Physics 102
Formula sheet for Final Exam
Fall Session 2005-2006(Term 051)

Column 1:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$PV = nRT = NkT$$

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

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

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

Column 2:

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

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

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

$$C_p - C_v = R$$

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

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

$$PV^\gamma = constant, \quad TV^{\gamma-1} = constant$$

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

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

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

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

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

$$\varphi = \int_{Surface} \vec{E}.d\vec{A}, \quad E = \frac{kq}{r^2}$$

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

$$\varphi_c = \oint \vec{E}.d\vec{A} = \frac{q_{in}}{\varepsilon_0}$$

$$E = \frac{\sigma}{2\varepsilon_o}, \qquad E = \frac{\sigma}{\varepsilon_o}$$

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

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

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

$$U = \frac{kq_1 q_2}{r_{12}}, \quad C = \frac{Q}{V}, \quad C_o = \frac{\varepsilon_0 A}{d}$$

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

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

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

kappa= κ

Column 3:

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

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

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

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

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

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

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

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

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

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

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

$$\varphi_B = \int_{Surface} \vec{B}.d\vec{A}$$

$$\varepsilon = -\frac{d\varphi_B}{dt}, \quad \varepsilon = BLv$$

$$v = v_o + at$$

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

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

$\varepsilon_0 = 8.85 \times 10^{-12} C^2/N.m^2$

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

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

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

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

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

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

$micro = 10^{-6}, nano = 10^{-9},$

$pico = 10^{-12}$

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

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

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

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

$R = 8.31 J/mol. K$

$Pi = \pi$

$g = 9.8 m/s^2$

$1 cal = 4.186 Joule$