

# NCERT/CBSE CHEMISTRY CLASS 11 textbook

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## CHAPTER TWO

### STRUCTURE OF ATOM

2.61 If the position of the electron is measured within an accuracy of  $\pm 0.002$  nm, calculate the uncertainty in the momentum of the electron. Suppose the momentum of the electron is  $\frac{h}{4\pi m \times 0.05 \text{ nm}}$ , is there any problem in defining this value.

**2.61Solution:**

Uncertainty in position of electron,  $\Delta x = \pm 0.002$  nm

Using heisenberg's uncertainty principle,

$$\Delta x \Delta p = \frac{h}{4\pi}$$

$$\Rightarrow \Delta p = \frac{h}{4\pi \Delta x} = \frac{6.6 \times 10^{-34}}{4 \times 3.1416 \times 0.002 \times 10^{-9}} = 2.63 \times 10^{-23}$$

If momentum is taken as  $\frac{h}{4\pi} \times 0.05 \times 10^{-9}$ , we have  $p < \Delta p$ . Thus this value of momentum is not valid.

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