Version 2 Final Exam: Physics 1B Spring 2012, Dr. Michelsen. You may not bring in anything written. You will be given the following on the quiz:

You may find some of the following formulas and information useful:

$G = 6.67\times10^{-11}$ N-m^2/kg^2 $\quad g = 9.8$ m/s^2 $\quad$ electron mass $= 9.11\times10^{-31}$ kg

proton charge $= +1.6\times10^{-19}$ C $\quad k_e = 8.99\times10^{9}$ N-m^2/C^2 $\quad \varepsilon_0 = \dfrac{1}{4\pi k_e} = 8.85\times10^{-12}$ F/m

surface area of a sphere $= 4\pi r^2$ $\quad$ volume of a sphere $= \dfrac{4}{3}\pi r^3$

$x_f = x_i + v_i t + at^2/2$ $\quad$ torque: $\boldsymbol{\tau} = \mathbf{r}\times\mathbf{F}$ $\quad \mathbf{F}_e = k_e \dfrac{q_1 q_2}{r^2}\hat{\mathbf{r}}_{12}$

$\mathbf{E} \equiv \mathbf{F}_e / q_0 = k_e \sum_i \dfrac{q_i}{r_i^2}\hat{\mathbf{r}}_i$ $\quad \Phi_E = \mathbf{E}\bullet\mathbf{A} = 4\pi k_e q_{in} = \dfrac{q_{in}}{\varepsilon_0}$

$\Delta V = \dfrac{\Delta U}{Q} = -\int_A^B \mathbf{E}\bullet d\mathbf{r}$ $\quad V(\mathbf{r}) = k_e \dfrac{q}{|\mathbf{r}|}$ $\quad C \equiv \dfrac{Q}{\Delta V} = \dfrac{\varepsilon_0 A}{d}$ $\quad U = \dfrac{1}{2}C(\Delta V)^2 = \dfrac{1}{2}\dfrac{Q^2}{C}$

$R_{tot} = R_1 + R_2$ $\quad \dfrac{1}{R_{tot}} = \dfrac{1}{R_1} + \dfrac{1}{R_2}$ $\quad C_{tot} = C_1 + C_2$ $\quad \dfrac{1}{C_{tot}} = \dfrac{1}{C_1} + \dfrac{1}{C_2}$

$P \equiv \dfrac{\Delta E}{\Delta t} = (\Delta V) I$ $\quad \Delta V = IR$

$\mathbf{F}_B = I\boldsymbol{\ell}\times\mathbf{B}$ $\quad d\mathbf{B}(at\ P) = k_m \dfrac{I\, d\mathbf{s}\times\hat{\mathbf{r}}}{r^2}$, $\quad k_m = 10^{-7}$ T-m/A, $\quad |\mathbf{x}\times\mathbf{y}| = |\mathbf{x}||\mathbf{y}|\sin\theta$

$\mathbf{F}_B = q\mathbf{v}\times\mathbf{B}$ $\quad \mathbf{F}_{total} = q(\mathbf{E} + \mathbf{v}\times\mathbf{B})$ $\quad \mu_0 \equiv 4\pi k_m = 4\pi\times10^{-7}$ T-m/A $\quad \oint_{around} \mathbf{B}\cdot d\mathbf{s} = \mu_0 I_{through}$

$\Phi_B \equiv \iint_{area} \mathbf{B}\bullet d\mathbf{A}$ $\quad \mathcal{E} = \Delta V = -\dfrac{d\Phi_B}{dt}$ $\quad \Delta V = B\ell v$

You are expected to know Kirchoff's laws, since they follow from simple conservation principles, and the definition of current.

For this exam, you do *not* need to know $I = nqv_d A$, nor do you need to know the magnetic dipole vector, $\boldsymbol{\mu}$.