YAKEEN NEET 2.0

2026

Electrochemistry

Physical Chemistry | Lecture -7

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Topics to be covered

1. Medics Test, Revision of Last Class
2. Primary & Secondary cells, corrosion
3. Electrolytic cells
4. MPQ, 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

$3\log 2 \quad + \log 10$

$3 \times 0.3 + 1$

The concentration of K^+ ions in the interior (in) and exterior (ex) of a nerve cell are 400 mM and 15 mM respectively. Thus, electrical potential that exists across the membrane is (2.303 RT/F = 0.06 V)

A. +0.172 V

B. – 0.172 V

C. – 0.086 V

D. 0.086 V ✓

K^+ move from low Conc. to high Conc.

anode :- $K \longrightarrow K^+_{(ex.)} + e^-$

Cathode $K^+_{(in.)} + e^- \rightarrow K$

$K^+_{(in.)} \rightarrow K^+_{ex.}$

$n = 1$

$E^\circ_{cell} = ?$

$E_{cell} = ?$

$$E_{cell} = + \frac{0.06}{1} \log \frac{[K^+ in.]}{[K^+ ex.]}$$

$$= 0.06 \log \frac{400}{15}^{80}_{3}$$

$$= 0.06 [\log 80 - \log 3]$$

$$= 0.06 [1.9 - 0.48]$$

$$= 0.06 \times 1.42 = 0.086 \text{ V}$$

Question

E° of different half-cells are given

$E^o_{Cu^{2+}/Cu} = 0.34\ V$ $E^o_{Ag^+/Ag} = 0.80\ V$

$E^o_{Zn^{2+}/Zn} = -0.76\ V$ $E^o_{Mg^{2+}/Mg} = -2.37\ V$

In which cell is ΔG° is most negative?

E^o_{cell}

(A) $Zn \mid Zn^{2+}(1M) \parallel Mg^{2+}(1M) \mid Mg$ $-2.37 - 0.76 =$

(B) $Cu \mid Cu^{2+}(1M) \parallel Ag^{+}(1M) \mid Ag$ $0.8 - 0.34 = 0.46$

(C) ✗ $Ag \mid Ag^{+}(1\ M) \parallel Mg^{2+}(1\ M) \mid Mg$ $-2.37 - 0.8 =$

(D) ✓ $Zn \mid Zn^{2+}(1M) \parallel Ag^{+}(1M) \mid Ag$ $0.8 - (-0.76) = 1.56\ V$

Question

For the cell reaction taking place in the galvanic cell, when equilibrium is set up

$$Zn \mid Zn^{2+}(C_2) \parallel Cu^{2+}(C_1) \mid Cu$$

the change in free energy at a given temperature is a function of

$E_{cell} = 0$

$\Delta G = 0$

$$\Delta G = \Delta G^\circ - \frac{2.303RT}{nF} \log \frac{C_2}{C_1}$$

$$\Delta G^\circ = \frac{2.303RT}{nF} \log \frac{C_2}{C_1}$$

(A) $\log C_1$

(B) $\log C_2$

(C) $\log (C_1 + C_2)$

(D) $\log \left(\frac{C_1}{C_2}\right)$

Question

Given: $E^{o}_{Ag^{+}/Ag} = 0.80\ V$

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

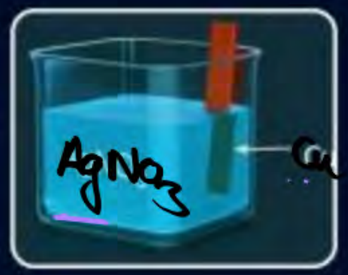
$E^{o}_{Hg^{2+}/Hg} = 0.79\ V$

$E^{o}_{Mg^{2+}/Mg} = -2.37\ V$

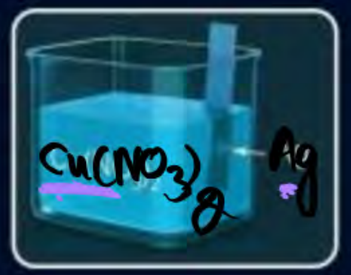
$E^{o}_{Zn^{2+}/Zn} = -0.76\ V$

Based on the above values, which storage arrangement is possible?

A



B



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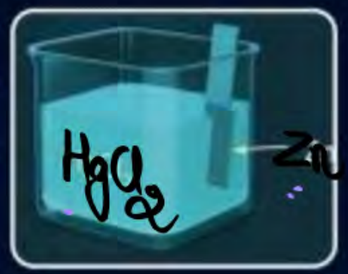

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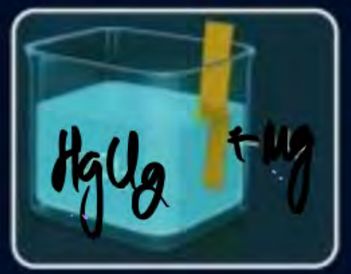


Question

Potential for the following concentration cell at 298 K is

$\left(\frac{2.303RT}{F} = 0.06V\right)$ $n=2$

Pt | H_2(1bar) | HCl(aq) | H_2(0.5bar) | Pt

$E_{cell} = + \frac{0.06}{2} \log \frac{1^2}{0.5}$

$= \frac{0.06}{2} \times 0.3$

$= \frac{0.018}{2} = 0.009\ V$

A. 0.00 V

B. 9×10^{-3} V

C. -9×10^{-3} V

D. 0.06 V

Question

For the following changes

$\frac{1}{2}Cl_2 \xrightarrow{n_1=1} ClO^-$ — (1) $\quad E_1^\circ = x_1$

$\frac{1}{2}Cl_2 \xrightarrow{n_2=5} ClO_3^-$ — (2) $\quad E_2^\circ = x_2$

$ClO^- \xrightarrow{n_3=4} ClO_3^-$ — (3) $\quad E_3^\circ = x_3$

Thus, x_3 expressed in terms of x_1 and x_2 is equal to

(A) $(x_2 - x_1)$

(B) $(x_1 - 5x_2)$

(C) $\frac{(5x_2 - x_1)}{4}$

(D) $x_1 + x_2$

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

$$-x_2 \times 5 = 4 \times E_1^\circ + 1 \times -x_1$$

$$E_1^\circ = \frac{-5x_2 + x_1}{4}$$

$$= \frac{5x_2 - x_1}{4}$$

eq ② − eq ① = eq ③

$$-\eta_2 E_2^0 + \eta_1 E_1^0 = \eta_3 E_3^0$$

$$\frac{-5x_2 + 1x_1}{4} = E_3^0$$

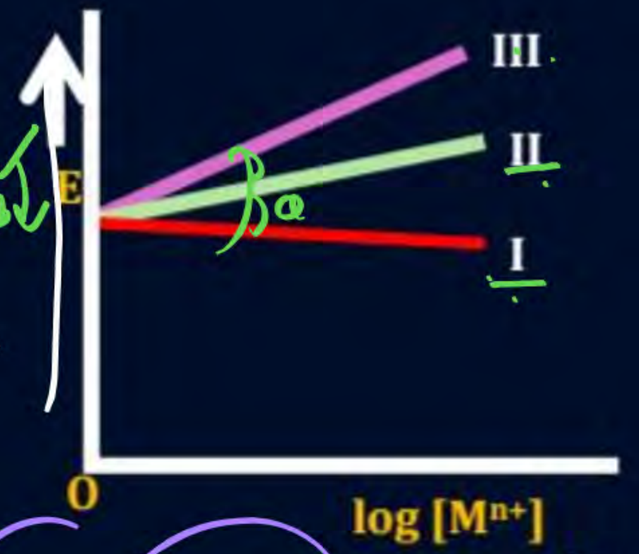
Question

For the half-cell, $M^{n+}(aq) \mid M$

(E) values are plotted against log $[M^{n+}]$ as shown,

for different values of n at a given temperature T.

Select correct graphs for given value of n.



$\tan\theta = \frac{2.303RT}{nF}$

$E_{M^{n+}/M} = E^{\circ}_{M^{n+}/M} + \frac{2.303RT}{nF} \log [M^{n+}]$

$y = c + m x$

(A) (I)-1; (II)-2; (III)-3

(B) (I)-3; (II)-2; (III)-1

(C) (I)-1; (II)-3; (III)-2

(D) (I)-3; (II)-1; (III)-2

Question

For the cell

$Pt(H_2)$ | 0.01M $H^+(aq)$ || 0.1M $H^+(aq)$ | $Pt(H_2)$ $\quad E_{cell} = 0\ V$

(x bar) (y bar)

Thus, (x/y) is

n = 2

E°_{cell}

$$E_{cell} = E^\circ_{cell} + \frac{0.06}{n} \log \frac{[H^+]^2_C (P_{H_2})_A}{[H^+]^2_A (P_{H_2})_C}$$

$E_{cell} = 0$, $E^\circ_{cell} = 0$

$$\log \frac{x}{y} = \log 10^{-2}$$

$$\frac{x}{y} = 10^{-2} = \frac{1}{100}$$

$$\log \frac{(10^{-1})^2\, x}{(10^{-2})^2\, y} = \log \frac{100x}{y} = 0$$

$$\log 10^2 + \log \frac{x}{y} = 0$$

$$10^2 = \frac{-x}{y}$$

- A. 0.1
- B. 10
- C. 0.01
- D. 100

Question

For a (Ag – Zn) button cell, the net reaction is

$Zn(s) + Ag_2O(s) \longrightarrow ZnO(s) + 2Ag(s)$

$\Delta G^\circ = -nFE^\circ_{cell}$

$\Delta G^\circ_f (Ag_2O) = -11.21\ kJ\ mol^{-1}$

$\Delta G^\circ_f (ZnO) = -318.3\ kJ\ mol^{-1}$

$[-318.3 - (-11.21)] \times 1000 = -2 \times 96500\ E^\circ_{cell}$

Thus, E°_{cell} of the button cell is

(A) 3.182 V

(B) 1.71 V

(C) – 1.591 V

(D) 1.591 V

Cut off

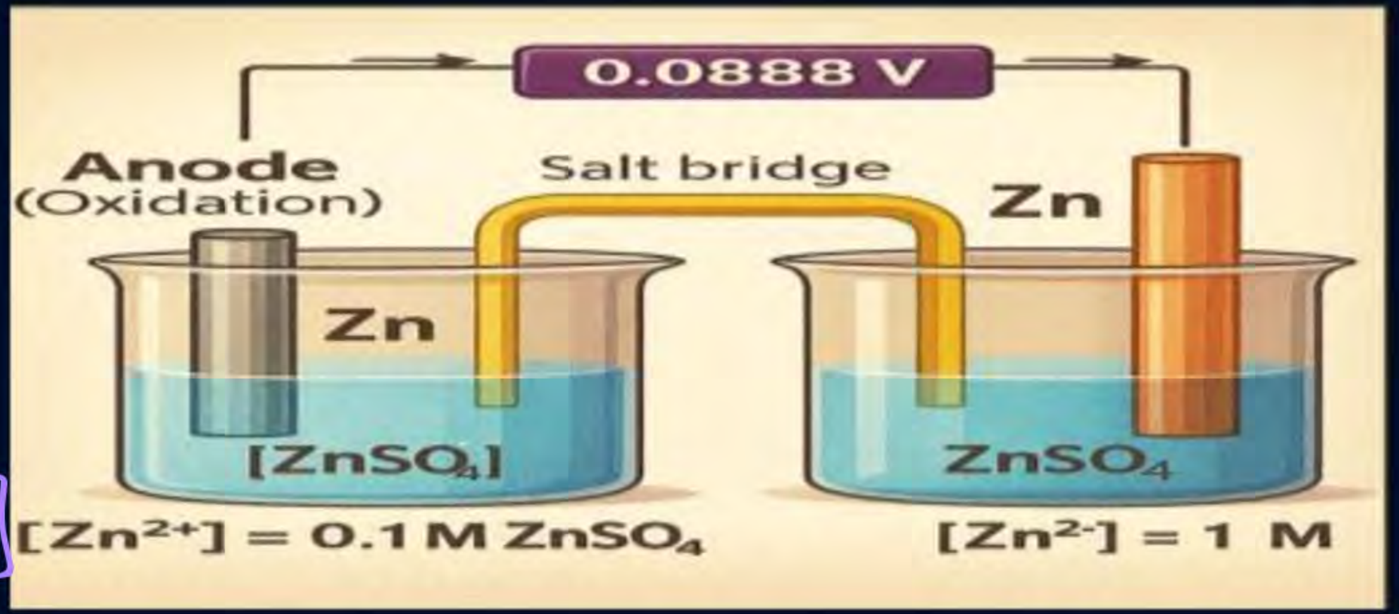
Revision of Last Class

$E^{\circ}_{cell} = 0$

$E_{cell} = \frac{0.06}{n} \log \frac{[C]}{[A]}$

H_2 electrolyte conc.

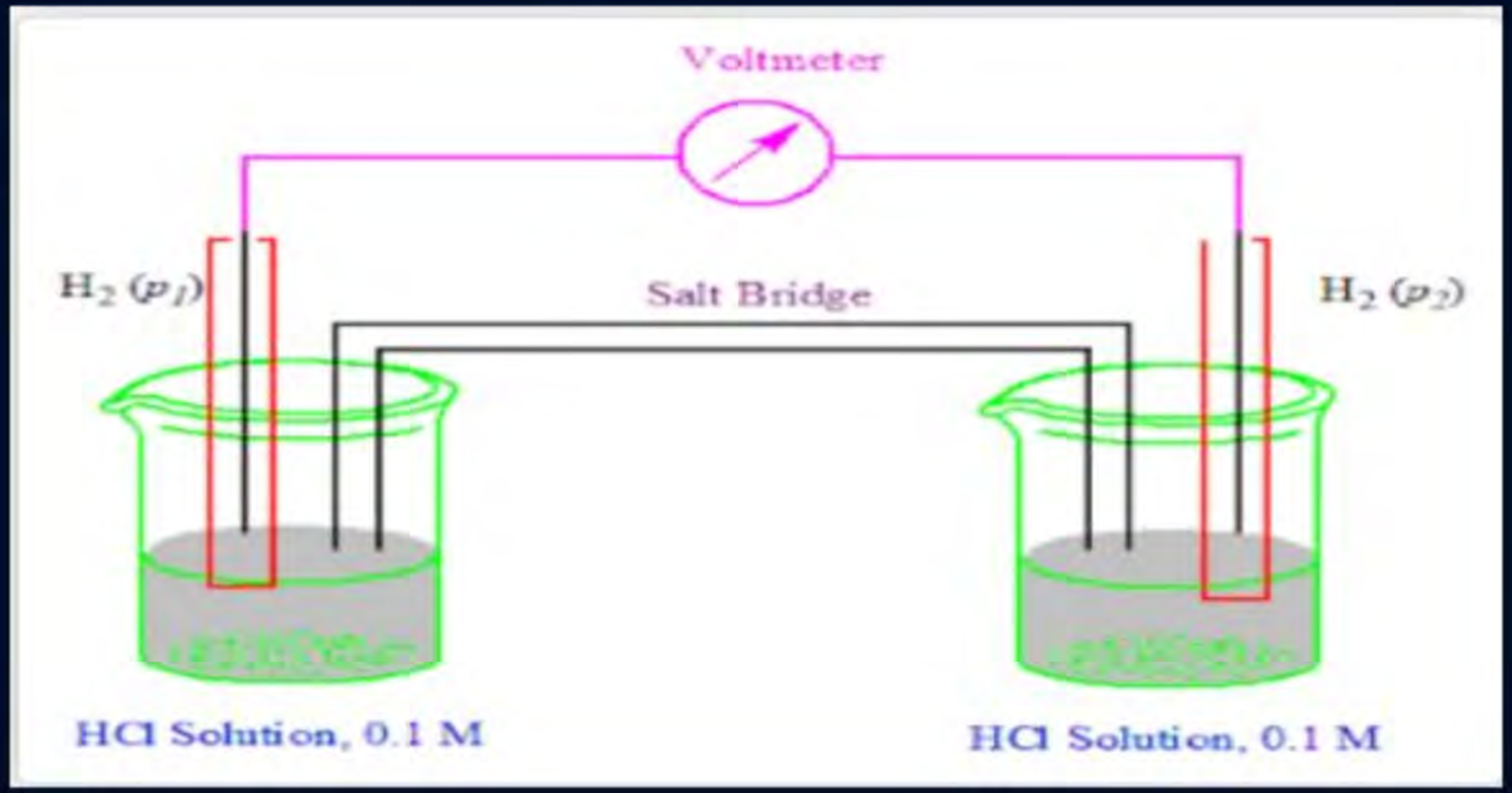
$E_{cell} = 0.06 \{ pH_{anode} - pH_{cathode} \}$



Electrode Concentration Cells

E°_{cell} $\quad n=2.$

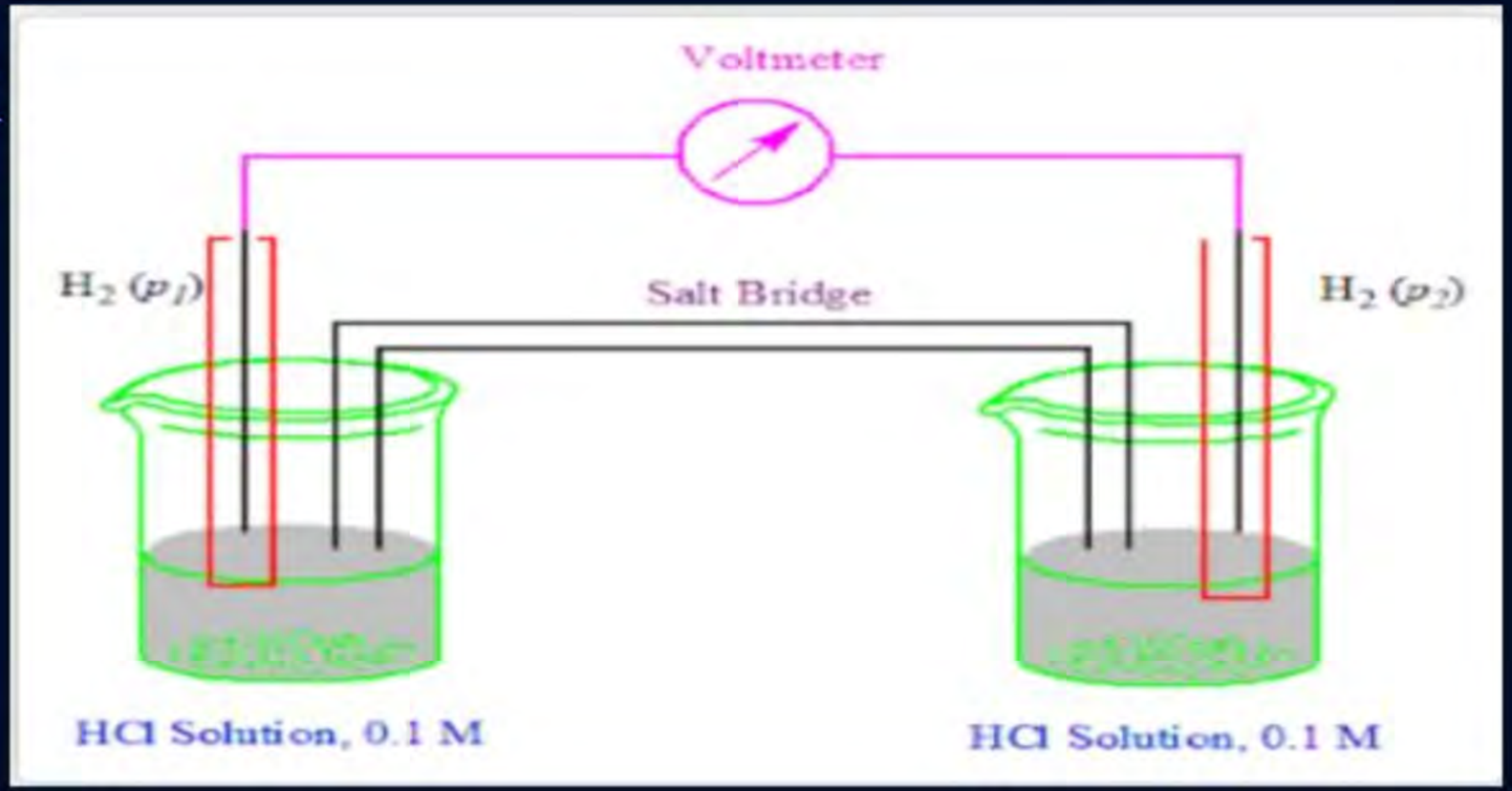
$$E_{cell} = \frac{0.06}{n} \log \frac{(P_{H_2})_A}{(P_{H_2})_C}$$



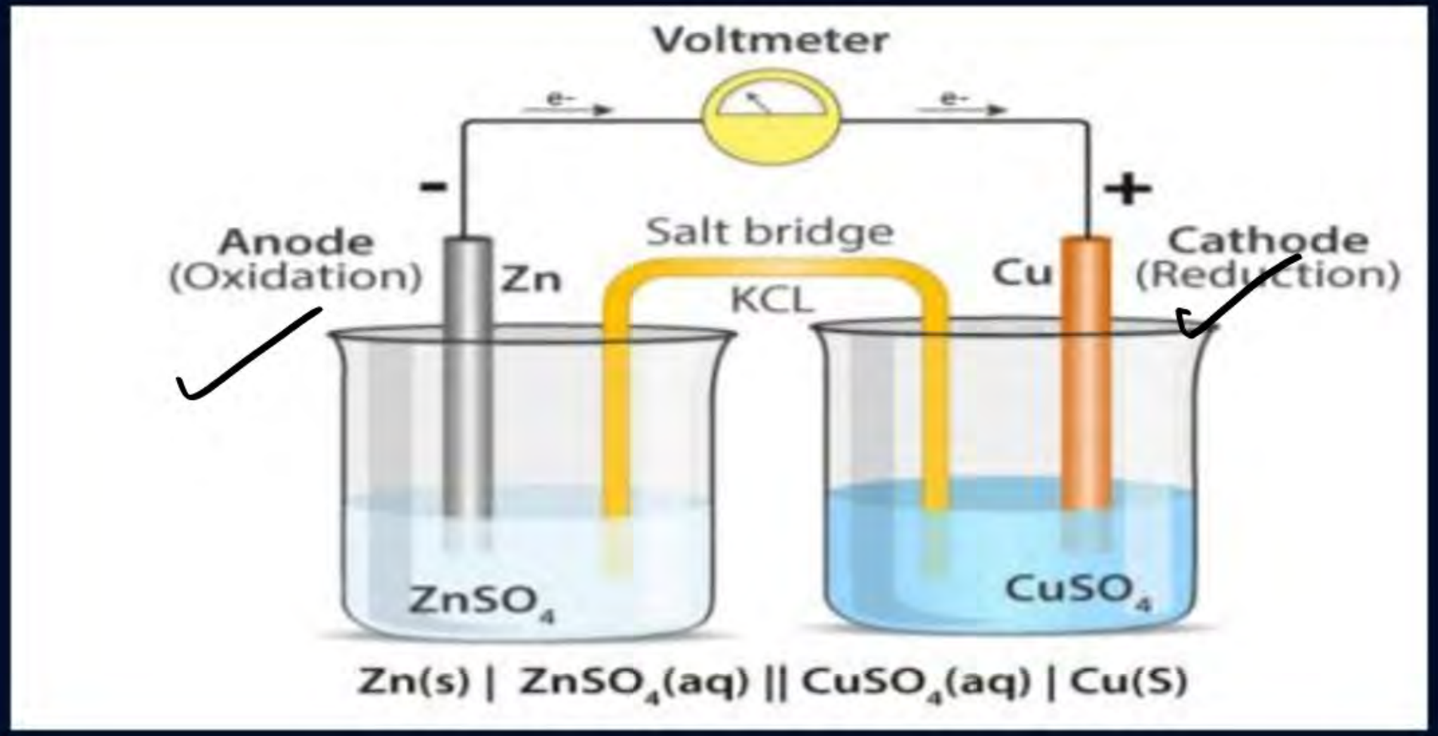
When Electrode pressure and Electrolyte conc. Both are different:

$$E_{cell} = \frac{0.06}{n} \log \frac{(P_{H_2})_A [H^+]_C^2}{(P_{H_2})_C [H^+]_A^2}$$

$n = 2$



How Cells are Discharged ?



trick

Join → Discord → Modern day library

PW

→ study room → 25 students

Types of Electrochemical Cells

- **Primary Cells:** which can't be recharged again & again.

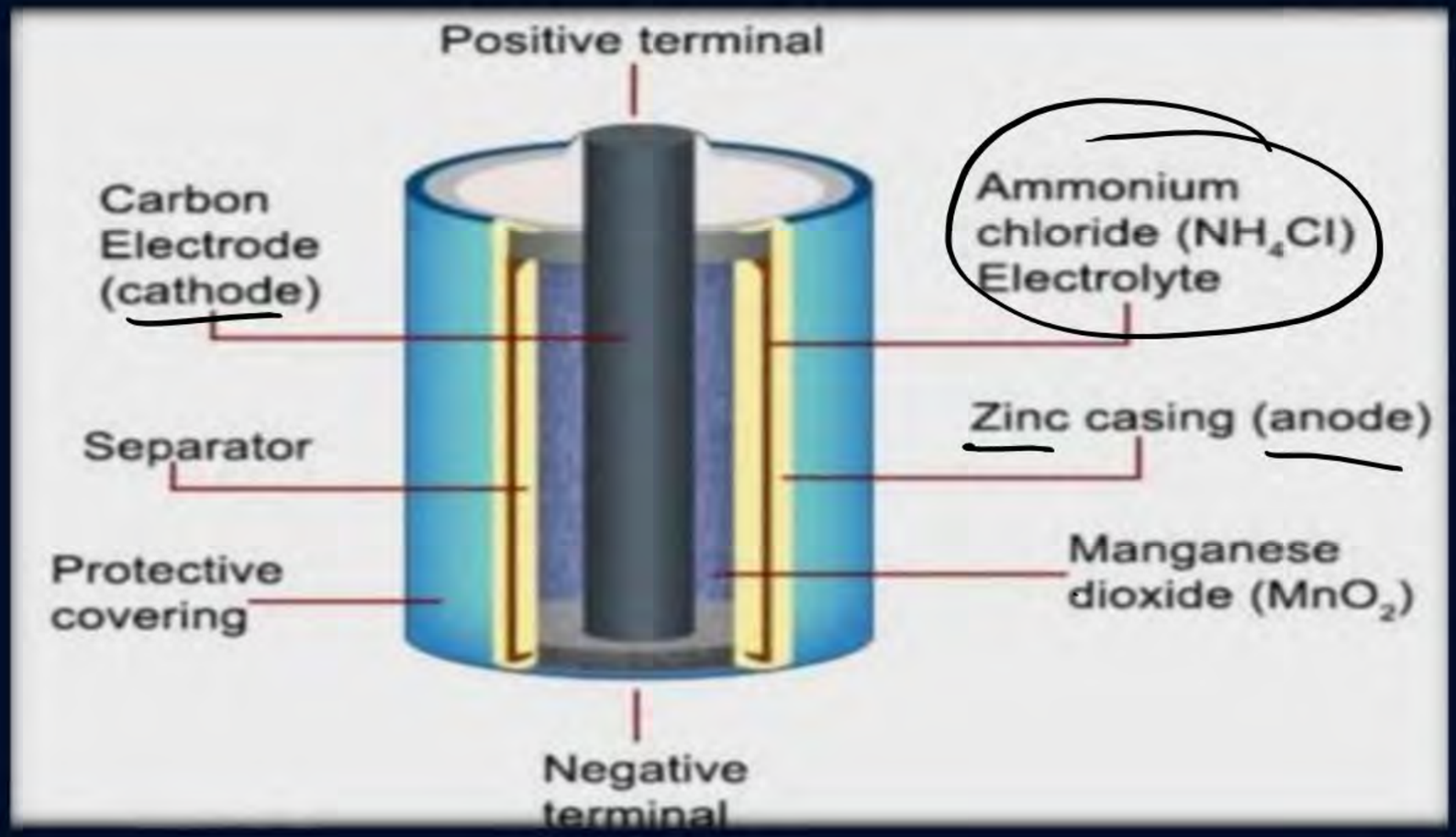
- **Secondary Cells:** which can be recharged again & again.

discharging → electrochemical cell

recharging → electrolytic cell

Primary Cell:

Dry Cell (Leclanche Cell)



- **Anode:-**

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

- **Cathode:-**

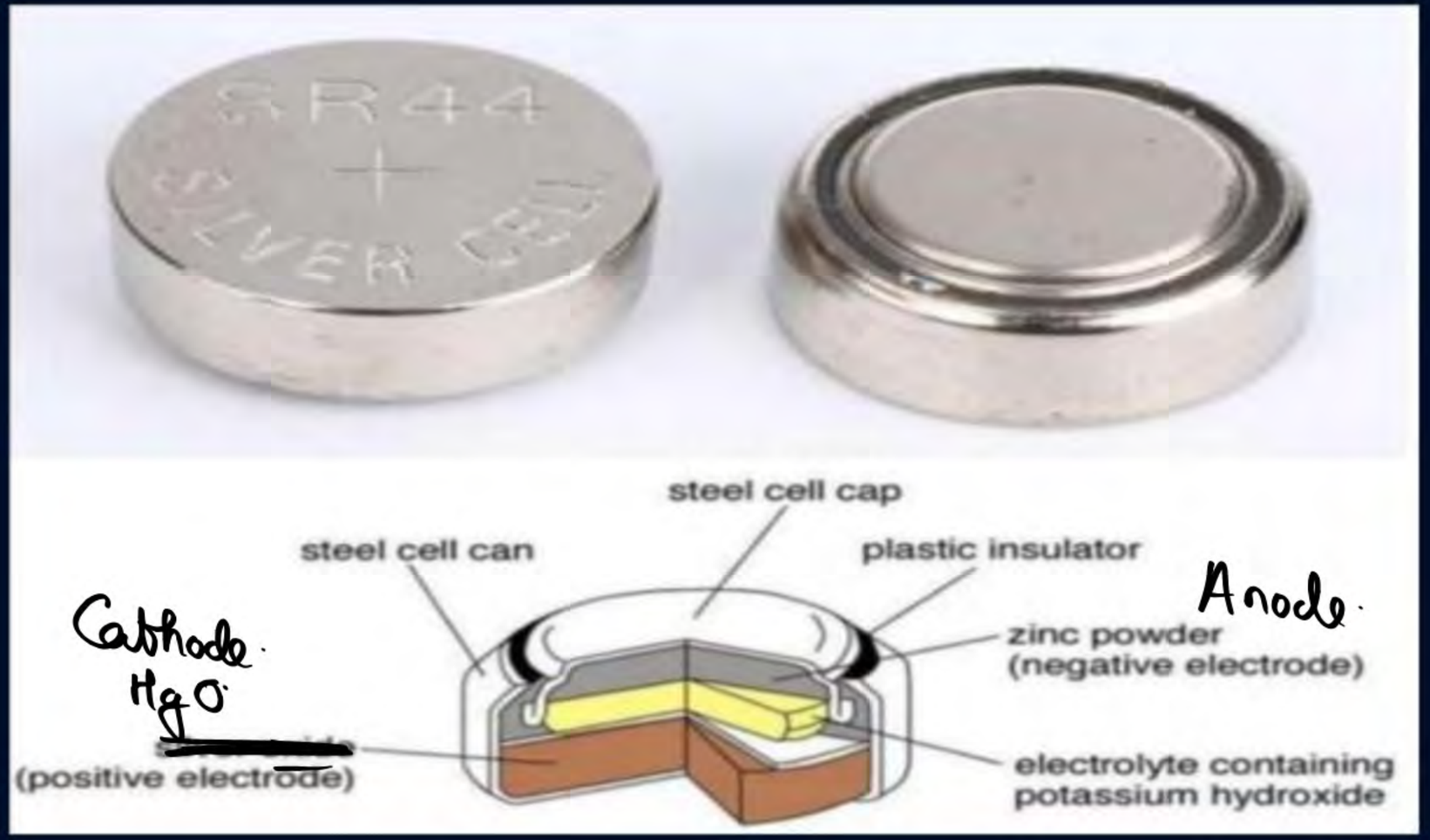
Graphite surrounded by paste of MnO_2 and carbon black

$$2MnO_2 + 2NH_4^+ + 2e^- \longrightarrow Mn_2O_3 + 2NH_3 + H_2O$$

- **Electrolyte:-**

$NH_4Cl + ZnCl_2$

Mercury Cell Or Rubben Malory Cell or Button Cell



- **Anode:-**

$$\overset{0}{Zn} + 2OH^- \longrightarrow \overset{+2}{ZnO} + H_2O + 2e^-$$

- **Cathode:-**

$$\overset{+2}{HgO} + H_2O + 2e^- \longrightarrow \overset{0}{Hg} + 2OH^-$$

$$Zn + HgO \Rightarrow ZnO + Hg$$

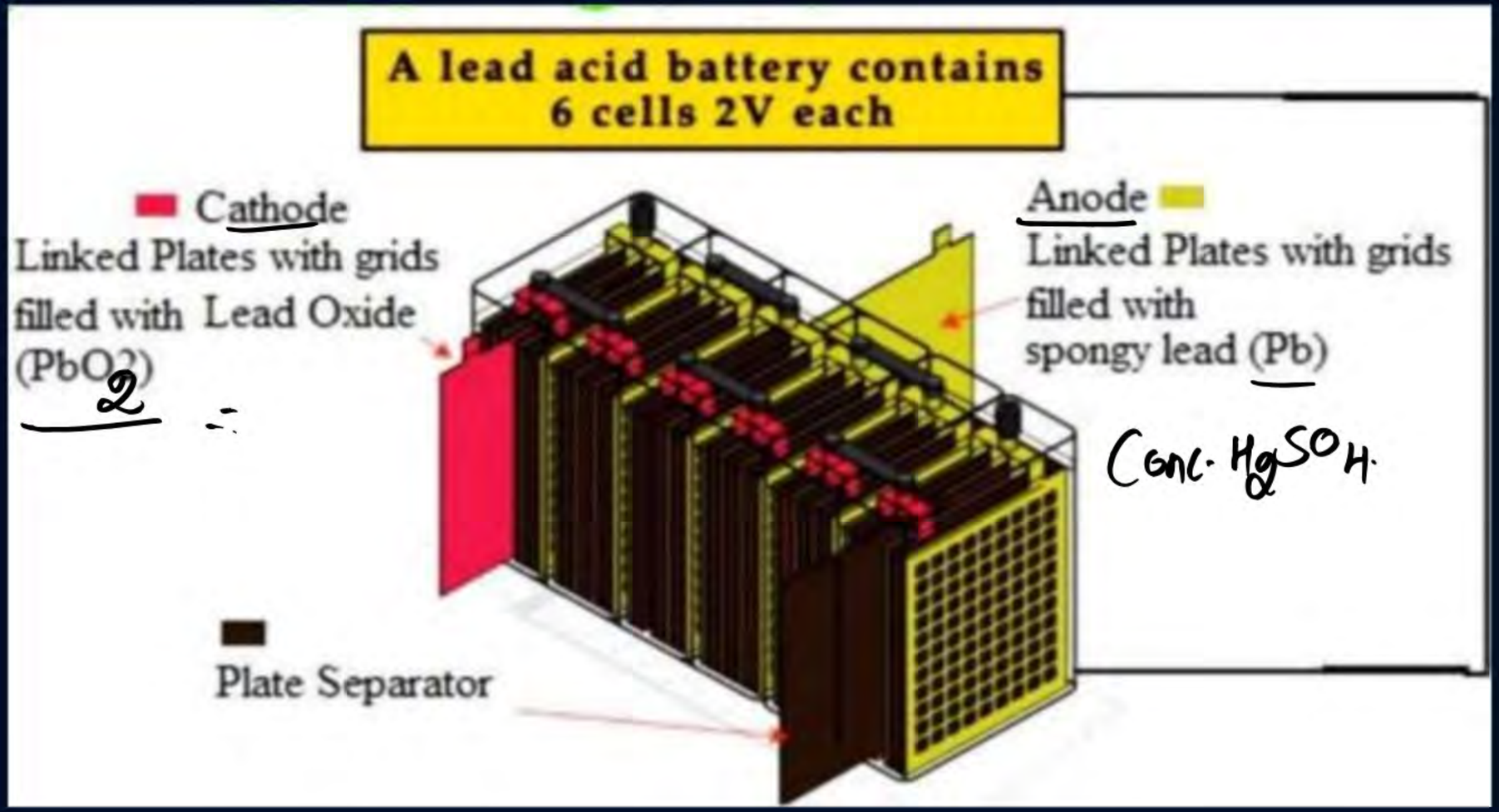
- **Electrolyte:-**

$$KOH + ZnO$$

Secondary Cell.

Lead Storage Battery

Battery is Combination of Cells.
6 Cells of 2 V each Combination 12 V battery.



Discharging ÷ electrochemical Cell

- **Anode:- Pb**

$$Pb + SO_4^{2-} \longrightarrow PbSO_4 + 2e^-$$

- **Cathode:- PbO_2**

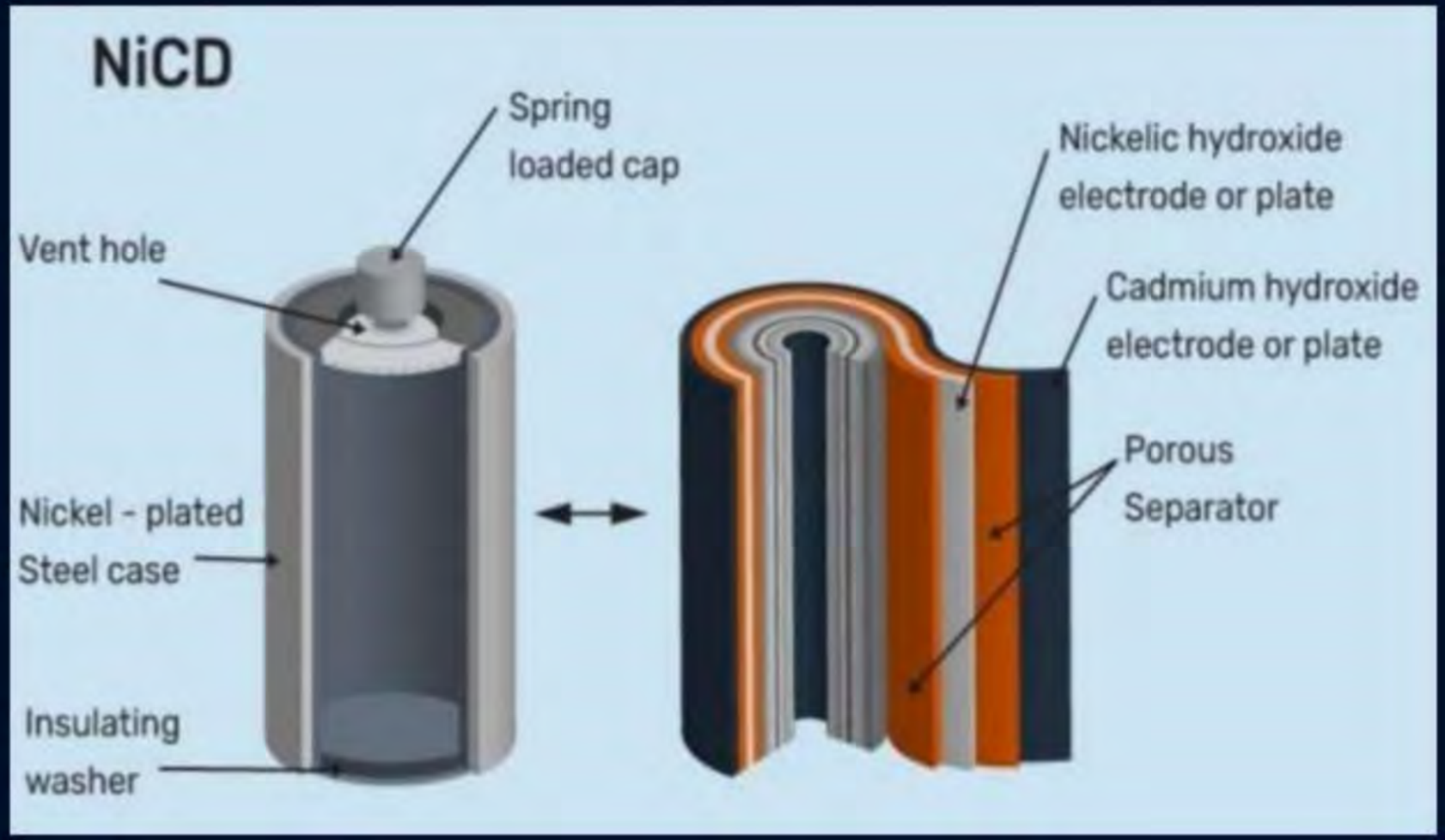
$$PbO_2 + 4H^+ + SO_4^{-2} \longrightarrow PbSO_4 + 2H_2O$$

- **Electrolyte:-**

38% w/w of H_2SO_4

Note:- When conc. Of H_2SO_4 falls below 1.2 g/ml, then battery needs recharging

Nickel Cadmium Cell (Ni Cad Cell)



- **Anode:-**

$$Cd + 2OH^- \longrightarrow Cd(OH)_2 + 2e^-$$

- **Cathode:-**

$$NiO_2 + 2H_2O + 2e^- \longrightarrow Ni(OH)_2 + 2OH^-$$

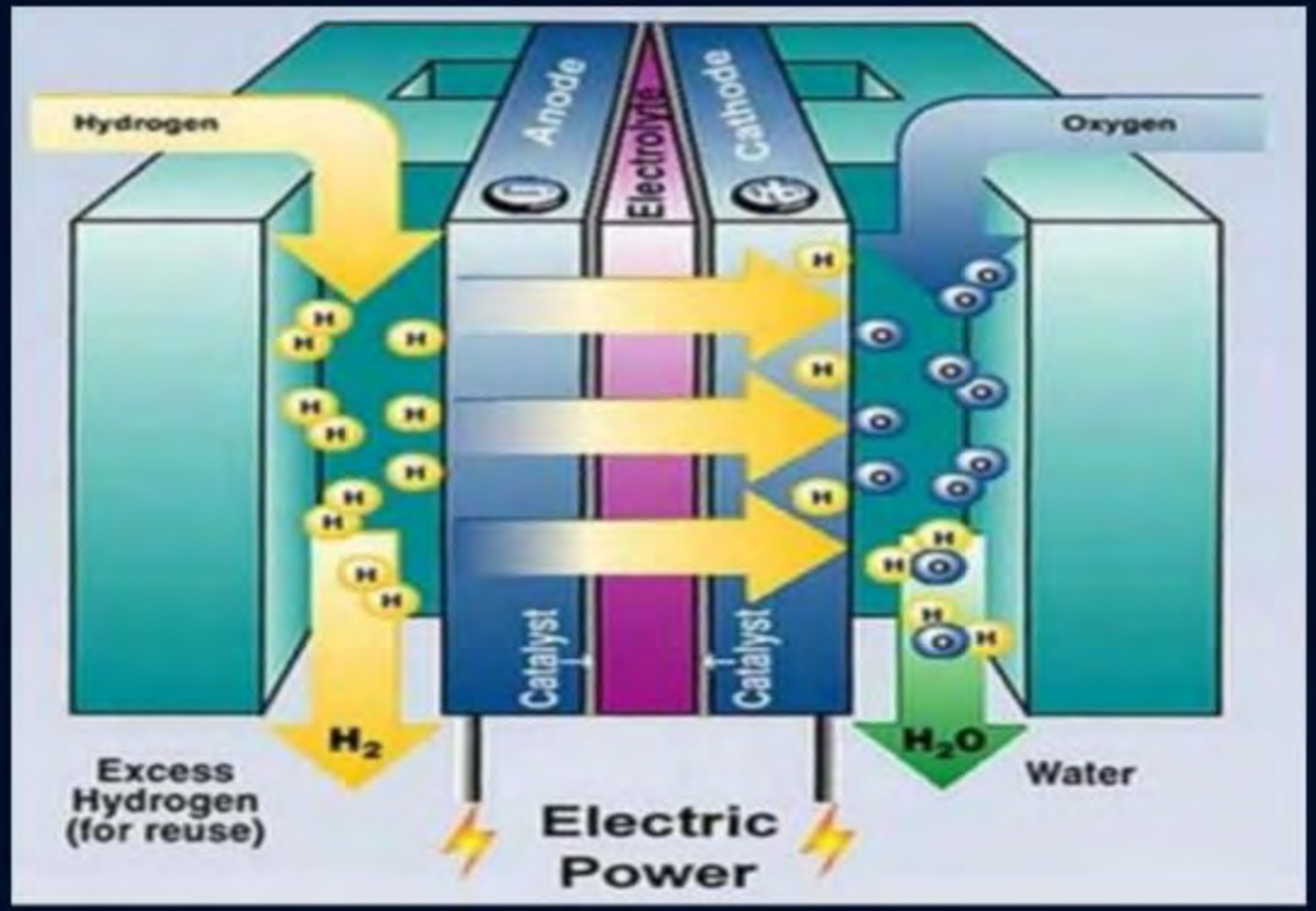
- **Electrolyte:-**

KOH

$H_2 - O_2$ Fuel Cell

↓

11 days apollo moon flight.



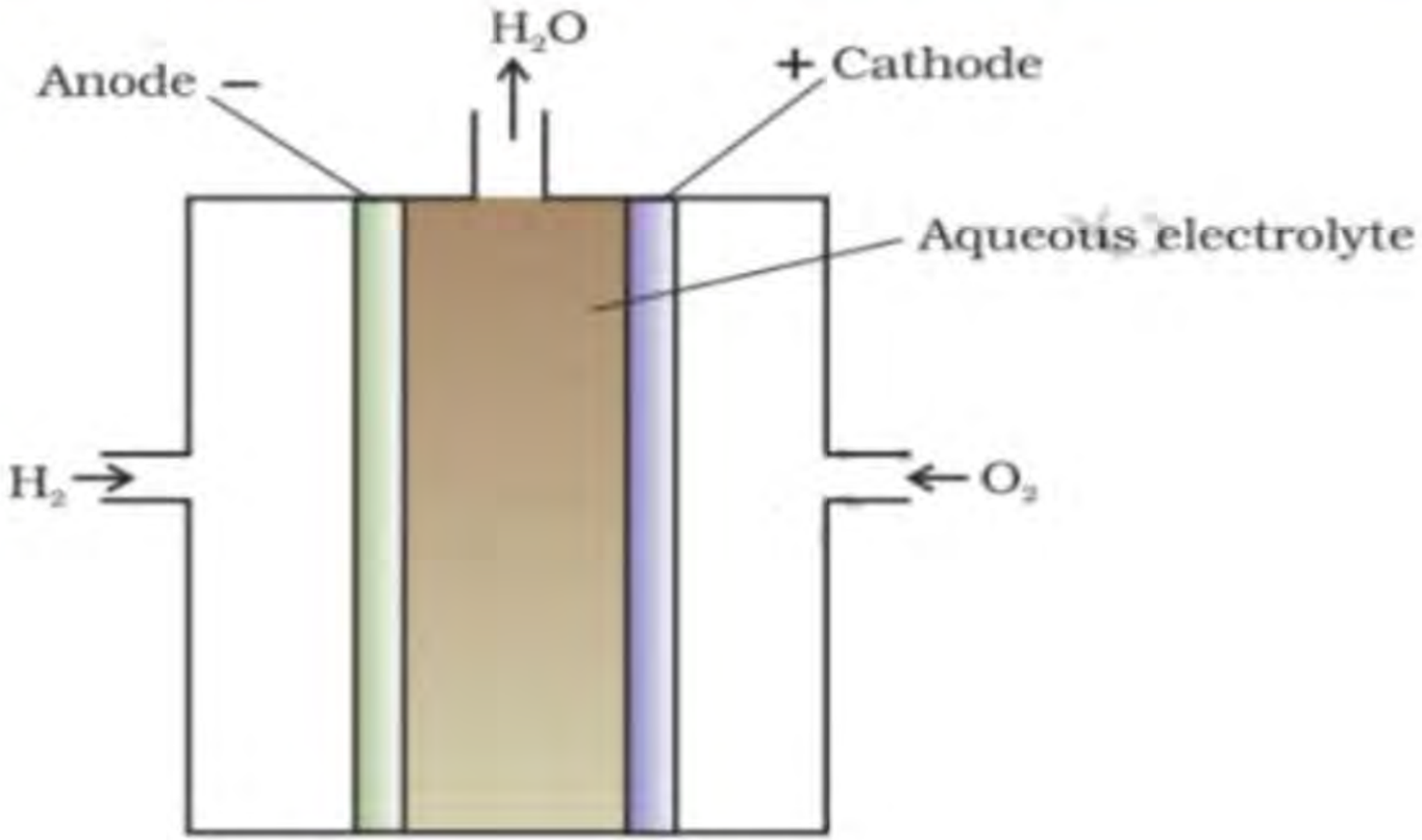


Fig: H_2-O_2 Fuel Cell

- **Anode:-**

$$2\overset{0}{H_2} + 4OH^- \longrightarrow \overset{+1}{4H_2O} + 4e^-$$

- **Cathode:-**

$$\overset{0}{O_2} + 2H_2O + 4e^- \longrightarrow \overset{-2}{4OH^-}$$

$$2H_2(g) + 1O_2(g) \rightarrow 2H_2O(g) \quad \Delta H = (-)ve$$

- **Electrolyte:-**

Resin containing aq. NaOH`

advantages

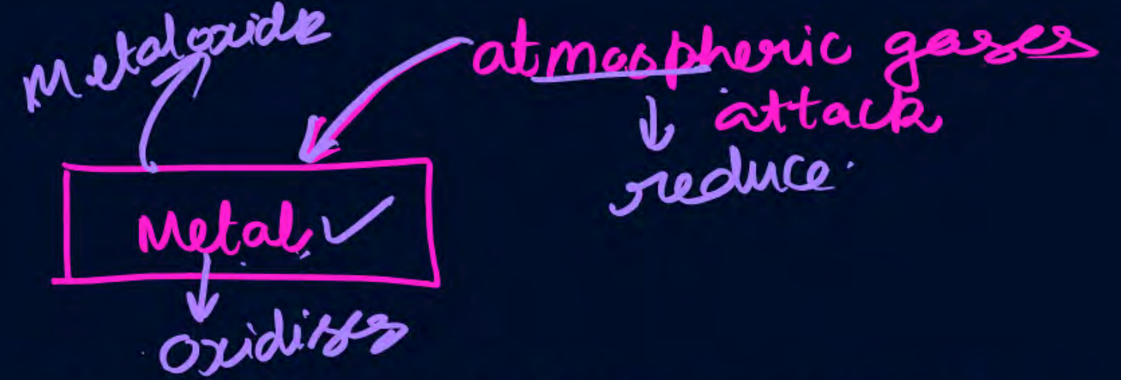
1. No pollution.
2. Compact.
3. efficiency high

$$\eta = \frac{-\Delta G}{\Delta H}$$

Disadvantages

1. Costly.
2. gases contact is bit difficult.

Corrosion



Process of eating away of metal by attack of atmospheric gases on it.

Metal → Oxidation

Atmospheric gases → Reduction

Corrosion of Iron is rusting.

Mechanism of rusting:

- $O_2 + 4H^+ + 4e^- \longrightarrow 2H_2O$ (Cathode)
- $Fe \longrightarrow Fe^{2+} + 2e^-$ (anode)

Corrosion

Overall reactions:

- **Anode :** $2Fe(s) + O_2(g) + 4H^+ \longrightarrow 2Fe^{2+} + 4H_2O$
- **Cathode :** $4Fe^{2+} + O_2 + 4H_2O \longrightarrow 2Fe_2O_3 + 8H^+$
- $Fe_2O_3 + xH_2O \longrightarrow Fe_2O_3 \cdot xH_2O$

Rust

Prevention of Corrosion

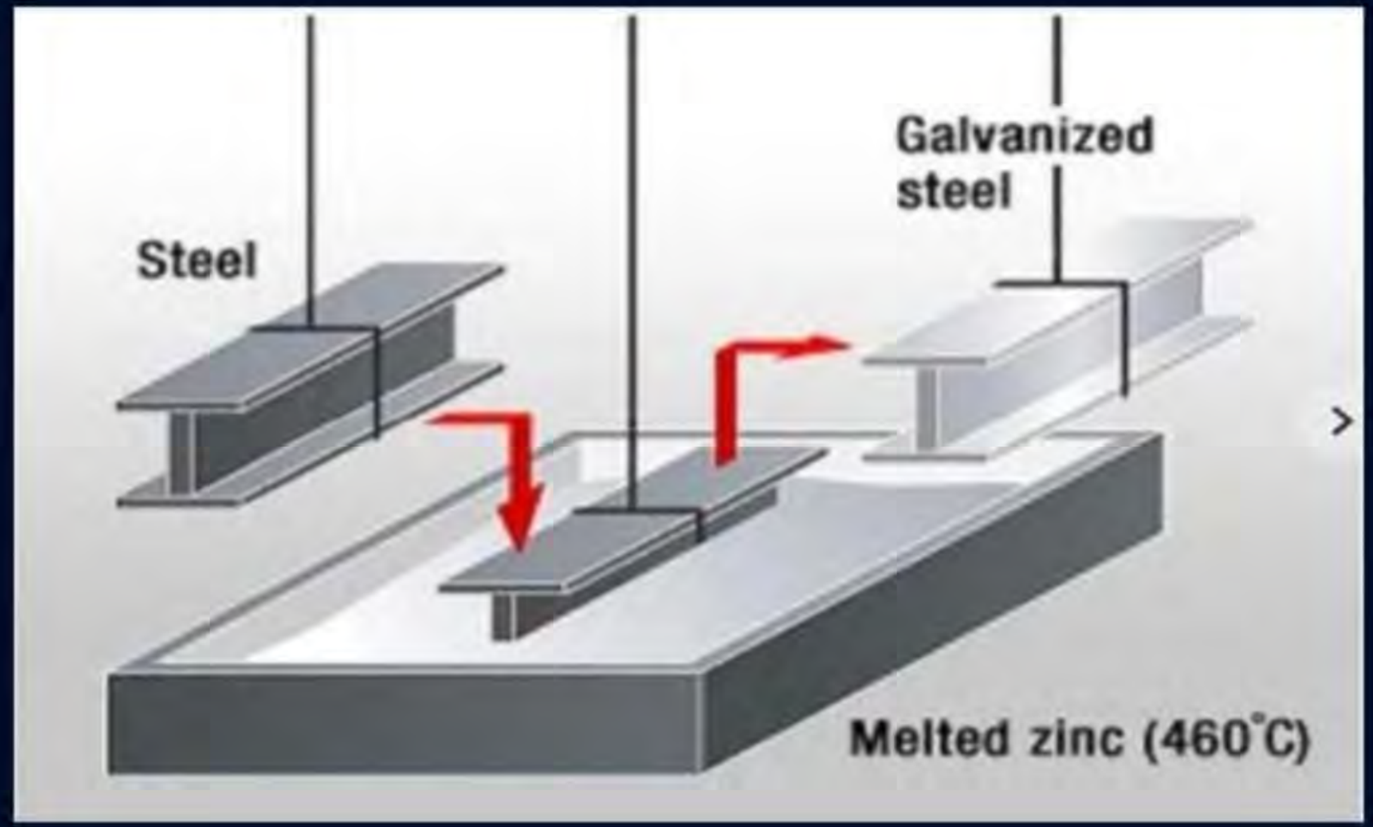
Barrier Protection:

- By coating with paint, oil, grease
- By coating with non-corroding metals such as Ni, Cr and Al (Nichrome coating with Ni + Cr)

Sacrificial Protection

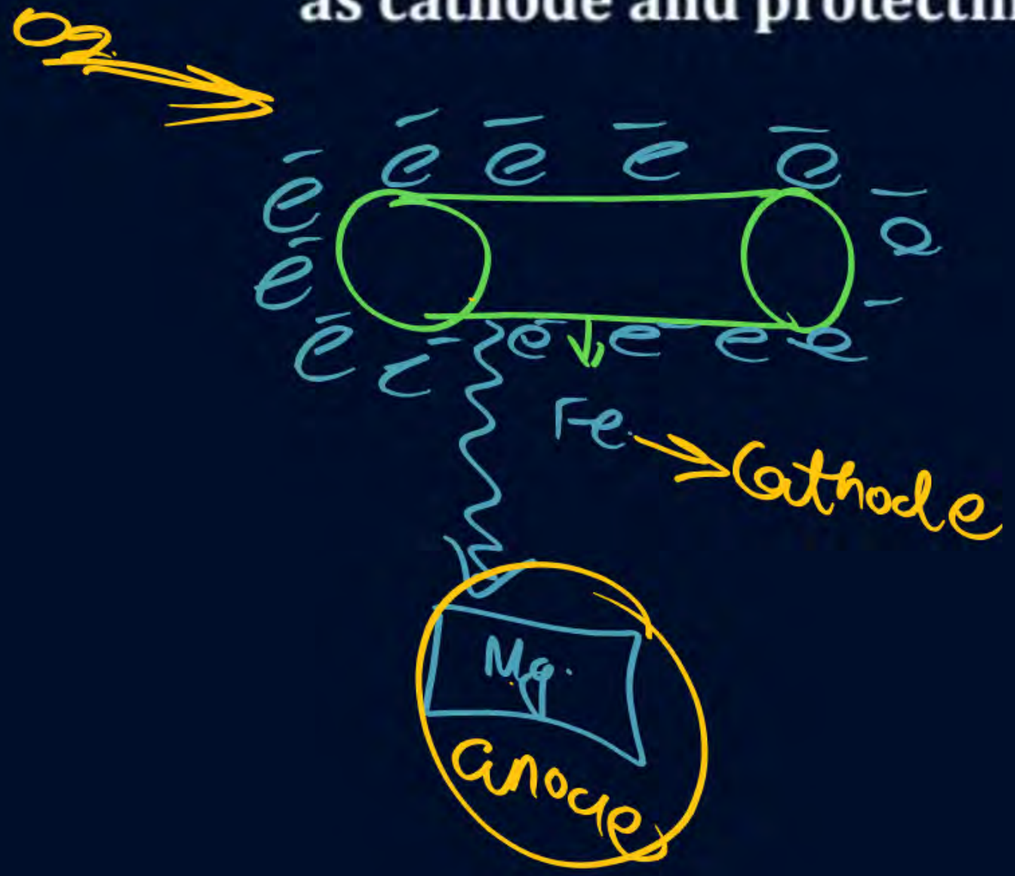
Iron coated with more electropositive metal than iron:

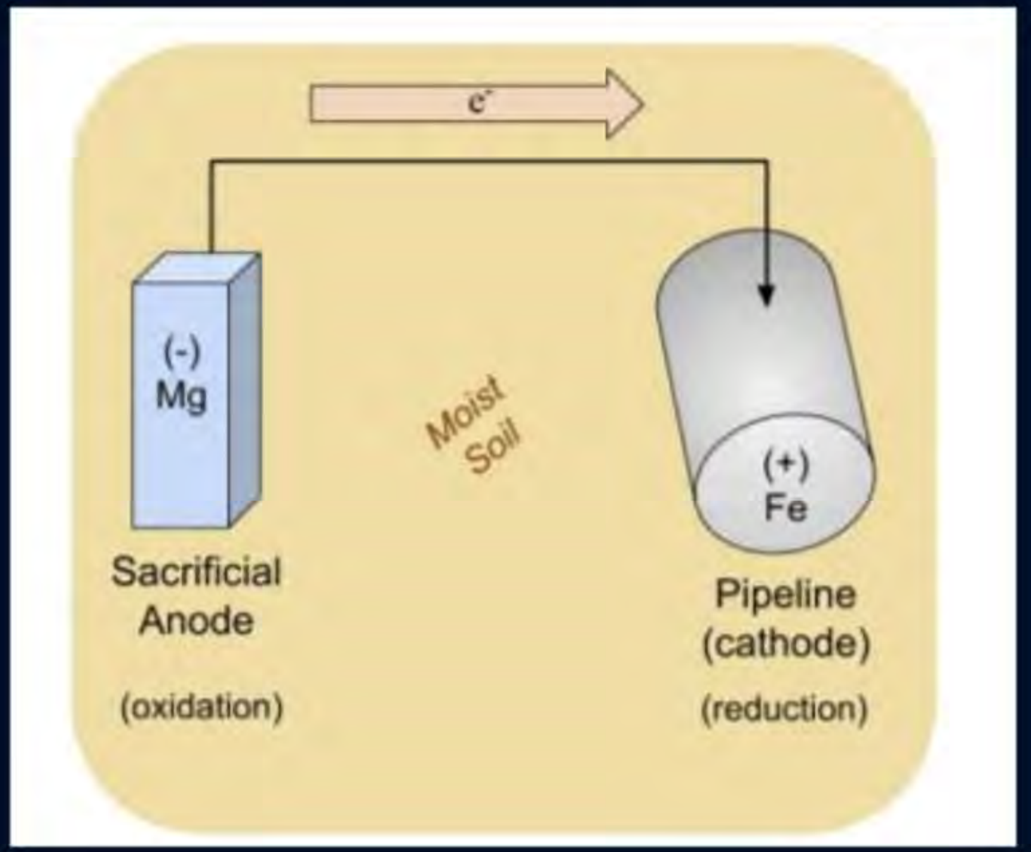
- If zinc is coated it is known as galvanisation



Electrical Protection (Cathodic Protection)

Iron attached to more active metal directly or through wire iron acts as cathode and protecting metal as anode





Using Anti-rust solutions:

There are alkaline phosphate and alkaline Chromate solution. Alkalinity prevents availability of H^+ ions at atmospheric gases will be reduced less. Iron is oxidised (corroded) less.

QUESTION

Compound A used as a strong oxidizing agent is amphoteric in nature. It is the part of lead storage batteries. Compound A is:

A PbO_2

B $PbSO_4$

C Pb_3O_4

D PbO

QUESTION

Galvanization is applying a coating of

A Pb

B Cr

C Cu

D Zn

QUESTION

The overall reaction of a hydrogen-oxygen fuel cell is:

A $2H_2(g) + O_2(g) \longrightarrow 2H_2O(l)$

B $2H_2(g) + 4OH^-(aq) \longrightarrow 4H_2O(l) + 4e^-$

C $O_2(g) + 2H_2O(l) + 4e^- \longrightarrow 4OH^-(aq)$

D $4OH^-(aq) + 4e^- \longrightarrow 2H_2O(l)$

QUESTION

Which of the following is an example of primary battery?

A. Lead storage battery

B. Leclanche cell

C. Nickel-cadmium cell

D. None of these

QUESTION

For lead storage battery, pick the correct statements.

A) During charging of battery, $PbSO_4$ on anode is converted into PbO_2.

B) During charging of battery, $PbSO_4$ on cathode is converted into PbO_2.

C) Lead storage battery consists of grid of lead packed with PbO_2 as anode.

D) Lead storage battery has ~38% solution of sulphuric acid as an electrolyte.

Choose the correct answer from the option given below:

(A) A, B, D only

(B) B, D only

(C) B, C, D only

(D) B, C only

QUESTION

Match List-I with List-II:

List-I		List-II	
(A)	$Cd_{(s)} + 2Ni(OH)_{3(s)} \longrightarrow CdO_{(s)} + 2Ni(OH)_{2(s)} + H_2O_{(l)}$	(I)	Primary Battery
(B)	$Zn(Hg) + HgO_{(s)} \longrightarrow ZnO_{(s)} + Hg(l)$	(II)	Discharging of secondary battery
(C)	$2PbSO_{4(s)} + 2H_2O_{(l)} \longrightarrow Pb_{(s)} + PbO_{2(s)} + 2H_2SO_{4(s)}$	(III)	Fuel cell
(D)	$2H_{2(g)} + O_{2(g)} \longrightarrow 2H_2O_{(l)}$	(IV)	Charging of secondary battery

Choose the correct answer from the options given below:

A (A)-(I), (B)-(II), (C)-(III), (B)-(IV)

B (A)-(IV), (B)-(I), (C)-(II), (B)-(III)

C (A)-(II), (B)-(I), (C)-(IV), (B)-(III)

D (A)-(II), (B)-(I), (C)-(III), (B)-(IV)

QUESTION

Hydrogen-oxygen fuel cells are used in space-craft to supply

A Oxygen

B Power

C Water

D Both (B) and (C)

QUESTION

When iron is rusted, it is:

A Reduced

B Decomposed

C Oxidised

D Changed in the fine power

QUESTION

Chemical formula of rust is:

A $Fe_2O_3 . H_2O$

B $Fe_2O_3 . 5H_2O$

C $Fe_2O_3 . xH_2O$

D None of these

QUESTION

Which of the following is/are example/s of corrosion?

(A) Tarnishing of silver → Black (Ag_2S)

(B) Rusting of iron

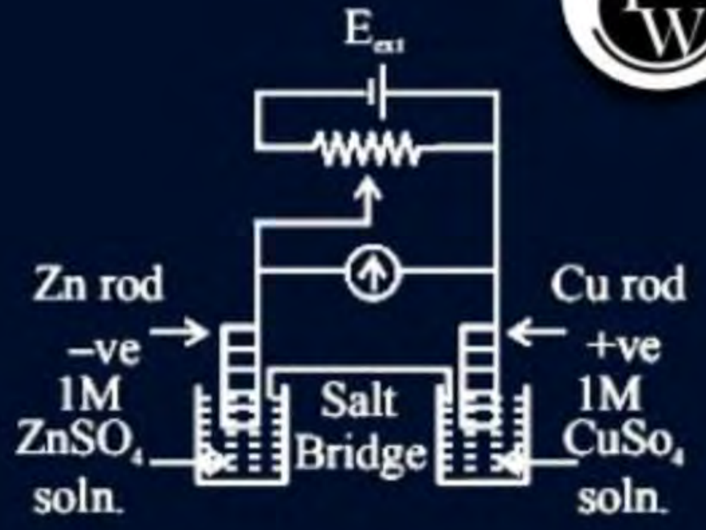
(C) Development of green coating on copper

(D) All of these ✓

QUESTION [4th Sept 1st Shift-2020]

$E^{o}_{Cu^{3+}/Cu} = +0.34$ V; $E^{o}_{Zn/Zn} = -0.76$ V.

Identify the incorrect statement from the options below for the above cell.



(A) If $E_{ext} > 1.1$ V, e^- flows from Cu to Zn

(B) If $E_{ext} < 1.1$ V, Zn dissolves at anode and Cu deposits at cathode

(C) If $E_{ext} = 1.1$ V, no flow of e^- or current occurs

(D) If $E_{ext} > 1.1$ V, Zn dissolves at Zn electrode and Cu deposits at Cu electrode

QUESTION

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 given $H_2(g)$

(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+}.

A) C > A > B > D

B) C > A > D > B

C) A > C > D > B

D) A > C > B > D

QUESTION – (AIIMS 2018 (M), 27 May)

In following cell reaction

$Mg(s) + 2Ag^{+}\ (0.001\ M) \rightarrow Mg^{2+}\ (0.20\ M) + 2Ag(s)$

Calculate E_{cell} for the reaction. [$E^{\circ} = 3.17$ V]

A. 2.63 V

B. 3.04 V

C. 3.33 V

D. 3.51 V

QUESTION

Calculate E_{cell}

Pt, H_2 (10 atm)/ H^+/ H_2 (5 atm), Pt

QUESTION – (AIIMS 2018 (M), 26 May)

Cell equation:

$A + 2B^{2+} \rightarrow A^{2+} + 2B$

$A^{2+} + 2e^- \rightarrow A \qquad E^\circ = +0.34\ V$

And $\log_{10} K = 15.6$ at 300 K for cell reactions. Find E° for $B^+ + e^- \rightarrow B$

$$Given \left[\frac{2.303\ RT}{F} = 0.059\right] at\ 300\ K$$

(A) 0.80

(B) 1.26

(C) –0.54

(D) +0.94

Magarmach Practice Questions

QUESTION – (AIIMS 2010)

For a cell reaction involving two electron change, the standard EMF of the cell is 0.295 V at 25°C. The equilibrium constant of the reaction at 25°C will be:

A 29.5×10^{-2}

B 10

C 1×10^{10}

D 2.95×10^{-10}

QUESTION-(NEET 2023)

Given below are two statements: one is labelled as Assertion A and the other is labelled as Reason R:

Assertion A: In equation $\Delta_r G = -nFE_{cell}$ value of $\Delta_r G$ depends on n.

Reasons R: E_{cell} is an intensive property and $\Delta_r G$ is an extensive property.

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

(A) A is false but R is true.

(B) Both A and R are true and R is the correct explanation of A.

(C) Both A and R are true but R is NOT the correct explanation of A.

(D) A is true but R is false.

QUESTION-(NEET 2022)

Find the emf of the cell in which the following reaction takes place at 298 K

$Ni(s) + 2Ag^{+}\ (0.001\ M) \rightarrow Ni^{2+}\ (0.001\ M) + 2Ag(s)$

(Given that $E^{0}_{cell} = 10.5\ V, \frac{2.303\ RT}{F} = 0.059$ at 298 K)

A 1.05 V

B 1.0385 V

C 1.385 V

D 10.4115 V

QUESTION-(NEET 2022)

Given below are half cell reaction:

$MnO_4^- + 8H^+ + 5e^- \rightarrow Mn^{2+} + 4H_2O$

$E^0_{Mn^{2+}/MnO_4^-} = -1.510\ V$

$1/2\ O_2 + 2H^+ + 2e^- \rightarrow H_2O$

$E_{O_2/H_2O} = +1.223\ V$

Will the permanganate ion MnO_4^- liberate O_2 from water in the presence of an acid?

(A) No, because $E^0_{cell} = -2.733$ V

(B) Yes, because $E^0_{cell} = +0.287$ V

(C) No, because $E^0_{cell} = -0.287$ V

(D) Yes, because $E^0_{cell} = +2.733$ V

QUESTION-(NEET 2019)

For a cell involving one electron $E^\circ_{cell} = 0.59$ V at 298 K, the equilibrium constant for the cell reaction is:
[Give that $2.303RT/F = 0.059$ V at T = 298 K]

A 1.0×10^2

B 1.0×10^5

C 1.0×10^{10}

D 1.0×10^{30}

QUESTION

Find E_{cell} of following:

$Pt, H_2 \mid H^+ (10^{-3}\ M) \parallel H^+(10^{-4}\ M) \mid H_2, Pt$

Home work from modules

Prarambh → Q 77 to Q 81

Parikshit → Q 2, 5, 12, 17, 18, 19, 20, 27, 28

THANK YOU