Name _____

PH 106-4 / LeClair Fall 2008

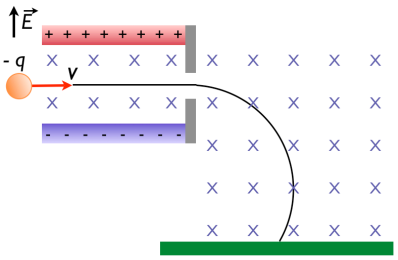
Quiz 6: magnetism ...

1. A loose spiral spring carrying no current is hung from the ceiling. When a switch is thrown so that a current exists in the spring, do the coils move

- □ closer together
- □ farther apart
- □ not at all
- □ we need to know the direction of the current

2. Consider a solenoid that is very long compared to the radius. Of the following choices, the most effective way to increase the magnetic field in the interior of the solenoid is to

- □ double its length, keeping the number of turns per unit length constant
- □ reduce its radius by half, keeping the number of turns per unit length constant
- □ overwrapping the entire solenoid with an additional layer of current-carrying wire.

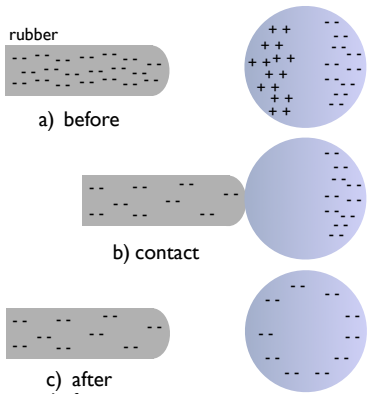


3. The figure shows a simplified mass spectrometer. Particles with charge q and mass m enter at left with a velocity v, and encounter a region with both an E and B field as shown. What is the relationship between v, B, and E for particles that make it through the aperture in the middle of the detector?

- □ $EB = v$
- □ $E/B = v$
- □ $E^2/B = v$
- □ $B/E = v$

4. Once the particle enters the second region of the detector from the previous question, it is in a region of magnetic field only. In this region, the particle travels in a circular path. What is the radius of the circle?

- □ $r = mB/qv$
- □ $r = qvB/m$
- □ $r = qB/mv$
- □ $r = mv/qB$



5. Permanent magnets sticking to a refrigerator door happens because the permanent magnet is able to induce magnetic poles in the steel of the door. This process is analogous to electrically charging objects by *induction*, where a charged object induces opposing charges in a conductor without contact.

Can a process like *conduction*, where a charged object transfers some of its charges to another, happen with magnets? Refer to the figure at left for the analogy.

- □ No, because there are no single magnetic charges.
- □ Yes, but it is a small effect due since $\mu_0 \ll \epsilon_0$
- □ Yes, this is how permanent magnets become magnetized
- □ No, because magnetic poles are not mobile.