Formula sheet IV

$\vec{F} = m\vec{a}$

$\vec{F} = k\frac{q_1 \cdot q_2}{r^2}\hat{r}$

$\vec{\mathrm{F}} = q\vec{v} \times \vec{B}$

$\vec{\mathrm{F}} = I\vec{l} \times \vec{B}$

$\vec{E} = \frac{\vec{F}}{q}$

$\int \vec{E} \cdot d\vec{A} = \Phi = \frac{q}{\varepsilon_0}$

$\Delta V = \int \vec{E} \cdot d\vec{l}$

$\Delta \mathrm{V} = \mathrm{I}\,\mathrm{R}$

$\Delta \mathrm{U} = \Delta \mathrm{V} \cdot \mathrm{q}$

$\epsilon = -\frac{d\phi}{dt}$

$\epsilon = l\vec{v} \times \vec{B}$

$\vec{B} = \frac{\mu_0}{4\pi}\frac{I \cdot \vec{l} \times \hat{r}}{r^2}$

$\int \vec{B} \cdot d\vec{A} = \Phi_B = 0$

$\oint \vec{B} \cdot d\vec{l} = \mu_0 I$

$\oint \vec{E} \cdot d\vec{A} = \frac{Q}{\varepsilon_0}$

$\oint \vec{E} \cdot d\vec{A} = 0$

$\oint \vec{E} \cdot d\vec{l} = -\frac{d\Phi_B}{dt}$

$\oint \vec{B} \cdot d\vec{l} = \mu_0 \varepsilon_0 \frac{d\Phi_E}{dt}$

$\frac{d^2E}{dx^2} = \mu_0 \epsilon_0 \frac{d^2E}{dt^2}$

$k = 1/4\pi\varepsilon_0$

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

$k = 8.99 \times 10^9 (N \cdot m^2)/C^2$

For point charge: $V = \frac{kq}{r}$

For infinite long wire: $|E| = \frac{\lambda}{2\pi r \varepsilon_0}$

For infinite large metal plate: $|E| = \frac{\lambda}{2\varepsilon_0}$

For parallel charged plates (with same charge density on both sides): $|E| = \frac{\lambda}{\varepsilon_0}$

For disc: $|E| = \frac{\sigma}{2\epsilon_0}(1 - \frac{z}{\sqrt{z^2+r^2}})$

For ring: $|E| = \frac{\lambda z r}{2\epsilon_0 (r^2+z^2)^{3/2}}$

0° C = 273.15 K, $T_F = \frac{9}{5}T_C + 32°$

$\Delta L = L\alpha\Delta T$

$\Delta V = V\alpha\Delta T$

$Q = C\Delta T = cm\Delta T$

$Q = Lm$

$W = \int pdV$

$\Delta U = Q - W$

$\frac{Q_{cond}}{t} = kA\frac{\Delta T}{L}$

$\frac{Q_{rad}}{t} = \sigma\epsilon AT^4$

$PV = nRT = Nk_BT$

$R = 8.31$ J/mole K

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

$U = \frac{3}{2}Nk_BT$

$dS = \frac{d\bar{Q}}{T}$

$n_1 sin\theta_1 = n_2 sin\theta_2$

$\frac{1}{o} + \frac{1}{i} = \frac{1}{f}$

$\frac{x}{L} = sin\theta = \frac{\lambda}{d}$