



CHEMISTRY

ELECTROCHEMISTRY

Name: _____ Date: _____ Class: XII Sec: ____

Choose the correct answer

- Standard electrode potential of $\text{Sn}^{4+}/\text{Sn}^{2+}$ couple is 0.15V & Cr^{3+}/Cr couple is -0.74V. The two have connected in their standard state to make a cell. Calculate cell potential.(2023)
a) 0.89V b) -0.89V c) 0.59V d) -0.59V
- Which of the following is affected by catalyst ? (2024)
(a) H (b) G (c) Ea (d) S
- Dilution affects both conductivity and molar conductivity. How does it affect? (2023)
a) Molar conductivity increases and conductivity decreases with dilution b) Molar conductivity decreases and conductivity increases with dilution c) Both decreases with dilution d) Both increases with dilution.

Answer the following

- For the following electrochemical cells, give the cell representation. Also write the Nernst equation for these cells at 25⁰ C
a) $\text{Mg(s)} + \text{Ag}^+(\text{aq}) \rightarrow \text{Mg}^{2+}(\text{aq}) + \text{Ag(s)}$
b) $\text{Cu}^{2+}(\text{aq}) + \text{Ni(s)} \rightarrow \text{Ni}^{2+}(\text{aq}) + \text{Cu(s)}$
c) $\text{F}_2(\text{s}) + 2\text{I}^-(\text{aq}) \rightarrow 2\text{F}^-(\text{aq}) + \text{I}_2(\text{s})$
- Why is equilibrium constant K related to only E^0 cell and not E_{cell} ?
- Electrolysis of KBr (aq) gives Br_2 at anode but electrolysis of KF (aq) does not give F_2 . Give reason for disparity in behavior.
- Use the data to answer the following . Justify your answer giving reason:

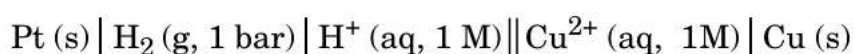
E^0 values	Cr	Mn	Fe	Co
$E^0 \text{M}^{2+}/\text{M}$	-0.91	- 1.18	-0.44	-0.28
$E^0 \text{M}^{3+}/\text{M}^{2+}$	- 0.41	+1.57	+0.77	+1.97

- Which is a stronger reducing agent in aqueous medium, Cr^{2+} or Fe^{2+} and why?
 - Which is the most stable ion in +3 oxidation state and why?
- Write the cell reaction and calculate the emf of the following cell at 298 K .
 $\text{Sn(s)} / \text{Sn}^{2+} (0.001 \text{ M}) // \text{H}^+ (0.020 \text{ M}) / \text{H}_2 (\text{g}) (1 \text{ bar}) / \text{Pt (s)}$ (Given $E^0 \text{Sn}^{+2} / \text{Sn} = -0.14 \text{ V}$)
 - If specific conductance of 0.25M KCl at 25⁰C is $2.56 \times 10^{-2} \text{ S/cm}$, find Λ_m .

7. Calculate the molar conductance of Ba(OH)_2 . The molar ionic conductance of Ba^{2+} and OH^- ions are 127 and $199 \text{ S cm}^2 \text{ mol}^{-1}$ respectively.
8. $\Lambda^0_m \text{ NH}_4\text{Cl}$, $\Lambda^0_m \text{ NaOH}$ & $\Lambda^0_m \text{ NaCl}$ are 129.8, 217.4 & $108.9 \text{ Scm}^2/\text{mol}$ respectively. Molar conductivity of $1 \times 10^{-2} \text{ M}$ solution of NH_4OH is $9.33 \text{ Scm}^2/\text{mol}$. Calculate the degree of dissociation of NH_4OH . **(2025)**
9. Conductivity of $2 \times 10^{-3} \text{ M}$ methanoic acid is $8 \times 10^{-5} \text{ S cm}^{-1}$. Calculate its molar conductivity and degree of dissociation if Λ^0_m for methanoic acid is $404 \text{ Scm}^2 \text{ mol}^{-1}$.

10. (2024)

- (i) A cell and its emf is given below :

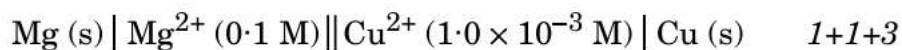


emf of the cell = $+ 0.34 \text{ V}$.

Write the reduction half-reaction at cathode.

- (ii) How is standard Gibbs energy for a reaction related to equilibrium constant ?

- (iii) Calculate emf of the given cell :



Given : $E^\circ_{\text{Cu}^{2+}/\text{Cu}} = + 0.34 \text{ V}$, $E^\circ_{\text{Mg}^{2+}/\text{Mg}} = - 2.37 \text{ V}$

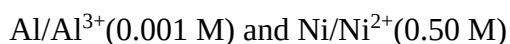
($\log 100 = 2$)



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11. Two electrolytic cells containing silver nitrate solution and copper sulphate solution are connected in series. A steady current of 2.5 amp was passed through them till 1.078 g of Ag were deposited. How long did the current flow ? What weight of copper will be deposited ? ($\text{Ag} = 107.8 \text{ u}$, $\text{Cu} = 63.5 \text{ u}$).

12. A voltaic cell is set up at 25°C with the following half cells:



Write an equation for the reaction that occurs when the cell generates an electric current and determine the cell potential. [$E^\circ_{\text{Ni}^{2+}/\text{Ni}} = -0.25 \text{ V}$ and $E^\circ_{\text{Al}^{3+}/\text{Al}} = -1.66 \text{ V}$]

12. Calculate the standard cell potential of the galvanic cell in which the following reaction takes place.

$\text{Fe}^{2+} + \text{Ag}^+ \rightarrow \text{Fe}^{3+} + \text{Ag}$. Calculate ΔG^0 and equilibrium constant of the reaction.

$E^0_{\text{Ag}^+/\text{Ag}} = 0.80\text{V}$, $E^0_{\text{Fe}^{3+}/\text{Fe}^{2+}} = 0.77\text{V}$.

13. The Gibbs energy for the decomposition of Al_2O_3 at 500°C is as follows:

$2/3\text{Al}_2\text{O}_3 \rightarrow 4/3\text{Al} + \text{O}_2$; $\Delta_r G^0 = +966 \text{ kJ/mol}$.

Calculate the potential difference needed for electrolytic reduction of Al_2O_3 at 500°C .

14. On diluting two electrolytes A & B the Λ_m of A increases 25 times and that of B increases 2.5 times. Which of the two electrolytes is strong? Justify your answer graphically. (2023)

15. The electrical resistance of a column of 0.05 mol L^{-1} NaOH solution of diameter 1 cm and length 50 cm is $5.55 \times 10^3 \text{ ohm}$. Calculate the conductivity.

16. The electrical resistance of a column of 0.05 M KOH solution of cell constant 60 cm^{-1} is $5.4 \times 10^3 \text{ ohm}$. Calculate its resistivity, conductivity and molar conductivity.

17.a) Why is lead storage battery regarded as a secondary cell? b) Give two examples of the fuels used in the fuel cell. (2022)

18. (a) Write the Arrhenius equation. (b) Define half-life of a reaction.

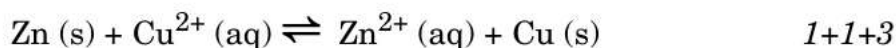
19. (2023)

(i) State Kohlrausch's law of independent migration of ions.

(ii) How much electricity in terms of Faraday is required to produce 40 g of Al from molten Al_2O_3 ?

(Given : atomic mass of Al = 27 u)

(iii) Calculate $\log K_c$ for the following reaction at 298 K :



Given : $E^0_{\text{Zn}^{2+}/\text{Zn}} = -0.76 \text{ V}$, $E^0_{\text{Cu}^{2+}/\text{Cu}} = +0.34 \text{ V}$

Reasoning Assertion Questions

1. Assertion: Conductance of a solution decreases with dilution of an electrolytic solution. Reason: The number of ions in 1 liter of solution increases with dilution of an electrolytic solution.

2. Assertion: The molar conductance of weak electrolyte at infinite dilution is equal to the sum of molar conductance of cation and anion.

Reason: Kohlrausch's law is applicable for both strong and weak electrolytes.

3. Assertion: Cell potential changes with time.

Reason: Change in concentration varies the electrode potential.