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Low Energy Nuclear Reactions w/o Tunnelling Explained STEWART BREKKE, Northeastern Illinois University (former grad student) — Using the phenomenon of nuclear vibration low energy nuclear reactions can be explained using classical mechanics. Consider an incoming positive charge such as a proton approaching a vibrating nucleus. If he amplitudes of nuclear oscillation are equal in all directions, the position of the incoming positive charge is $r = [(x + AcosX)^2 + (y + AcosY)^2 + (z + AcosZ)^2]^{1/2}$. Then the KE needed (barrier height) is $KE = kQ_1`Q_2/r$. If the nucleus is considered as point nucleus, and the contact point is $x = AcosX, y = AcosY$ and $z = AcosZ$, KE needed is $KE = kQ_1Q_2/[(2AcosX)^2+(2AcosY)^2+(2AcosZ)^2]^{1/2}$. Collecting terms KE needed is $KE = kQ_1Q_2/(12A^2cos^2B)^{1/2}$ if all the cosines are equal. Therefore, the barrier height for an oscillating nucleus with incoming positive charge is $KE = kQ_1Q_2/(3.46AcosB.)$ If $RMScos = 0.707$, the average barrier height is $KE = kQ_1Q_2/2.45A$, where A is the average amplitude of nuclear of vibration. In deuterium-deuterium fusion occurring on the sun, the temperature needed is $4.0x10^7K$. The nuclear barrier height to be overcome is $8.286x10^{-15}$j using the equipartition of energy formula $1/2mv^2 = 3/2kT$. Solving for A, the average amplitude of vibration needed for two deuterium nuclei to fuse is approx. 11.33 fermis.

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