Solution

The position of an electron in the lowest-energy state of a hydrogen atom; is known to an accuracy of about $\Delta x = 0.05$ nm (the radius of the atom). What is the minimum range of momentum measurements? Velocity?

$\Delta x \Delta p \geq \hbar$ Heisenberg's Uncertainty Principle

$$\Delta p \geq \hbar / \Delta x \qquad\qquad \hbar = h / 2\pi$$

$$= 2.1 \times 10^{-24} \, \text{J} \cdot \text{s/m}$$

$$= \boxed{2.1 \times 10^{-24} \, \text{kg} \cdot \text{m/s}}$$

$$\Delta v = \Delta p / m_e \qquad\qquad m_e = 9.1 \times 10^{-31} \text{kg}$$

$$= \boxed{2.3 \times 10^{6} \text{m/s}}$$