74. (a) When $n = 1$, $V = V_m = RT/p$, where V_m is the molar volume of the gas. So

$$V_m = \frac{RT}{p} = \frac{(8.31\,\text{J/mol}\cdot\text{K})(273.15\,\text{K})}{1.01\times10^5\,\text{Pa}} = 22.5\ \text{L}\ .$$

(b) We use $v_{\text{rms}} = \sqrt{3RT/M}$. The ratio is given by

$$\frac{v_{\text{rms,He}}}{v_{\text{rms,Ne}}} = \sqrt{\frac{M_{\text{Ne}}}{M_{\text{He}}}} = \sqrt{\frac{20\,\text{g}}{4.0\,\text{g}}} = 2.25\ .$$

(c) We use $\lambda_{\text{He}} = (\sqrt{2}\pi d^2 N/V)^{-1}$, where the number of particles per unit volume is given by $N/V = N_A n/V = N_A p/RT = p/kT$. So

$$\begin{aligned}\lambda_{\text{He}} &= \frac{1}{\sqrt{2}\pi d^2(p/kT)} = \frac{kT}{\sqrt{2}\pi d^2 p}\\ &= \frac{(1.38\times10^{-23}\,\text{J/K})(273.15\,\text{K})}{1.414\pi(1\times10^{-10}\,\text{m})^2(1.01\times10^5\,\text{Pa})} = 0.84\,\mu\text{m}\ .\end{aligned}$$

(d) $\lambda_{\text{Ne}} = \lambda_{\text{He}} = 0.84\,\mu\text{m}$.