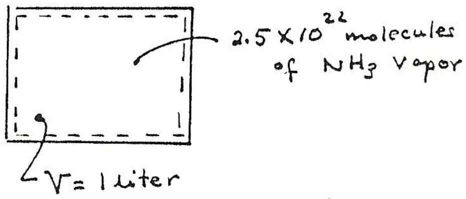
## PROBLEM 1.22




(a) From Sec. 1.5, the number of molecules in a gram mole (mol) is $6.022 \times 10^{23}$ (Avogadro's number).

Thus $$n = \frac{2.5 \times 10^{22} \text{ molecules}}{6.022 \times 10^{23} \text{ molecules/mol}} = 4.15 \times 10^{-2} \text{ mols}$$

Converting to kmol,

$$n = 4.15 \times 10^{-2} \text{ mol} \left| \frac{1 \text{ kmol}}{10^3 \text{ mol}} \right| = 4.15 \times 10^{-5} \text{ kmol}$$

Using Eq. 1.8, $m = nM$, so

$$m = 4.15 \times 10^{-5} \text{ kmol} \left( \underbrace{17.03 \frac{\text{kg}}{\text{kmol}}}_{\text{Table A-1}} \right) = 7.07 \times 10^{-4} \text{ kg}$$

Then

$$v = \frac{V}{m} = \frac{(1 \text{ liter})}{7.07 \times 10^{-4} \text{ kg}} \left| \frac{10^{-3} \text{ m}^3}{1 \text{ liter}} \right| = 1.41 \frac{\text{m}^3}{\text{kg}}$$

$$\bar{v} = \frac{V}{n} = \frac{10^{-3} \text{ m}^3}{4.15 \times 10^{-5} \text{ kmol}} = 24.1 \frac{\text{m}^3}{\text{kmol}}$$