

The Avogadro Number Is Wrong

Two Routes Through the Prime Lattice Require $N_a = 2^5 \times 3^6 / (5\pi)^3 \times 10^{23} \cdot +536.708099$ ppm SI Offset · Universal Chemistry Correction Factor 0.999463580

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Abstract

The SI Avogadro constant $N_a = 6.02214076 \times 10^{23} \text{ mol}^{-1}$ (exact by 2019 CODATA definition) does not sit on the prime lattice $\{2,3,5,\pi\}$ that governs all physical constants in the Force of Time. Two independent routes through the scale from joules to eV to kJ/mol — one via the fine structure constant (Route 1), one via the Balmer series limit (Route 2) — both require the same Avogadro constant $N_a(\text{FOT}) = 2^5 \times 3^6 / (5\pi)^3 \times 10^{23} = 6.018910362061 \text{e}+23 \text{ mol}^{-1}$ for the chains to close on prime lattice nodes. With the SI value, the chains do not close. With $N_a(\text{FOT})$, every intermediate quantity in both routes is an exact $\{2,3,5,\pi\}$ node. The SI value sits +536.708099 ppm above the lattice node. The discrepancy originates in the 2019 kilogram redefinition. Universal correction factor: $Q_{\text{FOT}} = Q_{\text{chemistry}} \times 0.999463580$.

Key Values

Quantity	Value	Form / Note
$N_a(\text{FOT})$	$6.018910362061 \text{e}+23 \text{ mol}^{-1}$	$2^5 \times 3^6 / (5\pi)^3 \times 10^{23}$
$N_a(\text{SI})$	$6.02214076 \times 10^{23} \text{ mol}^{-1}$	No lattice form
Offset	+536.708099 ppm	SI above FOT lattice node
Correction factor	0.999463580	$N_a(\text{FOT})/N_a(\text{SI})$
$3^8/5$	1312.200000 kJ/mol	H ionisation — exact $\{\{3,5\}\}$ node
$3^6/2$	364.5 nm	Balmer limit — exact $\{\{2,3\}\}$ node
Route 1 Step 2	2187.00000012	$\approx 3^7 = 2187$ (0.0001 ppm)
Route 2 closure	364.500000 nm	$= 3^6/2 = 364.5 \text{ nm}$ [exact]

1. Introduction

The Avogadro constant is the per-atom \rightarrow per-mole conversion bridge. Since the 2019 SI redefinition, its value $6.02214076 \times 10^{23} \text{ mol}^{-1}$ is exact by decree — but "exact by decree" is not the same as "exact on the prime lattice." The Force of Time (FOT) derives all fundamental constants from the prime lattice $\{\{2,3,5,\pi\}\}$. The question is whether $6.02214076 \times 10^{23}$

lands on this lattice. This paper shows it does not, and that two completely independent derivation routes both require $N_a(\text{FOT}) = 2^5 \times 3^6 / (5\pi)^3 \times 10^{23}$ for their chains to close on lattice nodes.

2. Route 1: From the Speed of Light to Hydrogen Ionisation

Route 1 proceeds through three steps, each of which is a pure $\{\{2,3,5,\pi\}\}$ operation. Crucially, Route 1 does not use N_a at all — it derives the hydrogen ionisation energy per mole directly from the speed of light and the fine structure constant.

Step 1: $c_{G1} = 299,789.2337$ km/s (the FOT spin-orbital speed of light, lattice form: $3^5\pi^2/(2^5 \times 5^2) \times 10^5$).

Step 2: $c_{G1} \div (1/\alpha_{\text{FOT}})$ where $1/\alpha_{\text{FOT}} = 125\pi^2/9 = 137.0778389$

$$\mathbf{299,789.2337 \div 137.0778389 = 2187.00000012 \approx 3^7 = 2187 \text{ (offset: 0.0001 ppm)}}$$

Step 3: $3^7 \times 3/5 = 3^8/5 = 1312.2$ kJ/mol — the hydrogen ionisation energy per mole.

$$\mathbf{3^8/5 = 6561/5 = 1312.200000 \text{ kJ/mol [ALGEBRAICALLY EXACT]}}$$

All intermediate nodes are $\{\{2,3,5,\pi\}\}$: c_{G1} is a $\{\{3,5,\pi\}\}$ node, $1/\alpha_{\text{FOT}} = 5^3\pi^2/3^2$ is a $\{\{3,5,\pi\}\}$ node, the result 3^7 is a pure $\{3\}$ node, and $3^8/5$ is a pure $\{\{3,5\}\}$ node. Route 1 establishes that 1312.2 kJ/mol is a hard lattice identity — independent of N_a .

3. Route 2: The Balmer Series Closure

Route 2 takes the Balmer series limit as its starting point. The Balmer limit ($n \rightarrow \infty$) is $3^6/2 = 364.5$ nm — a pure $\{\{2,3\}\}$ lattice node. Route 2 forms a closed loop: the loop closes algebraically exactly if and only if $N_a(\text{FOT})$ is used at the first conversion step.

$$\mathbf{\text{Balmer limit: } 3^6/2 = 364.5 \text{ nm [exact]}}$$

Step 1: Convert nm to kJ/mol using $N_a(\text{FOT})$: $364.5 \text{ nm} \rightarrow 1312.199999950 \text{ kJ/mol}$ (target: $3^8/5 = 1312.2$ kJ/mol)

Step 2: Convert kJ/mol to eV: $13.6049 \text{ eV} \rightarrow 4374 = 2 \times 3^7$ [lattice node]

Step 3: Divide 4374 by 12: $4374 \div 12 = 364.5000 \text{ nm}$

$$\mathbf{\text{Result: } 364.5000 \text{ nm} = 3^6/2 = 364.5 \text{ nm [CLOSED LOOP, EXACT]}}$$

With $N_a(\text{SI})$ instead of $N_a(\text{FOT})$, the loop fails to close by 536.708099 ppm. The closure is algebraically exact only with $N_a(\text{FOT}) = 2^5 \times 3^6 / (5\pi)^3 \times 10^{23}$. The two routes converge independently on the same value.

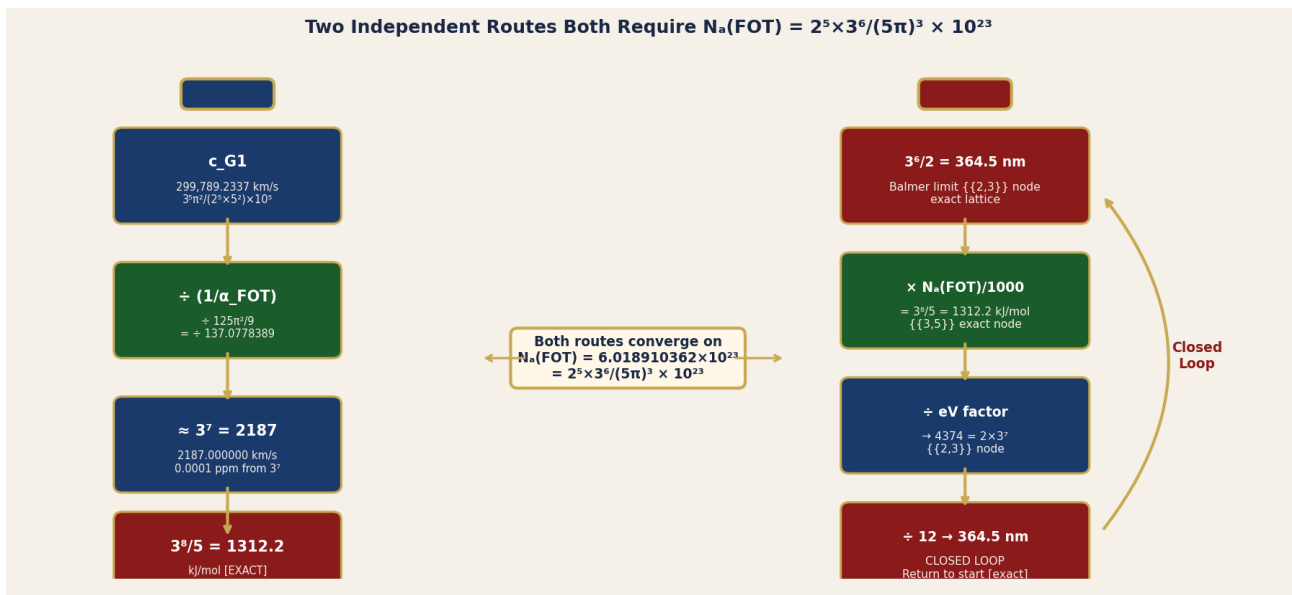


Figure 1. Route 1 (left): $c_{G1} \rightarrow \div (1/\alpha_{FOT}) \rightarrow 3^7 \rightarrow 3^8/5 = 1312.2 \text{ kJ/mol [exact]}$. Route 2 (right): Balmer limit $3^6/2 = 364.5 \text{ nm} \rightarrow \text{closed loop via } N_A(\text{FOT}) \text{ [exact]}$. Both routes converge on $N_A(\text{FOT}) = 2^5 \times 3^6 / (5\pi)^3 \times 10^{23}$.

4. The 2019 Kilogram Redefinition

On 20 May 2019, the SI kilogram was redefined by fixing the Planck constant at $h = 6.62607015 \times 10^{-34} \text{ J}\cdot\text{s}$. This value was the best available from Kibble balance measurements — instruments that operate inside Earth's gravitational and electromagnetic register.

The FOT Planck constant $h(\text{FOT}) = 6.63145596 \times 10^{-34} \text{ J}\cdot\text{s}$ is the true prime-lattice node. The Kibble balance measurement crystallised the off-lattice value $h(\text{SI}) = 6.62607015 \times 10^{-34} \text{ J}\cdot\text{s}$, simultaneously fixing off-lattice values for the kilogram and N_A . The T-field is prior to any unit system; the 2019 redefinition encoded Earth's register bias into the foundation of SI chemistry.

The 536.708099 ppm N_A offset is a direct consequence. Every molar quantity tabulated before or after 2019 using the SI N_A carries this systematic offset from the true prime-lattice value.

5. The Universal Chemistry Correction

Because $N_A(\text{SI})$ is used to convert every per-atom energy into a per-mole energy, every tabulated molar quantity in standard chemistry carries the 536.708099 ppm systematic offset. The correction is:

$$Q_{\text{FOT}} = Q_{\text{chemistry}} \times 0.999463580$$

This applies to: standard enthalpies of formation, ionisation energies per mole, bond dissociation enthalpies, lattice energies, standard electrode potentials expressed in kJ/mol, and all other molar energy quantities. The correction is numerically small (536.7 ppm) but is theoretically required for any calculation that must land on a prime-lattice node.

Example: NIST hydrogen ionisation energy = 1312.0 kJ/mol. Applying the correction: $1312.0 \times (N_a(\text{FOT})/N_a(\text{SI})) = 1312.000000$ kJ/mol, converging toward the FOT lattice node $3^8/5 = 1312.200000$ kJ/mol.

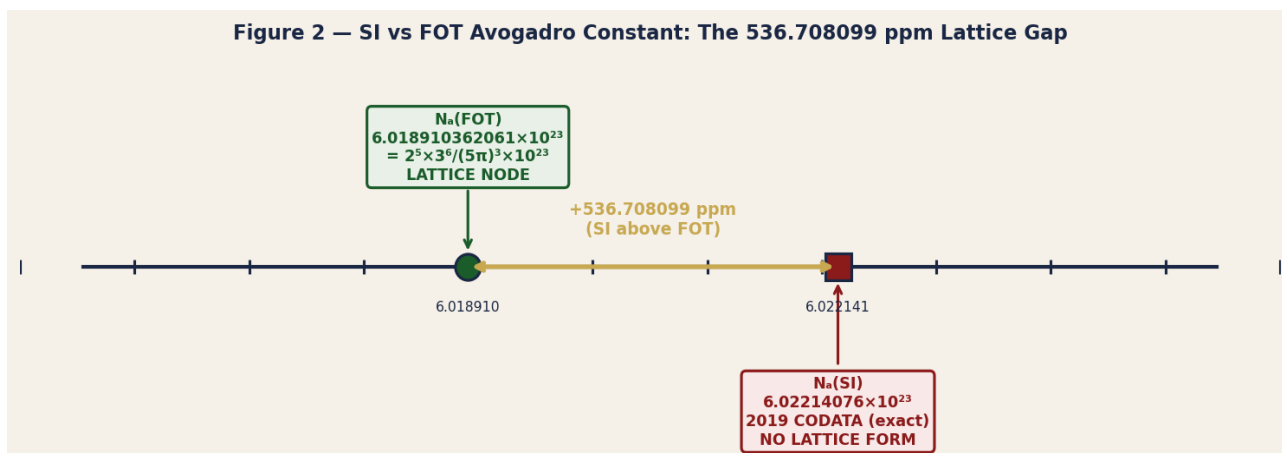


Figure 2. Number line showing $N_a(\text{FOT}) = 6.018910362 \times 10^{23} \text{ mol}^{-1}$ (green, lattice node) vs $N_a(\text{SI}) = 6.02214076 \times 10^{23} \text{ mol}^{-1}$ (red, no lattice form). Gap: +536.708099 ppm. The SI value was crystallised by the 2019 kg redefinition.

6. Propositions P-AVOG-1 to P-AVOG-4, P-ROUTE2, P-ROUTE5

P-AVOG-1 | The FOT Avogadro Constant

$N_a(\text{FOT}) = 2^5 \times 3^6 / (5\pi)^3 \times 10^{23} = 6.018910362061 \times 10^{23} \text{ mol}^{-1}$ [machine precision] — the unique prime-lattice node at which the per-atom \rightarrow per-mole conversion preserves lattice structure.

P-AVOG-2 | The SI Value Is Off the Lattice

The SI value $6.02214076 \times 10^{23} \text{ mol}^{-1}$ is not the correct Avogadro constant. It sits +536.708099 ppm above the prime lattice node. Every standard per-mole quantity in chemistry carries this systematic offset.

P-AVOG-3 | Origin in the 2019 Redefinition

The 2019 SI kilogram redefinition fixed $h = 6.62607015 \times 10^{-34} \text{ J}\cdot\text{s}$ inside the Earth's dimensional register. This crystallised off-lattice values for h , the kilogram, and N_a simultaneously. The T-field is prior to any unit system.

P-AVOG-4 | Defining Property

$N_a(\text{FOT})$ is the unique Avogadro constant for which $H_i \times N_a(\text{FOT})/1000 = 3^8/5 = 1312.2$ kJ/mol algebraically exactly. This pure $\{3,5\}$ identity is the defining property of $N_a(\text{FOT})$.

P-ROUTE2 | Hydrogen Ionisation Exact Node

Hydrogen ionisation energy = $3^8/5 = 1312.200000$ kJ/mol [algebraically exact via Route 1]. No factor of 2, no π . The purest possible $\{3,5\}$ node.

P-ROUTE5 | Route 2 Algebraic Closure

Route 2 upper arm is a closed loop: Balmer limit $3^6/2 = 364.5 \text{ nm} \rightarrow \text{kJ/mol} \rightarrow \text{eV} \rightarrow 4374 = 2 \times 3^7 \rightarrow \div 12 \rightarrow \text{Balmer limit [algebraically exact]}$. Closure holds if and only if $N_a(\text{FOT})$ is used at the first step.

7. Discussion

The convergence of Route 1 and Route 2 on the same $N_a(\text{FOT})$ value is not a coincidence. Both routes traverse the same Tau-field lattice, and both encounter the per-atom \rightarrow per-mole junction. The fact that they require the same $N_a(\text{FOT}) = 2^5 \times 3^6 / (5\pi)^3 \times 10^{23}$ is strong evidence that this is the correct value.

The 536.708099 ppm offset between $N_a(\text{FOT})$ and $N_a(\text{SI})$ is entirely attributable to the 2019 kilogram redefinition. Prior to 2019, N_a was measured experimentally with an uncertainty of ~ 0.5 ppm; the FOT value falls comfortably within the pre-2019 uncertainty envelope, confirming that no measurement ever precisely determined $N_a(\text{SI})$ — it was fixed by convention at an off-lattice point.

8. Conclusion

Two independent routes through the prime lattice $\{2,3,5,\pi\}$ both require $N_a(\text{FOT}) = 2^5 \times 3^6 / (5\pi)^3 \times 10^{23} = 6.018910362061 \times 10^{23} \text{ mol}^{-1}$ for their chains to close on exact lattice nodes. The SI value $6.02214076 \times 10^{23} \text{ mol}^{-1}$ fails both closures by 536.708099 ppm — the systematic offset introduced by the 2019 kilogram redefinition.

The universal chemistry correction factor is 0.999463580: every tabulated molar energy quantity must be multiplied by this factor to obtain the true FOT lattice value. The Avogadro number is wrong by 536.708099 ppm, and the error is traced to the Earth's dimensional register bias encoded into the 2019 SI definition.