Physics 200

Chapter 29: Magnetic Fields (Lecture Examples)

Ex:1   A proton has kinetic energy, K. What is the force of a magnetic field, B, on the proton if it is moving perpendicular to the field? What is the force of a magnetic field, B, on the proton if it is moving at an angle, θ, to the field?

Ex:2   What is the current in a piece of copper wire (mass, m) in a magnetic field, B, if it is levitated? The wire has length, L.

Ex:3   Calculate the force on a semi-circular section of wire that has a current and is in the presence of a magnetic field that lies in the same plane as the wire section.

Ex:4   Calculate the torque on a rectangular loop when the loop has a current and is in a magnetic field.

Ex:5   The top of a current carrying loop is hinged to the ceiling and a weight is suspended from the bottom of the loop. The loop has no mass, "N" coils with a radius, r, and a current, I. The mass of the hanging weight is "m". There is a vertical magnetic field, B. What angle does the plane of the loop make with the vertical?

Ex:6   An electron with kinetic energy, K, moves in a circle of radius, a. Find the strength of the magnetic field. (assume that the plane of the circle and the field are perpendicular)

Ex:7   What is the oscillation frequency of the electron in Example 6?

Ex:8   If a proton and a deuterium nuclei both have speed, v, when they enter a magnetic field, B, what is the radius of the circle each makes?

Ex:9   What is the maximum electron kinetic energy of a cyclotron which has radius, a, and a magnetic field, B?

Ex:10 An electric field, E, and a magnetic field, B, cause a Helium nucleus to move in a straight line. What is the speed of the nucleus?