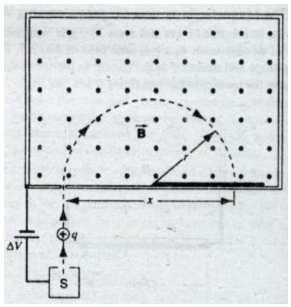
Name _____
Physics 51M Section ___ Box # _____
Problem Set 8
11 November 2019

Collaborators:

***HRK P32.6** Figure 32-40 shows an arrangement used to measure the masses of ions. An ion of mass m and charge $+q$ is produced essentially at rest in source S, a chamber in which a gas discharge is taking place. The ion is accelerated by potential difference $\triangle V$ and allowed to enter a magnetic field $\vec{B}$. In the field it moves in a semicircle, striking a photographic plate at distance x from the entry slit. Show that the ion mass m is given by $m = \frac{B^2 q}{8\triangle V} x^2$.



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HRK E33.13 Consider the circuit of Fig. 33-42. The curved segments are along the radii. Find the magnetic field $\vec{B}$ at P, assuming a current i in the circuit.

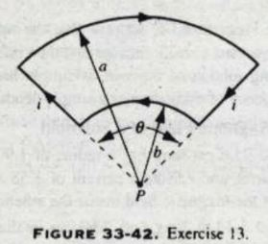

FIGURE 33-42. Exercise 13.

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HRK E33.15 Figure 33-43 shows a cross section of a long, thin ribbon of width w that is carrying a uniformly distributed total current i into the page. Calculate the magnitude and the direction of the electric field $\vec{B}$ at a point P in the plane of the ribbon at a distance d from its edge. (Hint: Imagine the ribbon to be constructed from many long, thin, parallel wires.)

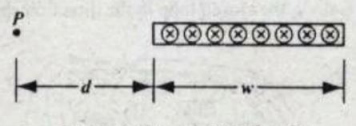

FIGURE 33-43. Exercise 15.

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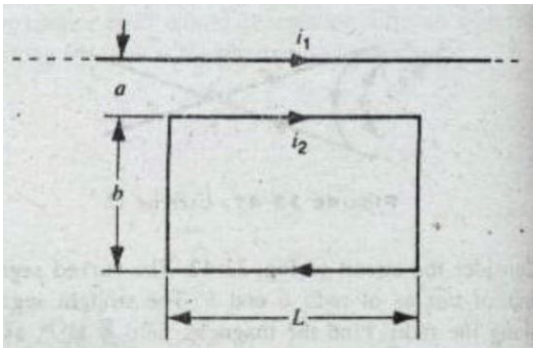
HRK E33.24 Figure 33-50 shows a long wire carrying a current i_2. Calculate the resultant force acting on the loop. Assume that $a = 1.10cm, b = 9.20cm, L = 32.3cm, i_1 = 28.6A$, and $i_2 = 21.8A$.



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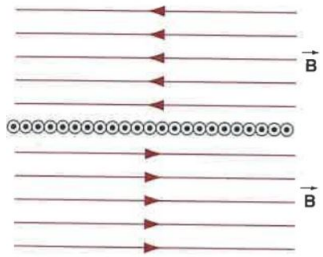
A conductor consists of an infinite number of adjacent wires, each infinitely long and carrying a current i. Show that the lines of $\vec{B}$ are as represented in the figure and that B for all points above and below the infinite current sheet is given by $B = \frac{1}{2}\mu_0 ni$, where n is the number of wires per unit length.



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HRK P33.13 The current density inside a long, solid, cylindrical wire of radius a is in the direction of the axis and varies linearly with radial distance r from the axis according to $j = \frac{j_0 r}{a}$. Find the magnetic field inside the wire. Express your answer in terms of the total current i carried by the wire.

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