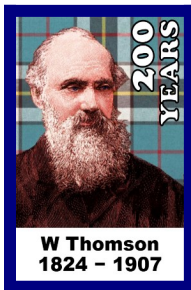


Finding Absolute Zero



From the thermometer invented in 1714, ideal gas behavior was given in Charles's Law by 1787:

$$T_1/V_1 = T_2/V_2$$

The Ideal Gas Law approximates certain gases @ molecular mass (m), temperature (T_i), volume (V_i) w/restrictions:

a) average Kinetic Energy $\equiv \langle \frac{1}{2}mv^2 \rangle \propto T$.

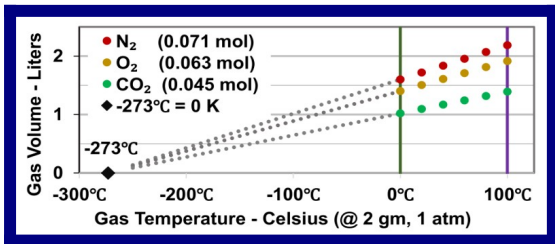
b) point particles w/no interactions.

c) constant motion w/elastic collisions.

In 1848, William Thomson (Lord Kelvin) proposed an Absolute Zero (0 K) @ -273°C extrapolated from near ideal gas data between 0°C & 100°C .

At Absolute Zero, particle thermal kinetic energy stops. A "Zero-Point Energy" of random quantum motion remains:

$$\Delta x_i \Delta p_i = \frac{1}{2} \hbar \quad \& \quad \Delta E \Delta t = \frac{1}{2} \hbar$$



local	add \diamond \diamond subtract	absolute
Celsius ($^\circ\text{C}$)	± 273.15	Kelvin (K)
Fahrenheit ($^\circ\text{F}$)	± 459.67	Rankine (R)