

d- & f-BLOCK ELEMENTS



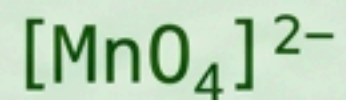
Potassium Permanganate



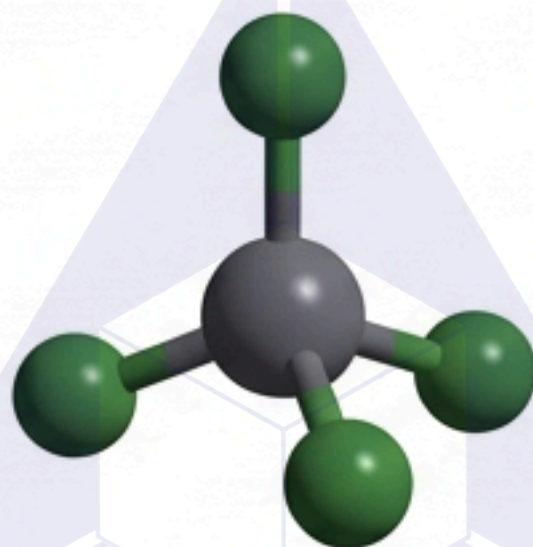
Structure, Oxidation Dynamics,
and NEET Mastery.



Molecular Anatomy & The Colour Paradox

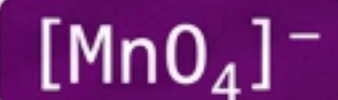


The Manganate Ion

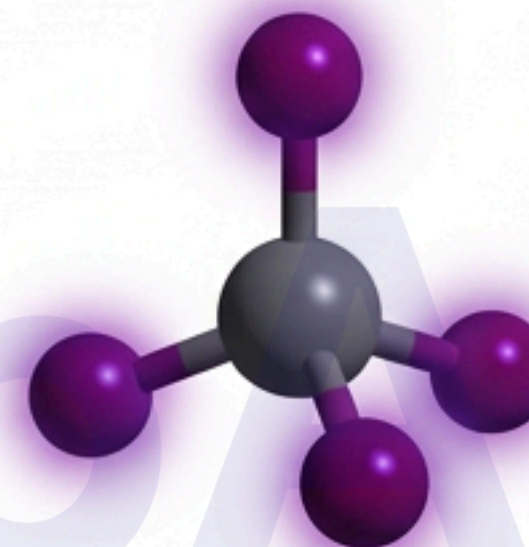


Oxidation State	+6
Configuration	d^1 (1 unpaired e^-)
Magnetic Nature	Paramagnetic

Dark green solution.



The Permanganate Ion



Oxidation State	+7
Configuration	d^0 (0 unpaired e^-)
Magnetic Nature	Diamagnetic

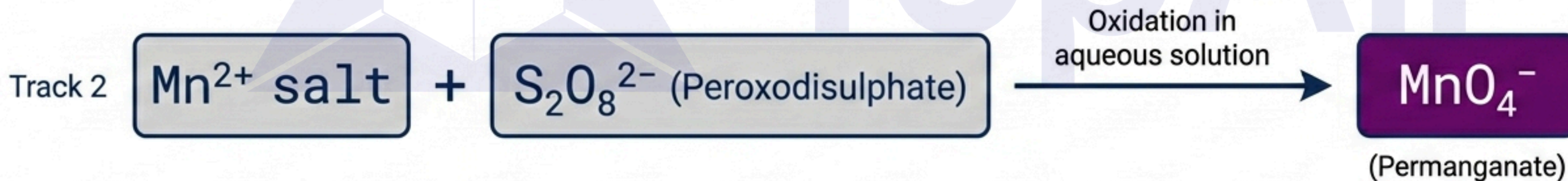
Intense purple colour.

The d^0 Paradox: If Permanganate has no unpaired d-electrons, why is it intensely purple?

Answer: π -bonding via overlap of p-orbitals of Oxygen with empty d-orbitals of Manganese (Ligand-to-Metal Charge Transfer).

Synthesis Pathways: Industry vs. Laboratory

Commercial Preparation



Laboratory Preparation

Did you know?

KMnO_4 forms dark purple (almost black) crystals that are isostructural with KClO_4 . It has limited solubility in water (6.4g/100g at 293K).



**You've Learned the Theory.
Let's Test Them Now.**

$$E=mc^2$$



Turn theory into marks with **unlimited MCQs, smart analysis, and focused revision.**

Practice Now



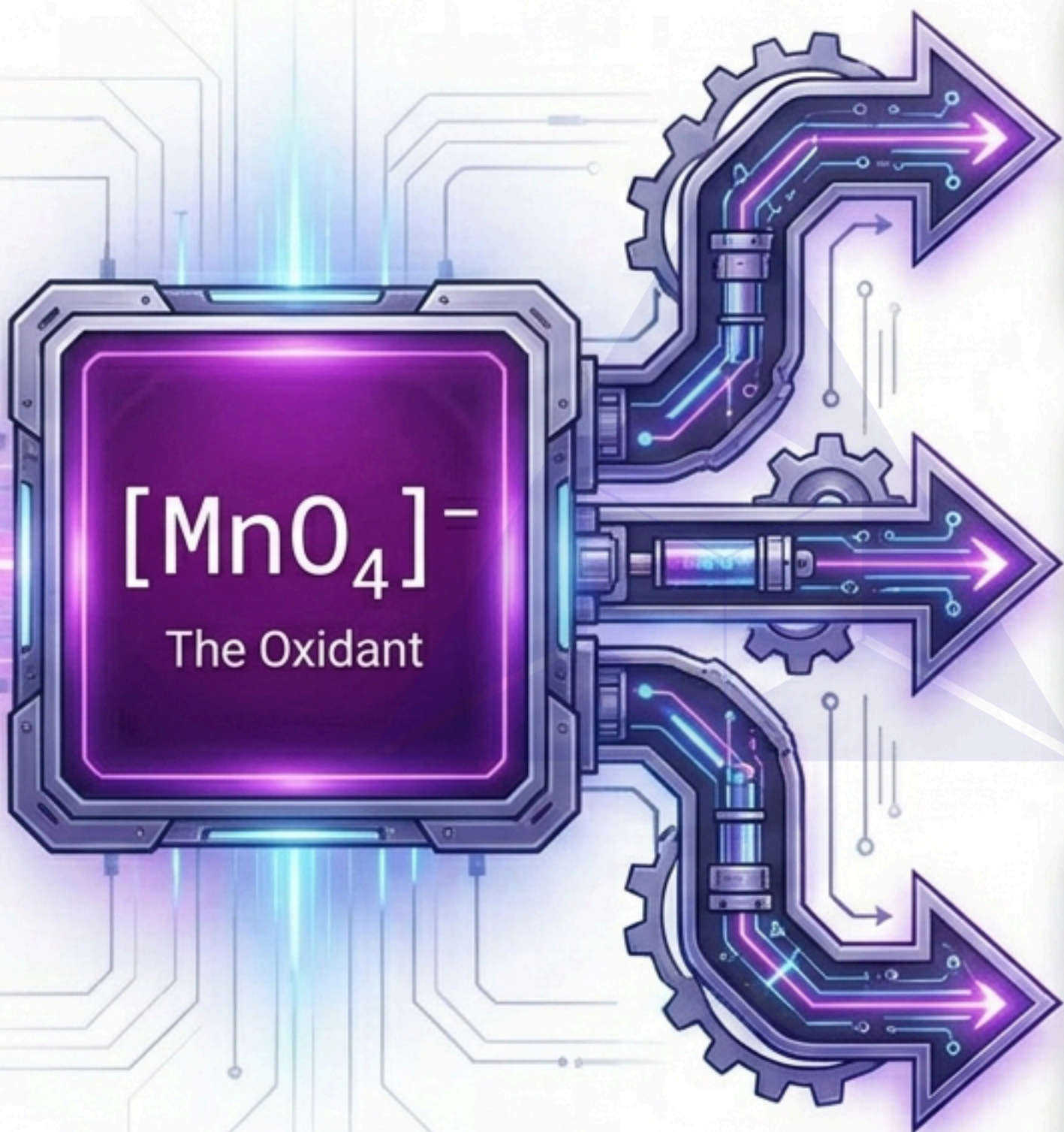
At prep.topall.app

Key Highlights

- » Free Study Material, Videos & Infographics
- » Push Your Limits with Level-Based Challenges
- » Climb the Leaderboard Among Fellow Aspirants
- » Practice Unlimited MCQs for NEET & JEE
- » Get Clear Explanations, Not Just Marks
- » Track Your Performance Smarter



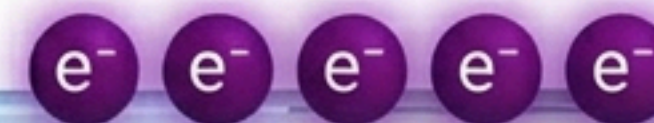
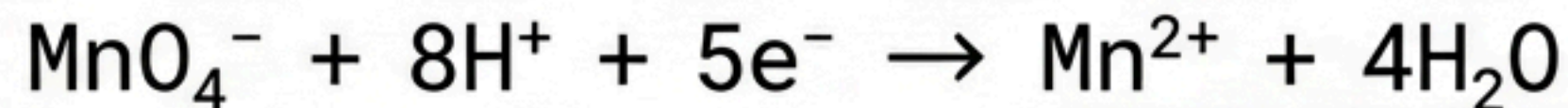
The Oxidising Engine: Core Mechanics



High $[\text{H}^+]$

Acidic Medium

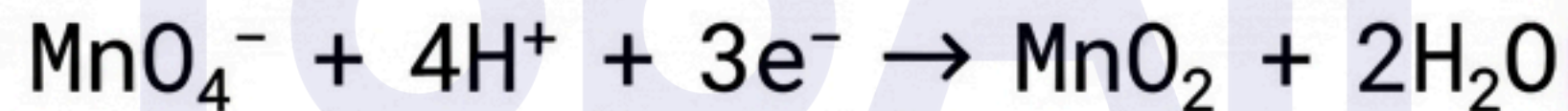
$E^\circ = +1.52\text{V}$



Low to zero $[\text{H}^+]$

Neutral / Faintly Basic Medium

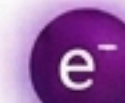
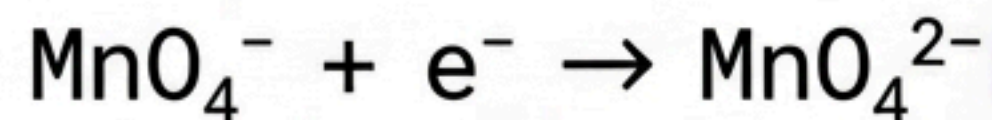
$E^\circ = +1.69\text{V}$



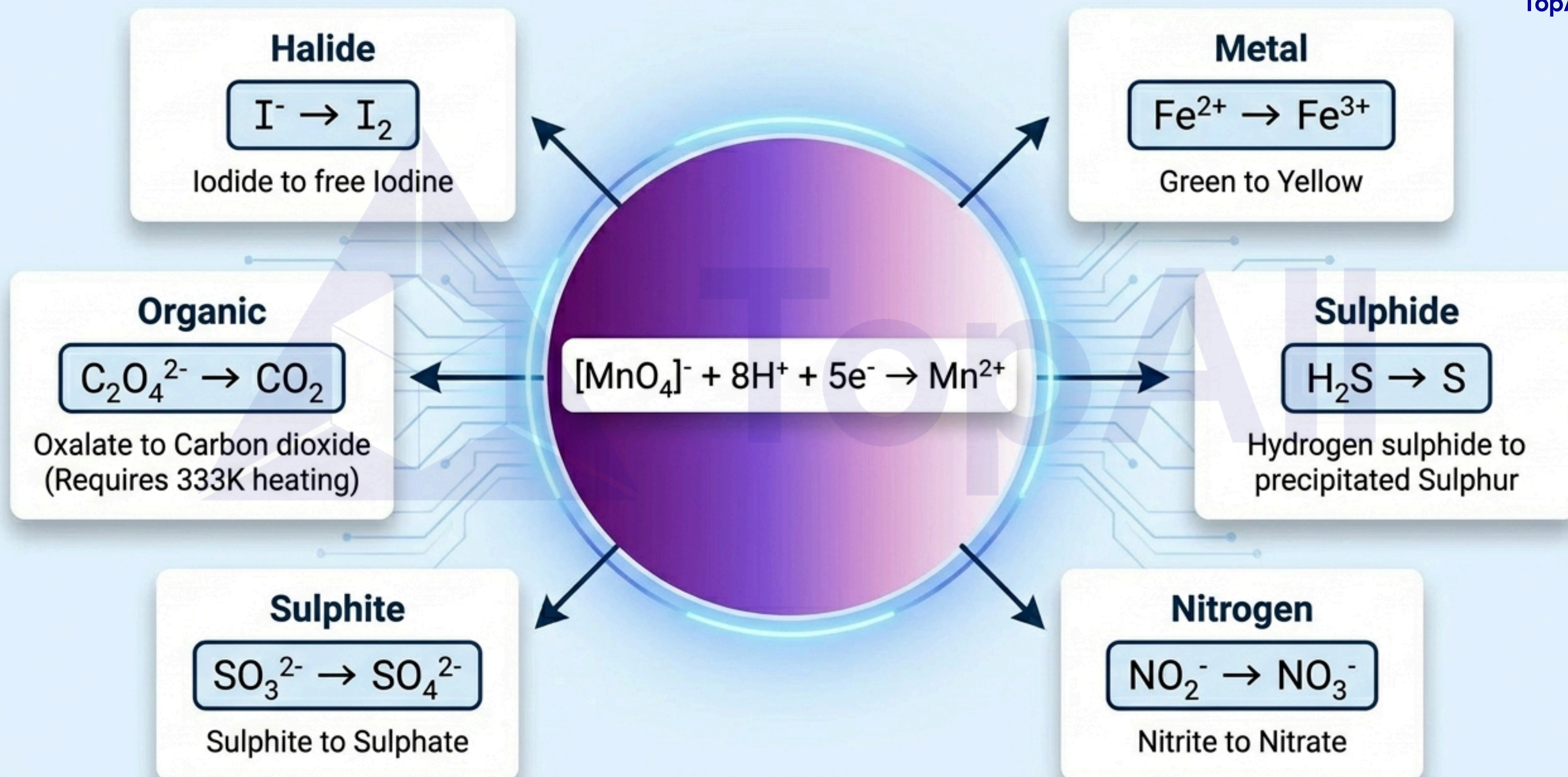
High $[\text{OH}^-]$

Basic Medium

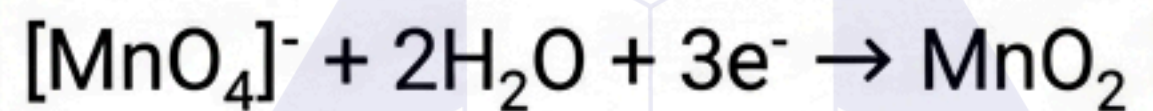
$E^\circ = +0.56\text{V}$



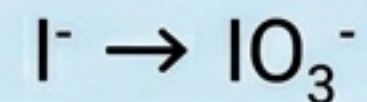
Reaction Matrix: Acidic Medium



Reaction Matrix: Neutral & Faintly Basic Medium

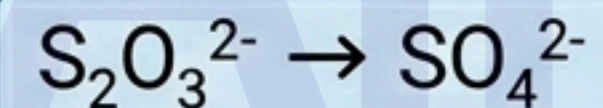


CRITICAL EXAM TRAP



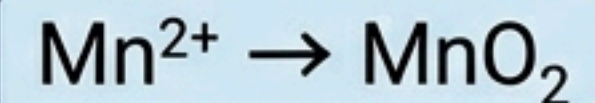
Unlike acidic medium (which yields I_2), neutral medium oxidises iodide all the way to iodate!

Thiosulphate



Almost quantitatively to sulphate

Manganous Salt



Catalysed by ZnSO_4 or ZnO

Applications & Analytical Constraints



Organic Synthesis

A favorite strong oxidant in preparative organic chemistry for driving multi-step reactions.



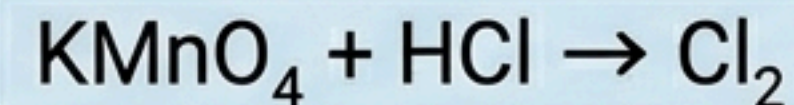
Industry Bleach

Exploits strong oxidising power to bleach wool, cotton, silk, and other textile fibres, as well as decolourising oils.



Titration Alert

Permanganate titrations are unsatisfactory in the presence of Hydrochloric Acid (HCl).



The HCl is oxidised to Chlorine gas, ruining the quantitative accuracy of the titration.

NEET/JEE Quick Revision Matrix



MEDIUM	n-FACTOR (e ⁻)	FINAL PRODUCT	COLOUR CHANGE
Acidic	n = 5	Mn ²⁺	Purple → Colorless
Neutral / Weak Base	n = 3	MnO ₂	Purple → Brown ppt
Strong Basic	n = 1	MnO ₄ ²⁻	Purple → Green

Thermal Decomposition (513 K)



Heating yields green manganate, black manganese dioxide, and oxygen gas.



You've Learned the Theory.

Now Let's Test It.

Reading notes gets you knowledge.

Practicing MCQs gets you marks.

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Practice the moment you finish studying
Jump in while the concept is still fresh in your head

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MCQs

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