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42 e^- p α

$$\lambda = \frac{h}{\sqrt{2\, m \cdot KE}}$$

$$m_{proton} = 1840\, m_e$$

$$m_\alpha = 4\, m_{proton}$$

40

-13.6

Li^{2+}

13.6×9

45
47
48

$$\lambda = \sqrt{\frac{150}{13.6 \times 8}}$$

$$KE = 13.6 \times 8 \text{ eV}$$

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37 $\phi = 40\ eV$

22 volt

$KE_{max} = \underline{22\ eV}$

$KE_{max} = 22 = h\nu - 40$

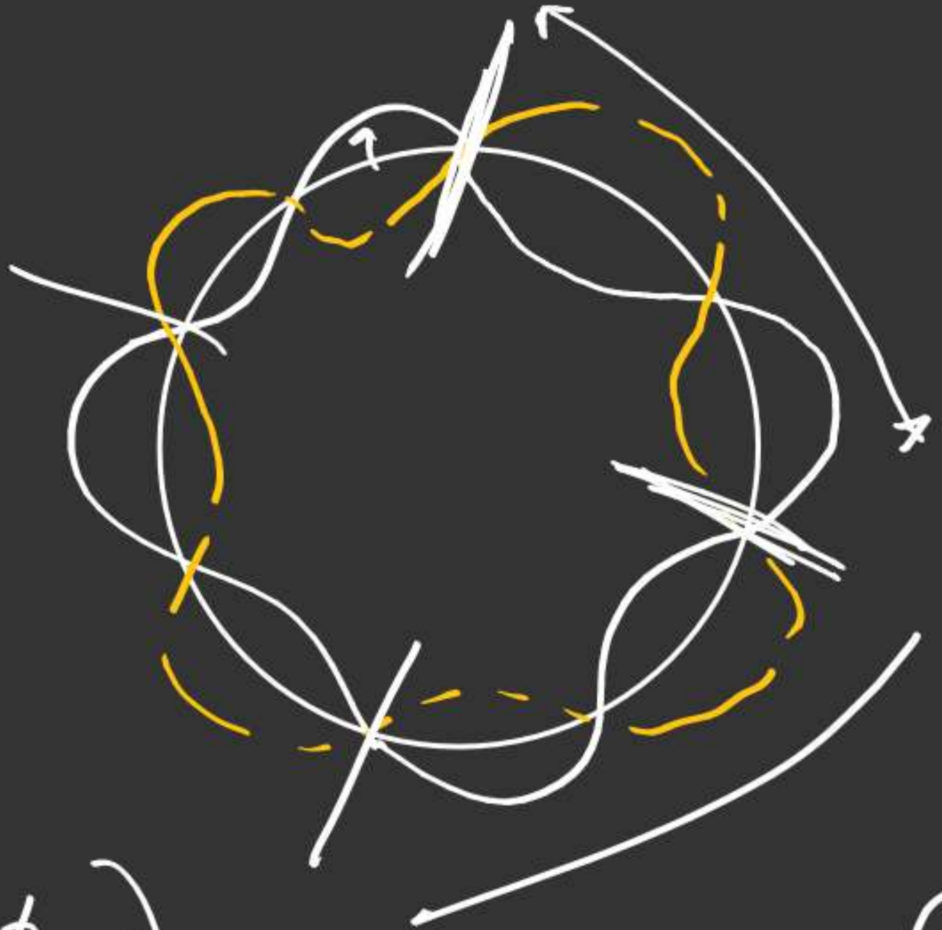
$\underline{62 = h\nu}$

Standing wave

$$\boxed{2\pi r = n\lambda}$$

$$2\pi\left(0.529\,\frac{n^{\cancel{2}}}{Z}\,A^\circ\right) = \cancel{n}\,\lambda$$

$$\boxed{\lambda = 2\pi\left(0.529\,\frac{n}{Z}\right)A^\circ}$$



$$\boxed{2\pi r = n\lambda}$$

$$2\pi r = n\,\frac{h}{mv}$$

$$\boxed{mvr = n\,\frac{h}{2\pi}}$$

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Heisenberg uncertainity principle :→

→ It is impossible to determine the exact position and momentum of a microscopic particle (like e^-), simultaneously.

$$\underbrace{\Delta x}_{\text{error or uncertainity in position}} \cdot \underbrace{\Delta P}_{\text{error in momentum}} \geq \frac{h}{4\pi}$$

$$\hbar = \frac{h}{2\pi}$$

for minimum error

$$\Delta x \cdot \Delta P = \frac{h}{4\pi}$$

$$dx \cdot dP = \frac{h}{4\pi}$$

$$dx \cdot \underbrace{dV}_{\text{error in Speed}} = \frac{h}{4\pi m}$$

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Q. Calculate minimum error in velocity, if error in position is $\pm 1\ A^\circ$ for an e^-.

$$\Delta x \cdot \Delta V = \frac{h}{4\pi m}$$

$$10^{-10} \cdot \Delta V = \frac{6.62 \times 10^{-34}}{4 \times \pi \times 9.1 \times 10^{-31}}$$

$$\Delta V = \frac{6.62}{4\pi \times 9.1} \times 10^{7}$$

Q. Calculate ΔV if $\Delta x = 1\,cm$ for a particle having mass $= 100\,gm$.

$x \times 10^{-y}$

$$10^{-2} \times \Delta V = \frac{6.62 \times 10^{-34}}{4\pi \times 0.1}$$

$$\Delta V = \frac{6.62}{4\pi} \times 10^{-31}$$

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$$dx \cdot dp = \frac{h}{4\pi}$$

$$\left[\begin{array}{l} p = mv \\ dp = m\,dv \end{array}\right]$$

$$dx \cdot dv = \frac{h}{4\pi m}$$

$$\left[\frac{1}{2}mv^2 = E\right]$$

$$\underline{dx}\left(\frac{h}{\lambda^2}d\lambda\right) = \frac{h}{4\pi}$$

error in

de broglie wavelength

$$p = \frac{h}{\lambda}$$

$$dp = -\frac{h}{\lambda^2}d\lambda$$

$$\lambda = \frac{h}{mv} = \frac{h}{p}$$

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Schrodinger eq^n :→

→ He considered the dual nature of particles.

→ The wave associated with an $\bar{e}$ is considered to be a standing wave.

$$\left[\frac{\partial^2\psi}{\partial x^2} + \frac{\partial^2\psi}{\partial y^2} + \frac{\partial^2\psi}{\partial z^2} + \frac{8\pi^2 m(E-V)}{h^2}\psi = 0\right.$$

ψ = Psi = amplitude of wave or wave function

E = Total Energy

V = Potential energy

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$$\frac{\partial}{\partial x} + \frac{\partial}{\partial y} + \frac{\partial}{\partial z} = \nabla = \text{nabla operator}$$

$$\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} + \frac{\partial^2}{\partial z^2} = \nabla^2 = \text{Laplacian operator}$$

$$\frac{\partial^2 \psi}{\partial x^2} + \frac{\partial^2 \psi}{\partial y^2} + \frac{\partial^2 \psi}{\partial z^2} = \nabla^2 \psi$$

$$\nabla^2 \psi + \frac{8\pi^2 m (E-V)}{h^2}\psi = 0$$

$$(E-V)\psi = -\frac{h^2}{8\pi^2 m}\nabla^2 \psi$$

$$E\psi = -\frac{h^2}{8\pi^2 m}\nabla^2 \psi + V\psi$$

$$E\psi = \left(-\frac{h^2}{8\pi^2 m}\nabla^2 + V\right)\psi$$

$$\boxed{E\psi = H\psi}$$

Hamiltonian operator

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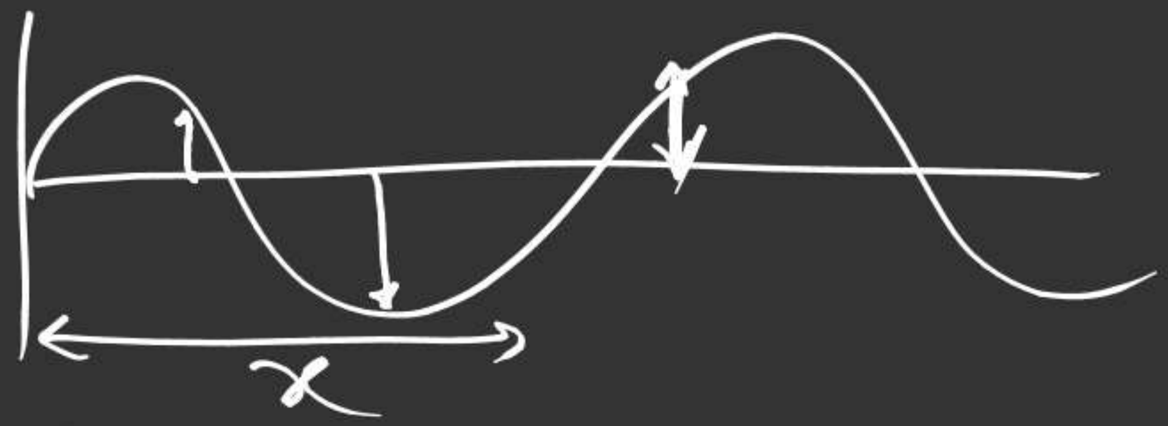

$$\frac{\partial^2 y}{\partial t^2} = \frac{1}{u^2}\frac{\partial^2 y}{d x^2}$$

$$y = A \sin(\omega t - kx)$$

displacement

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0-I 45 — 54

S-I 41 — 53