Answer the questions in the spaces provided. If you run out of room for an answer, continue on the back of the page.

Name: _____

Course code and period: _____

1 Multiple Choice

1. A charged particle with mass m passes into a magnetic field parallel to the field. What is the magnetic force the particle experiences?

   A. 0 N B. $+\infty$ C. $-\infty$ D. m N E. 1 N

2. A space fighter is flying perpendicularly through an enemy defence magnetic field of 5.00×10^2 T at a speed of 1.00×10^3km/h, and is struck by a charged particle lance, charging the fighter with 175C. What is the magnitude of the net force experienced by the fighter?

   A. 0 N B. 2.43×10^4 N C. 8.75×10^7 N D. 2.43×10^2 N E. 1 N

3. What current is needed for a conductor of length 0.025m, perpendicular to (and fully in) a magnetic field with a strength of 0.10 T, to have a force of 1 N?

   A. 0 A B. 400 A C. 4 A D. 40 A E. 1 N

4. A solenoid of 16 turns that is 15cm long creates a magnetic field with a strength of 2.4×10^{-2} T. What is the current flowing through this solenoid?

   A. 179 A B. 1790 A C. 17900 A D. 1.79 A E. None of the above

5. For a straight conductor of length L and current I and at a distance r, which of the following would cause a doubling in magnetic field strength?

   A. Halving r to $\frac{1}{2}r$ B. Doubling I to $2I$ C. Halving L to $\frac{1}{2}L$ D. A and B E. None of the above

2 Full Solution

1. (6 points) A particle with mass m and charge e is launched out of a device with a velocity of v m/s into deep space. After a while, the particle enters a magnetic field with a strength of B [into page] at an angle of 45° above the horizontal. Please see Figure 1 for a diagram.

   (a) (1 point) Using the variables given above, what is the $\vec{F}_m$ experienced by the particle?

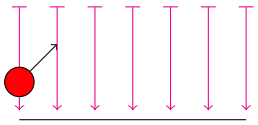

Figure 1: Particle and magnetic field

(b) (2 points) After a period of time, the particle settles into a rising circular orbit. Determine the radius of this orbit.

(c) (1 point) If the mass was halved to $\frac{m}{2}$ and the magnetic field was reversed to be [out of page], describe the new path the particle follows.

(d) (2 points) Determine the work done when the particle completes a $\frac{1}{4}$ revolution using the situation in (c).