$$H(q,p) = \frac{1}{2} m\omega^2 q^2 + \frac{1}{2m} p^2$$

$$\epsilon_n = \left(n + \frac{1}{2}\right)\hbar\omega$$

$$Q_1(T) = \frac{k_B T}{\hbar\omega}$$

$$Q_1(T) = \frac{1}{2\sinh\left(\frac{1}{2}\frac{\hbar\omega}{k_B T}\right)}$$

$$Q_N(T) = \left(\frac{k_B T}{\hbar\omega}\right)^N$$

$$Q_N(T) = \left[2\sinh\left(\frac{1}{2}\frac{\hbar\omega}{k_B T}\right)\right]^{-N}$$

$$F = -(k_B T) \ln Q_N(T)$$

$$F = N(k_B T) \cdot \ln\left(\frac{\hbar\omega}{k_B T}\right)$$

$$N(k_B T) \ln\left[2\sinh\left(\frac{1}{2}\frac{\hbar\omega}{k_B T}\right)\right]$$

$$\mu = k_B T \ln\left(\frac{\hbar\omega}{k_B T}\right)$$

$$k_B T \ln\left[2\sinh\left(\frac{1\,\hbar\omega}{2 k_B T}\right)\right]$$

$$P = 0$$

$$0$$

$$S = N k_B \ln\left[\frac{k_B T}{\hbar\omega} + 1\right]$$

$$N k_B\left[\frac{1}{2}\frac{\hbar\omega}{k_B T} \coth \frac{1}{2}\left(\frac{\hbar\omega}{k_B T}\right) - \ln\left[2\sinh\left(\frac{1}{2}\frac{\hbar\omega}{k_B T}\right)\right]\right]$$

$$U = N(k_B T)$$

$$N\left[\frac{1}{2}\hbar\omega + \frac{\hbar\omega}{e^{\frac{\hbar\omega}{k_B T}} - 1}\right]$$

$$C_p = C_V = N k_B$$

$$N k_B \left(\frac{\hbar\omega}{k_B T}\right)^2 \frac{e^{\frac{\hbar\omega}{k_B T}}}{\left(e^{\frac{\hbar\omega}{k_B T}} - 1\right)^2}$$

$$g(E) = \frac{1}{(\hbar\omega)^N} \cdot \frac{E^{N-1}}{(N-1)!}$$

$$\sum_{R=0}^{\infty} \binom{N+R-1}{R} \delta\left(E - \left\{R + \tfrac{1}{2}N\right\}\hbar\omega\right)$$

Mikrokanonikus