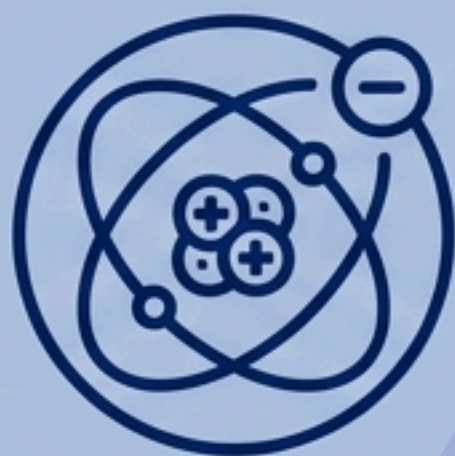


THE FRACTIONAL OXIDATION NUMBER TRAP

Why standard algebra fails, why structures reveal the truth, and how to avoid negative marking in competitive exams.





The Paradox

Electrons are elementary particles. They are transferred or shared in whole numbers.

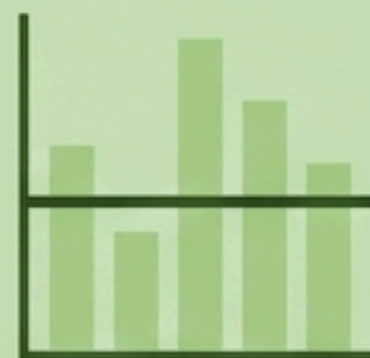
Therefore, a fractional oxidation state is a physical impossibility.



The Mathematical Trap

$$\sum \text{Oxidation States} = \text{Net Charge}$$

When we use standard algebra, we falsely treat all atoms of the same element in a molecule as occupying identical chemical environments.



The Reality

A fractional oxidation number is merely an Average Oxidation State. It indicates that the element exists in multiple, different, whole-number oxidation states within the same species.

Carbon Suboxide (C_3O_2): Average vs. Actual States

Formula Calculation (Average)

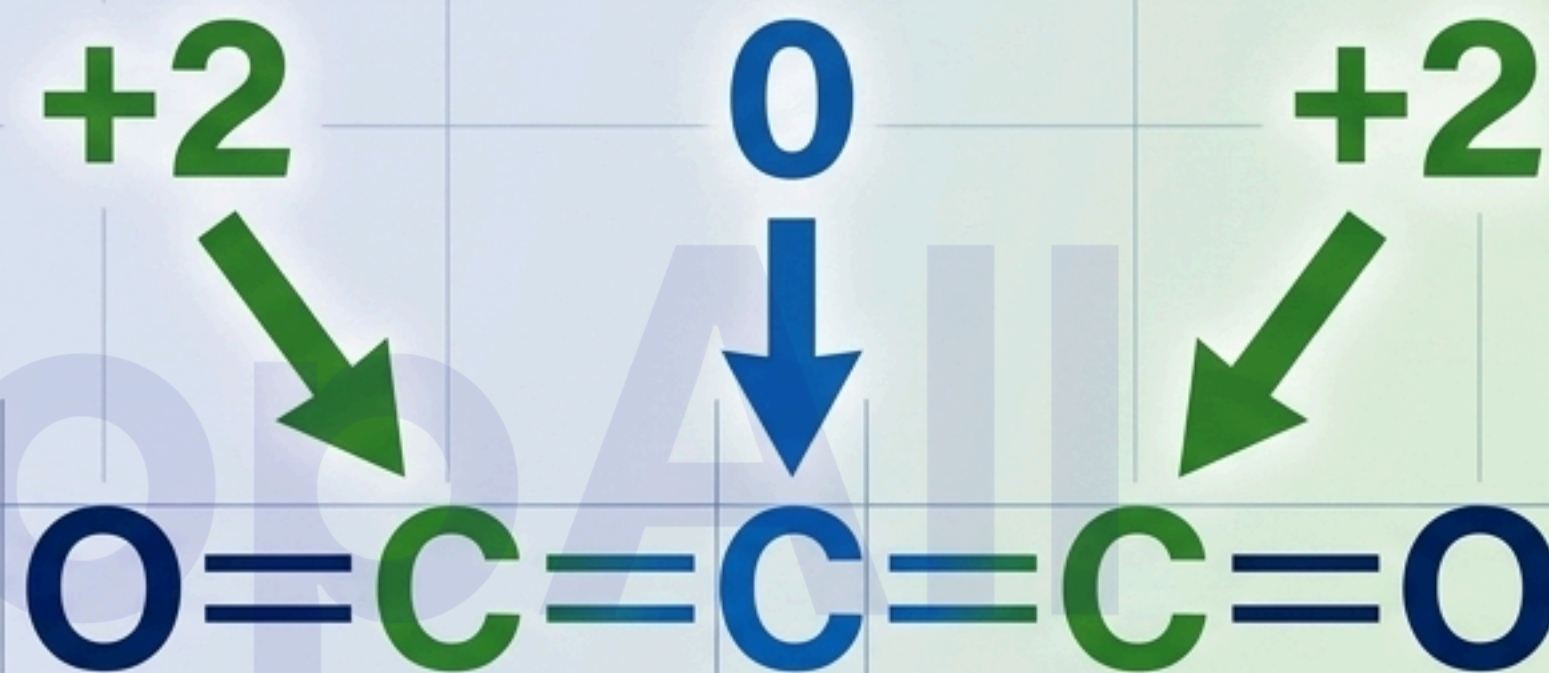
$$3x + 2(-2) = 0$$

$$3x = +4$$

$$x = +4/3$$

The algebraic method suggests every Carbon atom has a +1.33 state. Physically impossible.

Structural Reality (Actual)



$$\text{Average} = \frac{[(+2) + 0 + (+2)]}{3} = +\frac{4}{3}$$



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



Tribromooxide (Br₃O₈): Average vs. Actual States

Formula Calculation (Average)

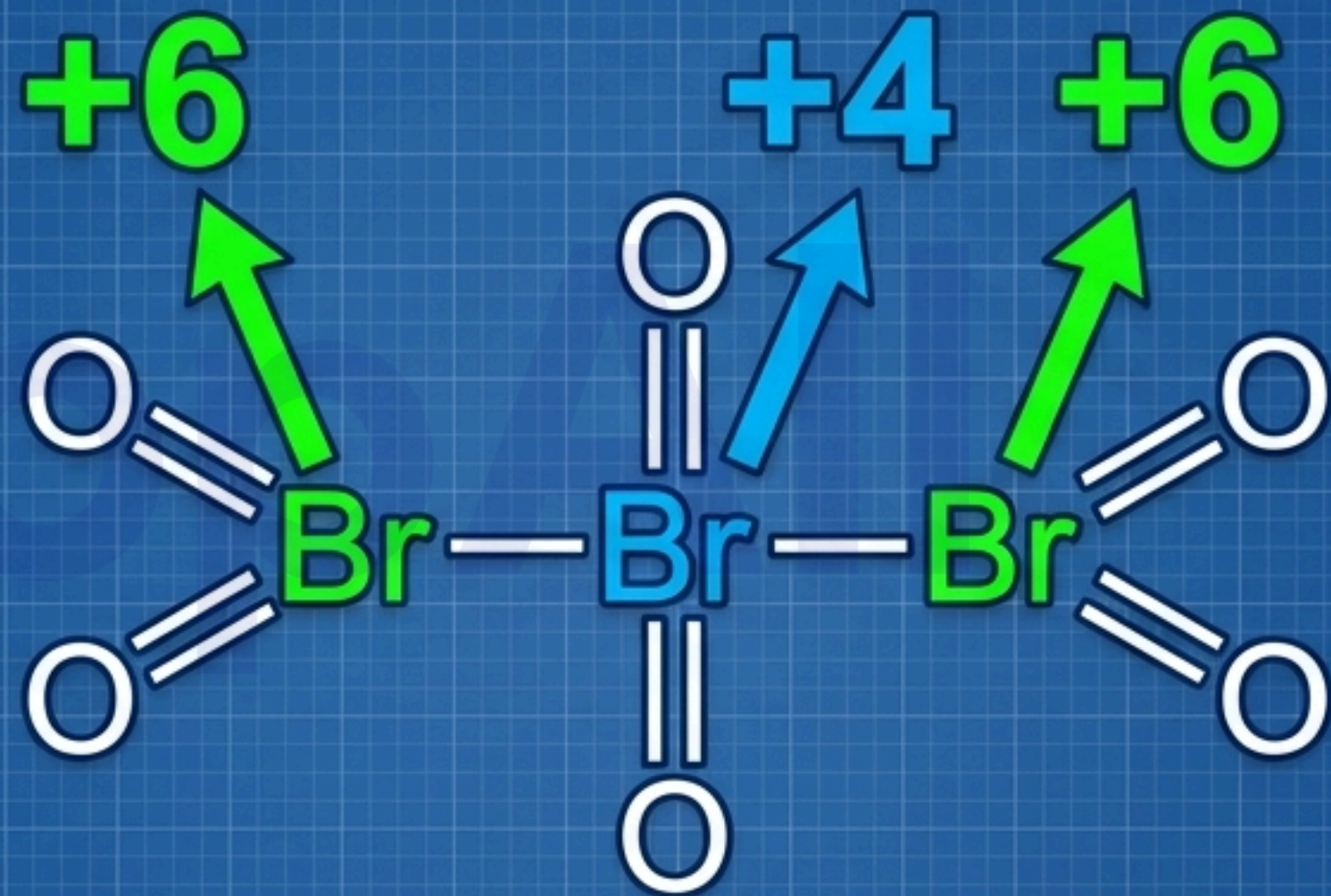
$$3x + 8(-2) = 0$$

$$3x = +16$$

$$x = +16/3$$

The algebraic method suggests every
Bromine atom has a +5.33 state.
Physically impossible.

Structural Reality (Actual)



$$\text{Average} = [(+6) + (+4) + (+6)] / 3 = +16/3$$

Tetrathionate Ion ($\text{S}_4\text{O}_6^{2-}$): Average vs. Actual States

Formula Calculation



JEE Trap Alert: Always equate algebraic sum to the net ionic charge, not zero!

Reality (Actual)

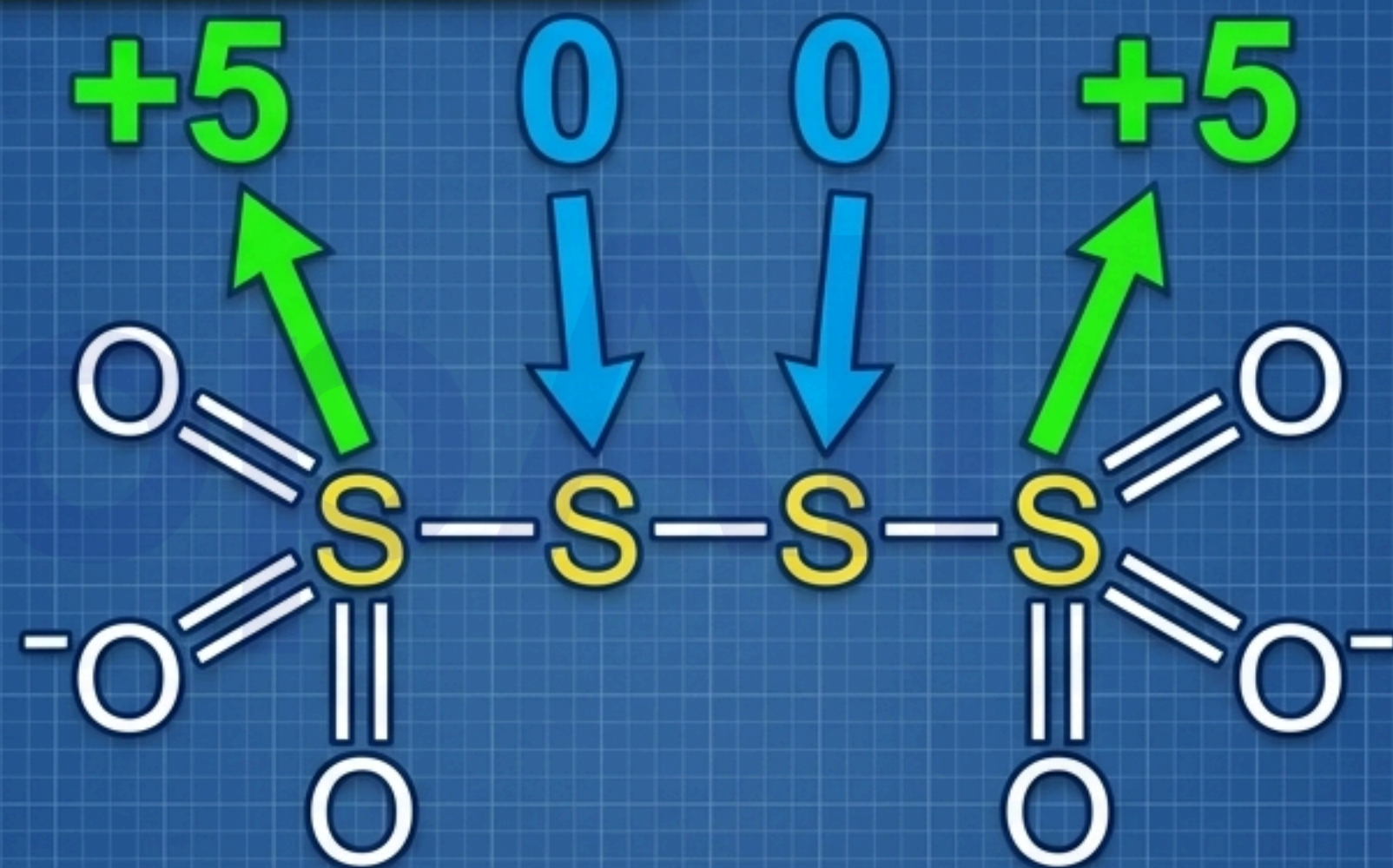
$$4x + 6(-2) = -2$$

$$4x = +10$$

$$x = +2.5$$

The algebraic method suggests every Sulfur atom has a +2.5 state.

Physically impossible.



$$\text{Average} = [(+5) + 0 + 0 + (+5)] / 4 = +2.5$$

The Blueprint Master-Matrix: Structure Reveals Reality

Species	Molecular Name	Mathematical Average	Structural Reality (Individual Atoms)
C_3O_2	Carbon Suboxide	+4/3	+2, 0, +2
Br_3O_8	Tribromooctaoxide	+16/3	+6, +4, +6
$S_4O_6^{2-}$	Tetrathionate Ion	+2.5	+5, 0, 0, +5

Mixed Oxides Extension

The Fractional Trap also applies to mixed oxides, which are stoichiometric mixtures of two different oxides.

Fe_3O_4 (Actually $FeO \cdot Fe_2O_3$)
→ Real states: +2, +3

Pb_3O_4 (Actually $2PbO \cdot PbO_2$)
→ Real states: +2, +4

Exam Snapshot: Surviving the Fractional Trap



Identify

If your algebraic calculation yields a fraction, STOP. You have found the average, not the absolute oxidation state.



Investigate

The fraction guarantees the element exists in ≥ 2 different whole-number oxidation states within that specific molecule.



Execute

Draw the Lewis structure. Look immediately for element-element bonds—these contribute 0 to the local oxidation state and are usually the source of the average discrepancy.

Key Takeaway: Treat fractional oxidation states as red flags. The reality of electron distribution is revealed by the structural blueprints only!



You've Learned the Theory.

Now Let's Test It.

Reading notes gets you knowledge.

Practicing MCQs gets you marks.

That's exactly what TopAll Pro is built for.

Try TopAll Pro Now

What TopAll Pro Does Differently

-  **Stuck? Snap it. Solve it. — Doubts AI**
Photo → step-by-step solution in seconds, 24/7
-  **Your AI Coach finds your blind spots**
Concept-level weakness detection — not just chapter-level
-  **4.5 Lakh+ questions. Never run out.**
13× more content than any other prep app in India
-  **Build your own test in 60 seconds**
Pick a chapter, set difficulty — AI does the rest instantly.
-  **AI Recommendation that helps you improve**
AI Recommendation Analysis your Tests and tell you where you need to improve.



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

4.5L+
MCQs

1.5L+
Students

AI Powered
In-Depth Analysis