Structure of Atom IV

Mainly about Bohr's Model of Atom

- $e^{\ominus}$ revolves around nucleus in circular path called orbits.
- $e^{\ominus}$ moving in an orbit is quantized
- $P = \frac{nh}{2\pi}$, angular momentum is the integral multiple of $\frac{h}{2\pi}$.

* Ionization Energy $= k \times \frac{Z^2}{n^2}$ eV/atom.

* Hydrogen Spectrum :

Lymen	Balmer	Paschen	Brackett	Pfund	- -
UV	Visible	⟵ Infrared		⟶	

* De-broglie hypothesis $\Rightarrow$ $\lambda = \frac{h}{p} = \frac{h}{mv}$

Also, $\lambda = \frac{h}{\sqrt{2mE}} = \frac{h}{\sqrt{2mqV}}$

* Bohr's model is applicable only for H and H like species i.e single electron system and not for multi-electronic species.

* Bohr's model cannot explain why momentum is integral multiple of $\frac{h}{2\pi}$.

Short Problems:

- Calculate de broglie wavelength of an $e^{\ominus}$ moving with velocity 10^6 m/s.

Sol. $\lambda = \frac{h}{p} = \frac{h}{mv} = \frac{6.6 \times 10^{-34}}{9.1 \times 10^{-31} \times 10^6} = 0.71\ \text{Å}$.

Heisenberg Uncertainity (Main important topic)

which essentialy says $\Delta x \cdot \Delta p \geq \frac{h}{4\pi}$.

Q) If uncertainity in the position is 0.33 pm. what will be uncertainity in velocity of $e^{\ominus}$

soln. Consider $\Delta x \cdot \Delta p = \frac{h}{4\pi}$

i.e $\Delta x \cdot m \cdot \Delta v = \frac{h}{4\pi}$.

$0.33 \times 10^{-12} \times 9.1 \times 10^{-31} \times \Delta v = \frac{h}{4\pi} = \frac{6.6 \times 10^{-34}}{4 \times 3.14}$

$\Delta v = 1.78 \times 10^8$ m/s.