UDAAN

2025

Bharat Mata Ki Jai ♡

METALS AND NON-METALS

Corrosion, Its Types and Ways to Prevent It

CHEMISTRY | Lecture - 10

BY: SUNIL BHAIYA

Topics

to be covered

1. NCERT Chipa Hua Gyaan
2. Introduction to Corrosion and Its Types
3. Ways to Prevent Corrosion


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Knowledge Ride On

NCERT Chipa Hua Gyaan

Knowledge Ride On

Introduction to Corrosion and Its Types

Knowledge Ride On

Ways to Prevent Corrosion

Knowledge Ride On

Insaniyat Ka Gyaan

RIDDLE WALLAH

'X' says, I am different from 'Y' because I am made from different Y's but still I am a pure substance.
Identify 'X' and 'Y'!

RIDDLE WALLAH

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Identify 'X' and 'Y'!

Pyaare Bacche Be Like ---------→

NCERT Chipa Hua Gyaan

Similarly, aluminium is obtained by the electrolytic reduction of aluminium oxide.

(Metal of high reactivity)

Step Ist Crushing & Grinding of Ore

↓

Powdered Ore

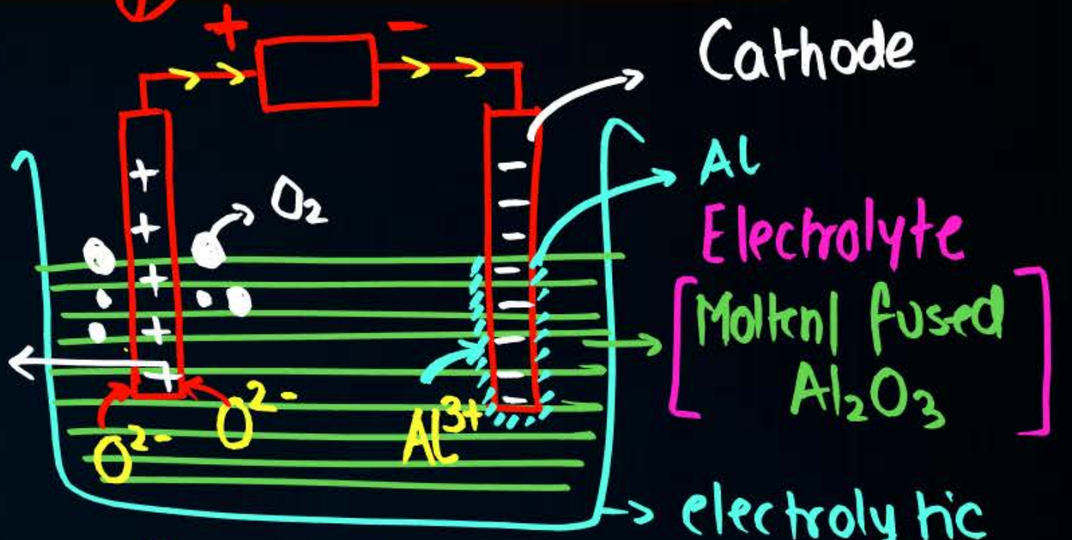
Step IInd Concentration of Ore [Leaching]

↓

Concentrated ore

Step IIIrd Electrolytic Reduction

Inert / unreactive electrodes like platinum or graphite are used.



At anode - Oxidation [Loss of electron(s)]

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

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

$2O^{2-} \rightarrow O_2 + 4e^-$

O → Nascent oxygen

At cathode - Reduction - Gain of electron(s)

$$Al^{3+} + 3e^- \longrightarrow Al$$

Al → obtained at cathode

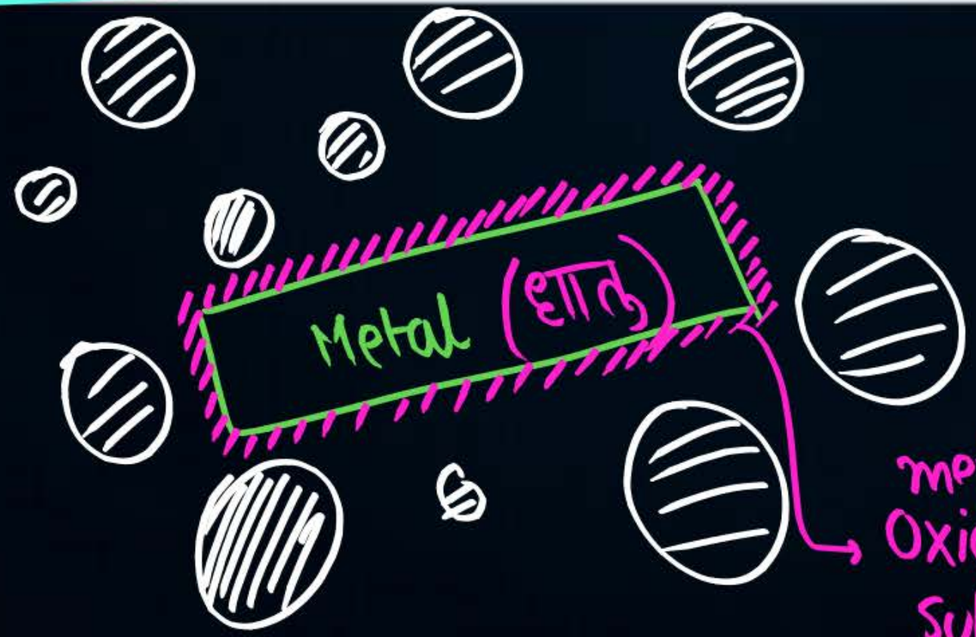
Introduction to Corrosion (संक्षारण) and Its Types

Corrosion

When these layers are formed on surface of metal, metal loses its lustre.

or degradation

It is a surface deterioration process of metals in which they convert to a more stable form, i.e. oxides, sulphides, carbonates and more, due to the attack of atmospheric gases.



Metal
↓
love to donate electron(s)

→ Atmospheric Gases
↓
non-metallic
↓
love to accept electron(s)

metal Oxide / Carbonate / Sulphide

Types of Corrosion

Type of corrosion	Colour of layer and chemical equation
Rusting of iron (लोहे पर जंग लगना)	 Reddish-brown

Iron reacts with moist air to form hydrated ferric oxide.

→ oxygen
→ water-vapour / water

flaky (non-sticky) & brittle

(RUST) Hydrated ferric oxide

$$4Fe(s) + 3O_2(g) + xH_2O(g) \rightarrow 2Fe_2O_3.xH_2O(s)$$

$4Fe(s)$ → Silvery Grey

Give a Thought

Can rusting happen without having any one factor, i.e. oxygen or water-vapour?

A. Yes

B. No

Give a Thought

Can rusting happen without having any one factor, i.e. oxygen or water-vapour?

A. Yes

B. No

For rusting of iron to happen both factors, i.e. oxygen and water-vapour/water are required.

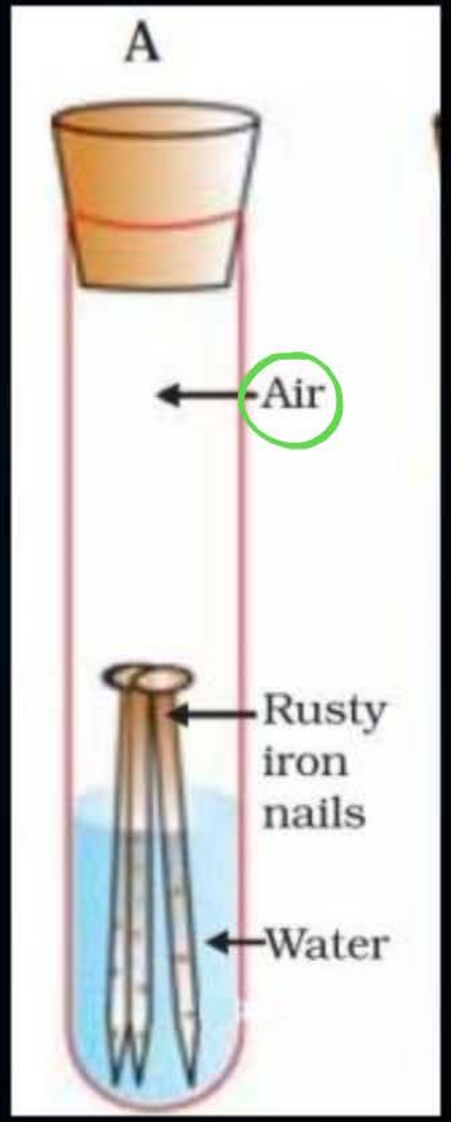
Let's Analyse

Will rusting happens in this case?

→ AIR [20.95% Oxygen] ✓

→ WATER [Dissolved O_2] ✓

Yes, rusting will happen.



Let's Analyse

Will rusting happens in this case?

(i) Air from above: → ✗

(ii) Normal water:
- dissolved oxygen ✓
- water ✓

Yes, rusting of iron nail will happen.

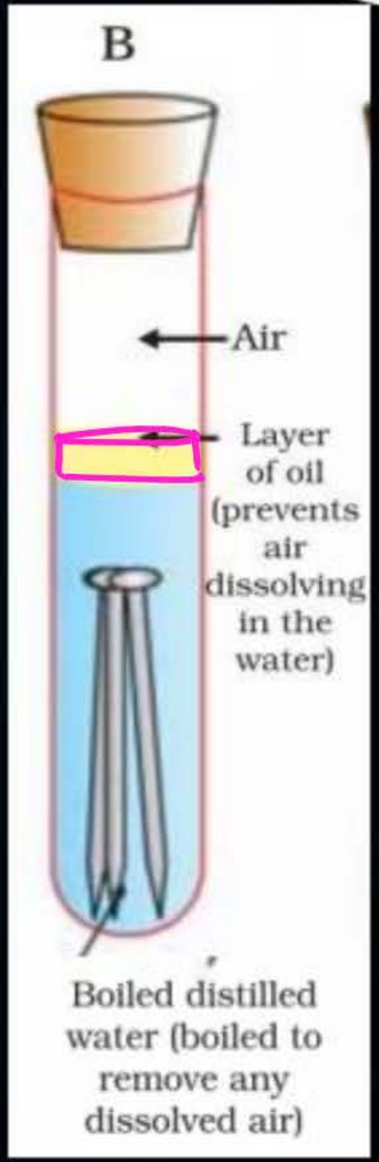
20.95% oxygen

(i) Air from above: → ✗

Temp(↑), solubility of gases (↓)

(ii) Boiled water:
- dissolved oxygen → ✗
- water ✓

only water is available, so 'NO' Rusting.



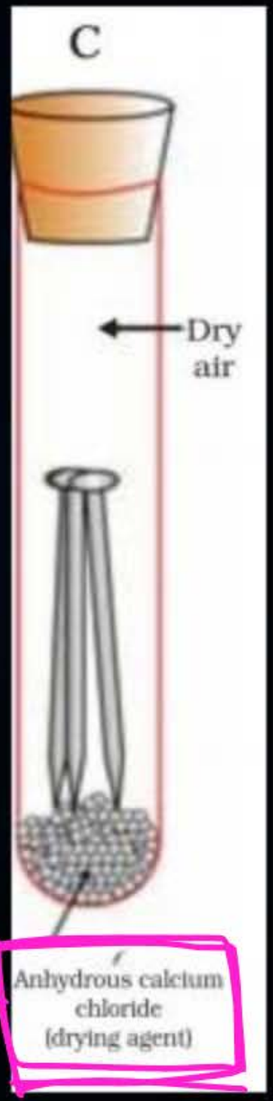
Let's Analyse

Will rusting happens in this case?

→ AIR [20.95 · 1. O_2] ✓

→ WATER / WATER-VAPOUR ✗

No, rusting won't happen.



absorbs moisture from air

What if, iron nails are placed in moist / humid air?

(A) Rusting will happen.

(B) -11- won't happen.

MOIST / HUMID AIR

- Oxygen ✓
- Water-vapour ✓

Types of Corrosion

Type of corrosion	Colour of layer and chemical equation
Tarnishing of copper	

Copper reacts with moist carbon dioxide gas in the air to form basic copper carbonate.

- Copper → H_2O
- carbon dioxide → CO_2
- gas in the air → O_2

$$2Cu(s) + CO_2(g) + O_2(g) + H_2O(g) \rightarrow CuCO_3.Cu(OH)_2(s)$$

Green

PATINA

sticky & protective layer

Copper(II) carbonate hydroxide

OR

Basic copper carbonate

Reddish-Brown

Types of Corrosion

Type of corrosion	Colour of layer and chemical equation
Tarnishing of silver Silver reacts with hydrogen sulphide gas present in the air to form silver sulphide.	 Black $4Ag(s) + 2H_2S(g) + O_2(g) \rightarrow 2Ag_2S(s) + 2H_2O(g)$

H_2S

O_2

Silver (I) sulphide

Pros of Corrosion

↳ 'in favour of'

Pros of Corrosion – Patina

Ag, Al etc.

Patina seems to be helpful for some of the metals like Copper (Cu), which on oxidation forms an impervious protective layer that protects further corrosion (here tarnishing) of metal.

(impenetratable)

**

Patina → Sticks to the surface of metal & protects inner metal from corrosion

Cons of Corrosion

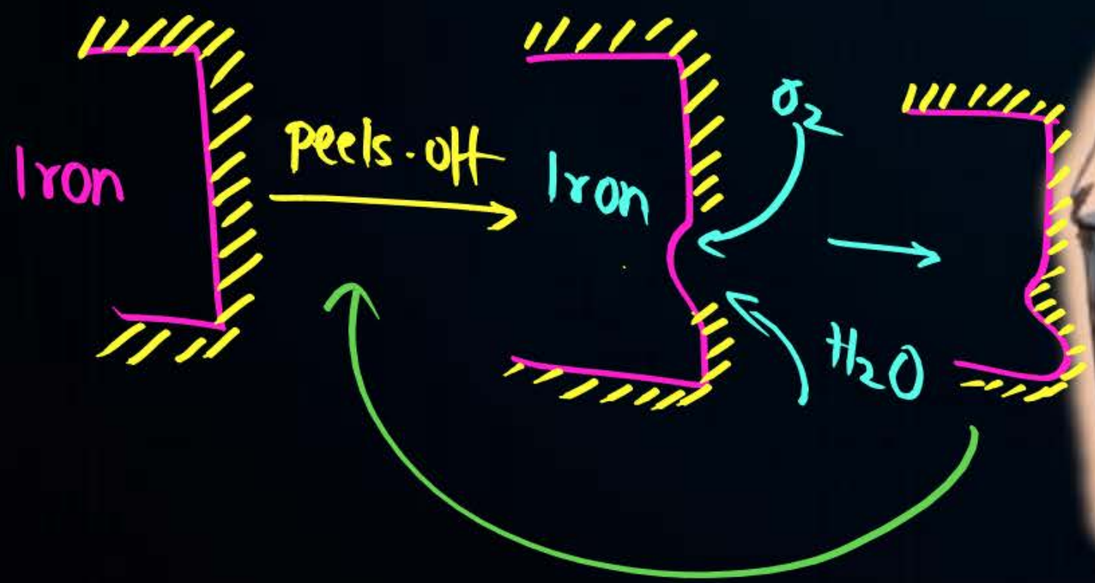
'not in favour of'

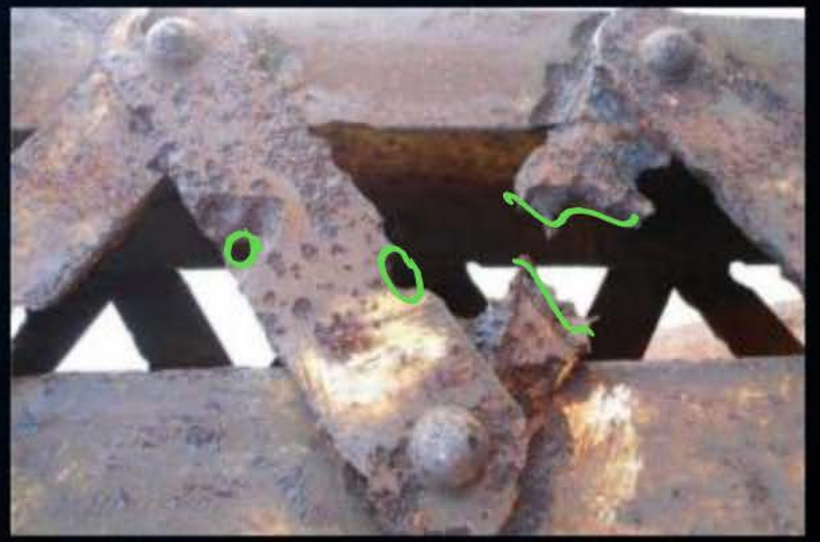
easily breaks into pieces

Cons of Corrosion – Rusting

(GIF)

Rust is a flaky (non-sticky) layer that is very brittle and peels-off. It then exposes the fresh iron layer to moisture and oxygen. This continuous cycle makes iron objects weak and can collapse buildings and bridges, break oil pipelines and more.





Revision Table

CORROSION

	RUSTING	TARNISHING
(I) Happens in:	Iron (Fe)	Silver (Ag), Copper (Cu), Aluminium (Al) etc.
(II) Name of layer:	RUST	PATINA
(III) Type of layer:	Flaky (non-sticky) & non-protective layer	Protective layer as it sticks to surface to metal

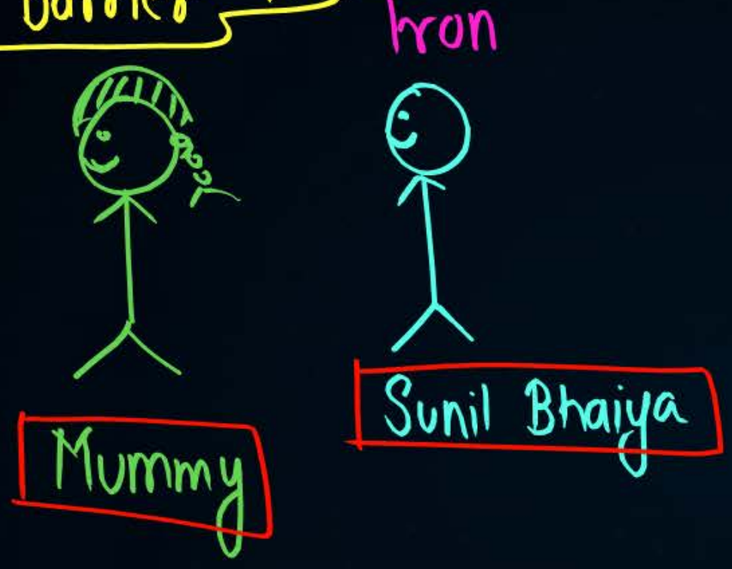
Ways To Prevent Corrosion - Rusting

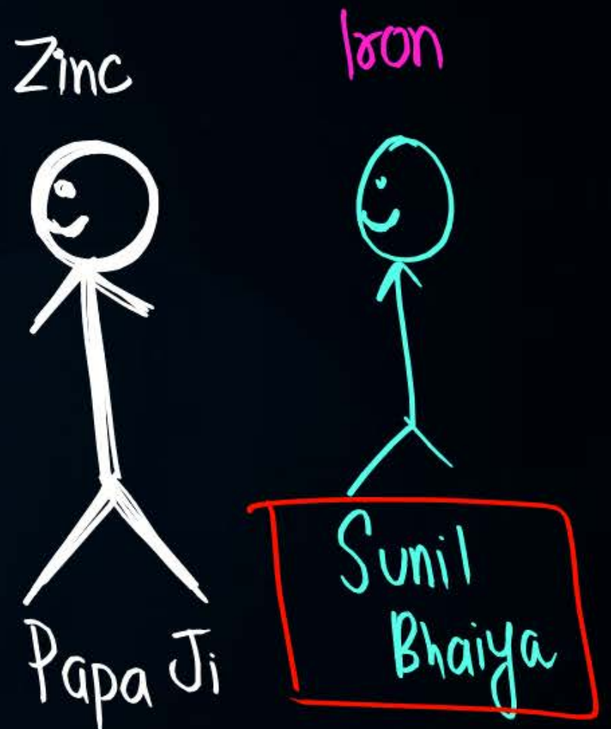
aye bhaiya

'STORY OF SUNIL BHAIYA'

Barrier Protection → Paint / Oil / Grease

Sacrificial Protection





Ways to Prevent Rusting of Iron

ensures that oxygen & water-vapour don't get in contact with iron.

Type of Protection	What is Being Done?	Temporary/Permanent
(I) Barrier Protection	• Applying a layer of paint, oil or grease on iron	Temporary Solution
(II) Sacrificial Protection	• Galvanisation *(Applying a layer of zinc on iron)*	Better than barrier but not a permanent solution

① Layer of Zn ensures that oxygen & water-vapour don't get in touch with Fe.

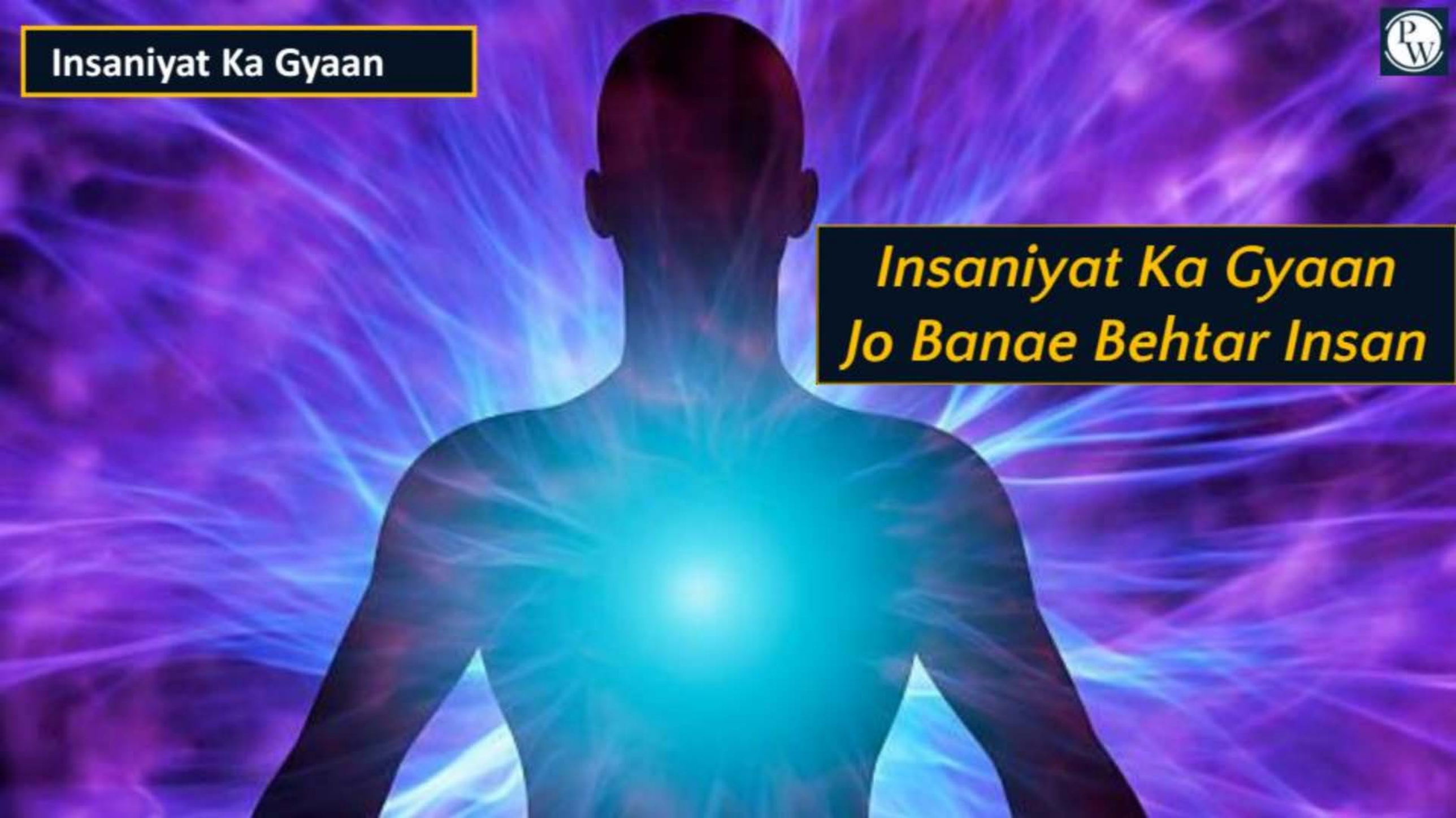
② Zn being more reactive than Fe, oxidises in place of Fe.

Concept Polish (गृहकार्य)

Give a Thought

H.W.

You must have seen tarnished copper vessels being cleaned with lemon or tamarind juice. Explain why these sour substances are effective in cleaning the vessels.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THANK YOU