

$v = \sqrt{\tau / \mu}$ $y = y_m \sin(kx - \omega t)$ $v = \sqrt{B / \rho}$ $s = s_m \cos(kx - \omega t)$ $I = \frac{P_s}{4\pi r^2}$ $P_{avg} = \frac{1}{2} \mu \omega^2 v y_m^2$ $\Delta P = \Delta P_m \sin(kx - \omega t)$ $\Delta P_m = \rho v \omega S_m$ $I = \frac{1}{2} \rho (\omega S_m)^2 v$ $\beta = 10 \log \frac{I}{I_0}, I_0 = 10^{-12} W/m^2$ $f' = f \left(\frac{v \pm v_D}{v \mp v_s} \right)$ $y = \left(2y_m \cos \frac{\phi}{2} \right) \sin \left(kx - \omega t - \frac{\phi}{2} \right)$ $\Delta L = \frac{\lambda}{2\pi} \phi$ $\Delta L = m\lambda, m = 0, 1, 2, 3, \dots$ $\Delta L = \left(m + \frac{1}{2} \right) \lambda, m = 0, 1, 2, 3, \dots$ $y = 2y_m (\sin kx) (\cos \omega t)$ $f_n = \frac{nv}{2L}, n = 1, 2, 3, \dots$ $f_n = \frac{nv}{4L}, n = 1, 3, 5, \dots$ $\alpha = \frac{\Delta L}{L} \frac{1}{\Delta T}, \beta = \frac{\Delta V}{V} \frac{1}{\Delta T}$ $PV = nRT = NkT$ $W = \int P dV$ $W = n R T \ln (V_f / V_i)$ $v_{rms} = \sqrt{\frac{3RT}{M}}, \frac{1}{2} m v^2 = \frac{3}{2} kT$ $Q = mc\Delta T, Q = mL$ $\Delta E_{int} = Q - W, \Delta E_{int} = n C_v \Delta T$ $Q = n C_p \Delta T, Q = n C_v \Delta T$ $C_p - C_v = R, \gamma = C_p / C_v$ $P_{cond} = \frac{Q}{t} = \kappa A \frac{T_H - T_C}{L}$	$PV^\gamma = \text{constant}, TV^{\gamma-1} = \text{constant}$ $T_f = \frac{9}{5} T_c + 32, T_k = T_c + 273$ $W = Q_H - Q_L, \varepsilon = \frac{W}{Q_H} = 1 - \frac{Q_L}{Q_H}$ $K_{ref} = \frac{Q_L}{W}, K_{HP} = \frac{Q_H}{W}, \Delta S = \int \frac{dQ}{T}$ $\Delta S = nR \ln \frac{V_f}{V_i} + nC_v \ln \frac{T_f}{T_i}$ $F = \frac{kq_1 q_2}{r^2}, F = qE$ $U = -\vec{p} \cdot \vec{E}, \vec{\tau} = \vec{p} \times \vec{E}$ $\phi_c = \oint \vec{E} \cdot d\vec{A} = \frac{q_{in}}{\varepsilon_0}$ $\phi = \int_{Surface} \vec{E} \cdot d\vec{A}, E = \frac{kq}{r^2}$ $E = \frac{kQ}{R^3} r, E = \frac{2k\lambda}{r}$ $E = \frac{\sigma}{2\varepsilon_0}, E = \frac{\sigma}{\varepsilon_0}$ $\Delta V = V_B - V_A = -\int_A^B \vec{E} \cdot d\vec{s} = \frac{\Delta U}{q_0}$ $V = \frac{kQ}{r}, U_{12} = \frac{kq_1 q_2}{r_{12}}$ $E_x = -\frac{\partial V}{\partial x}, E_y = -\frac{\partial V}{\partial y}, E_z = -\frac{\partial V}{\partial z}$ $C = \frac{Q}{V}, C = \frac{\varepsilon_0 A}{d}$ $C = \frac{2\pi\varepsilon_0 L}{\ln(b/a)}, C = \frac{4\pi\varepsilon_0 ab}{b-a}$ $U = \frac{1}{2} CV^2, C_\kappa = \kappa C_{air}$ $I = \frac{dQ}{dt}, I = JA, J = nev_d$ $R = \frac{V}{I} = \rho \frac{L}{A}, J = \sigma E = E / \rho$ $\rho = \rho_0 [1 + \alpha(T - T_0)], P = IV$ $q(t) = C\varepsilon [1 - e^{-t/RC}], i(t) = \frac{\varepsilon}{R} e^{-t/RC}$ $q(t) = q_0 e^{-t/RC}, i(t) = \frac{q_0}{RC} e^{-t/RC}$	$\vec{F} = q(\vec{v} \times \vec{B}), \vec{F} = i(\vec{L} \times \vec{B})$ $\vec{\tau} = \vec{\mu} \times \vec{B}, \vec{\mu} = Ni\vec{A}$ $U = -\vec{\mu} \cdot \vec{B}$ $d\vec{B} = \frac{\mu_0}{4\pi} \frac{i d\vec{s} \times \vec{r}}{r^3}$ $\oint \vec{B} \cdot d\vec{s} = \mu_0 i_{enc}$ $B = \frac{\mu_0 i}{4\pi R} \phi, B = \frac{\mu_0 i}{2\pi r}$ $F_{ba} = \frac{\mu_0 L i_a i_b}{2\pi d}, B = \frac{\mu_0 i}{2\pi R^2} r$ $B_s = \mu_0 n i$ $\Phi_B = \int \vec{B} \cdot d\vec{A}$ $\varepsilon_{ind} = -\frac{d\Phi_B}{dt}, \varepsilon_{ind} = BLv$ <hr/> $\varepsilon_0 = 8.85 \times 10^{-12} C^2/N.m^2$ $k = 9.00 \times 10^9 N.m^2/C^2$ $q_e = -e = -1.60 \times 10^{-19} C$ $q_p = +e = +1.60 \times 10^{-19} C$ $m_e = 9.11 \times 10^{-31} kg$ $m_p = 1.67 \times 10^{-27} kg$ $\mu = \text{micro} = 10^{-6}, n = \text{nano} = 10^{-9}$ $p = \text{pico} = 10^{-12}$ $\mu_0 = 4\pi \times 10^{-7} Wb/A.m$ $k_B = 1.38 \times 10^{-23} J/K$ $N_A = 6.02 \times 10^{23} \text{ molecules/mole}$ $1 \text{ atm} = 1.01 \times 10^5 N/m^2$ $R = 8.31 J/mol.K$ $g = 9.8 m/s^2$ $1L = 10^{-3} m^3$ <hr/> <p>For water:</p> $L_f = 333 \text{ kJ/kg}$ $L_v = 2256 \text{ kJ/kg}$ $c = 4190 \text{ J/kg.K}$ <hr/> $\int x^n dx = \frac{x^{n+1}}{n+1}$ $v = v_o + at$ $v^2 = v_o^2 + 2a(x - x_o)$ $\Delta K = -\Delta U$ $\Delta U_g = mg\Delta y$
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