

## Physics Formula Sheet

$$\vec{v}_{av} = \left( \frac{\vec{v}_1 + \vec{v}_2}{2} \right)$$

$$\vec{\Delta d} = \vec{v}_2 \Delta t - \frac{1}{2} \vec{a} \Delta t^2$$

$$\vec{v}_{og} = \vec{v}_{om} + \vec{v}_{mg}$$

$$\vec{F}_{net} = m\vec{a}$$

$$a_c = 4\pi^2 r f^2$$

$$W = \vec{F} \vec{\Delta d}$$

$$W = E_{k2} - E_{k1}$$

$$E_t = E_g + E_k + E_e + \dots$$

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

$$L_f = \frac{E_h}{m}$$

$$W = \vec{F} \cos \theta \vec{\Delta d}$$

$$v'_1 = v_1 \left( \frac{m_1 - m_2}{m_1 + m_2} \right)$$

$$v = \sqrt{\frac{2GM}{r}}$$

$$f = \frac{\# \text{ of cycles}}{\Delta t}$$

$$\frac{n_1}{n_2} = \frac{v_2}{v_1} = \frac{\lambda_2}{\lambda_1}$$

$$x_n = \frac{(n - \frac{1}{2})L\lambda}{d}$$

$$\frac{y_n}{L} = \sin \theta_n$$

$$p = \frac{h}{\lambda}$$

$$E = qI\Delta t$$

$$V_T = V_1 + V_2 + V_3 + \dots + V_n$$

$$P = \frac{V^2}{R}$$

$$\frac{V_p}{V_s} = \frac{N_p}{N_s} + \frac{I_s}{I_p}$$

$$E_e = \frac{kq_1 q_2}{r}$$

$$F_m = BIL \sin \theta$$

$$B = \mu_o \left( \frac{NI}{L} \right)$$

$$E_\gamma = E_f - E_i \text{ (absorption)}$$

$$\frac{B_1}{B_2} = \frac{N_1 I_1 \mu_1 d_2}{N_2 I_2 \mu_2 d_1}$$

$$\beta = 10 \log \left( \frac{I_2}{I_1} \right)$$

$$\Delta L = \frac{\lambda}{2}$$

$$v = \sqrt{\frac{GM}{r}}$$

$$\tan \theta_p = \frac{n_2}{n_1}$$

$$\vec{v}_2 = \vec{v}_1 + \vec{a} \Delta t$$

$$\vec{v}_2^2 = \vec{v}_1^2 + 2\vec{a} \vec{\Delta d}$$

$$F_g = mg$$

$$F_f = \mu F_N$$

$$\frac{F_1}{F_2} = \frac{r_2^2}{r_1^2}$$

$$E_g = mgh$$

$$W = E_{g2} - E_{g1}$$

$$E_\gamma = E_i - E_f \text{ (emission)}$$

$$E = mc^2$$

$$L_v = \frac{E_h}{m}$$

$$\vec{F} \Delta t = \vec{\Delta p}$$

$$v'_2 = v_1 \left( \frac{2m_1}{m_1 + m_2} \right)$$

$$E_t = E_g + E_k$$

$$v = f\lambda$$

$$\frac{1}{f} = \frac{1}{d_i} + \frac{1}{d_o}$$

$$\frac{x_n}{L} = \sin \theta_n$$

$$y_n = \frac{nL\lambda}{w}$$

$$\Delta x = \frac{L\lambda}{2t}$$

$$q = ne$$

$$P = I^2 R$$

$$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_n}$$

$$F_e = \frac{kq_1 q_2}{r^2}$$

$$\epsilon = \frac{V}{d}$$

$$\frac{e}{m} = 1.76 \times 10^{11} \text{ C/kg}$$

$$E_\gamma = hf$$

$$E_\gamma = E_i - E_f \text{ (emission)}$$

$$v_s = 332 + 0.6T$$

$$I = \frac{P}{4\pi r^2}$$

$$L_n = \frac{(2n-1)\lambda}{2}$$

$$C = \frac{R^3}{T^2}$$

$$|PS_1 - PS_2| = \left( n - \frac{1}{2} \right) \lambda$$

$$\vec{\Delta d} = \left( \frac{\vec{v}_1 + \vec{v}_2}{2} \right) \Delta t$$

$$\Delta t = \frac{2v_1 \sin \theta}{g}$$

$$F_g = \frac{Gm_1 m_2}{r^2}$$

$$a_c = \frac{v^2}{r}$$

$$F_e = kx$$

$$E_k = \frac{mv^2}{2}$$

$$P = \frac{W}{\Delta t} = \frac{\Delta E}{\Delta t}$$

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

$$E_h = mc\Delta t$$

$$E_k = \frac{p^2}{2m}$$

$$\text{Eff.} = \frac{\text{Useful Energy Output}}{\text{Energy Input}} \times 100\%$$

$$E_g = \frac{-Gm_1 m_2}{r}$$

$$E_k = E_b = |E_t|$$

$$n_1 \sin \theta_1 = n_2 \sin \theta_2$$

$$M = \frac{h_i}{h_o} = \frac{-d_i}{d_o}$$

$$x_n = \frac{nL\lambda}{d}$$

$$\Delta x = \frac{L\lambda}{d}$$

$$I = \frac{q}{\Delta t}$$

$$V = IR$$

$$I_T = I_1 + I_2 + I_3 + \dots + I_n$$

$$P = VI$$

$$\vec{F}_e = q\vec{e}$$

$$V = \frac{kq}{r}$$

$$\frac{q}{m} = \frac{e}{B^2 r}$$

$$f = \frac{c}{\lambda}$$

$$\lambda = \frac{h}{mv}$$

$$f_2 = f_1 \left( 1 \pm \frac{v_o}{v_s} \right)$$

$$\frac{I_1}{I_2} = \frac{r_2^2}{r_1^2}$$

$$\frac{f_1}{f_2} = \frac{L_2 d_2 \sqrt{T_1} \sqrt{\rho_2}}{L_1 d_1 \sqrt{T_2} \sqrt{\rho_1}}$$

$$F_2 = \frac{\mu_o I_1 I_2 L}{2\pi d}$$

$$|PS_1 - PS_2| = n\lambda$$

$$\vec{\Delta d} = \vec{v}_1 \Delta t + \frac{1}{2} \vec{a} \Delta t^2$$

$$\Delta d_x = \frac{v_1^2 \sin 2\theta}{g}$$

$$T = 2\pi \sqrt{\frac{L}{g}}$$

$$a_c = \frac{4\pi^2 r}{T^2}$$

$$E_e = \frac{1}{2} kx^2$$

$$W = \Delta E$$

$$E_t = E'_t$$

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

$$m_c c_c \Delta t_c = -m_h c_h \Delta t_h$$

$$\vec{p} = m\vec{v}$$

$$\vec{p} = \vec{p}'$$

$$E_t = \frac{1}{2} E_g$$

$$f = \frac{1}{T}$$

$$\sin \theta_c = \frac{n_2}{n_1}$$

$$P = \frac{1}{f}$$

$$y_n = \frac{(n + \frac{1}{2})L\lambda}{w}$$

$$\Delta y = \frac{L\lambda}{w}$$

$$V = \frac{E}{q}$$

$$\frac{R_1}{R_2} = \frac{A_2}{A_1} = \frac{L_1}{L_2}$$

$$R_T = R_1 + R_2 + R_3 + \dots + R_n$$

$$\text{Cost} = \text{Energy} \times \text{Rate}$$

$$\epsilon = \frac{kq}{r^2}$$

$$F_m = qvB \sin \theta$$

$$B = \mu_o \left( \frac{I}{2\pi r} \right)$$

$$E_\gamma = E_k + W$$

$$d_2 = d_1 \left( \frac{n_2}{n_1} \right)$$

$$f_2 = f_1 \left( \frac{v_s}{v_s \pm v_o} \right)$$

$$L_n = \frac{n\lambda}{2}$$

$$f_b = |f_2 - f_1|$$

$$f_n = n f_o$$

$$\frac{\lambda}{w} \geq 1$$

### Constants

$$e = 1.6 \times 10^{-19} \text{ C}$$

$$m_{Earth} = 5.98 \times 10^{24} \text{ kg}$$

$$h = 6.626 \times 10^{-34} \text{ J} \cdot \text{s}$$

$$R_{Earth} = 6.38 \times 10^6 \text{ m}$$

$$L_v(H_2O) = 2.3 \times 10^6 \text{ J/kg}$$

$$m_{Sun} = 1.99 \times 10^{30} \text{ kg}$$

$$m_{proton} = 1.67 \times 10^{-27} \text{ kg}$$

$$n_{diamond} = 2.42$$

$$k = 9.0 \times 10^9 \text{ N} \cdot \text{m}^2/\text{kg}^2$$

$$\mu_o = 4\pi \times 10^{-7} \text{ T} \cdot \text{m/A}$$

$$\Delta d_{Earth-Sun} = 1.50 \times 10^{11} \text{ m}$$

$$g = 9.8 \text{ N/kg}$$

$$n_{water} = 1.33$$

$$c = 3 \times 10^8 \text{ m/s}$$

$$C_{H_2O} = 4.18 \times 10^3 \text{ J/kg} \cdot ^\circ \text{C}$$

$$\Delta d_{Earth-moon} = 3.85 \times 10^8 \text{ m}$$

$$m_{electron} = 9.11 \times 10^{-31} \text{ kg}$$

$$n_{zircon} = 1.92$$

$$G = 6.67 \times 10^{-11} \text{ N} \cdot \text{m}^2/\text{kg}^2$$

$$L_f(H_2O) = 3.3 \times 10^5 \text{ J/kg}$$

$$m_{moon} = 7.35 \times 10^{22} \text{ kg}$$