# *Physics 102*
# *Formula sheet for Final Exam*
# *Spring Session 2003-2004(Term 031)*

$v = \sqrt{\frac{t}{ì}}$ $\quad v = ëf$

$v = \sqrt{\frac{B}{ñ}}$

$S = S_m \cos(kx - ùt)$

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

$y = y_m \sin(kx - ùt - ö)$

$P = \frac{1}{2} ì ù^2 y_m^2 v$

$ÄP = ÄP_m \sin(kx - ùt)$

$ÄP_m = ñvùS_m$

$I = \frac{1}{2} ñ(ùS_m)^2 v$

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

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

$y = \left(2y_m \cos\frac{ö}{2}\right) \sin\left(kx - ùt - \frac{ö}{2}\right)$

$ÄL = \frac{ë}{2ð} j$

$ÄL = n\frac{ë}{2}$ $\quad n = 0,2,4,....$ .

$ÄL = n\frac{ë}{2}$ $\quad n = 1,3,5,....$ .

$ÄL = më$ $\quad ÄL = \left(m + \frac{1}{2}\right)ë$

$f_n = \frac{n}{2L}\sqrt{\frac{ô}{ì}}, \quad n = 1,2,3,...$

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

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

$y = 2y_m \sin kx \cos ùt$

$á = \frac{ÄL}{L}\frac{1}{ÄT}$,

$PV = nRT = NkT$

$â = \frac{1}{V}\frac{ÄV}{ÄT}$ , $n = \frac{m}{M} = \frac{N}{N_A}$

$Q = mL$ , $W = \int P dV$ ,

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

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

$Q = m c \Delta T$ ,

$ÄE_{int} = Q - W$ , $ÄE_{int} = nc_v ÄT$

$C_p - C_v = R$

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

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

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

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

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

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

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

$F = \frac{kq_1q_2}{r^2}$ , $\quad F = q_0 E$

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

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

$ö_c = \oint \vec{E}.d\vec{A} = \frac{q_{in}}{å_0}$

$E = \frac{ó}{2å_o}$ , $\quad E = \frac{ó}{å_o}$

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

$W = \Delta K = -\Delta U$

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

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

$U = \frac{kq_1q_2}{r_{12}}$, $C = \frac{Q}{V}$ , $C_o = \frac{e_0 A}{d}$

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

$V = \frac{V_0}{ê}$, $I = \frac{dQ}{dt}$ , $I = J A$

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

$ñ = ñ_0[1 + á(T - T_0)]$, $\quad P = IV$

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

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

$u = \frac{1}{2} e_o E^2$

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

$F_{ba} = \frac{ì_o L i_a i_b}{2pd}$

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

$\vec{ô} = \vec{ì} \times \vec{B}$, $\quad \vec{ì} = i\vec{A}$

$d\vec{B} = \frac{ì_0}{4ð}\frac{i\, d\vec{s} \times \vec{r}}{r^3}$, $\oint \vec{B}.d\vec{s} = ì_0 i_{enc}$

$B = \frac{ì_0 i}{4ðR} j$ , $\quad B = \frac{ì_0 i}{2ðr}$,

$B = \frac{ì_0 i}{2ðR^2} r$

$B_s = ì_0 (\frac{N}{L}) i = ì_0 n i$

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

$å = -\frac{dö_B}{dt}$ , $\quad å = BL v$

---

$\vec{v} = \vec{v}_o + \vec{a}t$

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

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

---

$\varepsilon_0 = 8.85 \times 10^{-12}$ 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

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 = ð

g = 9.8 m/s$^2$

1 cal = 4.186 Joule