

Physics 9B Fall 2013 - Discussion #5

1. Suppose a refrigerated bottle of water at 5.00°C is opened, then closed, then left in a hot car with an internal temperature of 75.0°C . Neglecting thermal expansion of the water and bottle, what is the pressure in the air pocket trapped in the bottle?
2. Two moles of Xenon (molar mass 131.3 g/mol) are placed in a container whose volume is $8.5 \times 10^{-3}\text{ m}^3$. The absolute pressure of the gas is $4.5 \times 10^5\text{ Pa}$. (a) What is the average translational kinetic energy of a Xenon atom? (b) What is the root-mean-square speed of a Xenon atom?
3. The quantity $f(v) dv$ determines what fraction of ideal gas molecules have speeds between v and $v + dv$, where

$$f(v) = 4\pi \left(\frac{m}{2\pi kT} \right)^{3/2} v^2 e^{-mv^2/2kT}$$

is the Maxwell-Boltzmann distribution. Find the most probable speed, corresponding to where $df/dv = 0$.

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