$$Q_N(V,T) = \sum_{\{n_\epsilon\}}{}' g(\{n_\epsilon\})\, e^{-\frac{1}{kT}\left(\sum_\epsilon n_\epsilon \epsilon\right)}$$

$$g(\{n_\epsilon\}) = \prod_\epsilon \frac{1}{n_\epsilon!} \Rightarrow \sum_{\{n_\epsilon\}}{}' \prod_\epsilon \frac{1}{n_\epsilon!} \cdot \prod_\epsilon \left(e^{\left(-\frac{\epsilon}{kT}\right)}\right)^{n_\epsilon}$$

$$\frac{1}{N!} \sum_{\{n_\epsilon\}}{}' \left[\frac{N!}{\prod_\epsilon n_\epsilon!} \prod_\epsilon \left(e^{-\left(\frac{\epsilon}{kT}\right)}\right)^{n_\epsilon} \right]$$

$$+\; N = \sum_\epsilon n_\epsilon$$

$$\frac{1}{N!} \left[\sum_\epsilon e^{-\frac{\epsilon}{kT}} \right]^N$$

$$Q_1(V,T)$$

$$\frac{1}{N!} \left[Q_1(V,T)\right]^N$$

$$g\{n_\epsilon\} = 1 \qquad \sum_{\{n_\epsilon\}}{}' \left[e^{-\frac{1}{kT}\left(\sum_\epsilon n_\epsilon \epsilon\right)} \right]$$

→ diferentziak hemen daude

baina hau ez da kalkulatzen
partizio-funtzio makrokanonika baina ez da kalkulatzen.

$$\mathcal{Z}(z,V,T) = \sum_{N=0}^{\infty} \left[z^N \left(\sum_{\{n_\epsilon\}}{}' e^{-\frac{1}{kT}\left(\sum_\epsilon n_\epsilon \epsilon\right)} \right) \right]$$

→ saltu

$$\sum_{N=0}^{\infty} \left[\left(\sum_{\{n_\epsilon\}}{}' \left(\prod_\epsilon z e^{-\frac{\epsilon}{kT}} \right)^{n_\epsilon} \right) \right]$$

N finkatu eta problemak dira n_ϵ tan baitu, baina gero N tan aldatu

↓ aldatu

n_ϵ posible dauden balio guztiak hartzen ditu baldintzarik gabe, balio denetara hedatu, independenteki!

$$= \sum_{n_0, n_1} \left[\left(z e^{-\frac{\epsilon_0}{kT}}\right)^{n_0} \left(z e^{-\frac{\epsilon_1}{kT}}\right)^{n_1} \cdots \right] = \left[\sum_{n_0} z e^{-\frac{\epsilon_0}{kT}} \right]^{n_0} \cdots\cdots$$

$$\begin{cases} BE & z e^{-\frac{\epsilon}{kT}} < 1 \\ FD & 1 + z e^{-\frac{\epsilon}{kT}} \end{cases}$$

bi balio baino ez dituelako