YAKEEN NEET 2.0

2026

Elecrochemistry

Physical Chemistry | Lecture -1

By- Amit Mahajan Sir

Topics to be covered

1. Medics Test, Revision of Last Class
2. Electrode potential
3. Electrochemical Series
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

What is the hydrolysis constant of the OCl^- ion? The ionization constant of HOCl is 3×10^{-8}.

$OCl^- + H_2O \longrightarrow HOCl + OH^-$ $\quad K_h = K_b$

$K_{a(HOCl)} \times K_{b(OCl^-)} = K_w$

$3 \times 10^{-8} \times K_b = 10^{-14}$

$K_b = \frac{10^{-6}}{3} = 0.33 \times 10^{-6}$

$= 3.3 \times 10^{-7}$

(A) 3.33×10^{-8}

(B) 3.33×10^{-7} ✓

(C) 3×10^{-7}

(D) 3.33×10^{-6}

QUESTION

What is the pH of a 0.10 M $C_6H_5O^-$ solution? The K_a of C_6H_5OH is 1×10^{-10}?

(A) 10.51

(B) 11.04

(C) 11.50

(D) 12

$C_6H_5O^- + H_2O \longrightarrow C_6H_5OH + OH^-$

ch

$[OH^-] = ch$

$= c\sqrt{\frac{K_h}{c}}$

$= \sqrt{K_h c}$

$= \sqrt{\frac{K_w}{K_a} \times c}$

$= \sqrt{\frac{10^{-14} \times 10^{-1}}{10^{-10}}} = \sqrt{10^{-5}}$

$\frac{K_h}{K_w} \times K_a = 1$

$K_h = \frac{K_w}{K_a}$

$$pOH = -\log(10^{-5})^{1/2}$$

$$= \frac{5}{2} \log 10$$

$$= 2.5$$

$$pH = 14 - 2.5$$

$$= 11.5$$

QUESTION

What is the hydronium ion concentration of a 0.02 M solution of Cu^{2+} solution of copper(II) perchlorate? The acidity constant of the following reaction is 5×10^{-9}.

$$Cu^{2+}(aq) + 2H_2O(l) \rightleftharpoons Cu(OH)^{+}(aq) + H_3O^{+}(aq)$$

$[H^+] = [H_3O^+] = ?h$

$K_h = 5 \times 10^{-9}$

$= c\sqrt{\frac{K_h}{C}}$

$= \sqrt{K_h \times C}$

$= \sqrt{5 \times 10^{-9} \times 2 \times 10^{-2}}$

$= \sqrt{10 \times 10^{-11}}$

$= \sqrt{10^{-10}} = 10^{-5}$

A 1×10^{-5}

B 7×10^{-4}

C 5×10^{-4}

D 1×10^{-4}

QUESTION

150 mL of 0.0008 M ammonium sulphate is mixed with 50 mL of 0.04 M calcium nitrate. The ionic product of $CaSO_4$ will be: (K_{sp} = 2.4 × 10^{-5} for $CaSO_4$)

(A) $< K_{sp}$

(B) $> K_{sp}$

(C) $= K_{sp}$

(D) None of these

$(NH_4)_2SO_4$ $\quad Ca(NO_3)_2$

$[SO_4^{2-}] = 0.0006 = 6 \times 10^{-4}$ $\quad [Ca^{2+}] = 10^{-2}$

$K_{ip} = [Ca^{2+}][SO_4^{2-}]$

$[SO_4^{2-}]$

$V_1 = 150ml$ $\quad V_2 = 200ml$

$M_1 = 8 \times 10^{-4}$ $\quad M_2 = ?$

$M_2 = \frac{8 \times 10^{-4} \times 150}{200} = 6 \times 10^{-4}$

$[Ca^{2+}]$

$V_1' = 50ml$ $\quad V_2' = 200ml$

$M_1' = 0.04$ $\quad M_2' = \frac{0.04 \times 50}{200} = 0.01 = 10^{-2}$

6×10^{-4} $\quad 24 \times 10^{-6}$

$K_{ip} = 10^{-2} \times 6 \times 10^{-4} = 6 \times 10^{-6}$

QUESTION

The solubility of $Ba_3(AsO_4)_2$ (formula weight = 690) is 6.9×10^{-2} g/100 mL. What is the K_{sp}?

A. 1.08×10^{-11}

B. 1.08×10^{-13}

C. 1.0×10^{-15}

D. 6.0×10^{-13}

$x = 3, y = 2$

$K_{sp} = x^x y^y (s)^{x+y}$

$= (3)^3 (2)^2 (s)^{3+2}$

$= 108 (s)^5$

$= 108 \times (10^{-3})^5$

$= 108 \times 10^{-15}$

$S = 6.9 \times 10^{-3} \times 10$ g/L

$= \frac{690 \times 10^{-3}}{690}$ mol/L.

QUESTION

Which of the following would increase the solubility of $Pb(OH)_2$?

$Pb(OH)_2 + H_2O \rightleftharpoons Pb^{2+} + 2OH^-$

Pb^{2+}

OH^-

H^+

$HCl + H_2O \rightarrow Cl^- +$

$OH^- + H^+ \rightarrow H_2O$

(A) Add hydrochloric acid

(B) ✗ Add a solution of $Pb(NO_3)_2$

(C) ✗ Add a solution of NaOH

(D) ✗ None of the above-the solubility of a compound is constant at constant temperature

Medics test → Lec. 9, 10 → Ionic eq. → Revise → Tomorrow
Medics test.

Electrode Potential → E

tendency to loose or gain electron when placed in it's electrolyte.

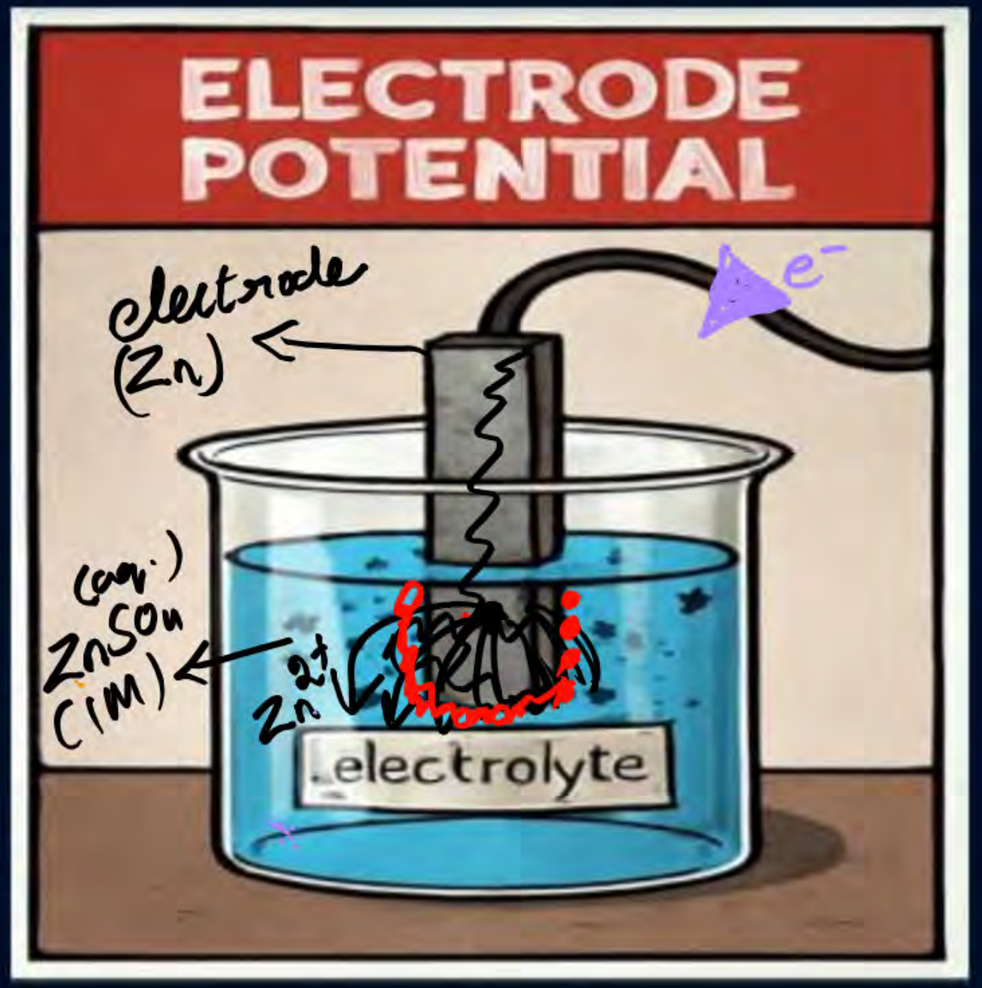
Oxidation ÷ loss of e^-

$$Zn^{0}(s) \longrightarrow Zn^{2+}(aq.) + 2e^-$$

Reduction ÷ gain of e^-

$$Zn^{2+}(aq.) + 2e^- \rightarrow Zn(s)$$

$$ZnSO_4(aq.) \rightarrow Zn^{2+}(aq.) + SO_4^{2-}(aq.)$$



MIT

① E.P → 2 Types.

O.P. = $E_{M/M^{n+}}$ $\quad M(s) \rightarrow M^{n+} + ne^-$

R.P. = $E_{M^{n+}/M}$ $\quad M^{n+} + ne^- \rightarrow M(s)$

② S.E.P → 2 types (E.P. std. Conditions: T = 298 K, 1 M or P = 1 atm)

S.O.P. = $E^{\circ}_{M/M^{n+}}$

S.R.P. = $E^{\circ}_{M^{n+}/M}$

③ Unit is Volt = V

④ S.O.P. = − S.R.P.

⑤ E° → is intensive Prop.

⑥ n^n added → ext. prop. add
↳ sub. → " " sub.

⑦ $\Delta G^{\circ} = -nFE^{\circ}$

F = Faraday Constt.
≈ 96500 C
n = no. of e^- lost or gain
E° = S.E.P.

$Zn \rightarrow Zn^{2+} + 2e^- \quad | \quad Zn^{2+} + 2e^- \rightarrow Zn$

$Ag \rightarrow Ag^{+} + 1e^- \quad | \quad Ag^{+} + 1e^- \rightarrow Ag$

$1Cu \rightarrow 1Cu^{2+} + 2e^-$ $\quad E_1^\circ = -0.34\,V$

$2Cu \rightarrow 2Cu^{2+} + 4e^-$ $\quad E_2^\circ = -0.34\,V$

Given

① $Fe(s) \rightarrow Fe^{2+} + 2e^-$ $\quad E_1^\circ = x\,V,\ \Delta G_1^\circ$, $n_1 = 2$

② $Fe^{2+} \rightarrow Fe^{3+} + 1e^-$ $\quad E_2^\circ = y\,V,\ \Delta G_2^\circ$, $n_2 = 1$

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③ $Fe \rightarrow Fe^{3+} + 3e^-$ $\quad E_3^\circ = ?,\ \Delta G_3^\circ$

$n_3 = 3$

$E^\circ_{Cu^{2+}/Cu} = S.R.P. = +0.34\,V$

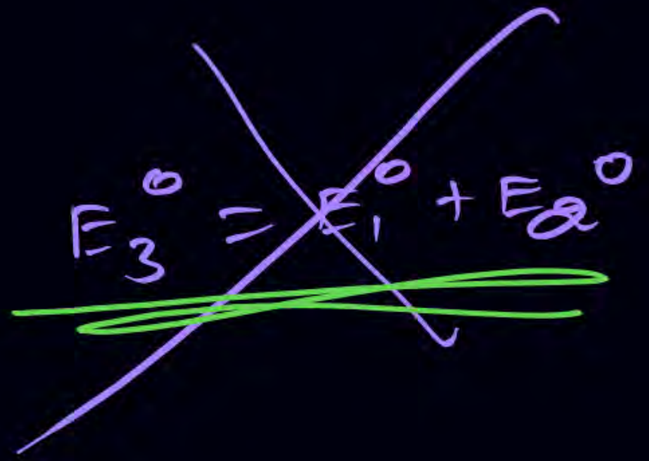
$E^\circ_{Cu/Cu^{2+}} = S.O.P. = -0.34\,V$

$E^\circ_{Zn/Zn^{2+}} = S.O.P. = +0.76\,V$

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

add eq. ① + eq. ② = eq. ③

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



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

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

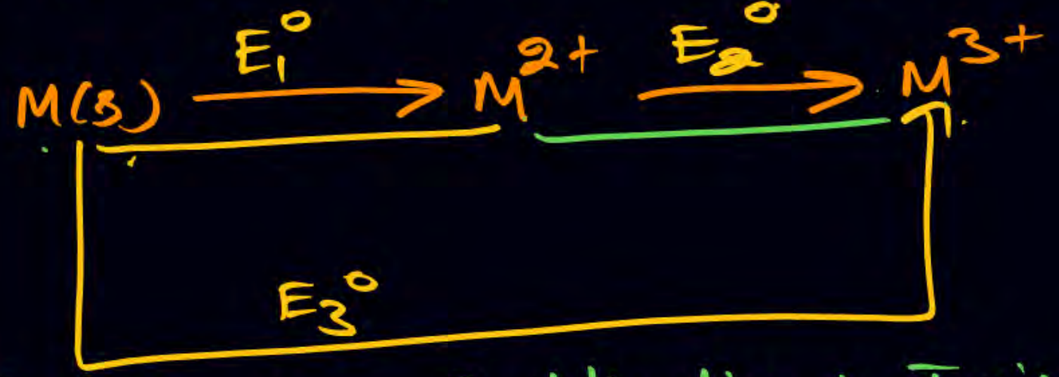
$$n_3 E_3^\circ = n_1 E_1^\circ + n_2 E_2^\circ$$

$$3 E_3^\circ = 2x + 1 \times y$$

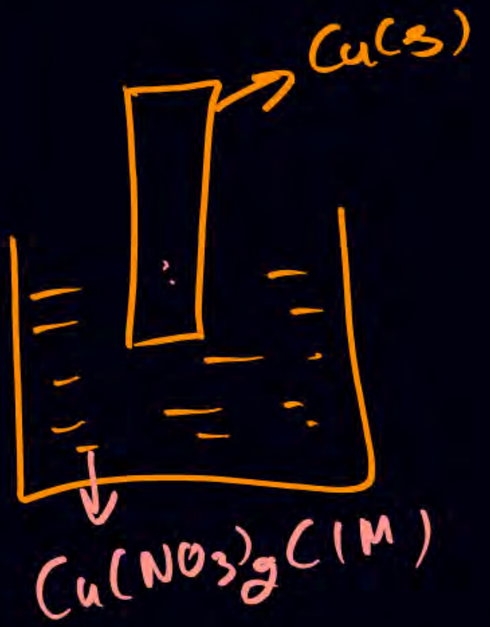
$$E_3^\circ = \left(\frac{2x + y}{3}\right) V$$

vn#

⑧ vn add: $n_3 E_3^\circ = n_1 E_1^\circ + n_2 E_2^\circ$



⑨ S.O.P. = Sublimation Energy + Ionisation Energy + Hydration Energy

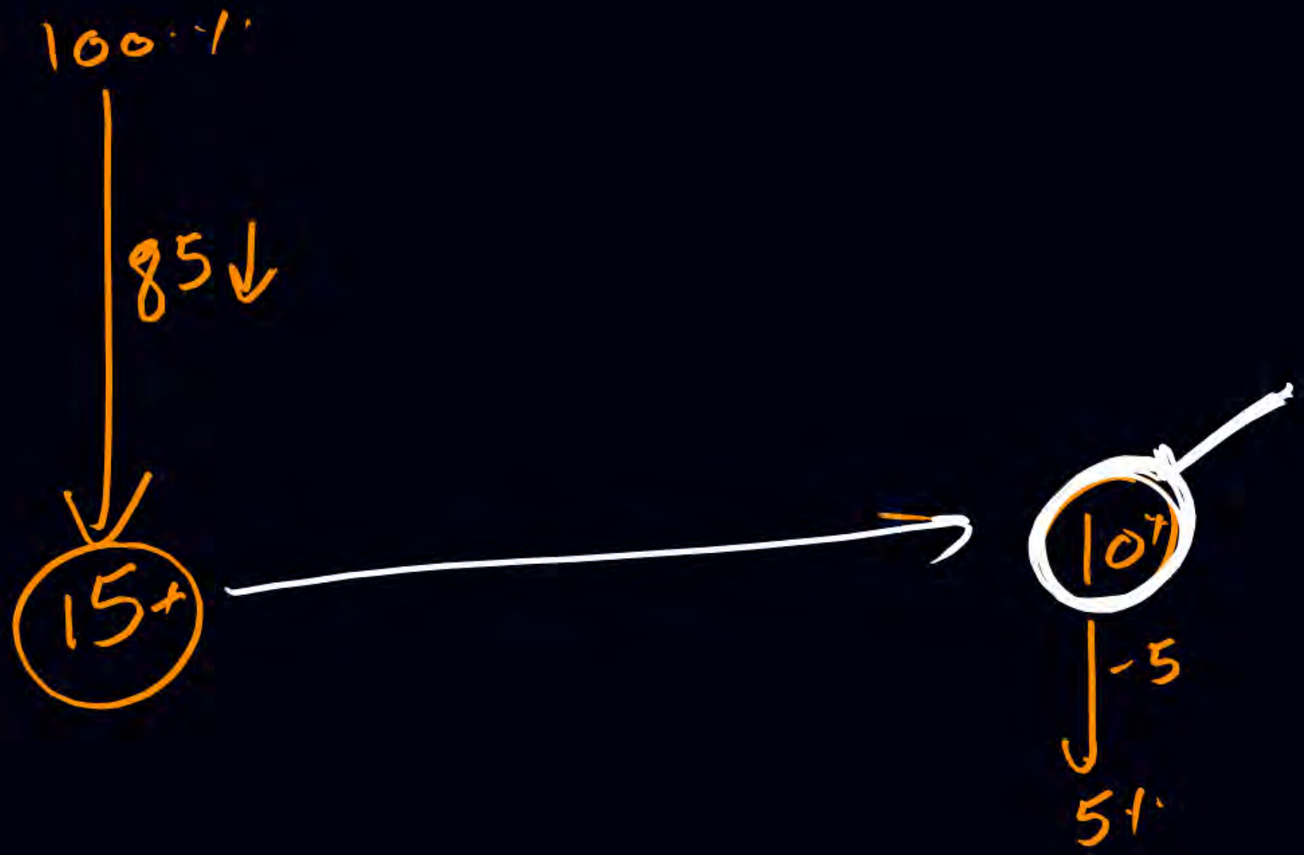


① $M(s) \longrightarrow M(g)$ ΔH_1 = Sublimation energy.

② $M(g) \rightarrow M^+(g) + 1e^-$ ΔH_2 = I.E.

③ $M^+(g) + H_2O \rightarrow M^+(aq)$ ΔH_3 = Hyd. E.

$M(s) + H_2O(l) \rightarrow M^+(aq.) + 1e^-$ S.O.P.


100 ft
85 ft
15 ft
10 ft
5 ft

QUESTION

$Fe \rightarrow Fe^{2+} + 2e^-$ $\quad E_1^0 = x$ volt

$Fe^{2+} \rightarrow Fe^{3+} + 1e^-$ $\quad E_2^0 = y$ volt

$Fe \rightarrow Fe^{3+} + 3e^-$ $\quad E_3^0 = ?$

$$E_3^0 = \left(\frac{2x+y}{3}\right) V$$

QUESTION (AMU (Med.) 2012)

The E° values of the following reduction reactons are given

$Fe^{3+}_{(aq)} + e \longrightarrow Fe^{2+}_{(aq)}$, $n_1 = 1$ $E° = 0.771V$

$Fe^{2+}_{(aq)} + 2e \longrightarrow Fe_{(s)}$, $n_2 = 2$ $E° = -0.447V$

What will be the free energy change for the reaction?

$Fe^{3+}_{(aq)} + 3e^- \longrightarrow Fe_{(s)}$ (1F = 96485C mol^{-1})

(A) +18.51 kJ mol^{-1}

(B) + 11.87 kJ mol^{-1}

(C) –8.10 kj mol^{-1}

(D) –10.41 kJ mol^{-1}

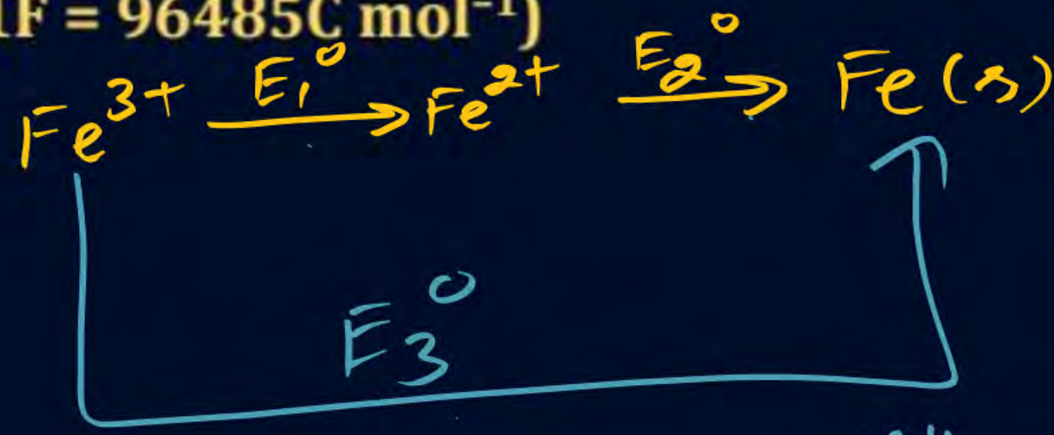
$\Delta G_3^\circ = -n_3 F E_3^\circ$

$= +(+0.124 \times 96485)$ KJ

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

$= 1 \times 0.77 + 2 \times -0.447$

$= -0.124$



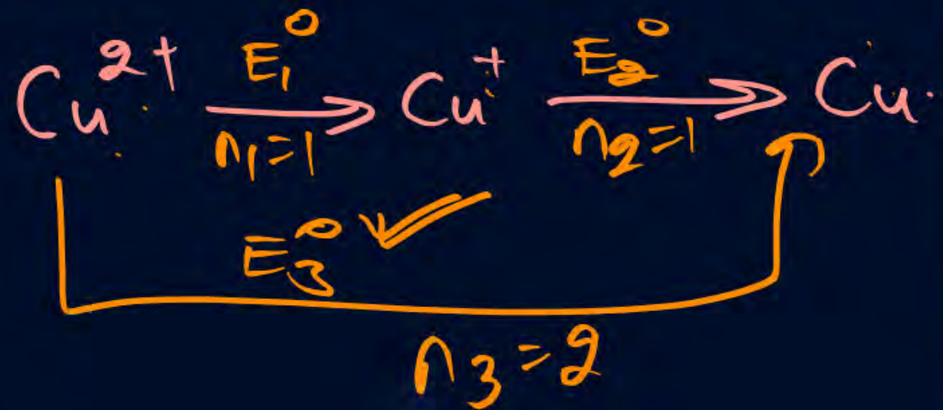
$\frac{96000 \times 124}{1000 \times 1000}$

$\frac{-.894}{.770}$

$\frac{}{124}$

QUESTION (AIPMT (Pre.) 2011)

The electrode potentials for $Cu^{2+}_{(aq.)} + e^- \longrightarrow Cu^+_{(aq).}$ And $Cu^+_{(aq.)} + e^- \longrightarrow Cu_{(s)}$ are + 0.15V and + 0.50 V respectively. The value of $E^o_{Cu^{2+}/Cu}$ will be :



$n_3E_3^\circ = n_1E_1^\circ + n_2E_2^\circ$

$2 \times E_3^\circ = 1 \times 0.15 + 1 \times 0.5$

$E_3^\circ = \frac{0.65}{2} = 0.325V$

(A) 0.500V

(B) 0.325V

(C) 0.650V

(D) 0.150V

QUESTION – (JEE Main 6th April 1st Shift 2023)

The standard electrode potential of M^+/M in aqueous solution does not depend on

A. Sublimation of a solid metal

B. Ionisation of a gaseous metal atom

C. Hydration of a gaseous metal ion

D. Ionisation of a solid metal atom

Q E° for $Cl_2 + 2e^- \rightarrow 2Cl^-$ 1.36 V

find E° for $Cl^- \rightarrow \frac{1}{2}Cl_2 + 1e^-$ -1.36 V

(a) 1.36 V

(b) -1.36 V

(c) -0.68 V

(d) 0.68 V

Q $A + B \rightleftharpoons C + D$ $\quad E^\circ = x\,V \quad K_{eq} = K_1$

$2A + 2B \rightleftharpoons 2C + 2D$ $\quad E^\circ = y\,V \quad K_{eq} = K_2 = (K_1)^2$

then.

① $x = y,\ K_1 = K_2$

② ✗ $x = 2y,\ K_1 = 2K_2$.

③ ✓ $x = y,\ K_1^2 = K_2$

④ ✗ $2x = y,\ K_1^2 = K_2$.

Q1 (JEE M-2025)

FeO_4^{2-} ($+6$) $\xrightarrow[n_1=3]{E_1^\circ = 2\ V}$ Fe^{3+} $\xrightarrow[n_2=1]{E_2^\circ = 0.8\ V}$ Fe^{2+} $\xrightarrow{-0.5\ V}$ Fe

find $E^\circ_{FeO_4^{2-}/Fe^{2+}} = ?$ $\quad E_3^\circ,\ n_3 = 4$

$n_3E_3^\circ = n_1E_1^\circ + n_2E_2^\circ$

$E_3^\circ = \dfrac{3\times 2 + 1\times 0.8}{4}$

$= \dfrac{6.8}{4} = 1.7\ V$

(a) 1.7 V

(b) 1.2 V

(c) 2.1 V

(d) 1.4 V

FeO_4^{2-}

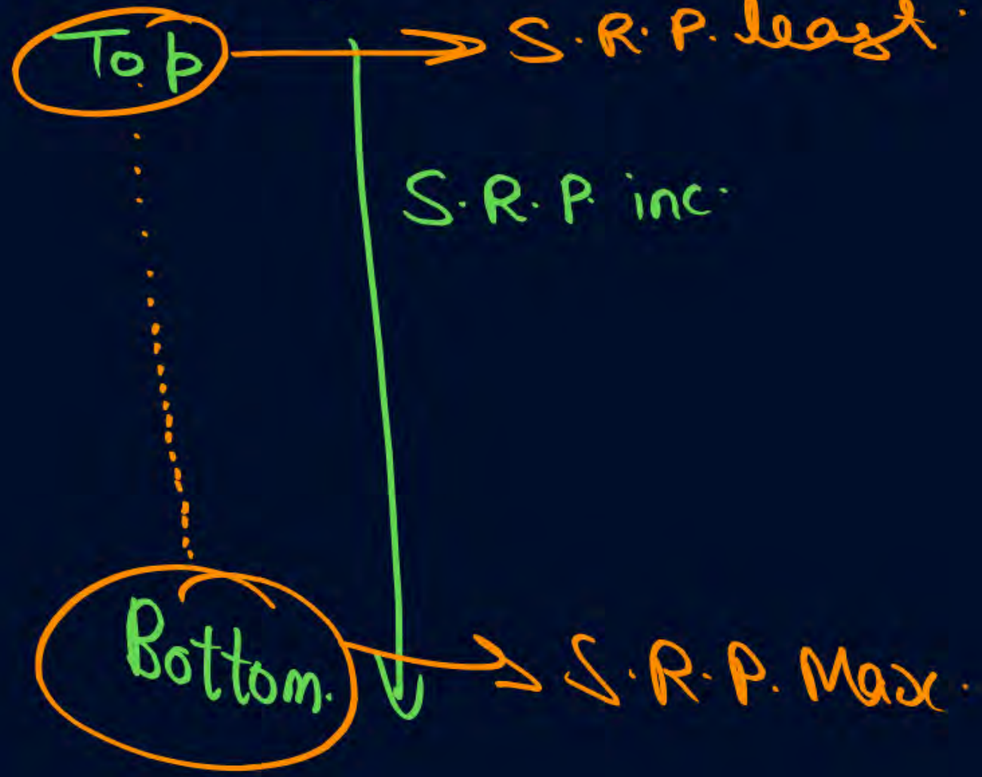
$x - 8 = -2$

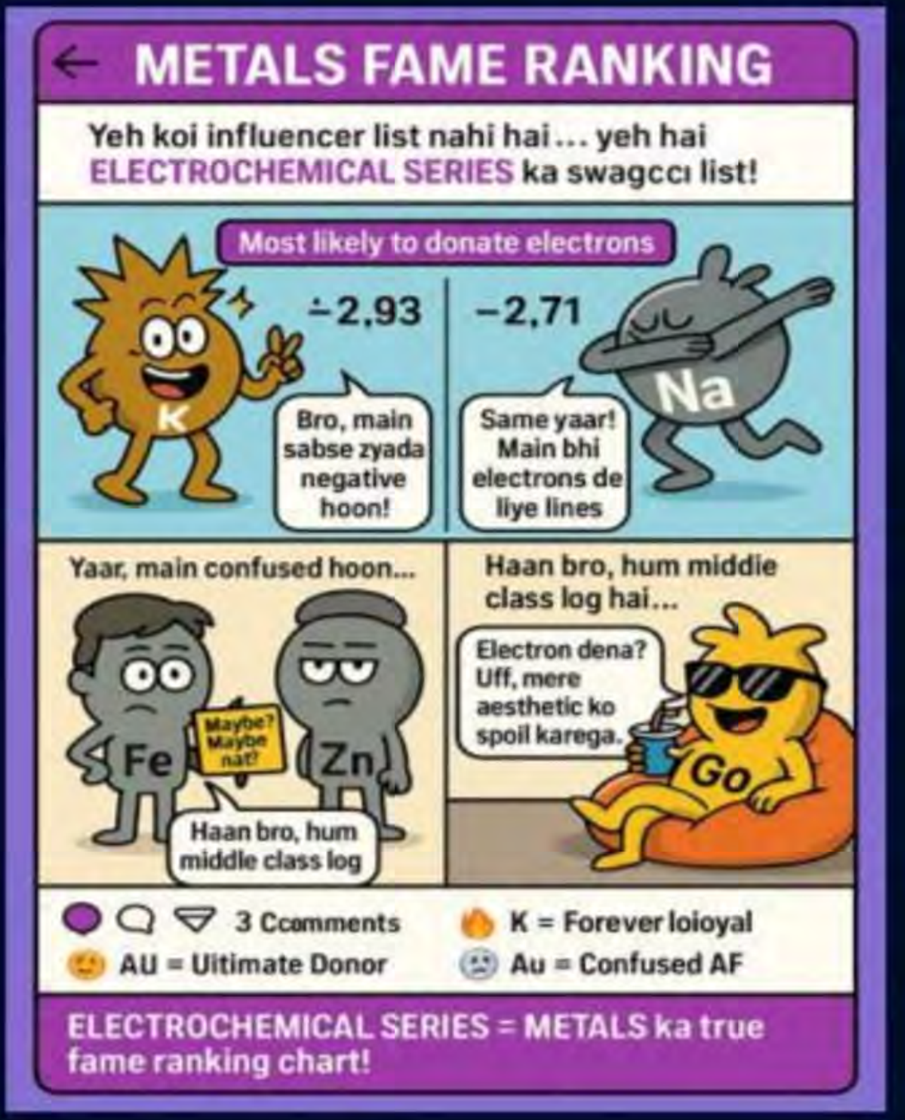
$x = 8 - 2 = +6$

$\dfrac{1.5 \quad 2}{1.7}$

Electrochemical Series

Particles are arranged in increasing order of S.R.P.





S.R.P most

Li^+ → ली (Li)

K^+ → के (ke)

Ca^{2+} → काका (kaka)

Na^+ → ने (Ne)

Mg^{2+} → मांगी (Mangi)

Al^{3+} → अलमारी (Almari)

H_2O → है (Hai)

Zn^{2+} → जमीन (Zameen)

Cr^{3+} → करोड़ो की (Crorooki)

Fe^{2+} → फॉरन (Faoran)

Ni^{2+} → नही (Nahin)

Sn^{2+} → स्नेह (Sneh)

Pb^{2+} → प्रभा से (Prabhase)

S.R.P increasing

H^+ → हाय $E^\circ_{H^+/H_2} = 0$ (Hai)

$AgBr$ → सब (Sab)

Ag^+ → सखी आजी (Sakhi aazi)

Cu^{2+} → कोई (Koi)

Cu^+ → कोई (Koi)

I_2 → आई (Aayi)

O_2 → ऊटी (Ooty se) → H_2O_2

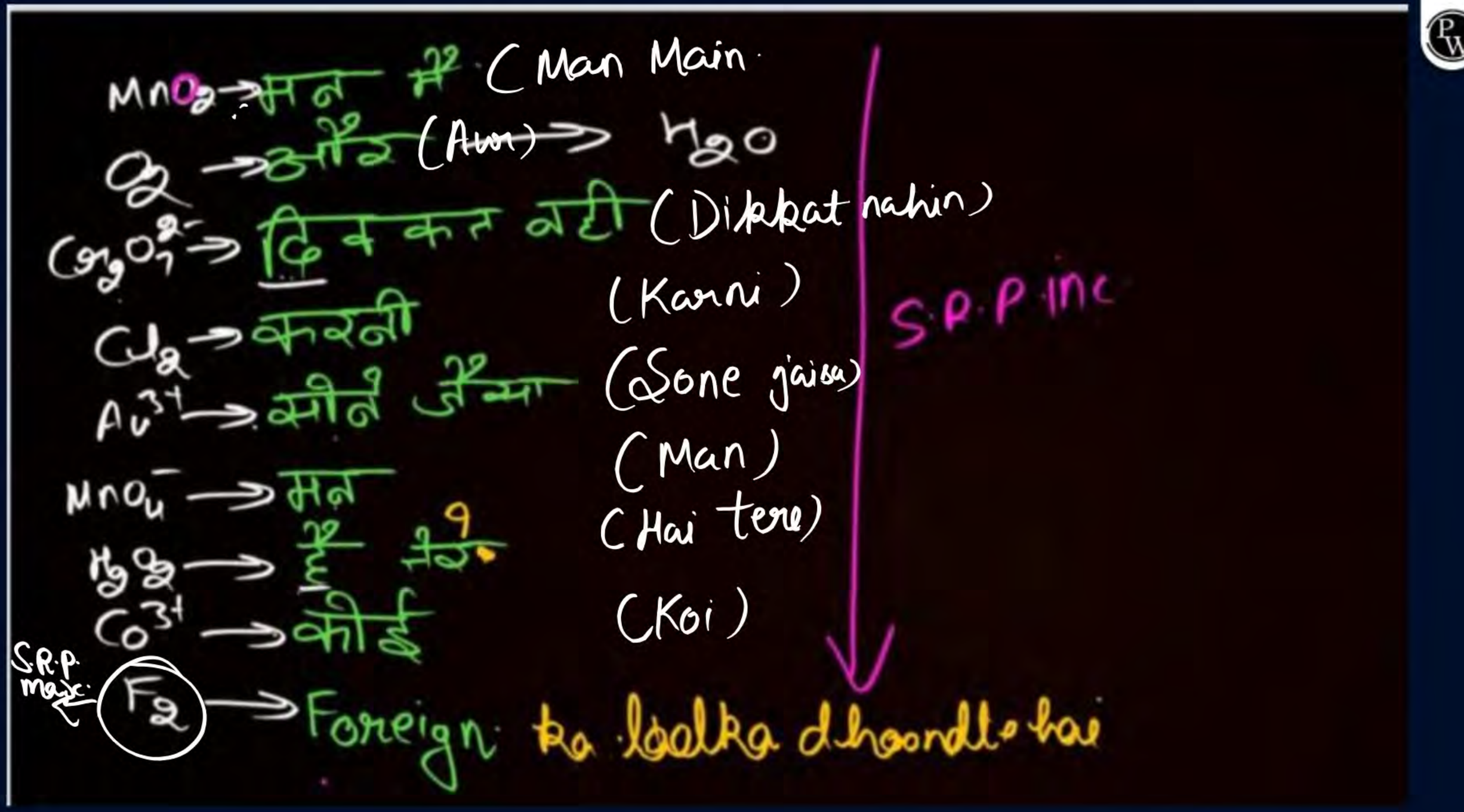
Fe^{3+} → फिर (Fir)

Ag^+ → सबने (Sabne)

Hg^{2+} → Hug kiya

Na^+ → ना (Na)

Br_2 → बिल्कुल (Bilkul)


MnO2 → मन
O2 → ऑक्सिजन
Cr2O7 2- → दिक्कत नहीं
Cl2 → करनी
Au3+ → सोने जैसा
MnO4 - → मन
H2O2 → है
Co3+ → कोई
F2 → Foreign
(Man Main
(Aur) → H2O
(Dikkat nahin)
(Karni)
(Sone jaisa)
(Man)
(Hai tere)
(Koi)
S.R.P. inc
S.R.P. max
ka koika dhoondta hai

$$Li^{+} + 1e^{-} \rightarrow Li$$

$$Cu^{2+} + 2e^{-} \rightarrow Cu$$

$$Cu^{+} + 1e^{-} \rightarrow Cu$$

Applications of Electrochemical Series

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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:

A $X > Y > Z$

B $X > Z > Y$

C $Y > Z > X$

D $Z > X > Y$

QUESTION (AIPMT 2012)

Standard reduction potential of the half reactions are given below:

$F_2(g) + 2e^- \longrightarrow 2F^-(aq)$; $E^\circ = +2.85\ V$

$Cl_2(g) + 2e^- \longrightarrow 2Cl^-(aq)$; $E^\circ = +1.36\ V$

$Br_2(l) + 2e^- \longrightarrow 2Br^-(aq)$; $E^\circ = +1.06\ V$

$I_2(s) + 2e^- \longrightarrow 2I^-(aq)$; $E^\circ = +0.53\ V$

The strongest and 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

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 V and –3.0 V respectively. The reducing power of these metals will be:

A. Y > Z > Z

B. Y > X > Z

C. Z > X > Y

D. X > Y > Z

QUESTION – (AIIMS 2011)

Given that: $E^{o}_{K^{+}/K} = -2.93\ V$;

$E^{o}_{Fe^{2+}/Fe} = -0.44\ V$; $E^{o}_{Zn^{2+}/Zn} = -0.76\ V$;

$E^{o}_{Cu^{2+}/Cu} = 0.34\ V$

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:

$Zn^{2+}(aq) + 2e^-$ $Zn(s)$; -0.762 V

$Cr^{3+}(aq) + 3e^-$ $Cr(s)$; -0.742 V

$2H^+(aq) + 2e^-$ $H_2(g)$; 0.00 V

$Fe^{3+}(aq) + e^-$ $Fe^{2+}(aq)$; 0.770 V

Which is the strongest reducing agent?

(A) $Zn(s)$

(B) $Cr(s)$

(C) $H_2(g)$

(D) $Fe^{3+}(aq)$

QUESTION – (NCERT Exemplar)

Find out which of the following is the strongest Oxidising agent.

$E^{\Theta}_{Cr_2O_7^{2-}/Cr^{3+}} = 1.33V; \quad E^{\Theta}_{Cl_2/Cl^-} = 1.36V$

$E^{\Theta}_{MnO_4^-/Mn^{2+}} = 1.51V; \quad E^{\Theta}_{Cr^{3+}/Cr} = -0.74V$

A Cl^-

B Mn^{2+}

C MnO_4^-

D Cr^{3+}

QUESTION – (NCERT Exemplar)

Find out the most stable ion in its reduced form.

$E^{\Theta}_{Cr_2O_7^{2-}/Cr^{3+}} = 1.33V$; $E^{\Theta}_{Cl_2/Cl^-} = 1.36V$

$E^{\Theta}_{MnO_4^-/Mn^{2+}} = 1.51V$; $E^{\Theta}_{Cr^{3+}/Cr} = -0.74V$

A Cl^-

B Cr^{3+}

C Cr

D Mn^{2+}

QUESTION – (JEE Advance 2013)

List-I		List-II	
P.	$E°(Fe^{3+}, Fe)$	1.	–0.18 V
Q.	$E°(4H_2O \longrightarrow 4H^+ + 4OH^-)$	2.	–0.4 V
R.	$E°(Cu^{2+} + Cu \longrightarrow 2Cu^+)$	3.	–0.04 V
S.	$E°(Cr^{3+}, Cr^{2+})$	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

Home work from modules

Concept application → 3

Prarambh → Q 8, 14, 18

Solution → Complete questions

Redox reaction → IMPQ solution → Recorded → Tomorrow Morning

THANK YOU