An electron exists within a region of 10^ -10 m, find its momentum uncertainty and approximate K.E..??

Uncertainty principle:

$$\Delta p \Delta x \geq \frac{h}{2\pi}$$

$\Delta p \ and \ \Delta x$ - momentum uncertainty and position uncertainty

h - Planck constant

Therefore:

$$\Delta p \approx \frac{h}{2\pi \, \Delta x} = 6.63 \frac{10^{-34} J \, s}{2\pi \, 10^{-10} \, m} = 1{,}1 \, 10^{-24} \, kg \frac{m}{s}$$

approximate K.E. equals:

$$T = \frac{\Delta p^2}{2m_e} = \frac{\left(1{,}1 \, 10^{-24} \, kg \frac{m}{s}\right)^2}{2 * 9.1 \, 10^{-31} \, kg} = 6.1 \, 10^{-19} \, J$$

m_e – electron mass

Answer: momentum uncertainty $= 1{,}1 \, 10^{-24} \, kg \frac{m}{s}$, kinetic energy $= 6.1 \, 10^{-19} \, J$