

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

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


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$$v \geq 0.1c \quad \gamma = \frac{1}{\sqrt{1 - (u/c)^2}} > 1 \quad t' = \gamma(t - \frac{ux}{c^2}) \quad x' = \gamma(x - ut)$$

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


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$$t_o = \gamma t_p \quad \text{rate} = \frac{1}{t} \quad L = \frac{L_p}{\gamma} \quad \left| \quad \beta = \frac{v}{c} \quad \lambda_o = \lambda_s \sqrt{\frac{1 \pm \beta}{1 \mp \beta}} \quad f_o = f_s \sqrt{\frac{1 \mp \beta}{1 \pm \beta}} \right.$$


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$$m = m_0 \gamma \quad E_t = mc^2 = \gamma m_0 c^2 = E_0 + \text{K.E} = m_0 c^2 + \text{K.E} \quad \text{K.E} = (\gamma - 1)m_0 c^2$$

$$\rho = \gamma m_0 v \quad \rho^2 c^2 = E_t^2 - E_0^2 = E_t^2 - m_0^2 c^4 \quad \rho = \frac{1}{c} \sqrt{E_t^2 - E_0^2} \quad F = \frac{\delta \rho}{\delta t} = \gamma^3 m_0 a$$

$$v = \frac{pc^2}{E_t} = c \sqrt{1 - (1/\gamma^2)} \quad \gamma = \frac{E_t}{E_o}$$


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$$P = \sigma AT^4 \quad \sigma = 5.6 \times 10^{-8} \quad \lambda_{\max} T = 2.898 \times 10^{-3} \text{mK} \quad ^\circ\text{K} = 273 + ^\circ\text{C}$$


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

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

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

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


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

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

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

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

$$1 \text{ \AA} = 10^{-10} \text{ m} \quad 1 \text{ L.Y} \approx 9.46 \times 10^{15} \text{ m} \quad 1 \text{ Ma} = 343 \text{ m/s}$$