

Q- At some place the temperature of air is 20 degrees C and the pressure is 1.021×10^5 Pa. Calculate the density of air.

Considering air as an ideal gas the ideal gas law can be written as

$$PV = \frac{m}{M} RT$$

Here P is the pressure, V is volume, T is absolute temperature, m is the mass of the gas, M is its molecular mass and R is universal gas constant.

Thus the density of the gas is given by

$$\rho = \frac{m}{V} = \frac{PM}{RT}$$

Now the molecular mass of air is 29 kg/kmol, and the universal gas constant R = 8314 J/kmol, we get

$$\rho = \frac{PM}{RT} = \frac{1.012 \times 10^5 \times 29}{8314 \times (20 + 273)} = 1.205 \text{ kg/m}^3$$