Useful Constants and Formulae

$c = 3.00 \times 10^8$ m/s

$N_A = 6.02 \times 10^{23}$ mole^{-1}

$|e| = 1.60 \times 10^{-19}$ C

$m_e = 9.11 \times 10^{-31}$ kg

$m_p = 1.67 \times 10^{-27}$ kg

1 u = 1.661×10^{-27} kg

1 u ≡ 931.5 MeV

$E = \Delta mc^2$

$r = r_0 A^{1/3}, \qquad r_0 = 1.2\,fm$

$k = 1/4\pi\varepsilon_o = 8.99 \times 10^9$ Nm^2/C^2

$\varepsilon_o = 8.85 \times 10^{-12}$ F/m or C^2/N.m^2

$\frac{dN}{dt} = -rN \;,\; t_{\frac{1}{2}} = \frac{\ln 2}{r}$

$N = N_O e^{-rt}$

$\vec{F} = \frac{kq_1q_2}{r^2}\hat{r}$

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

$\vec{E} = \frac{kq}{r^2}\hat{r}$

$\Phi_E = \oint \vec{E} \bullet d\vec{A} = \frac{Q}{\varepsilon_o}$

$V_B - V_A = -\int_A^B \vec{E} \cdot d\vec{s} = \frac{W_{AB}}{q}$

$\Delta V = Ed$

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

$q = C\Delta V$

$C = \frac{\kappa\varepsilon_o A}{d}$ // plate

$U_E = \frac{1}{2}C(\Delta V^2) \quad u_E = \frac{1}{2}\varepsilon_o E^2$

$I = \frac{dq}{dt}$

$\vec{J} = ne\vec{v}_d = \sigma\vec{E}$

$R = \frac{\rho l}{A}, \;\; \rho = \rho_o[1 + \alpha(T - T_o)]$

$P = I^2R$

$q = Q_0(1 - e^{-t/\tau}), \;\; \tau = RC$

$\vec{a} \times \vec{b} = \hat{i}(a_yb_z - a_zb_y) + \hat{j}(a_zb_x - a_xb_z) + \hat{k}(a_xb_y - a_yb_x)$

$|\vec{a} \times \vec{b}| = ab\sin\theta$

$g = 9.81$ m/s^2

$v = v_o + at$

$x = x_o + v_ot + \frac{1}{2}at^2$

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

$h = 6.63 \times 10^{-34}$ J.s

$E_n = \frac{-13.6}{n^2}(eV) = \frac{-E_1}{n^2}$

$\mu_o = 4\pi \times 10^{-7}$ H/m or T.m/A

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

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

$|\vec{B}(a)| = \frac{\mu_o I}{2\pi d}$

$\frac{F}{l} = \mu_o\frac{I_1I_2}{2\pi d}$

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

$B = \mu_o nI$

$\Delta V_H = \frac{IB}{tnq}$

$\varepsilon = -N\frac{d\Phi_B}{dt}$

$N\phi_B = LI$

$L = \mu_o n^2 lA$

$\Delta V = -L\frac{dI}{dt}$

$I = \frac{\varepsilon}{R}(1 - e^{-t/\tau}), \; \tau = L/R$

$U_B = \frac{1}{2}LI^2, \; u_B = \frac{1}{2}\frac{B^2}{\mu_0}$

$\frac{V_1}{V_2} = \frac{N_1}{N_2}$

$X_L = \omega L, \; Xc = \frac{1}{\omega C}$

$Z^2 = R^2 + (X_L - X_C)^2$

$\tan\theta = (X_L - X_c)/R$

$\overline{P} = I_{rms}V_{rms}\cos\phi$

$p = \frac{h}{\lambda}$

$\vec{a} \cdot \vec{b} = a_xb_x + a_yb_y + a_zb_z = ab\cos\theta$