Pressure: \[ P = \frac{F}{A} \]

\[ 1 \text{ N/m}^2 = 1 \text{ Pa} \]

\[ 1 \text{ atm} = 1.015 \text{ kg} = 15 \text{ psi} = 760 \text{ Torr} = 1 \text{ bar} \]

**Equipartition theorem**: Every term in the total energy that is proportional to a velocity\(^2\) or a position\(^2\) gets, on average, \( \frac{1}{2} k_B T \) of thermal energy. This applies if:
1. \( k_B T \gg \) quantum level spacing
2. system is in thermal equilibrium

\[ \Rightarrow \text{ For a gas molecule inside a box, } \frac{1}{2} m v_x^2 = \frac{1}{2} k_B T \]

\[ PV = n k_B T \]

**Ideal Gas Law**

**Boltzmann's constant**: \( k_B = 1.38 \times 10^{-23} \text{ J/K} \)

**Avogadro's number**: \( N_A \equiv \# \text{ of molecules needed to make a sample whose weight, } m \text{ grams, equals the molecular weight. } = 6.02 \times 10^{23} \)

\[ \# \text{ of moles} = n = \frac{N}{N_A} \]

\[ PV = nRT \text{ where } R = \frac{N_A k_B}{m} \]

**Heat Capacity**: \[ C = \frac{q}{\Delta T} \]

Heat added to a system

Resulting temperature increase

**Large C**: It takes a lot of heat to raise \( T \) by 1\(^\circ\).

**Absolute Temperature**: \( T \)

The \( T \) in the equipartition theorem \& in the ideal gas law is on the Kelvin scale, for which \( T = 0 \leftrightarrow \text{ absolute zero} \).

\[ T_{\text{Celsius}} = T_{\text{Kelvin}} + 273.15 \]

\[ C \propto m \Rightarrow \frac{c}{m} \]

"specific heat"

is a property of the material.