JEE MAIN : CHAPTER WISE TEST PAPER-2

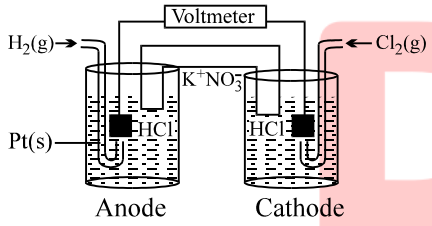
SUBJECT :- CHEMISTRY **DATE.....**
CLASS :- 12th **NAME.....**
CHAPTER :- ELECTROCHEMISTRY **SECTION.....**

(SECTION-A)

1. A current of 9.65 A is placed for 3 hr between nickel cathode and Pt anode in 0.5 L of a 2 M solution of $Ni(NO_3)_2$. The molarity of Ni^{2+} after electrolysis would be
(A) 0.46M (B) 0.92 M
(C) 1.08 M (D) none

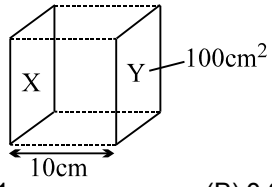
2. The standard reduction potential's of half cell OCl^-/Cl^-, OH^- and Cl_2/Cl^- are 0.94 volt and +1.36 volt respectively. What is the reduction potential of half cell whose cell reaction is represented as
$2OCl^- + 2H_2O + 2e \longrightarrow Cl_2(g) + 4OH^-$
(A) 0.21 V (B) 0.52 V
(C) 1.04 V (D) 2.1 V

3. Consider the following Galvanic cell.



By what value the cell voltage change when concentration of ions in anodic and cathodic compartments both increased by factor of 10 at 298 K
(A) +0.0591 (B) –0.0591
(C) –0.1182 (D) 0

4. The conductance of a salt solution (AB) measured by two parallel electrodes of area 100 cm^2 separated by 10 cm was found to be 0.0001 Ω^{-1}. If volume enclosed between two electrode contain 0.5 mole of salt, what is the molar conductivity(Scm^2mol^{-1}) of salt at same conc.



(A) 0.01 (B) 0.02
(C) 2×10^{-5} (D) none of these

5. How much time is required for complete decomposition of two moles of water using 4 ampere.
(A) 3.86×10^5sec (B) 1.93×10^5sec
(C) 96500 sec (D) 48250 sec

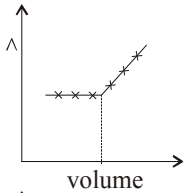
6. E° (SRP) of different half cell are given
$E^o_{Cu^{2+}/Cu}$ = 0.34 volt ; $E^o_{Zn^{2+}/Zn}$ = – 0.76 volt
$E^o_{Ag^+/Ag}$ = 0.8 volt ; $E^o_{Mg^{2+}/Mg}$ = – 2.37 volt
In which cell $\Delta G°$ is most negative
(A) Zn (s) | Zn^{2+} (1 M) | | Mg^{2+} (1 M) | Mg (s)
(B) Zn (s) | Zn^{2+} (1 M) | | Ag^+ (1 M) | Ag (s)
(C) Cu (s) | Cu^{2+} (1 M) | | Ag^+ (1 M) | Ag (s)
(D) Ag (s) | Ag^+ (1 M) | | Mg^{2+} (1 M) | Mg (s)

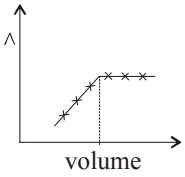
7. Select the correct option if it is know that K_{sp} (AgCl) > K_{sp} (AgBr) > K_{sp} (AgI)
(A) $E^o_{I^-/AgI/Ag} > E^o_{Br^-/AgBr/Ag} > E^o_{Cl^-/AgCl/Ag}$
(B) $E^o_{I^-/AgI/Ag} < E^o_{Br^-/AgBr/Ag} < E^o_{Cl^-/AgCl/Ag}$
(C) $E^o_{Ag/AgI/I^-} < E^o_{Ag/AgBr/Br^-} < E^o_{Ag/AgCl/Cl^-}$
(D) None of these

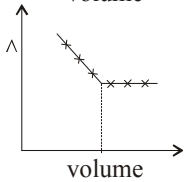
8. Which of the following is correct statement regarding conductance ?
(A) Conductance of HCl solution increases on adding NaOH, before the equivalent point.
(B) For potash alum ($K_2SO_4.Al_2(SO_4)_3.24H_2O$), $\Lambda^\infty_{eq} = 8.\Lambda^\infty_m$
(C) In general, conductivity increases with increase in concentration
(D) On increasing the temperature, the conductance of any conductor increases.

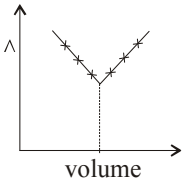
9. The amount of Cu deposited at the cathode in the electrolysis of aqueous $CuSO_4$ solution in a definite time period depends on (It is given that only Cu is deposited at cathode)
(A) Electric current strength
(B) Concentration of $CuSO_4$ solution
(C) Nature of electrodes (Inert or Cu)
(D) Temperature

10. $AgNO_3$(aq) was added to an aqueous NH_4Cl solution gradually and the conductivity of solution was measured. The plot of conductance (^) versus the volume of $AgNO_3$ is :

(A) 

(B) 

(C) 

(D) 

11. Select the **incorrect** statement with respect to commercial cells.
(A) In a dry cell, at cathode reduction of Mn from +4 state to +3 state occurs.
(B) During discharging of lead storage cell density of solution decreases.
(C) The ethane-oxygen fuel cell with acid electrolyte will produce 2 mole of H^+ per mole of electron produced at the anode.
(D) Efficiency of a fuel cell can be greater than 100%.

12. For the electrochemical cell : $Zn(s) \mid Zn^{2+}(aq) \parallel Cl^-(aq) \mid Cl_2(g) \mid Pt(s)$

Given : $E^\circ_{Zn^{2+}/Zn}$ = – 0.76 Volt, $E^\circ_{Cl^-/Cl_2(g)}$ = – 1.36 Volt
From these data one can deduce that :
(A) $Zn + Cl_2 \rightleftharpoons Zn^{2+} + 2Cl^-$ is a non-spontaneous reaction at standard conditions.
(B) $Zn^{2+} + 2Cl^- \longrightarrow Cl_2 + Zn$ is a spontaneous reaction at standard conditions with E°_{cell} = 2.12 volt .
(C) $Zn + Cl_2 \longrightarrow Zn^{2+} + 2Cl^-$ is a spontaneous reaction at standard conditions with E°_{cell} = 2.12 volt
(D) $Zn + Cl_2 \longrightarrow Zn^{2+} + 2Cl^-$ is a spontaneous reaction at standard conditions with E°_{cell} = 0.60 volt

13. During the electrolysis of an aqueous salt solution, the pH in the space near one of the electrode was increased and the other one was decreased. The salt solution was
(A) NaCl (very dilute) (B) $ZnCl_2$
(C) NaCl (Conc.) (D) $Cu(NO_3)_2$

14. Which of the following statements are correct regarding electrolysis of 0.2 M Li_2SO_4 if appropriate voltage is applied such that only one component can be deposited / liberated at cathode / anode?
(A) H_2 gas will be liberated at anode and O_2 gas at cathode.
(B) pH of the solution will not change due to electrolysis.
(C) Concentration of SO_4^{2-} ion will keep on decreasing due to electrolysis.
(D) At some time in the electrolysis concentration of Li^+ and SO_4^{2-} can be equal.

15. Conductivity of saturated solution of AgCl is given by which of the following options if limiting ionic conductance of Ag^+ and Cl^- ions is 60 $\Omega^{-1}cm^2$ mol^{-1} and 75 Ω^{-1} cm^2 mol^{-1} respectively & K_{sp} of AgCl = 10^{-10}
(A) 6×10^{-7} Ω^{-1} cm^{-1}
(B) 1.35×10^{-3} Ω^{-1} cm^{-1}
(C) 1.35×10^{-6} Ω^{-1} cm^{-1}
(D) 6×10^{-5} Ω^{-1} cm^{-1}

16. For an electrochemical reaction occuring in a galvanic cell.
$2Fe^{+3}_{(aq)} + Zn_{(s)} \longrightarrow Zn^{+2}_{(aq)} + 2Fe^{+2}_{(aq)}$
if concentration of Fe^{+2} is increased.
(A) E_{cell} will remain unchanged
(B) E^o_{cell} will decrease
(C) pH of the solution will change
(D) less non P–V work will be obtained

17. **Statement-1** : On increasing concentration conductivity of electrolyte increases.
Statement-2 : On increasing concentration number of ions per unit solution increases.
(A) Statement-1 is true, statement-2 is true and statement-2 is correct explanation for statement-1.
(B) Statement-1 is true, statement-2 is true and statement-2 is NOT the correct explanation for statement-1.
(C) Statement-1 is true, statement-2 is false.
(D) Statement-1 is false, statement-2 is true.

18. The metal mainly used in devising photoelectric cells is:
(A) Li (B) Cs (C) Rb (D) Na

19. Let C_{NaCl} and C_{BaSO_4} be the conductances (in S) measured for saturated aqueous solutions of NaCl and $BaSO_4$, respectively, at a temperature T. Which of the following is false?
(A) $C_{NaCl}(T_2) > C_{NaCl}(T_1)$ for $T_2 > T_1$
(B) $C_{BaSO_4}(T_2) > C_{BaSO_4}(T_1)$ for $T_2 > T_1$
(C) Ionic mobilities of ions from both salts increase with T.
(D) $C_{NaCl} >> C_{BaSO_4}$ at a given T

20. The molar conductivity of a conductivity cell filled with 10 moles of 20 mL NaCl solution is $\wedge_{m1}$ and that of 20 moles another identical cell having 80 mL NaCl solution is $\wedge_{m2}$, The conductivities ex hibited by these two cells are same. The relationship between $\wedge_{m2}$ and $\wedge_{m1}$ is
(A) $\wedge_{m2} = 2\wedge_{m1}$ (B) $\wedge_{m2} = \wedge_{m1}/2$
(C) $\wedge_{m2} = \wedge_{m1}$ (D) $\wedge_{m2} = 4\wedge_{m1}$

(SECTION-B)

21. On passing electricity through nitrobenzene solution, it is converted into azobenzene. Calculate the mass of azobenzene (in mg) if same quantity of electricity produces oxygen just sufficient to burn 96 mg of fullerene (C_{60}).
(Answer by multiplying the 1000)

22. Consider the following galvanic cell:
Pt | H_2 (1 bar) | HX | | KCl (1 M) | Hg_2Cl_2 (s) | Hg (l) | Pt
At 25° C, emf of the cell is 600 mV. When HX is replaced by a buffer solution at pH 6.80, the emf of cell becomes 750 mV. Calculate the pH of HX solution originally used.
Given : $\frac{2.303RT}{F}$ = 0.06 V.
(Answer by multiplying the pH by 1000)

23. Calculate acid dissociation constant for 0.1 M HCOOH if its solution shows a resistance of 50 Ω when filled in a cell having separation between parallel electrodes 4 cm and cross section area of electrode 10 cm^2
Given : $\wedge_m^\infty$ [$Ca(HCOO)_2$] = 230 $Scm^2\ mol^{-1}$
$\wedge_m^\infty$ [$CaCl_2$] = 280 $Scm^2\ mol^{-1}$
$\wedge_m^\infty$ [HCl] = 425 $Scm^2\ mol^{-1}$
[Fill your answer by multiplying the Answer with 10^5]

24. Equivalent conductance of saturated solution of $BaSO_4$ is 200 $ohm^{-1}\ cm^2\ eqv^{-1}$ and specific conductance is 4×10^{-5} $ohm^{-1}\ cm^{-1}$. K_{sp} of $BaSO_4$ is $x \times 10^{-y}$ M^2 in scientific notation. Value of **(x + y)** will be :

25. A solution of 0.1 M CH_3COOH is placed between parallel electrodes of cross-section area $4cm^2$, separated by 2cm. For this solution resistance measured is 100Ω. Calculate elevation in boiling point of the 0.1 M CH_3COOH solution, using following information.
K_b = 0.5 K kg/mol ; $\wedge_m^\infty(H^+)$ = 300 Scm^2 $mole^{-1}$; $\wedge_m^\infty(CH_3COO^-)$ = 100 $Scm^2\ mole^{-1}$
Fill your answer by multiplying it with 800.

26. Calculate E_{cell} of the given cell.
Pt | H_2 (4 atm) | H_2S (0.2 M), HCl (0.2 M) | | KCl(0.1 M) | AgCl | Ag(s)

$K_{a_1}(H_2S) = 10^{-8}\ M$;

$K_{a_2}(H_2S) = 10^{-13}\ M$;

$K_{sp}(AgCl) = 10^{-10}\ M^2$

$E^o_{Ag^+/Ag} = 0.8\ V$;

$\frac{2.303RT}{F} = 0.06$

[Fill your answer by multiplying it with 100.]

27. A current of 0.5 amp is passed through excess of molten mixture of Al_2O_3 and Na_3AlF_6 for 9.65 hours. The mass of Al (in mg) deposited at the cathode, with $\frac{1000}{12}$% current efficiency is (Al=27).

28. A 1 litre sample of a 0.1 M Cr^{3+} is electrolyzed with a current of 96.5 A. If the remaining Cr^{3+} concentration is 0.08 M then the duration of the process in second is

29. At 25°C following cell is at equilibrium under given set of condition,
Cd(s) | $Cd(OH)_2$(s) | NaOH(aq) (0.01M) | H_2(g) (1 bar) | Pt(s)
If $E^\circ_{Cd^{+2}/Cd}$ = – 0.39 Volt then calculate value of $\frac{1}{5}\log\frac{1}{Ksp}$.
[**Given :** $\frac{2.303RT}{F}$ = 0.06 at 25°C]

30. In electrolysis of an acetate solution, ethane is produced along with $CO_{2(g)}$ at anode. What is the total volume of the two gases produced (in lit.) at 1 atm and $\frac{10}{0.0821}$ K if current of 2 amp is passed through the solution for 965 hrs.