Formula Exam 1 - PH106

Electrostatic:

$Q = ne$
$F = k_e \frac{|q_1||q_2|}{r^2}$ $PE = k_e \frac{q_1 q_2}{r}$
$\vec{E} = \frac{\vec{F}}{q_0}$ $E = k_e \int \frac{dq}{r^2}$
$\lambda(x) = \frac{dq}{dl}$ $\sigma(x,y) = \frac{dq}{dA}$ $\rho(x,y,z) = \frac{dq}{dV}$
$\Phi(E) = \int \vec{E}\, d\vec{A}$ $\Phi(E) = EA\cos\theta$
$\Phi(E) = \frac{Q_{enc}}{\epsilon_0}$ for a close surface

$\Delta PE = PE_f - PE_i = -W_F = -\int_{x_i}^{x_f} F(x)dx = -q\int_{x_i}^{x_f} E(x)dx$
$\Delta V = V_f - V_i = \frac{\Delta PE}{q} = -\int_{x_i}^{x_f} E(x)dx.$
$V(x) = -\int_{\infty}^{x} E(x')dx'$
$E_x = -\frac{dV}{dx}$ $E_y = -\frac{dV}{dy}$ $E_z = -\frac{dV}{dz}$
$E = k_e \frac{q}{r^2}$ $V = k_e \frac{q}{r}$
$E = \frac{\sigma}{\epsilon_0}$ $\Delta V = -Ed$
$E = k_e Q \frac{1}{x(L+x)}$ $V = k_e \frac{Q}{L}\ln(\frac{x+L}{x})$
$V = k_e \int \frac{dq}{r}$

$C = \frac{Q}{\Delta V}$ $C = \epsilon_0 \frac{A}{d}$ $C = \frac{2\pi L \epsilon_0}{\ln(b/a)}$ $C' = kC$
$C = C_1 + C_2 + C_3 + ...$ $\Delta V = \Delta V_1 = \Delta V_2 = ...$ $Q = Q_1 + Q_2 + ...$ Parallel.
$\frac{1}{C_{eq}} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} + ...$ $\Delta V = \Delta V_1 + \Delta V_2 + ...$ $Q = Q_1 = Q_2 = ...$ Series.
$U = \frac{1}{2}Q\Delta V = \frac{1}{2}C(\Delta V)^2 = \frac{Q^2}{2C}$

From PH105:

$x(t) = x_0 + v_0 t + \frac{1}{2}at^2$ $v(t) = v_0 + at$ $v(t)^2 = v_0^2 + 2a\Delta x$ $\Delta x = [x(t) - x_0]$ $v_{av.} = \frac{v_i + v_f}{2}$
$a_c = \frac{v^2}{R}$ $a_t = \frac{dv_t}{dt}$ $\vec{a} = \vec{a_c} + \vec{a_t}$
$\sum_i \vec{F_i} = \vec{F}_{tot.} = m\vec{a}$ $\sum_i F_{ix} = ma_x$ $\sum_i F_{iy} = ma_y$
$\vec{p} = m\vec{v}$ $W = \int \vec{F} d\vec{x}$ $KE = \frac{1}{2}mv^2$ $I = \bar{F}t$
$\Delta KE = W = -\Delta PE$ $\Delta p = I$
$E_{Mech} = KE + PE$ $E_{Mech} = \text{const.}$ $\Delta E_{Mech} = 0$ $E_{Mech\,i} = E_{Mech\,f}$
$\vec{p_i} = \vec{p_f}$ $\vec{L} = \vec{r} \times \vec{p}$ $\vec{L_i} = \vec{L_f}$

$k_e = 8.99 \times 10^9$ $c = 3.00 \times 10^8$ $\epsilon_0 = 8.85 \times 10^{-12}$ $\mu_0 = 4\pi \times 10^{-7}$ $g = 9.81$
$e = 1.6 \times 10^{-19}$ $m_e = 9.11 \times 10^{-31}$ $m_p = 1.67 \times 10^{-27}$ $m_n = 1.67 \times 10^{-27}$