

Answer on Question #44263-Physics-Molecular Physics-Thermodynamics

The pressure exerted by gas is P . If the mass of molecule becomes half and velocity becomes double then pressure will become

Solution

The equation of state is

$$P = nkT,$$

where k is the Boltzmann's constant, n is the concentration of molecules, T is temperature.

We know that

$$T \sim \frac{mv^2}{2}.$$

So

$$P \sim mv^2.$$

If the mass of molecule becomes half and velocity becomes double then pressure will become

$$P' = P \frac{\left(\frac{m}{2}\right)(2v)^2}{mv^2} = P \frac{\left(\frac{m}{2}\right)4v^2}{mv^2} = 2P.$$

Answer: $2P$.