Answer on Question 74849, Physics, Molecular Physics, Thermodynamics

Question:

Using the Laplace formula, calculate the velocity of sound for air. Given $\gamma = 1.4$, $\rho = 1.29\ kgm^{-3}$ and $P = 1.01 \cdot 10^5\ Nm^{-2}$.

Solution:

The velocity of sound for air can be found from the Laplace formula:

$$v = \sqrt{\frac{\gamma P}{\rho}},$$

here, γ is the adiabatic index, ρ is the density of air and P is the pressure.

Then, we get:

$$v = \sqrt{\frac{\gamma P}{\rho}} = \sqrt{\frac{1.4 \cdot 1.01 \cdot 10^5\ \frac{N}{m^2}}{1.29\ \frac{kg}{m^3}}} = 331\ \frac{m}{s}.$$

Answer:

$v = 331\ \frac{m}{s}$.