

$$v < 0.1c \quad t' = t \quad u = v_{S'} - v_S \quad x' = x - ut \quad v'_x = v_x - u \quad a'_x = a_x$$

$$y' = y \quad v'_y = v_y \quad a'_y = a_y \quad \text{K.E} = \frac{1}{2}mv^2 \quad \rho = mv$$

$$v \geq 0.1c \quad \gamma = \frac{1}{\sqrt{1 - (u/c)^2}} > 1 \quad t = \gamma(t - \frac{ux}{c^2})$$

$$x' = \gamma(x - ut) \quad v'_x = \frac{v_x - u}{1 - \frac{v_x u}{c^2}} \quad y' = y \quad v'_y = \frac{v_y \sqrt{1 - (u/c)^2}}{1 - \frac{v_x u}{c^2}}$$

$$t_o = t_p \gamma \quad \Delta t_S = 0 \rightarrow \Delta t_{S'} \neq 0, \quad \Delta t_{S'} = 0 \rightarrow \Delta t_S \neq 0 \quad \gamma L_o = L_p //, \quad L_o = L \perp$$

$$\beta = v/c \quad \lambda = \lambda_o \sqrt{\frac{1 \pm \beta}{1 \mp \beta}} \quad f_o = f \sqrt{\frac{1 \pm \beta}{1 \mp \beta}} \quad \frac{v}{c} = \frac{\lambda_o^2 - \lambda^2}{\lambda_o^2 + \lambda^2} = \frac{f^2 - f_o^2}{f^2 + f_o^2}$$

$$m = m_o \gamma \quad E_t = mc^2 = \gamma m_o c^2 = E_o + \text{K.E} = m_o c^2 + \text{K.E} \quad \text{K.E} = (\gamma - 1)m_o c^2$$

$$\rho = \gamma m_o v \quad \rho^2 c^2 = E_t^2 - E_o^2 = E_t^2 - m_o^2 c^4 \quad \rho = \frac{1}{c} \sqrt{E_t^2 - E_o^2}$$

$$P = \sigma A T^4 \quad \sigma = 5.6 \times 10^{-8} \quad \lambda_{\max} T = 2.8 \times 10^{-3} \text{mK} \quad ^\circ\text{K} = 273 + ^\circ\text{C}$$

$$c = \lambda f \quad E_{\text{in}} = E_{\text{ph}} = hf = \frac{hc}{\lambda} = W + \text{K.E} = W + eV \quad W = hf_c = \frac{hc}{\lambda_c}$$

$$\text{K.E} = \frac{1}{2}mv^2 = eV_R \quad \text{K.E}_{\max} = \frac{1}{2}mv_{\max}^2 = eV_S \quad v_{\max} = \sqrt{\frac{2\text{K.E}_{\max}}{m}} = \sqrt{\frac{2eV}{m}}$$

$$\frac{n}{t} = \frac{IA}{h\nu} \quad i = \frac{n}{t} \cdot e = \frac{Q}{t} \quad I = \frac{P}{A} \quad P_{\text{ph}} = \frac{E_{\text{ph}}}{c} = \frac{h}{\lambda} \quad E_n = nhf$$

$$E_i > W, \quad f_i > f_c, \quad \lambda_i < \lambda_c$$

$$c = 3 \times 10^8 \text{ m/s} \quad 1.6 \times 10^{-19} \text{ J} = 1 \text{ eV} \quad h = 6.626 \times 10^{-34} \text{ J} \cdot \text{s}$$

$$e = 1.6 \times 10^{-19} \text{ C} \quad m_e = 9.11 \times 10^{-31} \text{ kg} \quad m_p = 1.67 \times 10^{-27} \text{ kg}$$

$$\text{MeV}/c^2 = 1.79 \times 10^{-30} \text{ kg} \quad \text{MeV}/c = 5.36 \times 10^{-22} \text{ kg} \cdot \text{m/s}$$

$$m_e c^2 = 0.511 \text{ MeV} \quad m_p c^2 = 938 \text{ MeV} \quad m_n c^2 = 939 \text{ MeV}$$