

Homework 18.

Please think on the following problems:

1. There is a cylinder with a piston filled with hydrogen. Mass of a hydrogen molecule is $3.22 \cdot 10^{-27} \text{ kg}$. At room temperature the molecules move randomly and collide elastically with the cylinder walls and the piston, and the collision time is 10^{-10} s . The velocity of the hydrogen molecules at room temperature is $\sim 1750 \text{ m/s}$. About $\sim 10^{16}$ molecules collide with the piston every second. Estimate the average force applied to the piston.
2. Each of two cylinders contain 1 mole of gas. Pressure in one cylinder is 4,000Pa, pressure in the other 6,000Pa. Find the pressure which will be established if we connect the cylinders with a narrow tube (neglect the volume of the tube). The temperature of both cylinders is the same and is maintained constant.
3. After we let a certain amount of gas out of the cylinder, the pressure in the cylinder dropped by 40% and the temperature – by 20%. Find the fraction of the initial gas mass which was lost.³