PHYS 202 Spring 2002 Formula Sheet for Exam I

(Cutnell and Johnson Chapters 18 and 19)

circumference of circle $= 2\pi r$ area of circle $= \pi r^2$
area of cylinder $= 2\pi rl + 2\pi r^2$ volume of cylinder $= \pi r^2 l$
area of sphere $= 4\pi r^2$ volume of sphere $= \frac{4}{3}\pi r^3$
mass of electron $m_e = 9.11 \times 10^{-31}$ kg mass of proton $m_p = 1.67 \times 10^{-27}$ kg
$e = 1.60 \times 10^{-19}$ C 1 eV $= 1.60 \times 10^{-19}$ J

$k = 1/(4\pi\epsilon_0) = 8.99 \times 10^9$ N·m^2/C^2 $\epsilon_0 = 8.85 \times 10^{-12}$ C^2/N·m^2

$F = k|q_1 q_2|/r^2$ $\mathbf{E} = \mathbf{F}/q_0$ $E = k|q|/r^2$ $E = \sigma/\epsilon_0$

$\Phi_E = \sum(E\cos\phi)\Delta A = Q/\epsilon_0$

$W_{AB} = \text{EPE}_A - \text{EPE}_B$ $V = \text{EPE}/q_0$ $\Delta V = \Delta(\text{EPE})/q_0 = -W_{AB}/q_0$

$V = kq/r$

$q = CV$ $\kappa = E_0/E$ $C = \kappa\epsilon_0 A/d$

Energy $= \frac{1}{2}CV^2$ Energy density $= \frac{1}{2}\kappa\epsilon_0 E^2$

PHYS 202 Spring 2002 Formula Sheet for Exam II

(Cutnell and Johnson Chapters 20, 21, 22)

$I = \Delta q/\Delta t$ $V = IR$ $R = \rho L/A$

$\rho = \rho_0[1 + \alpha(T - T_0)]$ $R = R_0[1 + \alpha(T - T_0)]$

$P = IV = I^2R = V^2/R$

resistors: series $R_S = R_1 + R_2 + R_3 \ldots$ parallel $1/R_P = 1/R_1 + 1/R_2 + 1/R_3 \ldots$

capacitors: series $1/C_S = 1/C_1 + 1/C_2 + 1/C_3 \ldots$ parallel $C_P = C_1 + C_2 + C_3 \ldots$

RC: charging $q = q_0[1 - e^{-t/RC}]$ discharging $q = q_0 e^{-t/RC}$ $\tau = RC$

$F = B|q_0|v\sin\theta$ $F_c = mv^2/r$

$F = ILB\sin\theta$ $\tau = NIAB\sin\phi$

$B = \mu_0 I/(2\pi r)$ $B = N\mu_0 I/(2R)$ $B = \mu_0 nI$ $\mu_0 = 4\pi \times 10^{-7}$ T·m/A

$\sum B_{\parallel}\Delta l = \mu_0 I$

$\varepsilon = vBL$ $\Phi = BA\cos\phi$ $\varepsilon = -N\,\Delta\Phi/\Delta t$ $\varepsilon = NAB\omega\sin\omega t,\quad \omega = 2\pi f$

$N_s\Phi_s = MI_p$ $\varepsilon_s = -M\,\Delta I_p/\Delta t$ $N\Phi = LI$ $\varepsilon = -L\,\Delta I/\Delta t$

Energy $= \frac{1}{2}LI^2$ Energy density $= B^2/(2\mu_0)$

$V_s/V_p = N_s/N_p$ $I_s/I_p = V_p/V_s$