

De-Broglie theory of Matter wave.

De-Broglie theory of matter wave → The essential properties of a wave is that it can undergo diffraction. According to classical physics, this property of diffraction is not shown by 'particles'. However, direct evidence of the existence of de-broglie waves associated with moving micro-particles has been furnished by experiments on electron-diffraction.

Theory → A free electron starting from rest, on being accelerated through a potential difference  $V$  acquires a kinetic energy given by  $\frac{1}{2} m_0 v^2 = eV$

Where  $m_0$ ,  $e$  and  $v$  are the rest mass, charge and velocity of the electron respectively

$$v = \sqrt{\frac{2Ve}{m_0}}$$

The de-broglie wavelength associated with the electron (moving non relativistically) is given by

$$\lambda = \frac{h}{m_0 v} = \frac{h}{\sqrt{2Ve m_0}}$$

in SI units  $\lambda = \frac{6.62 \times 10^{-34}}{\sqrt{2 \times 1.6 \times 10^{-19} \times 9.1 \times 10^{-31}}}$