Key points 03/30 lecture

- "Best" set given by : identical bosons : $\bar{n}_i = g_i \dfrac{1}{z^{-1} e^{\beta \varepsilon_i} - 1}$

identical fermions : $\bar{n}_i = g_i \dfrac{1}{z^{-1} e^{\beta \varepsilon_i} + 1}$

distinguishable particles : $\bar{n}_i = g_i \dfrac{1}{z^{-1} e^{\beta \varepsilon_i}}$

or: $\boxed{\bar{n}_i = g_i \dfrac{1}{z^{-1} e^{\beta \varepsilon_i} + a}}$ → $a = -1$ identical bosons
$a = +1$ identical fermions
$a = 0$ distinguishable particles

$\boxed{\dfrac{\bar{n}_i}{g}}$: most probable number of particles per energy level in the i^{th} cell

- Reinterpret (going back to $\varepsilon_{\vec{k}}$): $\bar{n}_{\vec{k}} = \dfrac{1}{z^{-1} e^{\beta \varepsilon_{\vec{k}}} + a}$

- For non-relativistic 3D gas consisting of distinguishable particles:

$$N = \sum_i n_i = z \sum_{\vec{k}} e^{-\beta \varepsilon_{\vec{k}}}$$

converting sum to integral

$$= z \frac{V}{(2\pi)^3} 4\pi \int_0^\infty e^{-\beta \varepsilon_k} k^2 \, dk$$

rewriting integral over k in terms of integral over ε and density of states

$$= \int_0^\infty n(\varepsilon) \underbrace{D(\varepsilon)}_{\text{density of states}} d\varepsilon = \frac{zV}{\lambda^3}$$