

Prediction & derivation of de Broglie's Theory

DE BROGLIE'S THEORY

Plank's quantum theory:

$$E = h\nu \text{ ----- (i)}$$

Einstein's relativity theory:

$$E = mc^2 \text{ ----- (ii)}$$

$$\text{c) } \times \text{ (ii)} \quad mc^2 = h\nu$$

or momentum,  $p$  of photon (ie.  $p = mc$ )

$$p = mc = \frac{h\nu}{c}$$

$$c = \nu \lambda \text{ or } \frac{\nu}{c} = \frac{1}{\lambda}$$

$$\text{Thus: } mc = \frac{h}{\lambda} = p \text{ ----- (iii)}$$

According to De Broglie's theory

Any particle of mass,  $m$  and velocity,  $v$   
is related to wavelength,  $\lambda$ .

$$mv = \frac{h}{\lambda} \quad \text{or} \quad p = \frac{h}{\lambda} \quad \text{or} \quad \lambda = \frac{h}{mv}$$

\* De Broglie's theory predicted that electrons  
are wave-like.