Constants and Formulas

You can detach this page if you want. There is more on the other side.

$c = 3\times10^8$m/s $e = 1.6\times10^{-19}$C $h = 6.6\times10^{-34}$ Js $\hbar = 1.0\times10^{-34}$Js $m_e = 9.1\times10^{-31}$kg

$$\gamma = \frac{1}{\sqrt{1-\frac{v^2}{c^2}}}$$

$$\begin{aligned} \tilde{x} &= \gamma(x - vt) \\ \tilde{t} &= \gamma(t - (v/c^2)x) \end{aligned}$$

$$s^2 = (c\Delta t)^2 - (\Delta x)^2$$

$$\tilde{u} = \frac{u - v}{1 - uv/c^2}$$

$$E = \gamma(u)mc^2$$

$$\vec{p} = \gamma(u)m\vec{u}$$

$$\gamma(u) = \frac{1}{\sqrt{1 - |\vec{u}|^2/c^2}}$$

$$E^2 = (pc)^2 + (mc^2)^2$$

$$\begin{aligned} \tilde{E} &= \gamma(E - vp) \\ \tilde{p} &= \gamma(p - (v/c^2)E) \end{aligned}$$

$$\lambda_{OBS} = \gamma\left(1 - \frac{v}{c}\cos\theta\right)\lambda$$

$$E = hf \quad c = \lambda f \quad E = cp \quad \text{photons}$$

$$\lambda = h/p \quad E = hf \quad E = \frac{p^2}{2m} \quad \text{de Broglie}$$

$$\lambda' - \lambda = \frac{h}{m_e c}(1 - \cos\theta)$$

$$K_{max} = hf - W$$

$$e^{i\theta} = \cos\theta + i\sin\theta$$
$$\text{magnitude}(a+ib) = \sqrt{a^2+b^2}$$
$$\text{if } a+ib = re^{i\theta} \text{ then } a = r\cos\theta \text{ and } b = r\sin\theta$$

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

f

$$\Psi(x) \ = \ \frac{1}{\sqrt{h}}\int \ \tilde{\Psi}(p)\ e^{ipx/\hbar}\ dp$$

$$\tilde{\Psi}(p) \ = \ \frac{1}{\sqrt{h}}\int \ \Psi(x)\ e^{-ipx/\hbar}\ dx$$

$$\langle x\rangle \ = \ \int \ x\ P(x)\ dx = \ \int \ x\ |\Psi(x)|^2\ dx$$

$$(\Delta x)^2 \ = \ \int \ (x-\langle x\rangle)^2|\Psi(x)|^2\ dx$$

$$\langle p\rangle \ = \ \int \ p\ |\tilde{\Psi}(p)|^2\ dp$$

$$(\Delta p)^2 \ = \ \int \ (p-\langle p\rangle)^2|\tilde{\Psi}(p)|^2\ dp$$

$$\Delta x\ \Delta p \ \geq \ \hbar/2$$

$$i\hbar\frac{\partial}{\partial t}\Psi(x,t) \ = \ -\frac{\hbar^2}{2m}\frac{\partial^2}{\partial x^2}\Psi(x,t) \ + \ V(x)\Psi(x,t)$$

$$\text{stationary state} = e^{-iEt/\hbar}\psi_E(x)$$

$$-\frac{\hbar^2}{2m}\frac{\partial^2}{\partial x^2}\Psi(x,t) \ + \ V(x)\psi_E(x) \ = \ E\psi_E(x)$$

$$E(n) = -\frac{13.60\text{eV}}{n^2}$$

$$\eta = \frac{\hbar}{\sqrt{2m(U-E)}}$$

$$P_{\text{tunneling}} = e^{-2d/\eta}$$