Chemistry

Chapterwise Practise Problems (CPP) for JEE (Main & Advanced)

Chapter - Electrochemistry

Level-1

SECTION - A

Straight Objective Type

This section contains multiple choice questions. Each question has 4 choices (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** is correct.

1. A solution containing one mol per litre each of $Cu(NO_3)_2$, $AgNO_3$, $Hg_2(NO_3)$ and $Mg(NO_3)_2$ is being electrolysed by using inert electrodes. The values of the standard oxidation potentials in volts are

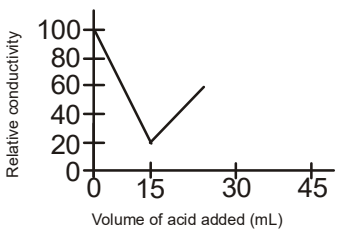
   $Ag / Ag^+ = -0.8 ; Hg / Hg_2^{2+} = -0.79 ; Cu / Cu^{2+} = -0.34 ; Mg / Mg^2$

   The order in which metal will be formed at the cathode, will be :

   (A) Ag, Cu, Hg, Mg (B) Ag, Hg, Cu, Mg

   (C) Ag, Hg, Cu (D) Cu, Hg, Ag.

2. 20 ml of KOH solution was titrated with 0.20 M H_2SO_4 solution in a conductivity cell. The data obtained were plotted to give the graph shown below :

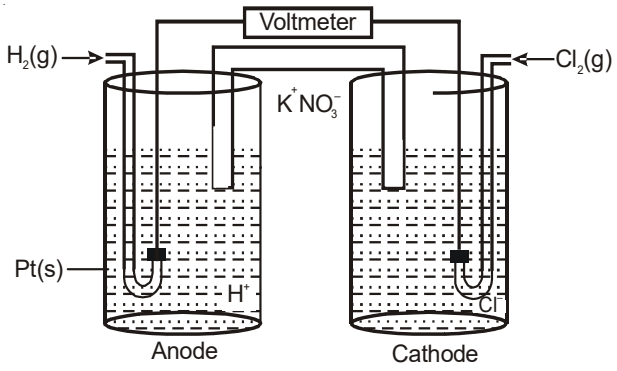


   The concentration of the KOH solution was :

   (A) 0.30 mol L^{-1} (B) 0.15 mol L^{-1}

   (C) 0.12 mol L^{-1} (D) 0.075mol L^{-1}

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. Calculate the cell potential of a cell having reaction: $Ag_2S + 2e^- \rightarrow 2Ag + S^{2-}$ in a solution buffered at pH=3 and which is also saturated with 0.1 M H_2S.

   For $H_2S : K_1 = 10^{-8}$ and $K_2 = 10^{-13}$, $K_{SP}(Ag_2S) = 10^{-49}$, $E°_{Ag+/Ag} = 0.8$. ,

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

   (A) –0.19V

   (B) 1.19V

   (C) –1.19V

   (D) –0.49V

5. Calculate molar conductivity at infinite dilution of the salt $\begin{matrix} COO^-K^+ \\ | \\ COO^-Na^+ \end{matrix}$. If the ionic conductivities at infinite dilution of Ox^{-2}, K^+ and Na^+ are 148.2, 50.1 and 73.5 Ω^{-1} cm^2mol^{-1} respectively

(A) 271.8 $\Omega^{-1}cm^2mol^{-1}$

(B) 135.9 $\Omega^{-1}cm^2mol^{-1}$

(C) 543.6 Ω^{-1} cm^2mol^{-1}

(D) 67.9 $\Omega^{-1}cm^2mol^{-1}$

SECTION - B

Multiple Correct Answer Type

This section contains multiple choice questions. Each question has 4 choices (A), (B), (C) and (D) for its answer, out of which **ONE OR MORE** is/are correct.

6. If $Sn^{+2} + 2e^- \rightarrow Sn; E^o = -0.14V$

$Sn^{+4} + 2e^- \rightarrow Sn^{+2}; E^o = -0.13V$

Then :

(A) Sn^{+2} is unstable and disproportionates to Sn^{+4} and Sn.

(B) Sn^{+2} is stable and disproportionation reaction is not spontaneous.

(C) Sn^{+4} is easily reduced to Sn in aqueous solution.

(D) $Sn^{+4} + Sn \rightarrow 2Sn^{+2}$ is spontaneous.

7.

Electrolyte	KCl	KNO_3	HCl	NaOAc	NaCl
$\wedge_m^\infty (Scm^2mol^{-1})$	149.9	145	426.2	91	126.5

Which of the following is/are correct ?

(A) $\wedge_{AcOH}^\infty$ is 517.2 (B) $\wedge_{HNO_3}^\infty$ is 450

(C) $\wedge_{AcOH}^\infty$ is 390.7 (D) $\wedge_{HNO_3}^\infty$ is 421.3

8. Perdisulphuric acid ($H_2S_2O_8$) can be prepared by electrolytic oxidation of H_2SO_4 as $2H_2SO_4 \rightarrow H_2S_2O_8 + 2H^+ + 2e^-$

Which of the following statements(S) is (are) correct for this electrolysis ?

(A) Oxygen and hydrogen gases are formed as other products at anode and cathode respectively.

(B) Concentrated H_2SO_4 solution can be used during this electrolysis to get $H_2S_2O_8$.

(C) Equivalents of $H_2S_2O_8$ formed is the difference between equivalents of H_2 and O_2 formed.

(D) Equivalents of $H_2S_2O_8$ formed is the sum of equivalents of H_2 and O_2 formed.

9. The cell given is $Mg|Mg^{2+}||Ag^+|Ag(s)$ $\left(E^o_{Mg/Mg^{2+}} = 2.37\ V\right)$ $\left(E^o_{Ag^+/Ag} = 0.80\ V\right)$

For the cell which of the following statements are correct (T=298K)?

(A) The value of $\log_{10}K_{eq}$ is 107.457 for the reaction; $Mg + 2Ag^+ \rightarrow Mg^{2+} + 2Ag$

(B) ε^0 for the cell is 1.57 V

(C) ε^0 for the cell is 3.17 V

(D) The maximum work done is -6.118×10^5 J

10. Standard electrode potential data are useful for understanding the suitability of an oxidant in a reaction. Some half-cell reactions and their standard potential are given below :

$MnO_4^-(aq) + 8H^+(aq) + 5e^- \rightarrow Mn^{2+}(aq) + 4H_2O(l)$ $E^\circ = 1.5\ V$

$Cr_2O_7^{2-}(aq) + 14H^+(aq) + 6e^- \rightarrow 2Cr^{3+}(aq) + 7H_2O(l)$ $E^\circ = 1.38\ V$

$Fe^{3+}(aq) + e^- \rightarrow Fe^{2+}(aq)$ $E^\circ = 0.77\ V$

$Cl_2(g) + 2e^- \rightarrow 2Cl^-(aq)$ $E^\circ = 1.40\ V$

Identify the correct statement(s) regarding the quantitative estimation of aqueous ferrous nitrate in solution.

(A) MnO_4^- can be used in aqueous H_2SO_4

(B) $Cr_2O_7^{2-}$ can be used in aqueous H_2SO_4

(C) MnO_4^- can be used in aqueous HCl

(D) $Cr_2O_7^{2-}$ can be used in aqueous HCl

11. For the given half-cell, $Ag \mid AgCl \mid Cl^-(M)$

The reaction is : $Ag(s) \rightarrow Ag^+(aq) + e$ — (i)

$Ag^+(aq) + Cl^-(aq) \rightleftharpoons AgCl(s)$ — (ii)

$Ag(s) + Cl^-(aq) \rightarrow AgCl(s) + e^-$ — (iii)

Which of the following is (are) true about this half cell?

(A) E^o of reaction (i) and E^o of reaction (iii) are same

(B) E^o of reaction (ii) is zero

(C) E of reaction (i) is same as E of reaction (iii)

(D) Moles of AgCl precipitated is same as moles of Ag used

12. Which of the following electrolytic arrangement(s) will produce oxygen at anode during electrolysis?

(A) Fused NaOH with inert electrodes

(B) Dilute H_2SO_4 with Cu electrodes

(C) Dilute H_2SO_4 with Pt electrodes

(D) Concentrated NaCl with Pt electrodes

13. Which one of the following statement(s) is/are incorrect regarding an electrochemical cell ?

(A) The electrode on which oxidation takes place is called anode

(B) Anode is the negative pole

(C) The direction of the current is same as that of the direction of flow of electrons

(D) The flow of current is partly due to flow of electrons and partly due to flow of ions.

14. Pick up the false Statement(s) : $\left[E^0_{Ca^{2+}/CO} = -0.28, E^0_{Cd^{2+}/Cd} = -0.4\right]$

(A) Galvanic cell reactions are always redox reactions

(B) In a galvanic cell made of cobalt and cadmium electrodes, cobalt electrode acts as cathode

(C) Standard potential increases with increasing concentration of the electrolyte

(D) Calomel electrode is reference electrode having 0.00 potential

15. A metal rod is dipped in a solution of its ions. Its electrode potential is independent of

(A) temperature of the solution

(B) concentration of the solution

(C) area of the metal exposed

(D) nature of the metal

16. After sometime, the voltage of an electrochemical cell becomes zero. This is because

(A) their electrode potential becomes zero

(B) their reduction potential become equal but have opposite sign

(C) their reduction potential become equal and have the same sign

(D) the ions of the electrolyte in the salt bridge stop moving

17. Consider certain observations about electrolysis and mark the correct Statement(s) :

(A) Electric current is used to drive a non-spontaneous reaction

(B) ΔG is negative for chemical process in electrolytic cell during electrolysis.

(C) Cations and anions move towards the cathode and anode, respectively.

(D) Over-voltage is generally associated with evolution of O_2 gas

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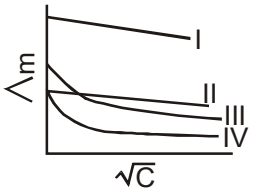
SECTION - C

Linked Comprehension Type

This section contains paragraph. Based upon this paragraph, 2 multiple choice questions have to be answered. Each question has 4 choices (A), (B), (C) and (D) for its answer, out of which **ONE OR MORE THAN ONE** is correct.

Paragraph for Question Nos. 18 and 19

See the graph below and answer the related questions



The variation of Λ_m for four electrolytes are shown above against $\sqrt{C}$. They are KCl, $CuSO_4$, CH_3COOH and HCl

18. Find the correct match of line number against the name of electrolyte

(A) I-KCl, II-$CuSO_4$, III-HCl, IV-CH_3COOH

(B) I-HCl, II-KCl, III-$CuSO_4$, IV-CH_3COOH

(C) I-KCl, II-HCl, III- CH_3COOH, IV-$CuSO_4$

(D) I-KCl, II-CH_3COOH, III-HCl, IV-$CuSO_4$

19. Find the correct explanation relative to figure given above

(A) Line-I could be that of KCl as K^+ is a faster moving ion as compared to H^+

(B) Line-II could be that of HCl as it is a strong electrolyte

(C) Faster increase with lowering concentration in line-III as compared to line-I could be that of $CuSO_4$ as both Cu^{+2} and SO_4^{-2} are bivalent ions

(D) Line-IV is for $CuSO_4$ as it is the weakest electrolyte amongst the species given

SECTION-D

Matrix-Match Type

This **Section D** have "match the following" type question. Question contains two columns, **Col-I** and **Col-II**. Match the entries in **Col-I** with the entries in **Col-II**. One or more entries in **Col-I** may match with one or more entries in **Col-II**.

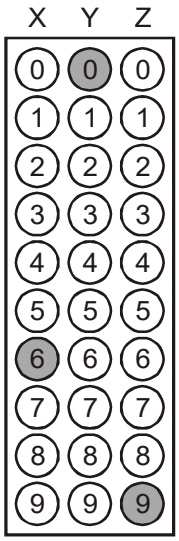
20. Match the following columns:

Column I	Column II
(A) Dilute solution of HCl	(p) O_2 evolved at anode
(B) Dilute solution of NaCl	(q) H_2 evolved at cathode
(C) Concentrated solution of NaCl	(r) Cl_2 evolved at anode
(D) $AgNO_3$ solution	(s) Ag deposited at cathode

SECTION-E

Integer Answer Type

This section contains Integer type questions. The answer to each of the questions is a single digit integer, ranging from 0 to 9. The appropriate bubbles below the respective question numbers in the ORS have to be darkened. For example, if the correct answers to question numbers X, Y and Z(say) are 6, 0 and 9, respectively, then the correct darkening of bubbles will look like the following :



21. For a cell, $A(g) + B^{2+}(aq) \longrightarrow B + A^{2+}(aq)$. The standard emf of cell is found to be 0.295 volt at 25°C. The equilibrium constant at 25°C will be $x \times 10^{10}$

22. An alloy of Pb-Ag weighing 1.08 g was dissolved in dilute HNO_3 and the volume made to 100 mL. A silver electrode was dipped in the solution and the emf of the cell set-up was 0.62 V.

Pt(s), $H_2(g)$ | $H^+(1\ M)$|| $Ag^+(aq)$ | Ag(s).

If E^o_{cell} is 0.80 V, what is the percentage of Ag in the alloy ? (At 25°C, RT/F = 0.06)

23. The conductivity of a saturated solution of CaF_2 at 18°C was found to be 5.2×10^{-5} S cm^{-1} and the conductivity of water used for making the solution was 2×10^{-6}S cm^{-1}. The molar ionic conductivities at infinite dilution of Ca^{2+} and F^- ions are 120 and 65 S cm^2 mol^{-1} respectively. The solubility product of CaF_2 is $4y\times10^{-12}M^3$. The Value of y is _____.

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SECTION - A

Straight Objective Type

This section contains multiple choice questions. Each question has 4 choices (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** is correct.

1. In acid medium, MnO_4^- is an oxidising agent.

$$MnO_4^- + 8H^+ + 5e^- \longrightarrow Mn^{2+} + 4H_2O$$

If H^+ ion concentration is doubled keeping the concentrations of Mn^{2+} and MnO_4^- unchanged, electrode potential (at 25°C) of the half-cell $MnO_4^-, Mn^{2+} / Pt$ will :

(A) Increase by 28.36 m V

(B) Decrease by 28.36m V

(C) Increase by 14.23m V

(D) Decrease by 142.30m V

2. A hydrogen electrode X was placed in a buffer solution of sodium acetate and acetic acid in the ratio a : b and another hydrogen electrode Y was placed in a buffer solution of sodium acetate and acetic acid in the ratio b : a. If reduction potential values for two cells are found to be E_1 and E_2 respectively with respect to standard hydrogen electrode, the pK_a value of the acid can be given as

(A) $\frac{E_1 + E_2}{0.118}$ (B) $\frac{E_2 - E_1}{0.118}$

(C) $-\frac{E_1 + E_2}{0.118}$ (D) $\frac{E_1 - E_2}{0.118}$

3. Calculate the voltage, E, of the cell at 25°C

$Mn(s) \mid Mn(OH)_2(s) \mid Mn^{2+}(x\ M), OH^-(2\times10^{-4}M) \mid\mid Cu^{2+}(0.675M) \mid Cu(s)$

given that $K_{SP} = 2.7\times10^{-13}$ for $Mn(OH)_2(S)$,

$E^0_{Mn^{2+}/Mn} = -1.18V;\ E^0_{Cu^{2+}/Cu} = -.34V$

(A) 1.67V (B) 2.67V

(C) 1.12V (D) 2.92V

4. Calculate the voltage, E, of the cell

$Ag(s) \mid AgIO_3(s) \mid Ag^+(x\ M), HIO_3\ (0.300M) \mid\mid Zn^{2+}\ (0.4M) \mid Zn(s)$

if $K_{SP} = 3\times10^{-8}$ for $AgIO_3(s)$ and $K_a = 0.15$ for HIO_3.

$E^0_{Ag^+/Ag} = 0.8$ V ; $E^0_{Zn^{2+}/Zn} = -0.76$ V

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

(A) –1.17 V (B) –2.17V

(C) –3.02V (D) +1.43

5. Estimate the cell potential of a Daniel cell having 1 M Zn^{++} and originally having 1 M Cu^{++} after sufficient NH_3 has been added to the cathode compartment to make NH_3 concentration 2 M.

K_f for $[Cu(NH_3)_4]^{2+} = 1\times10^{12}$, E^0 for the reaction,

$Zn + Cu^{2+} \longrightarrow Zn^{2+} + Cu$ is 1.1 V.

(A) 0.92V (B) 0.704V

(C) 1.23V (D) 3.26V

6. The overall formation constant for the reaction of 6 mol of CN^- with cobalt (II) is .

1×10^{19}. The standard reduction potential for the reaction

$[Co(CN)_6]^{3-} + e^- \rightarrow [Co(CN)_6]^{4-}$ is –0.83 V.

Calculate the formation constant of $[Co(CN)_6]^{3-}$

Given $Co^{3+} + e^- \rightarrow Co^{2+}$; $E^0 = 1.81$ V

(A) $K_f = 10^{43}$ (B) $K_f = 10^{32}$

(C) $K_f = 10^{63}$ (D) $K_f = 10^{38}$

7. Calculate the equlibrium concentrations of all ions in an ideal solution prepared by mixing 25.00 mL of 0.100M $T\ell^+$ with 25.00mL of 0.200M Co^{3+}.

$E^0(T\ell^+ / T\ell^{3+}) = -1.25$ V ; $E^0(Co^{3+} / Co^{2+}) = 1.84$ V, $\sqrt[3]{1.25} \cong 1$

(A) $T\ell^+ = 10^{-4}$, $Co^{3+} = 2 \times 10^{-8}$

(B) $T\ell^+ = 10^{-6}$, $Co^{3+} = 2 \times 10^{-4}$

(C) $T\ell^+ = 10^{-2}$, $Co^{3+} = 4 \times 10^{-6}$

(D) $T\ell^+ = 10^{-8}$, $Co^{3+} = 2 \times 10^{-8}$

SECTION - B

Multiple Correct Answer Type

This section contains multiple choice questions. Each question has 4 choices (A), (B), (C) and (D) for its answer, out of which **ONE OR MORE** is/are correct.

8. Which of the following is true about the given cell,

$$Ag\,|\,\text{saturated}\,AgCl\,||\,\text{saturated}\,Ag_2CrO_4\,|\,Ag\,?$$

$$(K_{sp}AgCl = 10^{-10}M^2)\quad (K_{sp}Ag_2CrO_4 = 3.2\times10^{-11}M^3)$$

(A) It is an electrolyte concentration cell

(B) It is a non-spontaneous concentration cell.

(C) The net reaction is $Ag^+_C \longrightarrow Ag^+_A$

(D) The EMF of cell is 0.0944V

9. An aqueous solution containing 1M $NiSO_4$ and 1M $S_2O_8^{2-}$ is electrolysed using palladium electrodes at 25°C.

$Ni^2 + 2e^- \rightarrow Ni \qquad E° = -0.25V$

$O_2 + 4H^+ + 4e^- \rightarrow 2H_2O \qquad E° = -1.23V$

$Pd^{2+} + 2e- \rightarrow Pd \qquad E° = 0.92V$

$S_2O_8^{2-} + 2e- \rightarrow 2SO_4^{2-} \qquad E° = 2.0V$

pH of solution is assumed as 7.

Select the correct statement(s) on the basis of above given information (Ignore over-voltage)

(A) Anode reaction : $Pd \rightarrow Pd^{2+} + 2e^-$

(B) Anode reaction : $2H_2O \rightarrow O_2 + 4H^+ + 4e^-$

(C) Cathode reaction : $Ni^{2+} + 2e^- \rightarrow Ni$

(D) Cathode reaction : $2H^+ + 2e^- \rightarrow H_2$

10. For the following cell

Pt $|H_2$ (1 atm)$|CH_3COOH$ (0.1M)$|$ $|CH_3COOH$ (0.01M)$|H_2$ (1 atm)|Pt

K_a (CH_3COOH) = 1.8 × 10^{-5}; log 3.6 = 0.5

(A) Degree of ionization of CH_3COOH (L.H.S.) is 1.34 × 10^{-2}

(B) Degree of ionization of CH_3COOH (R.H.S.) is 4.24 × 10^{-2}

(C) EMF for the cell is –0.4575

(D) The given cell is non-spontaneous

11. Which of the following is correct about the following cell?

Pt $|H_2$ (1 atm)$|C_2H_5COOH(0.15M)|$ $|NH_4OH$ (0.01M)$|H_2$ (1 atm)|Pt

Given that, K_a for C_2H_5COOH = 1.4 × 10^{-5}

K_b for NH_4OH = 1.8 × 10^{-5}

(A) E_{cell} = – 0.37 V

(B) $\Delta G = 0$

(C) $[H^+]$ in NH_4OH = 8.9 × 10^{-8}

(D) $pH_{mixture}$ = 7

SECTION - C

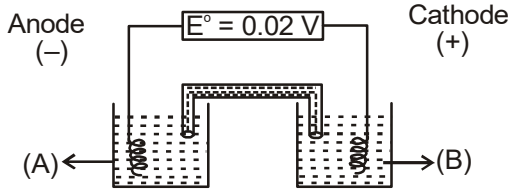
Linked Comprehension Type

This section contains paragraph. Based upon this paragraph, 2 multiple choice questions have to be answered. Each question has 4 choices (A), (B), (C) and (D) for its answer, out of which **ONE OR MORE THAN ONE** is correct.

Paragraph for Question Nos. 12 to 15

The cell potential for the unbalanced chemical reaction:

$$Hg_2^{2+} + NO_3^- + H_3O^+ \rightarrow Hg^{2+} + HNO_2 + H_2O$$



is measured under standard conditions in the electrochemical cell shown in the accompanying diagram.

12. In which dish, the solution is acidic ?

(A) Dish A

(B) Dish B

(C) Both

(D) None of these

13. What is the equilibrium constant for the reaction ?

(A) 1.97 (B) 4.76

(C) 2.18 (D) 1.40

14. How many moles of electrons pass through the circuit when 0.60 mole of Hg^{2+} and 0.30 mole of HNO_2 are produced in the cell that contains 0.50 mole of Hg_2^{2+} and 0.40 mole of NO_3^- at the beginning of the reaction?

(A) 0.30 (B) 0.60

(C) 0.15 (D) 1.20

15. How long will it take to produce 0.10 mole of HNO_2 by this reaction if a current of 10 A passes through the cell ?

(A) 965 s (B) 96500 s

(C) 1930 s (D) 482.5 s

Paragraph for Question Nos. 16 to 19

The Edison storage cell is represented as $Fe(s)|FeO(s)|KOH(aq)|Ni_2O_3(s)|Ni(s)$. The half cell reactions are

$Ni_2O_3(s) + H_2O(l) + 2e^- \rightarrow 2NiO(s) + 2OH^-$; $E^o = +0.40$ V

$FeO(s) + H_2O(l) + 2e^- \rightarrow Fe(s) + 2OH^-$; $E^o = -0.87$ V

16. What is the cell reaction ?

(A) $Ni_2O_3 + Fe(s) \rightarrow 2NiO(s) + FeO(s)$

(B) $2NiO + FeO(s) \rightarrow Ni(s) + Fe_2O_3(s)$

(C) $2NiO + FeO(s) \rightarrow Ni_2O_3(s) + Fe(s)$

(D) None of these

17. What is the standard cell emf ?

(A) 1.27 V (B) 0.47 V

(C) –1.27 V (D) –0.47 V

18. How does cell emf change on increasing the concentration of KOH ?

(A) increases (B) decreases

(C) remains unaffected (D) none of these

19. What is the maximum amount of electrical energy that can be obtained from one mole of Ni_2O_3 ?

(A) 2.54 J (B) 245.1 kJ

(C) 122.56 kJ (D) 90.7 kJ

Paragraph for Question No. 20 and 21

Copper reduces NO_3^- into NO and NO_2 depending upon of HNO_3 in solution. Assuming $[Cu^{2+}] = 0.1$ M, and $P_{NO} = P_{NO_2} = 10^{-3}$ atm and using given data answer the following questions.

$E^o_{Cu^{2+}/Cu} = +0.34$ volt

$E^o_{NO_3^-/NO} = +0.96$ volt

$E^o_{NO_3^-/NO_2} = +0.79$ volt

at 298 K $\frac{RT}{F}(2.303) = 0.06$ volt

20. E_{cell} for reduction of

$NO_3^- \longrightarrow NO$ by Cu (s), when $[HNO_3] = 1M$ is [At T = 298]

(A) ~ 0.61 (B) ~ 0.71

(C) ~ 0.51 (D) ~ 0.81

21. At what HNO_3 concentration thermodynamic tendency for reduction of NO_3^- into NO and NO_2 by copper is same ?

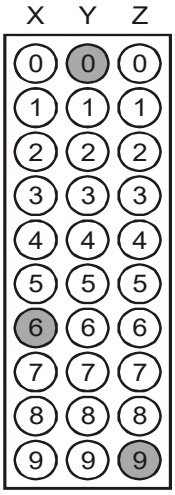
(A) $10^{1.23}$ M (B) $10^{0.56}$ M

(C) $10^{0.66}$ M (D) $10^{0.12}$ M

SECTION-E

Integer Answer Type

This section contains Integer type questions. The answer to each of the questions is a single digit integer, ranging from 0 to 9. The appropriate bubbles below the respective question numbers in the ORS have to be darkened. For example, if the correct answers to question numbers X, Y and Z(say) are 6, 0 and 9, respectively, then the correct darkening of bubbles will look like the following :



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22. In the electrolysis of KI, I_2 is formed at the anode by the reaction;

$$2I^- \rightarrow I_2 + 2e^-$$

After the passage of current of 0.5 ampere for 9650 seconds, I_2 formed required 40 ml of 0.1 M $Na_2S_2O_3 \cdot 5H_2O$ solution in the reaction;

$$I_2 + 2S_2O_3^{2-} \rightarrow S_4O_6^{2-} + 2I^-$$

What is the current efficiency ?

23. Consider the cell, $Ag \mid AgBr \mid Br^- \parallel Cl^- \mid AgCl \mid Ag$ at 25ºC. The K_{sp} of AgBr and AgCl are 5×10^{-13} and 1×10^{-10}. The concentration ratio of $\frac{[Cl^-]}{[Br]}$ ions when the emf of the cell is 0.118V, will be _____.

24. When 0.5 L of 16 M $SnSO_4$ is electrolysed for a period of 100 minutes using a current of 96.5 A and inert electrodes, the final concentration of Sn^{2+} in the solution will be _____.

($E°Sn^{2+}/Sn$ = –0.14 V, $E° Sn^{2+}/Sn^{4+}$= – 0.13V, $E°OH^-/O_2$=–0.4V, $E°SO_4^{2-}/S_2O_8^{2-}$ = –2.0V).

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ANSWERS

LEVEL-1

1. (C)	2. (A)	3. (C)	4. (A)	5. (A)	6. (B,D)
7. (C,D)	8. (A,B,C)	9. (A,C,D)	10. (A,B,D)	11. (C,D)	12. (A,C)
13. (C)	14. (C,D)	15. (C)	16. (C)	17. (A,C)	18. (B)
19. (C)	20. (A-p,q,B-p,q,C-q,r,D-p,s)		21. (1)	22. (1)	23. (8)

LEVEL-2

1. (A)	2. (C)	3. (A)	4. (A)	5. (B)	6. (C)
7. (D)	8. (A,C)	9. (B,C)	10. (A,B,D)	11. (A,C)	12. (B)
13. (B)	14. (B)	15. (C)	16. (A)	17. (A)	18. (C)
19. (B)	20. (B)	21. (A)	22. (8)	23. (2)	24. (4)

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