

Physics 102
Formula sheet for Final Exam
Spring Session 2003-2004(Term 032)

$$v = \sqrt{\frac{\tau}{\mu}} \quad v = \lambda f$$

$$v = \sqrt{\frac{B}{\rho}}$$

$$S = S_m \cos(kx - \omega t)$$

$$I = \frac{\text{Power}}{\text{Area}}$$

$$y = y_m \sin(kx - \omega t - \phi)$$

$$P = \frac{1}{2} \mu \omega^2 y_m^2 v$$

$$\Delta P = \Delta P_m \sin(kx - \omega t)$$

$$\Delta P_m = \rho v \omega S_m$$

$$I = \frac{1}{2} \rho (\omega S_m)^2 v$$

$$\beta = 10 \log \frac{I}{I_0}, \quad I_0 = 10^{-12} \text{W/m}^2$$

$$f' = f \left(\frac{v \pm v_D}{v \mp v_s} \right)$$

$$y = \left(2y_m \cos \frac{\phi}{2} \right) \sin \left(kx - \omega t - \frac{\phi}{2} \right)$$

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

$$\Delta L = n \frac{\lambda}{2} \quad n = 0, 2, 4, \dots$$

$$\Delta L = n \frac{\lambda}{2} \quad n = 1, 3, 5, \dots$$

$$\Delta L = m\lambda \quad \Delta L = \left(m + \frac{1}{2} \right) \lambda$$

$$f_n = \frac{n}{2L} \sqrt{\frac{\tau}{\mu}}, \quad n = 1, 2, 3, \dots$$

$$f_n = \frac{nv}{2L}, \quad n = 1, 2, 3, \dots$$

$$f_n = \frac{nv}{4L}, \quad n = 1, 3, 5, \dots$$

$$y = 2y_m \sin kx \cos \omega t$$

$$\alpha = \frac{\Delta L}{L} \frac{1}{\Delta T},$$

$$PV = nRT = NkT$$

$$\beta = \frac{1}{V} \frac{\Delta V}{\Delta T}, \quad n = \frac{m}{M} = \frac{N}{N_A}$$

$$Q = mL, \quad W = \int PdV,$$

$$P = \frac{2}{3} \frac{N}{V} \left(\frac{1}{2} m \vec{v}^2 \right), \quad v_{rms} = \sqrt{\frac{3RT}{M}}$$

$$\frac{1}{2} m \vec{v}^2 = \frac{3}{2} k_B T, \quad \Delta U = n c_v \Delta T$$

$$Q = m c \Delta T,$$

$$\Delta E_{int} = Q - W, \quad \Delta E_{int} = n c_v \Delta T$$

$$C_p - C_v = R$$

$$H = \frac{Q}{t} = \kappa A \frac{T_H - T_C}{L}$$

$$Q = n c_p \Delta T, \quad Q = n c_v \Delta T$$

$$P V^\gamma = \text{constant}, \quad T V^{\gamma-1} = \text{constant}$$

$$F = \frac{9}{5} C + 32, \quad K = C + 273$$

$$W = Q_H - Q_L, \quad \epsilon = \frac{W}{Q_H} = 1 - \frac{Q_L}{Q_H}$$

$$\frac{Q_L}{Q_H} = \frac{T_L}{T_H}, \quad (K)_{Ref} = \frac{Q_L}{W}$$

$$(K)_{\text{Heat-Pump}} = \frac{Q_h}{W}, \quad \Delta S = \int \frac{dQ_r}{T}$$

$$F = \frac{kq_1 q_2}{r^2}, \quad F = q_0 E$$

$$\phi = \int_{\text{Surface}} \vec{E} \cdot d\vec{A}, \quad E = \frac{kq}{r^2}$$

$$E = \frac{kQ}{R^3 r}, \quad E = \frac{2k\lambda}{r}$$

$$\Phi_c = \oint \vec{E} \cdot d\vec{A} = \frac{q_{in}}{\epsilon_0}$$

$$E = \frac{\sigma}{2\epsilon_0}, \quad E = \frac{\sigma}{\epsilon_0}$$

$$V = \frac{kQ}{r} \quad W = \Delta K = -\Delta U$$

$$\Delta V = V_B - V_A = - \int_A^B \vec{E} \cdot d\vec{S} = \frac{\Delta U}{q_0}$$

$$E_x = -\frac{\partial V}{\partial x}, \quad E_y = -\frac{\partial V}{\partial y}, \quad E_z = -\frac{\partial V}{\partial z}$$

$$U = \frac{kq_1 q_2}{r_{12}}, \quad C = \frac{Q}{V}, \quad C_o = \frac{\epsilon_0 A}{d}$$

$$C = 4\pi\epsilon_0 \frac{ab}{b-a}, \quad U = \frac{1}{2} CV^2$$

$$U = \frac{1}{2} \epsilon_0 E^2, \quad C = \kappa C_0, \quad E = \frac{E_0}{\kappa},$$

$$V = \frac{V_o}{\kappa}, \quad I = \frac{dQ}{dt}, \quad I = JA,$$

$$\kappa = \kappa$$

$$R = \frac{V}{I} = \rho \frac{L}{A}$$

$$\rho = \rho_0 [1 + \alpha(T - T_0)], \quad P = IV$$

$$q(t) = C\varepsilon [1 - e^{-t/RC}],$$

$$q(t) = q_0 e^{-t/RC}$$

$$d\vec{F} = i d\vec{s} \times \vec{B}, \quad r = \frac{mv}{qB}$$

$$F_{ba} = \frac{\mu_0 L i_a i_b}{2\pi d}$$

$$\vec{F} = q(\vec{v} \times \vec{B}), \quad \vec{F} = i(\vec{L} \times \vec{B})$$

$$d\vec{B} = \frac{\mu_0}{4\pi} \frac{i d\vec{s} \times \vec{r}}{r^3}, \quad \oint \vec{B} \cdot d\vec{s} = \mu_0 i_{enc}$$

$$B = \frac{\mu_0 i}{4\pi R} \varphi, \quad B = \frac{\mu_0 i}{2\pi r},$$

$$B = \frac{\mu_0 i}{2\pi R^2} r$$

$$B_s = \mu_0 \left(\frac{N}{L} \right) i = \mu_0 n i$$

$$\Phi_B = \int_{\text{Surface}} \vec{B} \cdot d\vec{A}$$

$$\epsilon = -\frac{d\Phi_B}{dt}, \quad \epsilon = BLv$$

$$\vec{v} = \vec{v}_o + \vec{at}$$

$$x - x_o = v_o t + \frac{1}{2} at^2$$

$$v^2 = v_o^2 + 2a(x - x_o)$$

$$\epsilon_0 = 8.85 \times 10^{-12} C^2/N.m^2$$

$$k = 9.0 \times 10^9 N.m^2/C^2$$

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

$$m_e = 9.11 \times 10^{-31} kg$$

$$m_p = 1.67 \times 10^{-27} kg$$

$$1 eV = 1.6 \times 10^{-19} J$$

$$1 cal = 4.186 J, \quad m = 10^{-3}$$

$$\text{micro} = 10^{-6}, \quad \text{nano} = 10^{-9}, \quad \text{pico} = 10^{-12}$$

$$\mu_0 = 4\pi \times 10^{-7} Wb/A.m$$

$$k = 1.38 \times 10^{-23} J/K$$

$$N_A = 6.02 \times 10^{23} \text{ molecules/mole}$$

$$1 \text{ atm} = 1.013 \times 10^5 N/m^2$$

$$R = 8.31 J/mol.K$$

$$\pi_i = \pi$$

$$g = 9.8 m/s^2$$

$$1 \text{ cal} = 4.186 \text{ Joule}$$