Magnetic Field Sources

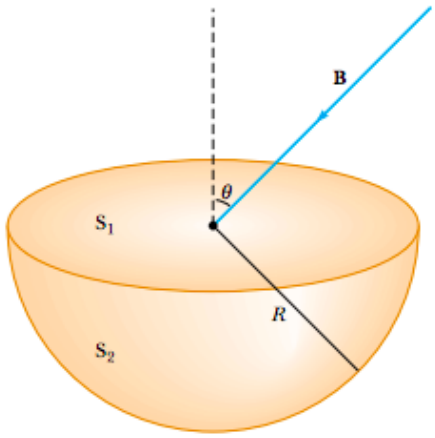
PHYSICS 202

NAME: SECTION:

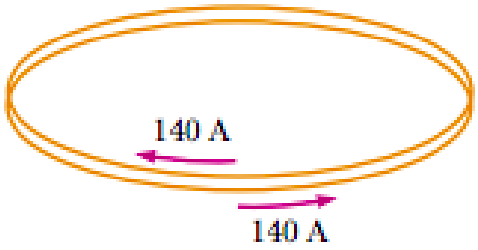
Problem 1. A solenoid 10.0 cm in diameter and 75.0 cm long (long enough to be treated as an infinite solenoid) is made from copper wire of diameter 0.100 cm, with very thin insulation. The wire is wound onto a cardboard tube in a single layer, with adjacent turns touching each other. What power must be delivered to the solenoid if it is to produce a field of 8.00 mT at its center?

$\rho_{copper} = 1.7 \times 10^{-8}\ \Omega \cdot m$

Problem 2. Consider the hemispherical closed surface below. The hemisphere is placed in a uniform magnetic field that makes an angle θ with the vertical. Calculate the magnetic flux through (a) the flat surface S_1 and (b) the hemispherical surface S_2.



Problem 3. Two circular loops are parallel, coaxial, and almost in contact, 1.00 mm apart. Each loop is 10.0 cm in radius. The top loop carries a clockwise current of 140 A. The bottom loop carries a counterclockwise current of 140 A. (a) Calculate the magnetic force exerted by the bottom loop on the top loop. (b) The upper loop has a mass of 0.0210 kg. Calculate its acceleration, assuming that the only forces acting on it are the force in part (a) and the gravitational force. Hint: From the point of view of one loop, the other loop looks like an infinite wire.



Problem 4. A magnet attracts a piece of iron. THe iron can then attract another piece of iron. On the basis of domain alignment, explain what happens to each piece of iron.