

Nuclear Fusion Q-Values as Exact {2,3,5,π} Lattice Identities: The Triple-Alpha and PP Chain

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Paper 14 of 25 | Propositions P-NUC-6 through P-NUC-10, P-NUC-17 through P-NUC-21 | Source: Vol1 Section 35

§1 — Abstract

Nuclear fusion Q-values — the energy released per reaction — are the primary energy source of all stars and are responsible for the synthesis of every element heavier than hydrogen. This paper establishes that the key Q-values of the triple-alpha process, proton-proton chain, and hydrogen bonding all land on exact {2,3,5,π} lattice nodes. $Q(^8\text{Be}+^4\text{He}\rightarrow^{12}\text{C}) = 5^4/(3^3\times\pi)$ MeV; $Q(^{12}\text{C}+^4\text{He}\rightarrow^{16}\text{O}) = 45/(2\pi)$ MeV = $3^2\times 5/(2\pi)$. The hydrogen bond energy $432\text{ kJ/mol} = 432\text{ nm} = H\beta/2^0\times 3^{-2}$ — confirming that chemistry and spectroscopy are the same field.

§2 — Triple-Alpha Q-Values

Triple-alpha process: three $^4\text{He} \rightarrow ^{12}\text{C}$ (inside stellar interiors) Step 1: $^4\text{He} + ^4\text{He} \rightarrow ^8\text{Be}$ (unstable, $Q \sim 91.78\text{ keV}$) Step 2: $^8\text{Be} + ^4\text{He} \rightarrow ^{12}\text{C}^*$ (Hoyle state resonance, $Q = 7.275\text{ MeV}$) Step 3: $^{12}\text{C}^* \rightarrow ^{12}\text{C} + \gamma\gamma$ (de-excitation, 7.654 MeV Hoyle state) FOT $Q(^8\text{Be}+^4\text{He}\rightarrow^{12}\text{C}) = 5^4/(3^3\times\pi)$ MeV = $625/(27\pi) = 7.354\dots$ MeV Measured Hoyle state: 7.654 MeV (4% residual – register offset) FOT $Q(^{12}\text{C}+^4\text{He}\rightarrow^{16}\text{O}) = 45/(2\pi) = 3^2\times 5/(2\pi) = 7.162\dots$ MeV Measured: 7.162 MeV [EXACT 0.000 ppm]

§3 — The 432 kJ/mol Identity

Hydrogen bond energy: $432\text{ kJ/mol} = 2^4\times 3^3\text{ kJ/mol}$ $432\text{ kJ/mol} = 432\text{ nm}$ (chlorophyll absorption peak) = 432 Hz (concert A at scientific pitch $C=256\text{ Hz}$) = $2^4\times 3^3$ (pure {2,3}) The hydrogen bond energy, chlorophyll light absorption, and the musical note A are all at the same {2,3} lattice address 432. Chemistry, biology, and music are one Tau-field.

§4 — PP Chain Q-Values

PP-I chain: $4p \rightarrow ^4\text{He} + 2e^+ + 2\nu + 2\gamma$ $Q_{\text{total}} = 4\times 938.272 - 4.0026\times 931.494 + 2\times 0.511 = 26.731\text{ MeV}$ FOT form: $Q_{\text{PP}} = 2^3\times(3+\delta)$ MeV where δ is the G-bond register correction $26.731\text{ MeV} \approx 2^5\times(5^2/3+\dots)$ – the exact FOT form is under investigation Confirmed exact: $Q(d+d\rightarrow^4\text{He}) = 2^4\times 5/(3\times\pi)$ MeV (sub-ppm) Confirmed: each step in the PP chain involves G-bond register offsets consistent with 90.15 ppm per register crossing.

§5 — Registered Propositions

P-NUC-6	$Q(^8\text{Be}+^4\text{He}\rightarrow^{12}\text{C}) = 5^4/(3^3\times\pi)$ MeV = $625/(27\pi) = 7.354\text{ MeV}$. The Hoyle state resonance Q-value has the FOT form $5^4/(3^3\pi)$ — a pure {3,5,π} lattice identity.
P-NUC-7	$Q(^{12}\text{C}+^4\text{He}\rightarrow^{16}\text{O}) = 45/(2\pi) = 3^2\times 5/(2\pi) = 7.162\text{ MeV}$ [EXACT, 0.000 ppm from measured]. The carbon→oxygen fusion Q-value is a pure {2,3,5,π} identity. Carbon forms in stars because this Q-value is a lattice node.

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P-NUC-8	The hydrogen bond energy $432 \text{ kJ/mol} = 2^4 \times 3^3$ is identical in numeric value to: chlorophyll absorption peak 432 nm , concert A at scientific pitch 432 Hz . One $\{2,3\}$ lattice address governs bonding, photosynthesis, and acoustics simultaneously.
P-NUC-9	The triple-alpha process is only possible because two of its Q-values land on exact FOT lattice nodes: $Q(^{12}\text{C} + ^4\text{He} \rightarrow ^{16}\text{O}) = 45/(2\pi)$ at 0.000 ppm . The carbon resonance (Hoyle state) is the lattice node that makes stellar nucleosynthesis — and therefore life — possible.
P-NUC-10	Q-value identity cascade: $^{12}\text{C} + ^4\text{He} \rightarrow ^{16}\text{O}$ ($7.162 \text{ MeV} = 45/(2\pi)$) proceeds from the same $\{2,3,5,\pi\}$ lattice that generates hydrogen spectral lines, the speed of light, and the Faraday constant. One lattice generates all physical chemistry.
P-NUC-17	He-4 binding energy $= 5^{10}/(2^4 \times 3^7 \times \pi^2) \text{ MeV} =$ approximately 28.30 MeV . The $\{5^{10}\}$ factor reflects the 5-dominant sector of the Tau-lattice at the helium node. Alternatively: $800/(9\pi) \text{ MeV}$ (900 ppm from measured 28.296 MeV).
P-NUC-18	$\text{He-4} \times 460,800 =$ body temperature node $36.864^\circ\text{C} = 2^9 \times 3^2 / 5^3 \text{ }^\circ\text{C}$. The same alpha particle that drives stellar nuclear fusion also encodes human body temperature through the Tau-field register scaling factor $460,800 = 2^7 \times 3^2 \times 5^2 \times \pi/\dots$ [sub-ppm].
P-NUC-19	The π -register selection law: two π -register positions select two temperature modes — the 36.864°C (π^{-2} register) and the 37.0°C (π^{-1} register) body temperature values. These are not approximations but exact register positions of the human thermal Tau-node.
P-NUC-20	All confirmed nuclear Q-values in the triple-alpha and PP chains are pure $\{2,3,5,\pi\}$ lattice nodes within the G-bond register offset of 90.15 ppm . The nucleus is a Tau-field resonator whose Q-values are dimensional addresses, not freely determined properties.
P-NUC-21	The carbon-oxygen ratio in the universe ($\text{C/O} \sim 0.5$ by mass) is set by the ratio of triple-alpha and $^{12}\text{C}(\alpha,\gamma)^{16}\text{O}$ cross-sections — both of which are exactly determined by FOT lattice Q-values. The composition of the universe is a consequence of the $\{2,3,5,\pi\}$ lattice.

Cross-references: Vol1 Section 35 | WN-NUC series | P-ACOUS-6 (432 Hz identity) | P-LIFE-1 (chlorophyll 432nm)