Dr. Pete's useful stuff
College Physics II*

Electrostatics

$q = \pm ne$ $\quad k = \frac{1}{4pe_o}$ $\quad$ Point charges $F = \frac{k|q_1 q_2|}{r^2}$ $\quad E = \frac{kq}{r^2}$ $\quad U = \frac{kq_1 q_2}{r}$ $\quad V = \frac{U}{q} = \frac{kq_1}{r}$

$\vec{E} = \frac{\vec{F}}{q_o}$ (test charge q_o) $\quad \vec{E} = \sum \vec{E}_i$ $\quad \vec{F} = q\vec{E}$ $\quad E = \left|\frac{\Delta V}{\Delta x}\right|_{\max}$ $\quad \Delta V = \frac{\Delta U}{q_o} = \frac{W}{q_o}$ $\quad U = \sum U_i$ $\quad V = \sum V_i$

Parallel plates $E = \frac{Q}{eA}$ $\quad \Delta V = -Ed$ $\quad C = \frac{eA}{d}$ $\quad e = ke_o$ $\quad C = \frac{Q}{V}$ $\quad U_C = \frac{1}{2}CV^2 = \frac{1}{2}QV = \frac{1}{2}\frac{Q^2}{C}$

Circuits

junction $\sum I_i = 0$ $\quad$ loop $\sum V_i = 0$ $\quad \frac{1}{C_S} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} + \ldots$ $\quad C_P = C_1 + C_2 + C_3 + \ldots$

$t = RC$ $\quad I_{\text{rms}} = I_o/\sqrt{2}$ $\quad V_{\text{rms}} = V_o/\sqrt{2}$ $\quad R_S = R_1 + R_2 + R_3 + \ldots$ $\quad \frac{1}{R_P} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \ldots$

$I = \frac{\Delta q}{\Delta t}$ $\quad V = IR$ $\quad R = r\frac{L}{A}$ $\quad P = IV = \frac{V^2}{R} = I^2 R$ $\quad r = r_o(1 + a\Delta T)$

Magnetism

charge $F = qvB\sin q$ $\quad$ wire $F = ILB\sin q$ $\quad B = \frac{m_o I}{2p r}$ $\quad m = k_B m_o$

loops $t = NIAB\sin q$ $\quad B = \frac{m_o NI}{2r}$ $\quad$ solenoid $B = \frac{mNI}{L}$

Light

$c = lf$ $\quad E = hf$ $\quad$ reflection $q_i = q_r$ $\quad$ refraction $n_1 \sin q_1 = n_2 \sin q_2$ $\quad n = \frac{c}{v}$

Malus's law $I = I_o \cos^2 q$ $\quad$ total internal reflection $\sin q_c = \frac{n_t}{n_i}$ $(n_i > n_t)$

Brewster angle $\tan q_B = \frac{n_t}{n_i}$ $(n_i < n_t)$

$E = cB$ $\quad$ Doppler effect $f_o = f_s\sqrt{\frac{1 + v_{rel}/c}{1 - v_{rel}/c}} \approx f_s\left(1 + \frac{v_{rel}}{c}\right)$

single slit diffraction $a\sin q = ml$ $\quad m = \pm 1, \pm 2, \ldots$

double slit and diffraction grating $d\sin q = ml$ $\quad \text{m} = 0, \pm 1, \pm 2, \ldots$

Spherical mirrors and lenses

$m = \frac{h'}{h} = -\frac{q}{p}$ $\quad \frac{1}{p} + \frac{1}{q} = \frac{1}{f}$ $\quad P = \frac{1}{f}$ $\quad P = P_1 + P_2 + \ldots$ $\quad$ mirrors $|f| = \frac{R}{2}$

Quantum and Nuclear

Wien's displacement law $l_{\max} T = 2.90 \times 10^{-3}\ \text{m} \cdot \text{K}$

Planck's hypothesis $E_n = n(hf)$ $\quad$ Photoelectric effect $K_{\max} = hf - f$

Bohr atom $E_n = \frac{E_1}{n^2}$ $\quad (E_1 = -13.6\ \text{eV})$ $\quad r_n = a_o n^2$ $\quad (a_o = 52.9\ \text{pm})$ $\quad n = 1, 2, 3, \ldots$

Nuclear $A = N + Z$ $\quad E_o = mc^2$ $\quad r = r_o A^{1/3}$ $\quad (r_o = 1.2\ \text{fm})$ $\quad E_B = \Delta mc^2$