Constants and Formulas

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$c = 3 \times 10^8 m/s \qquad e = 1.6 \times 10^{-19} C \qquad h = 6.6 \times 10^{-34} Js \qquad m_e = 9.1 \times 10^{-31} kg$

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

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

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

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

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

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

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

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

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

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

$$E = hf \qquad c = \lambda f \qquad E = cp$$

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

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

$$e^{i\theta} = \cos\theta + i\sin\theta$$

$$\text{magnitude}(a + ib) = \sqrt{a^2 + b^2}$$

$$\text{if } a + ib = re^{i\theta} \text{ then } a = r\cos\theta \text{ and } b = r\sin\theta$$