Physics 1214, Homework #5 (due 10/3)

M1 An electron is moving directly towards you in a horizontal path when it suddenly enters a uniform magnetic field that is either vertical or horizontal. If the electron begins to curve upward in its motion just after it enters the field, you can conclude that the direction of the magnetic field is

A. upward.

B. downward.

C. to the left.

D. to the right.

M2 An electrical current is suddenly sent through a metal helical spring. The current will cause the coils of the spring to

A. push apart, elongating the spring.

B. pull together, compressing the spring.

C. remain the same, since the current will have no effect on the spring.

M3 A certain current produces a magnetic field B near the center of a solenoid. If the current is doubled, the field near the center will be

A. $4B$.

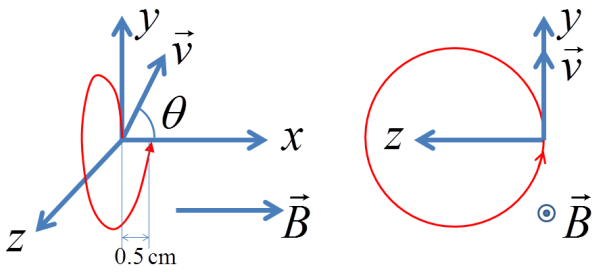
B. $2B$.

C. $B\sqrt{2}$.

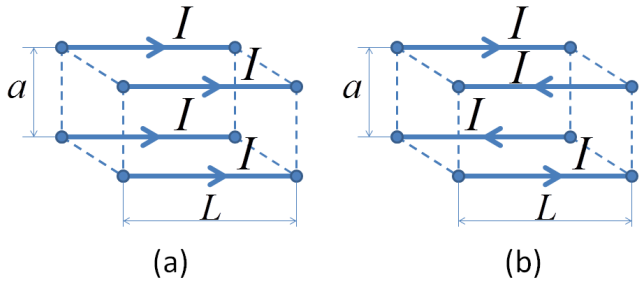
D. B.

Problems

P1 A magnetic field of 0.1 T is directed along the x axis as shown below. A chlorine anion particle of charge $q = -|e|$ and mass $m = 5.89 \times 10^{-26}$ kg is emitted at $\theta = 60°$ with respect to the x axis. After a full turn, the particle is found at 0.5 cm along the x axis. (a) What is the radius of the trajectory? (b) What is the particle'speed?



P2 Four wires of length $L = 1$ m are attached to the corners of two squares with side length $a = 1$ cm as shown below. Each wire carries a current of $I = 0.2$ A. Find the magnetic force acting on each wire for the cases (a) and (b).



P3 Two parallel long wires separated by 10 cm carry currents of 0.1 A and 0.4 A in the same direction. At what distance from each of the wires is the net magnetic field equal to zero?

P4 A solenoid of diameter 10 cm and length 20 cm is made of a 100 m long copper wire. If the current through the solenoid is 1 A, what is the magnetic field at the center of the solenoid?