

Cpt 9 Wave properties of Particle

2023年3月20日 星期一 下午1:32

Wave properties of Particle

e^- is a particle bt. can behave as wave

Wave-Particle Duality — 2 properties which are wave property & particle property

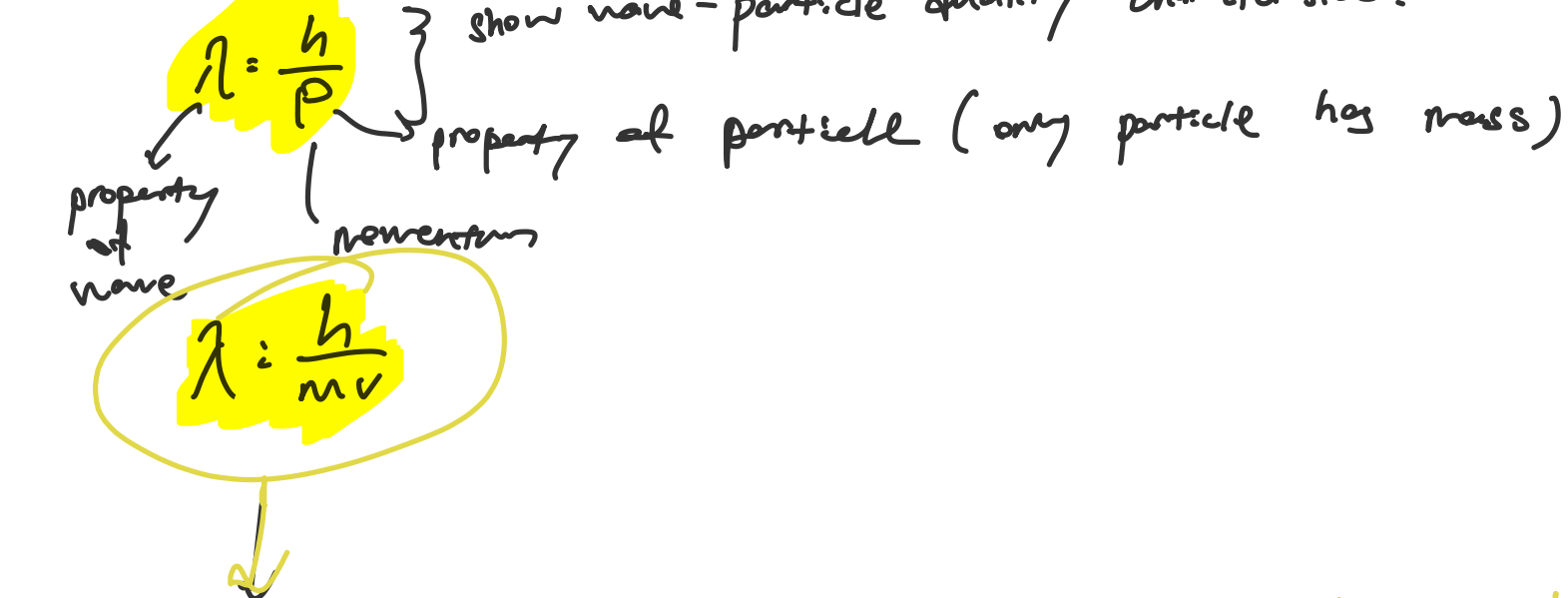
continuous energy something u can see

= phenomenon where under certain condition there is wave, under other condition, there is particle, 2 properties cant exist simultaneously

= both properties for differ condition

de Broglie wavelength

show wave-particle duality characteristic.



This formula can be used in any object (include electron, photon, light)

Energy of photon → only for light

$E = hf$ → Planck's quantum theory.

$$= \frac{hc}{\lambda}$$

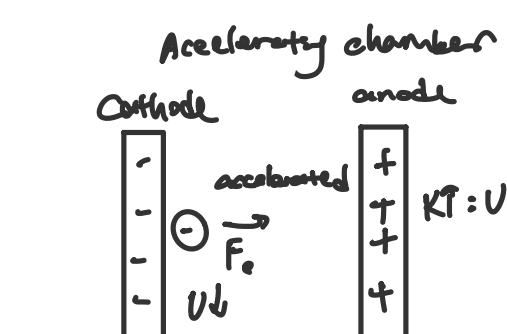
Photon $h\nu$ energy

light particle

Electron Diffraction

Davieson - Germer Experiment

↳ try to prove that e^- also show wave property & e^- exhibit diffraction pattern.



$$eV = K$$

$$eV = \frac{1}{2}mv^2$$

K.E. of electron → only for e^-

$$K.E. \quad E = \frac{1}{2}mv^2$$

$$K = \frac{1}{2}mv^2 \quad (p = mv) \quad = \frac{p^2}{2m}$$

$$K = \frac{p^2}{2m}$$

$$K.E. \quad p = \sqrt{2mK} \quad (\lambda = \frac{h}{p})$$

$$\lambda = \frac{h}{\sqrt{2mK}} \quad \left(\begin{array}{l} \Delta U = \Delta K \\ q\Delta V = K \\ eV = K \end{array} \right)$$

$$\lambda = \frac{h}{\sqrt{2meV}}$$

e^- $h\nu$, K.E.

According to de Broglie

$$\lambda \propto \frac{1}{v} \quad \text{velocity}$$

$$\lambda \propto \frac{1}{\sqrt{2meV}} \quad \text{voltage}$$

$$d \sin \theta = n \lambda$$

less diffraction
Rings (Diffraction Pattern)
become narrower

Sharper image
Higher resolution