Question #78265, Engineering / Chemical Engineering

Evaluate the volume occupied by 7.000 kg of air at a gage ressure of 623 kPa and a temperature of 686 C. Calculate air density undet the same conditions.

Solution

Considering air ideal gas.

$$pV = nRT \Leftrightarrow V = \frac{nRT}{p},$$

where p is pressure, in Pa;

R is gas constant; R = 8.31 J/MK;

T is the absolute temperature, in K;

n is the number of moles; $n = \frac{m}{M}$ (m is mass, M is molar mass; M = 28.9647 g/mol)

$$V = \frac{mRT}{Mp} = \frac{7.000 \times 8.31 \times (686 + 273)}{28.9647 \times 10^{-3} \times 623 \times 10^{3}} = 3.09 \text{ m}^3$$

Answer: 3.09 m^3.