

19. According to kinetic theory, the rms speed is

$$v_{\text{rms}} = \sqrt{\frac{3RT}{M}}$$

where T is the temperature and M is the molar mass. See Eq. 20-34. According to Table 20-1, the molar mass of molecular hydrogen is $2.02 \text{ g/mol} = 2.02 \times 10^{-3} \text{ kg/mol}$, so

$$v_{\text{rms}} = \sqrt{\frac{3 (8.31 \text{ J/mol}\cdot\text{K}) (2.7 \text{ K})}{2.02 \times 10^{-3} \text{ kg/mol}}} = 180 \text{ m/s} .$$