

Non-Metal Displacement Reactions

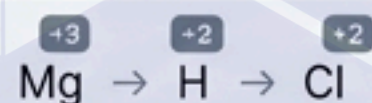
Target: JEE Advanced Redox Chemistry

Decoding Hydrogen and Halogen Electron Transfers

System A: Metals (Reductants)

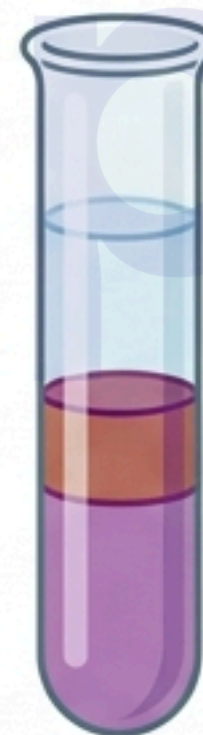


Metals (reductants) release hydrogen gas to release the hydrogen gas butleing the witra gas evolution.



The metal performs surface and evolution with extesit hydrogen and halogen of metals indicatoing to release to hydrogen gas on to evolution.

System B: Halogens (Oxidants)



Halogen displacement reactions based on density, or melered in organic solvents, it to separation for in organic solvents.



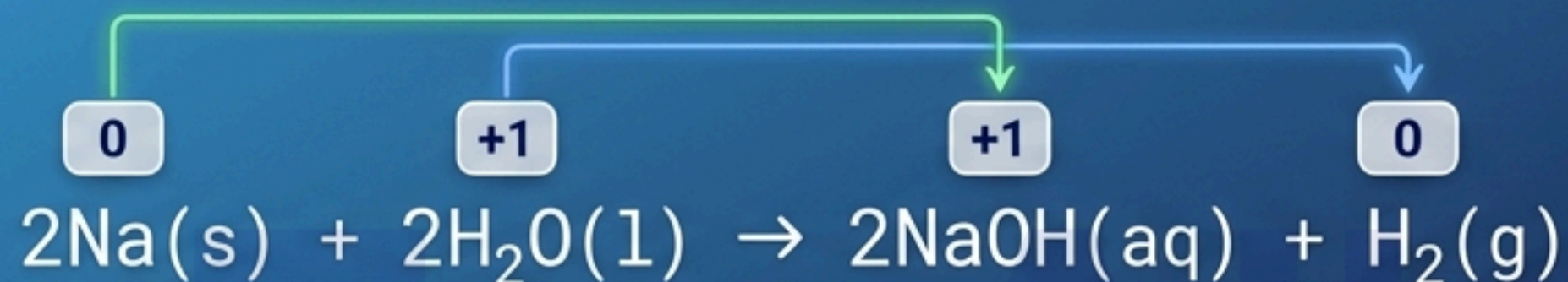
Halogen species are fosazrt caused on density and solubility solubility tn the lests in density species - identifications, in organic solvents.

The Reactivity Matrix: Water vs. Steam

Cold Water

Metals: Alkali & Active Alkaline
(Na, Ca, Sr, Ba)

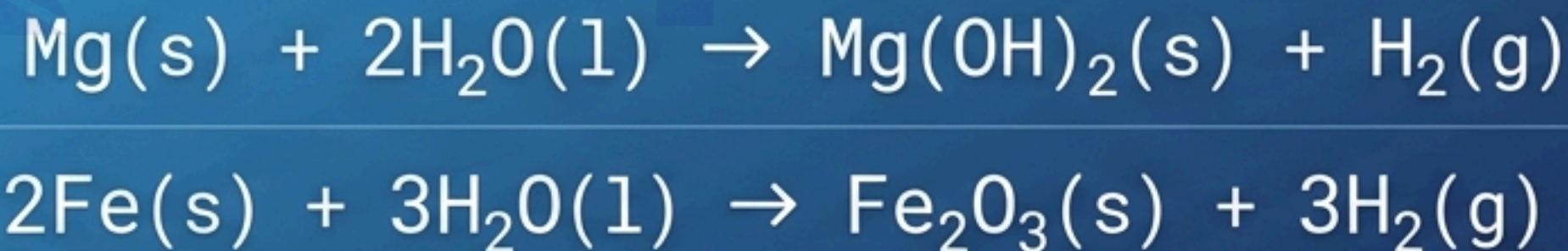
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Steam

Metals:
Less Active
(Mg, Fe)

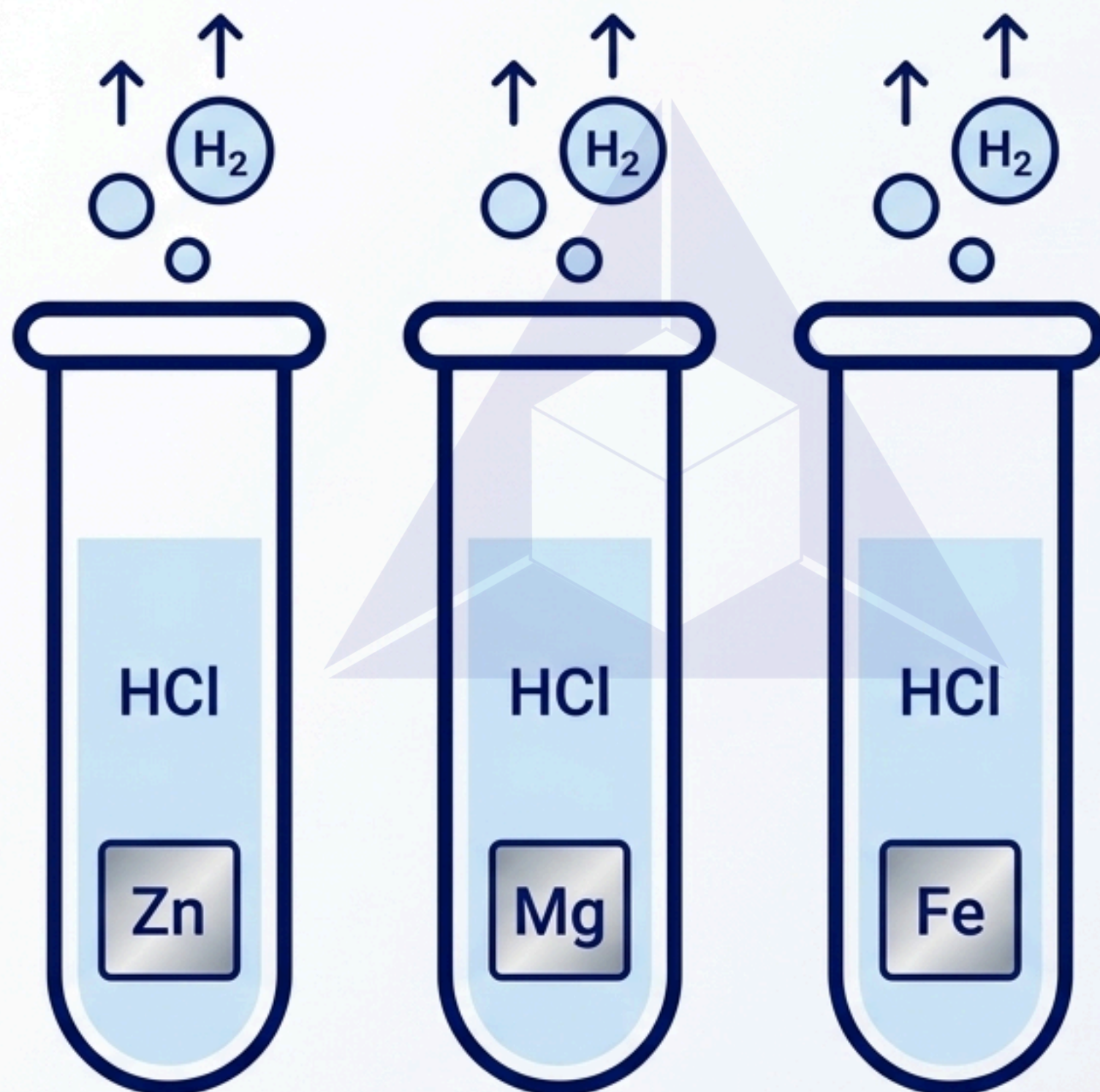
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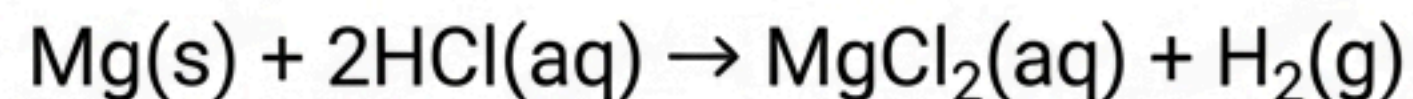
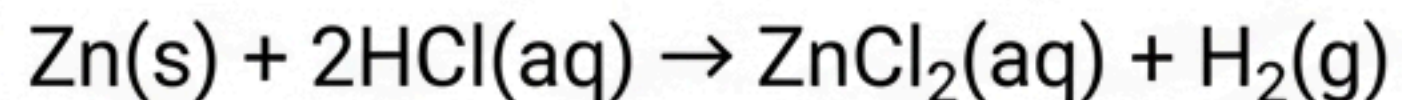
Key Takeaway:

High electropositivity is required to break H_2O bonds at room temperature. Lower electropositivity requires the thermal energy of steam.

Acidic Mediums Unlock Lower-Tier Metals



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Acids allow metals that fail to react with steam (like **Cadmium and Tin**) to displace **Hydrogen**.



JEE Trap Alert:

Native metals (Ag, Au) are at the absolute bottom of the activity series. They do NOT react even with hydrochloric acid.



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The Reaction Speedometer



Exam Snapshot

The rate of H_2 gas evolution is a direct macroscopic reflection of microscopic metal reactivity (electron-losing capability).

The Halogen Flip: Competitive Electron Vacuums

Metals

Reducing Agents - Donors



Electron Transfer



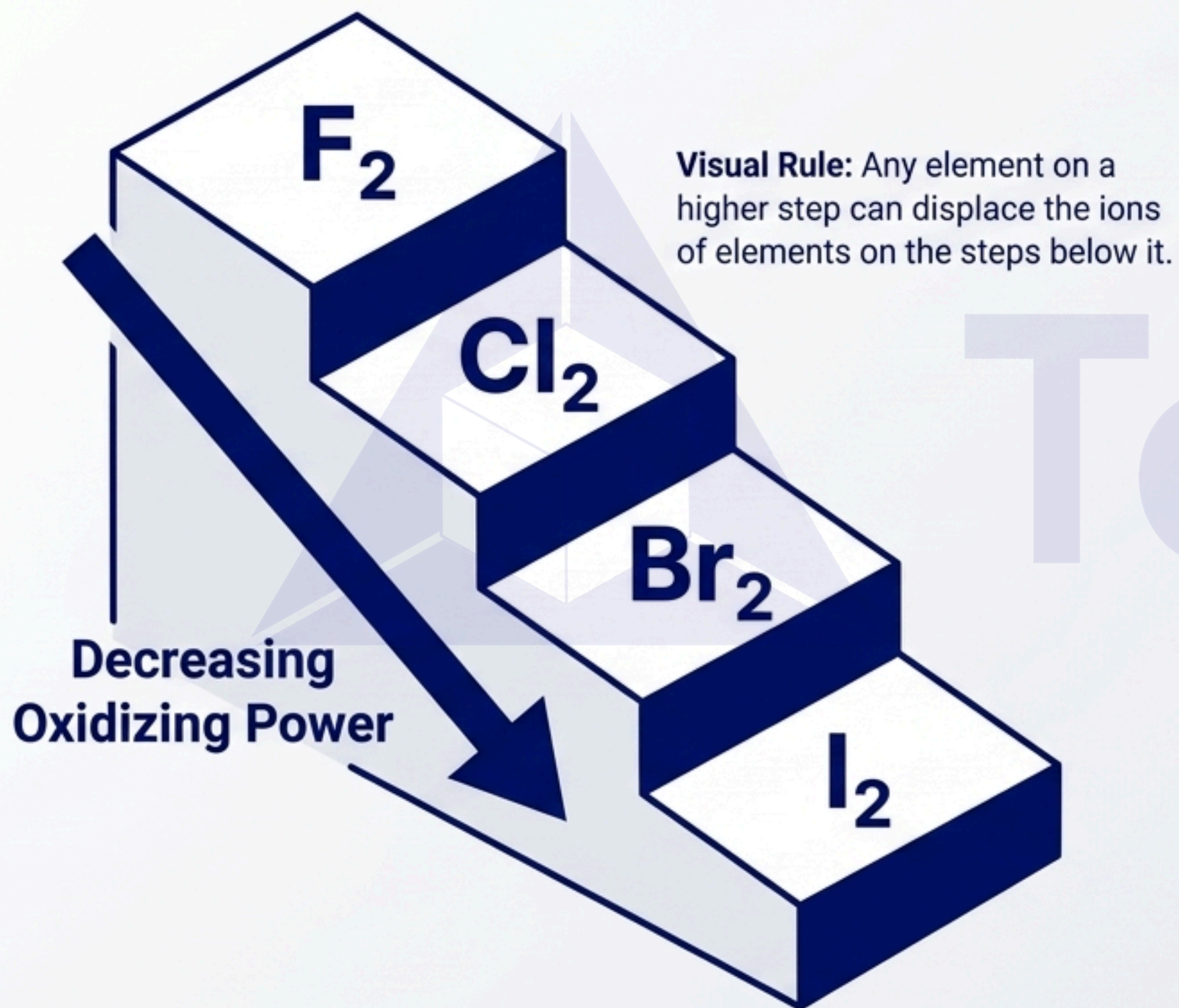
Halogens

Oxidizing Agents - Acceptors

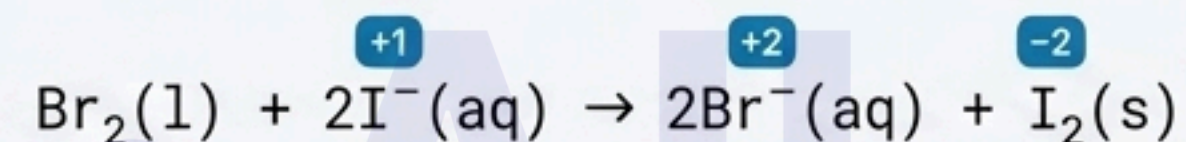
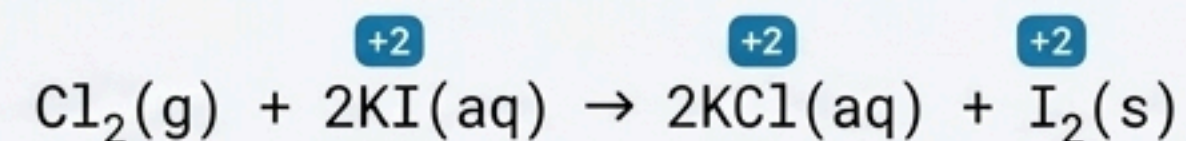


Key Takeaway: Non-metal displacement relies entirely on oxidizing power. A more reactive halogen forcefully strips electrons from a less reactive halide ion.

The Electron Hunger Hierarchy



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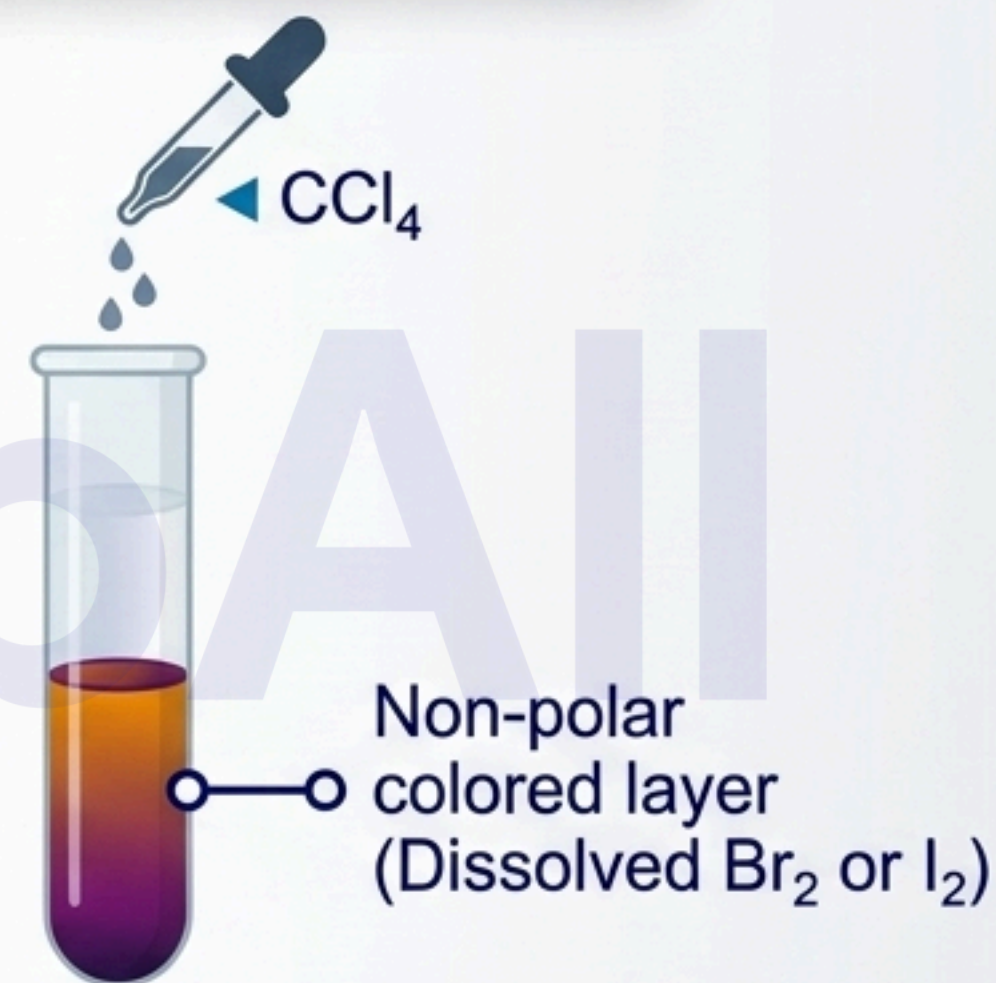
Industrial Application: Halogen recovery requires oxidizing halides ($2X^- \rightarrow X_2 + 2e^-$). Higher halogens act as powerful chemical vacuums for this process.

Laboratory Application: The Layer Test

Step 1: Aqueous Displacement



Step 2: Phase Extraction



Exam Snapshot

Br_2 and I_2 are distinctly colored and highly soluble in non-polar CCl_4 . This allows visual identification of the displaced halogen, forming the basis of the Layer Test.

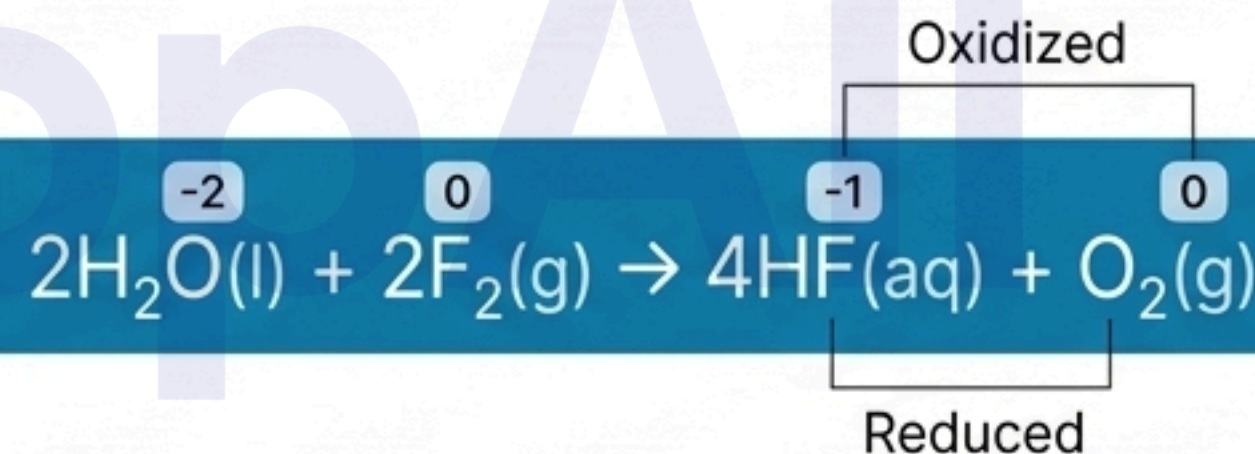
The Boundary Case: The Fluorine Anomaly

What Students Expect



What Actually Happens

F_2 violently attacks the water molecules



Fluorine is so reactive it cannot be used for aqueous displacement! It acts as such a strong oxidizing agent that it strips electrons from the water itself, releasing Oxygen gas.



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