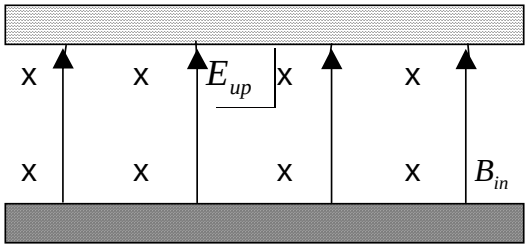
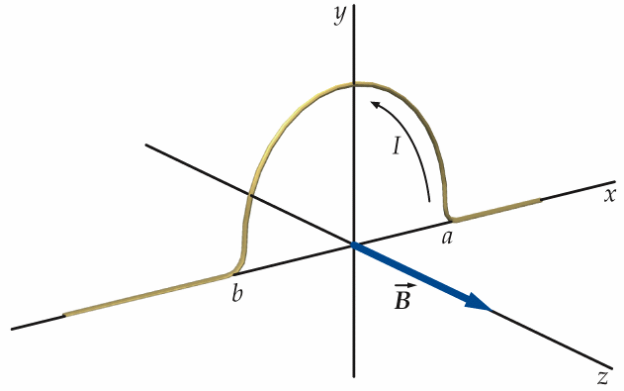
Chapter 28 Examples, Magnetic Forces

1) A proton moves at right angles to a magnetic field of 0.10 T with a speed of $2.0\times10^{7}\ m/s$. Find the magnitude of the proton's acceleration.

2) Using crossed Electric and Magnetic fields a velocity selector shoots out charged particles of a particular speed. (NOTE: This apparatus was part of Thomson's original experiment which he used in the late 1800's to discover the ratio of *e/m* for an electron.) Calculate the velocity of the selected particles for the set-up shown below. Your answer may be in terms of the mass of the selected charges is *m*, their charge *q*, and the Electric and Magnetic field strengths, *E* and *B*.



3) A wire bent into a semicircular loop of radius R lies in the xy plane. It carries a current I from point a to point b, as shown. There is a uniform magnetic field $\vec{B} = B\hat{k}$ perpendicular to the plane of the loop. Find the force acting on the semicircular loop part of the wire.



4) A singly charged positive ion has a mass of 2.5×10^{-26} kg. After being accelerated through a potential difference of 250 V, the ion enters a magnetic field of 0.50 T, in a direction perpendicular to the field. Calculate the radius of the path of the ion in the field, noting the direction of the magnetic force on the ion. NOTE: A typical *mass spectrometer* consists of a set-up like that described above.