YAKEEN NEET 2.0

2026

Electrochemistry

Physical Chemistry | Lecture -3

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Topics to be covered

1. Medics Test, Revision of Last Class
2. Electrochemical cell
3. S.H.E., Gibbs free energy
4. Home work from modules

Rule to Attend Class

1. Always sit in a peaceful environment with headphone and be ready with your copy and pen.
2. Never ever attend a class from in between or don't join a live class in the middle of the chapter.
3. Make sure to revise the last class before attending the next class & always complete your home work along with DPP.
4. Never ever engage in chat whether live or recorded on the topic which is not being discussed in current class as by doing so u can be blocked by the admin team or your subscription can be cancelled.

Rule to Attend Class

5. Try to make maximum notes during the class if something is left then u can use the notes pdf after the class to complete the remaining class.
6. Always ask your doubts in doubt section to get answer from faculty. Before asking any doubt please check whether same doubt has been asked by someone or not.
7. Don’t watch the videos in high speed if you want to understand better.


There is one big flaw in your Preparation that's name is Backlog ? What do we say to Backlog ?
NOT TODAY !!!

MEDICS

Mastery
Checks your grasp over NEET-level concepts

Evaluation
Judging both knowledge and test-smartness

Decision Making
Testing your speed + accuracy under pressure

Intuition
Some answers need gut + logic – can you spot the trick?

Concepts
It's all about strong basics – no shortcuts here

Strategy
The MEDICS test – built for those who heal, hustle, and hope.

pOH of H_2O is 7.0 at 298 K. If water is heated at 350 K, which of the following statement should be true?

(a) pOH will decrease T↑ pH↓ pOH↓

(b) pOH will increase

(c) pOH will remain 7.0

(d) concentration of H^+ ions will increase but that of OH^- will decrease.

Which of the following has the highest degree of ionisation? α↑ V↑ C↓

(a) 1 M NH_3

(b) 0.001 M NH_3

(c) 0.1 M NH_3

(d) 0.0001 M NH_3

If an aqueous solution at 25° C has twice as many OH^- as pure water its pOH will be :

$[OH^-] = 2 \times [OH^-]_{\text{pure water}}$

$= 2 \times 10^{-7}$

(a) 6.699

$pOH = -\log 2 \times 10^{-7}$

$= -[\log 2 + \log 10^{-7}]$

$= -[0.3 - 7]$

$= 6.7$

(b) 7.307

$pOH = 7 - \log 2$

$= 7 - 0.3$

$= 6.7$

(c) 7

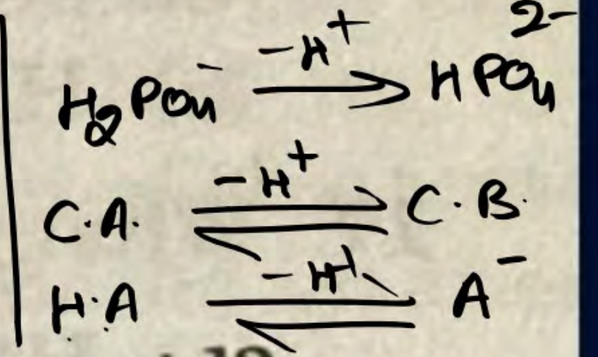
(d) 6.98

Three reactions involving $H_2PO_4^-$ are given below :

(P) $H_3PO_4 + H_2O \longrightarrow H_3O^+ + H_2PO_4^-$

(Q) $H_2PO_4^- + H_2O \longrightarrow HPO_4^{2-} + H_3O^+$

(R) $H_2PO_4^- + OH^- \longrightarrow H_3PO_4 + O^{2-}$



In which of the above $H_2PO_4^-$ acts as an acid?

(a) Q only (b) P and Q

(c) R only (d) P only

$H_2O \xrightarrow{-H^+} OH^-$

$[Al(H_2O)_2(OH)_4]^-$

The conjugate base of $[Al(H_2O)_3(OH)_3]$ is :

(a) $[Al(H_2O)_3(OH)_2]^+$ (b) $[Al(H_2O)_3(OH)_2O]^-$

(c) $[Al(H_2O)_3(OH)_3]^-$ (d) $[Al(H_2O)_2(OH)_4]^-$

4/5

Tomorrow → Lec-6 to Lec-10 ionic eq

Moderate

Revision of Last Class

S.R.P ↑ Reduces itself ⇒ S.O.A

S.R.P ↓ or S.O.P ↑ Oxidises itself ⇒ S.R.A

$Zn + CuSO_4 \longrightarrow ZnSO_4 + Cu$

$Zn^0 + Cu^{+2} \longrightarrow Zn^{+2} + Cu^0$

Zn → S.R.P ↑

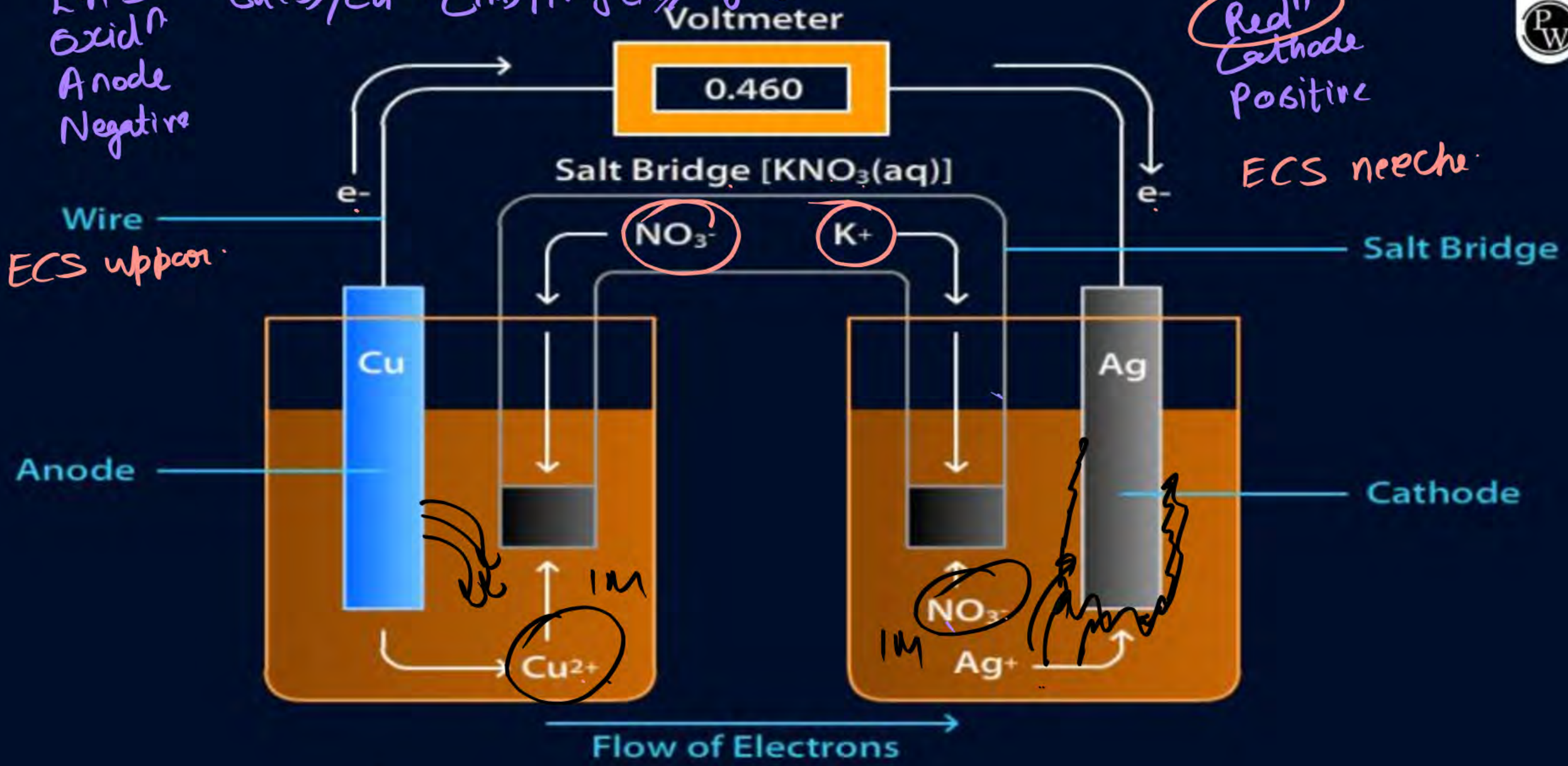
S.R.P ↓ Activity ↑

L.H.S. Oxidn Anode Negative

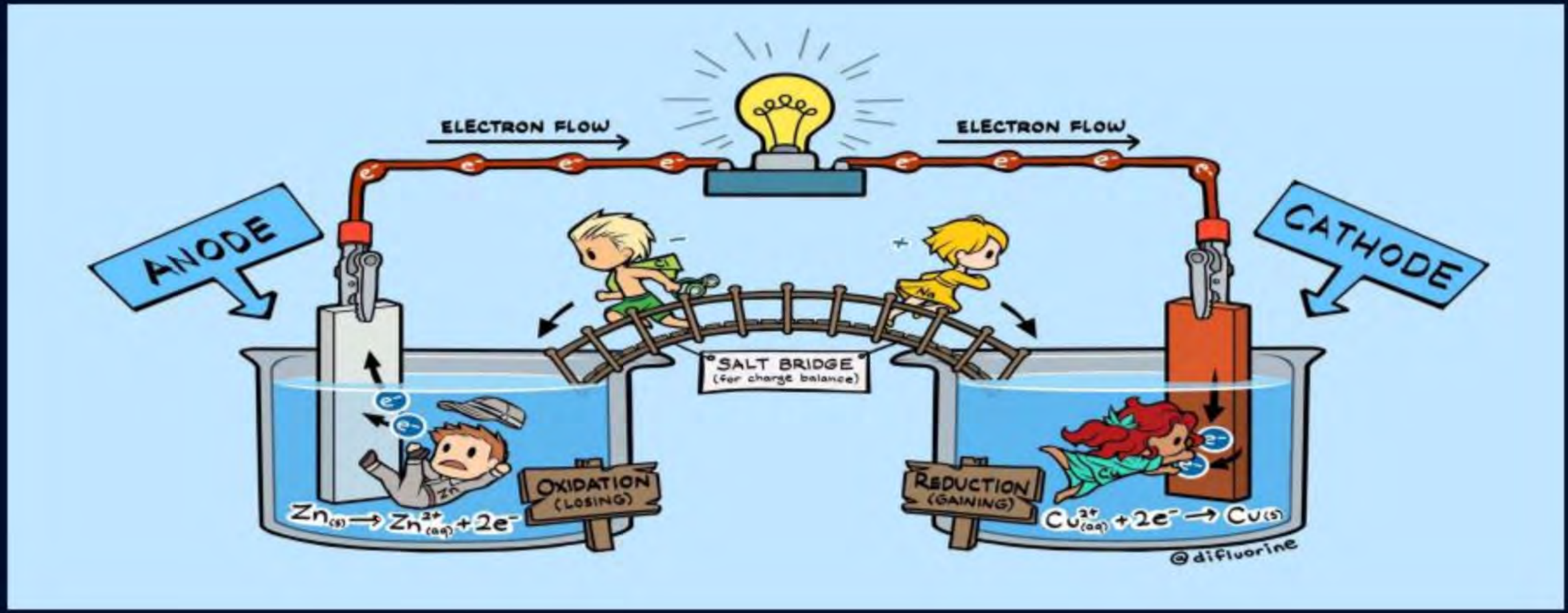
$Cu(s)/Cu^{2+}(1M)\,||\,Ag^{+}(1M)/Ag(s)$

R.H.S. Redn Cathode Positive

ECS neeche



Electrochemical Cell



MIT

① Cell representation :

L.H.S. R.H.S.

$M(s) / M^{n+}(C_1) || M'^{n+}(C_2) / M'(s)$

Salt bridge

② E°_{Cell} = Standard e.m.f. of Cell

$= E^\circ_{Anode} + E^\circ_{Cathode}$

E°_{Anode} → S.O.P

$E^\circ_{Cathode}$ → S.R.P.

✓ $E^\circ_{Cell} = E^\circ_{Cathode} - E^\circ_{anode}$

$E^\circ_{Cathode}$ → S.R.P

E°_{anode} → S.R.P.

③ E°_{Cell} = (+)ve ⇒ rxn occur.

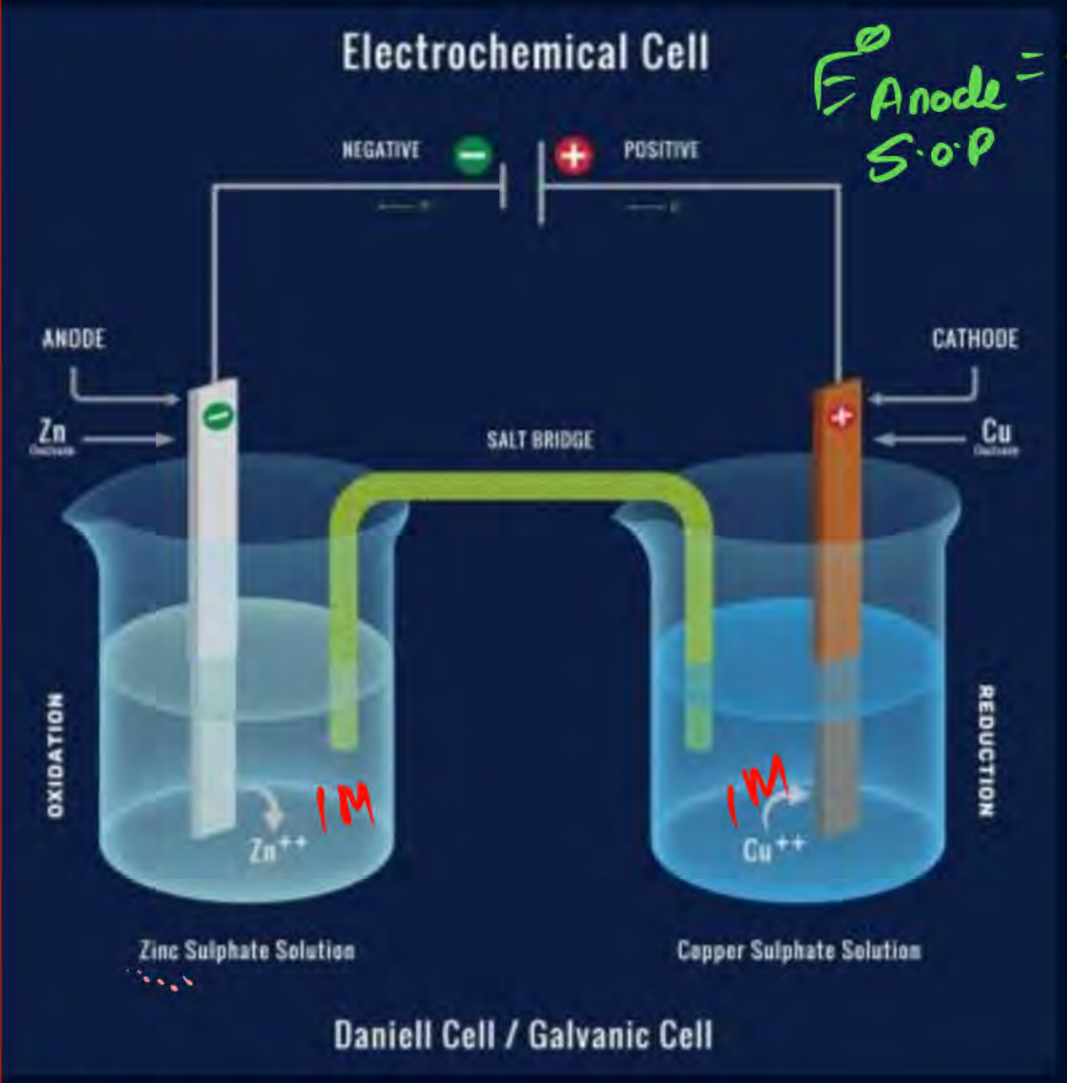
④ Metal + Metal ion

S.R.P low ← M + M'^{n+} → M' + M^{n+}

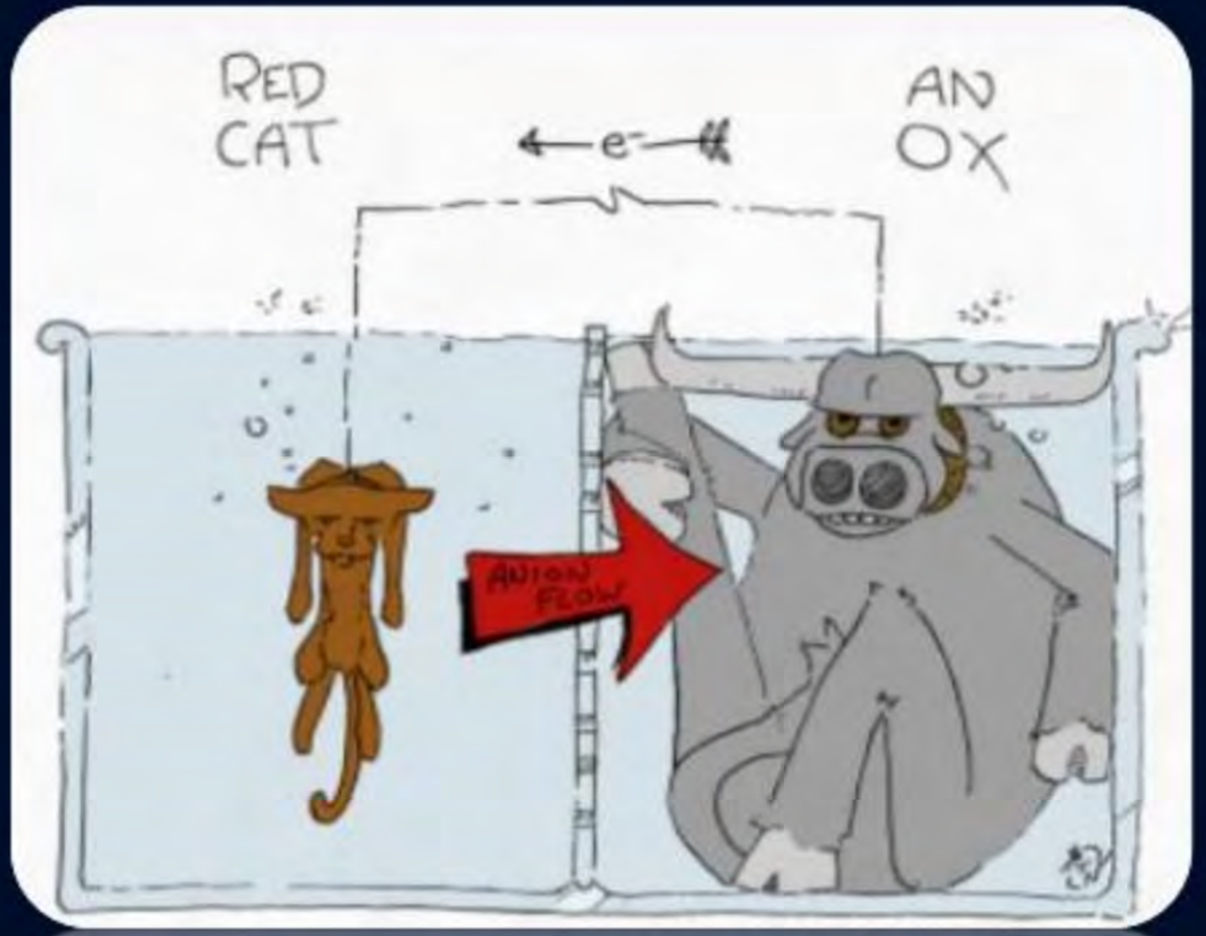
M'^{n+} → S.R.P high

E°_{Cell} = (+)ve.

$Zn(s) / Zn^{2+}(1M) || Cu^{2+}(1M) / Cu(s)$



E°_{Anode} S.O.P = $-E^\circ_{Anode}$ S.R.P


RED
CAT
e⁻
AN
OX
ANION
FLOW

QUESTION

Zn can displaced?

(A) Mg for its aqueous solution

(B) Cu from its aqueous solution

(C) Na from its aqueous solution

(D) Al from its aqueous solution

S.R.P low

$Zn + Mg^{2+} \rightarrow$ ✗

$Zn + Cu^{2+} \rightarrow Zn^{2+} + Cu$

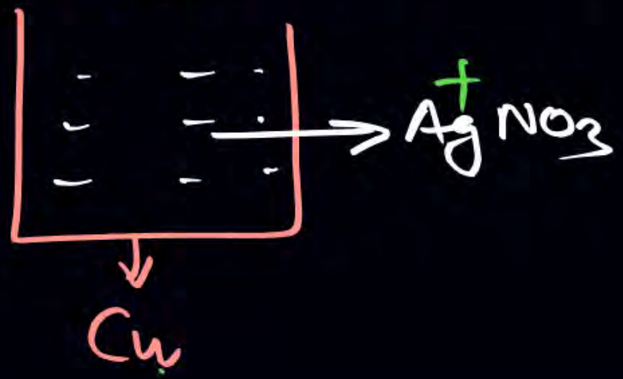
S.R.P high

$Zn + Na^{+} \rightarrow$ ✗

$Zn + Al^{3+} \rightarrow$ ✗

Q Can we store aq. $AgNO_3$ in Copper beaker

Ans E°_{cell} = (+)ve ∴ ΔG° < 0 ∴ reaction occurs ∴ we can't store it.



$$Cu + Ag^+ \rightarrow Cu^{2+} + Ag$$

Cu → S.R.P. low

Ag^+ → S.R.P. high

$$E^\circ_{cell} = E^\circ_{Ag^+/Ag} - E^\circ_{Cu^{2+}/Cu}$$

$$= 0.8 - 0.34$$

$$= 0.46\ V$$

QUESTION – (AIIMS 1999)

Which cannot displace hydrogen from its compound?

(A) Al

(B) Fe

(C) Hg

(D) Pb

$Hg + H_2SO_4 \longrightarrow$ No rxn.

↓

ECS down

↓

S.R.P. high

QUESTION (AIPMT(Pre.) 2012)

Standard electrode potential for Sn^{4+}/Sn^{2+} couple is +0.15 V and that for the Cr^{3+}/Cr couple is –0.74 V. These two couples in their standard state are connected to make a cell. The cell potential will be:

(A) +1.19 V

(B) +0.89 V

(C) +0.18 V

(D) +1.83 V

$E^{\circ}_{cell} = E^{\circ}_{Cathode} - E^{\circ}_{Anode}$

(High S.R.P.) (low S.R.P.)

$= 0.15 - (-0.74)$

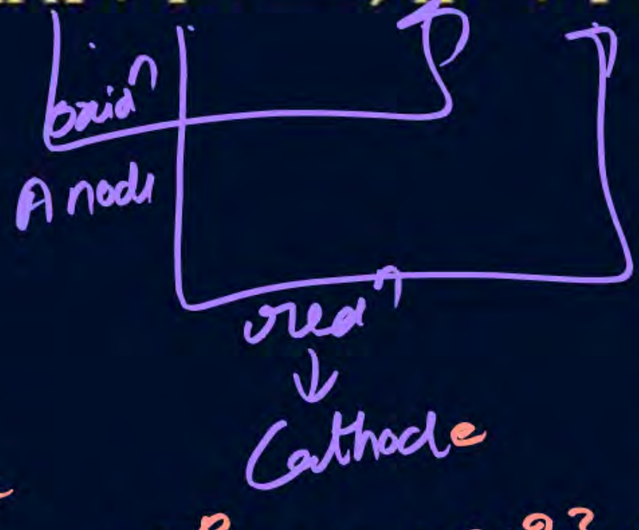
$= 0.89\ V$

QUESTION

The standard reduction potentials for Zn^{2+}/Zn, Ni^{2+}/Ni and Fe^{2+}/Fe are −0.76, −0.23 and −0.44 V respectively. The reaction $X + Y^{2+} \longrightarrow X^{2+} + Y$ will be spontaneous when

Zn Ni Fe

$\longrightarrow E^\circ_{cell} = (+)ve$



(A) X = Ni, Y = Zn ✗

(B) X = Fe, Y = Zn ✗

(C) X = Zn, Y = Ni ✓

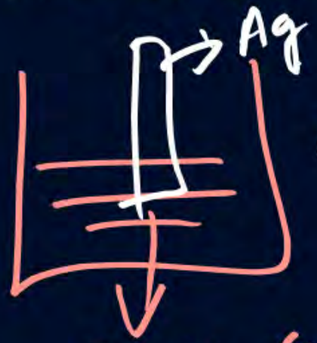
(D) X = Ni, Y = Fe

$Zn + Ni^{2+} \rightarrow Ni + Zn^{2+} \Rightarrow E^\circ_{cell} = -0.23 - (-0.76)$

$= +0.53\ V$

QUESTION

When an aqueous solution of $CuSO_4$ is stirred with a silver spoon then:



$Ag + Cu^{2+} \rightarrow$ No rn.

$CuSO_4(aq.)$ ↓ slow S.R.P.

(A) Cu^{+} will be formed

(B) Ag^{+} will be formed

(C) Cu^{2+} will be deposited

(D) None of these

$$E^{\circ}_{cell} = E^{\circ}_{Cathode} - E^{\circ}_{anode}$$

$E^{\circ}_{Cathode}$ ↓ S.R.P. E°_{anode} ↓ S.R.P.

Anode :

$$Zn \longrightarrow Zn^{2+} + 2e^- \quad E_1^{\circ} = E^{\circ}_{Zn/Zn^{2+}}$$

$n_1 = 2$

Cathode

$$Cu^{2+} + 2e^- \longrightarrow Cu \quad E_2^{\circ} = E^{\circ}_{Cu^{2+}/Cu}$$

$n_2 = 2$

$$Zn + Cu^{2+} \longrightarrow Zn^{2+} + Cu \quad E_3^{\circ}$$

$n_3 = 2$

$$\Delta G_3^{\circ} = \Delta G_1^{\circ} + \Delta G_2^{\circ}$$

$$+n_3 F E_3^{\circ} = +n_1 F E_1^{\circ} + n_2 F E_2^{\circ}$$

$$\not{2} E^{\circ}_{cell} = \not{2} E^{\circ}_{Zn/Zn^{2+}} + \not{2} E^{\circ}_{Cu^{2+}/Cu}$$

$$E^{\circ}_{cell} = E^{\circ}_{Cu^{2+}/Cu} - E^{\circ}_{Zn^{2+}/Zn}$$

QUESTION (AIPMT (Main) 2011)

A solution contains Fe^{2+}, Fe^{3+} and I^- ions. This solution was treated with iodine at 35° C. E° for Fe^{3+}, Fe^{2+} is +0.77 V and E° for $I_2/2I^-$ = 0.536 V. The favourable redox reaction is:

(A) I_2 will be reduced to I^-

(B) There will be not redox reaction

(C) I^- will be oxidised to I_2

(D) Fe^{2+} will be oxidised to Fe^{3-}

$Fe^{2+}, Fe^{3+}, I^- + I_2(s)$

$Fe^{3+} + I^- \longrightarrow Fe^{2+} + I_2(s)$

QUESTION – (AIIMS 2016)

Given that the standard reduction potentials for M^+/M and N^+/N electrodes at 298 K are 0.52 V and 0.25 V respectively. Which of the following is correct in respect of the following electrochemical cell ?

$$M/M^+ \,||\, N^+/N$$

(Anode) (Cathode)

$E^\circ_{cell} = 0.25 - 0.52 = -0.27\,V$

(A) The overall cell reaction is a spontaneous reaction.

(B) The standard EMF of the cell is –0.27 V.

(C) The standard EMF of the cell is 0.77V.

(D) The standard EMF of the cell is –0.77 V.

QUESTION

dec. electropositive character.
inc. S.R.P.

The position of some metals in the electrochemical series in decreasing electropositive character is Mg > Al > Zn > Cu > Ag. What will happened if copper spoon is used to stirred solution of aluminium nitrate?

(A) The spoon gets coated with aluminium

$Cu + Al^{3+} \rightarrow X$

(B) An alloy of aluminium and copper is formed

(C) No reaction occurs ✓

(D) The solution starts turning blue

Standard Hydrogen Electrode (S.H.E.) or Normal Hydrogen electrode (N.H.E.)

#MIT

anode : $E^{\circ}_{H_2/H^+} = 0V$

$H_2(g) \rightarrow 2H^+ + 2e^-$

Anode half cell

$Pt, H_2(g) / H^+(1M)$

Cathode : $E^{\circ}_{H^+/H_2} = 0V$

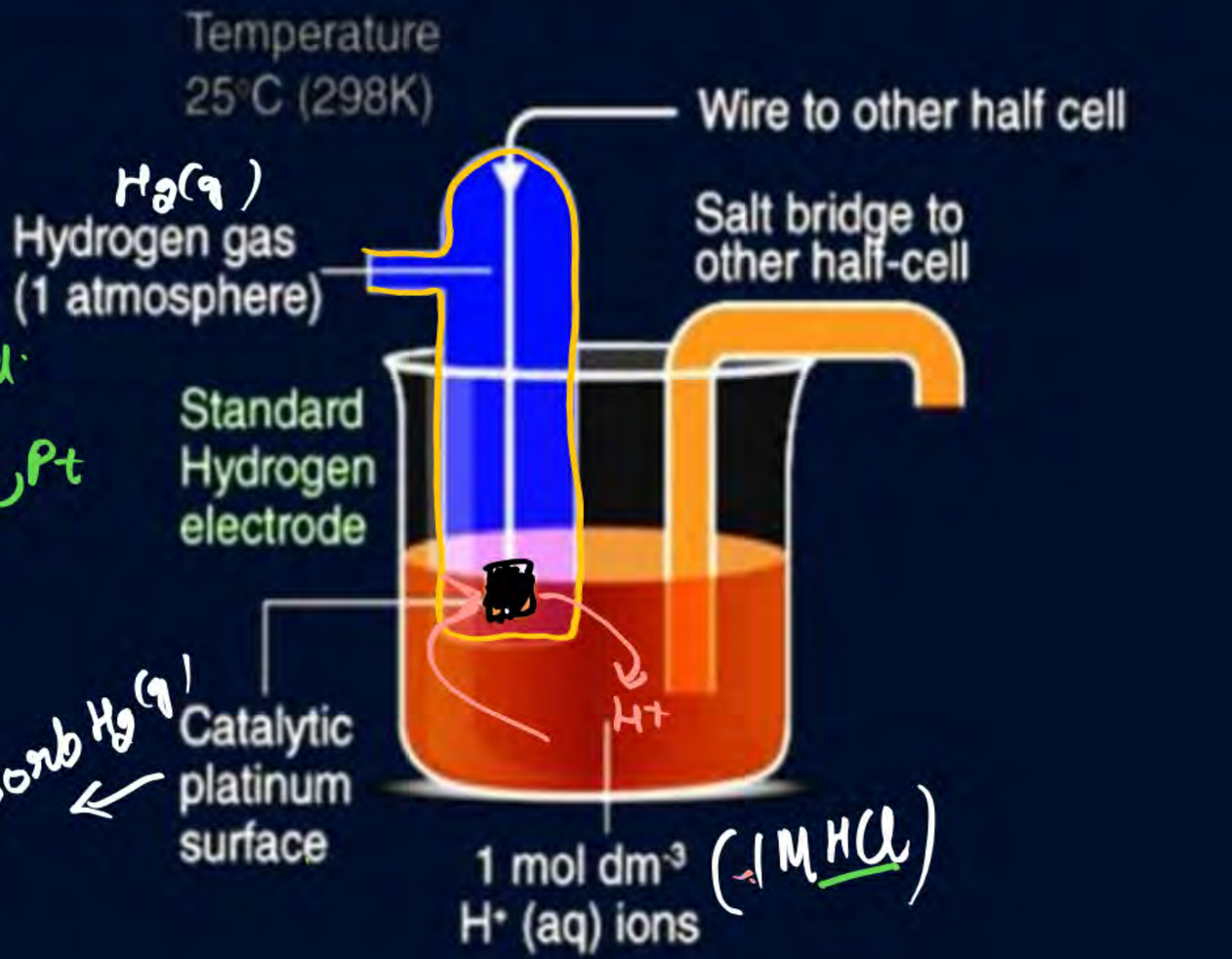
$2H^+ + 2e^- \rightarrow H_2(g)$

Cathode half cell

$H^+(1M) / H_2(g), Pt$

to find S.E.P. of any metal

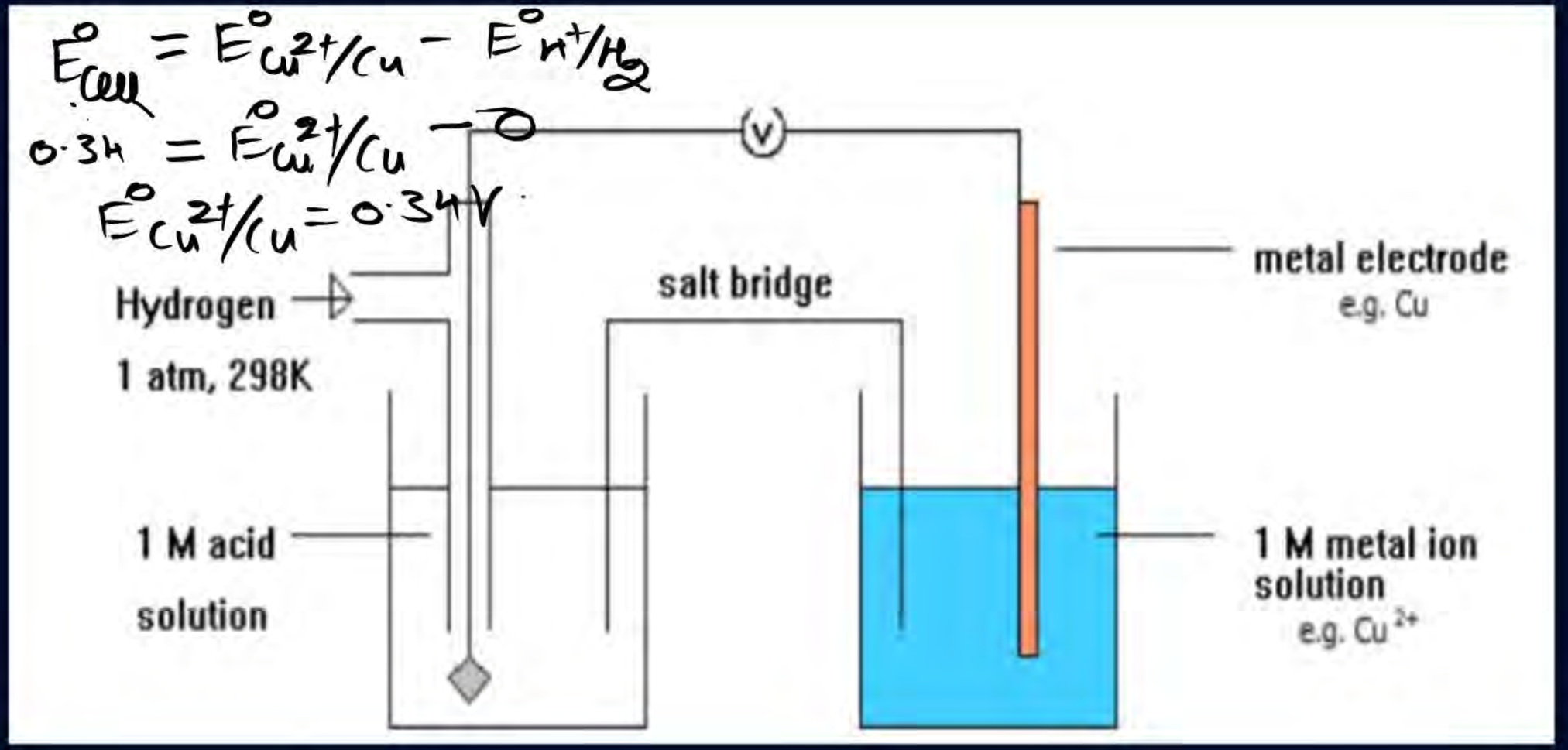
Couple it with S.H.E.



$E^\circ_{cell} = E^\circ_{Cu^{2+}/Cu} - E^\circ_{H^+/H_2}$

$0.34 = E^\circ_{Cu^{2+}/Cu} - 0$

$E^\circ_{Cu^{2+}/Cu} = 0.34\,V$

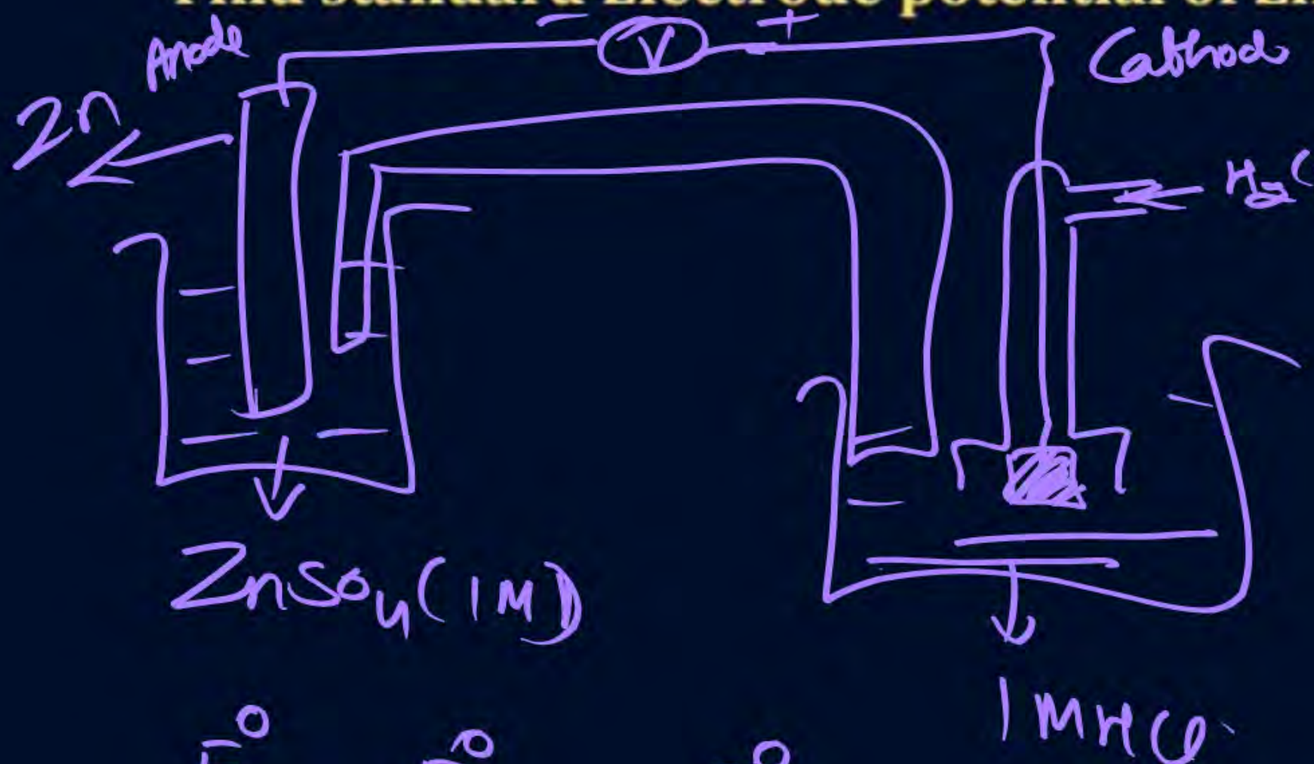


QUESTION

Find standard Electrode potential of Cu?

QUESTION

Find standard Electrode potential of Zinc?



$$E^\circ_{Cell} = E^\circ_{H^+/H_2} - E^\circ_{Zn^{2+}/Zn}$$

$$0.76 = 0 - E^\circ_{Zn^{2+}/Zn}$$

$$E^\circ_{Zn^{2+}/Zn} = -0.76\,V$$

Zn | uppar → S.R.P ↓ Anode

ECS

H_2 | neeche → S.R.P ↑ Cathode

QUESTION

For the electrochemical cell $Pt(s) \mid H_2(g) \mid H^+(1\ M) \mid\mid Cu^{2+}(1\ M) \mid Cu(s)$, which one of the following statements is true?

A. H^+ ions are formed at anode and Cu is deposite at cathode

B. H_2 liberated at cathode and Cu id deposite at anode

C. Oxidation occurs at cathode

D. Reduction occurs at anode

QUESTION

A or B + C + HCl → H_2

D + HCl → ✗

Based on the following information arrange four metals A, B, C and D in order of decreasing ability to act as reducing agents:

(I) Only A, B and C react with 1 M HCl to give $H_2(g)$

(II) When C is added to solution of the other metal ions, metallic B and D are formed

(III) Metal C does not reduce A^{n+}.

S.R.P. S.R.P. S.R.P.

A, B, C < $H_2(g)$ < D

(A) C > A > B > D

(B) C > A > D > B

(C) A > C > D > B

(D) A > C > B > D

D > B > C > A

S.R.P.T.

Red. agent T.

$C + B^+ \rightarrow B$

$C + D^+ \rightarrow D$

$C + A^+ \rightarrow$ No rn.

S.R.P.

B > C

D > C

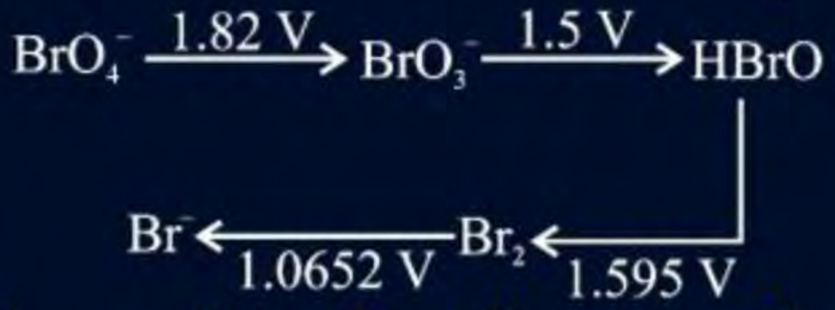
C > A

Latimer diagram

1 Page

QUESTION-(NEET 2018)

Consider the change in oxidation state of Bromine corresponding to different emf values as shown in the diagram below:



Then the species undergoing disproportionation is:

(A) BrO_3^-

(B) BrO_4^-

(C) HBrO

(D) Br_2

QUESTION – (NCERT Exemplar)

The difference between the electrode potentials of two electrodes when no current is drawn through the cell is called _____.

A. Cell potential

B. Cell emf

C. Potential difference

D. Cell voltage

Gibbs Free Energy and E.M.F. of Cell

1 Page

QUESTION

A button cell used watches function as following:

$Zn(s) + Ag_2O(s) + H_2O \longrightarrow 2Ag(s) + Zn^{2+}(aq) + 2OH^-(aq)$, if half cell potentials are $Zn^{2+}(aq) + 2e^- \longrightarrow Zn(s)$; $E° = -0.76$ V

$Ag_2O(s) + H_2O(l) + 2e^- \longrightarrow 2Ag(s) + 2OH^-(aq)$; $E° = 0.34$ V

The Cell potential will be:

(A) 1.34 V

(B) 1.10 V

(C) 0.42 V

(D) 0.84 V

QUESTION (NEET 2019)

For the cell reaction: $2Fe^{3+}(aq) + 2I^{-}(aq) \longrightarrow 2Fe^{2+}(aq) + I_2(aq)$ $E^\circ = 0.24$ V at 298 K. The standard Gibbs energy ($\Delta_r G^\circ$) of the cell reaction is: [Given that Faraday constant F = 96500 C mol^{-1}]

(A) 23.16 kJ mol^{-1}

(B) –46.32 kJ mol^{-1}

(C) –23.16 kJ mol^{-1}

(D) 46.32 kJ mol^{-1}

QUESTION (AIPMT (Mains) 2012)

The Gibb's energy for the decomposition of Al_2O_3 at 500°C is as follows:

$\frac{2}{3}Al_2O_3 \longrightarrow \frac{4}{3}Al + O_2$, $\Delta rG^\circ = -966\ kJ\ mol^{-1}$

The potential difference needed for electrolytic reduction of Al_2O_3 at 500°C is at least the

(A) 5.0 V

(B) 4.5 V

(C) 3.0 V

(D) 2.5 V

QUESTION (NEET (Phase-II) 2016)

If the E°_{Cell} for a given reaction has a negative value, which of the following gives the correct relationship for the values of ΔG° and K_{eq}?

(A) $\Delta G^\circ > 0; K_{eq} < 1$

(B) $\Delta G^\circ > 0; K_{eq} > 1$

(C) $\Delta G^\circ < 0; K_{eq} > 1$

(D) $\Delta G^\circ < 0; K_{eq} < 1$

QUESTION

The cell reaction $2Ag^+(aq) + H_2(g) \longrightarrow 2H^+(aq) + 2Ag(s)$, is best represented by:

(A) $Ag(s) \mid Ag^+(aq) \mid\mid H^+(aq) \mid H_2(g) \mid Pt(s)$

(B) $Pt(s) \mid H_2(g) \mid H^+(aq) \mid\mid Ag^+(aq) \mid Ag(s)$

(C) $Ag(s) \mid Ag^+(aq) \mid\mid H_2(g) \mid H^+(aq) \mid Pt(s)$

(D) $Ag^+(aq) \mid Ag(s) \mid\mid H_2(g) \mid H^+(aq)$

QUESTION

Consider the following equations for a cell reaction:

$A + B \longrightarrow C + D$; $E^\circ = x$ volt, $K_{eq} = K_1$

$2A + 2B \longrightarrow 2C + 2D$; $E^\circ = y$ volt, $K_{eq} = K_2$

Then:

A $x = y, K_1 = K_2$

B $x = 2y, K_1 = 2K_2$

C $x = y, K_1^2 = K_2$

D $x^2 = y, K_1^2 = K_2$

QUESTION

What is the standard electrode potential for the reduction of HClO?

$HClO(aq) + H^+(aq) + 2e^- \longrightarrow Cl^-(aq) + H_2O(l)$ $E^\circ_{ClO^-/Cl^-} = ?$

Given: $Cr^{2+}(aq) \longrightarrow Cr^{3+}(aq) + e^-$, $E^\circ = 0.41\ V$

$HClO(aq) + H^+(aq) + 2Cr^{2+}(aq) \longrightarrow 2Cr^{3+}(aq) + Cl^-(aq) + H_2O(l)$, $E^\circ_{cell} = 1.80$

A 1.39

B 1.54

C 1.22

D 0.90

QUESTION

Standard electrode potential of SHE at 298 K is:

A 0.05 V

B 0.10 V

C 0.50 V

D 0.00 V

QUESTION

The nature of curve of E°_{cell} vs log K_c is:

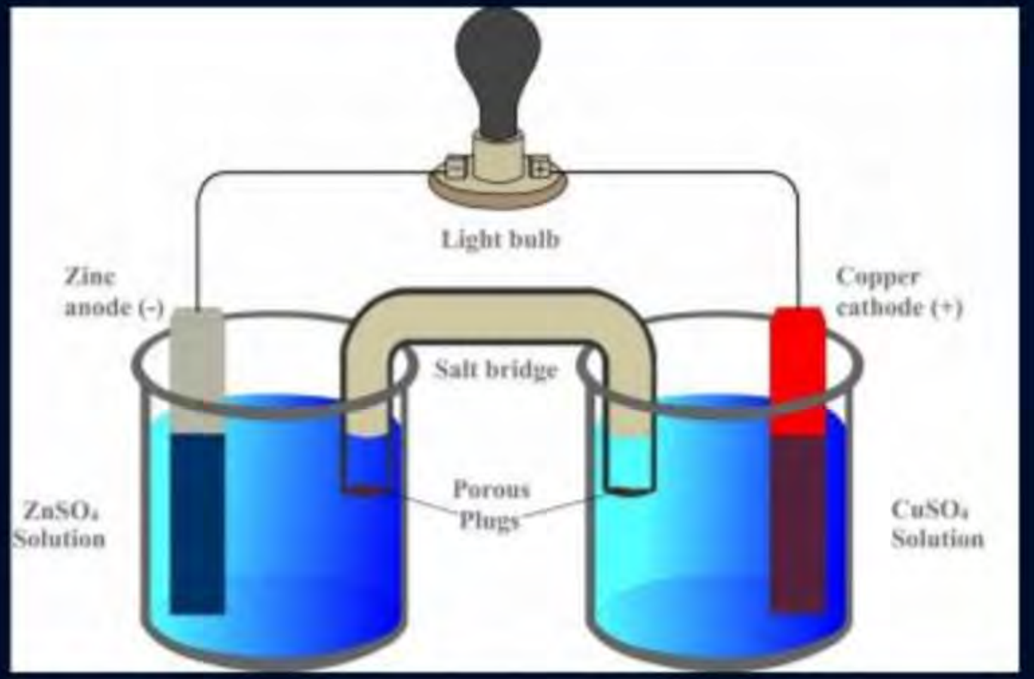
A Straight line

B Parabola

C Hyperbola

D Elliptical curve

Salt Bridge & its Functions



Home work from modules

Prarambh → Q 1, 2, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19
20, 21, 22

Prabal → Q 1, 2, 9,

THANK YOU