

JEE MAIN ELECTROCHEMISTRY — PYQS
Max. Marks: 144
Questions: 36
Section A (MCQ) — 17 questions
Q.1 Given at 298 K :

$$E_{\text{Fe}^{2+}/\text{Fe}}^{\ominus} = X \text{ Volt}$$

$$E_{\text{Fe}^{3+}/\text{Fe}}^{\ominus} = Y \text{ Volt}$$

 The $E_{\text{Fe}^{3+}/\text{Fe}^{2+}}^{\ominus}$ in Volt at 298 K is given by :

- [JEE Main 2026 (Online) 8th April Evening Shift]
- (1) $2X - 3Y$ (2) $3Y - 2X$
 (3) $3Y + 2X$ (4) $Y + X$

 Scan or tap for the
full solution

Q.2 Consider the following data.

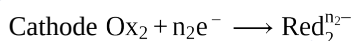
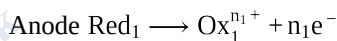
 Electrolyte Λ°_m ($\text{S cm}^2 \text{ mol}^{-1}$)

 BaCl_2 x_1
 H_2SO_4 x_2
 HCl x_3

BaSO_4 is sparingly soluble in water. If the conductivity of the saturated BaSO_4 solution is $x \text{ S cm}^{-1}$ then the solubility product of BaSO_4 can be given as (Here $\Lambda_m = \Lambda^{\circ}_m$)

- [JEE Main 2026 (Online) 6th April Morning Shift]
- (1) $\frac{10^6 x^2}{\alpha^2(x_1 + x_2 - 2x_3)^2}$ (2) $\frac{x^2}{(x_1 + x_2 - 2x_3)^2}$
 (3) $\frac{\alpha^2(x_1 + x_2 - 2x_3)^2}{10^6 x^2}$ (4) $\frac{x^2}{(x_1 + x_2 + 2x_3)^2}$

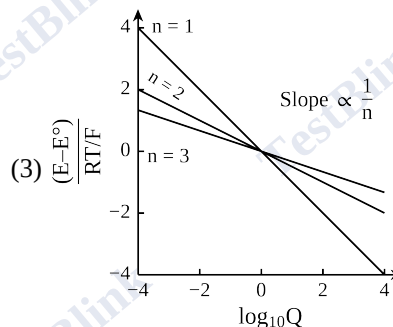
 Scan or tap for the
full solution

Q.3 For a general redox reaction


Which of the following statement is incorrect?

[JEE Main 2026 (Online) 6th April Evening Shift]

- (1) The overall reaction can be written as
 $n_2 \text{Red}_1 + n_1 \text{Ox}_2 \rightleftharpoons n_2 \text{Ox}_1^{n_1+} + n_1 \text{Red}_2^{n_2-}$
 (2) The electrons do not appear in the overall reaction because electrons produced at the anode are consumed at the cathode.


 Here n is the number of electrons transferred in redox reaction.

- (4) If the reaction is carried out reversibly, the electrical work done is equal to the ratio of charge and potential difference through which charge is moved.

 Scan or tap for the
full solution

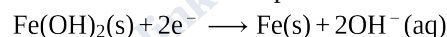
Q.4 One half cell in a voltaic cell is constructed by dipping silver rod in AgNO_3 solution of unknown concentration, other half cell is Zn rod dipped in 1 molar solution of ZnSO_4 .

 A voltage of 1.60 V is measured at 298 K for this cell. What is the concentration of Ag^+ ions used in terms of $\log x$ ($x = [\text{Ag}^+]$)?

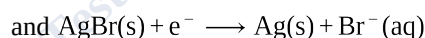
$$E_{\text{Zn}^{2+}/\text{Zn}}^{\ominus} = -0.76 \text{ V}, E_{\text{Ag}^+/\text{Ag}}^{\ominus} = +0.80 \text{ V}, \frac{2.303RT}{F} = 0.059 \text{ V}$$

- [JEE Main 2026 (Online) 5th April Evening Shift]
- (1) $\frac{2}{3.9}$ (2) $\frac{4}{5.9}$ (3) $\frac{2.9}{2}$ (4) $\frac{5.9}{4}$

 Scan or tap for the
full solution

Q.5 An electrochemical cell is constructed using half cells in the direction of spontaneous change:


$$E^{\ominus} = -0.88 \text{ V}$$

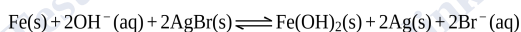


$$E^{\ominus} = +0.07 \text{ V}$$

Which of the following options is correct?

[JEE Main 2026 (Online) 2nd April Morning Shift]

(1) Overall reaction



(2) $E^\theta_{\text{cell}} = -0.95 \text{ V}$

(3) Fe is reduced in the electrochemical cell

(4) E^θ_{cell} is an extensive property

Scan or tap for the full solution



Q.6 In the given electrochemical cell, $\text{Ag(s)}|\text{AgCl(s)}|\text{FeCl}_2(\text{aq}), \text{FeCl}_3(\text{aq})|\text{Pt(s)}$ at 298 K, the cell potential (E_{cell}) will increase when :

- A. Concentration of Fe^{2+} is increased.
- B. Concentration of Fe^{3+} is decreased.
- C. Concentration of Fe^{2+} is decreased.
- D. Concentration of Fe^{3+} is increased.
- E. Concentration of Cl^- is increased.

Choose the correct answer from the options given below :

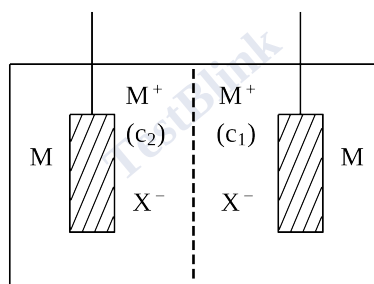
[JEE Main 2026 (Online) 23rd January Morning Shift]

- (1) C, D and E Only
- (2) A and B Only
- (3) B Only
- (4) A and E Only

Scan or tap for the full solution



Q.7



Semipermeable membrane

Consider the above electrochemical cell where a metal electrode (M) is undergoing redox reaction by forming M^+ ($\text{M} \rightarrow \text{M}^+ + \text{e}^-$). The cation M^+ is present in two different concentrations c_1 and c_2 as shown above. Which of the following statement is correct for generating a positive cell potential?

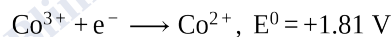
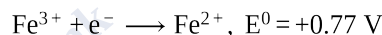
[JEE Main 2026 (Online) 23rd January Evening Shift]

- (1) If c_1 is present at anode, then $c_1 > c_2$.
- (2) If c_1 is present at cathode, then $c_1 > c_2$.
- (3) If c_1 is present at cathode, then $c_1 < c_2$.
- (4) If c_1 is present at anode, then $c_1 = c_2$.

Scan or tap for the full solution



Q.8 Consider the following reduction processes :



The tendency to act as reducing agent decreases in the order :

[JEE Main 2026 (Online) 22nd January Evening Shift]

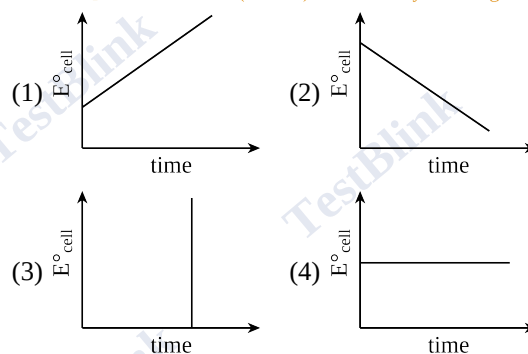
- (1) $\text{Al} > \text{Fe}^{2+} > \text{Cr} > \text{Co}^{2+}$
- (2) $\text{Al} > \text{Cr} > \text{Co}^{2+} > \text{Fe}^{2+}$
- (3) $\text{Cr} > \text{Fe}^{2+} > \text{Al} > \text{Co}^{2+}$
- (4) $\text{Al} > \text{Cr} > \text{Fe}^{2+} > \text{Co}^{2+}$

Scan or tap for the full solution



Q.9 For a closed circuit Daniell cell, which of the following plots is the accurate one at a given temperature?

[JEE Main 2026 (Online) 21st January Evening Shift]



Scan or tap for the full solution



Q.10 Given below are two statements :

Statement-I: Mohr's salt is composed of only three types of ions – ferrous, ammonium and sulfate.

Statement-II: If the molar conductances at infinite dilution for ferrous, ammonium and sulfate ions are x_1 , x_2 and $x_3 \text{ S cm}^2 \text{ mol}^{-1}$, respectively then the molar conductance for Mohr's salt solution at infinite dilution would be given by $x_1 + x_2 + 2x_3$

In the light of the given statements, choose the correct answer from the options given below :

[JEE Main 2025 (Online) 7th April Morning Shift]

- (1) Both Statement-I and Statement-II are true
- (2) Statement-I is true but Statement-II is false
- (3) Both Statement-I and Statement-II are false
- (4) Statement-I is false but Statement-II is true

Scan or tap for the full solution



Q.11 Given below are two statements :

1 M aqueous solutions of each of $\text{Cu}(\text{NO}_3)_2$, AgNO_3 , $\text{Hg}_2(\text{NO}_3)_2$, $\text{Mg}(\text{NO}_3)_2$ are electrolysed using inert electrodes. Given: $E^\circ_{\text{Ag}^+/\text{Ag}} = 0.80 \text{ V}$,

$E^\circ_{\text{Hg}_2^{2+}/\text{Hg}} = 0.79 \text{ V}$, $E^\circ_{\text{Cu}^{2+}/\text{Cu}} = 0.34 \text{ V}$ and

$E^\circ_{\text{Mg}^{2+}/\text{Mg}} = -2.37 \text{ V}$.

Statement-I: With increasing voltage, the sequence of deposition of metals on the cathode will be Ag, Hg and Cu.

Statement-II: Magnesium will not be deposited at the cathode instead oxygen gas will be evolved at the cathode.

In the light of the above statements, choose the most appropriate answer from the options given below :

[JEE Main 2025 (Online) 7th April Evening Shift]

- (1) Both Statement-I and Statement-II are incorrect
- (2) Statement-I is incorrect but Statement-II is correct
- (3) Statement-I is correct but Statement-II is incorrect
- (4) Both Statement-I and Statement-II are correct

Scan or tap for the full solution



Q.12 On charging the lead storage battery, the oxidation state of lead changes from x_1 to y_1 at the anode and from x_2 to y_2 at the cathode. The values of x_1 , y_1 , x_2 , y_2 are respectively :

[JEE Main 2025 (Online) 4th April Morning Shift]

- (1) 0, +2, +4, +2
- (2) +2, 0, 0, +4
- (3) +4, +2, 0, +2
- (4) +2, 0, +2, +4

Scan or tap for the full solution



Q.13 Correct order of limiting molar conductivity for cations in water at 298 K is :

[JEE Main 2025 (Online) 3rd April Morning Shift]

- (1) $\text{H}^+ > \text{Na}^+ > \text{K}^+ > \text{Ca}^{2+} > \text{Mg}^{2+}$
- (2) $\text{H}^+ > \text{Ca}^{2+} > \text{Mg}^{2+} > \text{K}^+ > \text{Na}^+$
- (3) $\text{Mg}^{2+} > \text{H}^+ > \text{Ca}^{2+} > \text{K}^+ > \text{Na}^+$
- (4) $\text{H}^+ > \text{Na}^+ > \text{Ca}^{2+} > \text{Mg}^{2+} > \text{K}^+$

Scan or tap for the full solution



Q.14 The standard cell potential (E°_{cell}) of a fuel cell based on the oxidation of methanol in air that has been used to power television relay station is measured as 1.21 V. The standard half cell reduction potential for O_2 ($E^\circ_{\text{O}_2/\text{H}_2\text{O}}$) is 1.229 V. Choose the correct statement :

[JEE Main 2025 (Online) 3rd April Evening Shift]

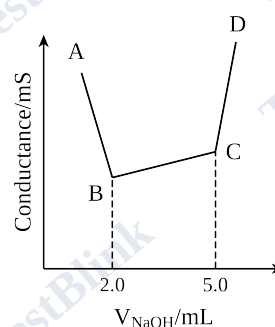
- (1) Reactants are fed at one go to each electrode.
- (2) Oxygen is formed at the anode.
- (3) The standard half cell reduction potential for the reduction of CO_2 ($E^\circ_{\text{CO}_2/\text{CH}_3\text{OH}}$) is 19 mV
- (4) Reduction of methanol takes place at the cathode.

Scan or tap for the full solution



Q.15 40 mL of a mixture of CH_3COOH and HCl (aqueous solution) is titrated against 0.1 M NaOH solution conductometrically. Which of the following statement is correct?

[JEE Main 2025 (Online) 3rd April Evening Shift]



- (1) The concentration of CH_3COOH in the original mixture is 0.005 M
- (2) The concentration of HCl in the original mixture is 0.005 M
- (3) CH_3COOH is neutralised first followed by neutralisation of HCl
- (4) Point 'C' indicates the complete neutralisation of HCl

Scan or tap for the full solution



Q.16 For a $\text{Mg} | \text{Mg}^{2+}(\text{aq}) || \text{Ag}^+(\text{aq}) | \text{Ag}$ the correct Nernst Equation is :

[JEE Main 2025 (Online) 29th January Morning Shift]

- (1) $E_{\text{cell}} = E^\circ_{\text{cell}} - \frac{RT}{2F} \ln \frac{[\text{Ag}^+]^2}{[\text{Mg}^{2+}]}$
- (2) $E_{\text{cell}} = E^\circ_{\text{cell}} - \frac{RT}{2F} \ln \frac{[\text{Mg}^{2+}]}{[\text{Ag}^+]}$
- (3) $E_{\text{cell}} = E^\circ_{\text{cell}} - \frac{RT}{2F} \ln \frac{[\text{Ag}^+]}{[\text{Mg}^{2+}]}$
- (4) $E_{\text{cell}} = E^\circ_{\text{cell}} + \frac{RT}{2F} \ln \frac{[\text{Ag}^+]^2}{[\text{Mg}^{2+}]}$

Scan or tap for the full solution



Q.17 The molar conductivity of a weak electrolyte when plotted against the square root of its concentration, which of the following is expected to be observed?

[JEE Main 2025 (Online) 29th January Morning Shift]

- (1) Molar conductivity increases sharply with increase in concentration.
- (2) Molar conductivity decreases sharply with increase in concentration.
- (3) A small increase in molar conductivity is observed at infinite dilution.
- (4) A small decrease in molar conductivity is observed at infinite dilution.

Scan or tap for the full solution



Section B (Numerical) — 19 questions

- Q.18** At 298 K, the molar conductivity of x% (w/w) MX solution (aqueous) is $123.5 \text{ S cm}^2 \text{ mol}^{-1}$. The conductance of same solution is $1.9 \times 10^{-3} \text{ S}$. The value of x is $\text{_____} \times 10^{-2}$.
(Given: cell constant = 1.3 cm^{-1} ; molar mass of MX is 75 g mol^{-1} , density of aqueous solution of MX at 298 K is 1.0 g mL^{-1})

[JEE Main 2026 (Online) 5th April Evening Shift]

Scan or tap for the full solution



- Q.19** An electrochemical cell consists of the following two redox couples, $\text{M}^{x+}(\text{aq})/\text{M}(\text{s})$ [$E_{\text{red}}^{\ominus} = +0.15 \text{ V}$] and $\text{Fe}^{3+}(\text{aq})/\text{Fe}(\text{s})$ [$E_{\text{red}}^{\ominus} = -0.036 \text{ V}$]. The cell EMF (E_{cell}) is recorded to be 0.2057 V . If the reaction quotient of the electrochemical reaction is found to be 10^{-2} , then the value of x is _____ . (Nearest integer)

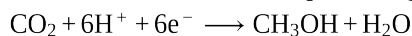
[Given : M is a p-block metal and $\frac{2.303RT}{F} = 0.059 \text{ V}$]

[JEE Main 2026 (Online) 4th April Evening Shift]

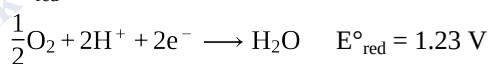
Scan or tap for the full solution



- Q.20** Consider the following two half-cell reactions along with the standard reduction potential given :



$$E_{\text{red}}^{\ominus} = 0.02 \text{ V}$$



A fuel cell was set up using the above two reactions such that the cell operates under the standard condition of 1 bar pressure and 298 K temperature. The fuel cell works with 80% efficiency. If the work derived from the cell using 1 mol of CH_3OH is used to compress an ideal gas isothermally against a constant pressure of 1 kPa, then the change in the volume of the gas,

$$\Delta V = \text{_____ m}^3. \text{ (nearest integer)}$$

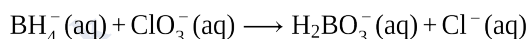
Given : $F = 96500 \text{ C mol}^{-1}$

[JEE Main 2026 (Online) 2nd April Evening Shift]

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- Q.21** Consider the following redox reaction taking place in acidic medium



If the Nernst equation for the above balanced reaction is

$$E_{\text{cell}} = E_{\text{cell}}^{\ominus} - \frac{RT}{nF} \ln Q,$$

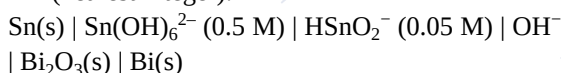
then the value of n is _____ . (Nearest integer)

[JEE Main 2026 (Online) 28th January Morning Shift]

Scan or tap for the full solution



- Q.22** A volume of x mL of 5 M NaHCO_3 solution was mixed with 10 mL of 2 M H_2CO_3 solution to make an electrolytic buffer. If the same buffer was used in the following electrochemical cell to record a cell potential of 235.3 mV, then the value of x = _____ mL (nearest integer).



Consider up to one place of decimal for intermediate calculations

$$\text{Given : } E_{\text{Sn}(\text{OH})_6^{2-} \mid \text{HSnO}_2^-}^{\ominus} = -0.9 \text{ V}$$

$$E_{\text{Bi}_2\text{O}_3 \mid \text{Bi}}^{\ominus} = -0.44 \text{ V}$$

$$\left[\begin{array}{l} \text{p}K_{\text{a}}(\text{H}_2\text{CO}_3) = 6.11 \\ \frac{2.303RT}{F} = 0.059 \text{ V} \end{array} \right]$$

$$\text{Antilog}(1.29) = 19.5$$

[JEE Main 2026 (Online) 28th January Evening Shift]

Scan or tap for the full solution



- Q.23** For strong electrolyte Λ_m increases slowly with dilution and can be represented by the equation $\Lambda_m = \Lambda_m^{\ominus} - A c^{1/2}$

Molar conductivity values of the solutions of strong electrolyte AB at 18°C are given below :

c [mol L ⁻¹]	0.04	0.09	0.16	0.25
Λ_m [S cm ² mol ⁻¹]	96.1	95.7	95.3	94.9

The value of constant A based on the above data [in $\text{S cm}^2 \text{ mol}^{-1}/(\text{mol/L})^{1/2}$] unit is _____ .

[JEE Main 2026 (Online) 28th January Evening Shift]

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- Q.24** The molar conductance of an infinitely dilute solution of ammonium chloride was found to be $185 \text{ S cm}^2 \text{ mol}^{-1}$ and the ionic conductances of hydroxide and chloride ions are 170 and $70 \text{ S cm}^2 \text{ mol}^{-1}$, respectively. If molar conductance of 0.02 M solution of ammonium hydroxide is $85.5 \text{ S cm}^2 \text{ mol}^{-1}$, its degree of dissociation is given by $x \times 10^{-1}$. The value of x is _____ . (Nearest integer)

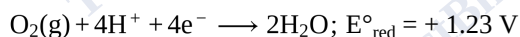
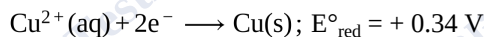
[JEE Main 2025 (Online) 4th April Evening Shift]

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- Q.25** Electricity is passed through an acidic solution of Cu^{2+} till all the Cu^{2+} was exhausted, leading to the deposition of 300 mg of Cu metal. However, a current of 600 mA was continued to pass through the same solution for another 28 minutes by keeping the total volume of the solution fixed at 200 mL. The total volume of oxygen evolved at STP during the entire process is _____ mL. (Nearest integer)

[Given:



Molar mass of Cu = 63.54 g mol⁻¹

Molar mass of O₂ = 32 g mol⁻¹

Faraday Constant = 96500 C mol⁻¹

Molar volume at STP = 22.4 L]

[JEE Main 2026 (Online) 24th January Morning Shift]

Scan or tap for the full solution



- Q.26** Molar conductivity of a weak acid HQ of concentration 0.18 M was found to be $\frac{1}{30}$ of the molar conductivity of another weak acid HZ with concentration of 0.02 M. If $\lambda^\circ_{\text{Q}^-}$ happened to be equal to $\lambda^\circ_{\text{Z}^-}$, then the difference of the pK_a values of the two weak acids (pK_a(HQ) – pK_a(HZ)) is _____ (Nearest integer).

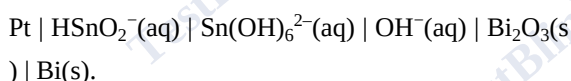
[Given: degree of dissociation (α) $\ll 1$ for both weak acids, λ° : limiting molar conductivity of ions]

[JEE Main 2026 (Online) 24th January Evening Shift]

Scan or tap for the full solution

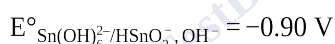
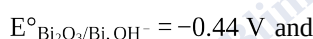


- Q.27** Consider the following electrochemical cell at 298 K



If the reaction quotient at a given time is 10⁶, then the cell EMF (E_{cell}) is _____ $\times 10^{-1}$ V (Nearest integer).

Given the standard half-cell reduction potential as



[JEE Main 2026 (Online) 22nd January Morning Shift]

Scan or tap for the full solution



- Q.28** Consider the following electrochemical cell :
Pt | O₂(g)(1 bar) | HCl(aq) || M²⁺(aq, 1.0 M) | M(s)
The pH above which, oxygen gas would start to evolve at anode is _____ (nearest integer).

[Given : $E^\circ_{\text{M}^{2+}/\text{M}} = 0.994 \text{ V}$
 $E^\circ_{\text{O}_2/\text{H}_2\text{O}} = 1.23 \text{ V}$ } standard reduction

potential and $\frac{RT}{F}(2.303) = 0.059 \text{ V}$ at the given condition]

[JEE Main 2026 (Online) 22nd January Evening Shift]

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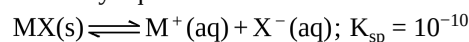
- Q.29** The pH and conductance of a weak acid (HX) were found to be 5 and $4 \times 10^{-5} \text{ S}$, respectively. The conductance was measured under standard condition using a cell where the electrode plates having a surface area of 1 cm² were at a distance of 15 cm apart. The value of the limiting molar conductivity is _____ S m² mol⁻¹. (nearest integer)
(Given : degree of dissociation of the weak acid (α) $\ll 1$)

[JEE Main 2026 (Online) 21st January Morning Shift]

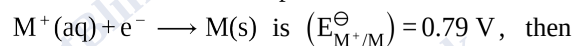
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- Q.30** MX is a sparingly soluble salt that follows the given solubility equilibrium at 298 K.



If the standard reduction potential for



the value of the standard reduction potential for the metal/metal insoluble salt electrode $E^\circ_{\text{X}^-/\text{MX}(\text{s})/\text{M}}$ is

_____ mV. (nearest integer)

[Given: $\frac{2.303RT}{F} = 0.059 \text{ V}$]

[JEE Main 2026 (Online) 21st January Evening Shift]

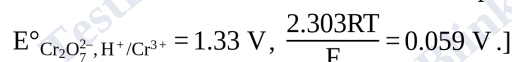
Scan or tap for the full solution



- Q.31** Consider the following half cell reaction
 $\text{Cr}_2\text{O}_7^{2-}(\text{aq}) + 6\text{e}^- + 14\text{H}^+(\text{aq}) \longrightarrow 2\text{Cr}^{3+}(\text{aq}) + 7\text{H}_2\text{O}(\ell)$
The reaction was conducted with the ratio of $\frac{[\text{Cr}^{3+}]^2}{[\text{Cr}_2\text{O}_7^{2-}]} = 10^{-6}$. The pH value at which the EMF of the half cell will become zero is _____.

(nearest integer value)

[Given: standard half cell reduction potential

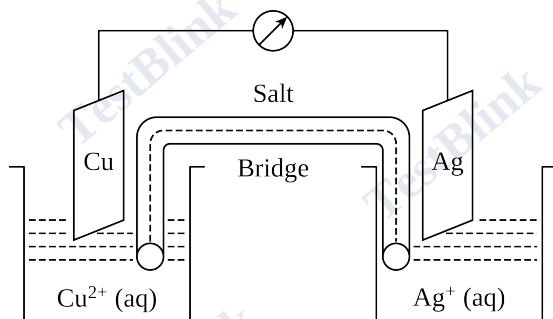


[JEE Main 2025 (Online) 8th April Evening Shift]

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- Q.32** 1 Faraday of electricity was passed through Cu^{2+} (1.5 M, 1 L)/Cu and 0.1 Faraday was passed through Ag^+ (0.2 M, 1 L)/Ag electrolytic cells. After this the two cells were connected as shown below to make an electrochemical cell. The emf of the cell thus formed at 298 K is _____ mV (nearest integer)



Given : $E^\circ_{\text{Cu}^{2+}/\text{Cu}} = 0.34 \text{ V}$

$E^\circ_{\text{Ag}^+/\text{Ag}} = 0.8 \text{ V}$

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

[JEE Main 2025 (Online) 7th April Morning Shift]

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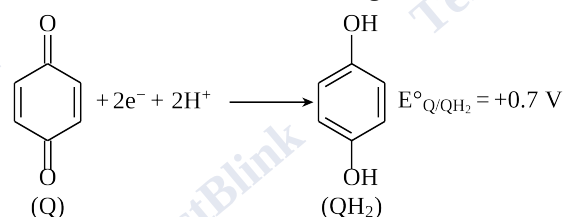


- Q.33** Consider the following electrochemical cell at standard condition.

$\text{Au(s)} \mid \text{QH}_2, \text{Q} \mid \text{NH}_4\text{X} (0.01 \text{ M}) \parallel \text{Ag}^+ (1 \text{ M}) \mid \text{Ag(s)}$

$E_{\text{cell}} = +0.4 \text{ V}$

The couple QH_2/Q represents quinhydrone electrode, the half cell reaction is given below:



[Given : $E^\circ_{\text{Ag}^+/\text{Ag}} = +0.8 \text{ V}$ and $\frac{2.303RT}{F} = 0.06 \text{ V}$]

The pK_b value of the ammonium halide salt (NH_4X) used here is _____. (nearest integer)

[JEE Main 2025 (Online) 2nd April Morning Shift]

Scan or tap for the full solution



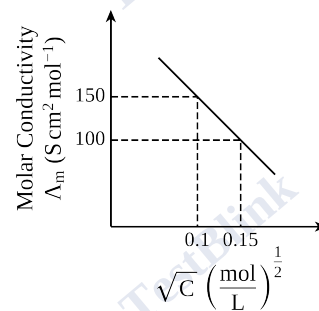
- Q.34** 0.2% (w/v) solution of NaOH is measured to have resistivity 870.0 mΩ m. The molar conductivity of the solution will be _____ $\times 10^2 \text{ mS dm}^2 \text{ mol}^{-1}$. (Nearest integer)

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- Q.35** Given below is the plot of the molar conductivity vs $\sqrt{\text{concentration}}$ for KCl in aqueous solution.



If, for the higher concentration of KCl solution, the resistance of the conductivity cell is 100Ω , then the resistance of the same cell with the dilute solution is 'x' Ω.

The value of x is _____. (Nearest integer)

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- Q.36** Electrolysis of 600 mL aqueous solution of NaCl for 5 min changes the pH of the solution to 12. The current in Amperes used for the given electrolysis is _____. (Nearest integer).

[JEE Main 2025 (Online) 28th January Evening Shift]

Scan or tap for the full solution



ANSWER KEY

Section A (MCQ) — 17 questions

Ques.	1	2	3	4	5	6	7	8	9	10	11
Ans.	2	1	4	2	1	1	2	4	4	2	3
Ques.	12	13	14	15	16	17					
Ans.	4	2	3	2	4	2					

Section B (Numerical) — 19 questions

Ques.	18	19	20	21	22	23	24
Ans.	15	2	560	24	78	4	3
Ques.	25	26	27	28	29	30	31
Ans.	111	2	4	4	6	200	10
Ques.	32	33	34	35	36		
Ans.	400	6	23	150	2		