

YAKEEN NEET 2.0

2026

Electrochemistry

Physical Chemistry

Lecture -2

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Topics to be covered

1 Medics Test, Revision of Last Class

2 Applications of ECS
~~Electrode potential~~

3 Electrochemical ~~Series~~ ^{cell}

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.

QUESTION



A solution is 0.1 M in CH_3COOH and 0.1 M in CH_3COONa Which of the following will change its pH significantly?

W.A

Salt



- ☒ A Addition of water X
- ☐ B Addition of small amount of CH_3COONa without change in volume X
- ☐ C Addition of small amount of CH_3COOH without change in volume X
- ☒ D None will change the pH significantly

QUESTION



K_a for HCN is 5×10^{-10} at 25°C . For maintaining a constant pH of 9, the volume of 5 M KCN solution required to be added to 10 ml of 2 M HCN solution is ($\log(2) = 0.3$):

$$-0.3 = \log V - 0.6$$

$$0.3 = \log V$$

$$9 = 9.3 + \log \frac{5V}{2 \times 10}$$

A 4 mL

B 8 mL

C 2 mL

D 10 mL

$$K_a(\text{HCN}) = 5 \times 10^{-10}$$

$$\text{pH} = 9 \quad \text{p}K_a = 10 - \log 5$$

$$= 10 - 0.7 = 9.3$$

KCN

$$M_1 = 5 \text{ M}$$

$$V_1 = V \text{ ml}$$

$$V_2 = 10 + V$$

$$M_2 = \frac{5 \times V}{10 + V} = [\text{KCN}]$$

HCN

$$M_1' = 2 \text{ M}$$

$$V_1' = 10 \text{ ml}$$

$$M_2' = ?$$

$$V_2' = 10 + V$$

$$M_2' = \frac{2 \times 10}{10 + V} = [\text{HCN}]$$

$$\underline{pH} = pK_a + \log \frac{[CN^-]}{[HCN]}$$

$$9 = 9.3 + \log \frac{\cancel{5V}/\cancel{10+V}}{\cancel{20}/\cancel{10+V}}$$

$$-0.3 = \log V - \log \underline{4}$$

$$-0.3 + 0.6 = \log V$$

$$\log V = 0.3$$

$$V = \text{antilog } 0.3 = 10^{\textcircled{0.3}} = 2 \text{ ml}$$

QUESTION



$$pK_a = 5 - \log 18 = 5 - 1.26 = 3.74$$

S.B

W.A.

If 50 mL of 0.2 M KOH is added to 40 mL of 0.5 M CH₃COOH the pH of the resulting solution is :

$$(K_a = 1.8 \times 10^{-4} \log(18) = 1.26)$$



$$\begin{array}{ccc} 40 \times 0.5 \times 1 & 50 \times 0.2 \times 1 & \\ 20 & 10 & \end{array}$$

millieq

$$20 - 10 = 10$$

$$[\text{CH}_3\text{COOH}] = \frac{10}{90}$$

$$[\text{CH}_3\text{COO}^-] = \frac{10}{90}$$

$$\text{pH} = \text{p}K_a + \log \frac{[\text{CH}_3\text{COO}^-]}{[\text{CH}_3\text{COOH}]}$$

$$\text{pH} = 3.74 + \log \frac{1}{1}$$

A 3.74

B 5.64

C 7.57

D 3.42

QUESTION

$$V_1 = V \text{ ml} \quad V_2 = 1.1V \text{ ml}$$



Pure water is added into the following solution causing a 10% increase in volume of each. The greatest percentage change in pH would be observed in which case (a), (b), (c) or (d)?

- ☒ A 0.1 M NaHCO_3 $\text{HCO}_3^- \rightarrow \text{pH} = \frac{\text{pK}_{a1} + \text{pK}_{a2}}{2}$
- ☒ B 0.2 M NaOH
- ☒ C 0.3 M NH_3 – 0.2 M NH_4^+ system
- ☒ D 0.4 M $\text{CH}_3\text{COONH}_4$

QUESTION



What fraction of an indicator HIn is in basic form at pH of 6 if the pK_a of the indicator is 5?



$$pH = pK_a + \log \frac{[In^-]}{[HIn]}$$

$$6 - 5 = \log \frac{[In^-]}{[HIn]}$$

$$\frac{[In^-]}{[HIn]} = \text{antilog } 1 = 10$$

$$\begin{aligned} \text{fraction} &= \frac{[In^-]}{[In^-] + [HIn]} \\ &= \frac{10 \cancel{[HIn]}}{10 \cancel{[HIn]} + \cancel{[HIn]}} \\ &= \frac{10}{11} \end{aligned}$$

- ☐ A 1/2
- ☐ B 1/11
- ☒ C 10/11
- ☐ D 1/10

QUESTION



What volume of 0.2M RNH_3Cl solution should be added to 100 mL of 0.1M RNH_2 solution to produce a buffer solution of $\text{pH} = 8.7$?

[Given: pK_b of $\text{RNH}_2 = 5$; $\log(2) = 0.31$]

- ☐ A 50 mL
- ☒ B 100 mL
- ☐ C 200 mL
- ☐ D None of these

$$5.3 = 5 + \log \frac{V \times 0.2}{100 \times 0.1}$$

$$0.3 = \log \frac{V}{50}$$

$$0.3 = \log V - (\log 5 + \log 10)$$

$$- (0.7 + 1)$$

$$2 = \log V$$

$$V = \text{antilog } 2 = 10^2 = 100$$

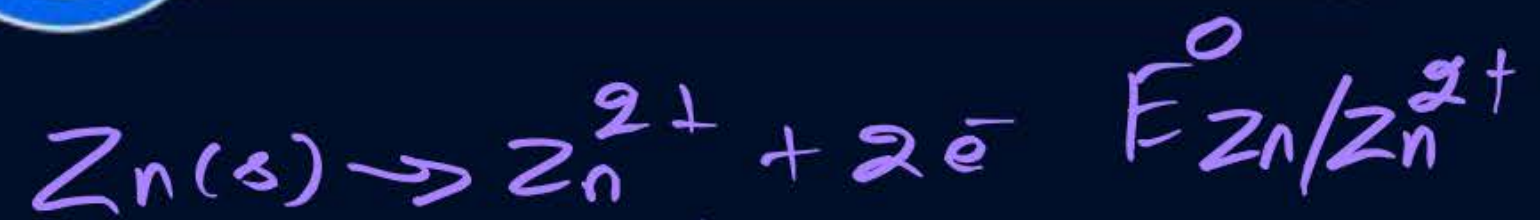
Cutoff

$$\frac{3}{6}$$

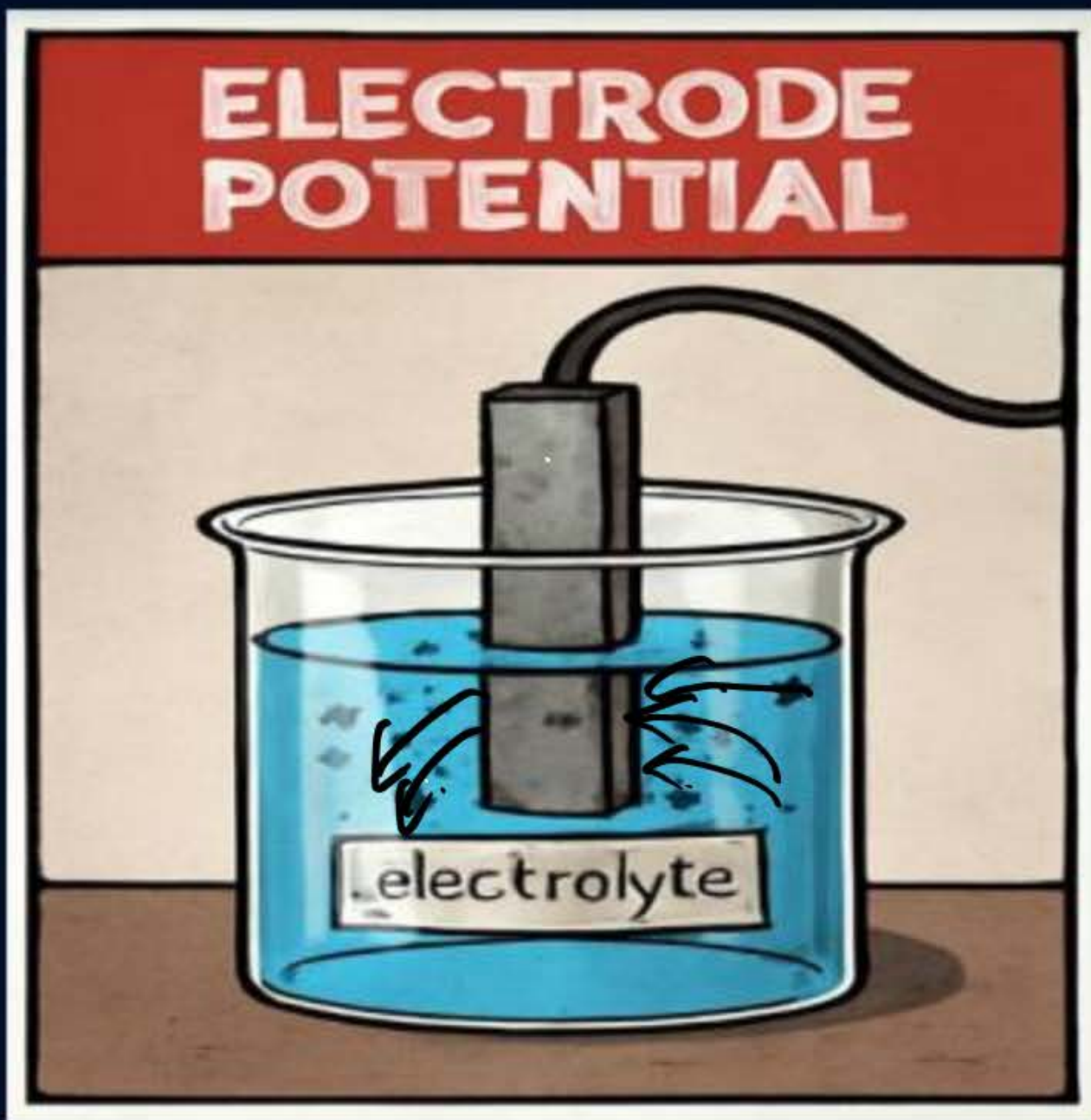
Monday → Lec-1 to Lec-5 → Ionic eq. → Medics
Test.
↓
Moderate



Revision of Last Class



$$\Delta G^\circ = -nFE^\circ$$





Electrochemical Series

← METALS FAME RANKING

Yeh koi influencer list nahi hai... yeh hai
ELECTROCHEMICAL SERIES ka swagccı list!

Most likely to donate electrons



-2.93

Bro, main
sabse zyada
negative
hoon!

-2.71

Same yaar!
Main bhi
electrons de
liye lines



Yaar, main confused hoon...



Haan bro, hum
middle class log

Haan bro, hum middle
class log hai...

Electron dena?
Uff, mere
aesthetic ko
spoil karega.



3 Comments

AU = Ultimate Donor

K = Forever loioyal

Au = Confused AF

ELECTROCHEMICAL SERIES = METALS ka true
fame ranking chart!

✓ Li^+	→	ली
K^+	→	कै
Ca^{2+}	→	काका
✓ Na^+	→	नै
Mg^{2+}	→	मांगी
Al^{3+}	→	अलमारी
Hg^{2+}	→	है
Zn^{2+}	→	जमीन
Co^{3+}	→	करीड़ी की
Fe^{2+}	→	फैरिन
Ni^{2+}	→	नी
Sn^{2+}	→	सेन
Pb^{2+}	→	प्रभा

S.P.P
inc

H^+	→	हाय	$E^\circ \text{H}^+/\text{H}_2 = 0$
Ag^+	→	आग	
AgCl	→	अरुची	आमी
Cu^+	→	कीर्	
Ce^{4+}	→	कीर्	
✓ I_2	→	आई	
O_2	→	उदयपुर	→ H_2O_2
Fe^{3+}	→	किर	
✓ Ag^+	→	आग	
Hg^{2+}	→	Hug kiza	
No_2	→	न	
Ba^{2+}	→	बिनाकुल	

$MnO_2 \rightarrow$ मन में

$O_2 \rightarrow$ ऑक्सीजन $\rightarrow H_2O$

$(AuO_2)^{2-} \rightarrow$ डिक्कत बही

✓ $Cl_2 \rightarrow$ करनी

$Au^{3+} \rightarrow$ सीन जैसा

$MnO_4^- \rightarrow$ मन

$H_2O_2 \rightarrow$ है ⁹ है

$Co^{3+} \rightarrow$ कीई

$Fe \rightarrow$ Foreign: ka lalaka dhaondt hai

S.P.Pinc



Applications of Electrochemical Series

$$\underline{S.R.P.} = -\underline{S.O.P.}$$

$$5 > 3$$

$$-5 < -3$$



MIT

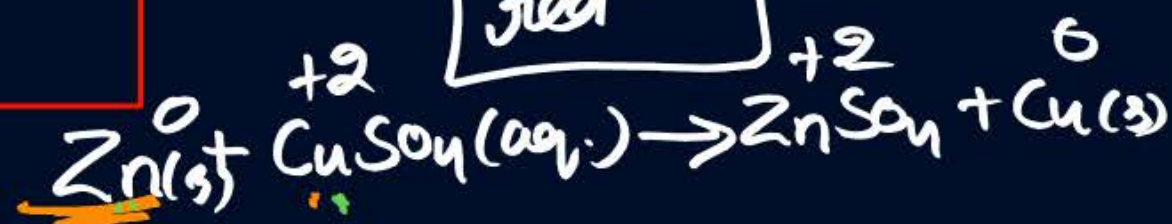
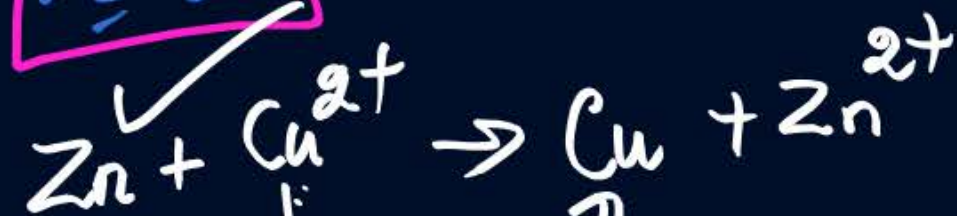
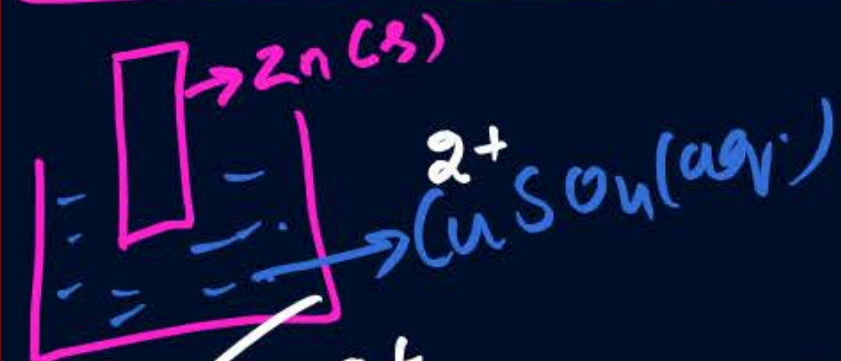
① S.R.P. ↑ or S.O.P. ↓ ⇒ reduce itself ⇒ oxidise others ⇒ Strong Oxid. agent (S.O.A.)
(Oxid. Power ↑)

S.R.P. ↓ or S.O.P. ↑ ⇒ oxidise itself ⇒ reduce others ⇒ Strong Red. agent (S.R.A.)
(Red. Power ↑)

② particles present above in ECS will displace
)) below in ECS

Metal + particle electrolyte → rxn occur.
↓ ↓
ECS upper. ECS neeche
(S.R.P. low) (S.R.P. high)

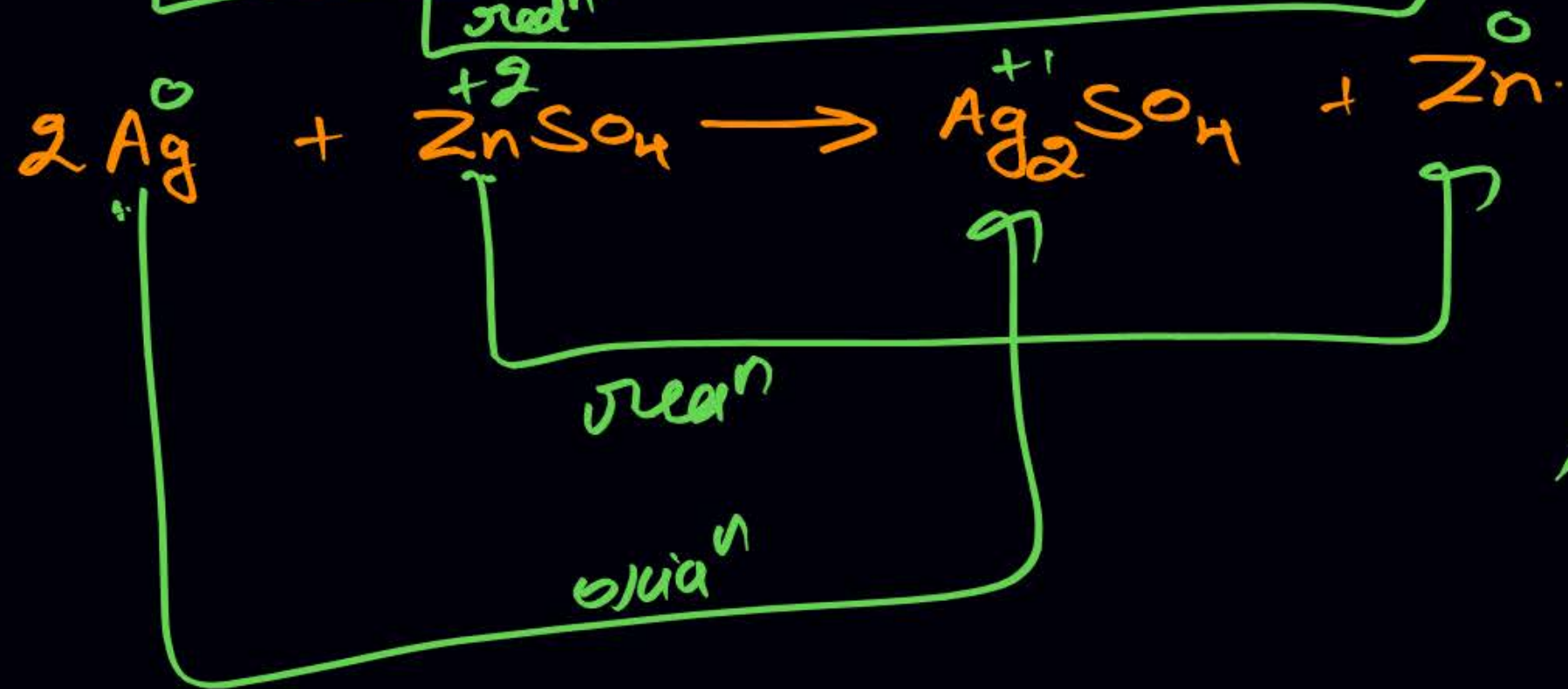
③ Activity ↑ S.R.P. ↓ S.O.P. ↑ ECS upper.



①



②



X

QUESTION (Kerala (PMT) 2015)



Standard electrode potential of three metals X, Y and Z are 0.52V, - 2.87 V and -0.44 V respectively. The reducing power of these metals are:

(S.R.P.)

~~X~~

Y

☐ A $X > Y > Z$

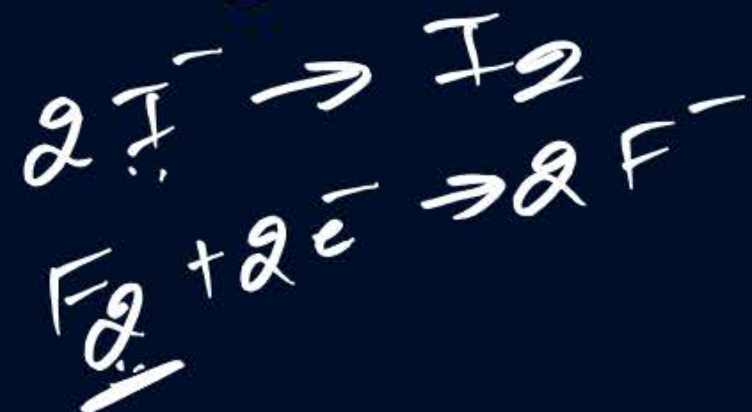
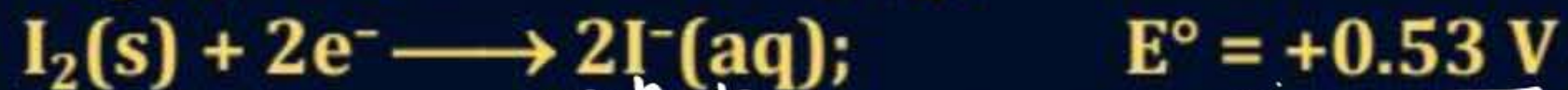
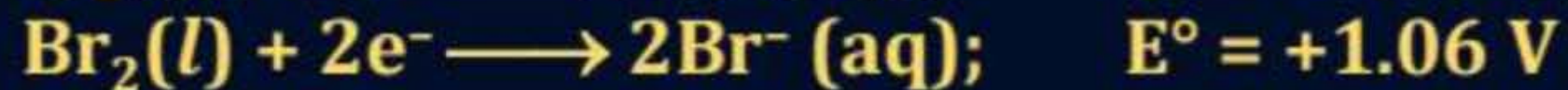
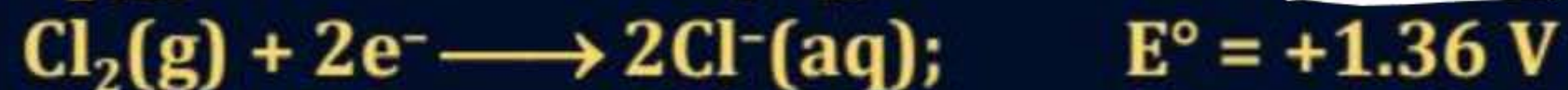
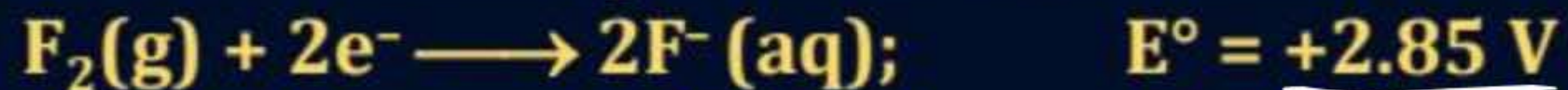
☐ B $X > Z > Y$

☒ C $Y > Z > X$

☐ D $Z > X > Y$

$Y > Z > X$
← R.P.T.

Standard reduction potential of the half reactions are given below:



The strongest and ^{weakest} reducing agents respectively are:



- ☒ A F_2 and I^-
- ☐ B Br_2 and Cl^-
- ☐ C Cl_2 and Br^-
- ☐ D Cl_2 and I_2

QUESTION



The correct order of reduction potentials of the following pairs is:

- (A) Cl_2/Cl^- (B) I_2/I^- (C) Ag^+/Ag (D) Na^+/Na
(E) Li^+/Li

Choose the correct answer from the options given below:

☒ A $A > C > B > D > E$

$$E < D < B < C < A$$

☐ B $A > B > C > D > E$

☐ C $A > C > B > E > D$ ✗

☐ D $A > B > C > E > D$ ✗

QUESTION (Kerala (PMT) 2011)



Standard electrode potential of three metals X, Y and Z are -1.2 V , $+0.5\text{ V}$ and -3.0 V respectively. The reducing power of these metals will be:

2

$Z > X > Y$

A $Y > Z > X$

B $Y > X > Z$

C $Z > X > Y$

D $X > Y > Z$

QUESTION – (AIIMS 2011)

Given that: $E_{K^+/K}^0 = -2.93 \text{ V}$;

$E_{Fe^{2+}/Fe}^0 = -0.44 \text{ V}$; $E_{Zn^{2+}/Zn}^0 = -0.76 \text{ V}$;

$E_{Cu^{2+}/Cu}^0 = 0.34 \text{ V}$

S.R.P. ↓

Based on this data, which of the following is the strongest reducing agent?

☐ A $Cu_{(s)}$

☒ B $K^+_{(aq)}$

☐ C $Zn^{2+}_{(aq)}$

☐ D $Fe_{(s)}$

QUESTION – (AIIMS 2013)

The standard reduction potential at 298 K for the following half reactions are given:



Which is the strongest reducing agent?



A Zn(s)

B Cr(s)

C H₂(g)

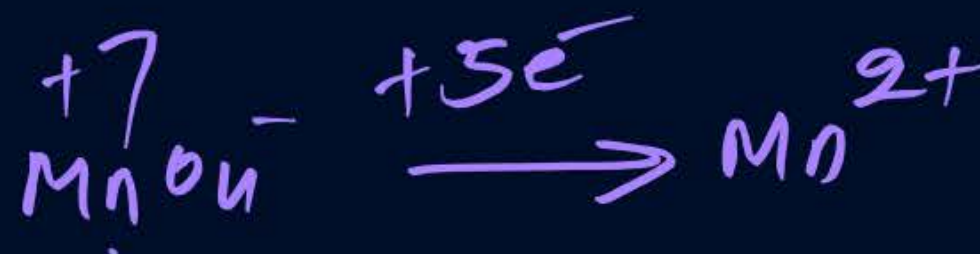
D Fe³⁺(aq)

QUESTION – (NCERT Exemplar)

Find out which of the following is the strongest Oxidising agent. \rightarrow S.P.P.T.

$$E_{\text{Cr}_2\text{O}_7^{2-}/\text{Cr}^{3+}}^\ominus = 1.33\text{V}; \quad E_{\text{Cl}_2/\text{Cl}^-}^\ominus = 1.36\text{V}$$

$$E_{\text{MnO}_4^-/\text{Mn}^{2+}}^\ominus = 1.51\text{V}; \quad E_{\text{Cr}^{3+}/\text{Cr}}^\ominus = -0.74\text{V}$$



- ☐ A Cl^-
- ☐ B Mn^{2+}
- ☒ C MnO_4^-
- ☐ D Cr^{3+}

QUESTION – (NCERT Exemplar)

Find out the most stable ion in its reduced form.

$$E_{\text{Cr}_2\text{O}_7^{2-}/\text{Cr}^{3+}}^{\ominus} = 1.33\text{V}; \quad E_{\text{Cl}_2/\text{Cl}^-}^{\ominus} = 1.36\text{V}$$

$$E_{\text{MnO}_4^-/\text{Mn}^{2+}}^{\ominus} = \underline{1.51\text{V}}; \quad E_{\text{Cr}^{3+}/\text{Cr}}^{\ominus} = -0.74\text{V}$$



- A** Cl^-
- B** Cr^{3+}
- C** Cr
- D** Mn^{2+}

QUESTION – (JEE Advance 2013)

List-I		List-II	
P.	$E^\circ(\text{Fe}^{3+}, \text{Fe})$	1.	-0.18 V
Q.	$E^\circ(4\text{H}_2\text{O} \longrightarrow 4\text{H}^+ + 4\text{OH}^-)$	2.	-0.4 V
R.	$E^\circ(\text{Cu}^{2+} + \text{Cu} \longrightarrow 2\text{Cu}^+)$	3.	-0.04 V
S.	$E^\circ(\text{Cr}^{3+}, \text{Cr}^{2+})$	4.	-0.83 V

- | | P | Q | R | S |
|---|---|---|---|---|
| A | 4 | 1 | 2 | 3 |
| B | 2 | 3 | 4 | 1 |
| C | 1 | 2 | 3 | 4 |
| D | 3 | 4 | 1 | 2 |

QUESTION

activity \uparrow S.R.P \downarrow



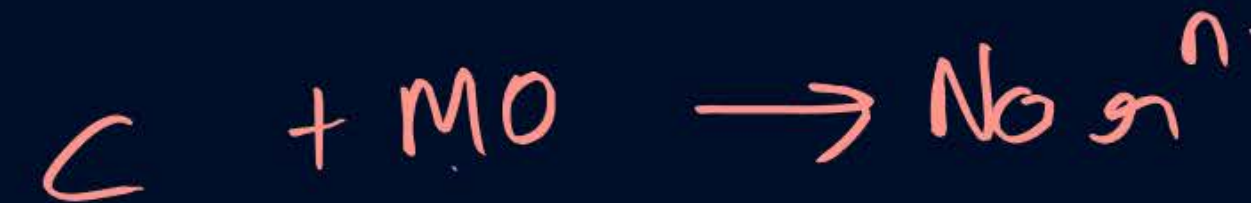
Red hot carbon will remove oxygen from the oxides AO and BO but not from MO, while B will remove oxygen from AO. The activity of metals A, B and M in decreasing order is :

A $A > B > M$

B $B > A > M$

C $M > B > A$

D $M > A > B$



S.R.P.

$A > C$

$B > C$

$C > M$

$A > B$

$A > B > M$

\leftarrow S.R.P \uparrow

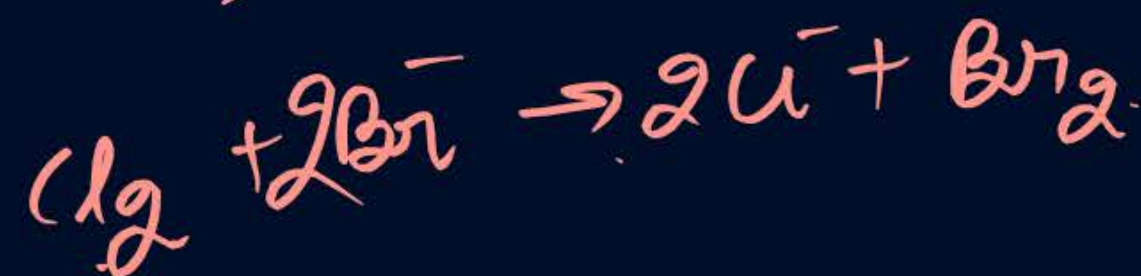
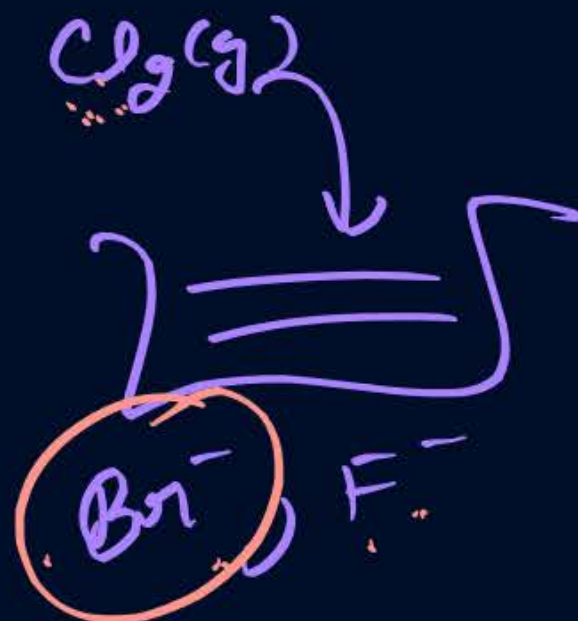
$\xrightarrow{\text{activity } \uparrow}$

QUESTION



A gas Cl_2 at 1 atm is bubbled through a solution containing a mixture of 1 M Br^- and 1 M F^- at 25°C . If the reduction potential order is $\text{F} > \text{Cl} > \text{Br}$, then:

- ☒ **A** Cl will oxidise Br^- and not F^-
- ☐ **B** Cl will oxidise F and not Br
- ☐ **C** Cl will oxidise both Br and F
- ☐ **D** Cl will reduce both Br and F



QUESTION



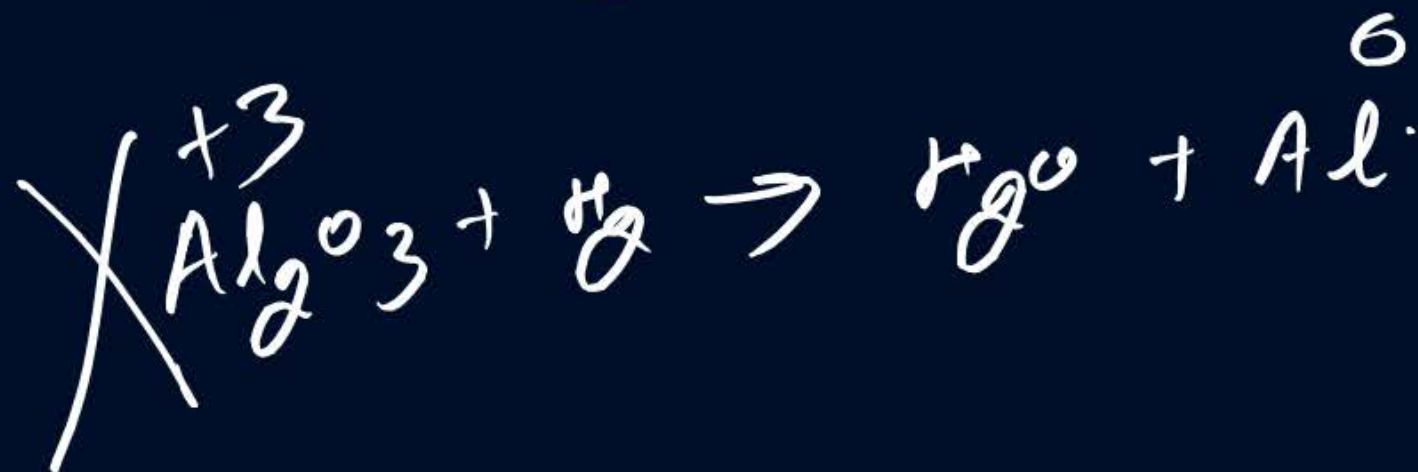
Hydrogen gas will not reduce :

$$E^0_{H^+/H_2} = 0 \text{ V}$$

A heated cupric oxide



B heated ferric oxide



C heated stannic oxide

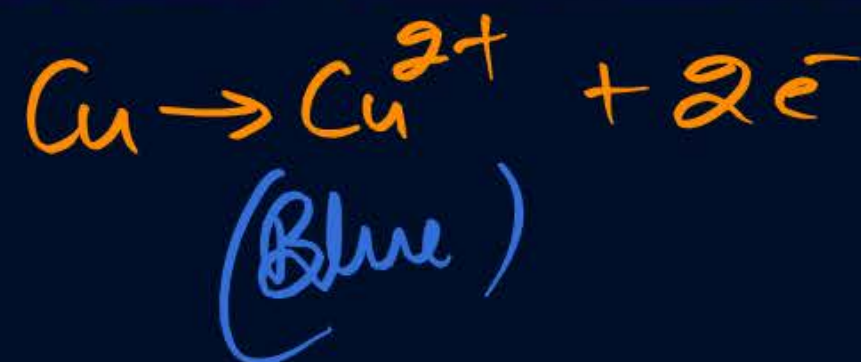
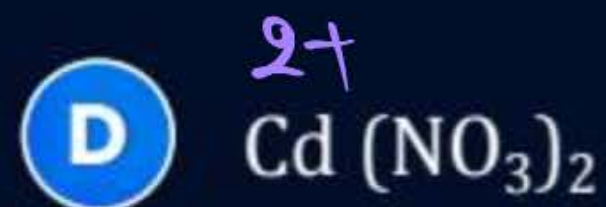
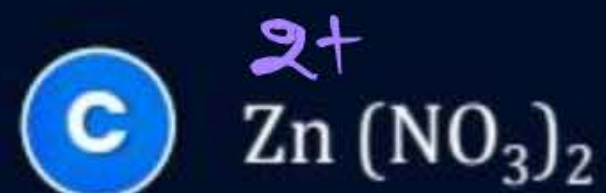
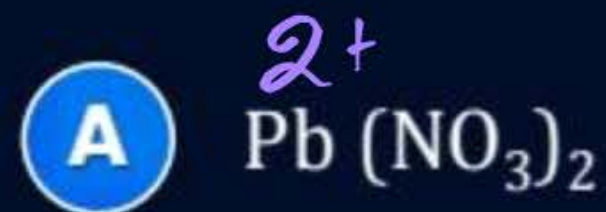
D heated aluminium oxide

$$[E^0_{Sn^{+4}/Sn^{+2}} = +0.15 \text{ V}; E^0_{Cu^{+2}/Cu^+} = 0.167; E^0_{Fe^{+3}/Fe^{+2}} = 0.771 \text{ V}; E^0_{Al^{+3}/Al} = -1.67 \text{ V}]$$

QUESTION



Four colourless salt solutions are placed in separate test tubes and a strip of copper is dipped in each. Which solution finally turns blue? (use data from electrochemical series)





Types of Cells

electrochemical Cell

① Chemical energy convert into electrical energy.

② spontaneous rxn .

$$(\Delta G)_{T,P} < 0$$

③ Cathode \rightarrow Reduction
Anode \rightarrow Oxidation.

electrolytic Cell:

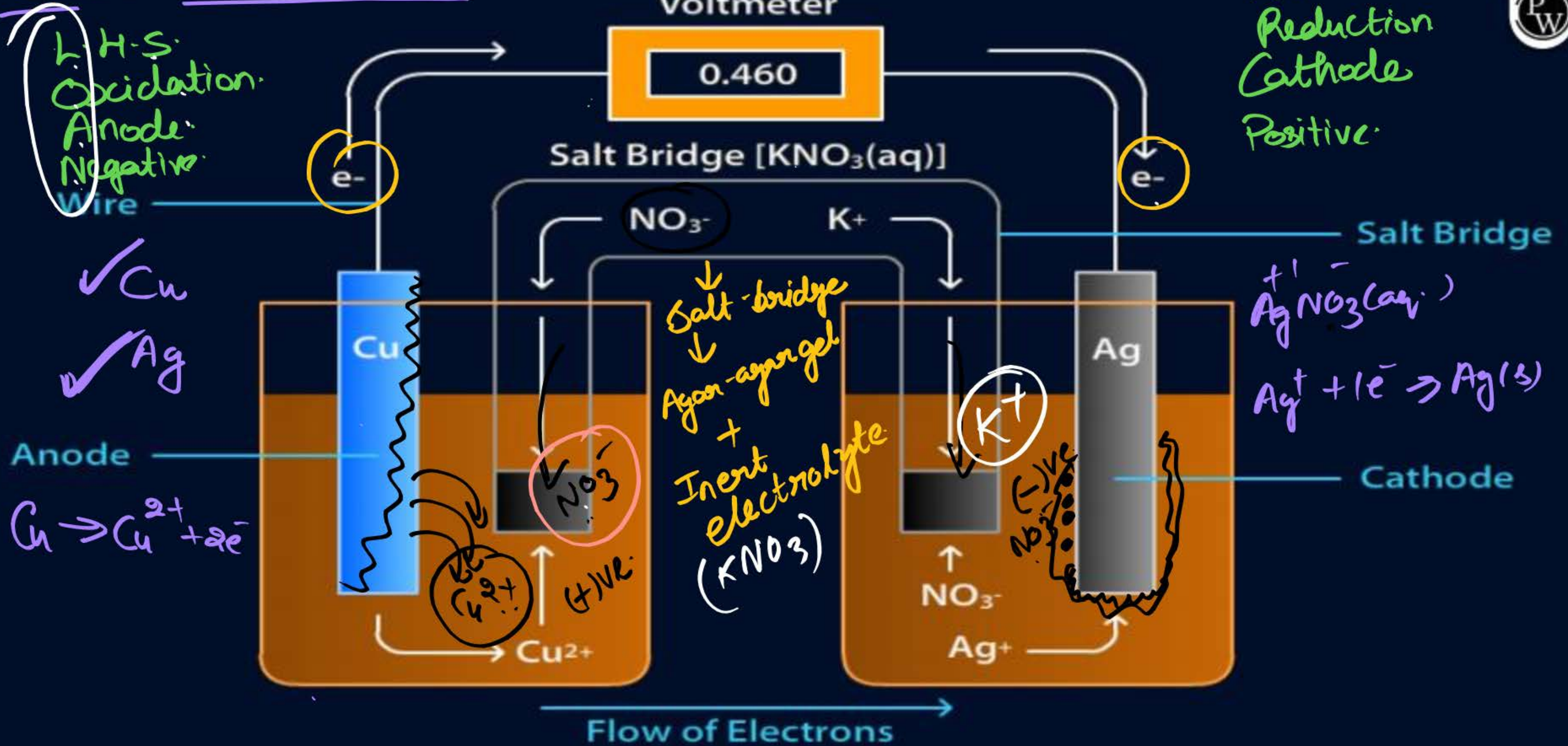
① electrical energy convert into chemical energy.

② Non-spontaneous rxn .

$$(\Delta G)_{T,P} > 0$$

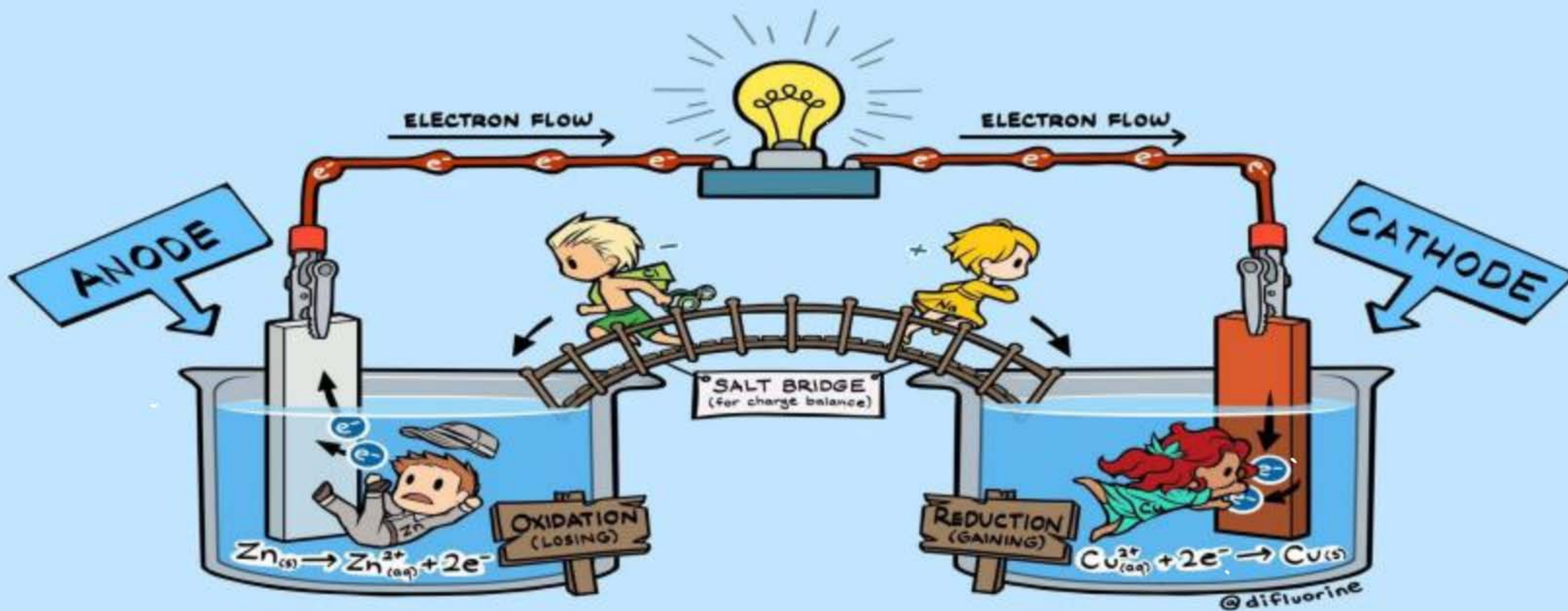
③ Cathode \rightarrow Redⁿ
Anode \rightarrow Oxidⁿ.

Electrochemical Cell:-





Electrochemical Cell



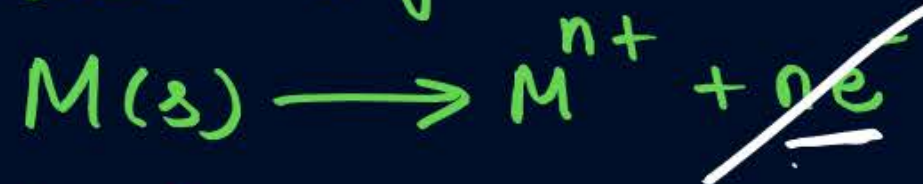
MIT



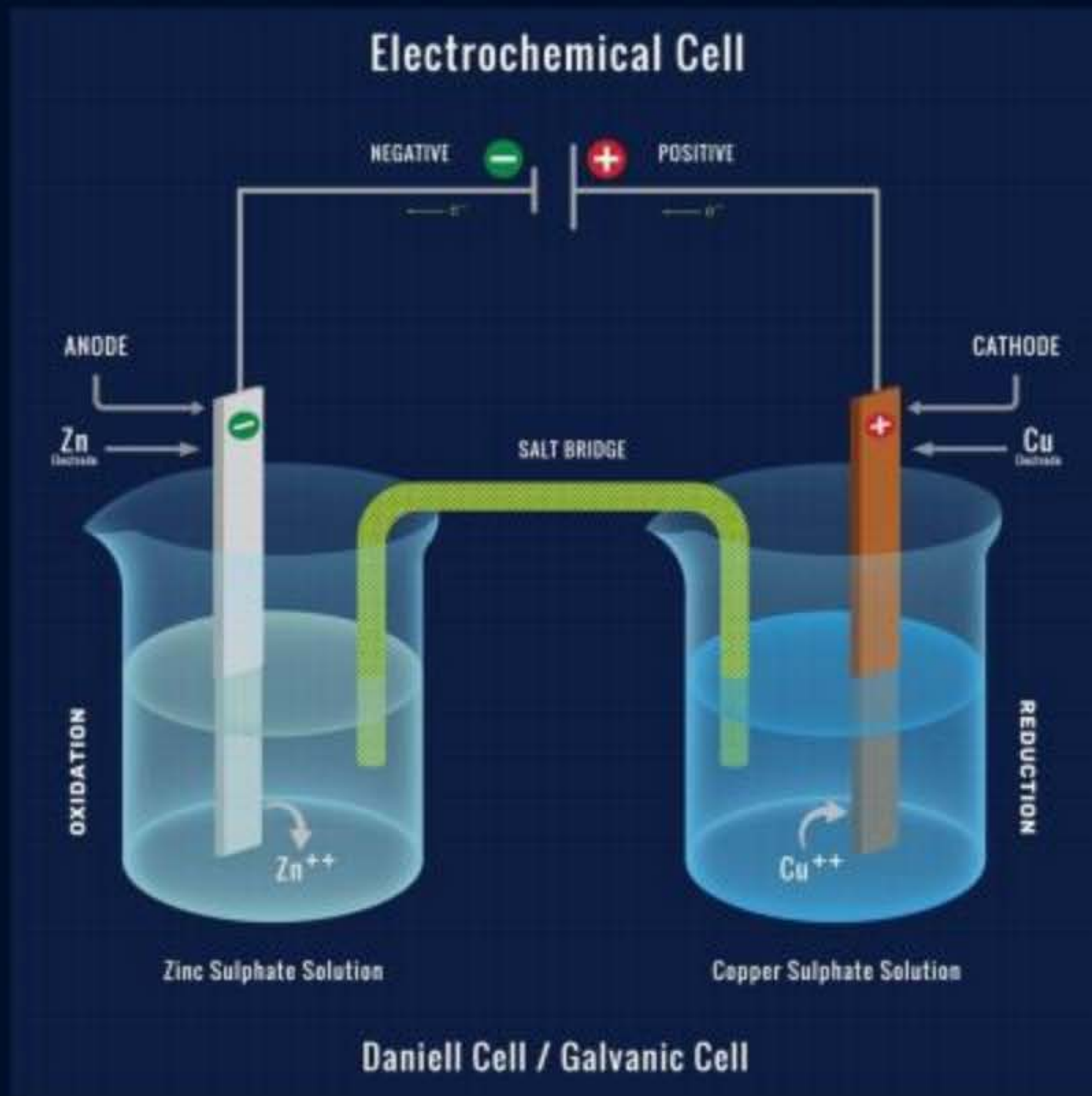
① L.H.S. Oxidⁿ
Anode.
Negative.
S.R.P. low

R.H.S. Redⁿ.
Cathode.
Positive.
S.R.P. high

② Oxidⁿ half cell (Anode)



Redⁿ half cell



Anode:-



Cathode:-



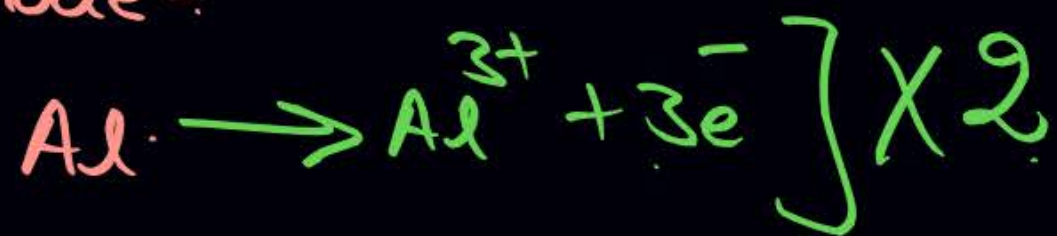
Anode:-



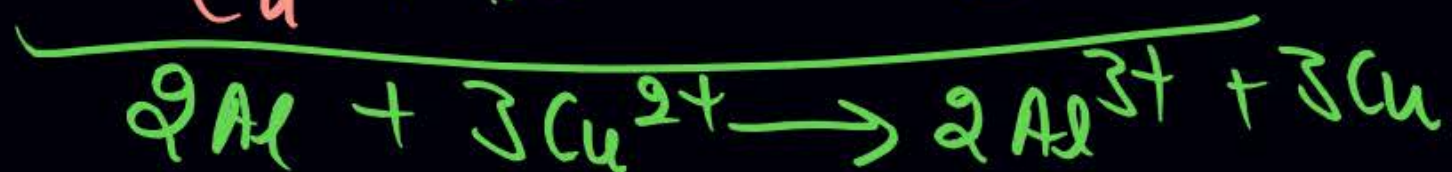
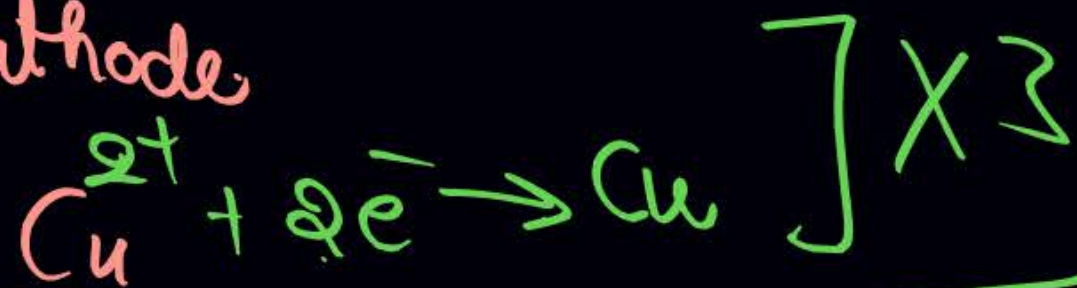
Cathode

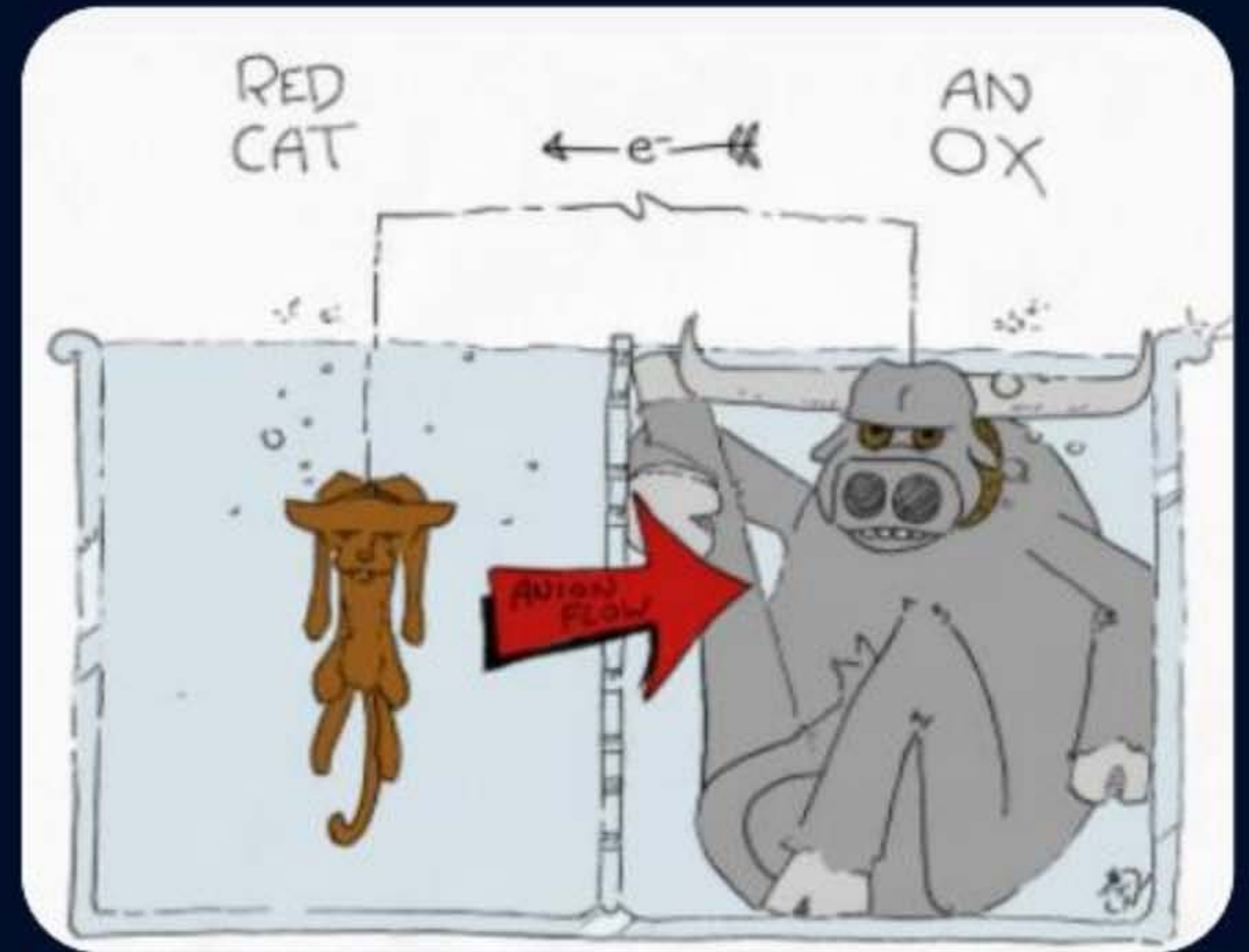


Anode:-



Cathode





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

QUESTION – (AIIMS 1999)

Which cannot displace hydrogen from its compound?

- A** Al
- B** Fe
- C** Hg
- D** Pb

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

Standard electrode potential for $\text{Sn}^{4+}/\text{Sn}^{2+}$ couple is $+0.15\text{ V}$ 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** $+1.19\text{ V}$
- B** $+0.89\text{ V}$
- C** $+0.18\text{ V}$
- D** $+1.83\text{ V}$

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 $\text{X} + \text{Y}^{2+} \longrightarrow \text{X}^{2+} + \text{Y}$ will be spontaneous when

- A** $\text{X} = \text{Ni}$, $\text{Y} = \text{Zn}$
- B** $\text{X} = \text{Fe}$, $\text{Y} = \text{Zn}$
- C** $\text{X} = \text{Zn}$, $\text{Y} = \text{Ni}$
- D** $\text{X} = \text{Ni}$, $\text{Y} = \text{Fe}$

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

- A** Cu^+ will be formed
- B** Ag^+ will be formed
- C** Cu^{2+} will be deposited
- D** None of these

A solution contains Fe^{2+} , Fe^{3+} and I^- ions. This solution was treated with iodine at 35°C . E° for $\text{Fe}^{3+}/\text{Fe}^{2+}$ is $+0.77 \text{ V}$ and E° for $\text{I}_2/2\text{I}^- = 0.536 \text{ V}$. 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+}

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 ?



- 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.

The position of some metals in the electrochemical series in decreasing electropositive character is $\text{Mg} > \text{Al} > \text{Zn} > \text{Cu} > \text{Ag}$. What will happen if copper spoon is used to stir solution of aluminium nitrate?

- A** The spoon gets coated with aluminium
- B** An alloy of aluminium and copper is formed
- C** No reaction occurs
- D** The solution starts turning blue



Home work from modules

Train your Brain \rightarrow Example 7, 8, 9.

Prarambh \rightarrow q 19, 20

Prarabhal \rightarrow q 19, 20, 21, 22, 23

THANK
YOU