Equations for Final Exam in 161 (Test 4 and Cumulative). More might be added, but this will be the minimal set:

$\varepsilon_o = 8.854\times10^{-12}\ C^2/(N\cdot m^2)$ $\quad 1/(4\pi\varepsilon_o) = 9.00\times10^{9}\ N\cdot m^2/C^2$

$W_{a\to b} = U_a - U_b \qquad K = \frac{1}{2}mv^2 \qquad a = \frac{v^2}{r}$

$W_{a\to b} = \int_a^b F\cdot dl$

MASS OF PROTON = 1.67×10^{-27} Kg

MASS OF ELECTRON = 9.11×10^{-31} Kg

CHARGE OF ELECTRON = $-e$

" " PROTON = $+e$

$e = 1.6\times10^{-19} C$

$1eV = 1.6\times10^{-19} J$

$\tau = RC$

$q = Q_f\left(1-e^{-t/RC}\right)$

$i = I_o e^{-t/RC}$

$U = \frac{Q^2}{2C} = \frac{1}{2}CV^2 = \frac{1}{2}QV$

$u = \frac{1}{2}\epsilon_o E^2 \qquad \epsilon = K\epsilon_o$

$E = \rho J \qquad R = \frac{\rho L}{A}$

$J = nqv_d \qquad J = \frac{I}{A}$

$\mu_o = 4\pi\times10^{-7}$

$\vec{B} = \frac{\mu_o}{4\pi}\frac{q\vec{v}\times\hat{r}}{r^2}$

$d\vec{B} = \frac{\mu_o}{4\pi}\frac{I\,d\vec{l}\times\hat{r}}{r^2}$

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

$\Phi_E = \int \vec{E}\cdot d\vec{A}$

$B = \frac{\mu_o I}{2\pi r}$; $B = \frac{\mu_o N I}{2\pi r}$; $B = \mu_o n I$

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

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

$B_x = \frac{\mu_o I a^2}{2(x^2+a^2)^{3/2}}$

$\vec{\tau} = \vec{\mu}\times\vec{B}$

$B = \frac{\mu_o I r}{2\pi R^2}$

$\oint \vec{B}\cdot d\vec{l} = \mu_o I_{enclosed}$

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

$i_D = \epsilon\frac{d\Phi_E}{dt}$

$T_C = T_K - 273.15$

$\Delta L = L_0 \alpha \Delta T$

$\Delta V = V_0 \beta \Delta T$

$pV = nRT$; $R = 8.315$

$\Delta U = Q - W$

$1\ atm = 1.013 \times 10^5\ Pa$

$Q = mL$

$Q = mc\Delta T = nC\Delta T$

$H = \dfrac{kA(T_H - T_C)}{L}$

$H = A\sigma e T^4$; $\sigma = 5.67 \times 10^{-8}$

$1\ calorie = 4.186\ J$

$K_{tr} = \frac{3}{2} nRT$

$m_{tot} = nM$; $M = N_A m$

Coefficient of linear expansion for Aluminum $= 2.5 \times 10^{-5}\ K^{-1}$

Thermal conductivity for:

Copper: 385 W/m.K

Steel: 50.2 W/m.K

Styrofoam: 0.01 W/m.K

Properties of Water:

Heat of fusion $= 3.34 \times 10^5 \frac{J}{kg}$

Heat of vaporization $= 2.256 \times 10^6\ J/kg$

Specific Heat (Liquid) $= 4190\ J/kg.K$

Specific Heat (ice) $= 2100\ J/kg.K$