Name: 09/23/13

Quiz #3: Magnetic Fields, Forces, and Lenz's Law

1. An electron is traveling to the right in a magnetic field directed out of the page. What is the direction of the force on the electron?
   a) Toward the bottom of the page
   b) toward the top of the page
   c) into the page
   d) out of the page
   e) there is no force.

2. A particle has a charge of 1×10^{-6} C. It moves at a speed of 3×10^{4} m/s through a magnetic field. The force on the particle is 0.09 N. What is the strength of the magnetic field?
   a) 0.333 T
   b) 3 T
   c) 30 T
   d) 1.2 T
   e) It cannot be determined from the given information.

3. A wire runs horizontally and carries current to the left. A magnetic field is directed toward the bottom of the page. What is the direction of the force on the wire?
   a) Into the page
   b) Out of the page
   c) to the left
   d) to the right
   e) toward the bottom of the page

4. A 2-meter long wire carries current current of 2 amps toward the bottom of the page. A magnetic field causes a force of 0.4N on the wire to the right. What is the strength and direction of the magnetic field?
   a) 0.1 T into the page
   b) 0.1 T out of the page
   c) 0.2 T into the page
   d) 0.2 T out of the page
   e) 1.6 T into the page

5. The solar wind is a stream of charged particles that flow outward from the sun. Some of these particles come close to the earth, and interact with the earth's magnetic field. When these particles strike the upper atmosphere, they case a phenomenon called Aurora. Which of the following formulas would be most appropriate for calculating quantities of this interaction?

   a) $\vec{F}_B = q\vec{v} \times \vec{B}$

   b) $\vec{F}_B = I\vec{\ell} \times \vec{B}$

   c) $\vec{F}_E = q\vec{E}$

   d) $F_E = \frac{k q_1 q_2}{r^2}$

   e) None of the above

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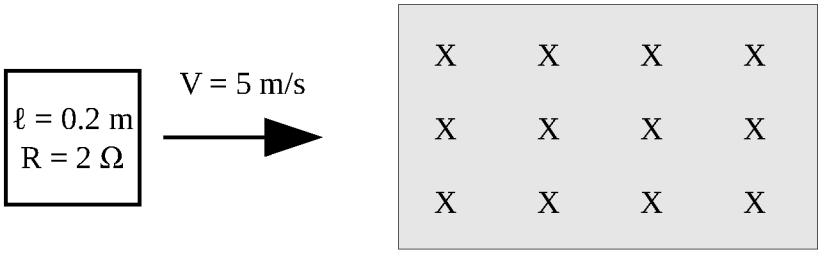
Questions 6-7 refer to this diagram. B = 3 T



6. A square of wire is moving toward a magnetic field, as shown above. As the square enters the magnetic field, what is the direction of the current induced in the loop?
   a) Clockwise
   b) Counterclockwise
   c) No current will flow
   d) It is not possible to determine for a square loop – it can only be circular.
   e) It cannot be determined with only the given information.

7. What is the magnitude of the current induced in the square as it enters the magnetic field?
   a) 0 A
   b) 0.75 A
   c) 1.5 A
   d) 3 A
   e) 6 A

8. A charged particle is moving to the left, and enters a region of both electric field, E=2000 N/C, directed toward the top of the page, and magnetic field, B = 2 T, directed out of the page. If the particle passes through the region without changing its path, its speed must be -
   a) 1000 m/s b) 50 m/s c) 1 m/s d) 0.001 m/s e) 0 m/s

9. Many navigators have noticed that during a thunderstorm, the ship's compass needle will sometimes spin in circles. This is best explained because -
   a) The ship is spinning, not the compass needle
   b) Lightning strikes create magnetic fields
   c) Friction between the ship and the water creates eddy-currents
   d) Air rushing past the ship causes an electrostatic buildup
   e) Raindrops block the magnetic field of the earth

10. What is the path that a charged particle will follow in a magnetic field?
    a) Linear
    b) Parabolic
    c) Circular or helical
    d) Hyperbolic
    e) It cannot be determined without knowing if the charge is negative or positive.