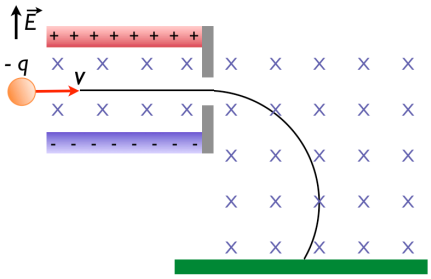
NAME & ID

PH 102 / LeClair Summer II 2010

Quiz 5: Magnets and Such

$$F_q = qvB\sin\theta_{vB} \qquad F_{centr} = \frac{mv^2}{r} \qquad F_q = qE$$

$$B_I = \frac{\mu_o I}{2\pi r} \qquad \mu_o = 4\pi \times 10^{-7}\,\mathrm{T\cdot m/A} \qquad e = 1.6 \times 10^{-19}\,\mathrm{C}$$



1. The figure at left 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?

2. Consider a proton moving with a speed of $1 \cdot 10^5$ m/s through the earth's magnetic field ($|\vec{\mathbf{B}}| = 55\,\mu$T). When the proton moves east, the magnetic force acts straight upward. When the proton moves northward, no force acts on it. What is the direction of the magnetic field? (*Note:* $\mu = 10^{-6}$.)

3. Two wires run parallel to each other and carry currents of 15 A in the same direction. What is the magnetic field halfway between the two wires?