**13.17** Two molecules of a gas have speeds of $9 \times 10^6 \, \text{m s}^{-1}$ and $1 \times 10^6 \, \text{m s}^{-1}$, respectively. What is the root mean square speed of these molecules.

$$V_{rms} = \sqrt{\frac{V_1^2 + V_2^2 + \cdots V_n^2}{n}}$$

Here, $V_1 = 9 \times 10^6 \, m/s$, $V_2 = 1 \times 10^6 \, m/s$, $n = 2$

$$\therefore V_{rms} = \sqrt{\frac{(9 \times 10^6)^2 + (10^6)^2}{2}}$$

$$= \sqrt{\frac{10^{12}(81 + 1)}{2}}$$

$$= 10^6 \sqrt{41}$$

$$\boxed{V_{rms} = 10^6 \times 6.4 \, m/s}$$