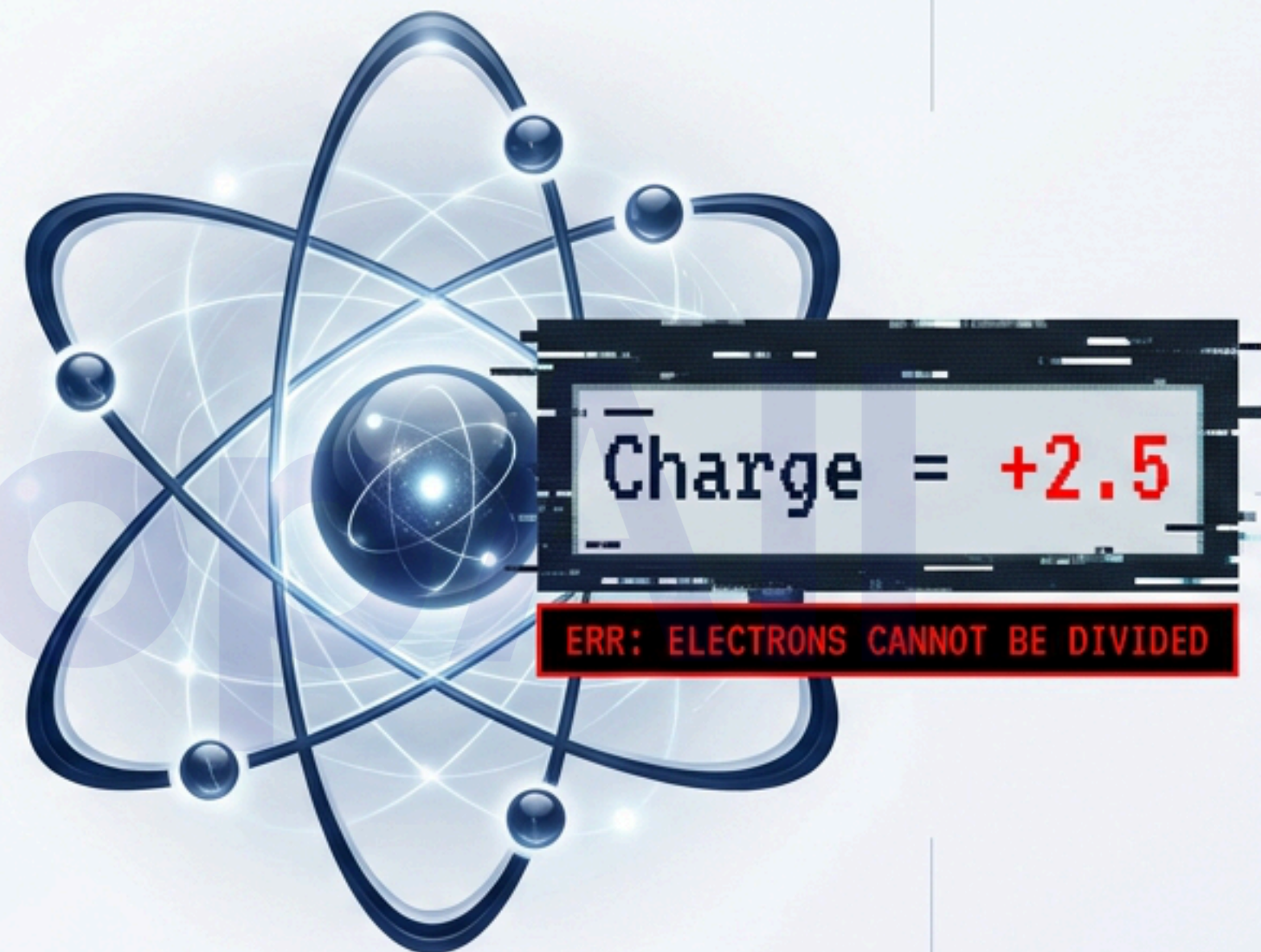


Fractional Oxidation Number

The Paradox of Average vs. Reality



NEET Concept Mastery

The Mathematical Illusion

The Math "Glitch"

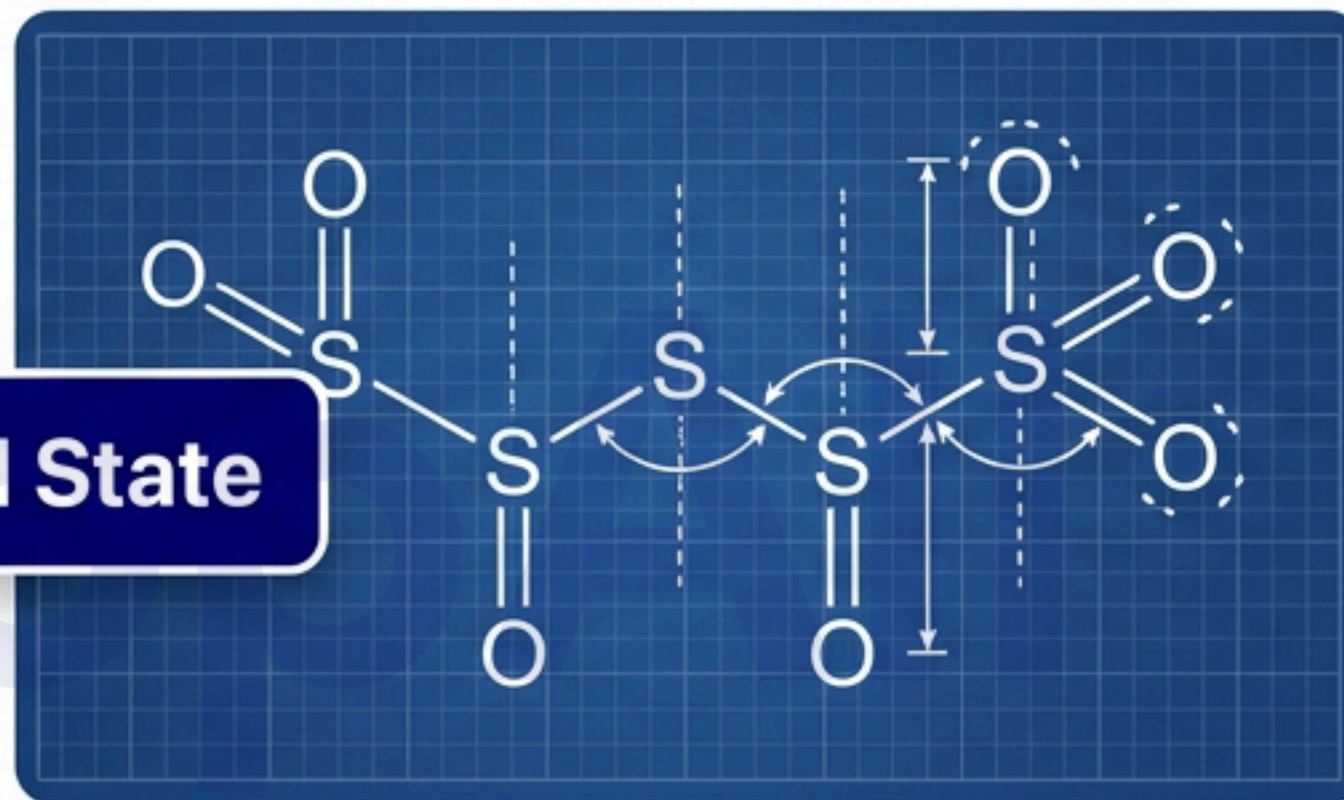


Average $\neq$ Real State

Oxidation numbers like +2.5 or +4/3 are mathematically correct but physically impossible. Electrons are indivisible; an atom cannot lose or gain a fraction of an electron.

The Structural Reality

The Structural Blueprint

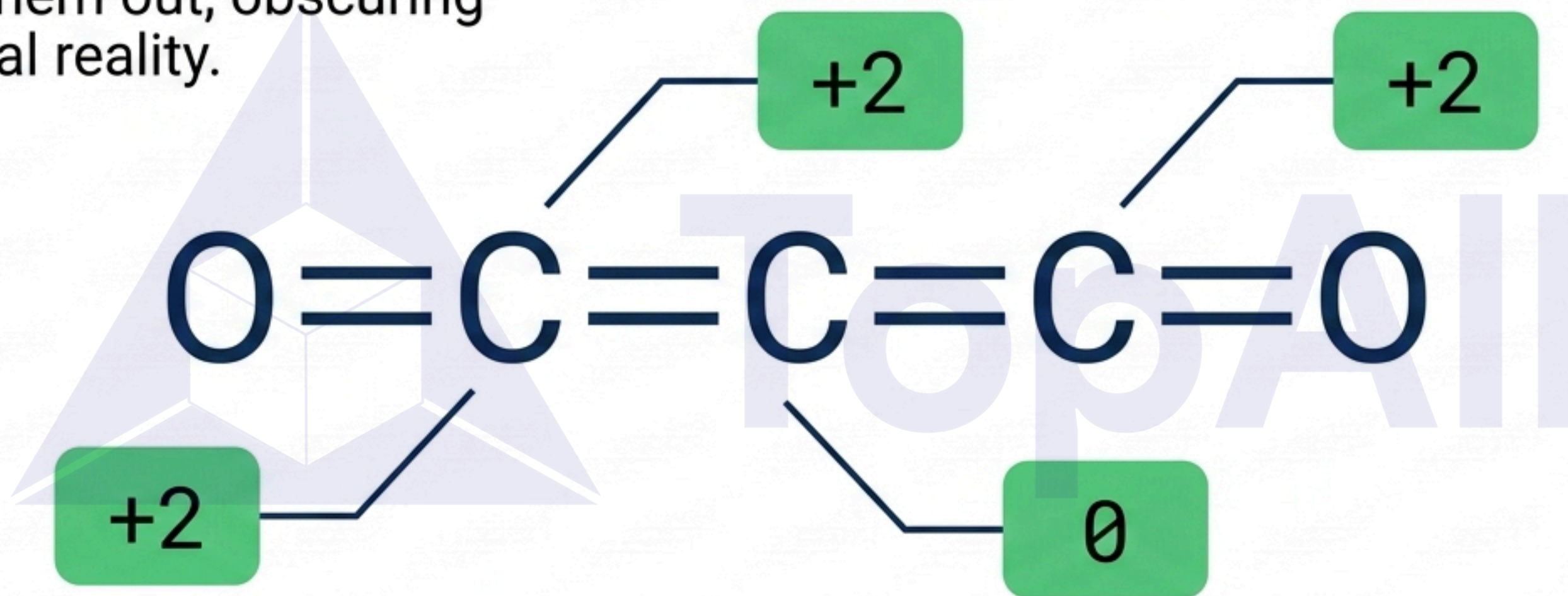


Fractional values are merely an average of the same element existing in different oxidation states within the same molecule. To find the truth, you must look at the structure.

Carbon Suboxide (C_3O_2)

Two carbon atoms are in a +2 state, while the middle carbon is in a 0 state. The math *averages* them out, obscuring the physical reality.

Average $\neq$ Real State



$$(+2 + 0 + 2) / 3 = +4/3$$



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Key Highlights

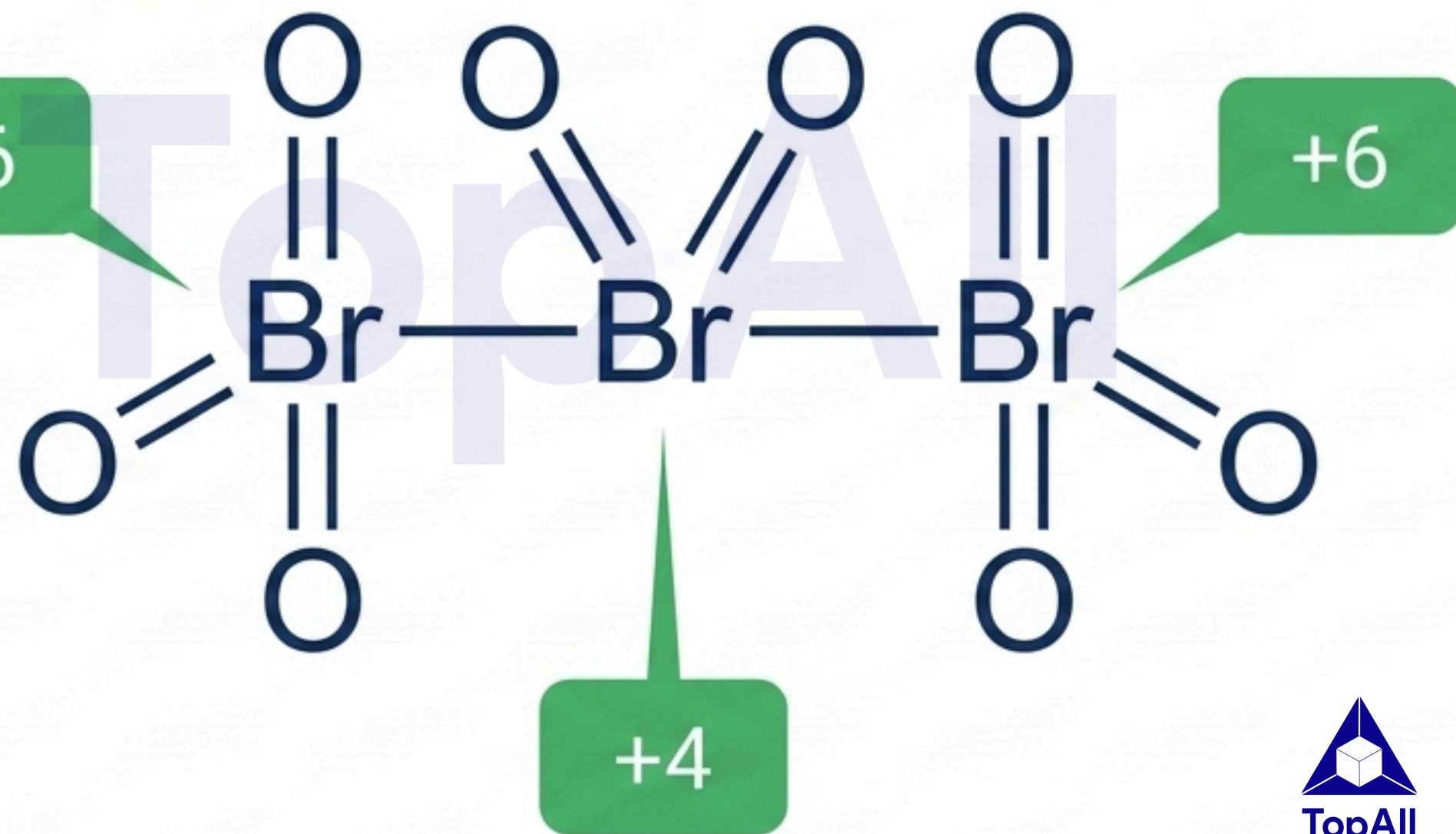
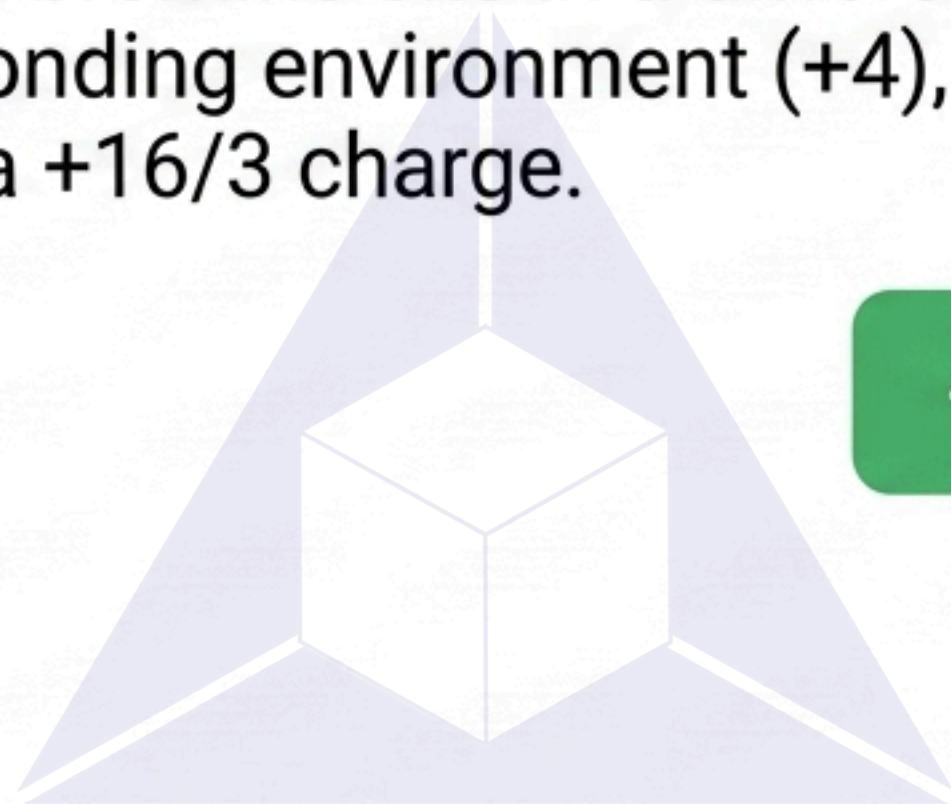
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Tribromooctaoxide (Br_3O_8)

Average $\neq$ Real State

The terminal bromine atoms are highly oxidized (+6).
The central bromine sits in a different
different bonding environment (+4), leading to the
illusion of a $+16/3$ charge.

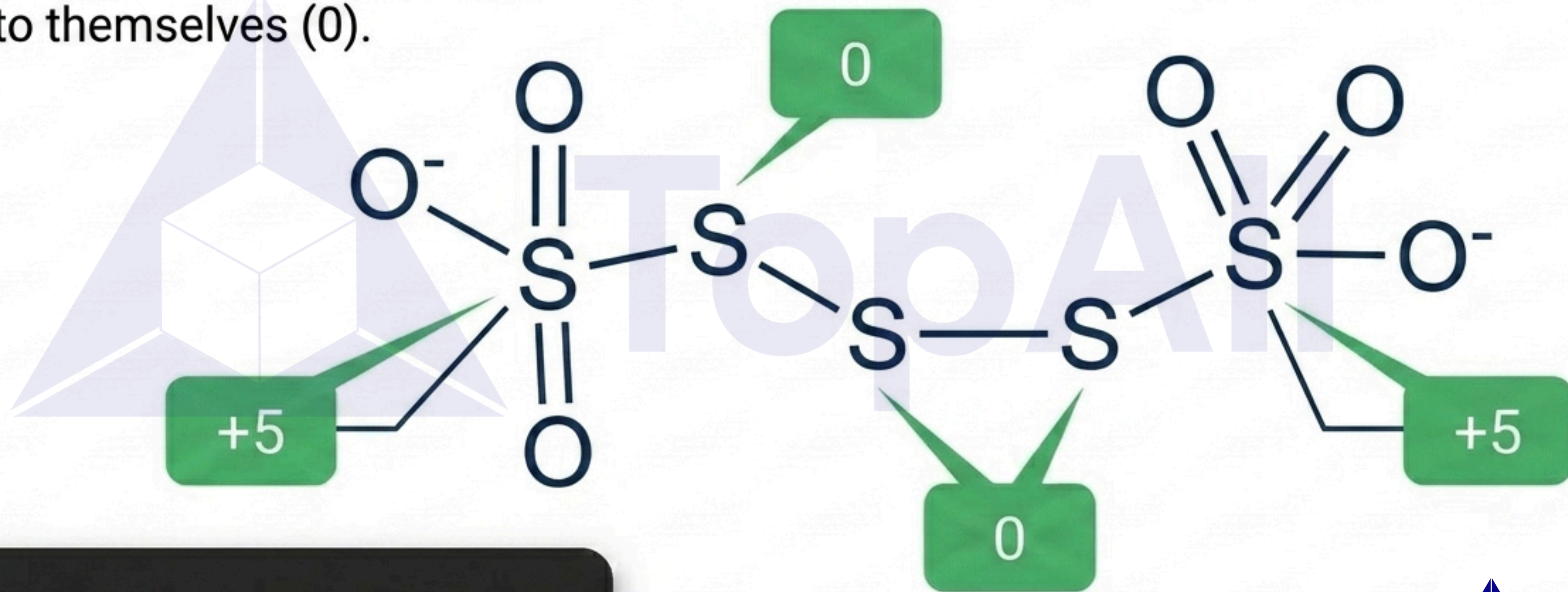


$$(+6 + 4 + 6) / 3 = +16/3$$

Tetrathionate Ion ($\text{S}_4\text{O}_6^{2-}$)

Average $\neq$ Real State

The extreme sulphur atoms lose electron density to oxygen (+5), while the middle sulphurs bond only to themselves (0).



$$(+5 + 0 + 0 + 5) / 4 = +2.5$$

The Fractional Oxidation Matrix

Molecule	Formula	The "Glitch" (Average)	The Reality (Individual States)
Carbon Suboxide	C_3O_2	+4/3	+2, 0, +2
Tribromooctaoxide	Br_3O_8	+16/3	+6, +4, +6
Tetrathionate Ion	$S_4O_6^{2-}$	+2.5	+5, 0, 0, +5

Exam Warning & Pro-Tips



The Rule of Fractions:

Whenever you calculate a fractional oxidation number on an exam, **STOP**. Draw the structure. The fraction is a trap; the structure is the truth.



Watch for Mixed Oxides:

Fractional states also appear in mixed oxides. These are stoichiometric mixtures, not single unified structures.

- Fe_3O_4
(Mixture of FeO & Fe_2O_3)

- Mn_3O_4

- Pb_3O_4
(Mixture of 2PbO & PbO_2)



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