

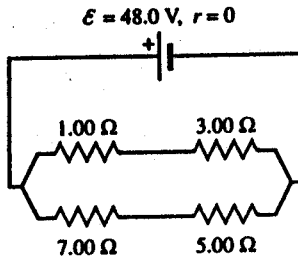
Exam IIA
Physics 208

March 10, 1998

Name _____

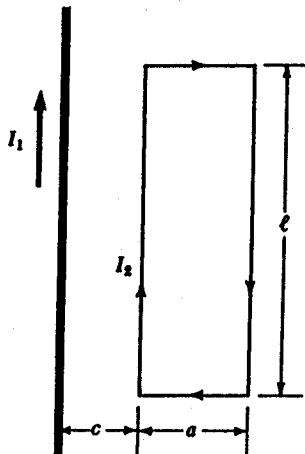
6 pts. 1a. In household wiring, copper wire 2.5 mm in diameter is often used. Find the resistance of a 25.0-m length of this wire.
 $\rho_{\text{cu}} = 1.72 \times 10^{-8} \Omega \cdot \text{m}$

10 pts. b. Compute the equivalent resistance of the network in the figure below and find the current in each resistor. The battery has negligible internal resistance.



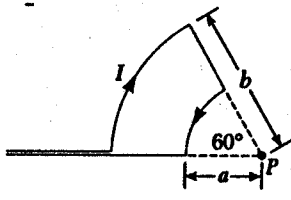
9 pts. c. A particle with a charge of $+3.0 \times 10^{-8} \text{ C}$ is moving with instantaneous velocity $\mathbf{v} = (-3.85 \times 10^4 \text{ m/s})\hat{i} + (4.19 \times 10^4 \text{ m/s})\hat{j}$. What is the force exerted on this particle by a magnetic field $\mathbf{B} = (1.40 \text{ T})\hat{j}$?

19 pts. 2a. For the arrangement shown in the figure below, the current in the long, straight conductor has the value $I_1 = 5 \text{ A}$ and lies in the plane of the rectangular loop, which carries a current $I_2 = 10 \text{ A}$. The dimensions are $c = 0.1 \text{ m}$, $a = 0.15 \text{ m}$, and $l = 0.45 \text{ m}$. Find the magnitude and direction of the net force exerted on the rectangle by the magnetic field of the straight current-carrying conductor.



6 pts. b. A capacitor with capacitance $C = 5 \times 10^{-10} \text{ F}$ is charged, with charge of magnitude $6 \times 10^{-8} \text{ C}$ on each plate. The capacitor is then connected to a voltmeter that has internal resistance $4.30 \times 10^5 \Omega$. What is the current through the voltmeter just after the connection is made?

25 pts. 3. Consider the current-carrying loop shown in the figure below formed of radial lines and segments of circles whose centers are at point P. find the magnitude and direction of the magnetic field B at P.



4. A deuteron (the nucleus of an isotope of hydrogen) has a mass of $3.34 \times 10^{-27} \text{ kg}$ and a charge of $+e$. The deuteron travels in a circular path with a radius of 4.52 cm in a magnetic field with magnitude 1.8 T .

8 pts. a. Find the speed of the deuteron.

9 pts. b. Find the time required for it to make one half of a revolution.

8 pts. c. Through what potential difference would the deuteron have to be accelerated to acquire this speed?