PHY 207 Practice Test II

Name: _____

Student ID: _____

Answer the first four problems. Partial credits are based on the clarity and the quality of the work you show.

$\vec{E} = \frac{kq}{r^2}\hat{r}$, $k = \frac{1}{4\pi\varepsilon_o} = 9\text{x}10^9\ \text{NM}^2\text{C}^{-2}$

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

$\oint \vec{E} \cdot d\vec{A} = \frac{Q_{in}}{\varepsilon_o}$

$V = \frac{kq}{r}, V = \int \frac{kdq}{r}$

$dV = \frac{dU}{q} = -\vec{E} \cdot dl = -(E_x dx + E_y dy + E_z dz),\ \vec{E} = -\nabla V = -(\frac{\partial V}{\partial x}\hat{i} + \frac{\partial V}{\partial y}\hat{j} + \frac{\partial V}{\partial z}\hat{k})$,

$V = Ed, C = \frac{Q}{V}, U = \frac{1}{2}\sum q_i V_i, U = \frac{1}{2}CV^2 = \frac{1}{2}\frac{Q^2}{C}, u_e = \frac{1}{2}\varepsilon E^2, \varepsilon = K\varepsilon_o$

$V = IR, P = IV = I^2R,\ I = \frac{dQ}{dt} = nqvA,\ J = \frac{I}{A},\ E = \rho J,\ R = \frac{\rho l}{A}, R = R_1 + R_2 + ..., \frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + ...$

$I = I_o \exp(\frac{-t}{RC})$

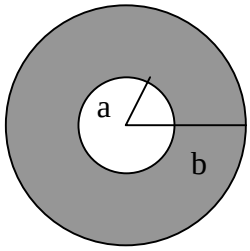
$F = qv \times B, dF = Idl \times B, \mu = NIA\hat{n}, \tau = \mu \times B$

$A_{sph} = 4\pi r^2, V_{sph} = \frac{4}{3}\pi r^3, dV_{sph} = 4\pi r^2 dr$

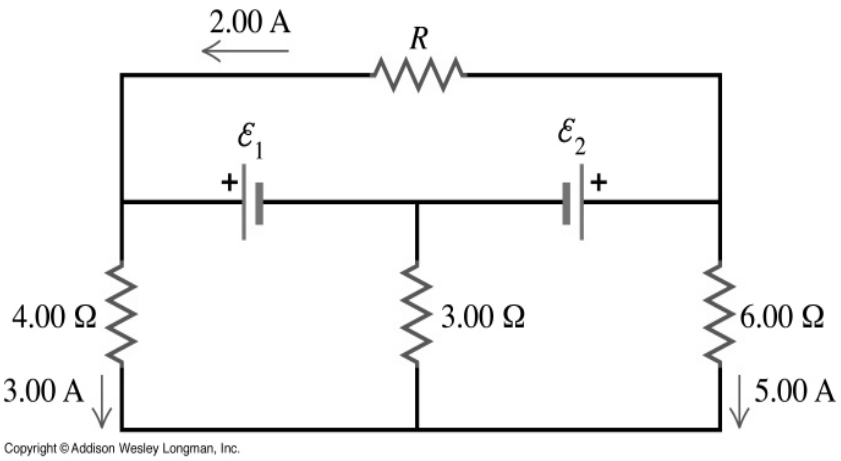
$A_{cyl} = 2\pi rL, A_{cir} = \pi r^2, dV_{cyl} = 2\pi r dr L$

$dq = \lambda dl = \sigma dA = \rho dV$

1. The region between two concentric conducting spheres with radii *a* and *b* is filled with a conducting material of resistivity ρ. A) Find the resistance between the two spheres.
B) If a current *I* flows from the inner sphere to the outer sphere, find the electric field at a given point in between the spheres (a<r<b).



2. In the circuit shown below, find a) the current in the 3.00-Ω resistor; b) the unknown emf's ε_1 and ε_2; c) the resistance R. Note the three currents are given.



3. A cylindrical capacitor of length L with inner radius a and outer radius b is charged with +Q on the inner cylinder and –Q on the outer one. A) Find the energy contained within a cylindrical shell of length L with radius r (a<r<b) and thickness dr. B) Find the total electric field energy.

4. A positive charge q and mass m with velocity v enters a region of uniform magnetic field B (into the paper), as shown. If the incident angle is θ. Find the exit angle Φ and the distance d in terms of given quantities.