2

- The average speed of a gaseous neon atom at 300 K is 609 m s^{-1}. What is the average speed of a helium atom at the same temperature?

As $E_{kinetic} = ½ mv^2$:

$E_{kinetic}$ (helium) = ½ $m_{He}v_{He}^2$

$E_{kinetic}$ (neon) = ½ $m_{Ne}v_{Ne}^2$

The average kinetic energy of each gas is the same, at the same temperature, in the ideal gas model:

$½ m_{He}v_{He}^2 = ½ m_{Ne}v_{Ne}^2$

$v_{He}^2 = (m_{Ne} / m_{He}) \times v_{Ne}^2$

The ratio of the atomic masses is the same as the ratio of the molar masses and so:

$v_{He}^2 = (20.18 / 4.003) \times (609 \text{ m s}^{-1})^2$

$v_{He} = 1370 \text{ m s}^{-1}$

Answer: **1370 m s^{-1}**