Class Notes

Zeroth Law of Thermodynamics:

\[ PV = \text{const} \cdot T \]

First Law - energy is conserved.

Ideal gas - particles are not interacting.

Average pressure:

\[ P = F_{\text{pist}} = \frac{\Delta V}{A \cdot \Delta t} = 2V_x \]

\[ V = L \cdot A = \text{Vol.} \]

\[ PV = nRT \]

\[ \frac{PV}{n} = \frac{mV_x^2}{V} = \frac{mV_x^2}{\text{Vol}} = \text{empirical gas law} \]

\[ N_{\text{Avagadro}} = R = 8.31 \times 10^3 \]

\[ R_0 = 1.38 \times 10^{-23} \text{ J/K} \]

\[ \frac{1}{2} m v^2 = \frac{1}{2} k_B T \]

Equipartition of Energy \[ \rightarrow KE_{\text{total}} = \frac{3}{2} k_B T \]

Thermal Energy of an ideal gas \[ \hat{E} = \frac{N f}{2} \frac{1}{2} k_B T \]

\[ N = \# \text{ of gas molecules} \]

\[ f = \text{d.o.f.} \]

\[ \hat{E} \text{ only dependent on temperature} \]

\[ E = E_0 + 2(r - r_0)^2 \]