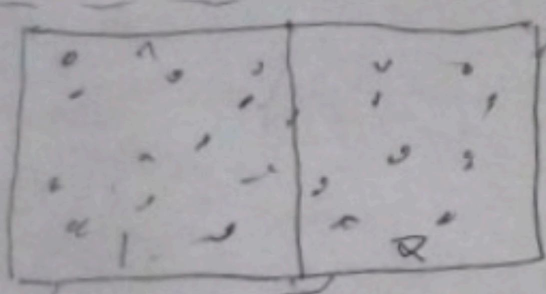
So maybe ρ involves only additive const. | Subsystems

system

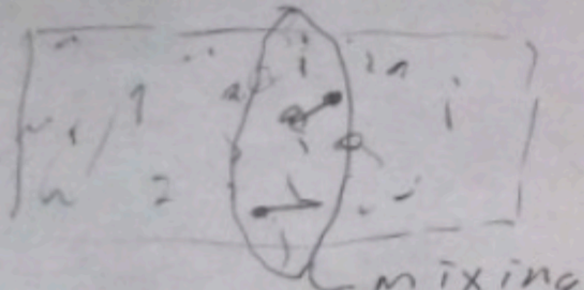


p_i, q_i

ρ_{total}

sub system

$$\rho_{total} = \rho_1 \cdot \rho_2$$



If supress mixing (at boundary)

$$\rho^{(total)} = \rho_1 \rho_2 \rho_3 \cdots \rho$$

$$\rho^{total} = \prod_{a=1} \rho^{(a)}(p^{(a)}, q^{(a)})$$

Gibbs

$\beta = \frac{1}{k_B T}$

$$\ln \rho^{(a)} = -\alpha^{(a)} - \beta E^{(a)}$$

$$\rho^{(a)} = e^{-\alpha^{(a)} - \beta E^{(a)}(p^{(a)}, q^{(a)})}$$

Gibbs distribution

in taking averages we int $dp^{(a)} dq^{(a)}$ in q.m.

$$\frac{dp\,dq}{h} \to \frac{dp^{(a)}\, dq^{(a)}}{(2\pi\hbar)^{s^{(a)}}}$$

quasi classical

$$\rho^{(a)} = \frac{1}{(2\pi\hbar)^{s^{(a)}}} e^{-\alpha^{(a)} - \beta^{(a)} E^{(a)}}$$

$$E^{(a)} = E(p^{(a)}, q^{(a)})$$

$$E \to H$$

$$\boxed{\rho^{(a)} = \frac{1}{(2\pi\hbar)^{s^{(a)}}} e^{-\alpha^{(a)} - \beta^{(a)} H^{(a)}(p^{(a)}, q^{(a)})}}$$

in eq. $\beta^{(a)} \to$ common

Gibbs