

51222, Physics, Other

Question The position and momentum of 1 keV electron are simultaneously measured. If the uncertainty in its position is 1Å, calculate the uncertainty in its momentum. Mass of electron = $9.1 \cdot 10^{-31}$ kg ?

Solution Uncertainty principle tells us

$$\delta x \cdot \delta p_x \geq \frac{\hbar}{2}$$

where $\hbar \approx 1.05 \cdot 10^{-34} \text{ J} \cdot \text{s}$ Hence, knowing δx we can find δp_x :

$$\delta p_x = \frac{\hbar}{2\delta x} = \frac{1.05 \cdot 10^{-34}}{2 \cdot 10^{-10}} \approx 5 \cdot 10^{-23} \text{ m} \cdot \text{s}$$

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