



• Multiplisitet til ideell gaas

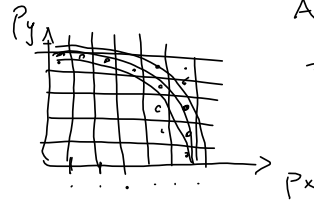
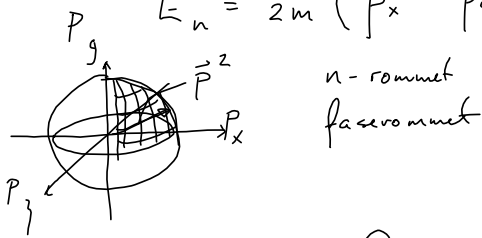
Einstein krystall  $U(x) = \frac{1}{2} kx^2 \rightarrow E_n = h\nu n$

Partikkel i boks  $U(x) = \begin{cases} 0, & x \in [0, L] \\ \infty, & x < 0, x > L \end{cases}$

$$E_n = \frac{1}{2} m v^2 = \frac{1}{2} \left(\frac{m v}{m} \right)^2 = \frac{1}{2} m \cdot P^2 = \frac{h^2 n^2}{8mL^2}$$

Impuls $P = \frac{h}{\lambda_n} = \frac{hn}{2L}$

3D $E_n = \frac{1}{2m} (P_x^2 + P_y^2 + P_z^2)$



Antall tilstander
= Arealet av
kule-skallet

$$\Omega_1 = \frac{1}{8} 4\pi n^2$$

N uavhengige partikler $E = \sum_{i=1}^N \frac{p_i^2}{2m} = \frac{h^2}{8mL^2} \sum_i (n_{xi}^2 + n_{yi}^2 + n_{zi}^2)$

$$= \frac{h^2}{8mL^2} \sum_{i=1}^{3N} n_i^2$$

Arealet sfære i n-dim rom

$$A = \frac{2\pi^{d/2}}{(\frac{d}{2}-1)!} r^{d-1}$$

positive n : $\frac{1}{2^{3N}}$

ikke skillbare partikler $\frac{1}{N!}, 3N-1 \approx 3N$

$$\Rightarrow \Omega_N = f(N) V^N E^{3N/2}$$

$$\Omega_N = \frac{2}{N! (\frac{3}{2}N)!} \left(\frac{2\pi m E L^2}{h} \right)^{3N/2}$$

Stirling's approx

$$\frac{S}{k} = \ln \Omega_N = N \left(\ln \frac{V}{N} \left(\frac{2\pi m E}{3NL^2} \right)^{3/2} + \frac{5}{2} \right)$$

E
U

$$S(N, V, E) = g(N, V) + \frac{Nk}{2} \ln E^{3/2}$$

$$\frac{1}{T} = \left(\frac{\partial S}{\partial E} \right)_{N, V} = \frac{3}{2} Nk \frac{1}{E}$$

$$E = \frac{3}{2} NkT$$