

UPDAAN



2025

Bharat Mata Ki
Jai ♡

METALS AND NON-METALS

(Extraction – IV and Refining of Metals)

CHEMISTRY

Lecture – 09

BY: SUNIL BHAIIYA



Topics

to be covered

- 1 Extraction of Metals of High Reactivity - *Part II*
- 2 Refining of Metals



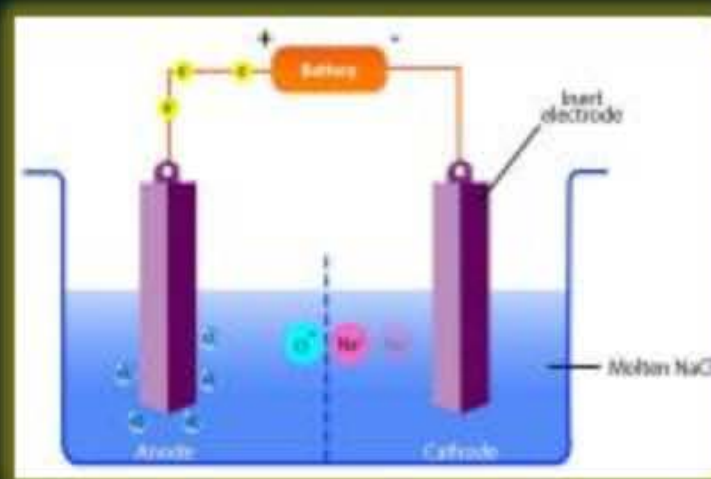


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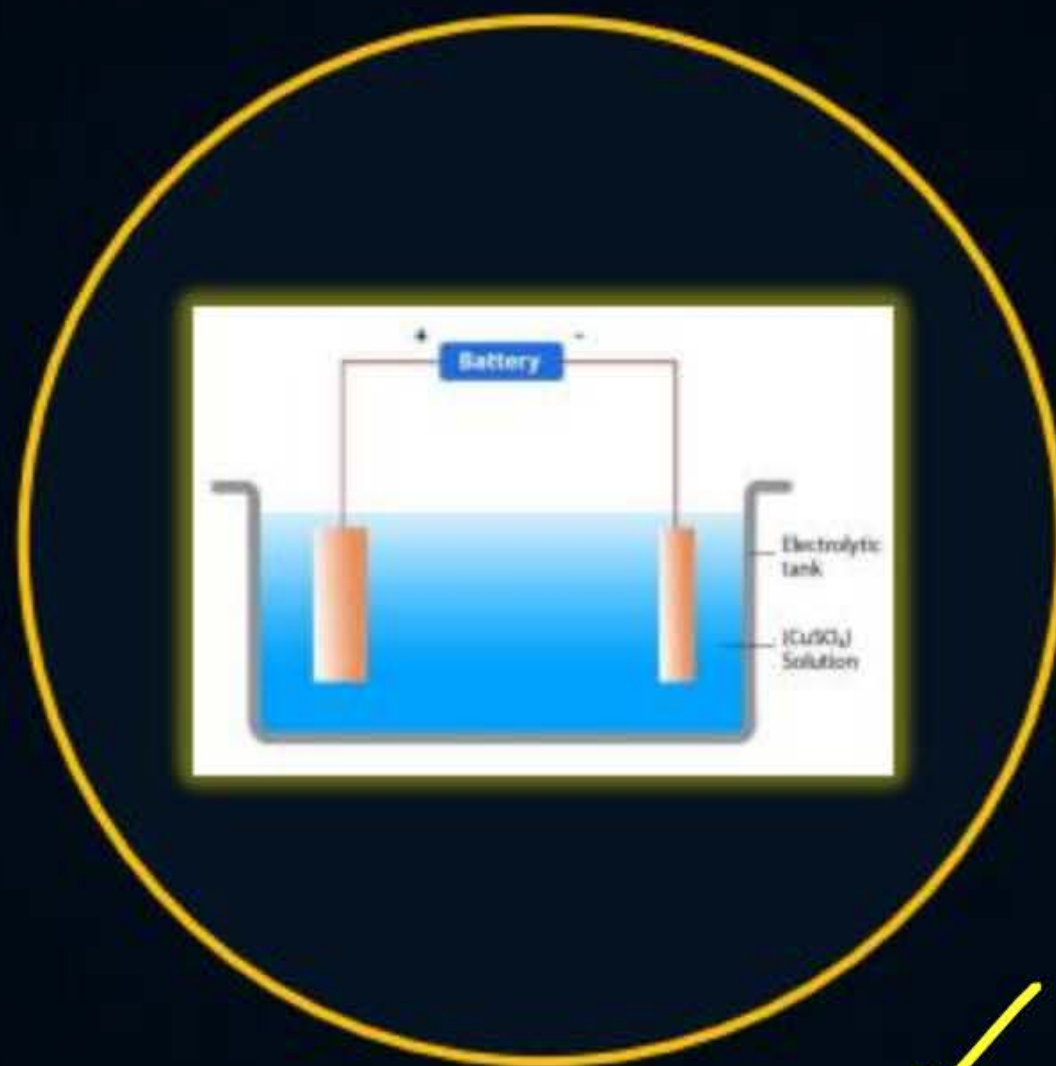


Knowledge Ride On



Extraction of Metals of High Reactivity – Part II ✓

Knowledge Ride On



Refining of Metals ✓

Knowledge Ride On



Insaniyat Ka Gyaan ✓



I am the most abundant state of matter in the entire universe. Who am I?

↓
'Plasma'



I am the most abundant state of matter in the entire universe. Who am I?

Udaanians be like



'Majjo Aa gayo re'



Extraction of Metals of High Reactivity – Part II



Extraction of Metals of High Reactivity – Recap

exists as 'OXIDES OR CHLORIDES'

After concentration of ore, can we use reduction of metal oxide through reducing agents like carbon?

- Ist Crushing & Grinding of Ore
- ↓
- IInd Concentration of ore
- ↓
- Concentrated oxide or chloride ore

No

aluminium

Hence, no roasting or calcination.

The oxides/chlorides of highly reactive metals are quite stable, cannot be reduced by any reducing agent.
They have more affinity for oxygen/halogen. chlorine.

AB REDUCTION
NAHI HOGA?



SUNIL SIR BE LIKE...

BHAIYA



NAHI

ARRE BACCHO DIL PAR MT LENA...





Extraction of Metals of High Reactivity

A special reduction process, i.e. electrolytic reduction is used for highly reactive metals like K, Na, Ca, Mg and Al.

Electrolytic
Reduction

The electrolytic reduction is a type of **electrolysis** [The oxides and chlorides of metals in fused/molten state are electrically reduced by using this method.]



Meaning of Electrolysis (Recap)

- The word electrolysis is made up of two words 'electro' meaning flow of electrons or electricity and 'lysis' meaning breakdown or separating, i.e., bringing about a (chemical) change in a substance by passage of electricity.
- Electrolytes are compounds which either in aqueous solution or in molten state allow electric current to pass through them.

or fused state

(because they break into ions)

→ Electrodes can be : ACTIVE OR INERT → don't participate in electrolysis

participates in electrolysis [Yes → chemical changes ← NO]



Give a Thought



Can HCl(aq), NaCl(aq), NaCl(l), H₂SO₄(aq) acts as electrolyte?

✓ A. Yes

B. No

→ All these substances break into ions in the mentioned states & conduct electricity

Handwritten notes above the question:
HCl(aq) → H^+ & Cl^-
NaCl(aq) → Na^+ & Cl^-
H₂SO₄(aq) → $2H^+$ & SO_4^{2-}



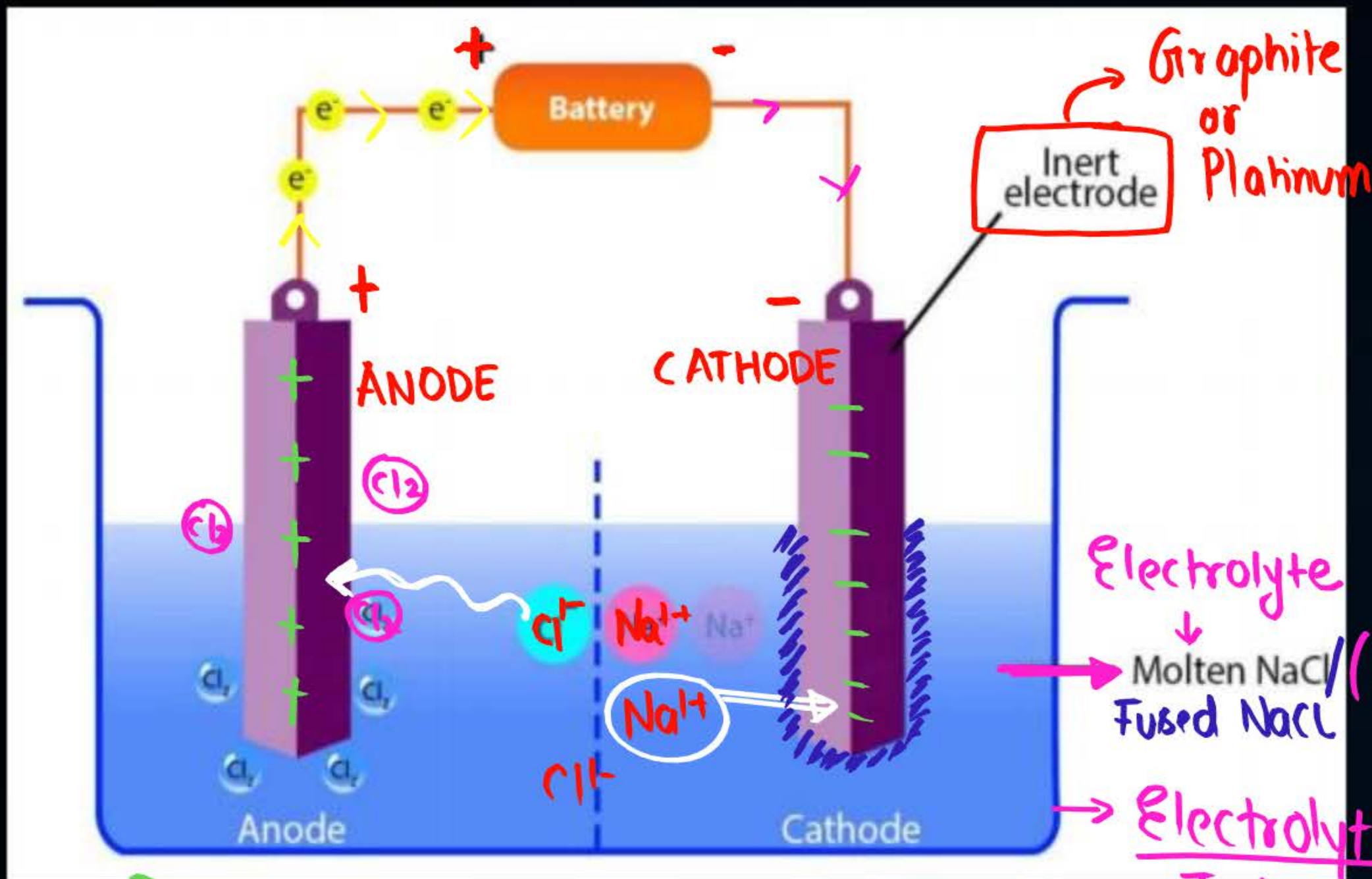
SUNIL DANCE CLASSES

OIL RIG Lekar Bhangra **PAO NCR** mein.

Oxidation is loss
of electron(s)

Reduction is
gain of electron(s)

negative is cathode-reduction
positive is anode → oxidation



Electrolytic Reduction

① Electrolyte (NaCl)
 $NaCl \longrightarrow Na^{+} + Cl^{-}$

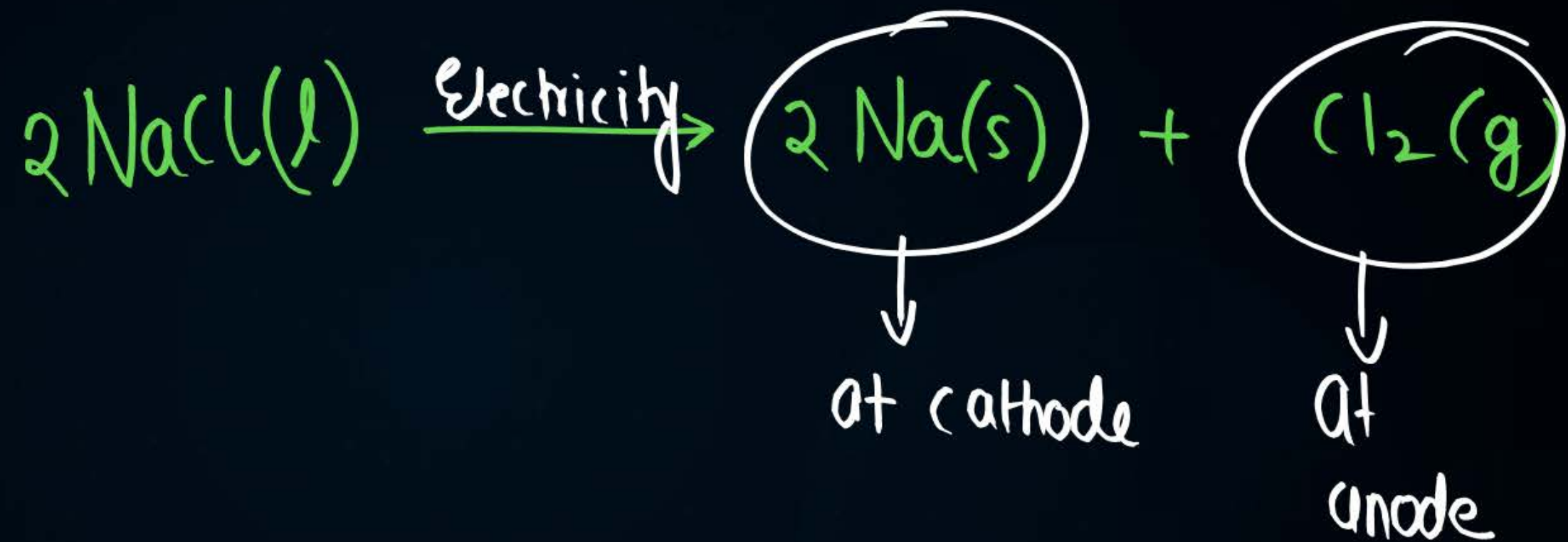
② Anode \rightarrow oxidation \downarrow loss of electron(s)
 $Cl^{-} \rightarrow Cl + e^{-}$
 $Cl^{-} \rightarrow Cl + e^{-}$



③ Cathode - Reduction \rightarrow gain of electron(s)
 $Na^{+} + e^{-} \rightarrow Na$

Nascent chlorine \leftarrow Highly reactive as it is unstable

Electrolysis of molten NaCl / fused NaCl





Give a Thought



Will the same products be obtained if we do electrolysis of aqueous sodium chloride?

A. YES

✓ B. NO

① Electrolysis of molten sodium chloride: Cathode: Sodium (Na), Anode: Cl_2 gas

② Electrolysis of aqueous sodium chloride (Chlor-alkali process):

Cathode: H_2 gas, Anode: Cl_2 gas, NaOH: Near the cathode



Summary of All Steps – Metals of High Reactivity

For example: Extraction of Na from NaCl

Step I

✓ *Crushing and Grinding of Ore*

powdered chloride ore

Step II

✓ *Concentration of Ore*

concentrated chloride ore

Step III

✓ *Electrolytic Reduction*

Na

Cl₂

purified metal
hence, no
refining is
required

Refining of Metals



Refining of Metals

Purification of Metals

↳ (Done for medium, low & least reactive metals)



Metals obtained after extraction still contains some impurities which are removed by:

OUR SYLLABUS

✓ (i) Electrolytic refining

→ Zn, Sn, Ni, Cu, Ag, Au etc.

✓ (ii) Distillation

✓ (iii) Liquefaction

✓ (iv) Vapour phase refining

✓ (v) Zone refining

Electrolytic Refining of Copper

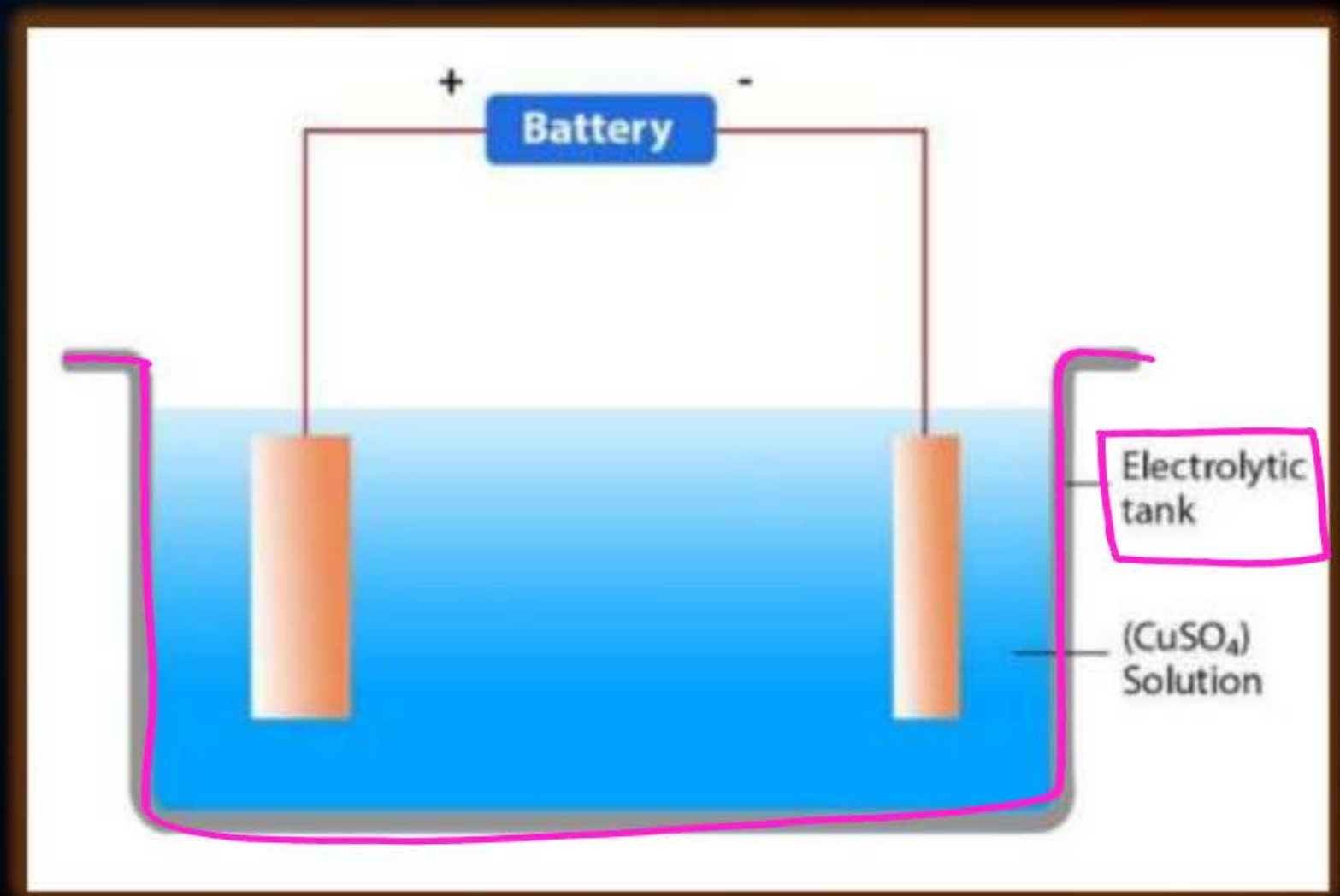


(i) The set-up consists of an electrolytic tank that contains copper sulphate solution.

① $\text{CuSO}_4(\text{aq}) \rightarrow \text{Electrolyte}$

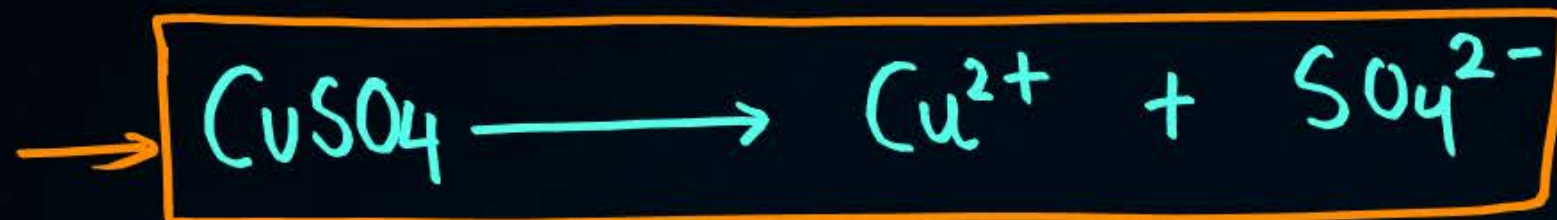
Why $\text{CuSO}_4(\text{aq})$?

② Metal salt (ionic compound) should be of metal whose refining needs to be done.

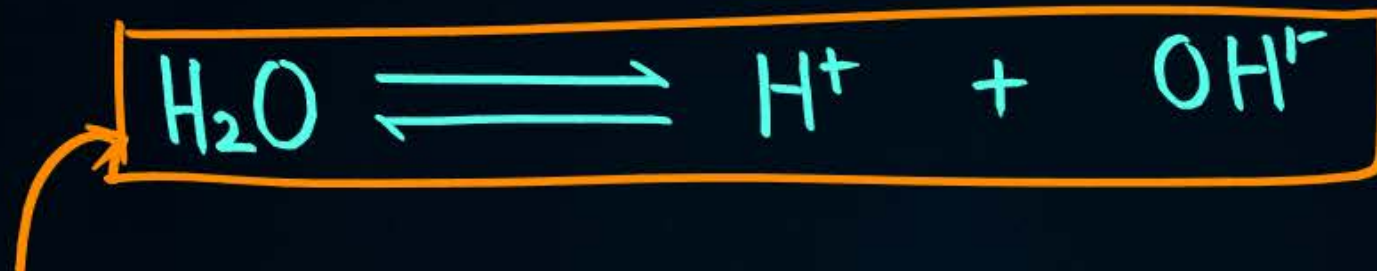


③ CuSO_4 dissolved in H_2O

Strong
electrolyte



Weak
electrolyte

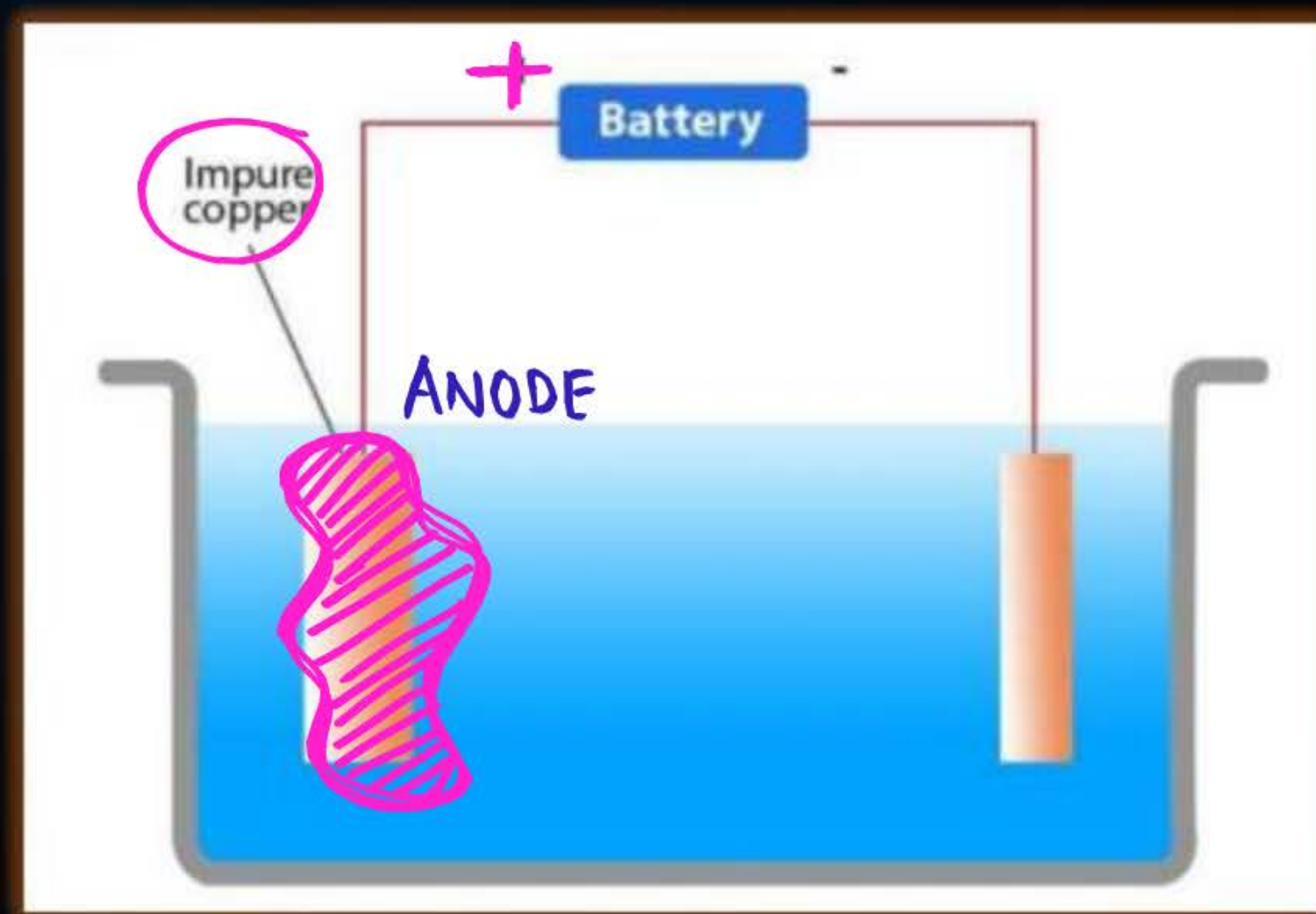




Electrolytic Refining of Copper



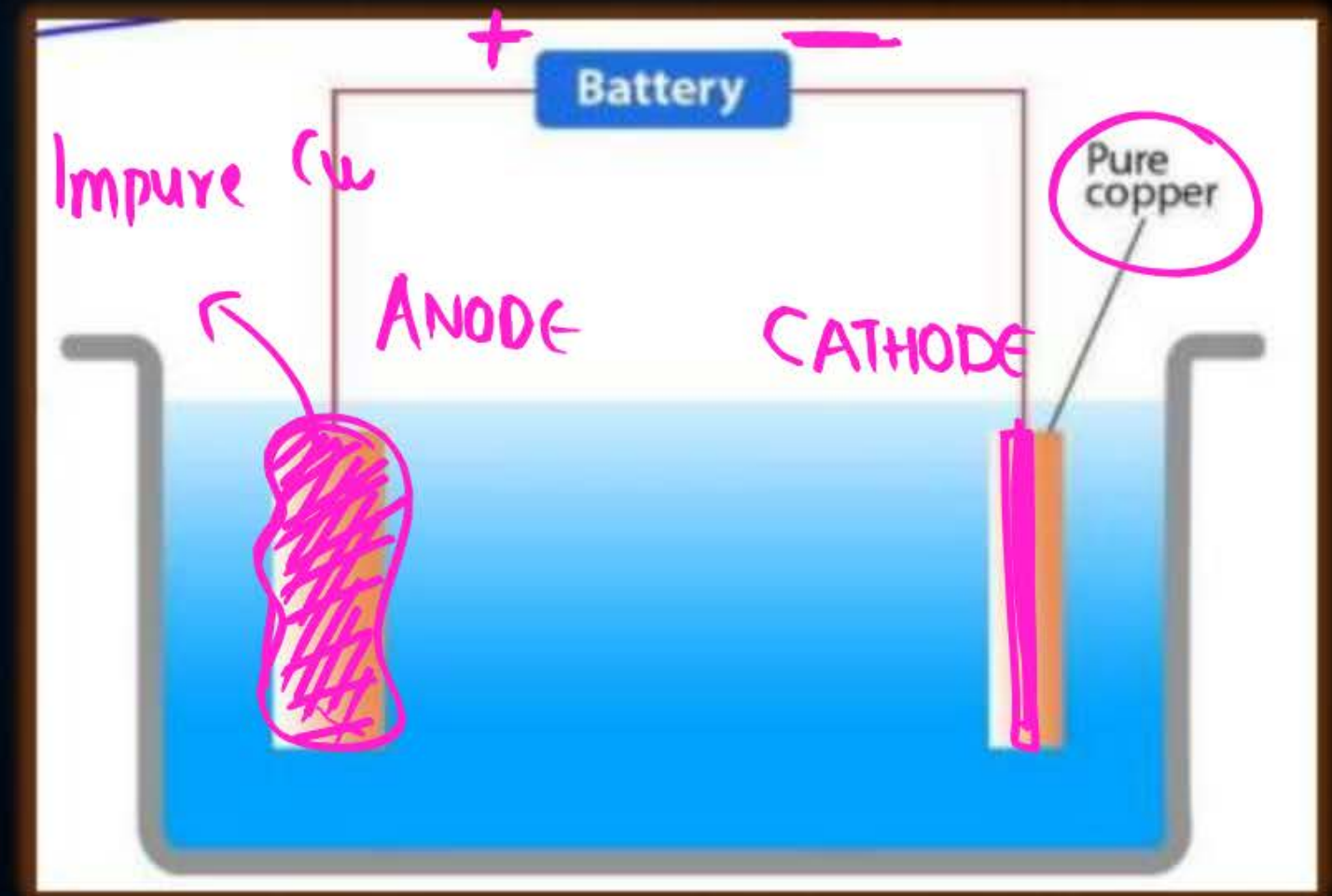
✓ (ii) A **thick block of impure copper metal** is connected to the positive terminal, i.e. anode.



Electrolytic Refining of Copper



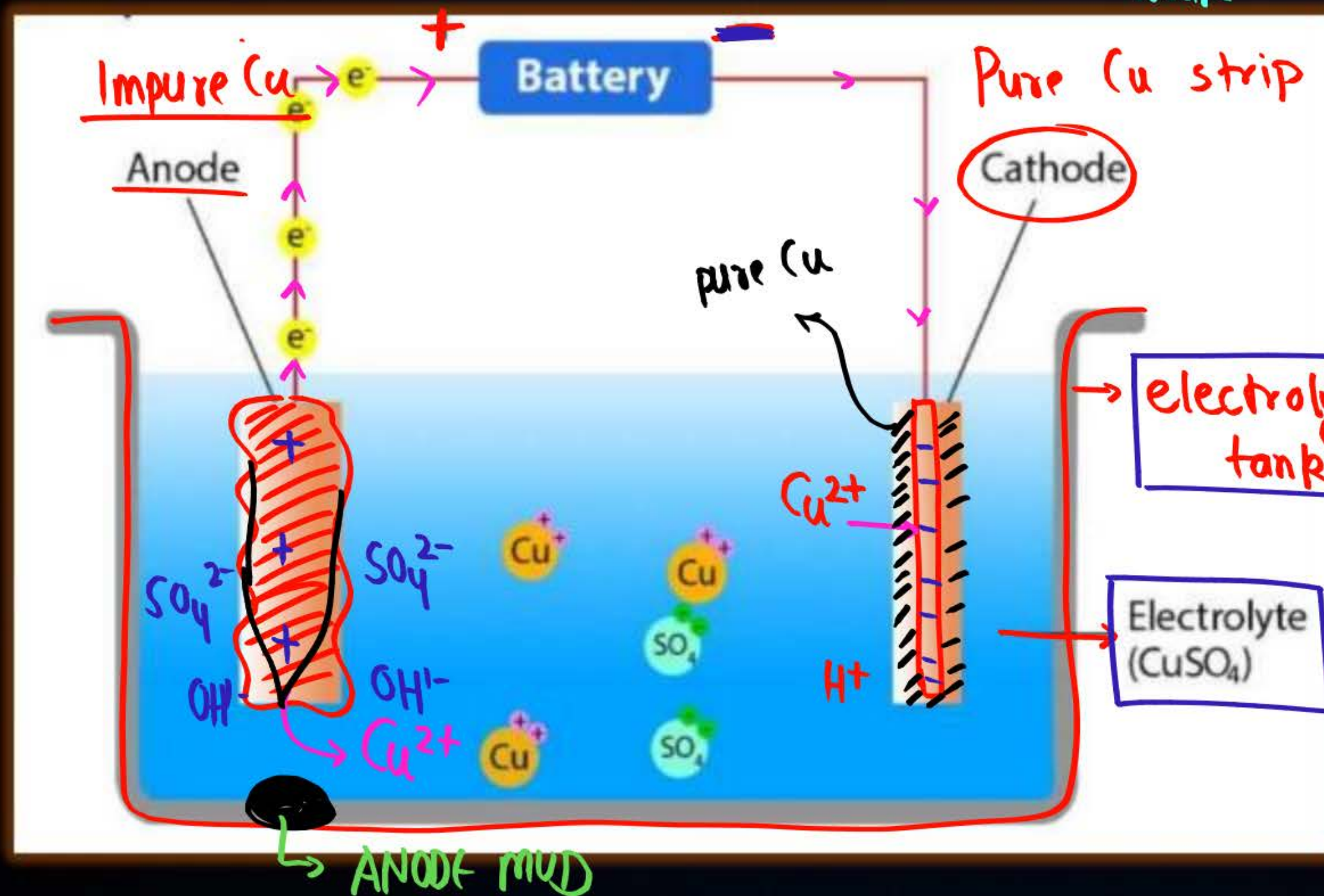
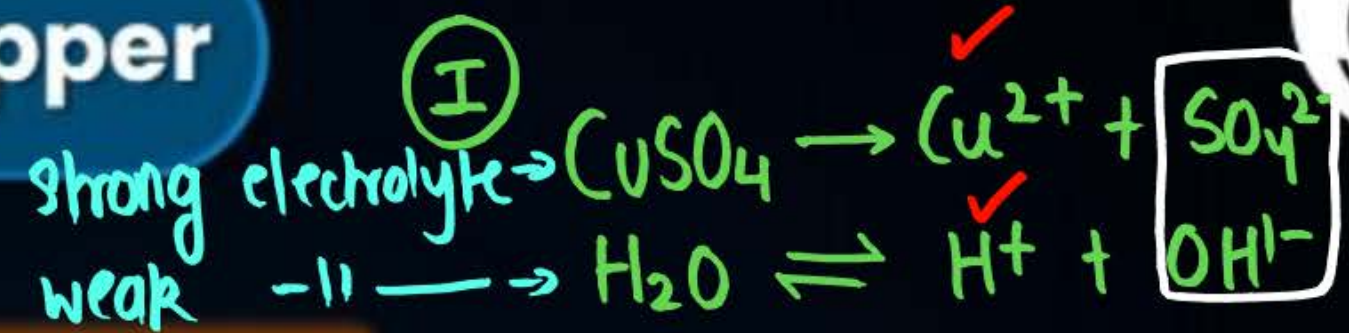
(iii) A thin strip of pure copper metal is connected to the negative terminal, i.e. cathode.



Here copper electrodes act as:

- (A) Inert electrodes
- ☒ (B) Active electrodes

Electrolytic Refining of Copper

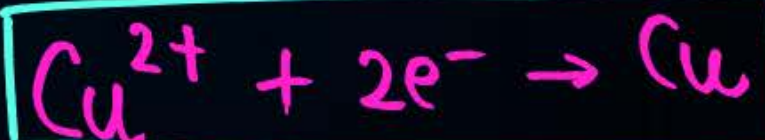


(II) Anode - Oxidation - loss of electron(s)



(III) Cathode - Reduction - gain of electron(s)

Preference will be given to Cu^{2+} over H^+



With Time
 Anode becomes THINNER ✓
 Cathode -||- THICKER ✓



Give a Thought



What happens to the impurities then?

Soluble Impurities

Fe will oxidise (lose electrons) and will jump into solution as Fe^{2+} and Fe^{3+} .

Insoluble Impurities

Ag and Au won't dissolve into electrolyte and will deposit below anode as *anode mud*.



Let's Practice

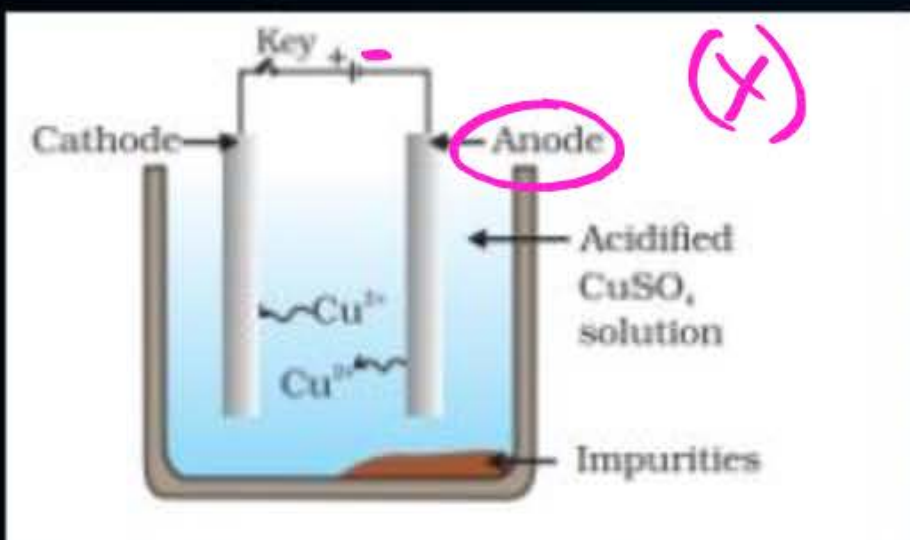


PW Ka **ChemStar!**

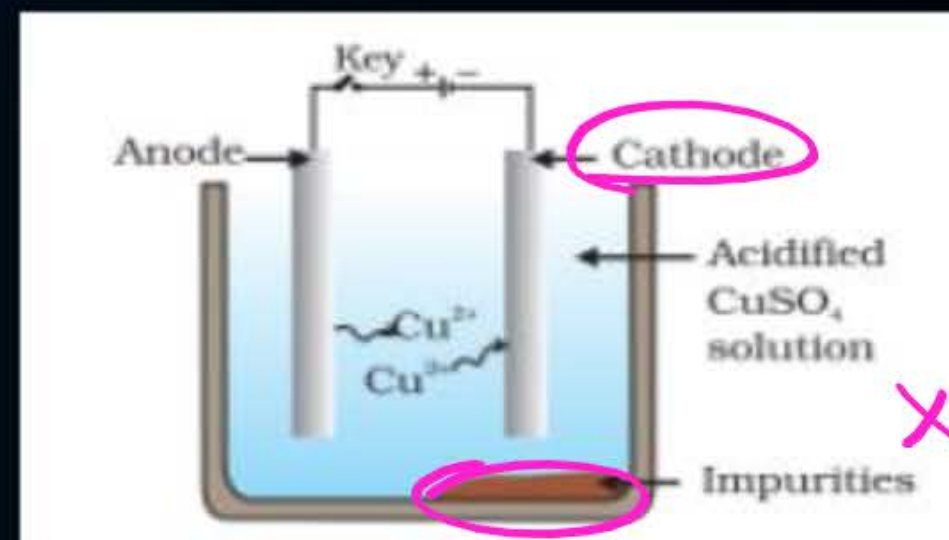
QUESTION

Which one of the following figures correctly describes the process of electrolytic refining?

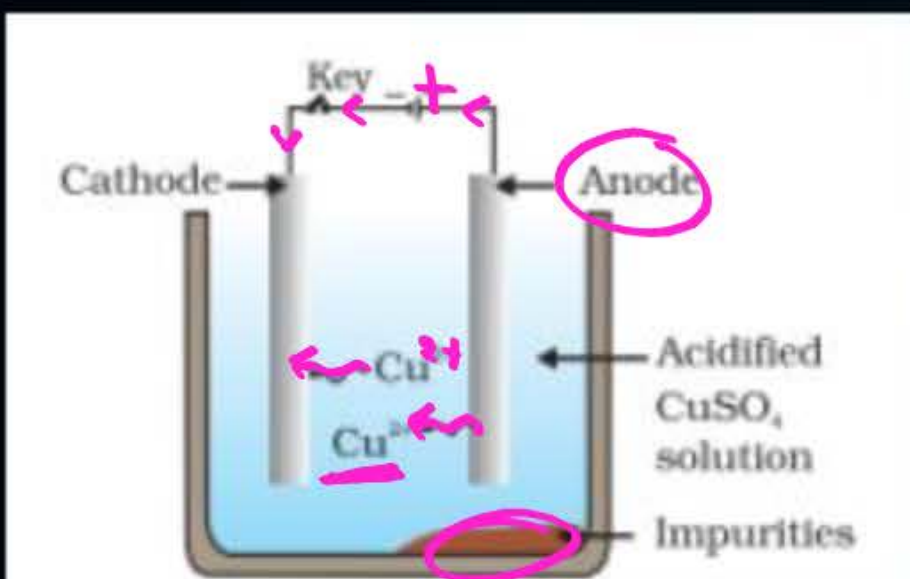
A



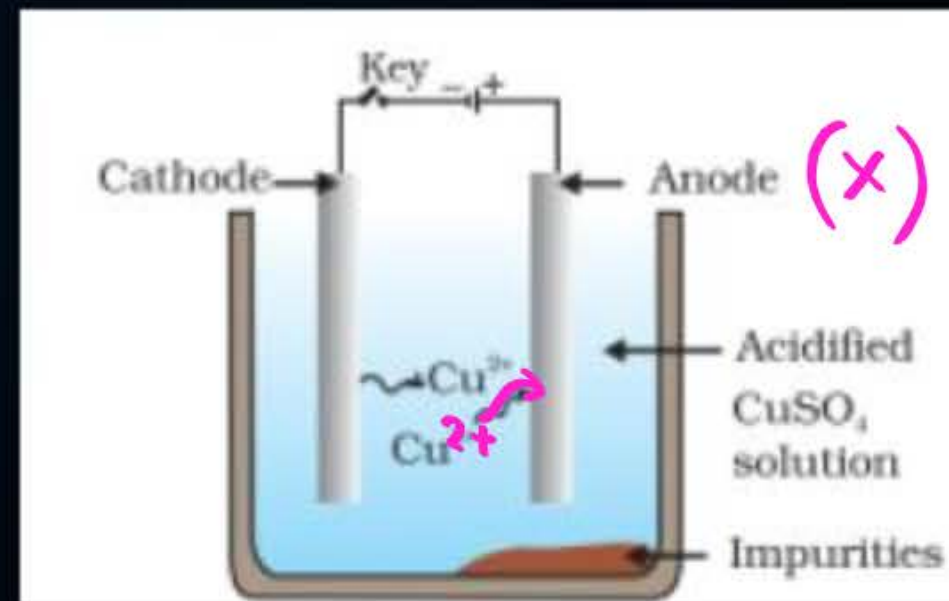
B



C

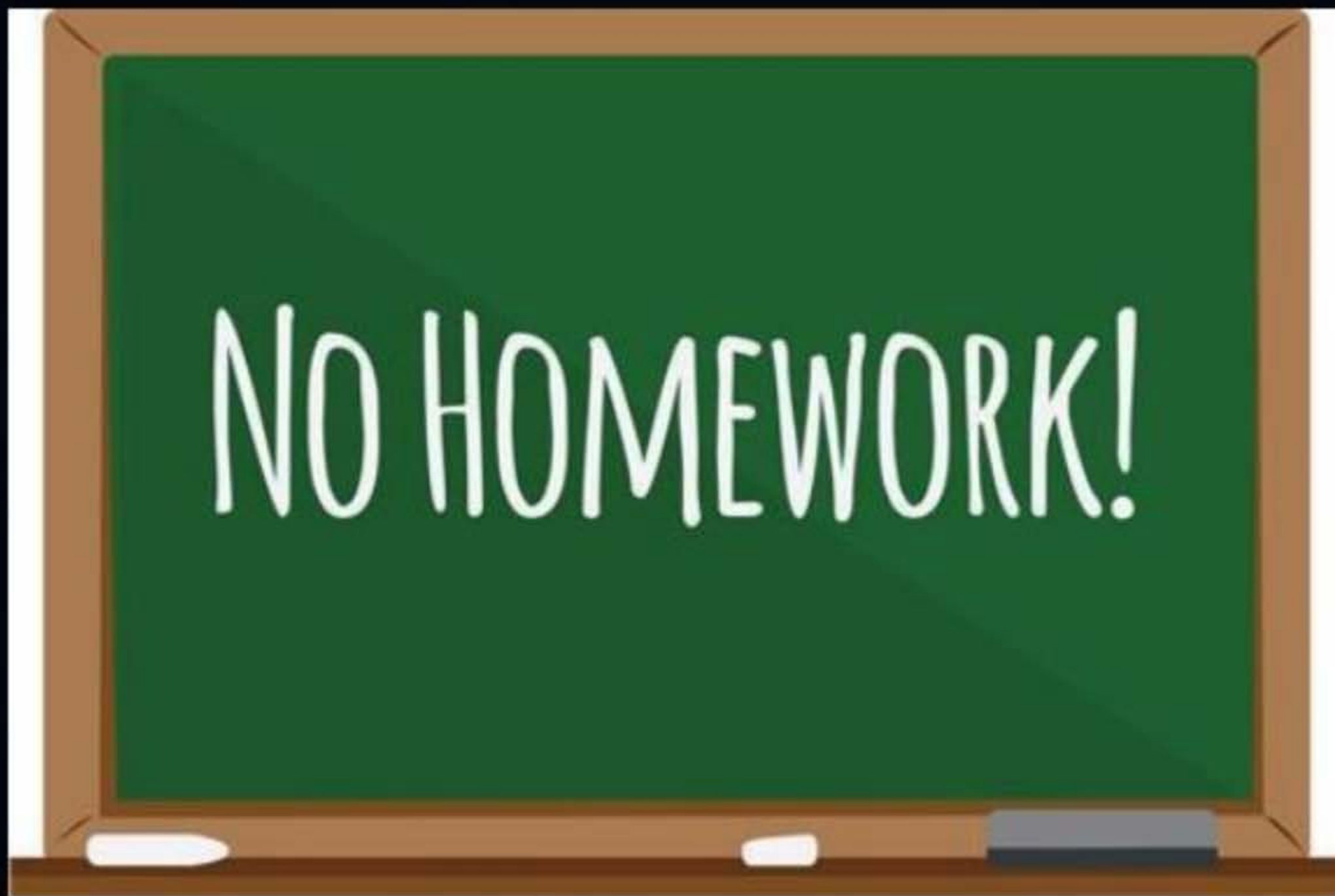


D



Concept Polish (गृहकार्य)





NON-ACADEMIC DOUBTS



Q1 Treta yug mein ravana ke dus (दस) sir the ye gina kaise gaya jab 'o' ki khoj kalyug.

for ex:

①



OR

②



OR

③

numbers are another way to represent things

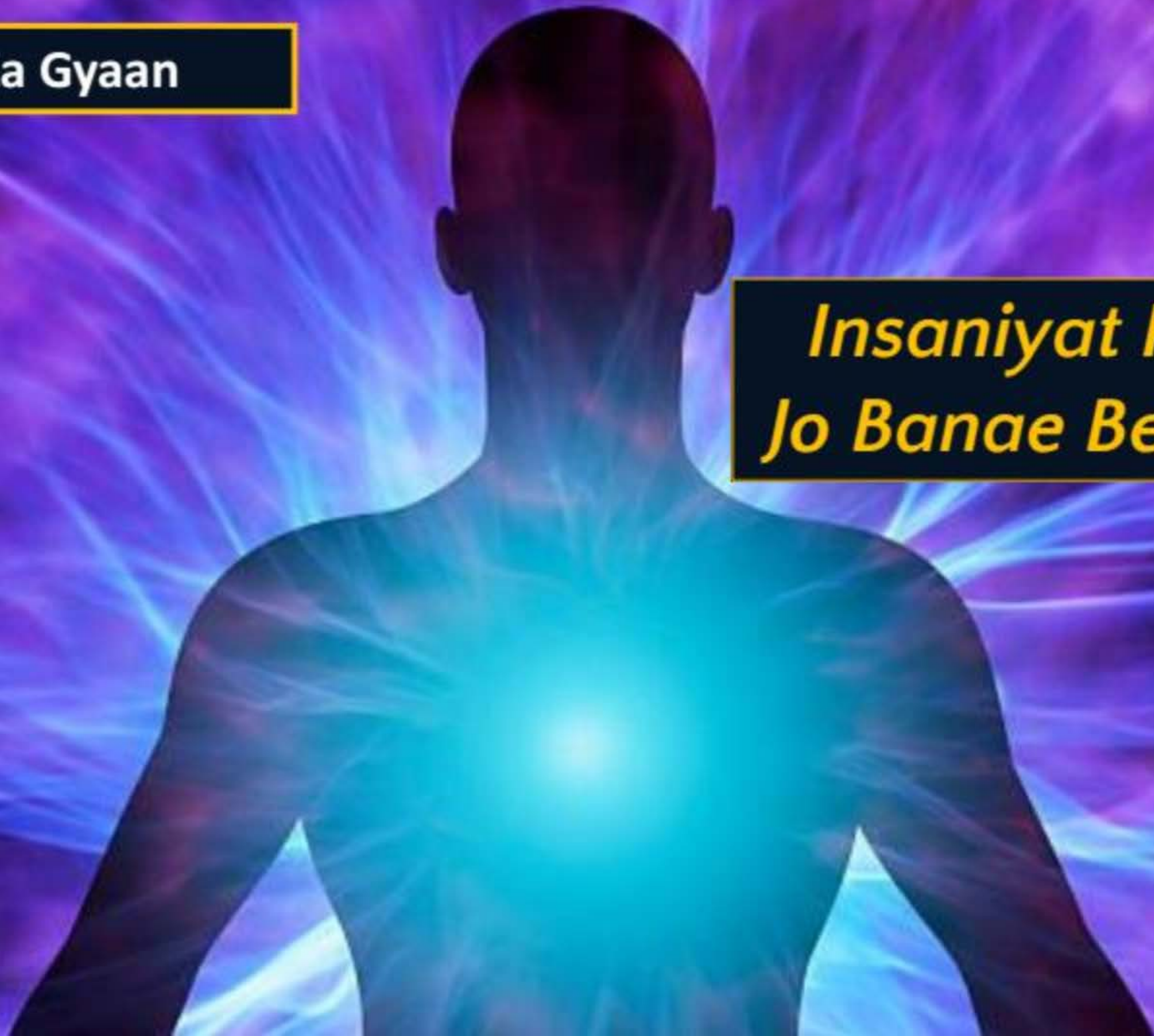
②

Phone par class dekhte hue distraction se bach nahi sakte!

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***Insaniyat Ka Gyaan
Jo Banae Behtar Insan***





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#sbsathhai (✓)
#pwsathhai (✓)



THANK
YOU

