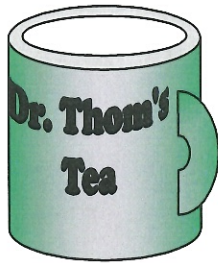


EXAMPLE

A tea mug, the volume of which is $V = 3.48 \times 10^{-4} \text{ m}^3$, sits empty on Dr. Tom's desk. His office is at 25°C and 101.325 kPa . If air is an ideal gas with $M = 28.97$,

- a) find the density of air in Dr. Tom's office.
- b) Find the mass of air filling the tea mug. How many air molecules is this?



2) BEST FORM of I.G. EQN IS

$$P = \rho R T$$

$$\rho = \frac{P}{RT}$$

$$R = \frac{R_u}{M} = \frac{8.314 \frac{\text{kJ}}{\text{kmol} \cdot \text{K}}}{28.97 \frac{\text{kg}}{\text{kmol}}}$$

$$\rho = \frac{101.325 \text{ kPa}}{\left(\frac{8.314 \text{ kJ}}{\text{kg} \cdot \text{K}} \right) \cdot [25 + 273] \text{ K}}$$

(Handwritten notes: kJ, kPa-m³, 60)

$$\rho = \boxed{1.185 \text{ kg/m}^3}$$

$$m_{\text{air}} = \rho_{\text{air}} V_{\text{mug}}$$

$$= 1.185 \frac{\text{kg}}{\text{m}^3} \cdot 3.48 \times 10^{-4} \text{ m}^3 = \boxed{4.123 \times 10^{-4} \text{ kg}}$$

$$m = nM$$

$$n = \frac{m}{M} = \frac{4.123 \times 10^{-4} \text{ kg}}{28.97 \frac{\text{kg}}{\text{kmol}}} = 1.42 \times 10^5 \text{ kmol}$$

$$\# = n \cdot 6.022 \times 10^{23} \text{ particles} = \boxed{8.57 \times 10^{21} \text{ particles}}$$

(Handwritten note: kmol)