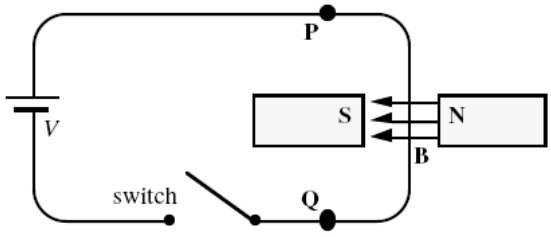
Name _____ IB Physics
Electromagnetics. Show Work and Diagrams to Get Full Credit.

1. A proton traveling due east in a region that contains only a magnetic field experiences a vertically *upward force* away from the surface of the earth. What is the direction of the magnetic field?
(a) north (c) south (e) down
(b) east (d) west

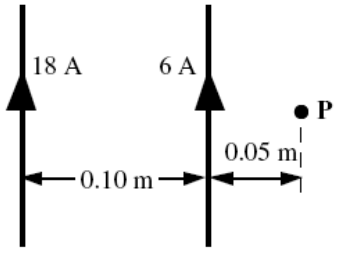
2. It is said that a *constant* magnetic field can do *no work* on a moving charged particle. Why is this so?
(a) The magnetic field is conservative.
(b) The magnetic force is a velocity dependent force.
(c) The magnetic field is a vector and work is a scalar quantity.
(d) The magnetic force is always perpendicular to the velocity of the particle.
(e) The electric field associated with the particle cancels the effect of the magnetic field on the particle.

3. An electron travels through a region of space with no acceleration. Which of the following statements could be true?
(a) Both **E** and **B** must be zero in that region.
(b) **E** must be zero, but **B** might be non-zero in that region.
(c) **E** and **B** might both be non-zero, but they must be mutually perpendicular.
(d) **B** must be zero, but **E** might be non-zero in that region.
(e) **E** and **B** might both be non-zero, but they must point in opposite directions.

4. A straight vertical segment of wire traverses a magnetic field of magnitude 2.0 T in the direction shown in the diagram. The length of the wire that lies in the magnetic field is 0.060 m. When the switch is closed, a current of 4.0 A flows around the circuit in the clockwise direction. What is the magnitude of the magnetic force acting on the wire?
(a) 0.12 N (c) 0.48 N (e) zero
(b) 0.24 N (d) 67 N



5. Two long, straight wires separated by 0.10 m carry currents of 18 A and 6 A in the same direction as shown. Determine the magnitude of the magnetic field at the point **P**.
(a) 2.4×10^{-5} T (c) 7.2×10^{-5} T e) zero
(b) 4.8×10^{-5} T (d) 9.6×10^{-5} T



6. An electron approaches a bar magnet as shown. Determine the direction of the Force on the electron. S N

(a) Left (b) Right (c) Into the page (d) Out of the page

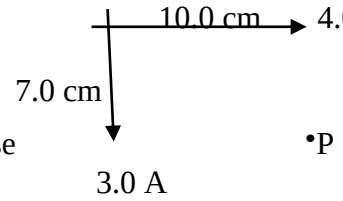
7. The two wires carrying current are perpendicular. Find the magnetic field at point P.

(a) 2.8×10^{-3} T, clockwise

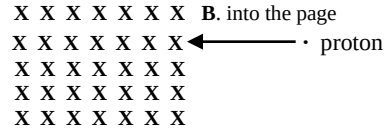
(b) 5.4 μT, into the page

(c) 5.4 μT, out of the page

(d) 4.5×10^{-3} T, counterclockwise



8. A proton with velocity 3.4 $x10^5$ m/s moves into a magnetic field of 2.5 T as shown. Find the radius of the circular path.



(a) 5.68 mm (b) 1.42 mm (c) 2.43 mm (d) not given

9. The current in a wire is 0.86 A, while the current in a parallel wire is 4.8 A. Both currents are in the same direction, and the wires are 2.5 cm apart. What is the value of the force per unit length on each wire?

(a) 5.6 $x10^{-5}$ N/m (c) 8.3$x10^{-5}$ N/m (e) not given

(b) 4.1 $x10^{-5}$ N/m (d) 3.3$x10^{-5}$ N/m

10. (Review) A circular loop of copper wire with current 6.4 A determines a magnetic field given by, $B = \mu_0 I/2r$. The area of the circle is 2.0 m^2. Find the magnitude of the magnetic field.