Answer on Question #42743, Physics, Molecular Physics — Thermodynamics

At room temperature the rms speed of the molecules of a certain diatomic gas is found to be 1920 m/s.The gas is (1) H2 (2)F2 (3) Cl2 (4) O2

Solution

Let is find the mass of molecula of this gas

$$v_{rms} = \sqrt{\frac{3kT}{m}}$$

$$m = \frac{3kT}{v_{rms}^2}$$

where $T = 293K$ is room temperature, $k = 1.38 \cdot 10^{-23} J \cdot K^{-1}$ is Boltzmann constant.

$$m = \frac{3 \cdot 1.38 \cdot 10^{-23} \cdot 293}{1920^2} \approx 3.29 \cdot 10^{-27}\, kg \approx 2u$$

This corresponds to molecula of H_2.