

27. The equilibrium constant of the reaction, $Cu_{(s)} + 2Ag^+_{(aq)} \longrightarrow Cu^{2+}_{(aq)} + 2Ag_{(s)}$, $E^0 = 0.46$ V at 298 K is :
    a) 2.0×10^{10} b) 4.0×10^{10} c) 4.0×10^{15} d) 2.4×10^{10}

28. The efficiency of a fuel cell is given by :
    a) $\Delta G/\Delta S$ b) $\Delta G/\Delta H$ c) $\Delta S/\Delta G$ d) $\Delta H/\Delta G$

29. Study the given cell carefully and fill in the blanks by choosing an appropriate option.



In the given cell, hydrogen and oxygen are bubbled through porous_____$^{(i)}$_____electrodes into concentrated aqueous_____$^{(ii)}$_____solution. Catalysts like finely divided_____$^{(iii)}$_____or_____$^{(iv)}$_____metal are incorporated into the electrodes for increasing the rate of electrode reactions.

a)

(i)	(ii)	(iii)	(iv)
hydrogen	potassium hydroxide	palladium	platinum

b)

(i)	(ii)	(iii)	(iv)
oxygen	hydrogen chloride	manganese	iron

c)

(i)	(ii)	(iii)	(iv)
carbon	sodium hydroxide	platinum	palladium

d)

(i)	(ii)	(iii)	(iv)
graphite	sodium chloride	nickel	platinum

30. Reduction potential for the following half-cell reactions are
    $Zn \rightarrow Zn^{2+} + 2e^-$
    $\left(E^\circ_{(Zn^2+/Zn)} = -0.76 \text{ V}\right)$
    $Fe \rightarrow Fe^{2+} + 2e^-, \left(E^\circ Fe^{2+}/Fe = -0.44 \text{ V}\right)$
    The EMF for the cell reaction,
    $Fe^{2+} + Zn \rightarrow Zn^{2+} + Fe$ will be
    a) +0.32 V b) -0.32 V c) +1.20 V d) -1.20 V

31. Mark the correct relationship from the following:
    a) Equilibrium constant is related to emf as $logk = \frac{nFE}{2.303RT}$
    b) EMF of a cell Zn I $Zn^{2+}_{(a1)}$ II $Cu^{2+}_{(a2)}$I Cu is $E = E^0 - \frac{0.591}{n} log \frac{[a_2]}{[a_1]}$
    c) Nernst equation is $E_{cell} = E^0_{cell} - \frac{0.0591}{n} log \frac{[Products]]}{[Reactants]]}$
    d) For the electrode M^{n+}/M at 273 K $E = E^0 - \frac{0.591}{n} log \left[M^{n+}\right]$

32. Match the column I with column II and mark the appropriate choice.

	Column -I		Column - II
(A)	Kohlrausch's law	(i)	$\Lambda^0_{eq} = \Lambda^0_c + \Lambda_a$
(B)	Molar conductivity	(ii)	$\Lambda_m = \frac{K}{C}$

	Column -I		Column - II
(C)	Degree of dissociation	(iii)	$a = \frac{\Lambda_m}{A_m^0}$
(D)	IDissociation constant	(iv)	$K_a = \frac{ca^2}{1-a}$

a) (A) → (iii), (B) → (iv), (C) → (i), (D) → (ii) b) (A) → (i), (B) → (ii), (C) → (iii), (D) → (iv)
c) (A) → (iv), (B) → (i), (C) → (ii), (D) → (iii) d) (A) → (ii), (B) → (iii), (C) → (iv), (D) → (i)

33. The charge required for reducing 1 mole of MnO_4^- to Mn^{2+} is:
a) 1.93 x 10^5 C b) 2.895 x 10^5 C c) 4.28 x 10^5 C d) 4.825 x 10^5 C

34. **Assertion:** When a copper wire is dipped in silver nitrate solution, there is no change in the colour of the solution.
Reason: Copper cannot displace silver from its salt 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.

35. Units of the properties measured are given below. Which of the properties has not been matched correctly?
a) Molar conductance = S m^2 mol^{-1} b) Cell Constant = ,m^{-1} c) Specific conductance = S m^2
d) Equivalent conductance = S m^2 $(g\ eq)^{-1}$

36. Limiting molar conductivity of NH_4OH (i.e., Åm (NH_4OH) is equal to :
a) Å $_{m(NH_4Cl)}$ + Å $_{m(NaCl)}$ - Å $_{m(NaOH)}$ b) Å $_{m(NaOH)}$ + Å $_{m(NaCl)}$ - Å $_{m(NH_4Cl)}$
c) Å $_{m(NH_4OH)}$ + Å $_{m(NH_4Cl)}$ - Å $_{m(HCl)}$ d) Å $_{m(NH_4Cl)}$ + Å $_{m(NaOH)}$ - Å $_{m(NaCl)}$

37. On the basis of the information available from the reaction
$\frac{4}{3}Al + O_2 \rightarrow \frac{2}{3}Al_2O_3, \Delta G = -827\ kJ\ mol^{-1}$ O_2 the minimum e.m.f. required to carry out an electrolysis of Al_2O_3 is $(F = 96500 C mol^{-1})$
a) 8.56 V b) 2.14 V c) 4.28 V d) 6.42 V

38. A weak monobasic acid is 5% dissociated in 0.01 mol dm^{-3} solution. Limiting molar conductivity of acid at infinite dilution is 4 x 10^{-2} ohm $^{-l}$ m 2mol $^{-1}$. What will be the conductivity of 0.05 mol dm-3 solution of the acid?
a) 8.94 x 10^{-6} ohm^{-1} cm^2 mol^{-1} b) 8.92 x 10^{-4} ohm^{-1} cm^2 mol^{-1} c) 4.46 x 10^{-6} ohm^{-1} cm^2 mol^{-1}
d) 2.23 x 10^{-5} ohm^{-1} cm^2 mol^{-1}

39. The equivalent conductance of Ba^{2+} and Cl^- are 127 and 76 Ω^{-l} cm^{-1} eq^{-1} respectively at infinite dilution. The equivalent conductance of $BaCl_2$ at infinite dilution will be:
a) 139.52 b) 203 c) 279 d) 101.5

40. Molar conductivity of NH_4OH can be calculated by the equation,
a) $\Lambda^0_{NH_4OH} = \Lambda_{Ba(OH)_2} + \Lambda_{NH_4cl} - \Lambda_{Bacl_2}$ b) $\Lambda^0_{NH_4OH} = \Lambda_{Bacl_2} + \Lambda_{NH_4cl} - \Lambda_{Ba(OH)_2}$
c) $\Lambda^0_{NH_4OH} = \frac{\Lambda_{Ba(OH)_2} + 2\Lambda_{NH_4cl} - \Lambda_{Bacl_2}}{2}$ d) $\Lambda^0_{NH_4OH} = \frac{\Lambda_{NH_4cl} + \Lambda_{Ba(OH)_2}}{2}$

41. Which of the following reactions cannot be a basis for electrochemical cell?
a) $H_2 + O_2 \rightarrow H_2O$ b) $AgNO_3 + Zn \rightarrow Zn(NO_3)_2 + Ag$ c) $AgNO_3 + NaCl \rightarrow AgCl \downarrow + NaNO_3$
d) KMnO4+FeSO4+H2SO4→ K_2SO_4+Fe2(SO_4)$_3$ + $MnSO_4$ + H_2O

42. **Assertion:** In mercury cell, the cell potential is approximately 1.35 V and remains constant during its life.
Reason : The overall reaction in mercury cell is represented as $Zn(Hg) + HgO_{(s)} \rightarrow ZnO_{(s)} + Hg_{(l)}$
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.

43. When a lead storage battery is discharged,
a) lead sulphate is consumed b) oxygen gas is evolved c) lead sulphate is formed
d) lead sulphide is formed.

44. On the basis of the information available. from the reaction : $\frac{4}{3}Al + O_2 \rightarrow \frac{2}{3}Al_2O_3$, $\Delta G = -827$ kJ mol^{-1} of O_2, the minimum EMF required to carry out the electrolysis of Al_2O_3 is : (F = 96500 C mol^{-1})
a) 2.14 V b) 4.28 V c) 6.42 V d) 8.56 V

45. Two solutions of X and Y electrolytes are taken in two beakers and diluted by adding 500 mL of water. A_m of X increases by 1.5 times while that of Y increases by 20 times, what could be the electrolytes X and Y?
a) X $\rightarrow$ NaCl, Y $\rightarrow$ KCl b) X $\rightarrow$ NaCl, Y $\rightarrow$ CH3COOH c) X $\rightarrow$ KOH, Y $\rightarrow$ NaOH
d) X $\rightarrow$ CH3COOH, Y $\rightarrow$ NaCl

46. Match the column I with column II and mark the appropriate choice.

	Column - I		**Column - II**
(A)	Electrochemical equivalent	(i)	Potential difference x Quantity of charge
(B)	Faraday	(ii)	Mass of substance deposited by one coulomb of charge
(C)	Ampere	(iii)	Charge carried by one mole of electrons
(D)	Electrical energy	(iv)	One coulomb of electric charge passed through one second

a) (A) $\rightarrow$ (i), (B) $\rightarrow$ (ii), (C) $\rightarrow$ (iii), (D) $\rightarrow$ (iv) b) (A) $\rightarrow$ (ii), (B) $\rightarrow$ (iii), (C) $\rightarrow$ (iv), (D) $\rightarrow$ (i)
c) (A) $\rightarrow$ (iii), (B) $\rightarrow$ (iv), (C) $\rightarrow$ (i), (D) $\rightarrow$ (ii) d) (A) $\rightarrow$ (iv), (B) $\rightarrow$ (i), (C) $\rightarrow$ (ii), (D) $\rightarrow$ (iii)

47. Which of the following statements is correct regarding variations of molar conductivity with concentration?
The variation in A_m with concentration for a strong electrolyte can be represented by the equation,
$$A_m = A_m^0 - AC^{1/2}$$
The value of constant A for a given solvent and temperature depends upon the type of electrolyte i.e., cations and anions produced on dissociation of electrolyte in the solution.
a) Molar conductivity decreases with decrease in concentration.
b) Variation in molar conductivity of weak and strong electrolytes is same.
c) Molar conductivity increases with decrease in concentration.
d) When concentration of the solution approaches zero, the molar conductivity is known as conductance.

48. $E^0_{Fe^{2+}/Fe}$= - 0.441 V and $E^0_{Fe^{3+}/Fe^{2+}}$= 0.771 V, the standard emf, of the reaction $Fe + 2Fe^{3+} \rightarrow 3Fe^{2+}$ will be :
a) 0.111 V b) 0.330 V c) 1.653 V d) 1.212 V

49. In electrolysis of NaCl when Pt electrode is taken then H_2 is liberated at cathode while with Hg cathode it forms sodium amalgam. This is because:
a) Hg is more inert than Pt b) More voltage is required to reduce H^+ at Hg than at Pt
c) Na is dissolved in Hg while it does not dissolved in Pt
d) Conc. of H^+ ions is larger when Pt electrode is taken

50. Electrolysis of an aqueous solution of $AgNO_3$ with silver electrodes produces (i) at cathode while (ii) ions are dissolved from anode. When Pt electrodes are used (iii) is produced at anode and (iv) is cathode.

a)

(i)	**(ii)**	**(iii)**	**(iv)**
H_2	NO_3^-	OH^-	H_2

b)

(i)	**(ii)**	**(iii)**	**(iv)**
Ag	H^+	O_2	H_2

c)

(i)	**(ii)**	**(iii)**	**(iv)**
Ag	Ag^+	O_2	Ag

d)

(i)	**(ii)**	**(iii)**	**(iv)**
Ag	H^+	Ag^+	O_2