

Вибрані формули статистичної фізики

$$dE = TdS - pdV - \sum A da + \mu dN,$$

$$d\Omega = -SdT - pdV - \sum A da - Nd\mu, \quad \Omega = F - \mu N = -pV - \sum A^i a^e.$$

$$C = \frac{\delta Q}{\delta T} = T \frac{dS}{dT}, \quad C_p - C_V = -T \left(\frac{\partial p}{\partial T} \right)_V^2 \left(\frac{\partial p}{\partial V} \right)_T^{-1},$$

$$\left(\frac{\partial T}{\partial p} \right)_H = -\frac{1}{C_p} \left(T \left(\frac{\partial p}{\partial T} \right)_V \left(\frac{\partial p}{\partial V} \right)_T^{-1} + V \right).$$

Заміна $(x, y) \rightarrow (u, y)$

$$\left(\frac{\partial F}{\partial x} \right)_y = \left(\frac{\partial F}{\partial u} \right)_y \left(\frac{\partial x}{\partial u} \right)_y^{-1}, \quad \left(\frac{\partial F}{\partial y} \right)_x = \left(\frac{\partial F}{\partial y} \right)_u - \left(\frac{\partial F}{\partial u} \right)_y \left(\frac{\partial x}{\partial y} \right)_u \left(\frac{\partial x}{\partial u} \right)_y^{-1}.$$

$$F^{\text{ideal}} = NT \ln \frac{An}{f(T)}.$$

ван дер Ваальса $p = \frac{nT}{1 - bn} - an^2,$

Дітерічі $p = \frac{nT}{1 - bn} \exp\left(-\frac{an}{T}\right),$

Бергело $p = \frac{nT}{1 - bn} - a \frac{n^2}{T},$

Редліха-Квонга $p = \frac{nT}{1 - bn} - \frac{an^2}{\sqrt{T}(1 + bn)}.$

$$\Gamma(E) = \sum_{\{n\}: E_n \leq E} 1 = \int_{H(p,q) \leq E} d\Gamma, \quad d\Gamma = \frac{dpdq}{(2\pi\hbar)^s},$$

$$g(E) = \sum_{\{n\}: E_n = E} 1 = \int \delta(E - H(p, q)) d\Gamma \equiv \frac{d\Gamma(E)}{dE}.$$

$$N = \sum_i \frac{1}{e^{\frac{\varepsilon_i - \mu}{T}} \pm 1} = \int_0^\infty \frac{g(\varepsilon) d\varepsilon}{e^{\frac{\varepsilon - \mu}{T}} \pm 1},$$

$$E = \sum_i \frac{\varepsilon_i}{e^{\frac{\varepsilon_i - \mu}{T}} \pm 1} = \int_0^\infty \frac{\varepsilon g(\varepsilon) d\varepsilon}{e^{\frac{\varepsilon - \mu}{T}} \pm 1},$$

$$pV = \pm T \sum_i \ln \left(1 \pm e^{-\frac{\varepsilon_i - \mu}{T}} \right) = \int_0^\infty \frac{\Gamma(\varepsilon) d\varepsilon}{e^{\frac{\varepsilon - \mu}{T}} \pm 1}.$$