# *PHYS 102 – Formula sheet for Final Exam*
## *Summer Session 2004(Term 033)*

$v = \sqrt{\tau / \mu}$

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

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

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

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

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

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

$s = s_m \cos(kx - \omega t)$

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

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

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

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

$\beta = 10 \log \frac{I}{I_0}$

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

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

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

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$T_F = \frac{9}{5}T_C + 32, \; T_K = T_C + 273$

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

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

$Q = m\,L$

$\Delta E_{int} = Q - W$

$P_{cond} = k\,A\,\Delta T/L$

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$PV = nRT = NkT$

$W = \int P\,dV$

$W = n\,R\,T \ln (V_f/V_i)$

$v_{rms} = \sqrt{\frac{3RT}{M}}$

$\frac{1}{2}mv^2 = \frac{3}{2}k_B T$

$\Delta E_{int} = n\,C_v\,\Delta T$

$C_p - C_v = R, \; \gamma = C_p/C_v$

$Q = n\,C_p\,\Delta T$

$Q = n\,C_v\,\Delta T$

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

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

$\frac{Q_L}{Q_H} = \frac{T_L}{T_H}, \; K = \frac{Q_L}{W}$

$\Delta S = \int \frac{dQ}{T}$

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$F = \frac{kq_1q_2}{r^2}, \quad F = q_o\,E$

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

$v = v_o + at$

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

$U = -\vec{P}.\vec{E}, \; \vec{\tau} = \vec{P} \times \vec{E}$

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

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

$E = \frac{kQ}{R^3}r$

$E = \frac{2k\lambda}{r}$

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

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

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

$U = \frac{kq_1q_2}{r_{12}}$

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

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$C = \frac{Q}{V}, \quad C_o = \frac{\varepsilon_0 A}{d}$

$U = \frac{1}{2}CV^2, \; C = \kappa\,C_{air}$

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$I = \frac{dQ}{dt}, \quad I = J\,A$

$R = \frac{V}{I} = \rho\frac{L}{A}, \quad J = \sigma\,E$

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

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

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

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

$\vec{\tau} = \vec{\mu} \times \vec{B}, \quad \vec{\mu} = i\,\vec{A}$

$U = -\vec{\mu}.\vec{B}$

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

$B = \frac{\mu_o\,i}{4\,\pi\pi}\varphi, \; B = \frac{\mu_o\,i}{2\,\pi\pi}$

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

$B_s = \mu_o\,n\,i$

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$\Phi_B = \int \mathbf{B} \cdot d\mathbf{A}$

$\mathcal{E} = -\frac{d\Phi_B}{dt}, \; \mathcal{E} = BLv$

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

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

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

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

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

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

$I_0 = 10^{-12}\ W/m^2$

$1\ atm = 1.01 \times 10^{5}\ N/m^2$

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

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