Magnetic field and Magnetic forces and Different Interactions

1. A ^{7}Li nucleus has a charge equal to $+3e$ and a mass that is equal to the mass of seven protons. A ^{7}Li nucleus and a proton are both moving perpendicular to a uniform magnetic field. The magnitude of the momentum of the proton is equal to the magnitude of the momentum of the nucleus. Find the ratios of the path of radius of curvature R^{p} and R^{Li}.

2. Find the magnetic force on a proton moving in the $+x$ direction at a speed of 0.446 Mm/s in a uniform magnetic field of 1.75 T in the $+z$ direction.

3. A velocity selector has a magnetic field that has a magnitude equal to 0.28 T and is perpendicular to an electric field that has a magnitude equal to 0.46 MV/m. (*a*) What must the speed of a particle be for that particle to pass through the velocity selector undeflected? What kinetic energy must (*b*) protons and (*c*) electrons have in order to pass through the velocity selector undeflected?

4. A proton moves in a 65-cm-radius circular orbit that is perpendicular to a uniform magnetic field of magnitude 0.75 T. (*a*) What is the orbital period for the motion? (*b*) What is the speed of the proton? (*c*) What is the kinetic energy of the proton?

5. A 4.5 keV electron moves in a circular orbit that is perpendicular to a magnetic field of 0.75 T. (*a*) Find the radius of the orbit. (*b*) Find the frequency and period of the orbital motion.

6. An alpha particle (+2e) travels in a circular path of radius 0.50 m in a region with a magnetic field whose magnitude is 0.10T. Find (a) the period, (b) the speed, and (c) the kinetic energy (in electron volts) of the alpha particle. (The mass of an alpha particle is 6.65×10^{-27} kg).

7. A straight, 2.5-m wire carries a typical household current of 1.5 A (in one direction) at a location where the earth's magnetic field is 65.0 μT from south to north. Find the magnitude and direction of the force that our planet's magnetic field exerts on this wire if is oriented so that the current in it is running (a) from west to east, (b) vertically upward, (c) from north to south. (d) Is the magnetic force ever large enough to cause significant effects under normal household conditions?

8. A circular coil 0.0500 m in radius, with 30 turns of wire, lies in a horizontal plane ($\vec{\mu} \perp \vec{B}$). It carries a counterclockwise (as viewed from above) current of 5.00 A. The coil is in a uniform 1.20-T magnetic field directed toward the right. (i) Find the magnitudes of the magnetic moment and the torque on the coil. (ii) If the coil rotates from its initial orientation to vertical plane ($\vec{\mu} \parallel \vec{B}$) what is the change in potential energy?