Kittel TP.

3.8. Particle in a box: $T = \frac{\hbar^2 k^2}{2m}$

$$\vec{k} = \left(\frac{n_x \pi}{L}, \frac{n_y \pi}{L}, \frac{n_z \pi}{L} \right), \quad \text{as.}$$

$$\psi(\vec{x}) \propto \sin\left(\frac{n_x \pi x}{L}\right) \sin\left(\frac{n_y \pi y}{L}\right) \sin\left(\frac{n_z \pi z}{L}\right).$$

for satisfaction of the boundary condition and Schrodinger eq..

$$\Rightarrow \quad T = \frac{\hbar^2}{2m}\left(\frac{\pi}{L}\right)^2 |\vec{n}|^2, \quad T_{GND} = \frac{\hbar^2 \pi^2}{2m L^2}.$$

With $n = L^{-3}$, $\boxed{T_{GND} = \frac{\hbar^2 \pi^2}{2m} n^{2/3}.}$

Impose. $\frac{\hbar^2 \pi^2}{2m} n^{*2/3} = T.$

$$n^{*2/3} = \frac{2m}{\hbar^2 \pi^2} T$$

$$\boxed{n^* = \frac{2m}{\hbar^2 \pi^2} T^{3/2}.}$$

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